VVT Bypass II Controller

Installation and Start-up Guide



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

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Introduction

What is a VVT Bypass II?

The VVT Bypass II (#OPN-VVTBP-02), a component of the i-Vu® Control System, regulates the supply duct static pressure by controlling one of the following:

- The system's bypass damper
  The controller's damper actuator provides 45 in/lbs (5 Nm) of torque. If the actuator's torque is insufficient, the VVT Bypass II can be used to drive an external high-torque actuator. Or, the controller can drive multiple external damper actuators.
- The air source supply fan's variable frequency drive (VFD)

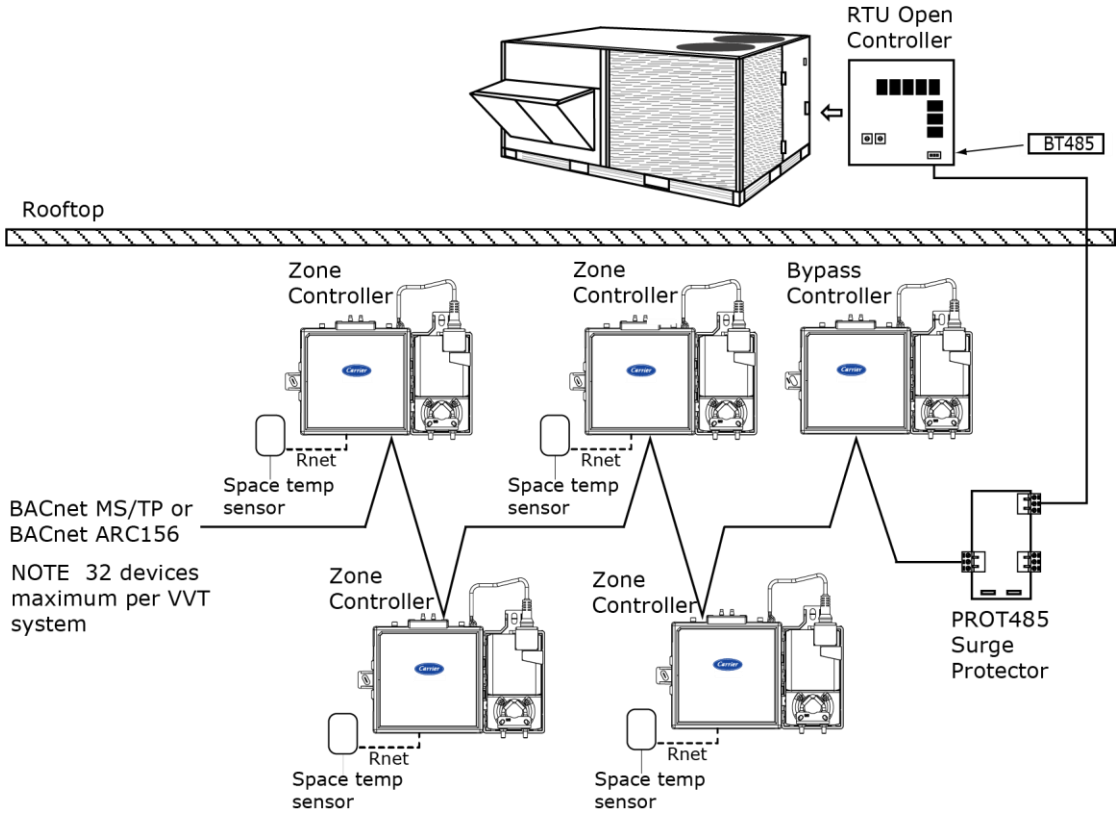
NOTE The VVT Bypass II controller is available in both English or Metric units. The metric version has (-M) appended to the part number. Everything in this document applies to both versions.

The i-Vu Control System uses linkage to exchange data between the zone terminals and their air source to form a coordinated HVAC system. The system's air source controller, zone controllers, and bypass controller are linked so that their data exchange can be managed by one zone controller configured as the VVT Master.

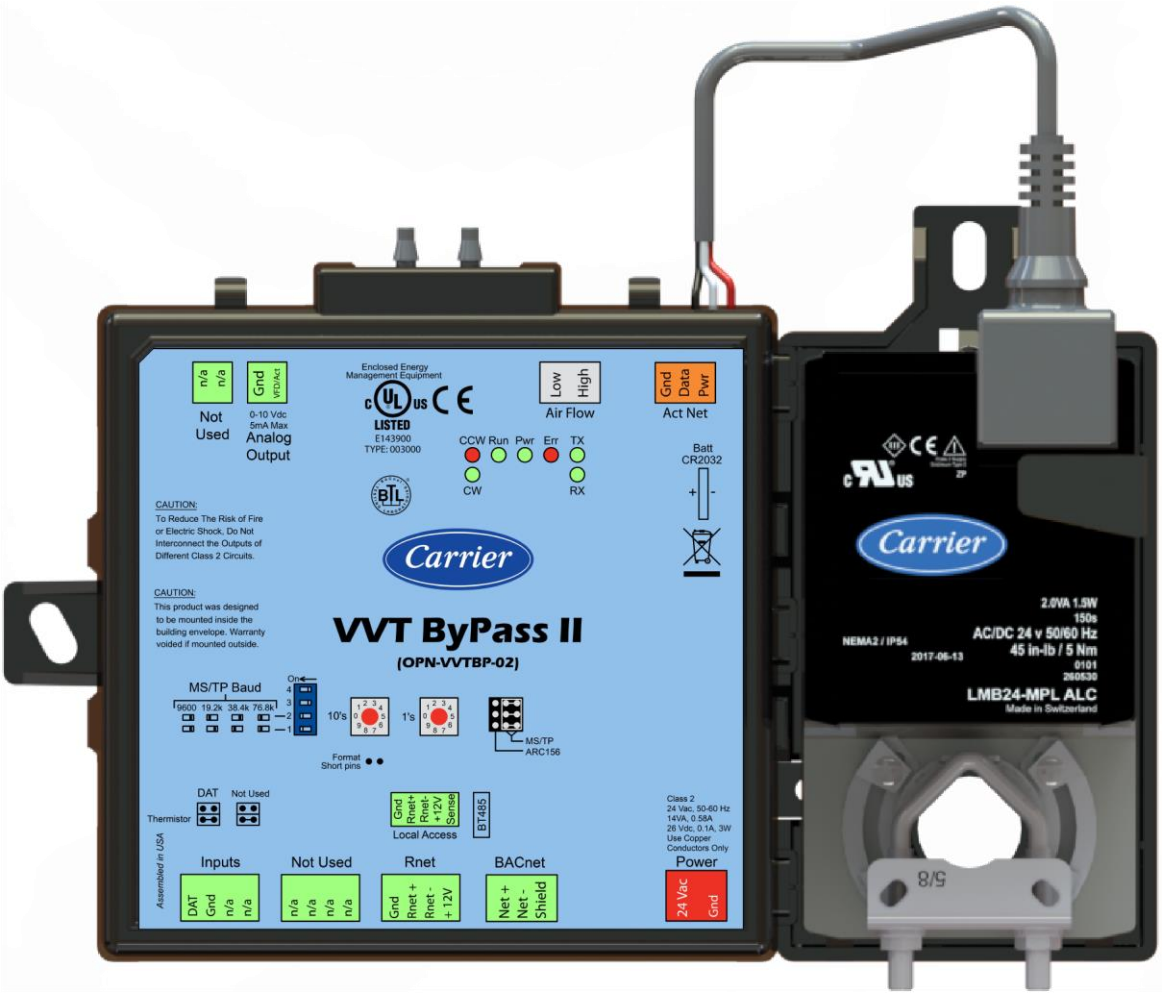
You can disconnect the actuator from the controller and mount them separately, connecting them with just the actuator cable or using an additional extension cable, up to a maximum distance of 300 feet.

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The following illustration shows the VVT Bypass II in a typical i-Vu® Control System.



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NOTE This document gives instructions for field-installation of a VVT Bypass II in an i-Vu® Control System.

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Specifications

Driver	drv_bpopn02
Power	24 Vac ±10%, 50–60 Hz 14 VA power consumption 26 Vdc (25 V min, 28.8 V max), 3W Single Class 2 source only, 100 VA or less
Actuator	Belimo brushless DC motor, torque 45 inch-pounds (5 Nm), runtime 154 seconds
Act Net port	To connect the actuator cable and the VVT Bypass II
BACnet port	For communication with the controller network using BACnet ARC156 (156 kbps) or BACnet MS/TP (9600 bps – 76.8 kbps)
Rnet port	You can connect: One Equipment Touch, using an external 24 Vac power supply or One TruVu™ ET Display, using an external 24 Vdc power supply
Local Access port	For system start-up and troubleshooting
Input	1 input for connecting the Duct air temperature sensor (#33ZCSENDAT)
Input resolution	10 bit A/D
Analog output	1 analog output, 0–10 Vdc (5 mA max). The controlled device must have a minimum of 2000 Ohms resistance measured from its input to ground and must share the same ground as the controller.
Output resolution	8 bit D/A
Integral airflow sensor	Precision differential pressure sensor 0–2 in. H20, sensitive down to ±0.001 in. H20. Barbed tapered airflow connections accept 3/16 in. (4.75 mm) I.D. tubing. Allows for readings across the 0–2 in. H20 range, accurate to ±5% of full flow at 2 in. H20.
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. Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec. **CAUTION** To protect against large electrical surges on serial EIA-485 networks, place a PROT485 at each place wire enters or exits the building.
BT485 connector	Attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment.
Status indicators	LEDs indicate status of communications, running, errors, power, and digital outputs

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Environmental operating range	32 to 130°F (0 to 54.4°C), 10–90% relative humidity, non-condensing
Storage temperature range	-24 to 140°F (-30 to 60°C), 0 to 90% relative humidity, non-condensing
Physical	Fire-retardant plastic ABS, UL94-5VA
Controller and actuator overall dimensions	Width: 8.9 in. (22.7 cm) Height: 5.9 in. (15.0 cm)
Controller and actuator mounting dimensions	7.1 in. (18.0 cm) from left side controller mounting hole centerline to actuator mounting hole centerline
Controller overall dimensions	Width: 6.4 in. (16.3 cm) Height: 5.7 in. (14.5 cm) Depth: 2.1 in. (5.3 cm)
Controller mounting dimensions	5.3 in. (13.4 cm) from left side controller mounting hole centerline to right side controller mounting hole centerline
Actuator overall dimensions	Width: 3.0 in. (7.6 cm) Height: 5.9 in. (15.0 cm) Depth: 2.5 in. (6.4 cm)
Actuator mounting dimensions	4.4 in. (11.2 cm) from shaft centerline to actuator mounting hole centerline
Panel depth	2.5 in. (6.4 cm) minimum
Shaft dimensions	Minimum shaft diameter: .25 in. (.64 cm) Maximum shaft diameter: .63 in. (1.59 cm) Minimum shaft length: 1.75 in. (4.45 cm)
Weight	1.8 lbs (0.82 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 B, CE
Compliance	Europe: CE Mark, UK: UKCA EN50491-5-2:2009; Part 5-2: EMC requirements for HBES/BACS used in residential, commercial and light industry environment RoHS Compliant: 2015/863/EU REACH Compliant

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Safety Considerations

CAUTION

Air conditioning equipment will provide safe and reliable service when operated within design specifications. The equipment should be operated and serviced only by authorized personnel who have a thorough knowledge of system operation, safety devices, and emergency procedures.

Good judgment should be used in applying any manufacturer's instructions to avoid injury to personnel or damage to equipment and property.

WARNING Electrical Shock Hazard

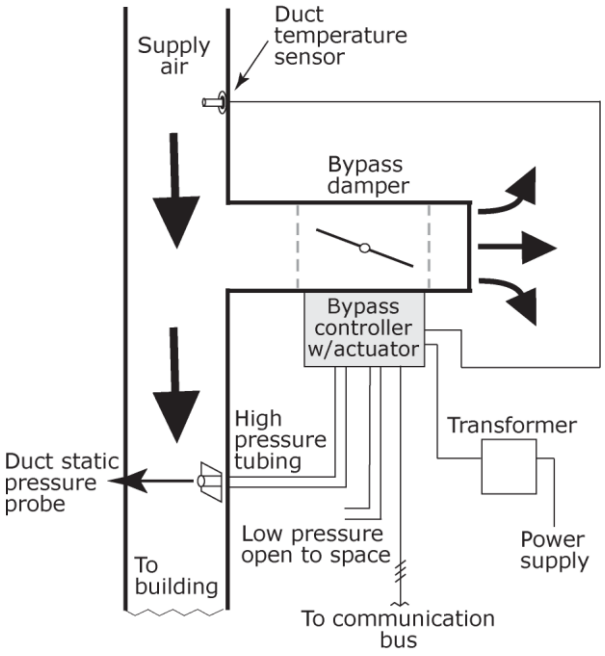
Failure to follow this warning could cause personal injury, death, and/or equipment damage.

Disconnect all power to the unit before performing maintenance or service. Unit may automatically start if power is not disconnected.

WARNING Follow all local, state, and federal laws regarding disposal of equipment containing hazardous materials such as mercury contactors.

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Installing the VVT Bypass II



To install the VVT Bypass II:

1 *Mount the controller* (page 8).

2 *Wire the controller for power* (page 12).

3 *Set the controller's address* (page 13).

4 *Wire the controller to the BACnet MS/TP or BACnet ARC156 network* (page 14).

5 *Wire the inputs and outputs* (page 15).

Field-supplied hardware

Each VVT Bypass II installation requires the following field-supplied components:

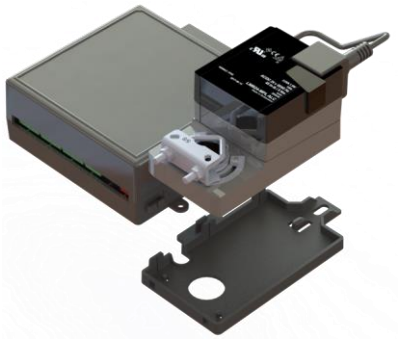
- damper
- damper actuator (if high-torque actuator or slaved dampers are required)
- duct air temperature sensor
- transformer— 24 Vac, 40VA
- wiring

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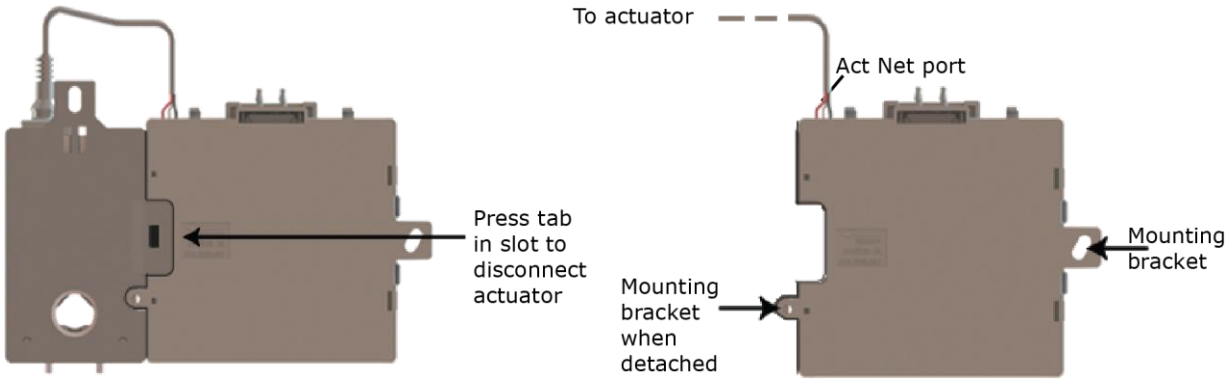
Mounting the VVT Bypass II

To mount the controller and actuator

To disconnect and mount the controller and actuator separately



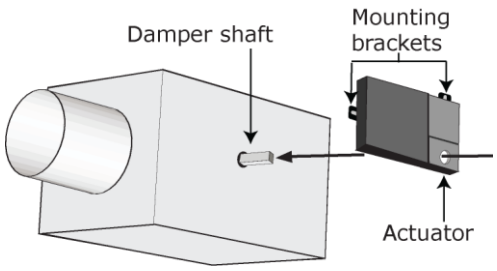
Disconnect the actuator from the controller by inserting a screw driver in the slot on the back of the VVT Bypass II and pressing the tab. The actuator cable or an attached extension cable must connect to the controller's **Act Net** port.



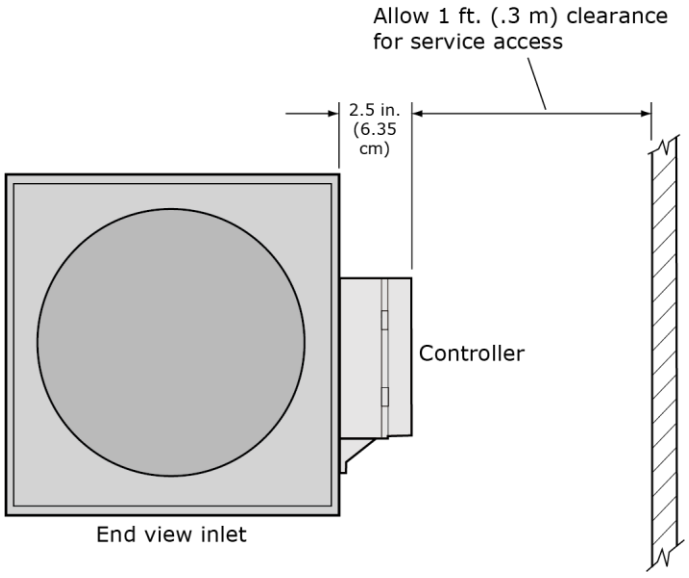
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1 Turn the damper shaft to fully close the damper position. Ensure the damper is closed.

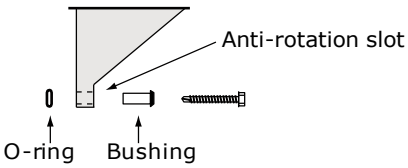
2 Mount the controller to the VVT terminal by sliding the clamp assembly onto the damper shaft.



NOTE For service access, allow at least 1 foot (.3 m) of clearance between the front of the controller and adjacent surfaces.



3 Secure the controller and the actuator by installing the screws, anti-rotation slot's bushings, and o-rings that are supplied with the VVT Bypass II.



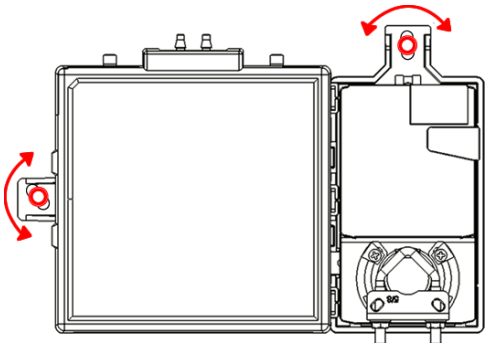
NOTES

- Center the bushing in the slot. Failure to do so may cause the actuator to stick or bind.
- The VVT Bypass II must be secured, but loose enough to allow movement. of the damper shaft.

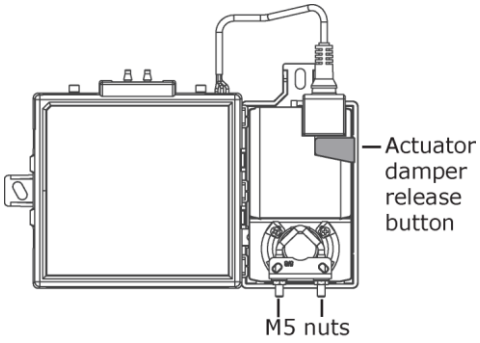
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CAUTIONS

- You **must** use the screws, anti-rotation slot's bushings, and o-rings that are shipped with the VVT Bypass II.
- Overtightening the screws so that the controller and actuator cannot move may damage the unit.



4 Hold down the controller's damper release button and rotate the actuator clamp in the same direction that closed the damper. Rotate the clamp until it stops, then rotate it back one notch.



5 Release the button.

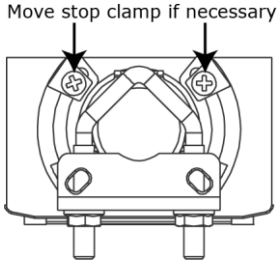
6 Tighten the actuator clamp to the damper shaft by tightening the two M5 nuts.

7 Hold down the actuator damper release button and rotate the damper from fully closed to fully open. If the damper traveled less than 90 degrees, do the following to set the actuator's fully open position:

a) Loosen the appropriate stop clamp screw. See figure below.

b) Move the stop clamp until it contacts the edge of the actuator cam.

c) Tighten the screw.



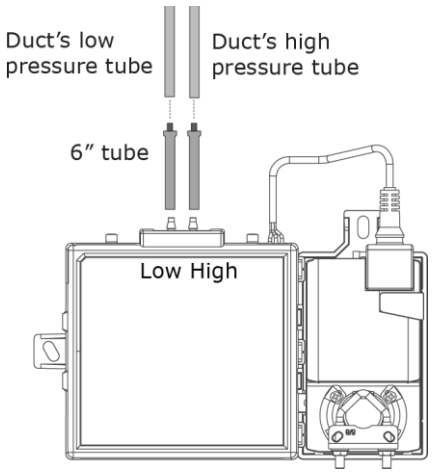
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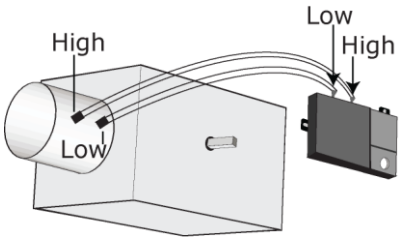
8 Hold down the actuator damper release button, rotate the damper to verify that it fully opens and closes, then release the button.

9 Connect the tube provided to the controller's **High** connector. Using 1/4" poly tubing, connect the other end to a duct static pressure probe (for example, Dwyer Instruments part #A-491, or the equivalent, for a 6" length probe) located in the supply air duct downstream of the bypass damper, but before the first branching of ductwork.

NOTE Tubing should be at least 2 ft. (.61 meters) long for stable airflow measurement. The combined high and low tubing length should not exceed 16.4 ft. (5 meters) in order to ensure accurate measurements.

10 Connect the controller's **Low** connector to open space for plenum return or to a room space if using ducted return.





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Wiring the VVT Bypass II for power

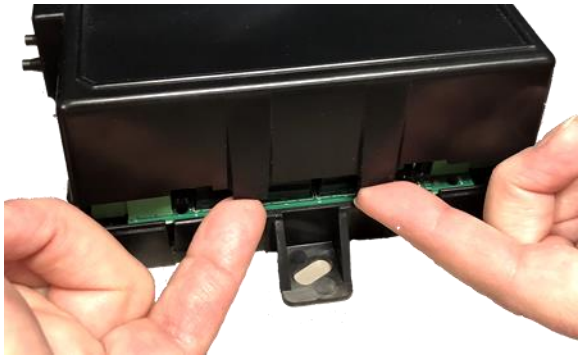
WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

CAUTIONS

- The VVT Bypass II 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.

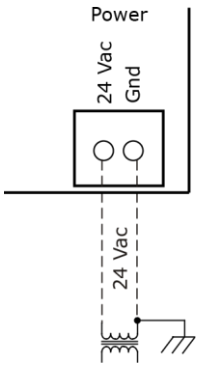
To wire the controller for power

1 To access the screw terminal connectors, lift up the controller's cover by pulling the tabs located on both sides of the controller's left mounting bracket.



2 Remove power from the power supply.

3 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.



4 Connect the transformer wires to the screw terminal connector.

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5 Apply power to the power supply.

6 Measure the voltage at the VVT Bypass II's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.

7 Connect a 4-inch (10.2 cm) wire from **Gnd** to the control panel.

8 Insert the screw terminal connector into the VVT Bypass II's power terminals.

9 Verify that the **Power** LED is on and the **Run** LED is blinking.

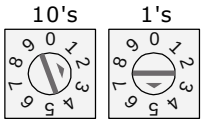
Addressing the VVT Bypass II

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

1 If the VVT Bypass II has been wired for power, pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**. The controller reads the address each time you apply power to it.

2 Using the rotary switches, set the controller's address. Set the **Tens** (**10's**) switch to the tens digit of the address, and set the **Ones** (**1's**) switch to the ones digit.

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



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

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Wiring for communications

The VVT Bypass II 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

WARNING Attaching any ARCNET or MS/TP network to the **Act Net** port damages BT485s, DIAG485s, or terminating resistors on that network.

1 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.

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 BACnet ARC156 or MS/TP jumper to...	Set DIP switches 1 and 2 to...
ARC156	**ARC156**	N/A. Baud rate will be 156 kbps regardless of the DIP switch settings.
MS/TP	**MS/TP**	The appropriate baud rate. See the **MS/TP Baud** diagram on the controller.

NOTE Use the same baud rate for all controllers on the network segment.

5 If the VVT Bypass II is at either end of a network segment, connect a BT485 to the VVT Bypass II.

6 Insert the power screw terminal connector into the VVT Bypass II's power terminals.

7 Verify communication with the network by viewing a Module Status report in the i-Vu® interface.

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Wiring inputs and outputs

WARNING Disconnect electrical power to the VVT Bypass II 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.

Wiring a Duct Air Temperature sensor to an input

Part #33ZCSENDAT

The VVT Bypass II must be connected to a Duct Air Temperature (DAT) sensor that monitors the temperature of the air delivered by the air source.

NOTE This document gives instructions for wiring the sensor to the VVT Bypass II. For mounting and wiring the sensor, see the *Carrier Sensors Installation Guide*.

Wiring specifications

Cable from sensor to controller:	If <100 ft (30.5 meters) If >100 ft (30.5 meters)	22 AWG, unshielded 22 AWG, shielded
Maximum length:	500 feet (152 meters)	

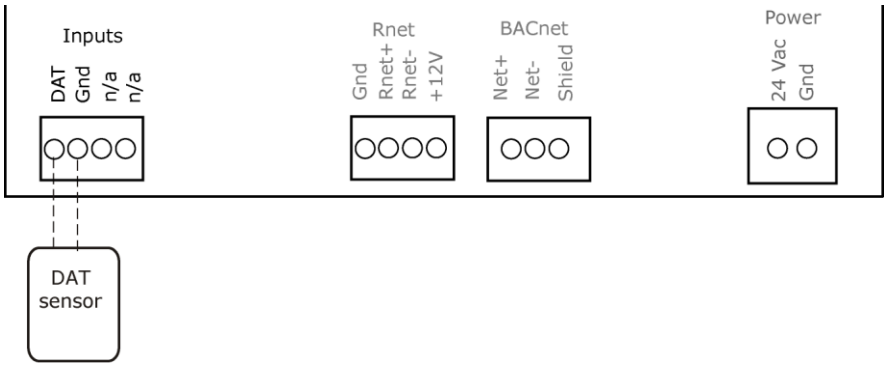
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To wire and mount the DAT sensor

1 Wire the sensor to the controller. See diagram below.

NOTE Sensor wiring does not have polarity. The wires can be connected to either terminal.

2 Using electrical tape, insulate any exposed wire to prevent shorting.



Wiring field-supplied actuators to the analog output

You can wire a high-torque actuator or parallel actuators to the controller's 0–10 Vdc analog output.

NOTES

- You cannot use the VVT Bypass II's actuator if wiring external actuator(s) to the analog output.
- When using external actuator(s), the internal actuator must remain connected to the controller for program operation.

High-torque actuators

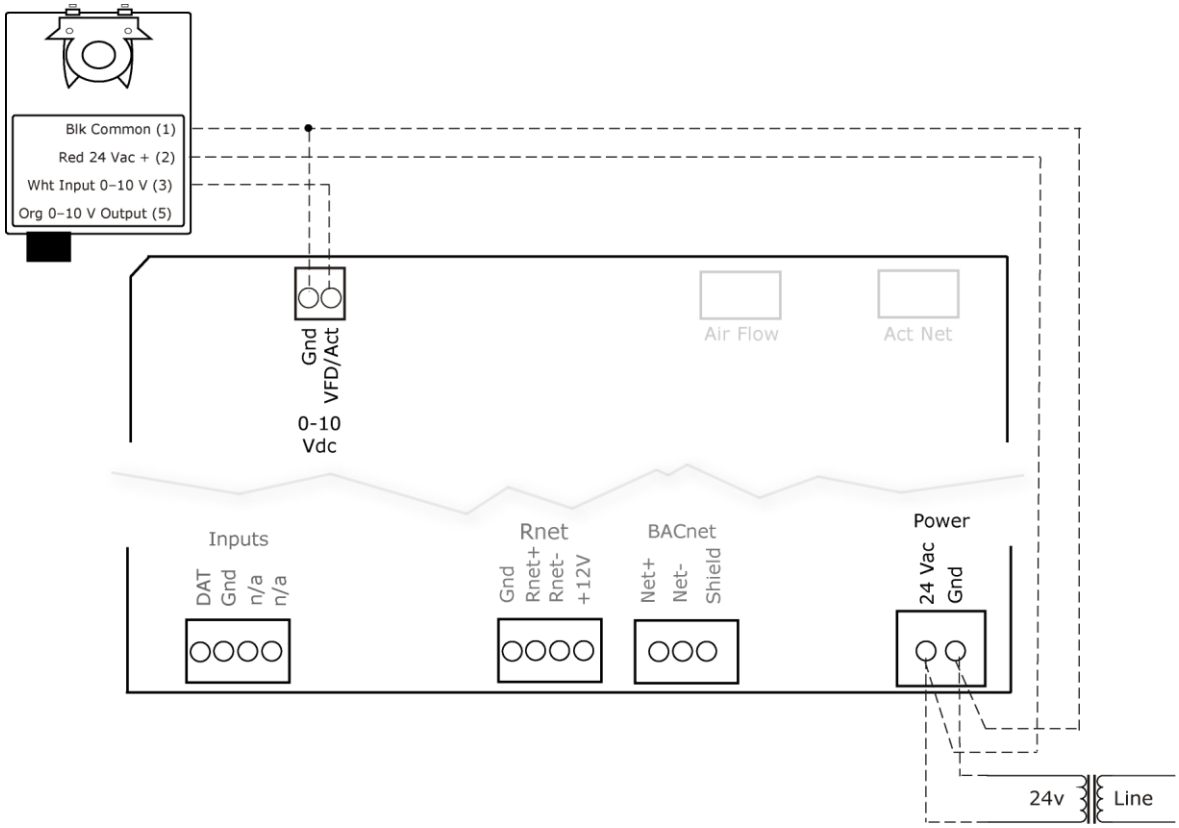
You can wire one of the following Belimo actuators to the VVT Bypass II's analog output instead of using the controller's 45 in.-lb (5 Nm) actuator.

NMX24-MFT P-10028	90 in.-lb (10 Nm) actuator with 0–10 Vdc control and 0–10 Vdc feedback
AMX24-MFT P-10028	180 in.-lb (20 Nm) actuator with 0–10 Vdc control and 0–10 Vdc feedback

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1 Install the actuator according to the manufacturer's instructions.

2 Wire the actuator to the controller using the diagram below.



NOTE For proper operation and to prevent damage to the devices, use the same polarity for the actuator's power and the VVT Bypass II's power.

Linked actuators

You can wire up to 4 of the following Belimo actuators to the VVT Bypass II's analog output. Link actuators whose travel times and other parameters coincide.

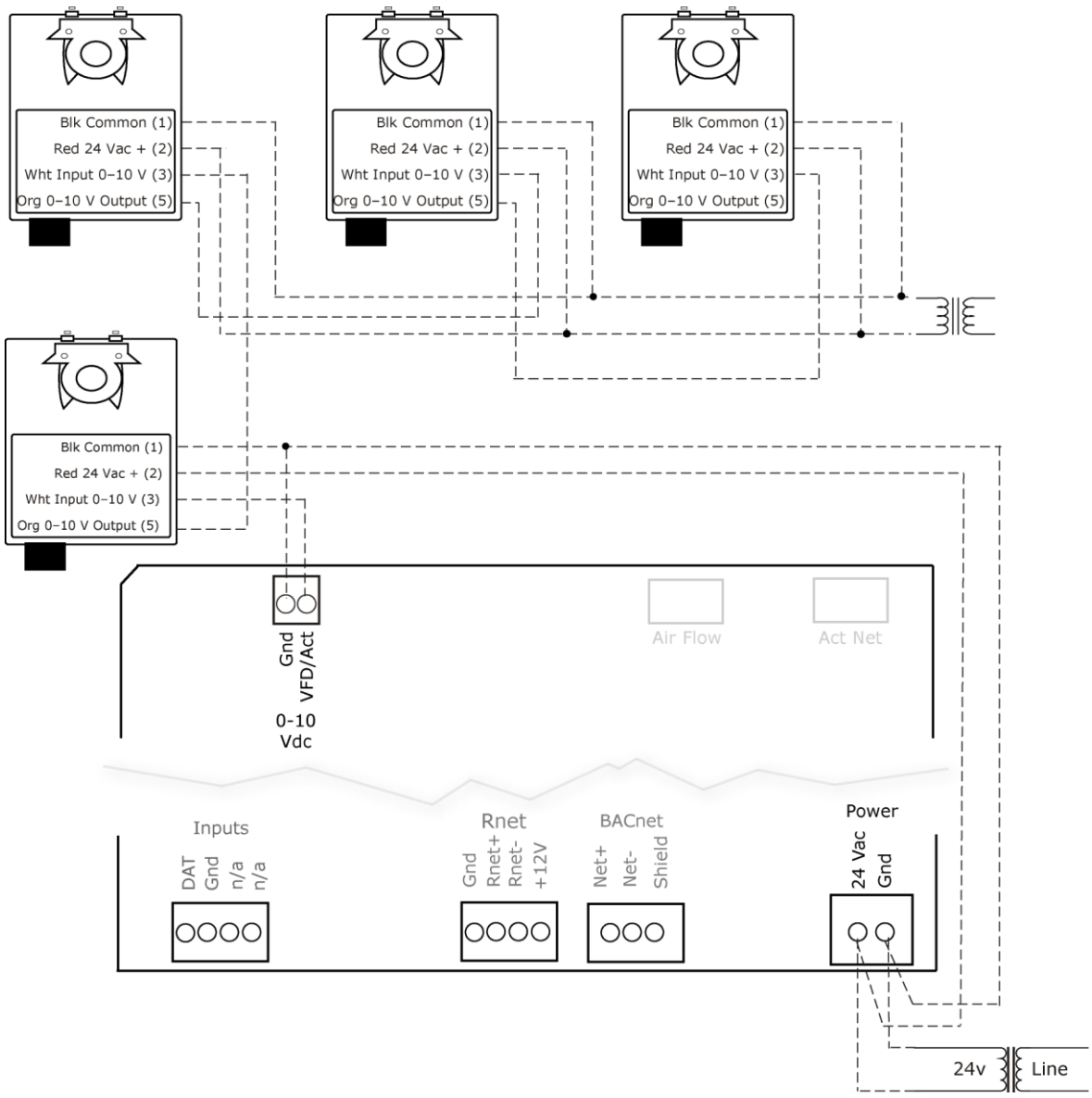
LMX24-MFT P-10028	45 in.-lb (5 Nm) actuator with 0–10 Vdc control
NMX24-MFT P-10028	90 in.-lb (10 Nm) actuator with 0–10 Vdc control
AMX24-MFT P-10028	180 in.-lb (20 Nm) actuator with 0–10 Vdc control

1 Install the actuators according to the manufacturer's instructions.

2 Wire the actuators to the controller using the diagram below.

3 Set the direction rotation switch on each actuator to CW.

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NOTE Maintain polarity if using the same power supply for more than one actuator.

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Wiring and mounting the Equipment Touch to the Rnet port

CAUTION If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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

Mounting

The Equipment Touch must be mounted within the building interior. You can mount the Equipment Touch:

- In a panel with the controller or on the panel door
- On a wall up to 500 feet from the controller

Wiring

- The Equipment Touch requires a 24 Vac power supply. It is not powered by the Rnet.

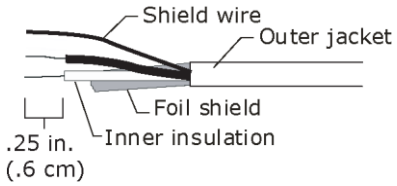
  CAUTION The Equipment Touch can share a power source with the Carrier controller as long as you:

  - Maintain the same polarity.
  - User the power supply only for Carrier controllers.

- You can also wire an external 10 kOhm, Type II thermistor (Carrier part# 33ZCT55SPT) to the Equipment Touch.

Only one Equipment Touch can be connected to the Rnet, using a 2-conductor cable instead of the standard 4-conductor Rnet cable and follow the instructions below.

1. Turn off the VVT Bypass II's power.
2. Partially cut, then bend and pull off the outer jacket of the cable. Do not nick the inner insulation.



1. Strip about .25 inch (.6 cm) of the inner insulation from each wire.
2. Wire the VVT Bypass II'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.
3. Connect the Equipment Touch to an external 24 Vac power source.
4. Turn on the VVT Bypass II's power.
5. Turn on the Equipment Touch.

NOTE You do not need to set an address for the Equipment Touch.

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Wiring the TruVu™ ET Display to the Rnet port

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

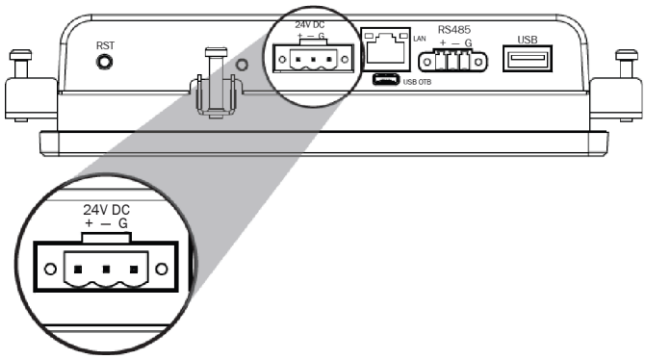
Wiring power

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.

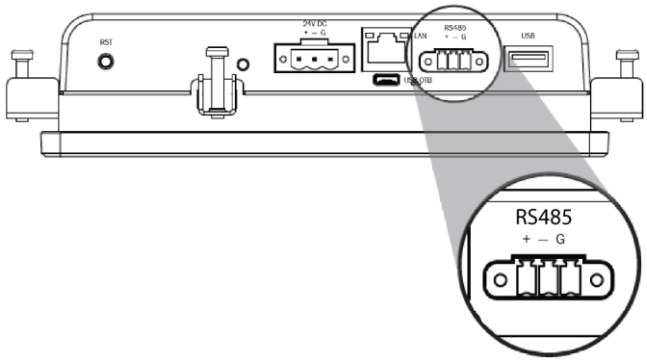
NOTE Purchase a power supply from a third-party manufacturer.



Wiring communication

1 Turn off the VVT Bypass II's power.

2 Wire the TruVu™ ET Display's **RS485** connector to the VVT Bypass II's **Rnet** port, **Gnd** 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 VVT Bypass II's power.

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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 - Runs on a laptop that connects to controller's Local Access port [1]	Temporary interface
Equipment Touch device - Connects to controller's Rnet port [2]	Temporary or permanent interface
i-Vu® application Available for BACnet systems only	Permanent interface
System Touch device Available only for BACnet MS/TP systems. 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.

Configuring the VVT Bypass II's properties

To start up the VVT Bypass II, you must configure certain points and properties. *Appendix A* (page 37) 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.

See *Appendix A* (page 37) for a complete list of the controller's points/properties.

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

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Performing system checkout

Bypass damper

1. Verify the VVT Bypass II is securely fastened to the bypass damper shaft and duct work.
2. Verify duct air temperature sensor is installed at the inlet of the damper or in the air source supply duct upstream of the bypass damper connection.
3. Verify that the high pressure tubing from the controller's airflow (pressure) sensor is connected to the duct static pressure probe downstream of the bypass damper. Then verify that the low pressure connector is not blocked.
4. Calibrate damper and pressure sensor:
   a) Disable the air source heating, cooling, and fan outputs using one of the following methods:
      - Physically disconnect the air source controller's output wiring to the unit.
      - In the i-Vu® or Field Assistant navigation tree, select the RTU Open controller. Go to **Properties** > **Control Program** > **Configuration** > **Service Configuration** > **Service Test**, then enable **Service Test**. Make sure all other outputs under **Service Test** are disabled.

   b) Select the Bypass controller in the tree, then go to **Properties** > **Control Program** > **Unit Configuration** > **Bypass Control** > **Details** tab.

   c) Click **Damper Full Close**, then verify that the damper is fully closed.

   d) Click **Damper Full Open**, then verify that the damper is fully open.

   e) Click **Zero Cal** to close the bypass damper and zero the pressure sensor. When **Done** appears, click **Apply**.

   f) Enable the air source fan output using one of the following methods:
      - Physically connect the air source controller's fan enable wiring at the unit.
      - In the i-Vu® or Field Assistant tree, select the RTU Open controller. Go to **Properties** > **Control Program** > **Configuration** > **Service Configuration** > **Service Test**, then enable **Fan Test**. Make sure all other outputs under **Service Test** are disabled.

   g) Select the Bypass controller in the tree, then go to **Properties** > **Control Program** > **Unit Configuration** > **Bypass Control** > **Details** tab.

   h) After the static pressure has stabilized, make sure that **Target Damper Position** and **Duct Static Pressure** are not locked and that **Target Damper Position** is >0% and <100%. You may have to adjust the **Duct Static Pressure Setpoint** slightly to get the damper within this range.

   i) Using a branch-tee, connect a magnehelic gauge to the **High** connector on the controller's airflow sensor, then measure the static pressure. If the measured static pressure is different from the **Duct Static Pressure** by ±.05 in. (+.012 kPa), click **Pressure Sensor Cal**, enter the measured value next to the button, then click **Apply**.

   j) Remove the magnehelic gauge from the **High** connector, then reinsert the pressure tubing.

   k) Click **Automatic Control** to return the bypass to normal control.

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l) Enable the air source's heating and cooling outputs using one of the following methods:

- Reconnect the air source controller's output wiring at the unit.
- In the i-Vu® or Field Assistant tree, select the RTU Open controller. Go to **Properties** > **Control Program** > **Configuration** > **Service Configuration** > **Service Test**, then disable **Service Test** and **Fan Test**. Make sure all other outputs under **Service Test** are disabled.

CAUTION Pressing the actuator release button and moving the damper or disconnecting the actuator ribbon connector while the bypass controller is powered will cause the damper position to be out of calibration. To recalibrate the damper position, you must perform steps 4c and 4d above or power cycle the controller.

Variable frequency drive (VFD)

1. Verify that the controller's **VFD/ACT** output wiring is correctly connected to the VFD and that the VFD is configured for a 0-10 Vdc control signal.
2. In the i-Vu® or Field Assistant tree, select the Bypass controller. Go to **Properties** > **Control Program** > **Unit Configuration**, then verify that **Control Device Type** is set to **VFD**.
3. Verify duct air temperature sensor is installed in the air source supply duct.
4. Verify that the high pressure tubing from the controller's airflow (pressure) sensor is connected to the duct static pressure probe downstream of the bypass damper. Then verify that the low pressure connector is not blocked.
5. Calibrate the VFD and pressure sensor:
   a) Disable the air source heating, cooling, and fan outputs using one of the following methods:
      - Physically disconnect the air source controller's output wiring to the unit.
      - In the i-Vu® or Field Assistant navigation tree, select the RTU Open controller. Go to **Properties** > **Control Program** > **Configuration** > **Service Configuration** > **Service Test**, then enable **Service Test**. Make sure all other outputs under **Service Test** are disabled.
   b) Select the Bypass controller in the tree, then go to **Properties** > **Control Program** > **Unit Configuration** > **Bypass Control** > **Details** tab.
   c) Click **Damper Full Open**, then verify the voltage at **VFD/ACT** and **Gnd** is 0 Vdc.
   d) Click **Damper Full Close**, then verify the voltage at **VFD/ACT** and **Gnd** is 10 Vdc.
   e) Click **Zero Cal** to zero the pressure sensor. When **Done** appears, click **Apply**.
   f) Enable the air source fan output using one of the following methods:
      - Physically connect the air source controller's fan enable wiring at the unit.
      - In the i-Vu® or Field Assistant tree, select the RTU Open controller. Go to **Properties** > **Control Program** > **Configuration** > **Service Configuration** > **Service Test**, then enable **Fan Test**. Make sure all other outputs under **Service Test** are disabled.
   g) Select the Bypass controller in the tree, then go to **Properties** > **Control Program** > **Unit Configuration** > **Bypass Control** > **Details** tab.
   h) After the static pressure has stabilized, make sure that **Target Damper Position** and **Duct Static Pressure** are not locked and that **Target Damper Position** is >0% and <100%. You may have to adjust the **Duct Static Pressure Setpoint** slightly to get the damper within this range.

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i) Using a branch-tee, connect a magnehelic gauge to the **High** connector on the controller's airflow sensor, then measure the static pressure. If the measured static pressure is different from the **Duct Static Pressure** by ±.05 in. (+.012 kPa), click **Pressure Sensor Cal**, enter the measured value next to the button, then click **Apply**.

j) Remove the magnehelic gauge from the **High** connector, then reinsert the pressure tubing.

k) Click **Automatic Control** to return the bypass to normal control.

l) Enable the air source's heating and cooling outputs using one of the following methods:

- Reconnect the air source controller's output wiring at the unit.
- In the i-Vu® or Field Assistant tree, select the RTU Open controller. Go to **Properties** > **Control Program** > **Configuration** > **Service Configuration** > **Service Test**, then disable **Service Test** and **Fan Test**. Make sure all other outputs under **Service Test** are disabled.

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Sequence of operation

The VVT Bypass II maintains supply duct static pressure under all system operating conditions and can operate as part of a linked VVT system or as a stand-alone controller.

Duct static pressure control

The VVT Bypass II modulates a bypass damper or VFD to maintain the static pressure in the supply duct of the pressure-dependent VVT system. The VVT Bypass II has a damper actuator that provides 45 in./lbs (5 Nm) of torque.

You can use the controller's 0–10 Vdc output to:

- Drive a larger actuator if the VVT Bypass II's actuator's torque is insufficient. The actuator must be installed so that 0 volts causes the bypass damper to fully open. See **NOTE** below and High-torque actuator.
- Drive multiple damper actuators from a single bypass controller. See **NOTE** below and Linked actuators.
- Control a VFD

NOTE You cannot use the VVT Bypass II's actuator if external actuator(s) are wired to the analog output.

If linkage is active, normal duct static pressure control is overridden if the linked air source is in either of the following modes:

- Fire shutdown or evacuation mode – The bypass damper will be fully open. If controlling a VFD, the VFD output will be at 0%.
- Pressurization mode – The bypass damper will be fully closed. If controlling a VFD, the VFD output will be at 100%.

LAT monitoring and limiting

To protect the air source from excessive supply air temperature conditions, the VVT Bypass II monitors the supply air temperature. If the temperature reaches either the **Minimum Cooling SAT** [45°F (7.2°C) default] or the **Maximum Heating SAT** [120° F (48.9°C) default], the Bypass controls to the **LAT Duct Static Pressure Setpoint** which increases airflow through the air source.

The amount of increase in airflow is related to the square root of the pressure increase. For example, a 25% increase in airflow at 1 in. (.249 kPa) of static pressure would require a 56% increase in duct static pressure [(1 in.H_2O (.249 kPa) * $(1.25)^2$) = 1.56 in. H_2O (.388 kPa)]. The default **LAT Duct Static Pressure Setpoint** of 0.8 in.H_2O (.199 kPa) provides a maximum 25% increase in airflow over the default Duct Static Pressure Setpoint of .5 in.H_2O (.125 kPa). [(.5 in.H_2O (.125 kPa)* $(1.25)^2$) = .75 [~.8] in.H_2O (.199 kPa)]. When the LAT exceeds the **Maximum Heating SAT** or **Minimum Cooling SAT**, the controller detects and indicates the excessive LAT condition and displays the **Controlling Pressure Setpoint** and the associated **LAT Airflow Increase** (%).

The Bypass does not resume normal control to the Duct Static Pressure Setpoint until the SAT drops 15Δ°F (8.3Δ°C) below the Maximum Heating Sat or rises 7Δ°F (3.9Δ°C) above the Minimum Cooing Setpoint.

If the supply air temperature exceeds the configured limits, a **Supply Air Temperature Alarm** is generated. If Linkage is active, the controller monitors the supply air temperature from the equipment rather than its own temperature input for faster response.

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Equipment fan off detection

The VVT Bypass II continuously monitors its damper's position and the supply duct static pressure. If the pressure drops below 10% of the nominal setpoint and the bypass damper is fully closed (or VFD is commanded to maximum speed), after 1 minute the controller assumes that the equipment fan turned off. The bypass damper then modulates to 65% open and the VFD speed is commanded to 35% (3.5 volts) to facilitate a fan restart. The controller monitors the static pressure to determine when the equipment fan restarts. If it rises above 10% of the nominal pressure setpoint, the controller assumes the fan restarted and controls to maintain the duct static pressure setpoint. If Linkage is active, the air source mode is provided to the VVT Bypass II.

Supply Air Temperature Alarm

The VVT Bypass II generates an alarm if the supply air temperature remains above the configured **Maximum Heating SAT** or below the configured **Minimum Cooling SAT** for more than 5 minutes.

Airside linkage

When the VVT Bypass II is part of a linked system, it uses data received through Linkage (equipment SAT and mode) to detect excessive leaving air temperature (LAT) conditions at the equipment and equipment operating mode.

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Air source mode determination

Linked air source modes – In a linked system, the air source determines its operating mode and qualifies that mode based on its own SAT. The following modes can be sent by the air source depending on its capability and configuration:

OFF	Air source fan is off. Terminal damper is positioned approximately 70% open to allow for system restart.
WARMUP	Air source fan is on and providing first cycle of heat when changing from unoccupied to occupied. It may also be used as an equipment safety to increase system airflow. The terminal's heating setpoint temporarily increases to the midpoint between the configured occupied heating and occupied cooling setpoints.
HEAT	Air source fan is on and providing heat. The terminal modulates its primary air damper to maintain the current heating setpoint.
FREECOOL	Air source fan is on and providing cooling using only the economizer and usually during an unoccupied period. The terminal modulates its primary air damper to maintain the midpoint between the configured occupied heating and occupied cooling setpoints.
COOL	Air source fan is on and providing cooling. The terminal modulates its primary air damper to maintain the current cooling setpoint.
PRESSURIZATION	Air source supply fan is on usually as a result of a fire-life safety input being active. It may also be used as an equipment safety to increase system airflow. The terminal modulates its primary air damper to provide the configured maximum cooling airflow.
EVACUATION	Evacuation is usually the result of a fire-life safety input at the air source being active. The terminal fully closes its primary air damper and disables its terminal fan, if equipped.
VENT	All terminals treat VENT mode the same as the COOL mode. For VVT terminals, VENT modes allows for an increase in airflow. VVT terminals use the greater of the configured Vent Damper Position or the Minimum Cooling Damper Position as the minimum during the VENT mode.

See the air source's installation manual for more specific operation.

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To adjust the driver properties

Use the following if you want to change the driver's properties in the i-Vu® interface.

1 On the i-Vu® navigation tree, right-click the VVT Bypass II and select **Driver Properties**.

2 Make changes as needed on the **Properties** page for **Driver** and any of its children.

Driver

On the **Driver** page > **Settings** tab, you can change the Module clock synchronization and failure. See table below.

TouchScreen Control	
TouchScreen Schedule Edit Enable	This field is checked automatically to allow a user to edit this controller's schedules from an Equipment Touch's Schedules screen. Uncheck to disable.
Module Clock	
Clock Fail Date and Time	Date and time the control program uses when controller's time is invalid.  **TIP** Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy.
Time Synch Sensitivity (seconds)	When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct.
Network Microblocks	
Number of poll retries before Network Input Microblocks indicate failure	The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support.
Periodic rebinding interval	If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object.

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BACnet COV Throttling	
Enable COV Throttling	Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below. When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the i-Vu® application listing all objects that are updating excessively. A Return-to-normal alarm is sent only after all objects have stopped updating excessively. EXCEPTION: In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You will also need to disable the **Excessive COV** alarms under the driver's **Common Alarms**.
Trend Sampling	
Collect a daily midnight sample for all points in this controller that are sampling on COV	For values that change infrequently, select to verify at midnight daily that the point is still able to communicate trend values.

Device

On the **Device** page, you can view the following properties:

- BACnet device object properties for the VVT Bypass II
- VVT Bypass II network communication

Configuration	**NOTE** The three APDU fields refer to all networks over which the VVT Bypass II communicates.
Max Masters and Max Info Frames	Apply only if the VVT Bypass II is on an MS/TP network.

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Notification Classes

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

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

Priorities	**NOTE** BACnet defines the following Network message priorities for Alarms and Events.	
	Priority range	**Network message priority**
	00–63	Life Safety
	64–127	Critical Equipment
	128–191	Urgent
	192–255	Normal
Priority of Off-Normal	BACnet priority for Alarms.	
Priority of Fault	BACnet priority for Fault messages.	
Priority of Normal	BACnet priority for Return-to-normal messages.	
Ack Required for Off-Normal, Fault, and Normal	Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms. **TIP** You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the i-Vu® database). In the i-Vu® interface on the **Alarm** > **Enable/Disable** tab, change the acknowledgment settings for an alarm source or an alarm category.	
Recipient List		
Recipients	The first row in this list is from the i-Vu® application. Do not delete this row. Click **Add** if you want other BACnet devices to receive alarms associated with this Notification Class.	
Recipient Description	Name that appears in the **Recipients** table.	
Recipient Type	Use **Address** (static binding) for either of the following: • Third-party BACnet device recipients that do not support dynamic binding • When you want alarms to be broadcast (you must uncheck **Issue Confirmed Notifications**). This use is rare.	
Days and times	The days and times during which the recipient will receive alarms.	
Recipient Device Object Identifier	Type the **Device Instance** from the network administrator for third-party devices in the **#** field.	
Process Identifier	Change for third-party devices that use a BACnet Process Identifier other than 1. The i-Vu® application processes alarms for any 32-bit Process Identifier.	
Issue Confirmed Notifications	Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient.	
Transitions to Send	Uncheck the types of alarms you do not want the recipient to get.	

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Calendars

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

Common Alarms

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

Common alarms:

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

Module Generated Alarm	
Description	Short message shown on the i-Vu® **Alarms** page or in an alarm action when this type of alarm is generated.
Events	
Alarm Category and Alarm Template	See *Alarms* in i-Vu® Help.
Enable	Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.
Notification Class	Do not change this field.

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Specific Events

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

Specific alarms:

- Flow Control Alarm
- Reheat Valve Alarm

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

Controller Generated Alarm	
Description	Short message shown on the i-Vu® **Alarms** page or in an alarm action when this type of alarm is generated.
Events	
Alarm Category and Alarm Template	See *Alarms* in i-Vu® Help.
Enable	Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.
Notification Class	Do not change this field.

Switches, Jumpers, Options

The **Switches, Jumpers, Options** page shows the current physical settings on the VVT Bypass II.

Flow Calibration Archive

The **Flow Calibration Archive** page shows measured flow and sensor readings that were entered in the i-Vu® Test and Balance tool.

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Act Net Network Details

Act Net Statistics

The actuator serial numbers are automatically read and displayed on the Act Net Network Details page in the i-Vu® interface. Only those devices that are physically connected or in the control program will show in the table.

NOTE See *To get the Carrier VVT Bypass II serial number* (page 35) for the controller serial number.

The **Act Net** network shows the VVT Bypass II's actuator has Address **1**.

CAUTION If you see **Duplicate address on network** or **No communication with device** under **Device Status**, contact Carrier Control Systems Support. Do not use **Act Net Address Setting** unless directed by Carrier Control Systems Support.

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Troubleshooting

If you have problems mounting, wiring, or addressing the VVT Bypass II, 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 on the VVT Bypass II show the status of certain functions. Verify the LED patterns by cycling power to the controller and noting the lights and flashes.

If this LED is on...	Status is...
Power	The VVT Bypass II has power.
Rx	The VVT Bypass II is receiving data from the network segment
Tx	The VVT Bypass II is transmitting data over the network segment
CW	The actuator motor is turning clockwise
CCW	The actuator motor is turning counterclockwise

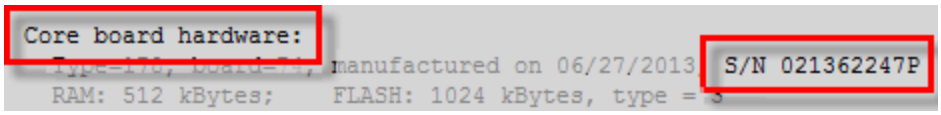
The **Run** and **Error** LED's indicate controller and network status.

If Run LED shows...	And Error LED shows...	Status is...
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	1 flash per second	The controller is alone on the network
2 flashes per second	On	Exec halted after frequent system errors or control programs halted
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 VVT Bypass II off, then on. • Format the VVT Bypass II. • Download memory to the VVT Bypass II. • Replace the VVT Bypass II.

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To get the serial number

If you need the VVT Bypass II's serial number when troubleshooting, the number is on a Module Status report (Modstat) under **Core** (or **Main**) **board hardware**



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

1 Select the VVT Bypass II in the navigation tree.

2 Right-click and select **Module Status**.

To restore factory defaults

WARNING This erases all archived information and user-configuration settings. You will have to reconfigure all custom settings. It is recommended to restore the factory defaults only under the guidance of Carrier Control Systems Support.

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

1 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**. Make sure the address switches are not set to 0, 0.

2 Short the **Format Short pins** jumper's pins and maintain the short for steps 3 and 4.

3 Insert the power screw terminal connector into the VVT Bypass II's power terminals.

4 Continue to short the jumper until the **Error** LED flashes three times in sync with the **Run** LED.

5 Remove the short.

To replace the battery

If the VVT Bypass II experiences a power outage and the control program stops functioning, replace the battery.

You need to replace the battery if the voltage measures below 2.9 volts when the controller is not powered.

1 Verify that the VVT Bypass II's power is on.

CAUTION If the controller's power is not **on** when replacing the battery, your date, time, and trend data will be lost.

2 Remove the VVT Bypass II's cover.

3 Remove the battery from the controller, making note of the battery's polarity.

4 Insert the new battery, matching the battery's polarity with the polarity indicated on the controller's cover.

5 Replace the VVT Bypass II's cover.

6 Download the VVT Bypass II.

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Compliance

FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1 This device may not cause harmful interference.

2 This device must accept any interference received, including interference that may cause undesired operation.

NOTE 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 it is not installed and used in accordance with this document, it 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 Any modifications made to this device that are not approved by Carrier will void the authority granted to the user by the FCC to operate this equipment.

CE and UKCA Compliance

WARNING This is a Class B product. In a light industrial 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.

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Appendix A: VVT Bypass II Points/Properties

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
Static Pressure - Prime Variable – The current supply duct static pressure. This value is shown on the default area graphic in i-Vu or Field Assistant.	R: 0 to 2.0 in. H_2O (0 to .498 kPa)
Supply Air Temperature – If **Airside Linkage Status** is **Active**, this is the air source's current supply air temperature. If **Airside Linkage Status** is **Not Active**, this value is from the local SAT sensor.	R: -56 to 245°F (-48.9 to 118.3°C)
Damper Position – If **Control Device Type** is **Actuator**, this is the current open damper position.	R: 0 to 100%
VFD output – If **Control Device Type** is **VFD**, this is the current VFD speed capacity.	R: 0 to 100%
LAT Control – The status of LAT Limit duct static pressure override control of the bypass.	R: On/Off
LAT Airflow Increase – If **LAT Control** is **On**, this is the percent of increase in supply airflow that the overriding **LAT Duct Static Pressure Setpoint** will provide above the normal **Controlling Pressure Setpoint**.	R: 0 to 100%

Unit Configuration

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

Point Name/Description	Default/Range
Control Device Type – The device the controller uses to control static pressure.	D: Actuator R: Actuator/VFD drive
Power Fail Restart Delay – How long the controller delays normal operation after the power is restored.	D: 60 seconds R: 0 to 600 secs
Automatic Deadband Adjustment – If using an actuator, set to Enable to automatically adjust the damper for full travel to correctly scale the damper position. If using a VFD drive, set to Disable.	D: Enable R: Enable/Disable

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Point Name/Description	Default/Range
Maximum Heating SAT – The value that the SAT must exceed to cause the static pressure setpoint to be set to the **LAT Duct Static Pressure Setpoint**. This is also the **Supply Air Temperature Alarm**'s high limit.	D: 120°F (48.9°C) R: 40 to 180°F (4.4 to 82.2°C)
Minimum Cooling SAT – The minimum low limit value that the SAT must exceed to cause the static pressure setpoint to be set to the LAT Duct Static Pressure Setpoint. This is also the **Supply Air Temperature Alarm**'s low limit.	D: 45°F (7.2°C) R: 40 to 180°F (4.4 to 82.2°C)
Pressure Control Deadband – The amount that is added to and subtracted from the bypass controlling setpoint (Duct Static Pressure Setpoint or LAT Duct Static Pressure Setpoint). When the static pressure is within the controlling setpoint +/- this value, the output to the actuator or VFD drive maintains at its current position. When the static pressure is greater than the controlling setpoint +/- this value, the output modulates accordingly. **CAUTION** If this value is too low, the damper may oscillate to maintain the static pressure. This could cause the actuator to fail prematurely.	D: .05 in H_2O (.012 kPa) R: 0 to 2.0 in. H_2O (0 to .498 kPa)
Bypass Control	
Direction Clockwise – Set this field to the damper's position when it rotates clockwise. (Only in the i-Vu®/Field Assistant applications)	D: Close R: Open/Close
Duct Static Pressure Setpoint – The normal static pressure setpoint the controller will maintain.	D: .5 in. H_2O (.125 kPa) R: .1 to 2.0 in. H_2O (.025 to .498 kPa)
LAT Duct Static Pressure Setpoint – The static pressure setpoint that the controller will maintain if the SAT exceeds the **Maximum Heating SAT** or **Minimum Cooling SAT** value. To disable this function, set this value less than or equal to the **Duct Static Pressure Setpoint**.	D: .8 in. H_2O (.199 kPa) R: .1 to 2.0 in. H_2O (.025 to .498 kPa)
Locks –  **CAUTION** Overriding these values may damage equipment or ductwork. **Duct Static Pressure** – Allows you to override the static pressure sensor input for testing and troubleshooting.	R: 0 to 2.0 in. H_2O (0 to .498 kPa)
Target damper position – Allows you to override the normal control of the damper/VFD for the purpose of testing and troubleshooting.	R: 0 to 100%

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Point Name/Description	Default/Range
Test and Balance **Zero Cal** – Closes the bypass damper and waits for the air source to go to the Off mode before zeroing out the static pressure sensor. This does not occur if the static pressure is > .05 in. H_2O (.0125 kPa) . **Pressure Sensor Cal** – Allows you to calibrate the pressure sensor after the Zero Cal has been performed. To enter a value here, neither the damper nor the pressure sensor can be locked, the bypass cannot be in LAT mode and the damper position must be >0% and <100%. The value entered will be the actual static pressure measured with an accurate static pressure measuring device. **Damper Full Open** – Overrides the damper to its full open position. **Automatic Control** – Returns the damper to its normal control routines. **This must be activated when you finish using any of the other Test and Balance commands.** **Damper Full Close** – Overrides the damper to its full closed position.	
Local Sensor Calibration	
Supply Air Temperature – Displays the current supply air temperature.	R: -56 to 245°F (-48.9 to 118.3°C)
Supply Air Temp Calibration – A calibration offset value to allow the supply air temperature sensor to be adjusted to match a calibrated standard measuring the temperature in the same location.	R: -20 to 20Δ°F (-11.1 to 11.1Δ°C)

Maintenance

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

Point Name/Description	Range
Static Pressure – The current supply duct static pressure.	R: 0 to 2.0 in. H_2O (0 to .498 kPa)
Controlling Pressure Setpoint – The active static pressure setpoint that the bypass controls to.	R: .1 to 2.0 in. H_2O (.025 to .498 kPa)
Maximum Duct Pressure Setpoint – The Pressure Control Deadband that is added to the active static pressure setpoint.	R: 0 to 2.0 in. H_2O (0 to .498 kPa)
Minimum Duct Pressure Setpoint – The Pressure Control Deadband that is subtracted from the active static pressure setpoint.	R: 0 to 2.0 in. H_2O (0 to .498 kPa)

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Alarms

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

Point Name/Description	Range
Supply Air Temperature Alarm – Indicates if the supply air temperature exceeds the high temperature alarm limit or drops below the low temperature alarm limit.	R: Normal/Alarm
Airside Linkage Alarm – Indicates that it lost Linkage communications with the air source.	R: Normal/Alarm

Linkage

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

Point Name/Description	Range
Air Linkage Status – If **Active**, the controller is part of a linked system. If **Not Active**, the controller is operating as a stand-alone device.	R: Active/Not Active
Air Source Mode – If **Airside Linkage Status** is **Active**, this is the current mode of the linked air source. If **Airside Linkage Status** is **Not Active**, this is the mode of the air source as determined by the zone controller's SAT sensor.	R: Off Warmup Heat Cool Freecool Pressure Evac Vent
Air Source Supply Air Temp – Shows the air source's SAT when **Airside Linkage Status** is **Active**. If **Airside Linkage Status** is **Not Active**, the controller's local DAT sensor value is displayed.	R: -56 to 245°F (-48.9 to 118.3°C)

I/O Points

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

Point Name/Description	Range
Pressure Input – The current duct static pressure of the controller's integrated airflow sensor.	R: 0 to 2.0 in. H_2O (0 to .498 kPa)
SAT Sensor – The current duct air temperature sensor that is physically connected to the controller.	R: -56 to 245°F (-48.9 to 118.3°C)
AO Output – The current voltage on the controller's **VFD/ACT** output terminal.	R: 0 to 10 Vdc

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Appendix B: BACnet points list

				BACnet	
Point Name	Point Access	Units	Default Value	BACnet Point Name	BACnet Object ID
Controlling Pressure Setpoint	R	in H20		sys_press_stpt	AV:1015
Damper Position	R	%		dpr_pos	AV:1013
LAT Airflow Increase	R	%		lat_airflow_inc	AV:5002
Air Source Supply Air Temp	R	°F		link_sat	AV:2608
Maximum Duct Pressure Setpoint	R	in H20		max_press_stpt	AV:5003
Maximum Heating SAT	R/W	°F	120	sat_ht_max	AV:83004
Minimum Cooling SAT	R/W	°F	45	sat_cl_min	AV:83003
Power Fail Restart Delay	R/W	sec	60	start_delay	AV:9007
Pressure Control Deadband	R/W	in H20	0.05	press_hysteresis	AV:3016
Static Pressure - Prime Variable	R	in H20		static_press	AV:1016
Supply Air Temperature	R	°F		sa_temp	AV:1008
VFD output	R	%		vfd_output	AV:1014
Airside Linkage Status	R	0=Not Active 1=Active		a_link_status	BV:2601
Automatic Deadband Adjustment	R/W	0=Disable 1=Enable	Active (1)	auto_adjust	BV:99003
Control Device Type	R/W	0=Actuator 1=VFD	Inactive (0)	ctrl_type	BV:99002
LAT Control	R	0=Off 1=Active		lat_control	BV:1013
Air Source Mode	R	1=Off 2=Warmup 3=Heat 4=Cool 5=Freecool 6=Pressure 7=Evac 8=Vent		link_ahu_mode	MSV:2005
Airside Linkage Alarm	R	0=Normal 1=Alarm		air_linkage_fail	BV:7030
Supply Air Temperature Alarm	R	0=Normal 1=Alarm		sat_alarm	BV:7004

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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*
4/25/24	Wiring field-supplied actuators to the analog input	Added note regarding external actuators	C-TS-AP-E
9/13/22	FCC Compliance	Updated for next gen	X-PM-AB-R-BH
	CE and UKCA Compliance	Added UKCA compliance	
	Specifications	Added Compliance row	
1/6/22	Specifications	"Physical" row changed to "Fire-retardant plastic ABS, UL94-5VA"	X-PM-BM-E
12/6/21	LAT monitoring and limiting	Corrected formula	C-AE-BB-O
	Appendix B: BACnet points list	Added BACnet point for Air Source Air Temp Added Object ID for Airside Linkage Status and Air Source Mode	C-AE-BR-O
4/6/20	To clean the airflow sensor orifice	Removed. This sensor does not require cleaning.	X-O-EH-E-RE
	Specifications	Power specs expanded to include watts	X-TS-TS-E-KC
1/25/19	Specifications	Added surge CAUTION to Protection specification.	X-TS-AK-E-CC
12/17/18	Wiring the VVT Bypass II for power > To wire the controller for power.	Added photograph of lifting up the cover.	X-H-RE-E-CC-JS
	Mounting the VVT Bypass II > To mount the controller and actuator	Added caution stating that you must use the bushing, O-ring, and screws that are shipped with the VVT Bypass II, along with applicable graphic.	X-H-RE-E-CC-JS
8/28/18	Wiring the TruVu™ ET Display to the Rnet port	New topic.	C-D
	Specifications	Added TruVu™ ET Display to Rnet port Added first paragraph to Protection specification.	C-H-JS-O

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