TruVu Controller Kit for Rooftop Units 48/50FE*20-30, 50FEQ17-28, 48/50GE*17-28, 50GEQ17-28, 48/50FC*20-30, 50FCQ17-28, 48/50GC*17-28, and 50GCQ17-28, 15 to 27.5 Tons

Installation Instructions

Part No. CRTRVUKT002A00

CONTENTS

Catalog No. 04-53480541-01 Printed in U.S.A. Form No. IIK-CRTRVUKT02-02 Pg 1 9-25 Replaces: New

SAFETY CONSIDERATIONS

Installation of this accessory can be hazardous due to system pressures, electrical components, and equipment location (such as a roof or elevated structure). Only trained, qualified installers and service technicians should install, start-up, and service this equipment.

When installing this accessory, observe precautions in the literature, labels attached to the equipment, and any other safety precautions that apply:

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

It is important to recognize safety information. This is the safety-alert symbol: ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices, which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

⚠ CAUTION

PERSONAL INJURY HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing air conditioning equipment.

⚠ DANGER

ELECTRICAL SHOCK HAZARD

Failure to follow this warning will result in personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lock(s) and lockout tag(s). Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate. Unit may have more than one power switch.

PACKAGE USAGE

UNIT	SIZES	TONS
48/50FE	20-30	17.5-27.5
48/50FC	20-30	17.5-27.5
50FEQ	17-28	15.0-25.0
50FCQ	17-28	15.0-25.0
48/50GE	17-28	15.0-25.0
48/50GC	17-28	15.0-25.0
50GEQ	17-28	15.0-25.0
50GCQ	17-28	15.0-25.0

IMPORTANT: The 24vac transformer varies based on the unit voltage and is not included in the TruVu kit (P/N: CRTRVUKT002A00). The appropriate transformer must be ordered separately.

- 208/230v unit: part number HT01BD202
- 460v unit: part number HT01BD702
- 575v unit: part number HT01BD902

PACKAGE CONTENTS

QTY	CONTENTS
3	Relay
3	Socket Relay
2	End Stop (Rail End)
12	No. 8 Screw
1	Harness Assembly (MRT)
1	TruVu Controller
2	Temperature Sensor
10	Wire Tie
1	Controller Bracket
1	DIN Rail 3-in.
1	DIN Rail 6-in.
1	OAT Bracket
8	Self-drilling No. 10 Screws
8	No. 10 Screws
6	Heat Shrink
2	Wiring Diagrams (HP, PAC and YAC)
1	Bag

Use Table 1 to determine the correct Chassis size based on your specific unit model number.

Table 1 — Chassis Size Table

CHASSIS SIZES	UNIT MODEL NUMBER
6	48/50FE*20, 50FEQ17, 48/50GE*17, 50GEQ17, 48/50FC*20, 50FCQ17, 48/50GC*17, 50GCQ17
7	48/50FE*24, 48/50GE*20 48/50FC*24, 48/50GC*20
8	48/50FE*28, 50FEQ24-28, 48/50GE*24, 50GEQ24, 48/50FC*28, 50FCQ24-28, 48/50GC*24, 50GCQ24
9	48/50FE*30, 48/50GE*28, 50GEQ28, 48/50FC*30, 48/50GC*28, 50GCQ28

REQUIRED TOOLS

- 5/16-in. Nut Driver
- Phillips Head Screwdriver
- Flathead Screwdriver
- Wire Cutter/Stripper
- Heat Gun (for non-gas units)

INSTALLATION

Control Box Access

Remove the controls box access panel and the high-voltage control box panel. (See Fig. 1.)

Mounting Bracket

1. Locate four No.8 screws, a 6-in. mounting rail, the TruVu Controller and the TruVu 24VAC Transformer (not included in Kit). Mount these items together. (See Fig. 2.)

   IMPORTANT: Ensure the TruVu 24Vac transformer leads are installed as shown in Fig. 2, with the leads oriented to the left. This orientation is required for safety. Do not install the transformer in the opposite direction.

2. Locate two No. 8 screws, two rail ends and a 3-in. mounting rail. For gas heat units locate three relays and three mounting bases. For optional electric heat and heat pump units: locate two relays and two mounting bases only. Mount these items together. (See Fig. 3.)
3. Using five No. 10 self-drilling screws, install the Mounting Bracket in Control Box. (See Fig. 4.)

IMPORTANT: For optional electric heat and heat pump units locate heat shrink tubing and insulate terminals "IGC RELAY 11," "IGC RELAY 14," "IGC IFO A1," and "IGC IFO A2."

Bank of Relays Connection

Connect harness terminals "SAFETY A1" and "SAFETY A2" to mounting base #1,"ENTH A1" and "ENTH A2" to mounting base #2. For gas heat units connect "IGC IFO A1" and "IGC IFO A2" to mounting base #3. Connect harness terminals "SAFETY RELAY 11" and "SAFETY RELAY 14" to mounting base #1,"ENTH RELAY 11" and "ENTH RELAY 14" to mounting base #2. For gas heat units connect "IGC RELAY 11" and "IGC RELAY 14" to mounting base #3. (See Fig. 5.)

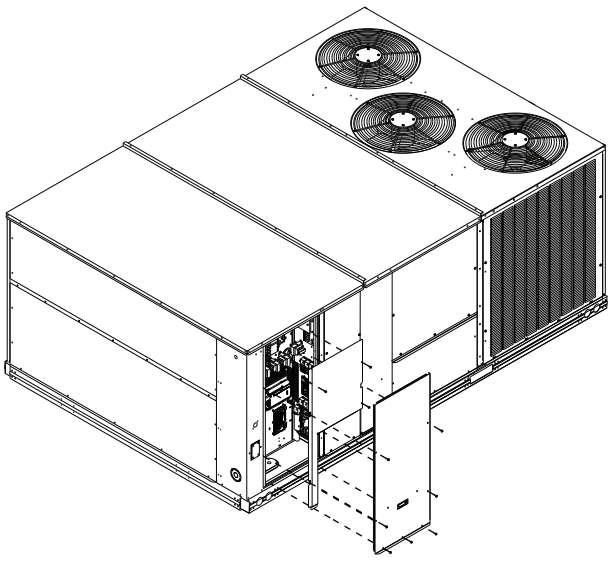


Fig. 1 — Control Box Panel Removal

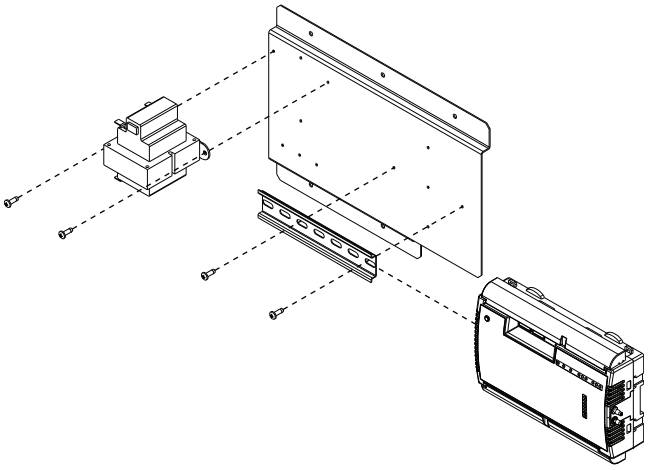


Fig. 2 — TruVu Transformer and TruVu Controller Mounting

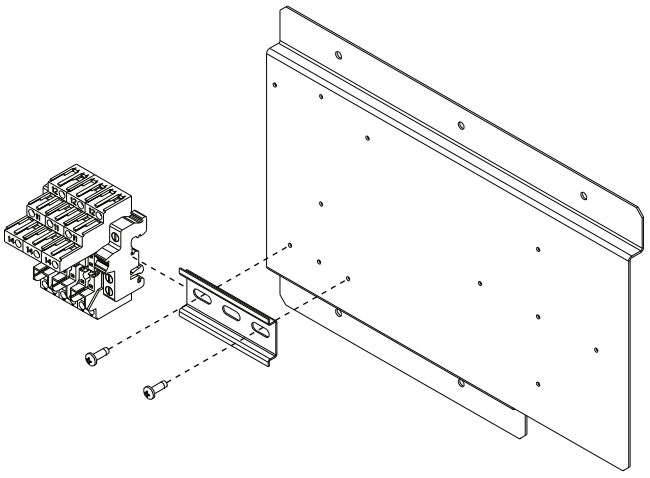


Fig. 3 — Relay Bank Mounting

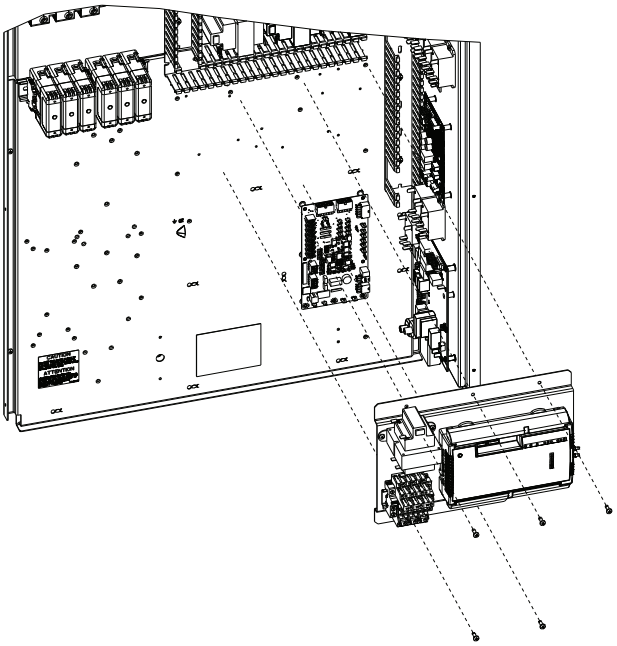


Fig. 4 — Mounting Bracket Installation

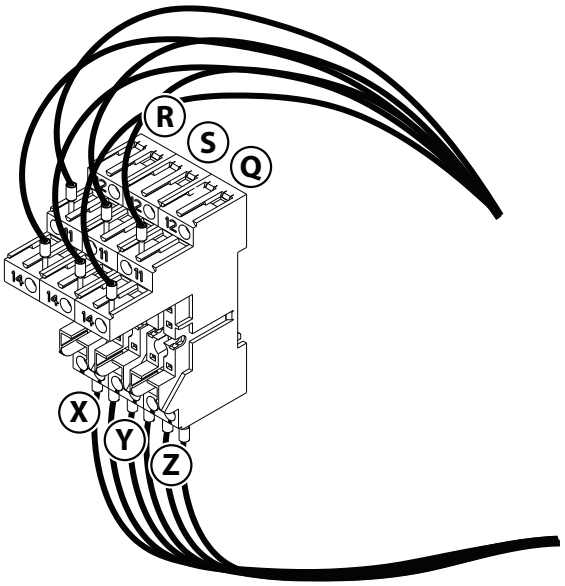


Fig. 5 — Harness Connection to Mounting Bases

NOTE: This view depicts supplied wire harness connection points labeled with a circle and letter to represent their connection points on various installed components shown throughout these instructions. For example: Connection "G" on Fig. B (Harness View, Appendix B) refers to the connection point "G" on Fig. C (Main Control Board View, Appendix C).

Unit Control Board (UCB) Connections

1. Connect main harness connectors labeled LCTB DDC and LCTB DDC T-STAT to the CTB at the DDC and DDC T-STAT. Disconnect IFM. (See Fig. 6.)

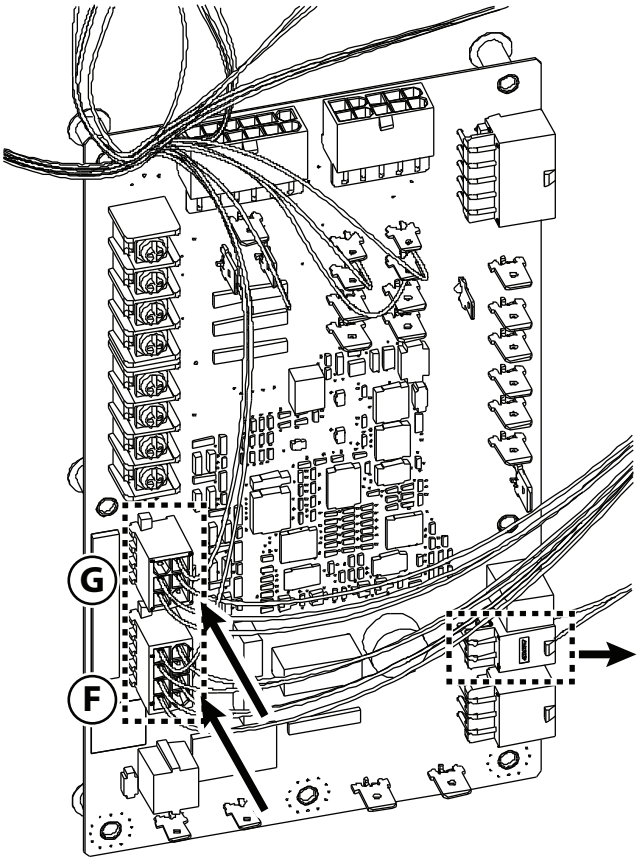


Fig. 6 — DDC and DDC TSTAT Connection, IFM Disconnection

2. Connect IFM to "IDF" TruVu harness plug. (See Fig. 7-8.)

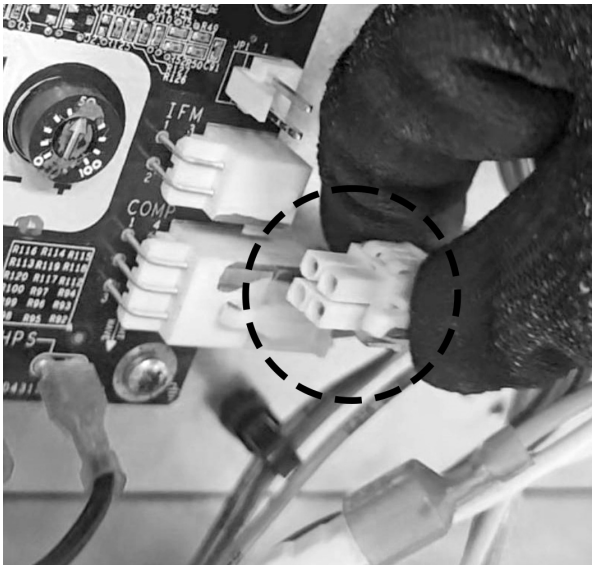


Fig. 7 — IFM Plug

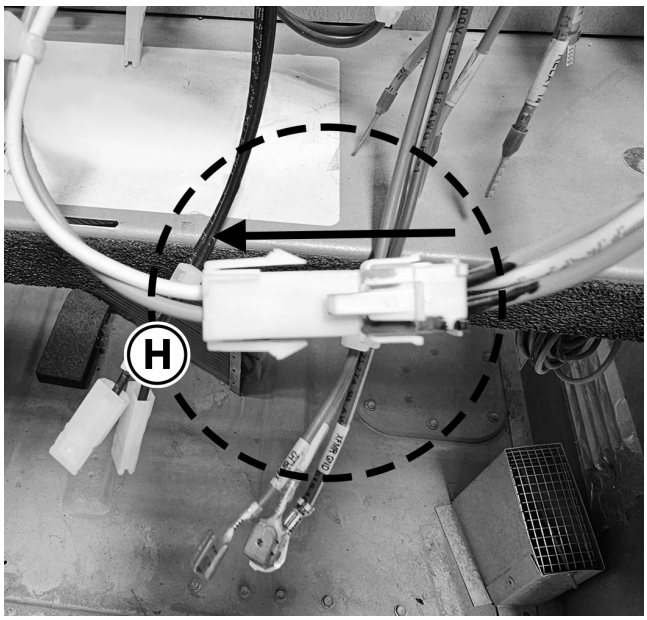


Fig. 8 — IFM Plug Connection

3. Connect main harness PIGGY-BACK connectors labeled "CTB COM" together and connect to the CTB at the "C" terminal connection. (See Fig. 9-10.)

Fig. 9 — CTB COMM Wires

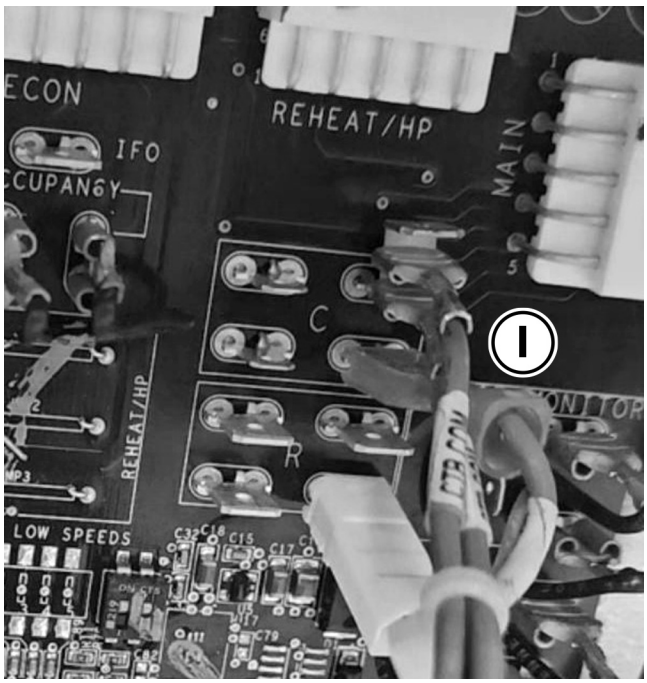


Fig. 10 — CTB COMM Connection to UCB

FOR GAS HEAT UNITS ONLY

4. Disconnect the occupancy jumper and connect the main harness connectors OCC A and OCC B to the UCB at the OCC terminal locations. (See Fig. 11-12.)

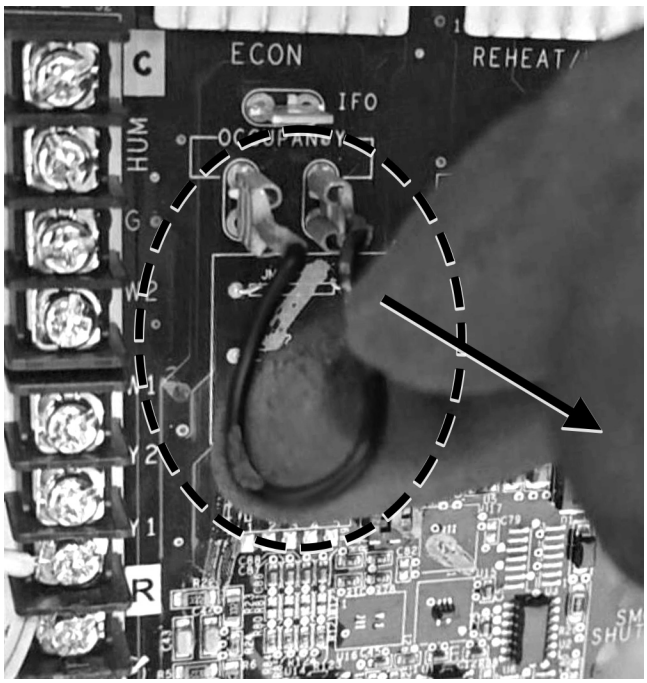


Fig. 11 — OCCUPANCY Jumper Disconnection

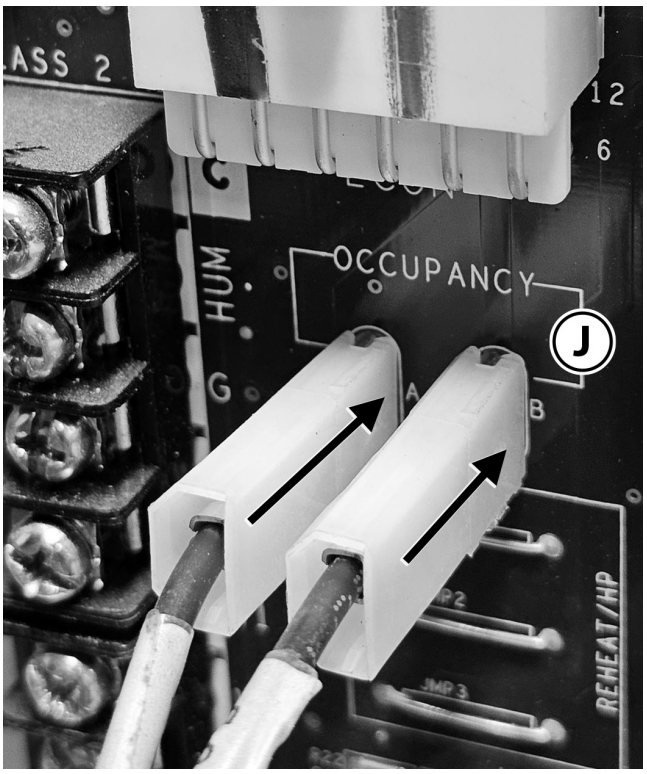


Fig. 12 — TruVu OCC A and OCC B Connection

5. Use a No. 8 screw and connect the main harness connector labeled “GND CHASSIS” to available ground position in the unit. (See Fig. 13.)

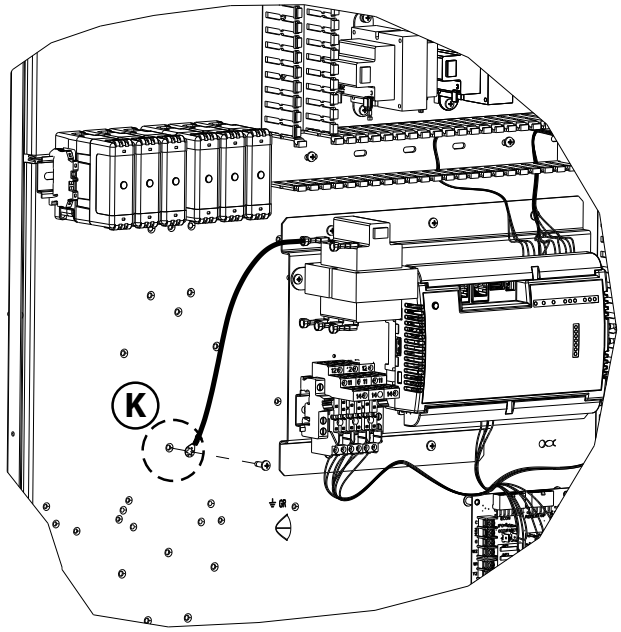


Fig. 13 — Chassis Ground Connection

6. Connect the low-voltage (LV) and high-voltage (HV) wires from the main harness to the TruVu Transformer. (See Fig. 14.)

NOTE: The 24 vac transformer varies based on the unit voltage and is not included in the TruVu kit (P/N: CRTRVUKT002A00). The appropriate transformer must be ordered separately.

- 208/230v unit: P/N: HT01BD202
- 460v unit: P/N: HT01BD702
- 575v unit: P/N: HT01BD902

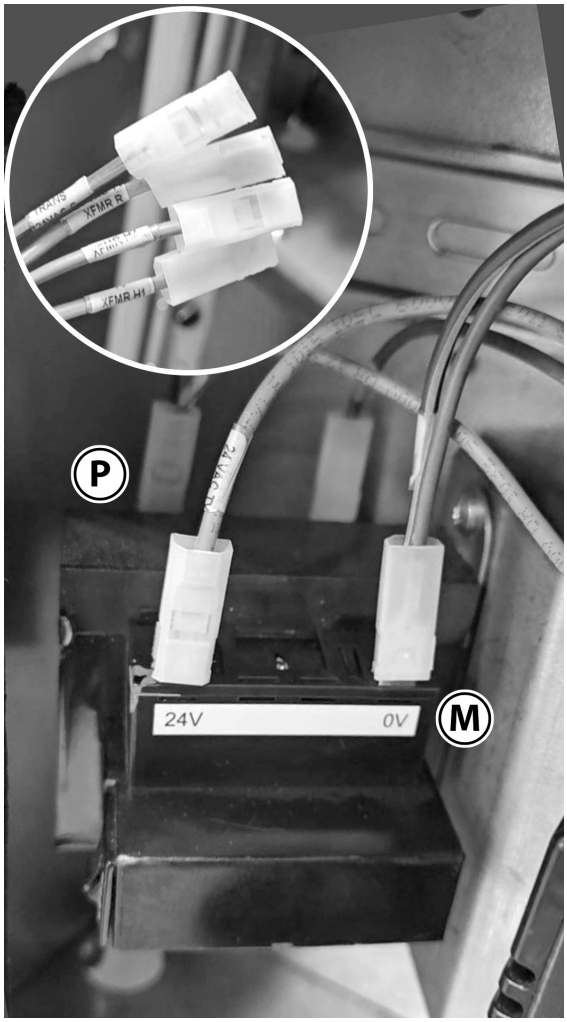


Fig. 14 — TruVu Transformer Connections (High Voltage and Low Voltage)

IMPORTANT: To avoid a double piggy-back connection, units that already have piggy-backs installed on the high-voltage terminals of TRANS1 (such as Heat Pump or Reheat Units) must use the terminal block “IFTB” as shown in Fig. 16.

7. For units without piggy-back connectors on the high-voltage leads from TRANS1, disconnect the TRANS1 high-voltage leads. Then, connect the piggy-back connectors from the main harness: route “TV XFMR H1” to “PRIMARY XFMR H1,” and “TV XFMR H2” to “PRIMARY XFMR H2.” Once connected, reconnect the leads to TRANS1 accordingly. (See Fig. 15.)

   For units where piggy-back connectors are already present on the high-voltage leads from TRANS1, connect the main harness leads as follows: “TV XFMR H1” must be routed to “IFTB H1,” and “TV XFMR H2” to “IFTB H2.” (See Fig. 16.)

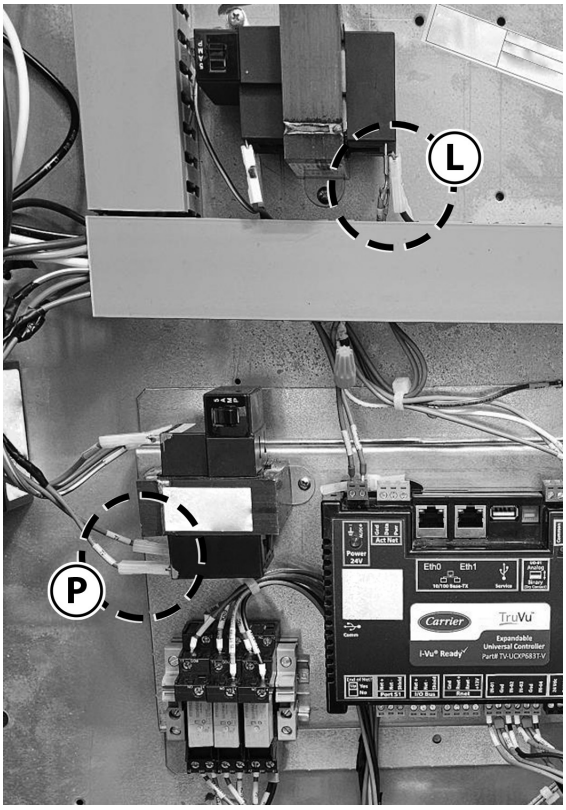


Fig. 15 — High Voltage Connection between TRAN1 and TV XFMR

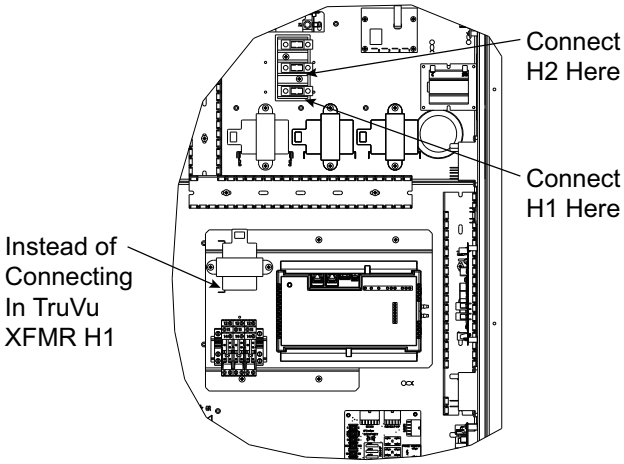


Fig. 16 — High Voltage TRAN1 Connection (between TRAN1 and Terminal Block for Heat Pump and Reheat Units)

Control Harness Assembly

1. Remove 2-pin, 8-pin, both 6-pin, and blue 3-pin bare connectors from the TruVu controller and discard them as the main harness already has these connectors wired. Plug in the 2-pin, 8-pin, both 6-pin, and 3-pin connectors from the harness. (See Fig. 17-18).

   NOTE: In the event that connectors are missing or need to be replaced from the harness, use the connectors that are supplied with the controller. Use Wiring Diagrams in Appendix D to assist in wire to connector placement.

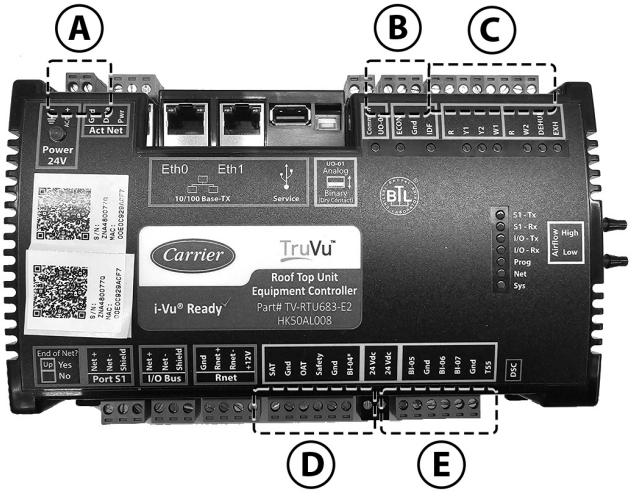


Fig. 17 — Removing the TruVu Bare Connectors

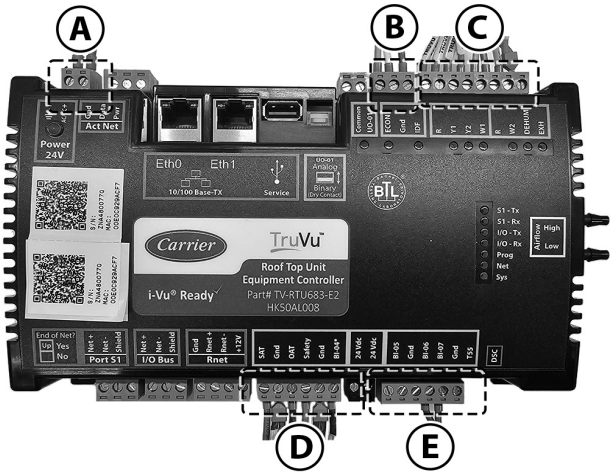


Fig. 18 — Connecting the TruVu Harness Plugs

Temperature Sensors

1. Remove the following unit panels to provide easier access for installing the SAT and OAT sensors (See Fig. 19.)

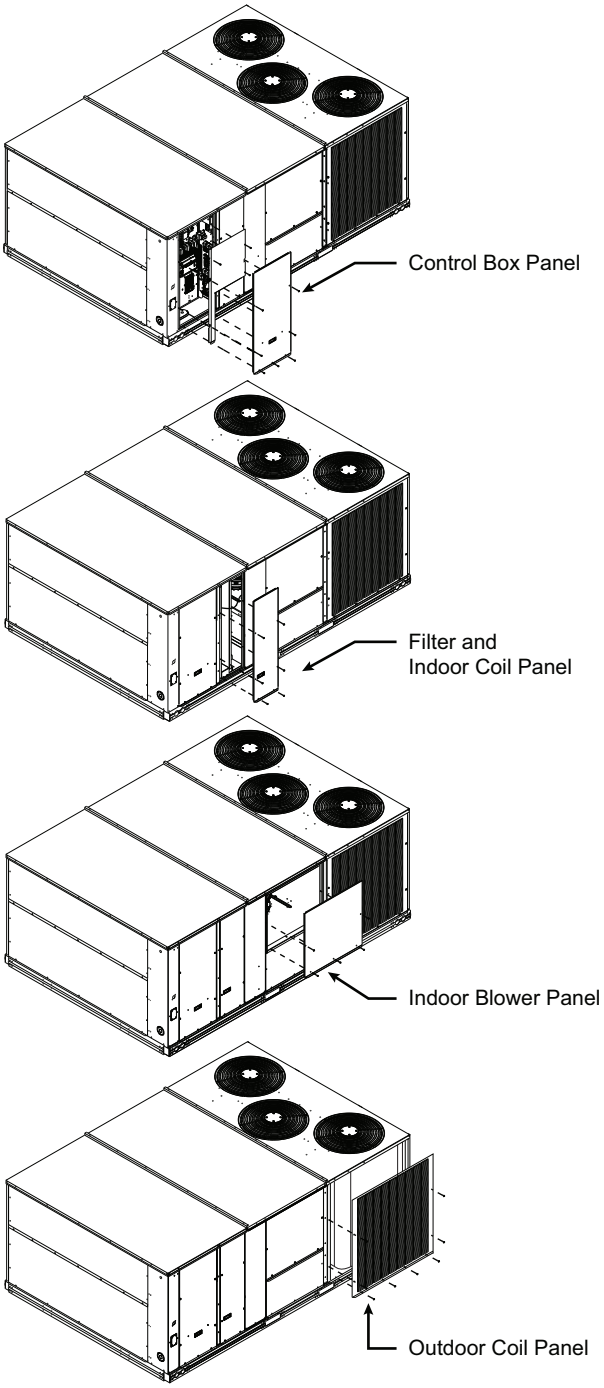


Fig. 19 — Remove Panels (Chassis 6 Shown)

2. Locate the SAT and OAT leads from the harness. See Fig. 20.

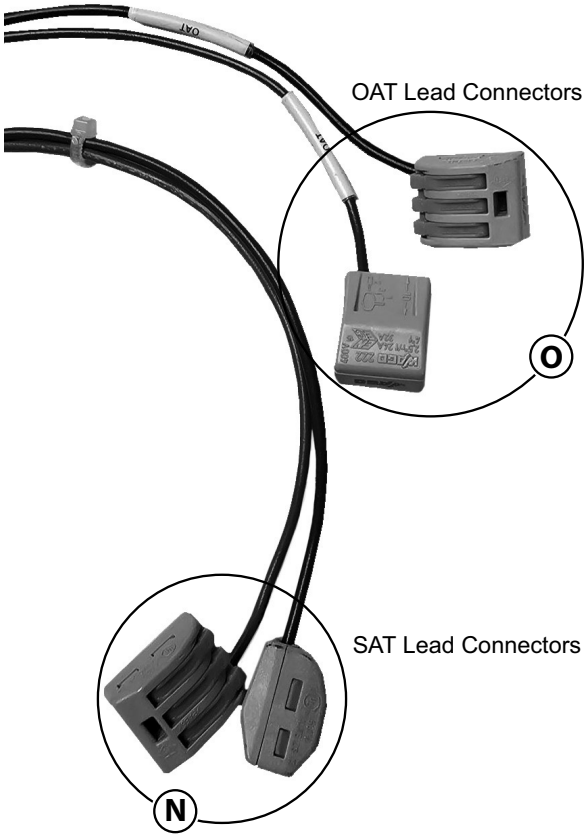


Fig. 20 — SAT and OAT Lead Connectors

3. Locate the plastic conduit at the right side of the TruVu Bracket Assembly in the Control Panel and the hole grommet from the upper right hand corner of the control box.
4. Route the OAT leads through the conduit and the grommet. (See Fig. 21-23.)

   NOTE: It may be easier routing the OAT wires through if the connector is disconnected. Leave these wires in the fan section for later use.

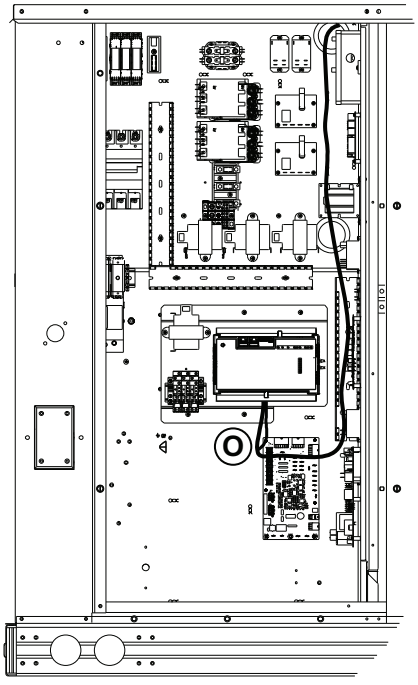


Fig. 21 — OAT Wire Routing (Control Box)

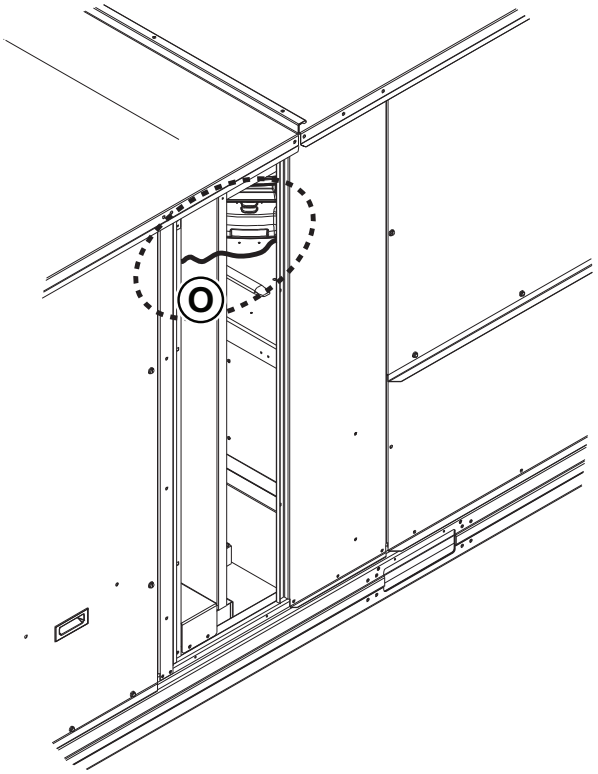


Fig. 22 — OAT Wire Routing (Filter and Indoor Coil)

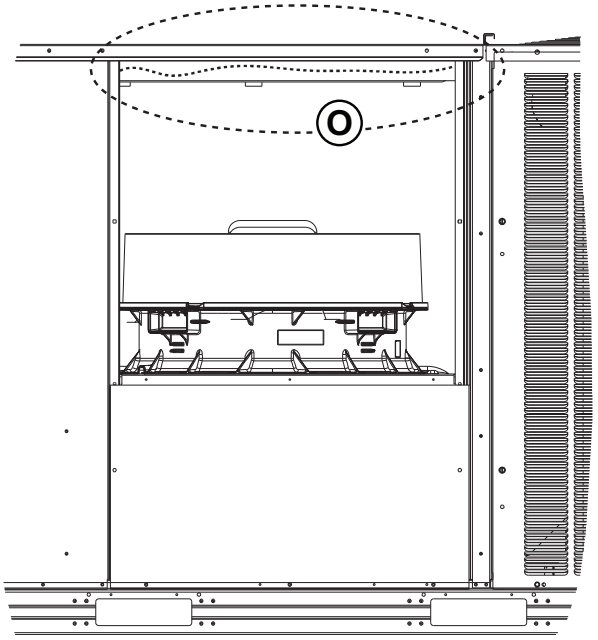


Fig. 23 — OAT Wire Routing (Indoor Blower)

5. For chassis 6-7 size units, locate the factory installed OAT Bracket in the coil area, two No. 10 screws and install OAT sensor. (See Fig. 24.)

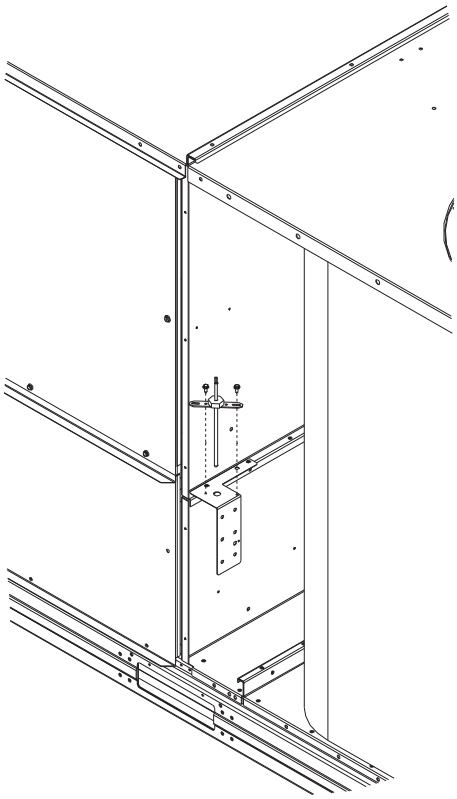


Fig. 24 — OAT Installation for Chassis 6 and 7 Units

6. For chassis 8-9 units, locate the factory installed OAT Bracket in the coil area, locate the OAT Bracket from the TruVu Kit and two No. 10 self-drilling screws.
7. For installing the sensor, locate the temperature sensor and two No. 10 screws.
8. Assembly all these items together. (See Fig. 25.)

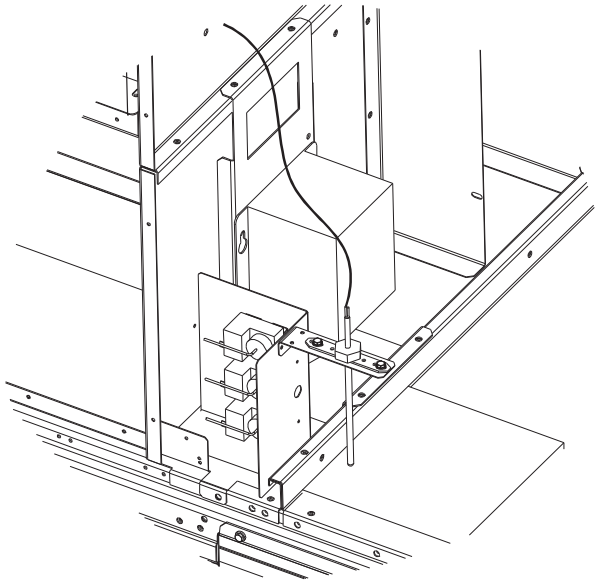


Fig. 25 — OAT Installation for Chassis 8 and 9 Units

9. Locate the two black and brown leads from the main wire harness that were routed into the coil section.
10. For installing the SAT Sensor, locate the temperature sensor, two No. 10 screws and follow the guidelines for wire routing and installation. (See Fig. 26.)

11. Locate the two blue and brown leads from the main wire harness that were routed into the fan section. (See Fig. 26.)

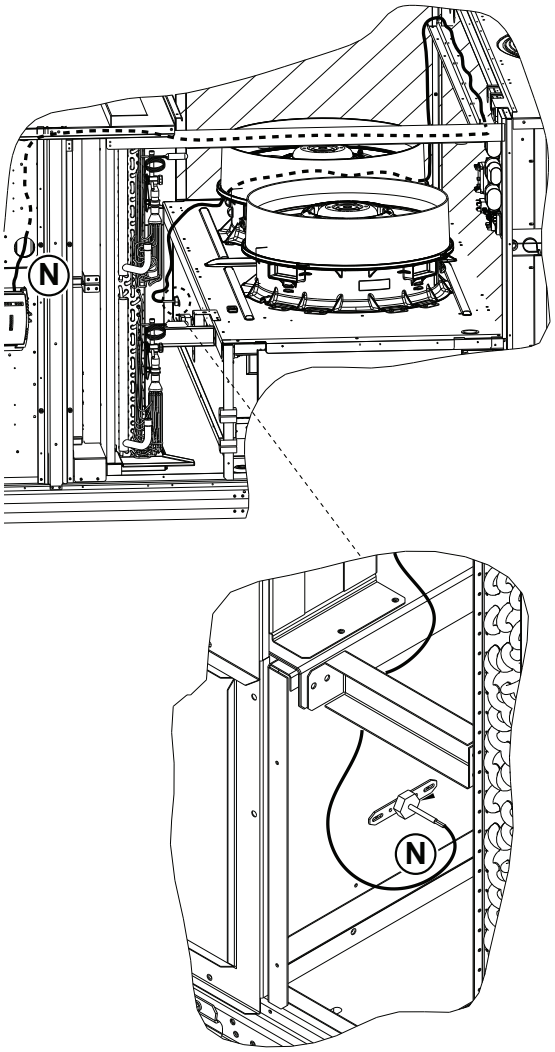


Fig. 26 — SAT Sensor Wire Routing and Installation (All Units)

IMPORTANT: Refer to the specific sensor or accessory instructions for its proper installation and for rooftop unit installation refer to base unit installation instructions and the unit's wiring diagrams.

⚠ DANGER

ELECTRICAL SHOCK HAZARD

Failure to follow this warning will result in personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lock(s) and lockout tag(s). Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate. Unit may have more than one power switch.

WIRING DIAGRAMS

Place the correct alternate control wiring diagram label (see Fig. 27) inside the unit panel. Use part number 48TC007360 for heat pump and electric heat units, and part number 48TC007361 for gas heat units.

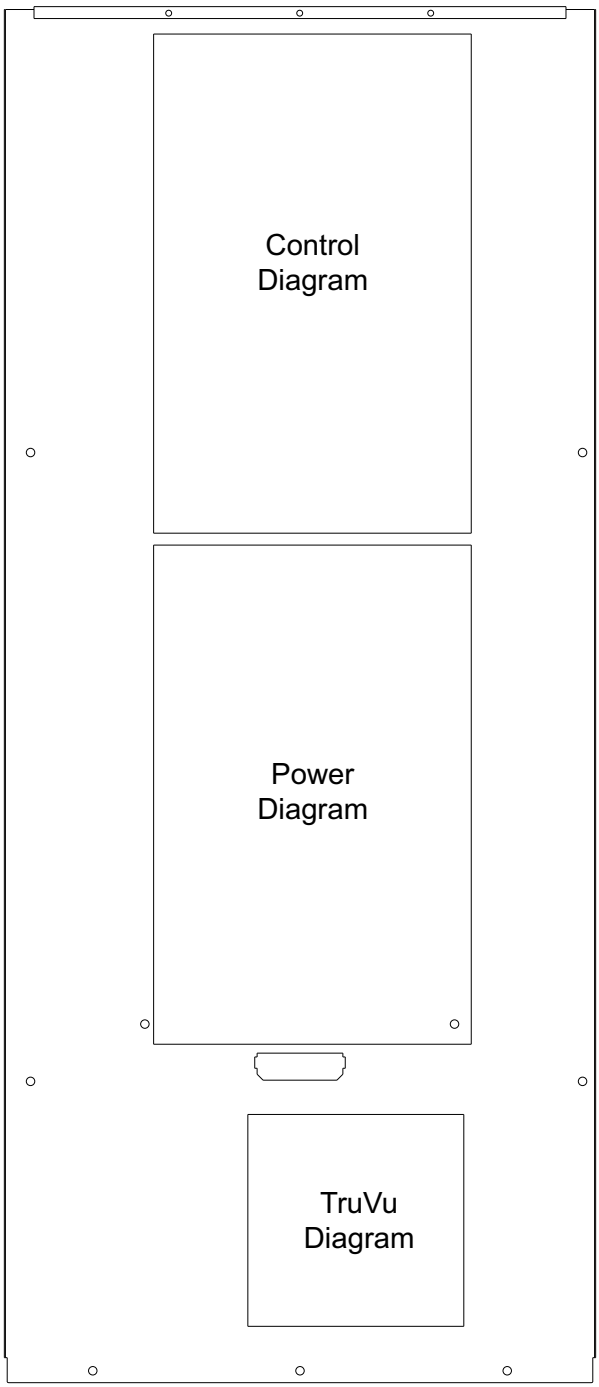


Fig. 27 — Wiring Diagram Label Placement (Chassis 6-9 units)

SENSOR/ACCESSORY INSTALLATION

There are a variety of sensors and accessories available for the TruVu controller. Some of these can be factory or field installed, while others are only field installable. The TruVu controller may also require connection to a building network system or building zoning system. All field control wiring that connects to the TruVu controller must be routed through the raceway built into the corner post of the unit or secured to the unit control box with electrical conduit. The unit raceway provides the UL required clearance between high and low-voltage wiring. Pass the control wires through the hole provided in the corner post, then feed the wires through the raceway to the TruVu controller. Connect the wires to the removable PCB connectors and then reconnect the connectors to the board.

Sensors and Accessories

The TruVu controller is configurable with the following field-supplied sensors:

- Space temperature sensor (ZS-CAR, ZS-C-CAR, ZS-H-CAR, ZS-HC-CAR, ZSPL-C-CAR, ZSPL-H-CAR, ZSPL-HC-CAR, ZSP-CAR, ZSP-C-CAR, ZSP-H-CAR, ZSP-HC-CAR, or 33ZCT55SPT)
- Outdoor air enthalpy switch (33CSENTHSW)
- Return air enthalpy sensor (33CSENTSEN) required for differential enthalpy control
- Humidistat (--HL--38MG-029)
- Smoke Detectors (CRSMKSEN002A00, CRSMKKIT002A00)
- Fan and/or Filter Status (CRSTATUS001A00, CRSTATUS005A00)

User Interfaces

- Field Assistant (USB-TKIT required)
- Wall mounted Equipment Touch™

Install Analog Sensors

SPACE TEMPERATURE SENSOR (SPT)

There are 2 types of space temperature sensors available from Carrier, 10 kilo-ohm type II resistive input non-communicating (T56 and T59 features not supported) and Rnet communicating (ZS-CAR, ZS-C-CAR, ZS-H-CAR, ZS-HCCAR, ZSPL-C-CAR, ZSPL-H-CAR, ZSPL-HC-CAR, ZSPCAR, ZSP-C-CAR, ZSP-H-CAR, ZSP-HC-CAR) sensors. Each type has a variety of options consisting of: timed override button, set point adjustment, a LCD screen and communication tie in. Space temperature can be also be written to from a building network or zoning system. However, it is still recommended that return air duct sensor be installed to allow stand-alone operation for back-up.

Rnet Communicating Sensor Wiring

The Rnet bus allows local communication with the TruVu controller, including communicating sensors. The Rnet bus can hold up to 6 devices in the following combinations wired in daisy-chain or hybrid configuration:

- 1-4 ZS-CAR sensor(s)
- 1 ZSPL-CAR or ZSP-CAR sensor
- 1-4 SPS sensor(s), and 1ZSPL-CAR or ZSP-CAR sensor

NOTE: Additional ZS sensors must be addressed. Use the jumpers on the ZS sensor's circuit board and refer to the sensor installation instructions for addressing.

For Rnet wiring up to 500 ft (152 m), use 18 AWG 4 conductor unshielded plenum rated cable. The TruVu controller J13-RNET connection has a 4 pin PCB connector wired as described below, Fig. 28 shows sensor Rnet wiring.

- RNET - 1 = Signal ground (GND)
- RNET - 2 = Signal (Rnet+)
- RNET - 3 = Signal (Rnet-)
- RNET - 4 = Power (+12v)

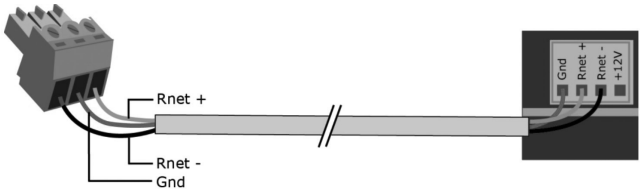


Fig. 28 — Rnet Communication Wiring

SENSOR AVERAGING

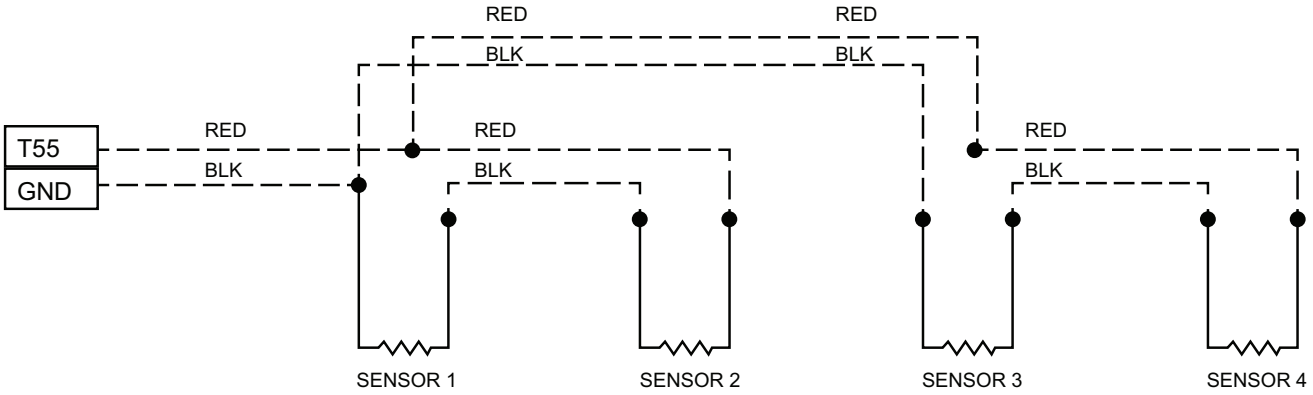
Non-communicating sensors:

See Fig. 29 for space temperature sensor averaging configurations, only combinations of 4 or 9 sensors will operate correctly.

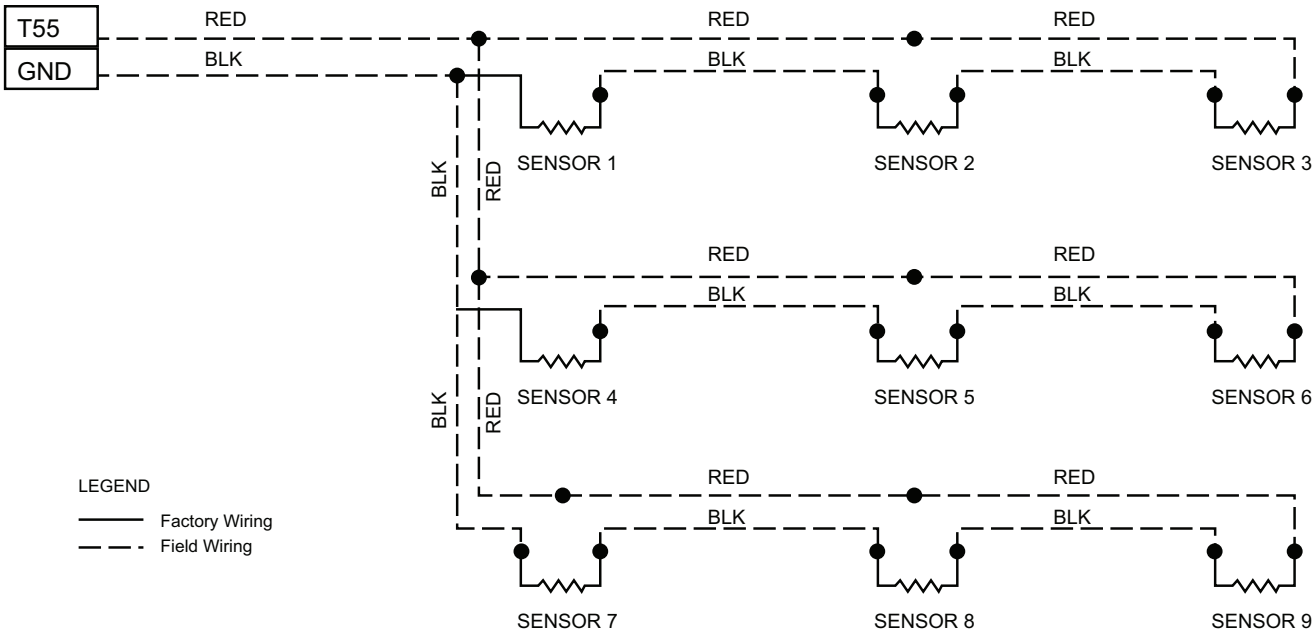
NOTE: T55/T56 Override button will no longer function when sensors are averaged. Only 1 T56 STO input can be used. Non-communication CO_2 sensors can not be averaged.

Communicating sensors:

Any combination of sensors described in the "Rnet Communicating Sensor Wiring" section can be used.



Space Temperature Averaging — 4 Sensor Non-Communicating Application



Space Temperature Averaging — 9 Sensor Non-Communicating Application

Fig. 29 — Space Temperature Averaging for Non-Communicating Sensors

Installing Discrete Inputs

HUMIDISTAT

The accessory humidistat provides the TruVu controller insight to the relative humidity in the space. The humidistat reads the RH level in the space and compares it to its setpoint to operate a dry contact. The humidistat is a dedicated input on the configurable input 9 and tells the TruVu controller when the RH level is HIGH or LOW. The normal condition for humidity is LOW. A normally open humidistat is the factory default control for the Humidi-MiZer® option.

SINGLE ENTHALPY (OUTDOOR ENTHALPY)

The outdoor enthalpy switch/receiver (33CSENTHSW) senses temperature and humidity of the air surrounding the device and calculates the enthalpy when used without an enthalpy sensor. The relay is energized when enthalpy is high (above 28 BTU/lb OR dry bulb temperature is above 75°F) and de-energized when enthalpy is low (below 27 BTU/lb AND dry bulb temperature is below 74.5°F). The enthalpy input is dedicated to input 8 and tells the TruVu controller when the outside air enthalpy is HIGH or LOW. The normal condition for the enthalpy input is HIGH.

NOTE: The enthalpy calculation is done using an average altitude of 1000 ft above sea level.

For field installation, refer to the enthalpy accessory instructions. See Fig. 30 for typical wiring.

DIFFERENTIAL ENTHALPY

Differential enthalpy control requires both an enthalpy switch/receiver (33CSENTHSW) and an enthalpy sensor (33CSENTSEN). The enthalpy sensor must be installed in the field as the factory can only provide single enthalpy. The enthalpy sensor must be mounted in the return airstream and calculates the enthalpy of the indoor air. The relay is energized when the enthalpy detected by the return air enthalpy sensor is less than the enthalpy at the enthalpy switch/receiver. The relay is de-energized when the enthalpy detected by the return air enthalpy sensor is greater than the enthalpy at the enthalpy switch/receiver (differential enthalpy control).

To wire return air enthalpy sensor:

Connect the 4-20 mA In terminal on the enthalpy switch/receiver to the 4-20 mA Out terminal on the return air enthalpy sensor. Connect the 24-36 VDC Out terminal on the enthalpy switch/receiver to the 24-36 VDC In terminal on the return air enthalpy sensor. (See Fig. 30.)

FIRE SHUTDOWN

The fire shutdown input is provided for unit shutdown in response to a fire alarm or smoke detector. The normal condition for fire shutdown is there is no fire alarm. The unit may have factory installed smoke detector(s); refer to the base unit installation instructions for details on any adjustments required during unit installation. Fire shutdown is always factory configured for a normally open smoke detector. For field installation of a smoke detector see instructions for that specific accessory.

FILTER STATUS

The filter status accessory is a field-installed accessory. This accessory detects plugged filters. When installing this accessory, the unit must have a free input (input 4, 5, 6, or 7).

FAN STATUS

The fan status accessory is a field-installed accessory. This accessory detects when the indoor fan is moving air. When installing this accessory, the unit must have a free input (input 4, 5, 6, or 7).

REMOTE OCCUPANCY

The remote occupancy accessory is a field-installed accessory. This accessory provides an input to change the units occupancy status. When installing this accessory, the unit must have a free input (4, 5, 6 or 7).

IGC OVERRIDE

This input provides an indication that the gas valve is stuck open and the heat is still operating after any call for heating has been dropped. This function is dedicated to input 4 if unit's heat type is gas.

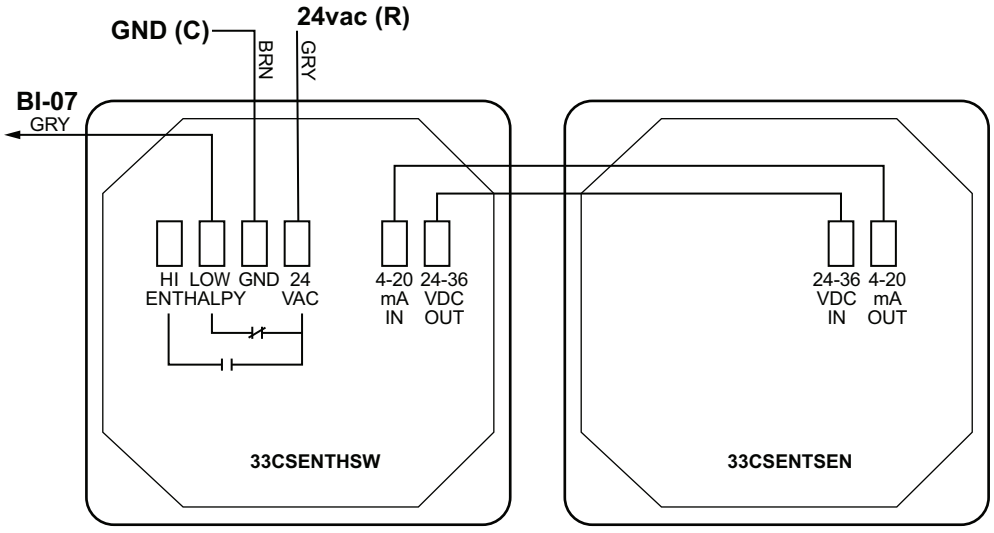


Fig. 30 — Enthalpy Switch and Sensor Wiring

Communication Wiring-Protocols

GENERAL

Protocols are the communication languages spoken by control devices. The main purpose of a protocol is to communicate information in the most efficient method possible. Different protocols exist to provide different kinds of information for different applications. In the BAS application, many different protocols are used, depending on manufacturer. Protocols do not change the function of a controller; just make the front-end user different. The TruVu controller can be set to communicate on two different protocols: BACnet IP and BACnet MS/TP. Refer to the TruVu v3 Integration Guide for more detailed information on protocols, third party wiring, and networking.

i-Vu BUILDING AUTOMATION SYSTEM

i-Vu® is a Carrier front-end and Building Automation System (BAS). It is a web based network system that uses a native BACnet over MS/TP communication protocol. The speed of the network can range from 9600 to 76,800 baud. Open controllers communicate with a proprietary language called Linkage in i-Vu. Linkage is established automatically and allows the flow of specific data across Open devices. Refer to i-Vu literature for more information on i-Vu.

BACnet MS/TP

BACnet MS/TP is used for communicating BACnet over a sub-network of BACnet-only controllers. This is the default Carrier communications protocol. Each TruVu module acts as an MS/TP Master. The speed of an MS/TP network can range from 9600 to 76.8K baud. Physical Addresses can be set from 01 to 99.

BACNET IP

The Carrier TruVu™ controllers that have dual IP ports support several ethernet network configurations. In addition to increased speed, many of these configurations offer advantages over serial networks, such as redundancy and fail-safe mechanisms. These aspects provide more options when designing controller networks and help to more quickly identify a failed controller or physical break in the network.

The features of the TruVu controllers that have dual IP ports include:

- Local access to the controllers' IP and BACnet settings over USB.
- An ethernet fail-safe relay mechanism.
- Wireless service adapter support.
- Methods to configure IP addresses of all the controllers on a subnet from a single location (such as the AddressIT app or through local access).

Supported ethernet network configurations:

- Ring network (requires RSTP-enabled switch).
- Daisy chain.
- Home run.
- Hybrid (combination of the above).

Please refer to the TruVu product family literature for details on networking wiring and configuration.

LOCAL ACCESS

Wall Mounted Equipment Touch

The Equipment Touch is a wall mounted interface used to connect to the TruVu controller to access the control information, read sensor values, and maintenance. This is an accessory interface that does not come with the TruVu controller. Wire the Equipment Touch to the TruVu controller Rnet port. There are 2 password protected levels in the display (User and Admin). See the Equipment Touch Installation and Setup Guide for more information. See Appendix G for navigation and screen content.

Field Assistant

Field Assistant is a computer program included with the purchase of the Tech Tool Kit (USB-TKIT). This is a field Tech Tool to set-up, service, or download application software to the TruVu controller and includes a USB Link Cable. The link cable connects a USB port to the J12 local access port. The Field Assistant program menu structure is similar to and functions the same as the i-Vu software. See Fig. 31.

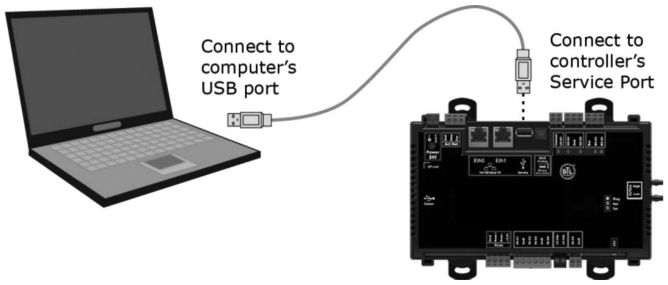


Fig. 31 — PC Running Field Assistant

START-UP

IMPORTANT: Follow the base unit's start-up sequence documented in its specific instructions. Use the base unit's start-up check list when performing the start-up.

Besides the base unit start-up, there are a few steps to take to properly start-up the controls. The TruVu Service Test function should be used to assist in the base unit start-up and also allows verification of output operation. Controller configuration is also part of start-up. This is especially important when field accessories have been added to the unit. The factory pre-configures options installed at the factory. There may also be additional installation steps or inspection required during the start-up process.

EcoBlue™ Fan Set Up

The TruVu controller controls the vane axial fan directly, therefore the UCB fan set up is not needed. The maximum, minimum, and heat speed setting can be adjusted to restrict too much or prevent to too less of air flow. However the control will speed up the fan as needed during heating or cooling so the maximum should be the only one needed for duct restrictions.

Additional Installation/Inspection

Inspect the field installed accessories for proper installation, making note of which ones do or do not require configuration changes. Inspect the TruVu Alarms for initial insight to any potential issues. See troubleshooting section for alarms.

SERVICE TEST

The Service Test function can be used to verify proper operation of compressors, heating stages, indoor fan, power exhaust fans, economizer, and dehumidification. Use of Service Test is recommended at initial system start up and during troubleshooting. See Appendix H for Service Test Mode table.

Service Test mode has the following changes from normal operation:

- Outdoor air temperature limits for cooling circuits, economizer, and heating are ignored.
- Normal compressor time guards and other staging delays are ignored.
- The status of Alarms (except Fire and Safety chain) is ignored, but all alerts and alarms are still broadcast on the network.

To activate Service Test, the unit must be shut down first. In Field Assistant, or the i-Vu® interface, you can verify on the ***Properties → BACnet Objects*** tab that the BBV System is shut down shows Yes. Service Test can be turned on or off from a Field Assistant or i-Vu® interface in ***Properties → Control Program → Configuration → Service Configuration***, or from an Equipment Touch. Select Default Value of Enable to turn on and Disable to turn off. Service Test allows testing of each controller output.

Binary Service Test functions are on when the Default Value is set to Enable and off when set to Disable.

The output of the Analog Service Test is controlled by percentage (0-100%) entered into the Default Value. It is recommended to return every Service Test variable to Disable or 0.00 after testing each function (unless that test variable must be active to test a subsequent function. As in Compressor 2 Test).

All outputs return to normal when Service Test is set to Disable.

Service Test mode does not timeout. Return all test variables to Disable or 0.00. Set Service Test to Disable or cycle power to the TV-RTU to return to normal operation.

FAN TEST

Use Fan Test (minimum ECM speed) to activate and deactivate the Supply Fan (IDF - AO-03) output. Note that this output may enable simultaneously with other Service Test modes even with its Default Value set to Disable.

COMPRESSOR 1 AND COMPRESSOR 2 TEST

Use Compressor 1 Test to activate and deactivate the Compressor 1 (Y1 – Relay 2, BO-02) output. The Supply Fan output will be activated and deactivated in conjunction with this output. Use Compressor 2 Test to activate and deactivate the Compressor 2 (Y2 – Relay 3, BO-03) output. Always test the Compressor 1 output first. For all units Compressor 1 Test output must be set to Enable for Compressor 2 Test to function.

HEAT 1 AND HEAT 2 TEST

Use Heat 1 Test to activate and deactivate the Heat 1 (W1 – Relay 4, BO-04) output. The Supply Fan output is activated and deactivated in conjunction with the Heat 1 Test output. Use Heat 2 Test to activate and deactivate the Heat 2 (W2 – Relay 5, BO-05) output. The Supply Fan output is activated and deactivated in conjunction with the Heat 2 Test output.

DEHUMIDIFICATION TEST

Use the Dehumidification Test to activate and deactivate the Humidi-MiZer® (DEHUM – Relay 6, BO-06) output. The Supply Fan output will be activated and deactivated in conjunction with the Dehumidification Test output.

POWER EXHAUST TEST

Use Power Exhaust Test to activate and deactivate the power exhaust (EXH – Relay 7, BO-07) output.

ECM SPEED TEST

ECM Speed Test is used to set the (IDF – AO-03) ECM Speed Control output to any value from 0 to 100% of configured output (0-10 Vdc).

ECONOMIZER TEST

Use Economizer Test to set the (ECON – AO-02) economizer output to any value from 0 to 100% of configured output (2-10vdc).

OPERATION

The TruVu controller will control the compressors, economizer and heating outputs based on its space temperature input and setpoints. It can also be controlled by a building control system or zoning system. The TruVu controller's default is to control to occupied setpoints all the time, until a type of occupancy control is set. The following sections describe the operation for the functions of the TruVu controller.

Occupancy

Occupancy is the fundamental overall control of equipment. The unit can be in one of two states: Occupied or Unoccupied. These are usually referred to as periods because they represent periods of any given day. The TV-RTU operates continuously in the Occupied mode until you configure an occupancy schedule or an Occupancy Source.

An occupancy schedule may be:

- A local schedule configured in the controller using an Equipment Touch or Field Assistant.
- A BACnet schedule configured for the TV-RTU in the i-Vu® application.
- A BACnet or local schedule configured in the VVT

Zones that are subordinate to the TV-RTU and employing Linkage To set up occupancy schedules, see the documentation for your user interface.

NOTE: A BACnet schedule, downloaded from the i-Vu® application will overwrite a local schedule that was set up with an Equipment Touch or Field Assistant.

OCCUPANCY SOURCE

The following settings determine occupancy. Options:

- Always Occupied (default)

  Controller operates continuously, regardless of any configured schedule
- BACnet Schedule

  Uses a local BACnet occupancy schedule configured within the controller
- BAS On/Off

  Occupancy is set over the network by another device or a third party BAS. Refer to the TV-RTU Integration Guide for additional instructions in communication protocols.
- Remote Occ Input

  Controller monitors an input contact connected to one of the available binary inputs configured to receive it. You must set ***Unit Configuration → Occupancy Source*** to Remote Occ Input and one Input Switch Configuration to Remote Occupancy.

Supply Fan

The TV-RTU supply fan is configured for variable speed Fan Control. The fan operates at a variable speed to maintain the desired supply air conditions when heating or cooling are operating. Variable speed fan control provides Staged Air Volume (SAV) operation by maximizing energy savings and minimizing fan horsepower consumption. Fan speed is NOT controlled to maintain duct static pressure. The TV-RTU supply fan may be configured for 1 of 3 Fan Modes

AUTO

When Fan Mode is set to Auto, the TruVu controller will cycle the fan on and off based on the demand for heating or cooling.

CONTINUOUS

When Fan Mode is set to Continuous, the fan runs continuously during occupancy and intermittently during unoccupied periods with heating or cooling.

ALWAYS ON

When Fan Mode is set to Always On, the fan runs continuously regardless of occupancy or calls for heating and cooling.

Occupancy can be determined by Linkage, BACnet schedules, BAS schedules, or in response to a remote occupancy switch.

FAN OFF DELAY

A Fan Off Delay allows the supply fan to continue operating after heating or cooling stops. If the following alarms are active, the fan turns off immediately, regardless of the occupancy state or demand:

- Fire Shutdown
- Safety Chain
- Supply Air Temp Sensor alarm

The TruVu controller does not include smoke-control functions such as smoke-purge, zone-pressurization, or smoke-ventilation.

The TV-RTU may be configured to accept a Supply Fan Status input to provide proof the supply fan is operating. When enabled, a loss or lack of fan status will stop heating and cooling operation.

A Supply Fan Alarm Service Timer function is available to track the number of supply fan run hours and generate an alarm when the accumulated runtime exceeds the set threshold.

Vent / Fan Only Mode

When the space temperature is between the heating and cooling setpoints, the fan operates at the minimum ECM speed (***IDF Min Speed***) configured under normal operating conditions.

NOTE: SAT must be above the SA Vent/Temper Setpoint if SA Tempering is Disabled or SAT must be above the SA Vent/Temper Setpoint –7.5°F (–21.9°C) if SA Tempering is Enabled and OAT is below the Minimum Cooling SAT.

Fan Only Override w/Variable Speed Fan Control

The TV-RTU monitors the SAT in fan only mode to ensure the SAT remains above an acceptable minimum value. Fan Override typically occurs when the outdoor air is cold in winter and the economizer increasingly opens at lower fan speeds to maintain a constant amount of outdoor air. If SA Tempering is disabled, then when the SAT drops below the SA Vent/Temper Setpoint, the fan speed increases up to the maximum configured speed, while at the same time, the economizer position will correspondingly decrease from the ***Low Fan Econ Min Pos*** toward the ***Vent Dmpr Pos/DCV Min Pos***. The ***Vent Dmpr Pos/DCV Min Pos*** is used when the fan is at the configured maximum fan speed. The ***Low Fan Econ Min Pos*** is used when the fan is at the lowest speed and depends on which value, minimum ECM speed or heating speed, is set lower.

Cooling

The TV-RTU's application and configuration determines the specific cooling sequence. The TV-RTU can control up to 2 stages of cooling. The number of stages is configurable or is defined by unit type. The following conditions must be true for the cooling algorithm to operate:

- Outdoor Air Temperature, if valid, is greater than the Cooling Lockout Temperature setpoint.
- Indoor Fan is ON.
- Heat mode is not active and the 5-minute time guard between modes has expired
- If occupied and the SPT > (occupied cool setpoint).
- Space Temperature and supply air temperature values are valid.
- Economizer is unavailable, or if the Economizer is active, mechanical cooling is available if the economizer is open > 90% for at least 7.5 minutes, the SAT and OAT > [Minimum Cooling SAT + 5 Δ°F (2.7 Δ°C)] and SPT > [Effective Cooling Set-point + 0.5 Δ°F (0.27 Δ°C)].

The cooling relays are controlled by the Cooling Control PID Loop and Cooling Capacity algorithm. They calculate the desired number of stages needed to satisfy the space by comparing the Space Temperature to the:

- Effective Occupied Cooling Setpoint when occupied.
- Effective Unoccupied Cooling Setpoint when unoccupied.

When the cooling algorithm preconditions have been met, the compressors are energized in stages, as applicable. Anti-recycle timers are employed to protect the equipment from short-cycling.

There are fixed 3 minute minimum on-times, and 5 minute off-times for each compressor output. During compressor operation, the TV-RTU may reduce the number of active stages if the rooftop supply air temperature falls below the Minimum Cooling SAT Setpoint. A compressor staged off in this fashion may be started again after the normal time-guard period has expired, if the Supply Air Temperature has increased above the Minimum Cooling SAT Setpoint.

Compressor Service Alarm Timer functions are available (1 for each stage of compression). This function tracks the number of compressor run hours and generates an alarm when the accumulated runtime exceeds the threshold set by the adjustable compressor service alarm timers.

SAV COOLING MODE

When the space temperature rises above the cooling setpoint and the cooling mode becomes active, the cooling capacity is calculated by the Cooling PID and the outputs are enabled as required. Initially, the fan runs at the configured minimum airflow (IDF Min Speed) and ECM speed as long as the SAT remains above the appropriate cooling stage setpoint (Stage 'x' SAT Stpt). As the SAT drops below the configured Stage 'x' SAT Stpt, the fan speed increases as required up to the configured maximum ECM speed (IDF Max Speed Voltage) to provide sufficient airflow across the coil and maintain the desired SAT setpoint. The number of setpoints displayed and used depends on the unit type and configuration. The specific setpoint used is based on how many stages of cooling are actively operating.

Economizer

The TV-RTU provides an analog economizer output for rooftop units with economizer dampers. Economizer dampers may be used to provide indoor air quality control and free cooling when outside air conditions are suitable.

The following conditions must be true for economizer operation:

- The Outdoor Air Temperature is less than the Space Temperature and less than the Economizer High OAT Lockout Temp setpoint.
- The indoor fan is on.
- The unit has a valid Supply Air Temperature input.
- The unit has a valid Space Temperature input.

The TV-RTU economizer minimum position is adjusted to provide a constant amount of outdoor air. If the fan is at max speed, the economizer minimum position will be set to the Vent Dmpr Pos / DCV Min Pos setpoint. If the fan is at min speed, the economizer minimum position will be set to the Low Fan Econ Min Pos.

If all preceding conditions are true, the economizer PID loop modulates the damper between the minimum position and 100% open.

The economizer will modulate to maintain the configured Minimum Cooling SAT limit when the unit is in an economizer only mode and will modulate closed only when the SAT drops below the Minimum Cooling SAT limit –5 Δ°F (–2.8 Δ°C) when mechanical cooling is also operating.

SAV ECONOMIZER MODE

When the economizer mode becomes active, the fan runs at the configured minimum airflow (IDF Min Speed). The economizer algorithm will first modulate the economizer to lower the SAT until reaching the configured Minimum Cooling SAT limit, while maintaining the minimum fan airflow. If this alone is insufficient to maintain the space temperature, the TV-RTU increases the fan speed to provide more OA for cooling. As necessary, the fan speed may increase up to the configured maximum ECM speed (IDF Max Speed Voltage) to provide the required cooling.

ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD)

The TV-RTU provides FDD (Fault Detection and Diagnostics) for economizer operation in compliance with California Title 24. The Economizer FDD routine for Title 24 is always active. The FDD logic detects 4 economizer faults:

- Fails to close.
- Fails to open.
- Stuck fully open.
- Fails to fully open.

Each condition causes an Economizer Operation alarm and displays the specific fault condition.

The following must be true to enable the FDD logic:

- TV-RTU must be in Economizer mode.
- 30 minutes must elapse since the last time heating or cooling was active.
- OAT must be < (OAT economizer lockout –15°F).

Failed To Fully Open

If the damper command is > 95%, the SAT must equal the OA temperature ±5°F, otherwise the Full Open Fail flag is set. If this condition continues for more than 30 minutes, the Economizer FDD alarm is active. This indicates that the damper failed to fully open when needed, since the SAT failed to reach the OA temperature ±5°F.

Stuck Open

If the damper is commanded to < 40% and the SAT is still equal to the OAT ±5°F, the Stuck Open flag is set. If this condition continues for more than 30 minutes, then the Economizer FDD alarm is active. This indicates the damper failed to close when needed, since the SAT failed to increase in temperature.

When the damper is modulating (MUST be above any minimum configured position) and between 25% and 100%, the FDD logic monitors the current and previous SAT, economizer-commanded position, and the OAT.

Failed To Open

If the FDD logic detects an increase in damper position, for example from 50% to 65%, it expects to also detect a decrease in SAT. If the SAT failed to decrease, or no change in SAT is detected, the FDD logic generates a Failed to Open alarm after 10 minutes.

Failed To Close

If the FDD logic detects a decrease in damper position, for example from 80% to 65%, it expects to also detect an increase in SAT. If the SAT failed to increase, or no change in SAT is detected, the FDD logic generates a Failed to Close alarm after 10 minutes.

Invalid Sensor

If the FDD logic detects an invalid Space Temperature, Supply Air Temperature, or Outdoor Air Temperature, for example the Supply Air Temperature value is -999°F, the FDD logic generates an Invalid Sensor alarm.

Power Exhaust

The TV-RTU may enable and disable an exhaust fan, based on either the controller's occupancy or its economizer damper position. The Power Exhaust Setpoint is automatically adjusted based on the fan's air delivery. The Calculated PE Setpoint used for control is displayed in the Maintenance section.

If Continuous Occupied Exhaust is Yes, the Power Exhaust binary output (EXH – Relay 7, BO-07) is energized while the TV-RTU is occupied and de-energized when unoccupied.

If Continuous Occupied Exhaust is No, the Power Exhaust binary output (EXH – Relay 7, BO-07) is energized when the economizer damper output exceeds the Calculated Power Exhaust (PE) Setpoint value. The output remains energized until the economizer output falls below the Power Exhaust Setpoint value by a fixed hysteresis of 10%.

Pre-Occupancy Purge

Pre-Occupancy Purge allow the rooftop equipment with an economizer damper to utilize outdoor air to purge the space of contaminates just prior to the beginning of the occupied period.

The following conditions must be true for pre-occupancy purge to operate:

- Pre-Occupancy Purge set to Enable
- Economizer Exists set to Yes
- The local time schedule is currently unoccupied and the remaining time is less than the configured Purge Time.
- A local time schedule is configured

When the TruVu controller schedule is unoccupied and the remaining unoccupied time is less than the purge time, the supply fan starts. The economizer damper opens to the configured Economizer Purge Min Pos. The TruVu controller continues to operate in this mode until the occupied start time is reached. The Pre-Occ Purge state is displayed in the Maintenance section.

Post-Event Manual Purge

Post-Event Manual Purge allows rooftop equipment with an economizer damper to use outdoor air to purge the space of contaminants. On activation the economizer opens to Manual Purge Mode Econ Pos and enables the Indoor Fan Motor to maximum ECM speed (***IDF Max Speed Voltage***) and optionally starts the TV-RTU's integral Power Exhaust if one exists and is configured. During Manual Purge all other outputs remain off.

The following conditions must be true for manual purge to operate:

- ***Economizer Exists*** set to ***Yes***.
- ***Manual Purge Enable*** set to ***Fan and Econ*** (if exhaust fan exists and is configured set to ***Fan and Econ and Exh***).

This is not an algorithmic function and does not activate automatically under any conditions. The features of Manual Purge Mode only activate when a BACnet command is initiated by the BACnet BAS. When connected to a BACnet network (MS/TP or BACnet/IP) the TV-RTU receives a network global BACnet (default BV: 87087) binary value or a specific network binary BACnet point (configurable) written to by the BAS.

NOTE: During Manual Purge, when the TV-RTU is an Airside Linkage air source, verify ***Linkage → Airside Linkage Status*** shows **Active**. All air terminals connected to the TV-RTU via Airside Linkage go into the Pressurize mode, opening their zone damper fully.

Unoccupied Free Cooling

Unocc Free Cool Enable allows rooftop equipment with an economizer damper to use outdoor air for free cooling during unoccupied periods.

The following conditions must be true for unoccupied free cooling to operate:

- Unocc Free Cool Enable set to Enable.
- The system is unoccupied.
- The outside air temperature is below the Economizer High OAT Lockout Temp setpoint.
- The outside air temperature is less than the space temperature.
- Enthalpy (if enabled) is Low.

When the TV-RTU schedule is unoccupied and the space temperature rises at least 1 Δ°F (0.5 Δ°C) above the Occupied Cooling Setpoint, the supply fan starts. The economizer damper opens as necessary to cool the space. The TV-RTU continues to operate in this mode until the space is satisfied or the outside air conditions are no longer suitable for free cooling.

Enthalpy Control

You may use an enthalpy switch to indicate the suitability of outdoor air for economizer cooling. You can use either an outdoor air or differential enthalpy switch. A differential enthalpy switch has a sensing device in both the outdoor and return air streams. A differential enthalpy switch indicates when outside air is more suitable to be used than the return air and is available for economizer cooling. If no enthalpy switch is configured, a network point (Object Name: oae) is available. This point is displayed in the i-Vu® application and an Equipment Touch as Enthalpy (BACnet).

The sequence of operation for economizer cooling is the same with or without an enthalpy switch, except that an enthalpy switch imposes one more validation on the suitability of outside air for economizer cooling. An Enthalpy Status that is High disables the economizer and the outside air damper goes to its minimum position. An Enthalpy Status that is Low enables the economizer if a call for cooling exists and the remaining preconditions are met.

Optimal Start

The TV-RTU may use either of 2 different Optimal Start methods. Learning Adaptive Optimal Start is used for heat pump applications and adjusts the effective setpoints to achieve the occupied setpoints by the time scheduled occupancy begins. This prevents or minimizes the need for auxiliary heat. The Optimal Start recovery period may begin as early as 4 hours prior to occupancy. The algorithm works by moving the unoccupied setpoints toward the occupied setpoints. The rate at which the setpoints move is based on the outside air temperature, design temperatures, and capacities.

The following conditions must be true for learning adaptive optimal start to operate:

- On the ***Properties page → Control Program tab → Configuration → Setpoints → Optimal Start***, the default value is set to **1** and must be set greater than **0** (0.00 disables Optimal Start) and less than or equal to 4.
- The system is unoccupied.

NOTE: If the controller does not have a valid outside air temperature, then a constant of 65°F (18.3°C) is used. This value is not adjustable.

The actual equation that the controller uses to calculate Learning Adaptive Optimal Start is nonlinear. An approximation of the result is shown in Fig. 32.

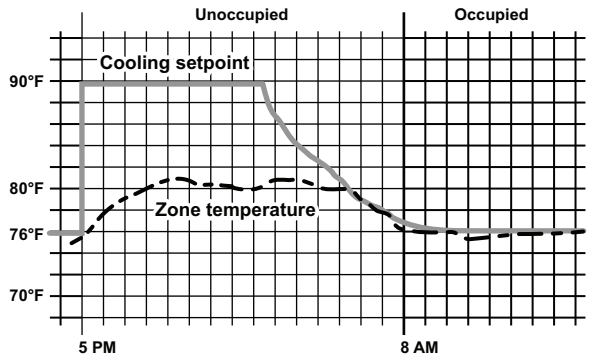


Fig. 32 — Example Equation Result for Learning Adaptive Optimal Start (IO Points Manual)

To change Learning Adaptive Optimal Start settings:

1. In the navigation tree, select the equipment that you want to change.
2. Click ***Properties page → Control Program tab → Configuration → Setpoints***.

Temperature Compensated Optimal Start is a second start method used for gas or electric heating applications. It switches from unoccupied to the occupied setpoints at a calculated time prior to occupancy. This minimizes the operation of the unit's fan. The Optimal Start recovery period may begin as early as 4 hours prior to occupancy. The time at which the setpoints move is based on the difference between the current space temperature and the desired setpoint, multiplied by the "K" factor, or recovery rate, for the required mode of operation.

The following conditions must be true for Temperature Compensated Optimal Start to operate:

- On the ***Properties page → Control Program tab → Configuration → Setpoints → Optimal Start***, the default value is set to **1** and must be set greater than **0** (0.00 disables Optimal Start) and less than or equal to 4.
- The system is unoccupied.

To change Temperature Compensated Optimal Start settings:

1. In the navigation tree, select the equipment that you want to change.
2. On the ***Properties page → Control Program tab → Configuration → Setpoints***, click **Heat Start K** factor or **Cool Start K** factor. This defines the equipment's recovery rate in minutes/deg.

Indoor Air CO_2 Level

Indoor Air CO_2 is controlled on rooftop equipment with an economizer. Indoor Air CO_2 sequence is enabled by installing an air quality (CO_2) sensor. A CO_2 sensor may be terminated at the TV-RTU, or a subordinate zone controller, when part of a zoned system.

An outdoor air quality sensor may also be installed and terminated at the TV-RTU, but it is not required. When an outdoor air quality sensor is not installed, the algorithm uses 400ppm as the fixed outdoor air CO_2 level.

The following conditions must be true for the Indoor Air CO_2 algorithm to operate:

• The system is occupied.

• The supply fan has been started for at least 30 seconds.

• The CO_2 sensor has a valid reading

As the air quality within the space changes, the minimum position of the economizer damper changes, which allows more or less outdoor air into the space, depending on the relationship of the indoor air CO_2 level to the differential setpoint.

The Indoor Air CO_2 algorithm calculates a minimum position value using a PID loop. The CO_2 minimum damper position is then compared against the Vent Dmpr Pos / DCV Min Pos setpoint and the greatest value becomes the final minimum damper position of the economizer output.

The degree to which the outside air damper may be opened by the Indoor Air CO_2 algorithm is limited by the DCV Max Vent Damper Pos setpoint, which is adjustable between zero and seventy-five percent (0-75%).

Heating

The specific heating sequence is determined by the controller's application and configuration. The TV-RTU controls up to 2 stages of gas or electric heating.

The following conditions must be true for the heating algorithm to operate:

- The Outdoor Air Temperature is less than the Heating Lockout Temperature setpoint.
- The indoor fan has been ON for at least 30 seconds.
- The unit has a valid Supply Air Temperature input.
- The unit has a valid Space Temperature input.
- Neither Cool mode nor economizer are active and the time guard between modes has expired.

The heating relays are controlled by the Heating Control PID Loop and Heating Stages Capacity algorithm, which calculate the desired number of stages to satisfy the space by comparing the Space Temperature to the:

• Effective Occupied Heating Setpoint when occupied.

• Effective Unoccupied Heating Setpoint when unoccupied

When the heating algorithm preconditions have been met, the heating is energized in stages. Anti-recycle timers are employed to protect the equipment from short-cycling. There are fixed one minute minimum on and off times for each heating output.

During heating operation, the TV-RTU may reduce the number of active stages if the rooftop Supply Air Temperature exceeds the Maximum Heating SAT setpoint. A heat stage turned off in this fashion may be started again after the normal time-guard period has expired, if the Supply Air Temperature has decreased below the Maximum Heating SAT setpoint.

SAV HEATING MODE

When the space temperature is below the heating setpoint and the heating mode becomes active, the heating capacity is calculated by the Heating Control PID Loop and the outputs are enabled as required. Initially, the fan operates at the configured heat airflow (IDF Heat Speed), whether higher or lower than the minimum ECM speed (IDF Min Speed), as long as the SAT remains below the Maximum Heating SAT minus 3 Δ°F (1.67 Δ°C). As the SAT increases above this value, the fan speed increases up to the configured maximum ECM speed (IDF Max Speed Voltage) to provide sufficient airflow across the coil and maintain the Maximum Heating SAT minus 3 Δ°F (1.67 Δ°C) setpoint. As the SAT exceeds the Maximum Heating SAT, the heat stages will be reduced or disabled.

Supply Air Tempering

The TV-RTU can provide supply air tempering to warm the discharge air under conditions where no heating or cooling is required, the outdoor air is cold, and the volume of outdoor air required for minimum ventilation causes the supply air temperature to fall below the adjustable SA Vent / Temper Setpoint.

To enable the tempering function, SA Tempering must be set to Enable. The following conditions must be true for the algorithm to operate:

- The unit cannot be a heat pump type (HP Y1/W1 Ctrl).
- The unit has been operating for at least 5 minutes.
- The unit has a valid Supply Air Temperature input.
- The unit is configured for gas or electric heat.
- The Outdoor Air Temperature is less than the Minimum Cooling SAT.
- The current operation mode is either Fan Only, IAQ Override,or Pre-occ Purge.
- The fan status is True (if configured for the fan status option).
- The supply air temperature falls below the configured SA Vent / Temper Setpoint

When the algorithm preconditions above have been met, the first stage of heating is energized. The heating operates to maintain the desired SA Vent / Tempering Setpoint subject to the minimum on timer and anti-recycle timer to protect the equipment from short-cycling and ensure minimum burn time for gas heat. There are fixed one- minute minimum on and off times for the heating output.

Heat Pump Operation

The TV-RTU heat pump (HP Y1/W1 Ctrl) control. Select HP Y1/W1 Ctrl for heat pumps that do not require a O terminal to energize the reversing valve. The sequences of operations are as described for Heating and Cooling. The reversing valve is not used in this application. W2 is used for auxiliary heat. Up to 2 stages of heat are available.

The TV-RTU will prevent auxiliary heat operation whenever the OA temp is greater than the configured HP Aux Heat Lockout Temp. This allows the TV-RTU to utilize the more efficient heating from the reverse cycle operation and prevents the operation of the auxiliary heat source.

IMPORTANT: Heat Pump units (HP Y1/W1 Ctrl) require a valid OA Temperature value.This value may be a local sensor connected to the TV-RTU or a value received from the network.

Dehumidification

The TV-RTU provides occupied and unoccupied dehumidification on units that are equipped with the Carrier Humidi-MiZer® option from the factory. This requires a space relative humidity sensor or a humidistat for control.

The following conditions must be true for the dehumidification control to operate:

- The Outside Air Temperature is greater than the Cooling Lockout Temperature setpoint.
- The Indoor Fan has been on for at least 30 seconds.
- The unit has a valid Supply Air Temperature input.
- The unit has a valid Space Temperature input.
- The unit has a valid Space Relative Humidity Sensor or humidistat input.
- Heat mode is not active and the time guard between modes has expired.

When using a relative humidity sensor to control dehumidification, occupied and unoccupied dehumidification setpoints are used. When using a humidistat, the setpoints are not used. The humidistat indicates a high humidity condition.

When a high indoor relative humidity condition is indicated and the above conditions are satisfied, the TV-RTU enters the dehumidification mode, energizing the Humidi-MiZer output. This mode continues to operate until the space relative humidity falls below the active setpoint by a 5% fixed Hysteresis when a humidity sensor is used, or when there is no longer a call for dehumidification where a humidistat is used.

See the unit specific operations manual and the Humidi-MiZer operations manual for additional information.

Demand Limit

The TV-RTU may employ a demand limit strategy. Demand limiting in the TV-RTU works through setpoint expansion. The controller's heating and cooling setpoints are expanded in steps or levels. The degree to which the setpoints are expanded is defined by the Demand Level Setpoints.

Each Demand Level (1 through 3) adusts the heating and cooling setpoints outwards. By default, Demand 1 yields a 1.0 Δ°F (0.5 Δ°C) expansion, Demand 2 yields a 2.0 Δ°F (1.1 Δ°C) expansion, and Demand 3 yields a 4.0 Δ°F (2.2 Δ°C) expansion.

The BACnet Demand Limit variable sets the desired level of setpoint expansion in the receiving controller. Level 0 leaves the standard occupied and unoccupied heating and cooling setpoints in effect. Levels 1 through 3 expand occupied heating and cooling setpoints.

Fire Shutdown

Fire Shutdown may be configured on binary input 4, 5, 6 or 7. A typical application involves a smoke detector or fire shutdown contact, which, when active, immediately shuts down equipment operation.

NOTE: If Heat Type is Gas, input 4 (BI-04*) is reserved for IGC Override and will be automatically configured. Fire Shutdown may be configured on any unused binary input.

Fan Status

Fan Status may be configured on any unused binary input channel. A typical application would be an airflow switch, current sensing relay, or other device that provides a supply fan running verification. Enabling this function displays the supply fan status on the equipment graphic.

If the controller loses fan status during operation, heating and cooling are disabled, the economizer damper (if available) is closed, and an alarm, for loss of status, is indicated.

If the fan status is on when the controller is commanding the fan off, the units remains in the off state. An alarm is generated indicating that the fan is running when it should be off.

Filter Status

Filter status may be configured on any unused binary input channel. A typical application is a differential pressure switch that senses the pressure drop across a filter bank. When the pressure across the filter bank exceeds the setpoint of the differential pressure switch. the Filter status is displayed as Dirty on the controller graphic. An alarm indicates a Dirty filter.

Door Switch

A Door Contact may be configured on any unused binary input. A typical application is a door or window contact mounted within the space served by a single zone rooftop. The Door Contact disables the mechanical cooling and any heating when active (an open door or window detected). Economizer cooling, if available, continues to operate. The input provides a configurable alarm delay (60 seconds by default) before heating and cooling are disabled.

Remote Occupancy

Remote occupancy may be configured on any unused binary input channel. A typical application is a remote contact, controlled by a third party, or an occupancy sensor to set the controller's occupied mode. The Remote Occupancy function requires both an input configured for Remote Occupancy, and Occupancy Source set to Remote Occ Input to operate. Once configured, the controller will operate in the occupied or unoccupied mode, as determined by the state of the Remote Occupancy input.

Linkage

The TV-RTU may serve as an air source to an Open Variable Volume and Temperature (VVT®) system. When the TV-RTU is part of a VVT system and the controllers are wired together to form a network, the controllers may use a method of communication known as Linkage. Linkage is a method by which an air source and its subordinate zone terminals exchange data 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. The VVT Master gathers the following information from the zone controllers:

- Occupancy status.
- Setpoints.
- Zone temperature.
- Relative humidity.
- CO_2 level.
- Damper position.
- Optimal start data.

The VVT Master performs mathematical calculations and algorithms on the data and then sends the composite information to the air source. The VVT Master receives information from the air source (such as: System Mode, Supply Air Temperature, and Outside Air Temperature) and passes that information to all linked controllers.

The TV-RTU will operate in an SAV (Staged Air Volume) mode that is ideally suited to VVT systems. SAV requires the unit's fan be controlled by an ECM to provide variable speed fan operation. In this mode, the fan runs at the lowest speed possible, saving energy and preventing excessive air from being bypassed during heating or cooling operations. Refer to the fan control and heating/cooling sequences for details on the specific operation.

NOTE: Using variable speed fan control does NOT eliminate the need for a Bypass Damper.

NOTE: The following paragraphs describe the interaction between the air source (TV-RTU) and its subordinate zones. Additional information regarding Open Zoned Systems may be found in the *VVT Zone* and *VVT Bypass Controller* Installation Guides.

The VVT Master determines system operation by prioritizing heating and cooling requirements from all zones based on their occupancy and demand. The VVT Master scans the system continuously to determine if any zones are unoccupied. Occupied zones are a higher priority than unoccupied zones. The VVT Master evaluates all the occupied zones' heating or cooling demands and sends a request to the air source (TV-RTU) for:

- Cooling, if the number of occupied zones with cooling demands exceeds the number of occupied zones with heating demands, and the demand is greater than, or equal to, the number of configured Linkage Callers.
- Heating, if the number of occupied zones with heating demand is greater than, or equal to, the number of Linkage Callers.

If no zones are occupied or no occupied zones require heating or cooling, the VVT Master performs the evaluation described above for the unoccupied zones.

The VVT Master then gathers the following information and sends it to the air source (TV-RTU):

- The setpoints and zone temperature from the zone with the greatest demand for the requested air source mode (heating or cooling). This zone is then referred to as the "Reference Zone."
- The system occupancy status.
- The most open damper position from any zone.
- RH and CO_2 values (if applicable).

The air source responds by sending the air source mode, supply air temperature and outside air temperature. The air source verifies the mode by comparing its supply air temperature to the space temperature of the reference zone received through Linkage. See the air source documentation for operation and parameters used to verify the mode. This verification allows the VVT system to determine if the desired air source mode is actually being provided. For example, if the VVT master sends a request for heating and the air source does not have heat, or its heat has failed, the air source's actual mode indicates that and its current mode is sent to the zones so that they can control accordingly.

The system remains in that mode until all zones of that demand are satisfied, or until the system mode Reselect Timer (default is 30 minutes) causes a forced re-evaluation of the system. If there is no demand for the opposite mode, the reselect timer starts again and the current mode continues until all zones are satisfied, or until the reselect timer expires, repeating the process.

If there is a demand for the opposite mode, the VVT master sends the reference zone's space temperature and setpoints to the air source and restarts the reselect timer. The air source re-evaluates its demand based on the new information and goes to the Vent mode until the new mode can be verified as described previously. The amount of time it takes is determined by the air source's operating parameters.

The VVT Master continuously evaluates the system and updates the air source with the most current system demand. Based on the evaluation, the reference zone can change from one zone to another. The evaluation process continues until there is no demand from any zone, or the system mode reselect timer causes a re-evaluation of the system conditions.

If no heating or cooling is required, or the current air source mode is satisfied, the VVT Master calculates the weighted average of the occupied and unoccupied heating and cooling setpoints. It also calculates a zone temperature that is midway between the setpoints (occupied or unoccupied based on the system's current occupancy status). This information, plus the occupancy status, is sent to the air source so that its current mode is disabled and the unit ceases heating or cooling operation. If the system is occupied, the air source fan and OA damper, if applicable, operate to maintain proper ventilation.

Linkage also provides a safety and system override function during any RTU heating mode. Whenever the TV-RTU is in a heating mode, the control monitors the supply air temperature (SAT). Normally, and initially, during heating the RTU sends the Linkage Heat mode which causes only those zones that require heat to modulate their dampers to utilize the heated primary air. If, during heating, the SAT increases and exceeds the Maximum Heating SAT plus 4 Δ°F, Linkage transmits the Linkage Warm-up mode to all terminals. This allows more zones to utilize the heated primary air and attempts to prevent any further SAT increase. If this is insufficient, then the rooftop's heat stages cycle off and on, subject to the minimum on and off timers, specific to the product and the type of heat provided.

⚠ CAUTION

It is important to properly set the value for the **Maximum Heating SAT** to match the value specified from the equipment product data recommendations. Many rooftop units have heat capacity that provides a higher heat rise, resulting in an SAT in excess of the **Maximum Heating SAT** default value (120°F).

LINKAGE AIR SOURCE MODE DETERMINATION

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. All zone dampers will open to 70% to facilitate the fan restarting.
WARMUP	Air source fan is on and typically used when providing the first cycle of heat when changing from unoccupied to occupied operation. It may also be used as a safety to increase airflow during a heating mode. All zones will modulate airflow to maintain the zone temperature at the midpoint between the occupied heat and occupied cool setpoints.
HEAT	Air source fan is on and providing heat. Equipment SAT is above the reference zone temperature and all zones modulate airflow to maintain the zone temperature at the appropriate (occ/unocc) heating setpoint.
FREECOOL	Air source fan is on and providing cooling using only the economizer and usually during an unoccupied period. All zones modulate airflow to maintain the zone temperature at the occupied cooling setpoint regardless of the zone's actual occupancy status.
COOL	Air source fan is on and providing cooling. Equipment SAT is below the reference zone temperature and all zones modulate airflow to maintain the zone temperature at the appropriate (occ/unocc) 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 a safety to increase airflow during a heating mode. All zones modulate airflow to maintain the zone's maximum cooling airflow.
EVACUATION	Air source supply fan is off usually as a result of a fire-life safety input being active. All zone dampers close and local terminal fans are disabled.
VENT	Air source fan is on and providing ventilation without heating or cooling.

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

Alarms

NOTE: Some of the Alarms functions described in this section will only be visible on the ***Properties page → Control Program tab → Alarms*** when the appropriate inputs are configured. Alarms are not initiated when the input is not configured. Please see Appendix H — TruVu Configuration for further Alarms details.

SAFETY CHAIN

You may use the TV-RTU safety chain circuit to shut down the unit for a safety condition. Examples: Low or High Temperature.

CUTOUTS (FREEZESTAT / FIRESTAT)

This alarm indicates the safety chain circuit (Input 3) is open. Cooling, heating, and supply fan operation stop after appropriate time guards. Normal operation resumes when the safety chain circuit is complete.

FIRE/SMOKE SHUTDOWN

You may configure the TV-RTU to accept a Fire Shutdown contact. Examples: Smoke detectors or fire shutdown relays. This alarm indicates this device has tripped. Cooling, heating, and supply fan operation immediately stop. Reset fire shutdown contact to resume normal operation.

GAS VALVE

If configured for the IGC input function, the TV-RTU will compare the state of this input with the requirement for heat (W1 or W2). If the IGC input, which detects an active flame in the gas heat section, is present 1 minute after any call for heating has ended, a gas valve failure alarm will occur, indicating a stuck gas valve.

SPACE TEMPERATURE

This alarm indicates if the space temperature is outside the configured alarm limits. If active (Alarm), displays additional values for the space temperature when the alarm condition occurred and the alarm limit exceeded.

The following values are related to the Space Temperature alarm:

- Alarming Temperature

  Displays the value of the space temperature that caused the alarm condition to occur and is only visible when the Space Temperature is in an alarm state.

- Alarm Limit Exceeded

  Displays the value of the alarm setpoint that was exceeded by the alarming temperature and is only visible when the Space Temperature is in an alarm state.

ZS SENSOR

This alarm indicates a communication failure of a connected ZS sensor that had previously been actively communicating. The alarm is reset when normal ZS sensor communications resume, if power is cycled to the controller, or if the Shutdown point is set to Active.

ZS CONFIGURATION

This alarm indicates that at least 1 ZS sensor is configured in the Sensor Binder properties and is not communicating. The alarm is reset when the configured ZS sensor is communicating, or the configuration is changed to reflect the sensor is no longer connected to the Rnet.

SPACE TEMP SENSOR

This alarm indicates an invalid sensor condition in a physically connected space temperature sensor (T55). Cooling, heating, and supply fan operation stop after the appropriate time guards. Normal operation resumes when the controller detects a valid sensor.

SUPPLY AIR TEMPERATURE

This alarm indicates that the supply air temperature is outside the configured alarm limits. The alarm is reset to normal when the supply air temperature returns within the configured alarm limits plus a 3 Δ°F (1.6 Δ°C) hysteresis. This alarm is inhibited until the fan has been running for 15 minutes to allow for system stabilization after start-up.

SUPPLY AIR TEMP SENSOR

This alarm indicates a shorted or open circuit in the SAT input. Cooling, heating, and supply fan operation stops after the appropriate time guards. Normal operation resumes when the controller detects a valid sensor.

INDOOR AIR QUALITY (SPACE CO_2)

The TV-RTU generates an Indoor Air Quality (Space CO_2) alarm if the CO_2 level exceeds the configured alarm limits. (This alarm is only shown when a valid indoor air quality sensor value is available).

INDOOR AIR QUALITY SENSOR (SPACE CO_2 SENSOR)

The TV-RTU generates an Indoor Air Quality Sensor (Space CO_2 Sensor) alarm if a valid sensor value is no longer available. For network sensors, the controller is no longer receiving a value from the network. Cooling, heating, and supply fan continue to operate. However, the controller's IAQ (CO_2) control function is disabled until the fault condition is corrected.

SPACE RELATIVE HUMIDITY

The TV-RTU generates a Space Relative Humidity alarm if the space humidity level exceeds the configured low or high alarm limits. (This alarm is only shown when a valid relative humidity sensor value is available.)

SPACE RELATIVE HUMIDITY SENSOR

The TV-RTU generates a Space Relative Humidity Sensor alarm if a valid sensor value is no longer available. For network sensors, the controller is no longer receiving a value from the network. Cooling, heating, and supply fan operation continues, however, the controller's Humidi-MiZer® binary output is disabled until the fault condition is corrected.

FILTER

If the TV-RTU is configured to monitor the filter through a hardware input switch contact, it generates a Filter alarm if the associated input channel detects a dirty filter condition (opposite state of the input "x" Switch Configuration. Otherwise, if no hardware switch monitoring is used, the TV-RTU generates a filter alarm when the accumulated runtime exceeds the ***Unit Configuration → Filter Service Alarm Timer*** value (when not set to 0). This alarm is most commonly used to indicate a filter replacement is due. Reset the filter service runtime accumulator by setting the ***Maintenance → Reset Filter Runtime Alarm*** to **On**, back to **Off**, and clicking **OK** after each setting. Set ***Unit Configuration → Filter Service Alarm Timer*** value to **0** to disable the filter service alarm function.

LOCAL OAT SENSOR

This alarm indicates a shorted or open circuit in the locally connected OAT input.

OUTDOOR AIR TEMP SENSOR

This alarm indicates a valid OAT sensor value is no longer available. An alarm condition can occur from a failed locally connected sensor or if a network OAT value is no longer being received by the controller. Cooling, heating, and supply fan operation continues. OAT lockouts will not operate while the sensor is in alarm. Normal operation resumes when the controller detects a valid sensor.

ECONOMIZER OPERATION

This alarm is active when an economizer fault is detected, as required by the CEC Title 24 Economizer FDD logic. Once detected, this alarm will stay active until the Shutdown input is set to Active or the fan is stopped.

ECONOMIZER

This point indicates the specific fault detected and announced by the Economizer Operation alarm above. Detected fault conditions include Failed to Fully Open, Failed to Open, Failed to Close, and Stuck Open.

OUTDOOR AIR QUALITY SENSOR

The TV-RTU generates an Outdoor Air Quality Sensor alarm if the network sensor, the controller is no longer receiving a value from the network. Cooling, heating, and supply fan operation continues. However, the controller's IAQ (CO_2) control function uses 400 ppm as the fixed outdoor air CO_2 level until the fault condition is corrected.

SWITCH CONFIGURATION

The TV-RTU generates this alarm when any two of the ***Unit Configuration → Input Functions 4***, ***5***, ***6***, or ***7*** are configured identically. Neither input may work reliably and downstream control may be affected, depending on the function duplicated. The alarm clears and normal control is restored when the input function duplication is corrected.

SUPPLY FAN RUNTIME

The TV-RTU generates a this alarm when the accumulated runtime exceeds the ***Unit Configuration → Supply Fan Service Alarm Timer*** value (when not set to 0). This alarm is most commonly used to indicate an equipment maintenance interval is due. The supply fan runtime accumulator may be reset by setting the ***Maintenance → Reset Supply Fan Runtime Alarm*** to **Clear**, and then back to **Run**, acknowledging each selection by clicking the OK button when it appears. Setting ***Unit Configuration → Supply Fan Service Timer*** value to **0** disables the supply fan runtime alarm function.

COMPRESSOR 1 RUNTIME

The TV-RTU generates this alarm when the accumulated runtime exceeds the ***Unit Configuration → Compressor 1 Service Alarm Timer*** value (when not set to 0). This alarm is most commonly used to indicate an equipment maintenance interval is due. The **Compressor 1 Runtime** accumulator may be reset by setting the ***Maintenance → Reset Comp 1 Runtime Alarm*** to **Clear**, and then back to **Run**, acknowledging each selection by clicking the OK button when it appears. Setting ***Unit Configuration → Compressor 1 Service Timer*** value to **0** disables the **Compressor 1 Runtime** alarm function.

COMPRESSOR 2 RUNTIME

The TV-RTU generates this alarm when the accumulated runtime exceeds the ***Unit Configuration → Compressor 2 Service Alarm Timer*** value (when not set to 0). This alarm is most commonly used to indicate an equipment maintenance interval is due. The Compressor 2 runtime accumulator may be reset by setting the ***Maintenance → Reset Comp 2 Runtime Alarm*** to **Clear**, and then back to **Run**, acknowledging each selection by clicking the OK button when it appears. Setting ***Unit Configuration → Compressor 2 Service Timer*** value to 0 disables the Compressor 2 runtime alarm function. Note that this function is unavailable if the ***Service Configuration → Compressor States*** value is not set to Two Stages.

AIRSIDE LINKAGE ALARM

A TV-RTU may act as an air source in a zoned system. Carrier systems use a function called **Linkage?** to pass data between a master zone and its air source over an BACnet network (MS/TP or BACnet/IP) connection. When the TV-RTU is part of a linked system, it will indicate an airside linkage alarm if it loses communications with its linkage master or if it receives data from more than 1 master zone.

Zone Environmental Index

NOTE: Environmental Index functions are only visible on ***Properties → Control Program tab → Maintenance*** when the TV-RTU is not an Airside Linkage air source. ***Verify Linkage → Airside Linkage Status*** shows **Not Active**.

The i-Vu® Control System uses Environmental Index (EI) to calculate a real-time numerical EI value for a zone based on ideal Occupied space temperature, optional relative humidity (RH) and/or CO_2. Environmental Index determines the source(s) derating the EI value by continuously evaluating Occupied zone conditions. EI Decreased By displays the source(s) derating the EI value. The EI Space Temp setpoint tolerance 0.5 Δ°F (0.28 Δ°C) is subtracted from Effective Heat setpoint and is added to Effective Cool Setpoint, expanding the ideal EI temperature sensitivity range. The EI is derated from the initial Occupied value of 100% if the space temperature deviates from the ideal EI temperature sensitivity range.

NOTE: The EI Space Temp Setpoint Tolerance does not affect the controlling space temperature Effective Heat Setpoint or Effective Cool Setpoint.

The optional RH and/or CO_2 values derate the EI value when they deviate from their setpoints.

- If RH Control is set to Enable, the EI is derated when the RH value is less than the EI Humidity Low Limit or when the RH value is greater than the Occupied RH Control Setpoint.
- If DCV Control is set to Enable, the EI is derated by CO_2 if the value exceeds the DCV Max Ctrl Setpoint.

If a zone is Unoccupied, the EI will calculate a value of 0%. EI Time Satisfied is the percentage of Occupied time which a zone maintains an EI value of 70% or higher.

Weighted EI determines the priority of a zone in an EI roll-up, which must be completed using a different control program. The value is determined by multiplying the real-time EI value by the EI Weighting Factor.

TROUBLESHOOTING

General

The TruVu controller acts as an intelligent embedded thermostat to the rooftop unit, but can be monitored and controlled from i-Vu® Open (Linkage) or a third party network. This causes the system as a whole to be troubleshot from three points of view. The three parts to the system are the rooftop unit, the Open controller, and the network connected. Determining which part needs to be troubleshot is the first step.

The Open controller can be used to troubleshoot the rooftop unit and/or itself with service test, communicating LEDs, and built in alarms. Disconnecting the TruVu controller from the network may also help troubleshooting the controller and rooftop unit. Third Party Network troubleshooting may also be required. For base unit troubleshooting, refer to specific base unit Service Maintenance manual.

Thermistor Troubleshooting

The TruVu controller uses thermistors to sense temperatures for control operation of the unit. Resistances at various temperatures are listed in Table 2. Thermistor pin connections are shown in the example wiring diagrams (see Appendix D). Thermistors are used for supply air temperature (SAT), outdoor air temperature (OAT), and space temperature (SPT) and all must be a 10 kilo-ohm type II sensor.

Table 2 — Thermistor Resistance vs Temperature Values for SPT Sensor, SAT Sensor, and OAT Sensor

TEMP (°C)	TEMP (°F)	RESISTANCE (Ohms)
–40	–40	335,651
–35	–31	242,195
–30	–22	176,683
–25	–13	130,243
–20	–4	96,974
–15	5	72,895
–10	14	55,298
–5	23	42,315
0	32	32,651
5	41	25,395
10	50	19,903
15	59	15,714
20	68	12,494
25	77	10,000
30	86	8,056
35	95	6,530
40	104	5,325
45	113	4,367
50	122	3,601
55	131	2,985
60	140	2,487
65	149	2,082
70	158	1,752

To check accuracy, use a high quality digital volt-ohmmeter. Connect the meter to the thermistor leads to obtain a resistance value. Use Table 2 to convert that resistance to a temperature. Next step is to measure temperature at probe location with an accurate thermocouple-type temperature-measuring instrument. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be close, within 5°F if care was taken in applying thermocouple and taking readings. If a sensor must be corrected, use the RTU Open controller calibration function to offset the temperature reading.

Communication LEDs

The TruVu controller has a set of LED indicator lights that can also be used to aid in troubleshooting the device. See Fig. 33 for a description of the LED indicators.

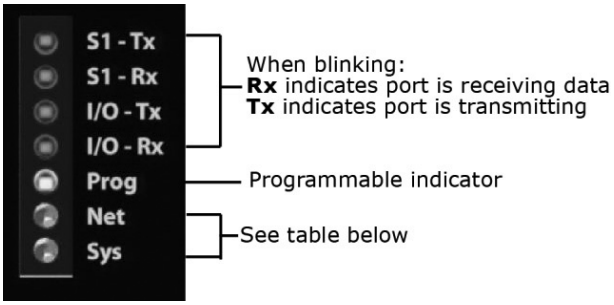


Fig. 33 — TruVu LED Indicator Lights

Use Tables 3 and 4 to identify the “Net” and “Sys” LED indicator definitions and troubleshooting causes or solutions.

Table 3 — Net (Network Status) Tricolor LED

COLOR	PATTERN	CONDITION	MESSAGE IN MODULE STATUS	POSSIBLE SOLUTIONS
RED	On	Ethernet connection problem.	No Ethernet Link.	• Connect Ethernet Cable. • Check other network components.
	1 blink	One of the following BACnet/IP (Ethernet) DLL reporting issue: • Unable to create tasks. • Unable to open socket for BACnet port.	BACnet/IP error.	Cycle power.
BLUE	On	One of the following issues: • Port communication firmware did not load properly. • Port communication firmware is not running. • Invalid protocol selected.	MSTP firmware error.	• Change protocol using USB Service Port • Cycle power
	1 blink	Invalid address selected for protocol.	Invalid address selection for MSTP.	Change MAC address to unique address using USB Service Port.
	2 blinks	Controller has same MAC address as another connected device	Duplicate address on MSTP.	Change MAC address to a unique value using USB Service Port to valid address.
	3 blinks	Controller is the only device on the network.	No other devices detected on MSTP.	• Check that network cable is connected properly. • Check that baud rate is correct.
	4 blinks	Excessive errors detected over 3 second period.	Excessive communication errors on MSTP.	• Check that network cable is connected properly. • Check that baud rate is correct.
GREEN	On	All enabled networks are functioning properly.	No errors.	No action required
MAGENTA	—	Operating system changes are downloading. **WARNING:** This process could take several minutes. Do NOT power off the controller during the download.	N/A	No action required
WHITE	1 blink every second for 15 seconds	The Blink button on the controller setup Local Network tab has been pressed.	N/A	No action required

Table 4 — Sys (System Status) Tricolor LED

COLOR	PATTERN	CONDITION	MESSAGE IN MODULE STATUS	POSSIBLE SOLUTIONS
RED	2 blinks	Restarting after an abnormal exit.	Auto restart delay due to system error on startup.	After 5 minute delay has expired, if condition occurs again then cycle power.
	4 blinks	Firmware image is corrupt.	Firmware error.	Download driver again.
	Fast blink	Firmware error has caused the firmware to exit and restart.	Fatal error detected.	No action required.
GREEN	1 blink	No errors.	Operational	No action required.
	2 blinks	Download of driver is in progress.	Download in progress.	No action required.
	3 blinks	BACnet Device ID is not set.	Download required.	Download the controller.
	Fast blink	Installation of recently downloaded driver is occurring.	N/A	No action required.
BLUE	On	Controller is starting up.	N/A	No action required.
	Slow blink	Linux (operating system) is starting up.	N/A	No action required.
	Fast blink	Linux is running but it could not start the firmware application.	N/A	No action required.
MAGENTA	—	Operating system changes are downloading. **WARNING:** This process could take several minutes. Do NOT power off the controller during the download.	N/A	No action required.
WHITE	1 blink every second for 15 seconds	The Blink button on the controller setup Local Network tab has been pressed.	N/A	No action required.

Configure the Custom "Prog" LED

You can customize the "Prog" LED for site-specific purposes by configuring the BACnet Analog Output (BAO) microblock. Open your control program in the Snap interface, select the AO microblock for the LED, and use Table 5 for the settings:

Table 5 — Settings for Customizing the "Prog" LED

STATUS/ ATTRIBUTE	MICROBLOCK TYPE	EXPANDER NUMBER: CHANNEL NUMBER	I/O TYPE	DESCRIPTION
LED	BAO	0:61	Special	• ≤ 0 = Normal • >15 = On The number of blinks equals the Present Value. The pulse pattern repeats after a 2 second delay The LED will blink the number of times given in the BAO, with ON pulse 0.5 seconds and OFF pulse 0.5 seconds.

Get a Module Status Report

A Module Status report provides information about the controller and verifies proper network communication with the controller. You can get this report:

- In the i-Vu® application, right-click the controller on the navigation tree, then select Module Status.
- In the Field Assistant application, right-click the controller in the navigation tree and select Module Status.
- On the controller setup ModStat tab.

Get a Device Log

If Carrier Control Systems Support instructs you to get the controller's Device Log containing diagnostic information for troubleshooting:

1. Select the TV-RTU in the i-Vu® navigation tree.
2. On the Properties page, click Device Log.

NOTE: You can click Device Log Archive to download a file containing multiple Device Logs to your computer. This also contains any network packet captures that have been run from the Network Diagnostics - Packet Captures driver page.

Get the TV-RTU's Serial Number

If you need the controller's serial number when troubleshooting, the number is on:

- A Module Status report (Modstat) under Core (or Main) board hardware (see Fig. 34 for an example).

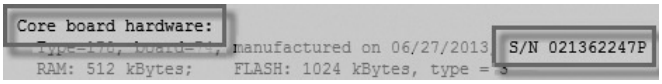


Fig. 34 — Example TV-RTU Serial Number

- A QR code, serial number, and MAC address printed on a sticker on the cover.
- A laser-etched number and QR code on the inside circuit board.

To Replace the TV-RTU's Fuse

The TV-RTU has one 3A fuse. See Fig. 35 for a detail of the fuse location.

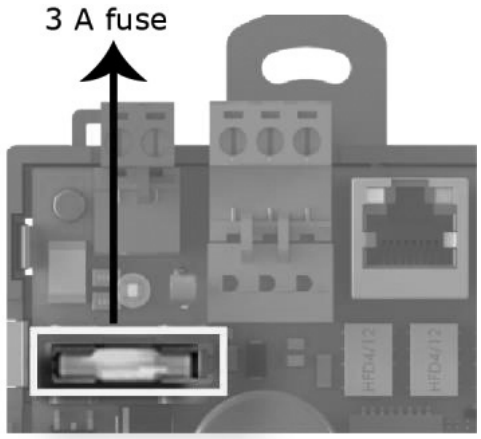


Fig. 35 — TV-RTU Fuse Location

If the TV-RTU's power LED is not lit, this could be due to a blown power fuse. If you suspect a fuse is blown, remove the fuse as described below, and use a multimeter to check it. If the fuse is blown, try to determine why it blew before you replace it. Check the power wiring polarity of the TV-RTU and any other devices that share the power supply. Use the same polarity for all of them. You can purchase the 3 A, fast acting, 5mm x 20mm glass fuse from Littelfuse, mfr part #0235003.HXP.

To replace the fuse:

1. Remove the red power connector
2. On both ends of the TV-RTU, insert a small flathead screwdriver as shown in Fig. 36, and then gently pry up the cover until it is released from the base.

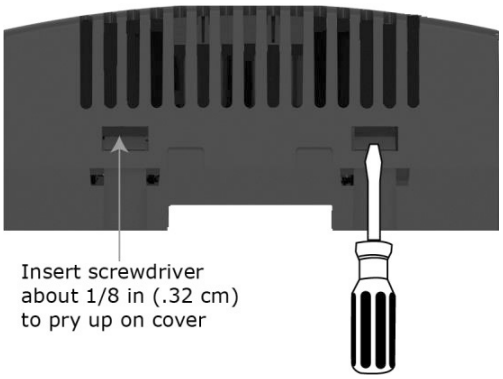


Fig. 36 — Fuse Access

3. Remove the cover from the base.
4. Remove the blown fuse.
5. Snap the new fuse into the fuse holder.
6. Replace the TV-RTU's cover.
7. Replace the power connector.
8. Verify the LEDs on the TV-RTU are lit.

Revert to Default Settings

⚠ CAUTION

This erases all archived information and user-configuration settings. When recovery is complete, you have to reconfigure all custom settings. You must connect locally to the TV-UCXP683T-V and manually reconfigure all the communications and firewall information. We highly recommend that you revert the defaults settings only under the guidance of Carrier Control Systems Support.

To erase volatile memory data and restore factory default configuration settings, use AppLoader to download the appropriate clipping. See the AppLoader User Guide for details.

Take the TV-RTU Out of Service

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

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

Software Version

During start-up and throughout the life of the equipment, it may be necessary to obtain the TruVu software version. To do this a module status (Modstat) must be run on the controller. This can be done from Field Assistant or from an Equipment Touch. An example of the beginning lines of a Modstat is shown in Fig. 37.

The application software version shows the current running software of the board. In this case, the current software version displayed as "tv_rtu_update_1_4-1_4_20241121" refers to TruVu software version 4-1_4_20241121. The last 8 digits of the number refer to a date (YYYYMMDD). The first 4 digits are the year (2024) and then the month and day (1121), so this version is from November 21, 2024.

```
================================================================================
=======
ADDRESS BINDING Used: device instance -1 is on network 0 mac 169.254.1.1:47808
04/08/2025          12:47:09          CM: 0
Last data backup :  01/01/1990        00:00:08
Last data restore : --/--/----        --:--:--
Model Name:         TV-RTU683-E2
Device Instance:    0165701
Driver built:       09/01/24-12:04    73507
Downloaded by:      AppLoader         AppLoader 04/08/25 12:46 9Q2GHR3 - 169.254.1.4
Application Software Version:         PRG:tv_rtu_update_1_4-1_4_20241121
Data Partition Version:               None
1 PRGs initialized.   1 PRGs running.
Controller status:
==========================================
Driver version 107.06.2102 information:
   drv_fwex v107.06:2102  Sep  1 2024
   fwex_107.06.2102_all
   io-server_107.06.2098_all
   io-modules_107.06.2061_all
   kerndriver_107.06.2082_all
   recoveryfiles_107.06.2061_all
   localaccess_107.06.2082_all
   webcontent_107.06.2082_all
   webframework_107.06.2082_all
   webserver_107.06.2061_all
   watchdog_107.06.2061_all
   osfiles_107.06.2061_all
   osrfiles_107.06.2082_all
   bootfiles_107.06.2084_all
   rootfsfiles_107.06.2061_all
Reset counters:
   1 Power failures
   2 Commanded boots
   0 System errors
   0 S/W Watchdog timeouts
   0 H/W Watchdog timeouts
System status:                Operational
Network status:               No Ethernet link
System error message history: Type   Specific
Warning message history:
   Hardware clock write error 11001       01/01/90 00:00:00
   Hardware clock read error 11001        --/--/-- --:--:--
   Hardware clock write error 11001       01/01/90 00:00:00
Information message history:
   Clock changed from 01/01/90 00:00:00 to        04/08/25 12:47:02
   RESET: BACnet reinitialize warmstart           01/01/90 00:00:00
   BACnet reinitialize warmstart                  01/01/90 00:00:00
   Controller formatted. PRG database clear       --/--/-- --:--:--
Core board hardware:
   Type=582, board=36, manufactured on 04/15/2024, S/N CRB4400G1QÛase board hardware:
   Type=582, board=54, manufactured on 04/15/2024, S/N ZNA44002SQÖ82
BACnet objects in device                  (336 network visible)
BACnet packets allocated:
Database Partition   Max Size      Used          Free
   Non-Volatile      3145426       649134        2496292
   Volatile          6291456       403772        5887684
IP Network           BBMD Active   BBMD Entries  FDT Entries
   IP_1              0             0             0
BACnet third party integration point capacity:          200
BACnet third party integration points requested:        0
BACnet third party integration points active:           0
Modbus integration point capacity:                      500
Modbus integration points active:                       0
Network Information:
   Ethernet MAC address      = 00-E0-C9-28-D4-93
   Current IP Address        = 127.0.0.1
   Current Subnet Mask       = 255.0.0.0
   Current Gateway Addr      = 0.0.0.0
   Current DNS Server 1      = 0.0.0.0
   Current DNS Server 2      = 0.0.0.0
   Assigned IP Address       = 127.0.0.1
   Assigned Subnet Mask      = 255.0.0.0
   Assigned Gateway Addr     = 0.0.0.0
   Assigned DNS Server 1     = 0.0.0.0
   Assigned DNS Server 2     = 0.0.0.0
Serial Ports:
   Port S1: Protocol = DisabledÞth0/Eth1 Port Ethernet Statistics
   Ethernet Rx packets                    0
   Ethernet Tx packets                    0
   Receive Errors (total)                 0
   Transmit Errors (total)                0
   Dropped Packets                        0
Eth0/Eth1 Port BACnet/IP Statistics
   BACnet/IP Rx Unicast Packets           0
   BACnet/IP Tx Unicast Packets           0
   BACnet/IP Rx Broadcast Packets         0
   BACnet/IP Tx Broadcast Packets         0
   Whitelist Rejections                   0
Route Information Port Number 1:   Primary IP Network       1600 *Home*
Route Information Port Number 2:   Service Port IP Network  65534
```

Fig. 37 — Example Modstat

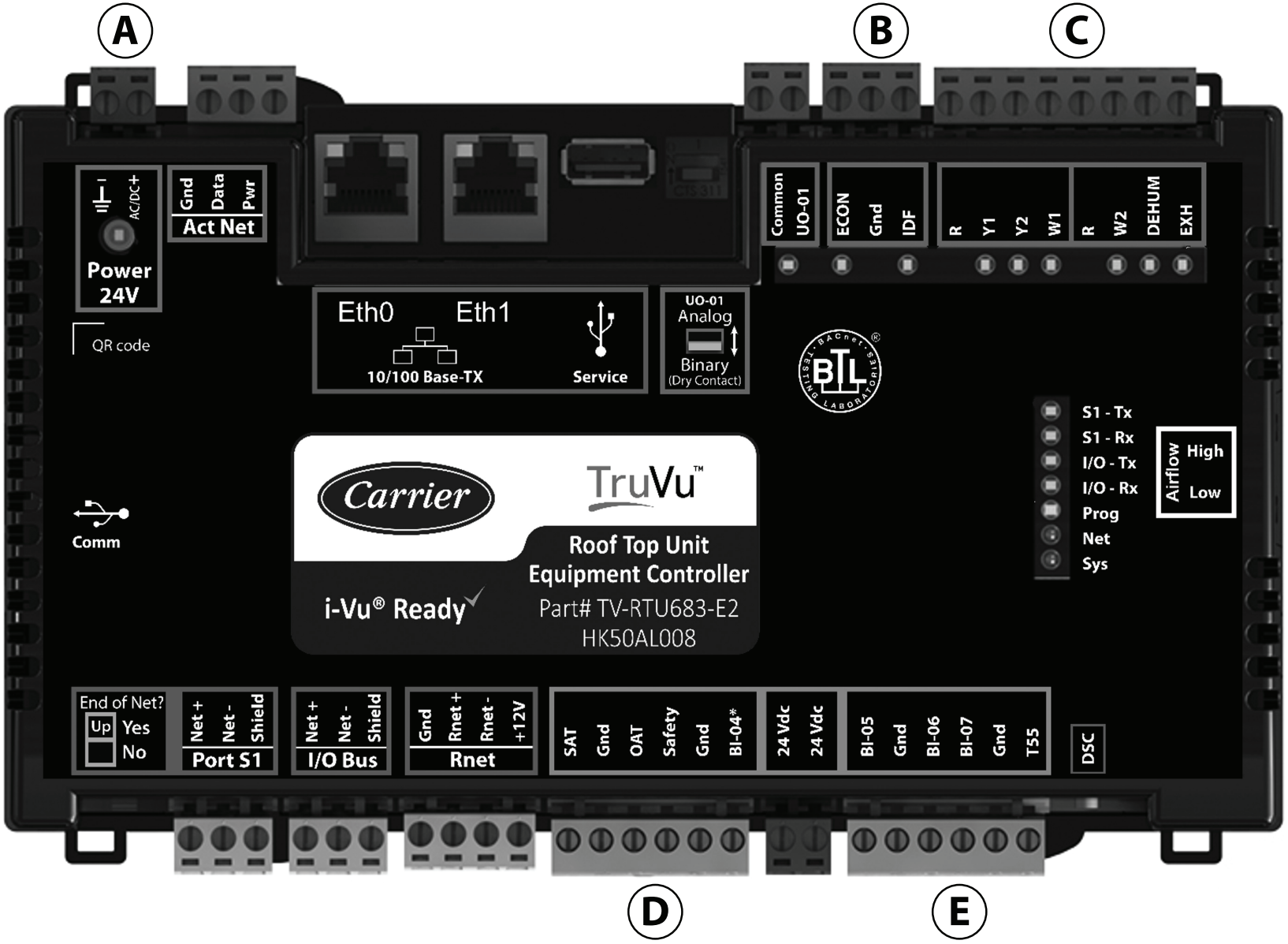
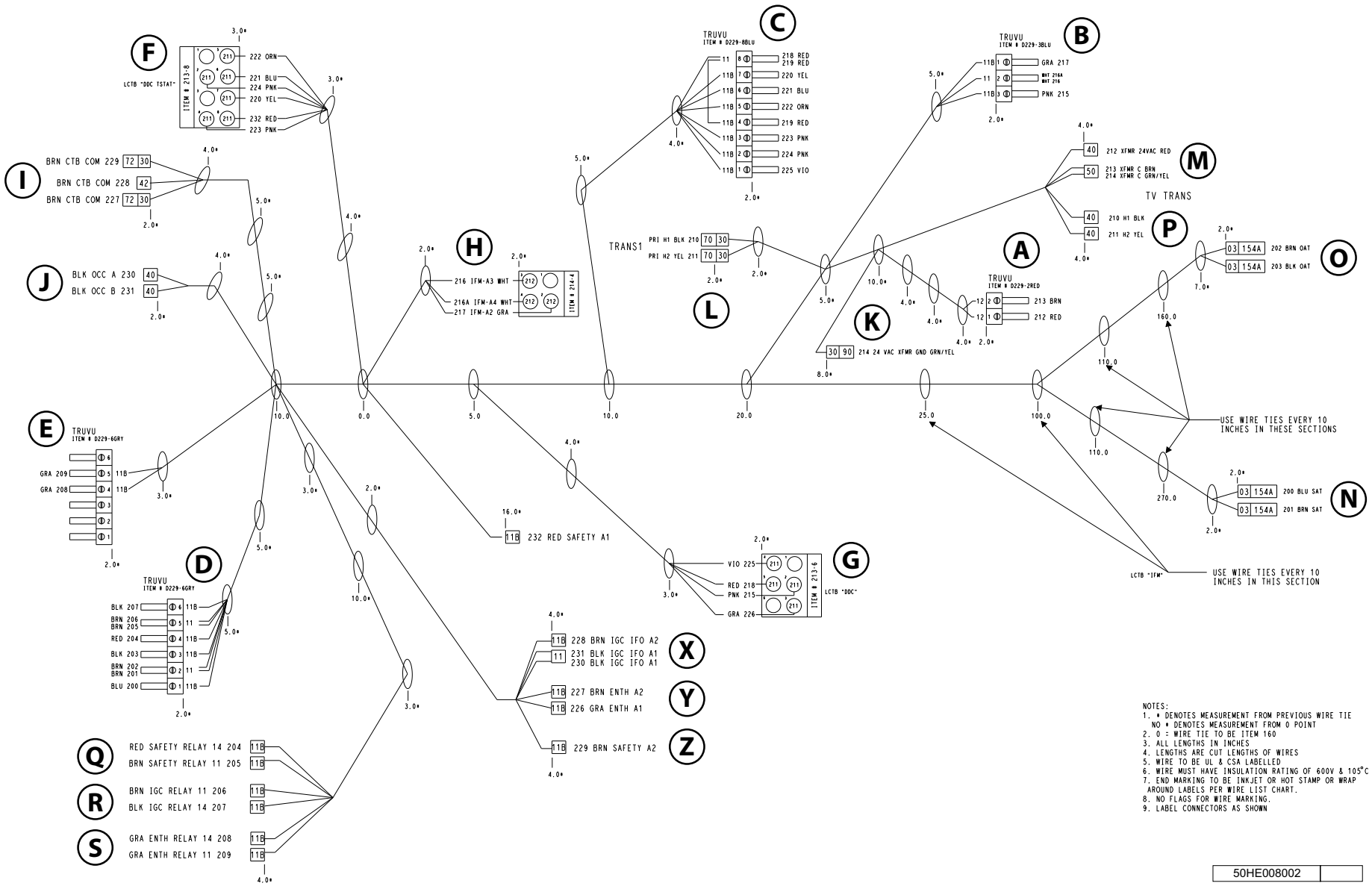


Fig. A — TruVu Controller

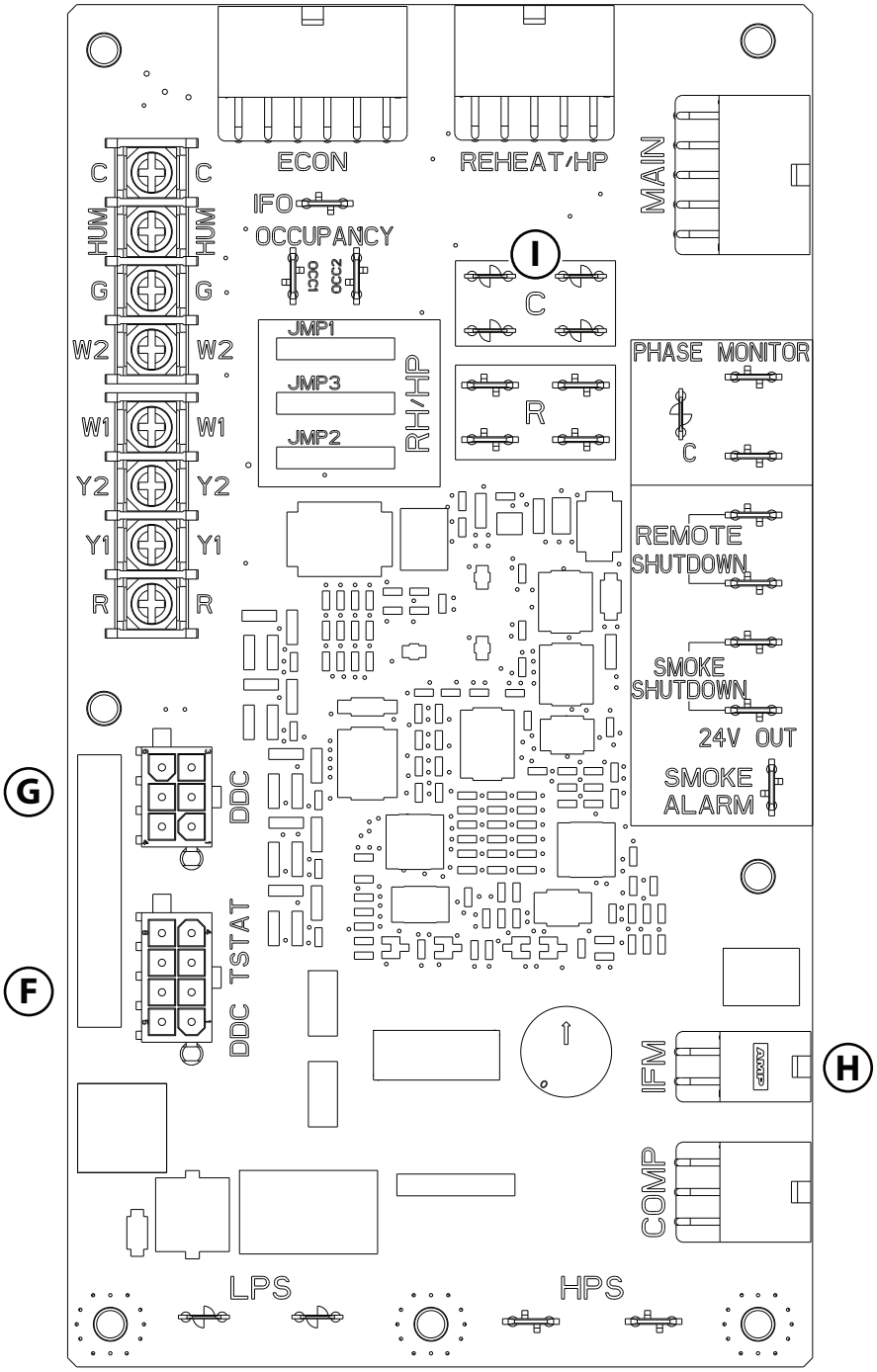
APPENDIX B — WIRING HARNESS



NOTE(S):
1. This view depicts the Wiring Harness labeled with a circle and a letter to represent its connection points on various installed components shown throughout these instructions.
   Example: Connection “G” on the “Wiring Harness Connections Diagram” refers to the connection point “G” on the “Main Control Board” on page 33.

Fig. B — Wiring Harness Connections Diagram

APPENDIX C — MAIN CONTROL BOARD



NOTE(S):
1. This view depicts Main Control Board (RTU Board) labeled with a circle and a letter to represent its connection points on various installed components shown throughout these instructions. Example: Connection “C” on the “Wiring Harness Connections Diagram” on page 32, Fig. B, refers to the connection point “C” on this diagram.

Fig. C — Main Control Board

48TC007360 | D

TRU VU CONTROL 230/460/575 PAC 3-27.5 TON & HP 3-25 TON

NOTES:
1. DISCONNECT IFM CONNECTOR FROM UCB AND CONNECT TO TRUVU BOARD IFM HARNESS CONNECTOR.
2. BI04-BI07 ARE FEATURE CONFIGURABLE IN THE SOFTWARE.

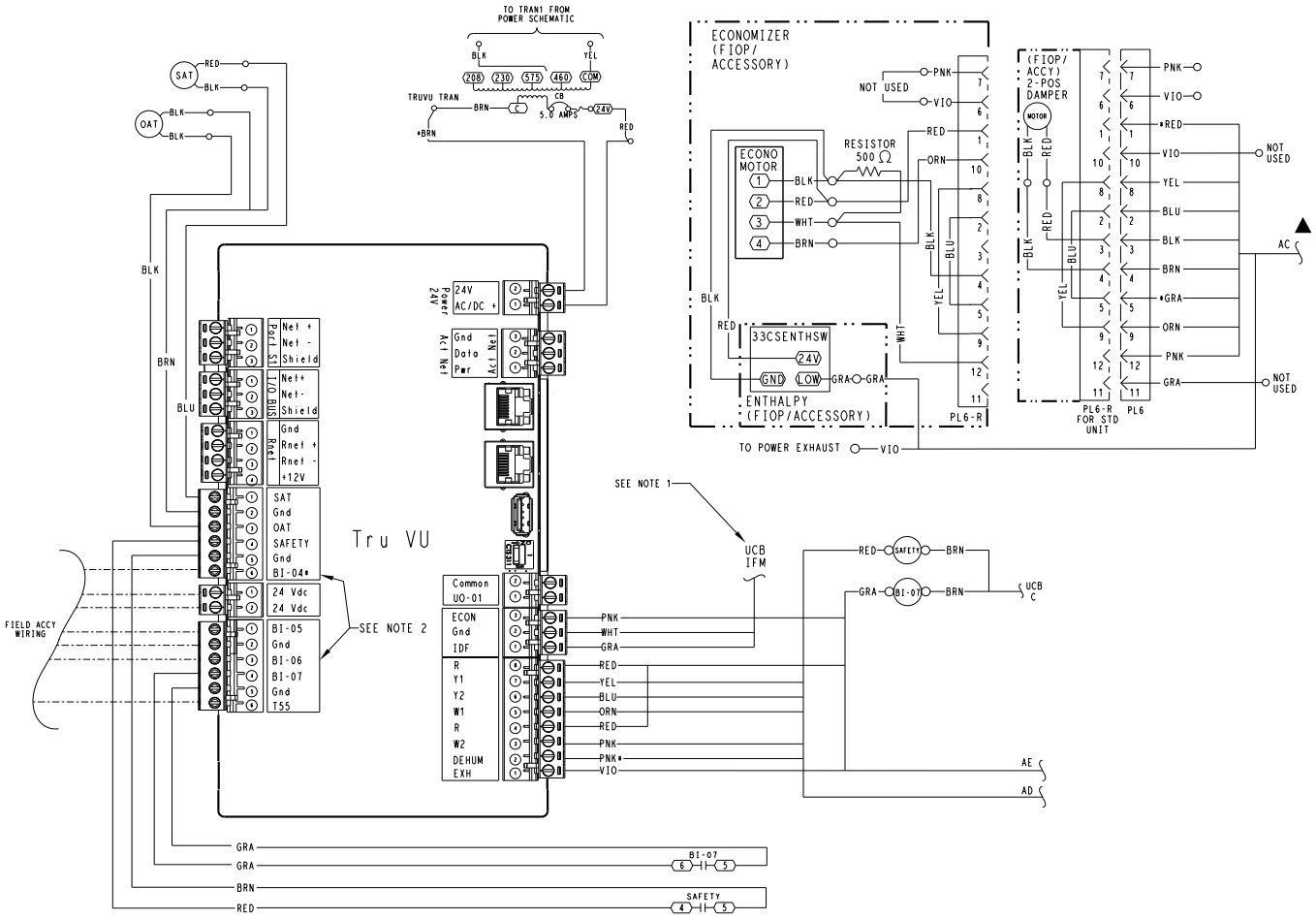


Fig. D — Typical PAC and Heat Pump (HP) Units — TruVu Control Wiring Diagram Overlay

48TC007361 | D

TRU VU CONTROL 230/460/575 ULNX YAC 3-6 TON & YAC 3-27.5 TON

NOTES:
1. DISCONNECT IFM CONNECTOR FROM UCB AND CONNECT TO TRUVU BOARD IFM HARNESS CONNECTOR.
2. BI-05-07 ARE FEATURE CONFIGURABLE IN THE SOFTWARE.
3. BI04 IS PRE-CONFIGURED IN SOFTWARE FOR IGC IFO.

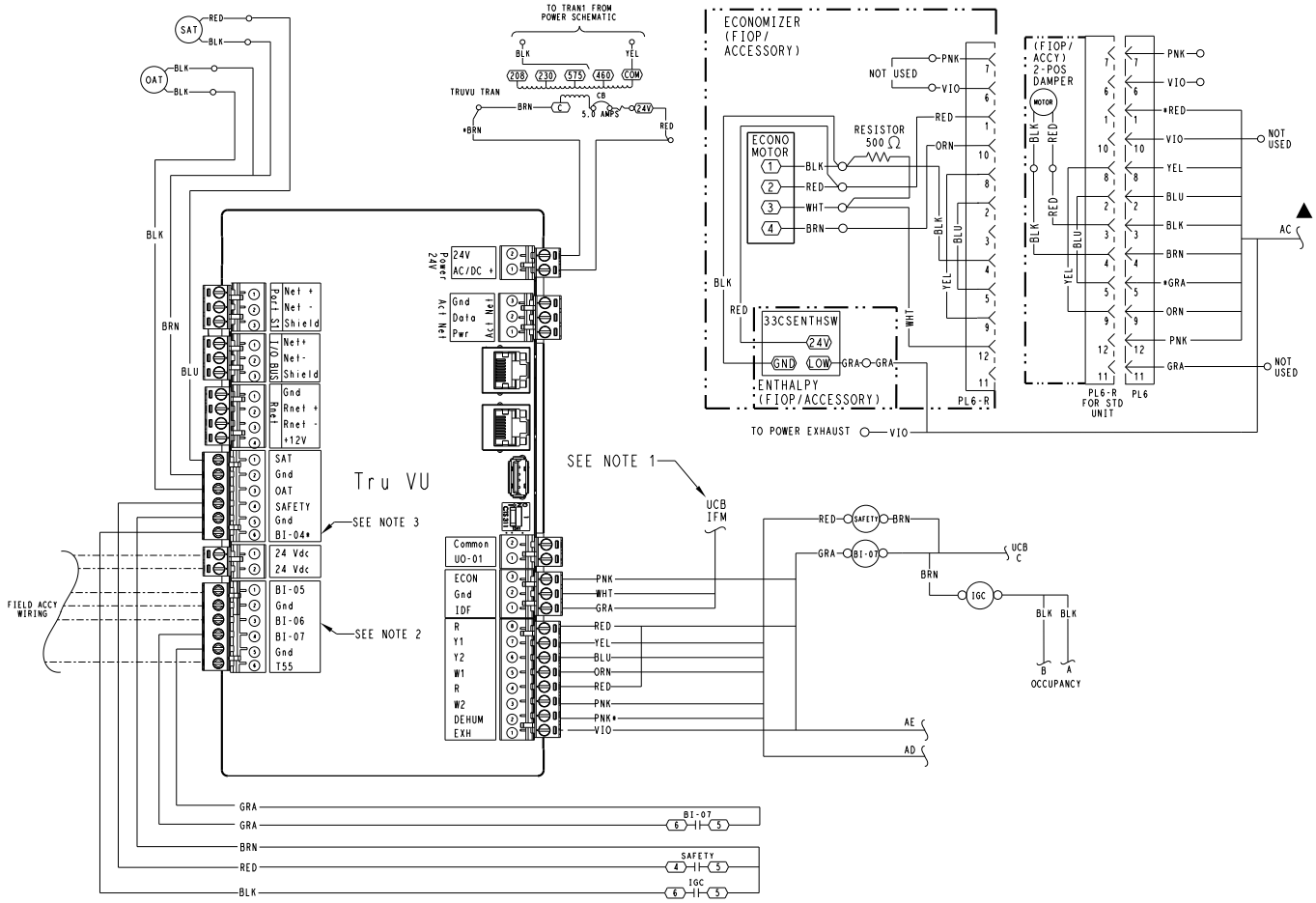
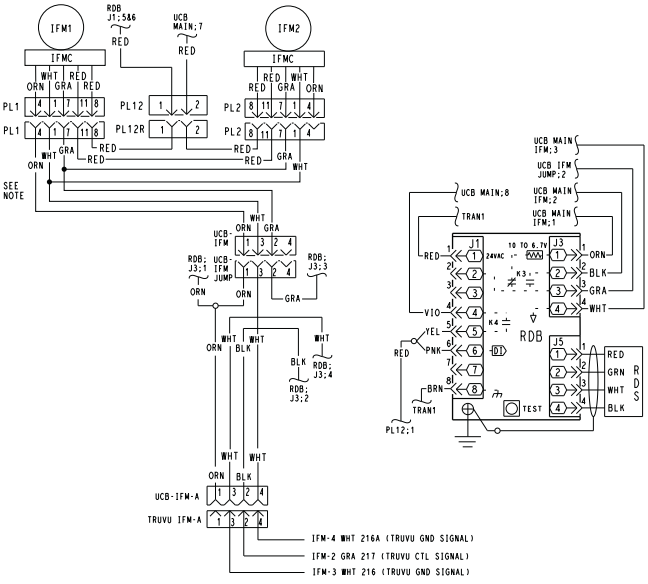


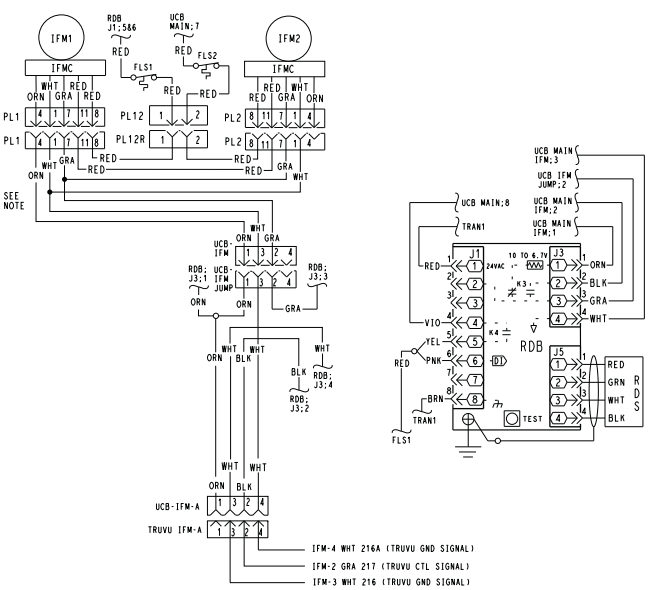
Fig. E — Typical Ultra Low NOx (ULNX) and YAC Units — TruVu Control Wiring Diagram Overlay

APPENDIX E — INDOOR FAN SIGNAL DIAGRAM



NOTE: ON HORIZONTAL SUPPLY UNITS, IFM2 GRA AND WHT WIRES WILL INCLUDE IN-LINE RESISTORS TO REDUCE IT'S SPEED.

YAC Units



NOTE: ON HORIZONTAL SUPPLY UNITS, IFM2 GRA AND WHT WIRES WILL INCLUDE IN-LINE RESISTORS TO REDUCE IT'S SPEED.

PAC and Heat Pump Units

Fig. F — Indoor Fan Wiring Diagram — YAC, PAC and Heat Pump Units

APPENDIX F — ENTHALPY SWITCH SIGNAL DIAGRAM

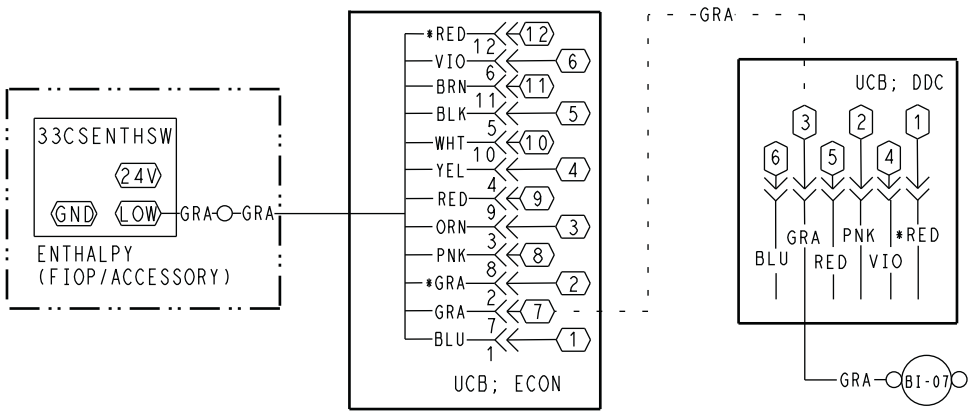


Fig. G — Typical Enthalpy Switch Wiring Diagram

APPENDIX G — USER INTERFACE MENUS

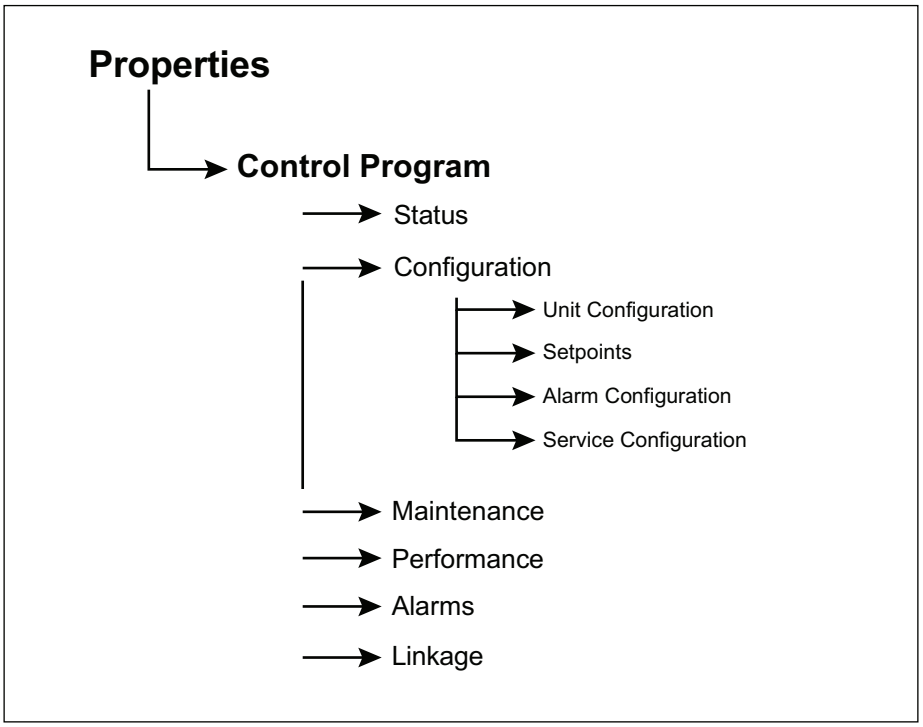


Fig. H — Field Assistant Navigation Chart

APPENDIX H — TRUVU CONFIGURATION

Status

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

Table A — Status

POINT NAME	DESCRIPTION	RANGE
Equipment Status	The controller's current status.	R:Disabled Test Run
System Mode	The controller's current operating mode.	R:Off Fan Only Economizer Cooling Cooling Heating Dehumidification Test Shutdown Unocc Free Cooling Fire Shutdown IAQ Override Pre-occ Purge IGC Override Manual Purge
Supply Fan Status	The current fan status if an input is configured for **Fan Status**.	R:Off/Running
Supply Fan ECM	The current commanded output to the ECM to control the fan's speed. NOTE: Based on **IDF Max Speed Voltage** equal 100%.	R:0 to 100%
Supply Fan ECM Voltage	The current commanded voltage output to the ECM to control the fan's speed.	R:0 to 10.0 V
Space Temperature - Prime Variable	The space temperature value currently used for control.	R:–35 to 240°F (–37.2 to 115.6°C)
Supply Air Temperature	Displays the current supply air temperature.	R:–35 to 240°F (–37.2 to 115.6°C)
Outdoor Air Temperature	The outdoor air temperature used for control.	R:–35 to 240°F (–37.2 to 115.6°C)
Space Relative Humidity	The current space relative humidity if a valid value exists either as a connected ZS sensor with RH or a value received through the Network or Linkage.	R:0 to 100.0% rh
Indoor Air Quality CO_2 (ppm)	The current space CO_2 concentration if a valid value exists either as a connected ZS sensor with CO_2 or a value received through the Network or Linkage.	R:0 to 5000ppm
Outdoor Air Quality CO_2 (ppm)	The current outdoor air CO_2 concentration	R:0 to 5000ppm
Economizer Output	The current economizer output with respect to the outdoor air damper (if equipped).	R:0 to 100% Open
Manual Purge is Active	When **Active**, manual purge is enabled.	R:Not Active/Active
Shutdown	When **Active**, all alarms are reset. (Any currently active alarms will continue to display.) Provides a means to stop heating and cooling in an orderly manner.	D:Inactive R: Inactive/Active

Unit Configuration

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

Table B — Unit Configuration

POINT NAME	DESCRIPTION	RANGE
Fan Mode	The supply fan's operating mode. Options: **Auto** - The fan cycles on/off in conjunction with heating or cooling. **Continuous** - The fan runs continuously during occupancy and intermittently during unoccupied periods with heating or cooling. **Always On** - The fan runs continuously regardless of occupancy or calls for heating and cooling.	D:Continuous R:Auto Continuous Always On
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 R:0 to 30 seconds
Fan Off Delay	The number of seconds that the fan continues to run after heating or cooling has ended.	D:90 seconds R:10 to 300 seconds
Minimum Cooling SAT	In cooling mode, the cooling outputs are controlled so that the supply air temperature does not drop below this value.	D:50°F (10°C) R:45 to 75°F (7.2 to 23.9°C)

APPENDIX H — TRUVU CONFIGURATION (cont)

Table B — Unit Configuration (cont)

POINT NAME	DESCRIPTION	RANGE
Maximum Heating SAT	In heating mode, the heating outputs are controlled so the supply air temperature does not rise above this value.	D:120°F (48.9°C) R:95 to 150°F (35.0 to 65.6°C)
Vent Dmpr Pos / DCV Min Pos	The minimum outdoor air damper position maintained during occupied periods.	D:20% Open R:0 to 100% Open
Economizer Purge Min Pos	The minimum outdoor air damper position maintained during an unoccupied purge cycle when the Pre-Occ Purge mode is active.	D:40% Open R:0 to 100% Open
Manual Purge Enable	Enable and configure equipment for manual purge.	D:Not Configured R:Not Configured Fan & Econ Fan & Econ & Exh
Man Purge Mode Econ Pos	The outdoor air damper position maintained during manual purge.	D:100% Open R:0 to 100% Open
Low Fan Econ Min Pos	The minimum outdoor air damper position maintained during occupied periods when the fan is running at minimum speed.	D:33% Open R:0 to 100% Open
DCV Max Vent Damper Pos	The maximum outdoor air damper position allowed while DCV is active.	D:50% Open R:0 to 75% Open
Supply Fan Service Alarm Timer	A Supply Fan Runtime alarm is generated when the supply fan run hours exceed this value. Set to 0 to disable.	D:0 hours R:0 to 9999 hours
Compressor 1 Service Alarm Timer	A Compressor 1 Runtime alarm is generated when the compressor 1 run hours exceed this value. Set to 0 to disable.	D:0 hours R:0 to 9999 hours
Compressor 2 Service Alarm Timer	A Compressor 2 Runtime alarm is generated when the compressor 2 run hours exceed this value. Set to 0 to disable.	D:0 hours R:0 to 9999 hours
Filter Service Alarm Timer	The amount of time the fan will run before generating a Filter Alarm. Set to 0 to disable the alarm and reset accumulated fan hours.	D:0 hours R:0 to 9999 hours
Door Alarm Delay	Determines the amount of delay before a door alarm is generated.	D:60 seconds R:0 to 3600 seconds
Pushbutton Override	Enables or disables the use of a pushbutton override from a local space temperature sensor.	D:Enable R:Disable/Enable
Setpoint Adjustment	Enables or disables the setpoint adjustment mechanism on the local space sensor. Does not apply to ZS sensors.	D:Enable R:Disable/Enable
Setpoint Adjustment Range	The maximum amount that a user can adjust the setpoint on the local sensor.	D:5 Δ°F (2.7 Δ°C)
Cooling Lockout Temperature	Cooling is inhibited below this outdoor air temperature.	D:45°F (7.2°C) R:–65 to 80°F (–53.9 to 26.6°C)
Economizer High OAT Lockout Temp	The outdoor air temperature above which economizer cooling is inhibited.	D:75°F (23.9°C) R:55 to 80°F (12.7 to 26.6°C)
HP Aux Heat Lockout Temp	The outdoor air temperature above which auxiliary heating is locked out. Once aux heat has been locked out, the OAT must fall 2 Δ°F (1.1 Δ°C) below this value to again allow aux heating. Requires that the unit be configured as a Heat Pump.	D:40°F (4.49°C) R:–20 to 65°F (–28.9 to 18.3°C)
Heating Lockout Temperature	Heating is inhibited above this outdoor air temperature.	D:65°F (18.3°C) R:35 to 150°F (1.6 to 65.5°C)
Pre Occupancy Purge	Enables or disables the use of a purge cycle immediately prior to the start of a scheduled occupied period.	D:Disable R:Disable/Enable
Purge Time	The maximum amount of time used for a pre-occupancy purge.	D:60 minutes R:0 to 240 minutes
Unocc Free Cool	Enables or disables the use of the economizer to provide unoccupied free cooling (NTFC).	D:Disable R:Disable/Enable
Minimum Setpoint Separation	The minimum amount of temperature separation between the heating and cooling setpoints.	D:5 Δ°F (2.7 Δ°C) R:2 to 10 Δ°F (1.1 to 5.5 Δ°C)
Occupancy Source	The method that the controller uses to determine occupancy. Options: **Always Occupied** - Controller operates continuously as occupied. **BACnet Schedule** - Controller follows a schedule set up in Field Assistant or the i-Vu® application. **BAS On/Off** - Occupancy is set over the network by another device or a third party BAS. **Remote Occ Input** - Occupancy is set by a remote contact or motion sensor.	D:Always Occupied R:Always Occupied BACnet Schedule BAS On/Off Remote Occ Input
Occ Override Delay	The amount of time the controller remains occupied after the remote occupancy switch returns to the unoccupied position. (This timer is in addition to the built-in delay of 4 minutes if using ZS Motion Sensor.) NOTE: If Occupied Standby is set to **Enable, Standby Offset** routine is automatically disabled.	D:15 minutes R:0 to 240 minutes

APPENDIX H — TRUVU CONFIGURATION (cont)

Table B — Unit Configuration (cont)

POINT NAME	DESCRIPTION	RANGE
Environmental Index Enable	If enabled, when a zone is occupied, it monitors the deviation of space temperature from effective heating and cooling setpoint range. It monitors optional relative humidity if **RH Control** is set to **Enable** and/or monitors CO_2 if **DCV Control** is set to **Enable**.	D: Enable R: Disable/Enable
CEC Title 24		
Enable CEC Title 24	Enables CEC Title 24 algorithm. NOTE: This allows Occupied Standby routine using presence sensing for Title 24. Economizer FDD (Fault Detection and Diagnostics) for Title 24 is always active.	D: (Disable) R: (Disable/Enable)
Occupied Standby (T24)	Enables Occupied Standby routine of CEC Title 24.	D: Disable R: Disable/Enable
Occupied Standby Delay (T24)	The amount of time the controller remains occupied after the presence sensor returns to the unoccupied position.	D: 5 minutes R: 0 to 15 minutes
Occupied Standby Offset (T24)	The value by which the occupied setpoints are expanded when the space presence sensor or Title 24 compliant system indicates that a Space/Zone is unoccupied.	D: 2 Δ°F (1.1 Δ°C) R: 0.5 to 15 Δ°F (0.27 to 8.3 Δ°C)
Inhibit Occupied Standby (T24) from this zone?	If **Yes**. Occupied Standby functionality Is ignored by this controller.	D: No R: No/Yes
System Occ Stdby (T24)	The status of the occupied standby input received over the network.	D: OFF R: OFF/ON
System Presence Sensor (T24)	The status of the presence sensor received over the network.	D: OFF R: OFF/ON
Input Configuration		
Input 4 Function	The usage of Input 4. You must also set Input 4 **Switch Configuration**. Options: **No Function** – The input is not used. **Fire Shutdown** – Fire Safety device status. Inhibits operation when tripped. **Fan Status** – Proves supply fan operation. **Filter Status** – Indicates a dirty filter. **Remote Occupancy** – Sets occupancy using a hardware contact. **Door Contact** – Disables mechanical cooling and electric or gas heating, when active. **Humidistat** – Indicates high humidity condition. **Occ Stdby (T24)** – Indicates presence for Occupied Standby (T24) by Title 24 compliant system using a hardware contact. **Presence Sensor (T24)** – Indicates presence for Occupied Standby (T24) using a hardware contact. **Stdby Offset Motion** – Indicates presence for Standby Offset using a hardware contact. **IGC Override** – Monitors the flame output from the Integrated Gas Control board. The input detects if a flame is still present after heating has been disabled. NOTE: If configured for Gas heating **IGC Override** is automatically **ENABLED**.	D: No Function R: No Function Fire Shutdown Fan Status Filter Status Remote Occupancy Door Contact HumidiStat Occ Stdby (T24) Presence Sensor (T24) Stdby Offset Motion No Function IGC Override
Input 4 Switch Configuration	The normal (de-energized) state for the set of contacts terminated at **Input 4**. NOTE: If Input 4 Function is set to **IGC Override**, Input 4 Switch Configuration is automatically set to NO and is not configurable.	D: NO R: NO/NC (normally open/normally closed)

APPENDIX H — TRUVU CONFIGURATION (cont)

Table B — Unit Configuration (cont)

POINT NAME	DESCRIPTION	RANGE
Input 5 Function	The usage of Input 5. You must also set **Input 5 Switch Configuration**. Options: **No Function** – The input is not used. **Fire Shutdown** – Fire Safety device status. Inhibits operation when tripped. **Fan Status** – Proves supply fan operation. **Filter Status** – Indicates a dirty filter. **Remote Occupancy** – Sets occupancy using a hardware contact. **Door Contact** – Disables mechanical cooling and electric or gas heating, when active. **Humidistat** – Indicates high humidity condition. **Occ Stdby (T24)** – Indicates presence for Occupied Standby (T24) by Title 24 compliant system using a hardware contact. **Presence Sensor (T24)** – Indicates presence for Occupied Standby (T24) using a hardware contact. **Stdby Offset Motion** – Indicates presence for Standby Offset using a hardware contact.	D: No Function R: No Function Fire Shutdown Fan Status Filter Status Remote Occupancy Door Contact HumidiStat Occ Stdby (T24) Presence Sensor (T24) Stdby Offset Motion
Input 5 Switch Configuration	The normal (de-energized) state for the set of contacts terminated at **Input 5**.	D: NO R: NO/NC (normally open/normally closed)
Input 6 Function	The usage of Input 6. You must also set **Input 6 Switch Configuration**. Options: **No Function** – The input is not used. **Fire Shutdown** – Fire Safety device status. Inhibits operation when tripped. **Fan Status** – Proves supply fan operation. **Filter Status** – Indicates a dirty filter. **Remote Occupancy** – Sets occupancy using a hardware contact. **Door Contact** – Disables mechanical cooling and electric or gas heating, when active. **Humidistat** – Indicates high humidity condition. **Occ Stdby (T24)** – Indicates presence for Occupied Standby (T24) by Title 24 compliant system using a hardware contact. **Presence Sensor (T24)** – Indicates presence for Occupied Standby (T24) using a hardware contact. **Stdby Offset Motion** – Indicates presence for Standby Offset using a hardware contact.	D: No Function R: No Function Fire Shutdown Fan Status Filter Status Remote Occupancy Door Contact HumidiStat Occ Stdby (T24) Presence Sensor (T24) Stdby Offset Motion
Input 6 Switch Configuration	The normal (de-energized) state for the set of contacts terminated at **Input 6**.	D: NO R: NO/NC (normally open/normally closed)
Input 7 Function	The usage of Input 7. You must also set **Input 7 Switch Configuration**. Options: **No Function** – The input is not used. **Fire Shutdown** – Fire Safety device status. Inhibits operation when tripped. **Fan Status** – Proves supply fan operation. **Filter Status** – Indicates a dirty filter. **Remote Occupancy** – Sets occupancy using a hardware contact. **Door Contact** – Disables mechanical cooling and electric or gas heating, when active. **Humidistat** – Indicates high humidity condition. **Occ Stdby (T24)** – Indicates presence for Occupied Standby (T24) by Title 24 compliant system using a hardware contact. **Presence Sensor (T24)** – Indicates presence for Occupied Standby (T24) using a hardware contact. **Stdby Offset Motion** – Indicates presence for Standby Offset using a hardware contact. **Enthalpy Switch** – Indicates enthalpy status (high or low).	D: No Function R: No Function Fire Shutdown Fan Status Filter Status Remote Occupancy Door Contact HumidiStat Occ Stdby (T24) Presence Sensor (T24) Stdby Offset Motion Enthalpy Switch
Input 7 Switch Configuration	The normal (de-energized) state for the set of contacts terminated at **Input 7**.	D: NO R: NO/NC (normally open/normally closed)

Table B — Unit Configuration (cont)

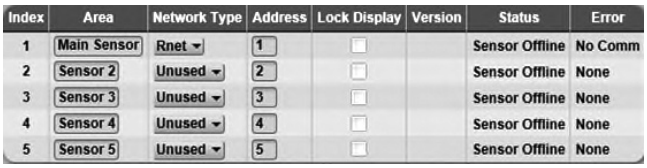
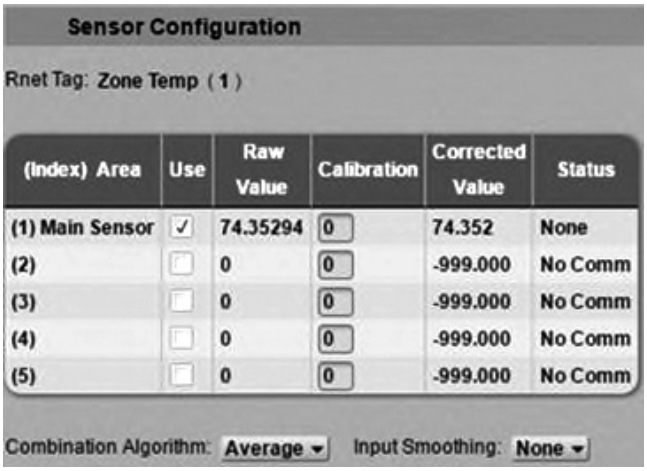
POINT NAME	DESCRIPTION	RANGE
Space sensor type	The type of local space temperature sensor.	D:T55 R:T55 N/A N/A None ZS Sensor N/A
T5x Override Duration	If using a T55 sensor, this is the amount of time that the controller runs in the occupied mode when a user presses the sensor's override button for 1 to 10 seconds.	D:1 hour R:0 to 24 hours
Sensor Binder / [zs] Space Temp / [zs] Space Humidity / [zs] Space CO_2 / [zs] Sensed Occupancy	**Ctrl+click** on the name of these properties to access the microblock popup ***Properties page*** → ***Details*** tab. See below for instructions on configuring your ZS sensors. See the microblock Help for more detailed explanations.	
Sensor Binder	Use the **Associated Sensors** table to configure the Rnet to use additional ZS sensors.  • **Network Type** - Set to **Rnet** • **Address** - Enter the DIP switch settings that are on the additional ZS sensors (up to 5 total) • **Lock Display** - Check to make the sensor display-only	D:**(Index)** - (1) **Network Type** - Rnet **Address** - 1
[zs] Space Temp	Configure additional ZS temperature sensors used on the TV-RTU.  • **Use** - Check to include ZS sensor's value in the **Combined Algorithm** (**Average** is the default). • **Raw Value** - Displays sensed temperature for each ZS temperature sensor's address. • **Calibration** - If needed, enter value to adjust the **Corrected Value** from the **Raw Value**, in order to calibrate an individual ZS sensor's sensed value. • **Combination Algorithm** - Use **Average**, **Maximum**, or **Minimum** zone temperature to calculate the **Corrected Value** for temperature control.	D:**(Index) Area** - (1) Main Sensor **Use** - Checked **Calibration** - 0 **Combination Algorithm** - Average **Input Smoothing** - None **Show on Sensors** - Calculated Value **Display Resolution** - 1 **COV Increment** - 1

Table B — Unit Configuration (cont)

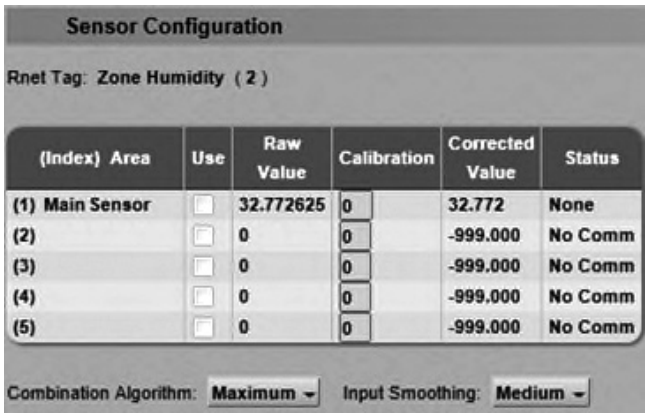
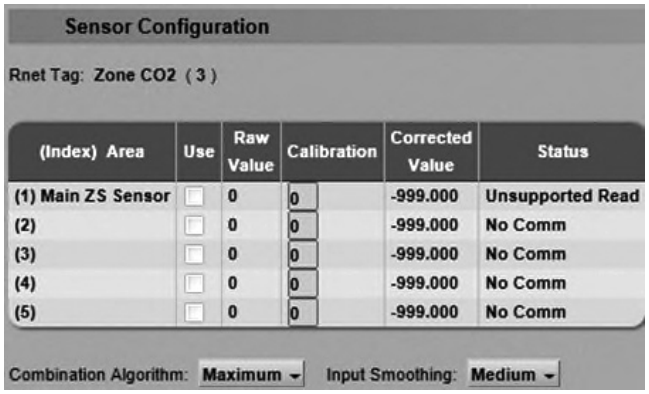
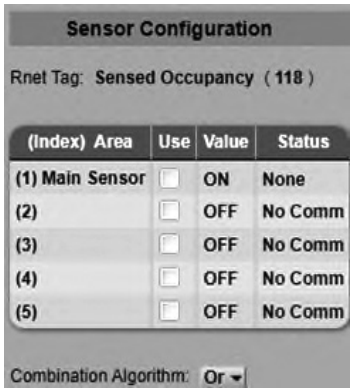
POINT NAME	DESCRIPTION	RANGE
[zs] Space Humidity	Configure additional ZS humidity sensors used on the TV-RTU.  **Sensor Configuration** Rnet Tag: Zone Humidity (2) (Index) Area / Use / Raw Value / Calibration / Corrected Value / Status (1) Main Sensor — 32.772625 — 0 — 32.772 — None (2) — 0 — 0 — -999.000 — No Comm (3) — 0 — 0 — -999.000 — No Comm (4) — 0 — 0 — -999.000 — No Comm (5) — 0 — 0 — -999.000 — No Comm Combination Algorithm: Maximum — Input Smoothing: Medium • **Use** - Check to include ZS sensor's value in the **Combined Algorithm** (**Maximum** is the default). • **Raw Value** - Displays sensed humidity for each ZS humidity sensor's address. • **Calibration** - If needed, enter value to adjust the **Corrected Value** from the **Raw Value**, in order to calibrate an individual ZS sensor's sensed value. • **Combination Algorithm** - Use **Average**, **Maximum**, or **Minimum** ZS humidity to calculate the **Corrected Value** for humidity control.	D:**(Index) Area** - (1) Main Sensor **Use** - Unchecked **Calibration** - 0 **Combination Algorithm** - Maximum **Input Smoothing** - None **Show on Sensors** - Calculated Value **Display Resolution** - 1 **COV Increment** - 1
[zs] Space CO_2	Configure additional ZS CO_2 sensors used on the TV-RTU.  **Sensor Configuration** Rnet Tag: Zone CO2 (3) (Index) Area / Use / Raw Value / Calibration / Corrected Value / Status (1) Main ZS Sensor — 0 — 0 — -999.000 — Unsupported Read (2) — 0 — 0 — -999.000 — No Comm (3) — 0 — 0 — -999.000 — No Comm (4) — 0 — 0 — -999.000 — No Comm (5) — 0 — 0 — -999.000 — No Comm Combination Algorithm: Maximum — Input Smoothing: Medium • **Use** - Check to include ZS sensor's value in the **Combined Algorithm** (Maximum is the default). • **Raw Value** - Displays sensed CO_2 for each ZS CO_2 sensor's address. • **Calibration** - If needed, enter value to adjust the **Corrected Value** from the **Raw Value**, in order to calibrate an individual ZS sensor's sensed value. • **Combination Algorithm** - Use **Average**, **Maximum**, or **Minimum** ZS CO_2 to calculate the **Corrected Value** for CO_2 control.	D:**(Index) Area** - (1) Main ZS Sensor **Use** - Unchecked **Calibration** - 0 **Combination Algorithm** - Maximum **Input Smoothing** - Medium **Show on Sensors** - Calculated Value **Display Resolution** - 1 **COV Increment** - 10

Table B — Unit Configuration (cont)

POINT NAME	DESCRIPTION	RANGE
[zs] Sensed Occupancy	Configure additional ZS Sensed Occupancy sensors used on the TV-RTU.  • **Use** - Check to include ZS sensor's value in the **Combined Algorithm** (**Or** is the default). • **Value** - Displays sensed occupancy for each ZS Sensed Occupancy sensor's address. • **Combination Algorithm** - Use **Or** or **And** ZS Sensed Occupancy to calculate the **Value** for Sensed Occupancy control.	D:**(Index) Area** - (1) Main Sensor **Use** - Unchecked **Combination Algorithm** - Or
Sensor Calibration		
Space Temperature	The current space temperature.	D:_°F/C
Space Temp Calibration	A calibration offset value to allow the local space temperature sensor to be adjusted to match a calibrated standard measuring the temperature in the same location.	D:0 ∆°F/C R:–9.9 to 10 ∆°F (–5.5 to 5.5 ∆°C)
Supply Air Temperature	Displays the current supply air temperature.	R:–35 to 240°F (–37.2 to 115.6°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.	D:0 ∆°F/C R:–9.9 to 10 ∆°F (–5.5 to 5.5 ∆°C)
Outdoor Air Temperature	The current outdoor air temperature.	R:–35 to 240°F (–37.2 to 115.6°C)
Outdoor Air Temp Calibration	A calibration offset value allows the outdoor air temperature sensor to be adjusted to match a calibrated standard measuring the temperature in the same location.	D:0 ∆°F/C R:–9.9 to 10 ∆°F (–5.5 to 5.5 ∆°C)

Occupied and Unoccupied

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

Use Table C for point information to configure the setpoints on TruVu for rooftop units. Follow the navigation provided to access and configure these points.

Select a color band on the setpoint graph to see the current setpoints in the **Heating** and **Cooling** fields. The values in this graphic are Fahrenheit. See setpoint descriptions below.

NOTE: This graphic is an example only. Your setpoints may differ.

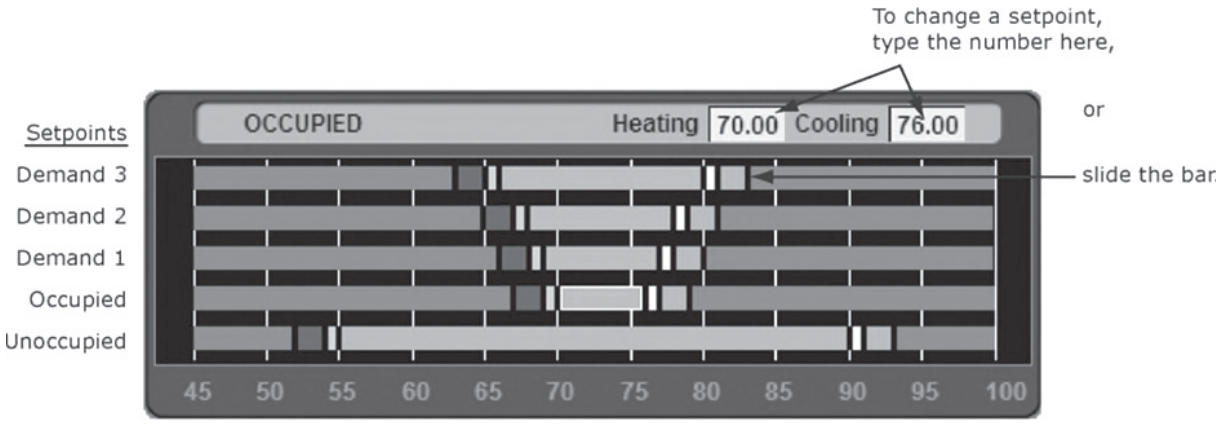


Fig. I — Example Setpoints Display

OCCUPIED SETPOINTS

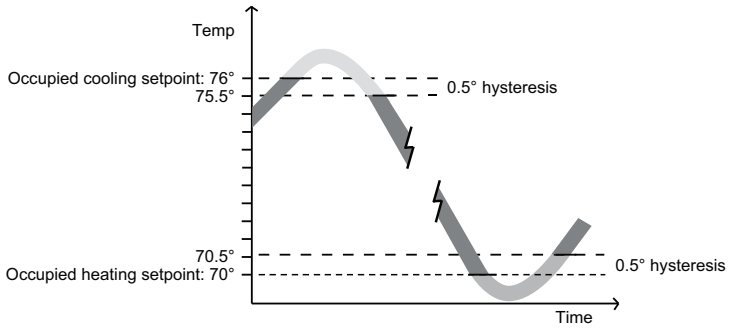
The occupied setpoints (described in Table C) are the setpoints under normal operating conditions. The Demand Level 1-3 setpoints apply if demand limiting is used.

Demand limiting is a cost-saving strategy to reduce energy consumption. The strategy expands the occupied heating and cooling setpoints when the system reaches one of 3 levels of consumption. With the expanded setpoints, the equipment works less, thereby saving energy. By default, Demand Level 1 expands the occupied heating and cooling setpoints by 1.0 Δ°F (0.5 Δ°C), Demand Level 2 by 2.0 Δ°F (1.1 Δ°C), and Demand Level 3 by 4.0 Δ°F (2.2 Δ°C). If the occupied heating or cooling setpoints change, the (effective) demand level setpoints automatically change by the same amount. See the Operation section for more information.

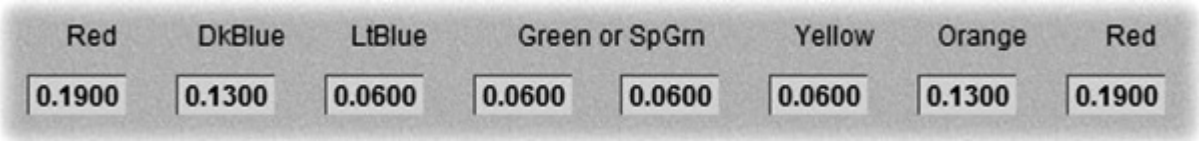
Table C — Setpoints

POINT NAME	DESCRIPTION	DEFAULT RANGE: –35 to 240°F (–37.2 to 115.6°C)			
		Occupied	Demand Level		
			1	2	3
Occupied Heating (Green)	The heating setpoint the controller maintains while in occupied mode.	D:70°F (21.1°C) R:40 to 90°F (4.4 to 32.2°C)	69°F (20.5°C)	68°F (20°C)	66°F (18.9°C)
Occupied Cooling (Green)	The cooling setpoint the controller maintains while in occupied mode.	D:76°F (24.4°C) R:55 to 99°F (12.7 to 37.2°C)	77°F (25°C)	78°F (25.5°C)	80°F (26.6°C)
Occupied Heating 1 (Light Blue)	The space temperature must be less than the **Occupied Heating 1** setpoint for the VVT Master to consider the zone a heating caller in a linked system. In a single-zone application, the heating requirement begins as soon as the space temperature falls below the **Occupied Heating** setpoint. We recommend that the **Occupied Heating 1** value be set no less than 0.5 Δ°F (0.27 Δ°C) below the **Occupied Heating** setpoint.	69°F (20.5°C)	68°F (20°C)	67°F (19.4°C)	65°F (18.3°C)
Occupied Heating 2 (Dark Blue)	The space temperature must be less than the **Occupied Heating 2** setpoint to generate a low space temperature alarm. We recommend that this value be set no less than 0.5 Δ°F (0.27 Δ°C) below the **Occupied Heating 1** setpoint.	67°F (19.4°C)	66°F (18.9°C)	65°F (18.3°C)	63°F (17.2°C)
Occupied Cooling 1 (Yellow)	The space temperature must be greater than the **Occupied Cooling 1** setpoint for the VVT Master to consider the zone a cooling caller in a linked system. In a single-zone application, the cooling requirement begins as soon as the space temperature exceeds the **Occupied Cooling** setpoint. We recommend that the **Occupied Cooling 1** value be set no less than 0.5 Δ°F (0.27 Δ°C) above the **Occupied Cooling** setpoint.	77°F (25°C)	78°F (25.5°C)	79°F (26.1°C)	81°F (27.2°C)
Occupied Cooling 2 (Orange)	The space temperature must be greater than the **Occupied Cooling 2** setpoint to generate a high space temperature alarm. We recommend that this value be set no less than 0.5 Δ°F (0.27 Δ°C) above the **Occupied Cooling 1** setpoint.	79°F (26.1°C)	80°F (26.6°C)	81°F (27.2°C)	83°F (28.3°C)

Table C — Setpoints (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Unoccupied Heating (Gray)	The heating setpoint the controller maintains while in unoccupied mode.	D:55°F (12.7°C) R:40 to 90°F (4.4 to 32.2°C)
Unoccupied Cooling (Gray)	The cooling setpoint the controller maintains while in unoccupied mode.	D:90°F (32.2°C) R:45 to 99°F (7.2 to 37.2°C)
Unoccupied Heating 1 (Light Blue)	The space temperature must be less than the **Unoccupied Heating 1** setpoint for the VVT Master to consider the zone an unoccupied heating caller in a linked system. In a single-zone application, the unoccupied heating requirement begins as soon as the space temperature falls below the **Unoccupied Heating** setpoint. We recommend that the **Unoccupied Heating 1** value be set no less than 0.5 Δ°F (0.27 Δ°C) below the **Unoccupied Heating** setpoint.	D:54°F (12.2°C) R:40 to 90°F (4.4 to 32.2°C)
Unoccupied Heating 2 (Dark Blue)	The space temperature must be less than the **Unoccupied Heating 2** setpoint to generate an unoccupied low space temperature alarm. We recommend that this value be set no less than 0.5 Δ°F (0.27 Δ°C) below the **Unoccupied Heating 1** setpoint.	D:52°F (11.1°C) R:40 to 90°F (4.4 to 32.2°C)
Unoccupied Cooling 1 (Yellow)	The space temperature must be greater than the **Unoccupied Cooling 1** setpoint for the VVT Master to consider the zone an unoccupied cooling caller in a linked system. In a single-zone application, the unoccupied cooling requirement begins as soon as the space temperature exceeds the **Unoccupied Cooling** setpoint. We recommend that the **Unoccupied Cooling 1** value be set no less than 0.5 Δ°F (0.27 Δ°C) above the **Unoccupied Cooling** setpoint.	D:91°F (32.7°C) R:45 to 99°F (7.2 to 37.2°C)
Unoccupied Cooling 2 (Orange)	The space temperature must be greater than the **Unoccupied Cooling 2** setpoint to generate an unoccupied high space temperature alarm. We recommend that this value be set no less than 0.5 Δ°F (0.27 Δ°C) above the **Unoccupied Cooling 1** setpoint.	D:93°F (33.9°C) R:45 to 99°F (7.2 to 37.2°C)
Heating Capacity	Used for Optimal Start, this is the rate at which the space temperature changes when the heating system runs at full capacity to maintain designed occupied heating setpoint.	D:3 Δ°F (1.6 Δ°C)/hr R:0 to 120 Δ°F (0 to 66.6 Δ°C)/hr
Heating Design Temp	The geographically-based outdoor air temperature at which the heating system must run constantly to maintain comfort. This information is available in ASHRAE publications and most design references.	D:0°F/*C* R:–100 to 150°F (–73.3 to 65.5°C)
Cooling Capacity	Used for Learning Adaptive Optimal Start, this is the rate at which the space temperature changes when cooling system runs at full capacity to maintain designed occupied cooling setpoint.	D:3 Δ°F (1.6 Δ°C)/hr R:0 to 140 Δ°F (0 to 77.7 Δ°C)/hr
Cooling Design Temp	The geographically-based outdoor air temperature at which the cooling system must run constantly to maintain comfort. This information is available in ASHRAE publications and most design references.	D:100°F (37.7°C) R:–100 to 150°F (–73.3 to 65.5°C)
Hysteresis	The desired difference between the temperature at which the zone color changes as the space temperature departs from the acceptable range between the heating and cooling setpoints (green) into the Cooling 1 (yellow) or Heating 1 (light blue) and the temperature at which the zone color changes back to the acceptable range between the heating and cooling setpoints. For example, the following graph shows the zone color that results as the space temperature departs from and returns to the acceptable range in a zone with the following settings: • **Color Change Hysteresis** - 0.5 Δ°F (0.27 Δ°C) (applies as the temperature returns to the acceptable range) • **Occupied Cooling Setpoint** - 76°F (24.4°C) • **Occupied Heating Setpoint** - 70°F (21.1°C)  NOTE: The values in the graph are in degrees Fahrenheit (°F).	D: 0.5 Δ°F (0.27 Δ°C) R: 0 to 120 Δ°F (0 to 66.6 Δ°C)

Learning Adaptive Optimal Start



When the Learning Adaptive Optimal Start algorithm runs, the learned heating capacity or learned cooling capacity values are adjusted based on the color that is achieved when occupancy begins. The adjustment amounts for each color are displayed in the thermographic color fields (shown above with English default values).

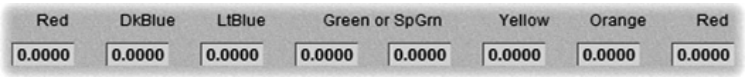
Table D — Thermographic Color Fields

POINT NAME	DESCRIPTION	RANGE	
		ENGLISH	METRIC
Red	The amount the zone's learned heating capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is red.	D:0.1900 R:0 to 1	0.1055
DkBlue	The amount the zone's learned heating capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is dark blue.	D:0.1300 R:0 to 1	0.0722
LtBlue	The amount the zone's learned heating capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is light blue.	D:0.0600 R:0 to 1	0.0333
Green	The amount the zone's learned heating capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is green.	D:0.0600 R:0 to 1	0.0333
SpGrn	The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is spring green.	D:0.0600 R:0 to 1	0.0333
Yellow	The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is yellow.	D:0.0600 R:0 to 1	0.0333
Orange	The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is orange.	D:0.1300 R:0 to 1	0.0722
Red	The amount the zone's learned cooling capacity is adjusted when the Learning Adaptive Optimal Start algorithm runs, when the zone's thermographic color at occupancy is red.	D:0.1900 R:0 to 1	0.1055

Table E — Learned Heating/Cooling Capacity Values

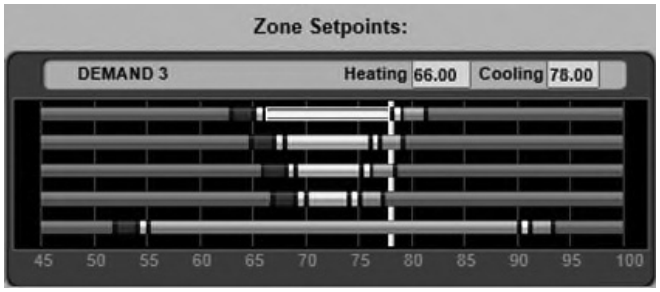
POINT NAME	DESCRIPTION	DEFAULT/RANGE
Heating (Occupied or Unoccupied, depending on mode)	The current programmed **Heating** setpoint adjusted by any offset that may be in effect.	R:0 to 120°F (–17.7 to 48.9°C)
Cooling (Occupied or Unoccupied, depending on mode)	The current programmed **Cooling** setpoint adjusted by any offset that may be in effect.	R:0 to 120°F (–17.7 to 48.9°C)
Learned cooling capacity	The cooling capacity learned by Learning Adaptive Optimal Start that is required to bring the space temperature down to the occupied cooling setpoint prior to the occupied time.	R: __ °F/C
Learned heating capacity	The heating capacity learned by Learning Adaptive Optimal Start that is required to bring the space temperature up to the occupied heating setpoint prior to the occupied time.	R: __ °F/C
Min Setpoint Separation	Minimum separation that must be maintained between the heating and cooling setpoints.	R: __ °F/C
Optimal Start	The number of hours prior to occupancy, at which the **Optimal Start** function may begin to adjust the effective setpoints to achieve the occupied setpoints by the time scheduled occupancy begins. Enter 0 to disable **Optimal Start**. NOTE: **Optimal Start** is automatically disabled when occupancy is controlled by a network write to the controller's **keypad_ovrde** variable. Display name: **BAS On/Off**, in ***Properties*** → ***Control Program*** → ***Maintenance*** → ***Occupancy*** → ***BAS On/Off*** or when utilizing Airside Linkage or the **System Occupancy Network** Variable.	D:1 hour R:0 to 4 hours

Table E — Learned Heating/Cooling Capacity Values (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Optimal Start Type	The method used to change from unoccupied to occupied setpoint. Options: **None** – Unit will not change to occupied setpoint until the scheduled time or the unit goes into an occupied mode. Setpoints do not ramp, but change immediately from unoccupied to occupied values. **Temp Compensated** – Unit changes to occupied setpoints at a variable time prior to the occupied time, which is calculated by the current difference between space temperature and the appropriate heating or cooling setpoint. At that time, the setpoints do not ramp, but change immediately from unoccupied to occupied values. **Learning Adaptive Start** – Unit gradually changes to occupied setpoints by adjusting the unoccupied setpoints over a specified period of time to achieve the occupied setpoint by the time scheduled occupancy begins. 	D: Temperature Compensated R: None Temperature Compensated Learning Adaptive
Heat Start K factor (min/deg)	If **Optimal Start Type** is **Temp Compensated**, this is the time in minutes per degree that the equipment starts before the occupied period when the space temperature is below the occupied heating setpoint (including any setpoint offset).	D: 15 (27) R: 0 to 99
Cool Start K factor (min/deg)	If **Optimal Start Type** is **Temp Compensated**, this is the time in minutes per degree that the equipment starts before the occupied period when the space temperature is above the occupied cooling setpoint (including any setpoint offset).	D: 15 (27) R: 0 to 99
Standby Offset	The value by which the occupied setpoints are expanded when the space occupancy sensor indicates that a zone is unoccupied. If 0, the unoccupied setpoints are used. NOTE: If **Occupied Standby** is set to **Enable, Standby Offset** routine is automatically disabled.	D: 0 Δ°F/°C R: 0 to 15 Δ°F (0 to 8.3 Δ°C)
Occ Relative Humidity Setpoint	The percentage of relative humidity in the space during occupancy that will energize DEHUM – Relay 6, BO-06 (Humidi-MiZer® dehumidification option).	D: 60%rh R: 0 to Unoccupied RH Control Setpoint
Unocc Relative Humidity Setpoint	The percentage of relative humidity in the space during the unoccupied time period that starts the unit and energizes DEHUM – Relay 6, BO-06 (Humidi-MiZer® dehumidification option).	D: 95%rh R: 30 to 100%rh
DCV Max Ctrl Setpoint	The design difference between indoor and outdoor CO_2 levels.	D: 600 ppm R: 0 to 9999 ppm
Power Exhaust Setpoint	The outside air damper position at which the controller energizes the Power Exhaust relay. ***Configuration*** → ***Service Configuration*** → ***Economizer Exists*** must be set to **Yes**, and ***Configuration*** → ***Service Configuration*** → ***Continuous Occupied Exhaust*** must be set to **No**.	D: 50% Open R: 20 to 90% Open
SA Vent / Temper Setpoint	The setpoint to energize one heat stage and, therefore, temper the supply air in low fan-speed situations.	D: 65°F (18.3°C) R: 40 to 75°F (4.4 to 23.9°C)

Setpoints for ZS Sensors

To configure setpoint properties for ZS sensors, **Ctrl+click** anywhere on the **Zone Setpoints**: graph at the top of the **Setpoints** section in order to access the **Properties** microblock popup.



In the popup, on the ***Properties*** → ***Sensor*** tab, configure ZS sensors for **Setpoint Adjust**.

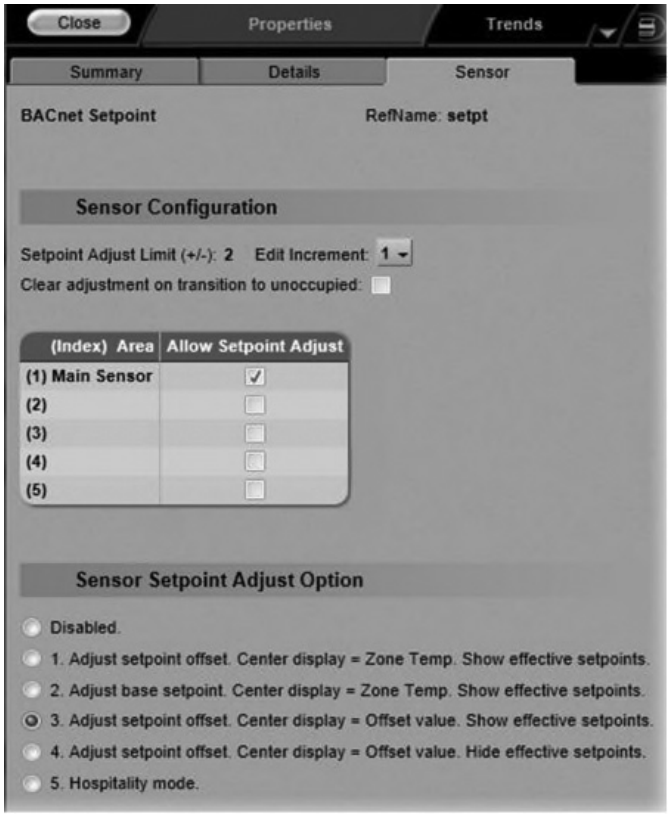


Table F — Setpoints for ZS Sensors

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Edit Increment	Amount of offset in degrees for each press of the up or down arrows on the ZS sensor for setpoint adjustment.	D:1 R:0.1 0.5 1
Allow Setpoint Adjust	Check to allow setpoint adjustments on the specified ZS sensor.	D:(1) enabled R:disabled/enabled
Sensor Setpoint Adjust Option	Check to select the ZS setpoint adjustment display.	D:3

Alarm Configuration

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

Table G — Alarm Configuration Setpoints

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Space Temperature Alarm		
Occupied Alarm Hysteresis	This value is added to the occupied high effective setpoint and subtracted from the occupied low effective setpoint to establish the occupied high and low limits that the space temperature must exceed before an occupied SPT alarm is generated. The alarm returns to normal when the space temperature drops below the high effective setpoint or rises above the low effective setpoint.	D:5.0 Δ°F (2.7 Δ°C) R:0 to 20.0 Δ°F (0 to 11.1 Δ°C)
Alarm Delay (min/deg)	Determines the amount of delay before an occupied space temperature alarm is generated when the controller transitions to the occupied mode. The delay time equals this value multiplied by the difference between the sensor temperature and occupied alarm setpoint plus 15 minutes.	D:10 (18) minutes R:0 to 60 minutes
Unoccupied Low SPT Alarm Limit	The value that the space temperature must drop below to generate a **Space Temperature Alarm** in the unoccupied mode. There is a fixed hysteresis of 1.0 Δ°F (0.5 Δ°C) for return to normal.	D:45°F (7.2°C) R:35 to 90°F (1.6 to 32.2°C)
Unoccupied High SPT Alarm Limit	The value that the space temperature must exceed to generate a **Space Temperature Alarm** in the unoccupied mode. There is a fixed hysteresis of 1.0 Δ°F (0.5 Δ°C) for return to normal.	D:95°F (35°C) R:45 to 100°F (7.2 to 37.7°C)
Supply Air Temperature Alarm		
Low SAT Alarm Limit	The value that the supply air temperature must drop below to generate a **Supply Air Temp Alarm**. There is a fixed hysteresis of 3.0 Δ°F (1.6 Δ°C) for return to normal.	D:38°F (3.3°C) R:15 to 90°F (–9.4 to 32.2°C)
High SAT Alarm Limit	The value that the supply air temperature must exceed to generate a **Supply Air Temp Alarm**. There is a fixed hysteresis of 3.0 Δ°F (1.6 Δ°C) for return to normal.	D:160°F (71.1°C) R:90 to 175°F (32.2 to 79.4°C)
Space Humidity Alarm		
Occupied High RH Alarm Limit	The value that the relative humidity sensor must exceed to generate a **Space Humidity Alarm** in the occupied mode if **RH Control** is set to **Enable**. There is a fixed hysteresis of 5%rh for return to normal.	D:70%rh R:0 to 100%rh
Alarm Delay (min/%RH)	Determines the amount of delay before an occupied RH alarm is generated when the controller transitions to the occupied mode. The delay time equals this value multiplied by the difference between the sensor RH value and the occupied RH setpoint plus 15 minutes.	D:5 minutes R:0 to 30 minutes
Unoccupied High RH Alarm Limit	The value that the relative humidity sensor must exceed to generate a **Space Relative Humidity** alarm in the unoccupied mode if **RH Control** is set to **Enable**. There is a fixed hysteresis of 5%rh for return to normal.	D:100%rh R:0 to 100%rh
Low RH Alarm Limit	The value that the relative humidity sensor must drop below to generate a **Space Humidity Alarm** in either the unoccupied or occupied modes if **RH Control** is set to **Enable**. There is a fixed hysteresis of 5%rh for return to normal.	D:30%rh R:0 to 100%rh
IAQ/Ventilation Alarm		
Occupied High CO_2 Alarm Limit	The value that the CO_2 sensor must exceed to generate an **IAQ Alarm** in the occupied mode. There is a fixed hysteresis of 100ppm for return to normal. Requires a valid **Indoor Air Quality CO_2** sensor value and **IAQ Control** is set to **Enable**.	D:1200ppm R:0 to 9999 ppm
Alarms Displayed on ZS Sensor	You can individually select items below to show the alarm indicator on the ZS sensor.	
Fire / Smoke Shutdown Alarm	If set to display, shows the alarm indicator on the communicating zone sensors with display, if the fire shutdown circuit trips.	D:Ignore R:Ignore/Display
Stuck Gas Valve Alarm	If set to display, shows the alarm indicator on the communicating zone sensors with display, if the fire shutdown circuit trips.	D:Ignore R:Ignore/Display
Safety Chain Alarm	If set to display, shows the alarm indicator on the communicating zone sensors with display, if the safety chain circuit trips.	D:Ignore R:Ignore/Display
Space Temperature High/Low Alarm	If set to display, shows the alarm indicator on the communicating zone sensors with display, if the space temperature sensor exceeds the high or low alarm limit.	D:Ignore R:Ignore/Display
Space Indoor Air CO_2 High Alarm	If set to display, shows the alarm indicator on the communicating zone sensors with display, if the occupied CO_2 level exceeds the configured high alarm limit.	D:Ignore R:Ignore/Display
Space Relative Humidity High Alarm	If set to display, shows the alarm indicator on the communicating zone sensors with display, if a valid space relative humidity sensor exceeds the configured alarm limits.	D:Ignore R:Ignore/Display
Supply Fan Failure Alarm	If set to display, shows the alarm indicator on the communicating zone sensors with display, if the supply fan is not operating when commanded on.	D:Ignore R:Ignore/Display
Supply Air Temperature Low OR High Alarm	If set to display, shows the alarm indicator on the communicating zone sensors with display, if the supply air temperature exceeds the configured alarm limits.	D:Ignore R:Ignore/Display
CEC Title 24		

Table G — Alarm Configuration Setpoints (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Economizer Fault Detection (FDD) Alarm	If set to display, shows the alarm indicator on the communicating zone sensors with display, if the CEC Title 24 Economizer FDD fault is detected.	D: Display R: Ignore/Display
Maintenance Displayed on ZS Sensor		
Sensor Faults	If set to display, shows the Maintenance or Fault indicator on the communicating zone sensors with display, if a valid space temperature sensor to sensor value is not available to the controller.	D: Ignore R: Ignore/Display
Filter Dirty Alarm/Maint	If set to display, shows the Maintenance or Fault indicator on the communicating zone sensors with display, if filter runtime exceeds the value of the **Filter Service Alarm** Timer or in response to a filter status switch binary input.	D: Ignore R: Ignore/Display
Airside Linkage Status Alarm	If set to display, shows the Maintenance or Fault indicator on the communicating zone sensors with display, if Linkage has failed in a zoned system using Linkage.	D: Ignore R: Ignore/Display
Misconfiguration - Switch/Analog Inputs	If set to display, shows the Maintenance or Fault indicator on the communicating zone sensors with display. Indicates if a duplicate configuration exists for two or more binary input (4, 5, 6, or 7) functions, OR if a duplicate configuration exists.	D: Display R: Ignore/Display
Compressor 1 Runtime Alarm	If set to display, shows the Maintenance or Fault indicator on the communicating zone sensors with display, if the **Compressor 1 Runtime** exceeds the value of the **Compressor 1 Service Alarm Timer**.	D: Ignore R: Ignore/Display
Compressor 2 Runtime Alarm	If set to display, shows the Maintenance or Fault indicator on the communicating zone sensors with display, if the **Compressor 2 Runtime** exceeds the value of the **Compressor 2 Service Alarm Timer**.	D: Ignore R: Ignore/Display
Supply Fan Hand Fault	If set to display, shows the Maintenance or Fault indicator on the communicating zone sensors with display, if the supply fan is operating when commanded off.	D: Ignore R: Ignore/Display
Supply Fan Runtime Alarm	If set to display, shows the Maintenance or Fault indicator on the communicating zone sensors with display, if the supply fan runtime exceeds the value of the **Supply Fan Service Alarm Timer**.	D: Ignore R: Ignore/Display

Service Configuration

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

Table H — Service Configuration Points

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Unit Type	The type of equipment that the TV-RTU is controlling. Options: **Heat/Cool** – Rooftop air handling unit. **HP Y1/W1 Ctrl** – Carrier Heat Pump application only.	D: Heat/Cool R: Heat/Cool N/A N/A HP Y1/W1 Ctrl
Compressor Stages	The number of mechanical cooling stages.	D: Two Stages R: One Stage Two Stages
Economizer Exists	Set to **Yes** to enable economizer control for units equipped with an economizer damper.	D: No R: No/Yes
Power Exhaust Exists	Set to **Yes** for units equipped with power exhaust.	D: No R: No/Yes
IDF Max Speed Voltage	Signal voltage used to set the indoor fan ECM maximum speed.	D: 7.8 Vdc R: 0 to 10 Vdc
IDF Min Speed	Used to set the indoor fan ECM minimum speed.	D: 66% R: 50% to 100%
IDF Heat Speed	Used to set the indoor fan ECM speed in heat mode.	D: 100% R: 80% to 100%
Stage 1 SAT Stpt	The ECM Supply Air Setpoint during stage 1 cooling. Must be at least 4°F (2.2°C) greater than **Minimum Cooling SAT**.	D: 57°F (13.9°C) R: 45 to 75°F (7.2 to 23.9°C)
Stage 2 SAT Stpt	The ECM Supply Air Setpoint during stage 2 cooling. Must be at least 4°F (2.2°C) greater than **Minimum Cooling SAT**.	D: 57°F (13.9°C) R: 45 to 75°F (7.2 to 23.9°C)
Heat Type	The type of heating used by the unit.	D: Electric R: Electric/Gas
Number of Heat Stages	The number heat stages.	D: 2 R: 1 / 2 /0 (no heating)
HP Aux Heat Exists	Set to Yes for units equipped with auxiliary heat.	D: No R: No/Yes

APPENDIX H — TRUVU CONFIGURATION (cont)

Table H — Service Configuration Points (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
SA Tempering	Supply Air Tempering allows heating, if installed to temper OA while unit is in **Fan Only** or **IAQ Override** or **Purge** mode.	D:Disable R:Disable/Enable
Continuous Occupied Exhaust	Configures the exhaust fan control strategy (EXH – Relay 7, BO-07). If **Yes**, the power exhaust runs continuously in occupied mode and is off in unoccupied mode. If **No**, the power exhaust is controlled by the **Power Exhaust Setpoint**.	D:No R:No/Yes
RH Control	Enables dehumidification control if an RH sensor or humidistat is available and the unit has the Humidi-MiZer dehumidification option installed.	D:Disable R:Disable/Enable
DCV Control	Enables demand controlled ventilation (DCV) if valid CO_2 sensor value is available and the unit has an economizer installed.	D:Disable R:Disable/Enable
OAT Source Priority	The primary outside air temperature (OAT) source (if valid) used for this equipment.	D:Local OAT priority R:Local OAT priority System OAT priority
System Space Temperature	The network space temperature value that the controller is using for control (if applicable).	D:–999.00° R:N/A
System Space RH	The network relative humidity value that the controller is using for control (if applicable).	D:–999% rh R:N/A
System Space AQ (System Space CO_2)	The network indoor air quality (CO_2) value that the controller is using for control (if applicable).	D:–999 ppm R:N/A
System Cool Demand Level	The system cool demand level being received over the network.	D:0.00 R:0 to 3
System Heat Demand Level	The system heat demand level being received over the network.	D:0.00 R:0 to 3
System Outdoor Air Temperature	Allows the outdoor air temperature value to be network readable when enabled. Requires controller be equipped with an outdoor air temperature sensor.	D:–999.00° R:N/A
System Outdoor AQ (System Outdoor CO_2)	Allows network-readable OAQ value for calculating the differential OAQ CO_2 levels and IAQ CO_2 levels to drive the IAQ control.	D:–999 ppm R:N/A
System Fire / Smoke	Allows network-readable Fire / Smoke signal to force shutdown.	D:Off R:Off/On
System Man Purge Mode Activate	Allows BACnet network-readable value from a BAS (Building Automation System) to force manual purge.	D:Normal R:Normal/Active
System Stdby Offset Motion	The status of the standby offset motion detector received over the network.	D:OFF R:OFF/ON
Service Test		
Service Test	Enable to stop automatic control so you can test the controller's outputs. Automatically resets to **Disable** after 1 hour.	D:Disable R:Disable/Enable
Fan Test	Enable to test the controller's fan operation. Operates fan at minimum speed. **Service Test** must be set to **Enable**.	D:Disable R:Disable/Enable
Compressor 1 Test	Enable to test the controller's compressor 1 output. **Service Test** must be set to **Enable**.	D:Disable R:Disable/Enable
Compressor 2 Test	Enable to test the controller's compressor 2 output. **Service Test** must be set to **Enable**.	D:Disable R:Disable/Enable
Heat 1 Test	Enable to test the controller's heat 1 output. **Service Test** must be set to **Enable**.	D:Disable R:Disable/Enable
Heat 2 Test	Enable to test the controller's heat 2 output. **Service Test** must be set to **Enable**.	D:Disable R:Disable/Enable
Dehumidification Test	Enable to test the controller's Humidi-MiZer output. **Service Test** must be set to **Enable**.	D:Disable R:Disable/Enable
Power Exhaust Test	Enable to test the controller's exhaust fan output. **Service Test** must be set to **Enable**.	D:Disable R:Disable/Enable
Economizer Test	Set to a value between 0 and 100% to test the controller's economizer output. **Service Test** must be set to **Enable**.	D:0 (% Open) R:0 to 100 (% Open)
ECM Speed Test	Set to a value between 0 and 100% to test the controller's variable speed fan output. **Service Test** must be set to **Enable**.	D:0% R:0 to 100%

Maintenance

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

Table I — Maintenance Points

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Unit		
Occupancy Status	The controller's occupancy status as determined by a network schedule, a local schedule, or a timed override.	R: Unoccupied/Occupied
	Indicates the current status of the system: **Temp Compensated Start** **Learning Adaptive Start**	R: Inactive/Active
Pre-Occ Purge	Indicates if the pre-occupancy purge cycle is active.	R: Inactive/Active
Space Temp Source	The source of the controlling space temperature value. Options: **Sensor Failure** – No valid space temperature or sensor status = failed. **T55** – A T55 sensor is connected to the controller's I/O terminals. **Network** – A network temperature sensor is bound to the controller's space temperature AV. **Airside Linkage** – The space temperature from a linked terminal. **Locked Value** –The controller's space temperature input has been manually locked at a value. **ZS Sensor** – A ZS sensor is connected to the controller's Rnet port.	R: Sensor Failure N/A T55 Network Airside Linkage Locked Value ZS Sensor N/A
Setpoint Adjustment	Indicates the amount of offset applied if you configured the space sensor as ZS sensor. Set the display value range in **Setpoint Adjustment Range**.	R: __ Δ°F/C
Effective Heat Setpoint	The current heating setpoint. May include offsets from configured occupied/unoccupied setpoints resulting from **Optimal Start** to **Demand Limit**.	R: __ °F/C
Effective Cool Setpoint	The current cooling setpoint. May include offsets from configured occupied/unoccupied setpoints resulting from **Optimal Start** to **Demand Limit**.	R: __ °F/C
Relative Humidity Source	The source of the relative humidity value.	R: N/A N/A Network Linkage Locked Value N/A ZS Sensor Linkage & ZS Sensor
IAQ Source (Space CO_2 Source)	The source of the indoor air quality (CO_2) value.	R: N/A N/A Network Linkage Locked Value N/A ZS Sensor Linkage & ZS Sensor
OAQ Source (Outdoor CO_2 Source)	The source of the outdoor air quality (CO_2) value.	R: N/A N/A Network Linkage Locked Value N/A
Outdoor Air Temperature Source	The source of the outdoor air temperature.	R: N/A Local Network Linkage Locked Value
System Cooling Demand Level	The demand limit used by the control in cooling mode.	R: 0 to 3
System Heating Demand Level	The demand level used by the control in heating mode.	R: 0 to 3
System Status	The System Status Variable for Title 24.	R: OA Econ unsuitable Free Cooling Avail Economizer Enabled Compressor Enabled Heating Enabled MA Low Limit Active

APPENDIX H — TRUVU CONFIGURATION (cont)

Table I — Maintenance Points (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Safety Chain Feedback	Indicates a completed circuit I/O terminals BI-03. This circuit is typically used for safety devices that immediately stop unit operation when tripped.	R: Off/Run Enabled
Fire Shutdown Status	Shutdown indicates that a fire shutdown is in effect.	R: Run Enabled/Shutdown
Calculated Min Econ Pos	Indicates the minimum position value that the economizer control is using.	R: 0 to 100%
Calculated PE Setpoint	Indicates the setpoint value the power exhaust fan control is using. This value is automatically calculated from the configured setpoint.	R: 0 to 100%
Active Compressor Stages	The number of compressor stages currently operating.	R: 0 to 2
Active Heat Stages	The number of heating stages currently operating.	R: 0 to 2
Enthalpy Status	The enthalpy status determined by an enthalpy switch.	R: High/Low
Enthalpy (BACnet)	The enthalpy status the controller receives through BACnet communication.	R: High (0) / Low (1)
Humidistat Input Status	The humidity status determined by a humidistat.	R: High/Low
Filter Status	Displays the current filter condition to the filter input if that option is configured.	R: Clean/Dirty
Door Contact Status	Displays the state of the door contact switch if that option is configured.	R: Off/On
IGC Override	Displays the state of the **IGC Override** input status. An **Active** state indicates a flame is present.	R: Off/Active D: Run
Reset Supply Fan Runtime	Set to **Clear** to reset **Supply Fan Runtime** to 0.	R: Run/Clear D: Run
Reset Comp 1 Runtime Alarm	Set to **Clear** to reset **Compressor 1 Runtime** to 0.	R: Run/Clear D: Run
Reset Comp 2 Runtime Alarm	Set to **Clear** to reset **Compressor 2 Runtime** to 0.	R: Run/Clear D: Run
Reset Filter Runtime Alarm	Set to **Clear** to reset **Filter Runtime** to 0.	R: Run/Clear
CEC Title 24		
Occupied Standby Source (T24)	The source of the presence value. **Sensor Failure** – No valid presence sensor status = failed **Local** – A presence sensor or Title 24 compliant system connected to the controller's I/O terminals. **Network** – A network presence sensor is bound to the controller's presence BV. **ZS Sensor** – A ZS sensor is connected to the controller's Rnet port. **Locked Value** – The controller's presence input has been manually locked at a value.	R: Sensor Failure Local Network ZS Sensor Locked Value
Occupied Standby Mode (T24)	The controller's current Occupied Standby operating mode. **Inactive** – Presence sensed in Space/Zone. **Fan Off** – No demand in Space/Zone. Supply Fan is off. **Fan Off & Econ Cls** – No demand in Space/Zone. Supply Fan is off and Economizer is closed. Note If **Economizer Exists** is set to **Yes**. **Heating** – Supply Fan is on and providing heat. Space Temperature is less than the Effective Heat Setpoint. **Cooling** – Supply Fan is on and providing cooling. Space Temperature is greater than the Effective Cool setpoint. **Fan Running** – Supply Fan is on.	R: Inactive Fan Off Fan Off & Econ Cls Heating Cooling Fan Running
Occupied Standby Delay (T24)	The status of the Occupied Standby presence delay.	R: Inactive/Active
Remaining Occupied Standby Delay (T24)	If **Occupied Standby Delay** is **Active**, this is the remaining delay time.	R: 0 to 15 minutes
Occupancy		
BAS On/Off	Determines the occupancy state of the controller and can be set over the network by another device or third party BAS. Options: **Inactive** – Occupancy is determined by a configured schedule. **Occupied** – The controller is always in the occupied mode. **Unoccupied** – The controller is always in the unoccupied mode. NOTE: If **BAS On/Off** is set to either **Unoccupied** or **Occupied**, the **Optimal Start** routine is automatically disabled.	D: Inactive R: Inactive Occupied Unoccupied
Pushbutton Override	**Active** indicates if a user pushed the sensor's override button to override the occupancy state.	R: Off/Active
Occupancy Contact	**ON** indicates an external contact is controlling the occupancy state.	R: Off/On
Override Time Remaining	The amount of time remaining in an override period.	R: 0 to 240 minutes

Table I — Maintenance Points (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Schedule	The controller's occupancy status based on the local schedule.	R: Unoccupied/Occupied
Runtime		
Supply Fan Runtime	The total number of hours that the supply fan relay has been energized since the runtime was last reset to 0 using **Reset Supply Fan Runtime Alarm**.	R: __ hours
Compressor 1 Runtime	The total number of hours that the Compressor 1 relay has been energized since the runtime was last reset 0 using **Reset Comp 1 Runtime Alarm**.	R: __ hours
Compressor 2 Runtime	The total number of hours that the Compressor 2 relay has been energized since the runtime was last reset using **Reset Comp 2 Runtime Alarm**.	R: __ hours
Filter Runtime	The total number of hours that the unit has been operating since the runtime was last reset to 0 using **Reset Filter Runtime Alarm**.	R: __ hours
Environmental Index		
Environmental Index (EI)	Initial **Occupied** value is 100%. A value of 0% means the zone is **Unoccupied**. If the space temperature deviates from **Effective Heat Setpoint** and **Effective Cool Setpoint** range, the value is derated. EI supports an optional RH and CO_2 sensor. The RH and/or CO_2 values could also derate an EI.	R: 0 to 100%
EI Time Satisfied	Percentage of Occupied time during which a zone maintains an EI of 70% or higher.	R: 0 to 100%
Weighted EI	Determines the priority of a zone in an EI roll-up, which must be completed using a different control program.	R: 0 to 100000.0
EI Total Weight	Current **EI Weighting Factor** used to scale the **Weighted EI**.	R: 0 to 1000.0
EI Decreased By	Source(s) of an EI value reduction. Options: **Temp** – EI decreased by Space Temperature **Temp & RH** – EI decreased by Space Temperature and Relative Humidity **Temp, RH, & CO_2** – EI decreased by Space Temperature, Relative Humidity, and CO_2 **RH** – EI decreased by Relative Humidity **RH & CO_2** – EI decreased by Relative Humidity and CO_2 **CO_2** – EI decreased by CO_2 **Temp & CO_2** – EI decreased by Space Temperature and CO_2 **None** – No source(s) decreasing Environmental Index value	R: Temp Temp & RH Temp, RH, & CO_2 RH RH & CO_2 CO_2 Temp & CO_2 None
EI Space Temp Setpoint Tolerance	Expands the ideal heating and cooling setpoint range for EI temperature sensitivity.	D: 0.5 Δ°F (0.27 Δ°C) R: 0 to 5.0 Δ°F (0 to 2.7 Δ°C)
EI Humidity Low Limit	Setpoint value that relative humidity must drop below in order to decrease an EI Value.	D: 30%rh R: 0 to 100%rh
EI Weighting Factor	Creates a weighted average of a zone EI value by indicating the priority of that zone in an EI roll-up. A value of 0 disables the zone from an EI roll-up.	D: 1 R: 0 to 1000.0

Performance

Navigation: i-Vu® / Field Assistant: ***Properties → Control Program → Performance***

Table J — Performance Points

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Current Performance Data		
Equipment Runtime	TV-RTU's hours of operation since the last reset of **Performance Data**.	R: __ hours
Economizer Utilization	Percentage of **Equipment Runtime** hours that are above the active Economizer time since the last reset of **Performance Data**.	R: 0 to 100%
DCV Utilization	Percentage of **Equipment Runtime** hours that are above the active DCV time since the last reset of **Performance Data**.	R: 0 to 100%
Unocc Free Cool Utilization	Percentage of **Equipment Runtime** hours that are above active Unoccupied Free Cooling since the last reset of **Performance Data**.	R: 0 to 100%
Part Load Cooling Utilization	Percentage of **Equipment Runtime** hours that are above Cooling time in which less than the maximum configured cooling stages were active since the last reset of **Performance Data**.	R: 0 to 100%
Full Load Cooling Utilization	Percentage of **Equipment Runtime** hours that are above Cooling time in which all of the configured cooling stages were active since the last reset of **Performance Data**.	R: 0 to 100%

Table J — Performance Points (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Heating Utilization	Percentage of **Equipment Runtime** hours that are above active Heating time since the last reset of **Performance Data**.	R:0 to 100%
Recorded High OAT	Maximum recorded OAT since the last reset of **Performance Data**.	R: __ °F/C
Recorded Low OAT	Minimum recorded OAT since the last reset of **Performance Data**.	R: __ °F/C
Performance Data	Resets all the **Current Performance Data** properties to zero and shifts all the **Current Performance Data** into the appropriate **Historical Performance Data** fields below.	D:Collect R:Collect/Reset
Historical Performance Data		
Save Performance Data Daily	If enabled, automatically moves **Current Performance Data** to **Historical Performance Data** when resetting the **Current Performance Data** every night at midnight.	D:Enable R:Disable/Enable
Equipment Runtime	TV-RTU's hours of operation which occurred in the previous period that was prior to the last **Performance Data** reset.	R: __ hours
Economizer Utilization	Percentage of **Equipment Runtime** hours, above active Economizer time, which occurred in the previous period that was prior to the last **Performance Data** reset.	R:0 to 100%
DCV Utilization	Percentage of **Equipment Runtime** hours that the DCV was active in the previous period that was prior to the last **Performance Data** reset.	R:0 to 100%
Unocc Free Cool Utilization	Percentage of **Equipment Runtime** hours that the Unoccupied Free Cooling was active in the previous period that was prior to the last **Performance Data** reset.	R:0 to 100%
Part Load Cooling Utilization	Percentage of **Equipment Runtime** hours that the Cooling, with less than the maximum configured number of cooling stages, was active in the previous period that was prior to the last **Performance Data** reset.	R:0 to 100%
Full Load Cooling Utilization	Percentage of **Equipment Runtime** hours that the Cooling, with all of the configured number of cooling stages, was active in the previous period that was prior to the last **Performance Data** reset.	R:0 to 100%
Heating Utilization	Percentage of **Equipment Runtime** hours that the Heating was active in the previous period that was prior to the last **Performance Data** reset.	R:0 to 100%
Previous High OAT	Maximum recorded OAT in the previous period that was prior to the last **Performance Data** reset.	R: __ °F/C
Previous Low OAT	Minimum recorded OAT in the previous period that was prior to the last **Performance Data** reset.	R: __ °F/C

Alarms

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

Table K — Alarm Points

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Safety Chain	Indicates if the safety chain circuit trips.	R:Normal/Alarm
Fire / Smoke Shutdown	Indicates if the fire shutdown circuit trips.	R:Normal/Alarm
Gas Valve	Indicates that the integrated gas valve is stuck open and a flame is still present while heat has been commanded off.	R:Normal/Alarm
Space Temperature Alarm Status	Indicates if the space temperature sensor exceeds the high or low alarm limit.	R:Normal/Alarm
Alarming Temperature	Indicates the space temperature value that caused the space temperature alarm. Visible only in an alarm condition.	R:The sensor's range
Alarm Limit Exceeded	The alarm limit that the alarming space temperature sensor exceeded. Visible only in an alarm condition.	R:The configured limit
ZS Temp Sensor	Indicates a configured ZS space temperature sensor is no longer communicating.	R:Normal/Alarm
ZS Sensor Configuration	Indicates if the ZS space temperature sensor is not configured correctly.	R:Normal/Alarm
Space Temp Sensor	Indicates that a valid space temperature sensor or sensor value is no longer available to the controller.	R:Normal/Alarm
Supply Air Temperature	Indicates if the supply air temperature exceeds the configured alarm limits.	R:Normal/Alarm
Supply Air Temp Sensor	Indicates if the supply air temperature sensor fails.	R:Normal/Alarm
Supply Fan Failure	The supply fan is not operating when commanded on.	R:Normal/Alarm
Supply Fan in Hand	The supply fan is operating when commanded off.	R:Normal/Alarm
Indoor Air Quality (Space CO_2)	Indicates if the occupied CO_2 level exceeds the configured high alarm limit.	R:Normal/Alarm
Indoor Air Quality Sensor (Space CO_2 sensor)	Indicates that a valid indoor air quality (CO_2) sensor or sensor value is no longer available to the controller.	R:Normal/Alarm
Space Relative Humidity	Indicates that a valid space relative humidity sensor exceeds the configured alarm limits.	R:Normal/Alarm
Space Relative Humidity Sensor	Indicates that a valid space relative humidity sensor or sensor value is no longer available to the controller.	R:Normal/Alarm
Filter	Indicates a dirty filter condition when the filter runtime exceeds the value of the Filter Service Alarm Timer or in response to a filter status switch binary input.	R:Clean/Dirty

Table K — Alarm Points (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Local OAT Sensor	Indicates the local outdoor air temperature sensor connected to this equipment fails.	R: Normal/Alarm
Outdoor Air Temp Sensor	Indicates if the controller is no longer receiving a valid outdoor air temperature value either through the network or from a local sensor.	R: Normal/Alarm
Economizer Operation	Indicates the state of the economizer's operation and if an economizer Operation Fault has been detected.	R: Normal/Fault Detected
Economizer	If **Economizer Operation** has been set to **Alarm**, the **Economizer Fault Detection Diagnostic Result** displays.	R: Normal Failed to Fully Open Failed to Open Failed to Close Stuck Open
Outdoor Air Quality Sensor (Outdoor Air CO_2 Sensor)	Indicates if the outdoor air quality (CO_2) sensor fails.	R: Normal/Alarm
Switch Configuration	Indicates if a duplicate configuration exists for two or more binary Input 4, 5, 6, & 7 Functions.	R: Normal/Alarm
Supply Fan Runtime	Indicates if the supply fan runtime exceeds the value of the **Supply Fan Service Alarm Timer**.	R: Normal/Alarm
Compressor 1 Runtime	Indicates if the compressor 1 runtime exceeds the value of the **Compressor 1 Service Alarm Timer**.	R: Normal/Alarm
Compressor 2 Runtime	Indicates if the compressor 2 runtime exceeds the value of the **Compressor 2 Service Alarm Timer**.	R: Normal/Alarm
Airside Linkage	Indicates if Linkage has failed in a zoned system using Linkage.	R: Normal/Alarm
CEC Title 24		
Alarms		
Economizer Operation	Indicates the state of the economizer's operation and if an economizer operation fault has been detected.	R: Normal/Fault
Economizer	If Economizer Operation has been set to **Alarm**, the **Economizer Fault Detection Diagnostic Result** displays.	R: Normal Failed to Fully Open Failed to Open Failed to Close Stuck Open Invalid Sensor
Economizer Fault Detection Diagnostic (FDD) Faults		
Air temperature sensor failure/fault	Indicates CEC Title 24 Economizer FDD Air temperature sensor failure/fault has been detected.	R: Normal/Fault
Not Economizing when it should	Indicates CEC Title 24 Economizer FDD Not Economizing when it should fault has been detected.	R: Normal/Fault
Economizing when it should not	Indicates CEC Title 24 Economizer FDD Economizing when it should not fault has been detected.	R: Normal/Fault
Damper not modulating	Indicates CEC Title 24 Economizer FDD Damper not modulating fault has been detected.	R: Normal/Fault
Excess outdoor air	Indicates CEC Title 24 Economizer FDD Excess outdoor air fault has been detected.	R: Normal/Fault
Current Economizer Fault Detection Diagnostic (FDD) Data		
Failed to Fully Open	Indicates OA damper Failed to Fully Open Economizer operation fault has been detected.	R: Normal/Fault
Failed to Open	Indicates OA damper Failed to Open Economizer operation fault has been detected.	R: Normal/Fault
Failed to Close	Indicates OA damper Failed to Close Economizer operation fault has been detected.	R: Normal/Fault
Stuck Open	Indicates OA damper Stuck Open Economizer operation fault has been detected.	R: Normal/Fault
Invalid Sensor	Indicates Space Temperature, Supply Air Temperature, or Outdoor Air Temperature Invalid Sensor Economizer operation fault has been detected.	R: Normal/Fault
Historical Economizer Fault Detection Diagnostic (FDD) Data		
Economizer FDD Data 1	Displays currently recorded Economizer Fault Detection Diagnostic Result. NOTE: If **Historical Economizer FDD Data** is Reset **Economizer FDD Data 1** field displays No Data and previously recorded fault is cleared.	R: No Data Normal Failed to Fully Open Failed to Open Failed to Close Stuck Open Invalid Sensor

Table K — Alarm Points (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Economizer FDD Data 2	Displays previously recorded Economizer Fault Detection Diagnostic Result from Economizer FDD Data 1 field. NOTE: If **Historical Economizer FDD Data** is Reset **Economizer FDD Data 2** field displays No Data and previously recorded fault is cleared.	R: No Data Normal Failed to Fully Open Failed to Open Failed to Close Stuck Open Invalid Sensor
Economizer FDD Data 3	Displays previously recorded Economizer Fault Detection Diagnostic Result from Economizer FDD Data 2 field. NOTE: If **Historical Economizer FDD Data** is Reset **Economizer FDD Data 3** field displays No Data and previously recorded fault is cleared.	R: No Data Normal Failed to Fully Open Failed to Open Failed to Close Stuck Open Invalid Sensor
Economizer FDD Data 4	Displays previously recorded Economizer Fault Detection Diagnostic Result from Economizer FDD Data 3 field. NOTE: If **Historical Economizer FDD Data** is Reset **Economizer FDD Data 4** field displays No Data and previously recorded fault is cleared.	R: No Data Normal Failed to Fully Open Failed to Open Failed to Close Stuck Open Invalid Sensor
Economizer FDD Data 5	Displays previously recorded Economizer Fault Detection Diagnostic Result from Economizer FDD Data 4 field. NOTE: If **Historical Economizer FDD Data** is Reset **Economizer FDD Data 5** field displays No Data and previously recorded fault is cleared.	R: No Data Normal Failed to Fully Open Failed to Open Failed to Close Stuck Open Invalid Sensor
Historical Economizer FDD Data	Resets all the **Historical Economizer FDD Data** properties to **No Data** and shifts the **Current Economizer FDD Data** into the appropriate **Historical Economizer FDD Data** field.	D: Collect R: Collect/Reset

Linkage

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

Table L — Linkage Collector Points

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Linkage Collector	Allows access to the Collector's details. The following properties can be seen by clicking on the Summary tab of microblock popup.	
Application Type	This parameter indicates the type of Linkage application. (**Display only**)	D: Airside Linkage
Application Instance	Should always be 1 for i-Vu®/Field Assistant Systems. NOTE: If using a CCN and BACnet System (i.e., CCN Air Terminal to BACnet Air Source), the **Application Instance** can be **1**, **2**, **3**, or **4**, depending on the number of air sources used in the system.	D: 1 R: 1 2 3 4
Maximum Providers	Indicates the maximum configurable size of the VVT zoning system. (***Display only → fixed value***)	D: 64
Number of Providers	Must be set to **0**.	D: 0
Input Values	Indicates the maximum number of parameters in the collector array for each device. (**Display only**)	D: 24
Feedback Values	Indicates the maximum number (4 possible) of parameters in the collector array for any TV-RTU. (***Display only → fixed value***)	D: 8
Feedback Update Time	Indicates the typical update rate of this application. (***Display only → fixed value***)	D: 60 seconds
Input Expiration Time	Indicates the maximum time that the data received from the master zones, since the last refresh, is considered as valid. (***Display only → fixed value***)	D: 300 seconds

Table L — Linkage Collector Points (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Airside Linkage Status	If Active, the controller is part of a linked system. If Not Active, the controller is a stand-alone device. If Airside Linkage Status is Active, the following information is received from the Zoning System Master Zone, as applicable: • Occupancy Status • Space Temperature • Occupied Cooling Setpoint • Occupied Heating Setpoint • Unoccupied Cooling Setpoint • Unoccupied Heating Setpoint • Indoor Air CO_2 • Space Relative Humidity • Linkage Optimal Start The following information is sent back to the Zoning System Master Zone: • Air Source Mode • Air Source Supply Air Temp • Air Source Outdoor Air Temp	R:Active/Not Active

I/O Points

Navigation: i-Vu® / Field Assistant: ***Properties → 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. The TV-RTU is not a programmable controller. I/O can only be used for the purpose designed in the equipment control program. Modifying these parameters may result in unpredictable equipment control.

See Appendix D — "Wiring Diagrams" for additional wiring inputs and outputs information. This table lists each of the I/O Channels, their functions, associated hardware, and terminal numbers.

Table M — I/O Channels

POINT NAME	DESCRIPTION	DEFAULT/RANGE
SAT - AI-01	Input Channel 1; 10K Thermistor only. Supply Air Temperature.	
OAT - AI-02	Input Channel 2; 10K Thermistor only. Outside Air Temperature.	
T55 - AI-08	Input Channel 8; 10K Thermistor only. Space Temperature (T55).	
[zs] Space CO_2	IAQ/CO_2 signal received from CO_2-enabled ZS Sensor(s).	
[zs] Space Humidity	The value provided by the controller's ZS sensor (if present). See details below.	
[zs] Space Temp	The value provided by the controller's ZS sensor (if present).	
ZS Senors		
	The following properties apply to the ZS Standard, ZS Plus, and ZS Pro only. Sensor configurations on the microblock's ***Properties*** → ***Details*** tab are listed below for: • [zs] Space CO_2 • [zs] Space Humidity • [zs] Space Temp.	
Default Value	The value that outputs when communication of all enabled sensors fails or during sensor startup. The default value is used for each sensor's corrected value in the i-Vu® system when the **Valid?** output is False (**Off**).	D: –999 R: –999 to 999
Sensor Configuration table		
(Index) Area	The Index number corresponds to the sensors defined in ***Configuration*** → ***Service Configuration*** → ***Sensor Binder***. (Ctrl+click the property name. See Service Configuration.)	D: (1) Main ZS Sensor R: (1) to (5)
Use	Check Enable for each sensor that you want to include in the combination algorithm used to determine the output value.	D: Enabled index (1) R: checked or unchecked
Calibration	If needed, enter a **Calculated Value** by adding the **Calibration** to the **Raw Value** for each ZS sensor.	D: 0 to 10
Combination Algorithm	If using more than one ZS sensor, select how the enabled sensors' values are to be combined to determine the output value. When the calculation is performed, only sensors with a valid value will be included.	D: Average R: Average Maximum Minimum
Sensor Configuration table		
(Index) Area	The Index number corresponds to the sensors defined in ***Configuration*** → ***Service Configuration*** → ***Sensor Binder***. (Ctrl+click the property name. See Service Configuration.)	D: (1) Main ZS Sensor R: (1) to (5)
Use	Check Enable for each sensor that you want to include in the combination algorithm used to determine the output value.	D: Enabled index (1) R: checked or unchecked
Calibration	If needed, enter a **Calculated Value** by adding the **Calibration** to the **Raw Value** for each ZS sensor.	D: 0 to 10
Combination Algorithm	If using more than one ZS sensor, select how the enabled sensors' values are to be combined to determine the output value. When the calculation is performed, only sensors with a valid value will be included.	D: Average R: Average Maximum Minimum
Input Smoothing	If the raw value from the sensor changes frequently, you can select one of the following options to send out an average of several readings on the output wire. •**None** - The raw value. •**Minimum** - The average of the last 2 readings. •**Medium** - The average of the last 5 readings. •**Maximum** - The average of the last 9 readings.	D: Medium R: None Minimum Medium Maximum
Show on Sensors	Select **Local Value** to have each enabled sensor display its individual sensed value, or **Calculated Value** to have each sensor display the value determined by the **Combination Algorithm**.	D: Calculated Value R: Calculated Value Local Value

Table M — I/O Channels (cont)

POINT NAME	DESCRIPTION	DEFAULT/RANGE
Display Resolution	Defines the resolution of the value to be displayed on the sensor. For example, 1 displays only integers (e.g., 74) and 0.5 displays values to the nearest 0.5 (e.g., 74.5).	D:1 R:1000 100 10 1 0.5 0.1 0.01 0.001
COV Increment	To reduce Rnet traffic, you can force the microblock to update its output only when the sensed value changes by more than the COV increment.	D:0.1 R:0 to 100
Safety-BI-03	Input Channel 3; Dry Contact only. Safety Chain.	
BI-04[a]	Input Channel 4; Dry Contact only. User-configurable for No Function, Fire Shutdown, Fan Status, Filter Status, Remote Occupancy, Door Contact, HumidiStat, Occ Stdby (T24), Presence Sensor (T24), Stdby Offset Motion, or IGC Override.	
BI-05	Input Channel 5; Dry Contact only. User-configurable for No Function, Fire Shutdown, Fan Status, Filter Status, Remote Occupancy, Door Contact, HumidiStat, Occ Stdby (T24), Presence Sensor (T24), or Stdby Offset Motion.	
BI-06	Input Channel 6; Dry Contact only. User-configurable for No Function, Fire Shutdown, Fan Status, Filter Status, Remote Occupancy, Door Contact, HumidiStat, Occ Stdby (T24), Presence Sensor (T24), or Stdby Offset Motion.	
BI-07	Input Channel 7; Dry Contact only. User-configurable for No Function, Fire Shutdown, Fan Status, Filter Status, Remote Occupancy, Door Contact, HumidiStat, Occ Stdby (T24), Presence Sensor (T24), Stdby Offset Motion, or Enthalpy Switch.	
[zs] Sensed Occupancy	The value provided by the controller's ZS sensor (if present).	
ZS Sensor		
	The following properties apply to the ZS Standard, ZS Plus, and ZS Pro only. Sensor configurations on the microblock's Properties > Details tab are listed below for: • [zs] Sensed Occupancy	
Default Value	The value that outputs when communication of all enabled sensors fails or during sensor startup. The default value is used for each sensor's corrected value in the i-Vu® system when the **Valid?** output is False (**Off**).	D:OFF R:OFF / ON
Sensor Configuration table		
(Index) Area	The Index number corresponds to the sensors defined in ***Configuration*** → ***Service Configuration*** → ***Sensor Binder***. (Ctrl+click the property name. See Service Configuration.)	D:(1) Main Sensor R:(1) to (5)
Use	Check **Enable** for each sensor that you want to include in the combination algorithm used to determine the output value.	D:Enabled index (1) R:checked or unchecked
Combination Algorithm	If using more than one ZS sensor, select how the enabled sensors' values are to be combined to determine the output value. When the calculation is performed, only sensors with a valid value will be included.	
Show on sensors	Select **Local Value** to have each enabled sensor display its individual sensed value, or **Calculated Value** to have each sensor display the value determined by the **Combination Algorithm**.	
ECON - AO-02	Analog Output Channel 2; 2-10 vdc. Signal used for Economizer control.	
IDF - AO-03	Analog Output Channel 3; 0-10 vdc. Provides signal used for ECM variable speed fan control.	
UO-01 - Relay 1	Universal Output 1. (Future) Output.	
Y1 - Relay 2	Binary Output 2; Cool 1 (Y1) Output.	
Y2 - Relay 3	Binary Output 3; Cool 2 (Y2) Output.	
W1 - Relay 4	Binary Output 4; Heat 1 (W1) Output.	
W2 - Relay 5	Binary Output 5; Heat 2 (W2) Output.	
DEHUM - Relay 6	Binary Output 6; Humidi-MiZer Output.	
EXH - Relay 7	Binary Output 7; Power Exhaust Output.	

NOTE(S):

a. If configured for Gas heating IGC Override is automatically ENABLED.

APPENDIX I — BACNET POINTS

BACnet Points List

POINT NAME	POINT ACCESS	UNITS	DEFAULT VALUE	BACnet POINT NAME	BACnet OBJECT ID
ECON - AO-02	R/W	%	0	ao_02	AO:2002
IDF - AO-03	R/W	%	0	ao_03	AO:2003
Active Compressor Stages	R	—	—	comp_run	AV:2020
Active Heat Stages	R	—	—	heat_run	AV:2003
Air Source Outdoor Air Temp	R	°F	—	link_ahu_oat	AV:2609
Air Source Supply Air Temp	R	°F	—	link_sat	AV:2608
Compressor 1 Runtime	R	hr	—	comp1_rntm	AV:2017
Compressor 1 Service Alarm Timer	R/W	hr	0	comp1_service_hrs	AV:83006
Compressor 2 Runtime	R	hr	—	comp2_rntm	AV:2018
Compressor 2 Service Alarm Timer	R/W	hr	0	comp2_service_hrs	AV:83007
Cooling Lockout Temperature	R/W	°F	45	oat_cl_lockout	AV:9002
DCV Max Ctrl Setpoint	R/W	ppm	600	iaq_stpt_max	AV:3013
DCV Max Vent Damper Pos	R/W	%Open	50	iaq_dpr_max	AV:9011
Dehum ECM Output	R/W	%	100	dehum_min_ecm	AV:3028
ECM Speed Test	R/W	%	0	ecm_spd_test	AV:81002
Economizer High OAT Lockout Temp	R/W	°F	75	oat_ec_lockout	AV:9008
Economizer Output	R	%Open	—	econ_output	AV:2022
Economizer Purge Min Pos	R/W	%Open	40	econ_purge_min	AV:9029
Economizer Test	R/W	%Open	0	econ_test	AV:81001
Effective Cool Setpoint	R	°F	—	eff_cl_stpt	AV:3005
Effective Heat Setpoint	R	°F	—	eff_ht_stpt	AV:3006
Factory Test Analog 1 Control	R/W	%	0	ao1_fac_test	AV:91001
Factory Test Analog 2 Control	R/W	%	0	ao2_fac_test	AV:91002
Fan Off Delay	R/W	seconds	90	fan_delay_off	AV:9024
Filter Runtime	R	hr	—	filter_rntm	AV:2015
Filter Service Alarm Timer	R/W	hr	600	filter_service_hrs	AV:2019
Heating Lockout Temperature	R/W	°F	65	oat_ht_lockout	AV:9003
HP Aux Heat Lockout Temp	R/W	°F	40	oat_auxht_lockout	AV:3025
IDF Heat Speed	R/W	%	100	heat_ecm_spd	AV:3033
IDF Max Speed Voltage	R/W	V	7.8	max_spd_volt	AV:83011
IDF Min Speed	R/W	%	66	min_ecm_spd	AV:3027
Indoor Air Quality CO2 (ppm)	R	ppm	—	iaq	AV:1009
Linkage Max Damper Position	R	%	—	link_max_dmpr	AV:2611
Low Fan Econ Min Pos	R/W	%Open	33	econ_min_2	AV:9030
Maximum Heating SAT	R/W	°F	120	sat_ht_max	AV:83004
Minimum Cooling SAT	R/W	°F	50	sat_cl_min	AV:83003
Occ Override Delay	R/W	min	15	occ_ovr_delay	AV:9028
Occ Relative Humidity Setpoint	R/W	%rh	60	occ_dehum_stpt	AV:3011
Occupied Standby Delay (T24)	R/W	min	5	os_delay_mins	AV:9054
Occupied Standby Offset (T24)	R/W	°^F	2	os_stpt_offset	AV:9053
Optimal Start	R/W	hr	1	optm_start	AV:9026
Outdoor Air Quality CO2 (ppm)	R	ppm	—	oaq	AV:1012
Outdoor Air Temperature	R	°F	—	oa_temp	AV:1003
Override Time Remaining	R	min	—	ovrde_time	AV:2016
Password Protected Output Variable	R/W	—	0	ppo	AV:90000
Power Exhaust Setpoint	R/W	%Open	50	pexh_stpt	AV:3010
Power Fail Restart Delay	R/W	seconds	5	start_delay	AV:9007
Remaining Occupied Standby Delay (T24)	R	min	—	os_delay_rem	AV:9058
SA Vent / Temper Setpoint	R/W	°F	65	tempering_stpt	AV:3032
Setpoint	R/W	°F	—	occ_cl_stpt	AV:3001
Setpoint	R/W	°F	—	occ_ht_stpt	AV:3002
Setpoint	R/W	°F	—	unocc_cl_stpt	AV:3003
Setpoint	R/W	°F	—	unocc_ht_stpt	AV:3004
Setpoint Adjustment	R	°^F	—	stpt_adj	AV:1006
Setpoint Adjustment Range	R/W	°^F	5	stpt_adj_range	AV:9015
Space Relative Humidity	R	%rh	—	space_rh	AV:1011
Space Temperature - Prime Variable	R	°F	—	space_temp	AV:2007
Stage 1 SAT Stpt	R/W	°F	57	stg_1_sat	AV:83013
Stage 2 SAT Stpt	R/W	°F	57	stg_2_sat	AV:83014
Standby Offset	R/W	°F	0	stdby_offset	AV:1033
Supply Air Temperature	R	°F	—	sa_temp	AV:1008
Supply Fan ECM	R	%	—	ecm_output	AV:2027
Supply Fan ECM Voltage	R	V	—	ecm_volt_output	AV:2032
Supply Fan Runtime	R	hr	—	sfan_rntm	AV:2014
Supply Fan Service Alarm Timer	R/W	hr	0	sfan_service_hrs	AV:83005
System Cooling Demand Level	R	—	—	cool_demand_level	AV:9006

APPENDIX I — BACNET POINTS (cont)

BACnet Points List (cont)

POINT NAME	POINT ACCESS	UNITS	DEFAULT VALUE	BACnet POINT NAME	BACnet OBJECT ID
System Heating Demand Level	R	—	—	heat_demand_level	AV:9036
System OAT Primary	R	°F	—	mstr_oa_temp	AV:80001
System Outdoor Air Temperature	R/W	°F	-999	system_oat	AV:1901
System Outdoor AQ (System Outdoor CO2)	R/W	ppm	-999	system_oaq	AV:1908
System Space AQ (System Space CO2)	R/W	ppm	-999	system_iaq	AV:1903
System Space RH	R/W	%	-999	system_rh	AV:1904
System Space Temperature	R/W	°F	-999	system_spt	AV:1902
T5x Override Duration	R/W	hr	1	ovr_dur	AV:9023
Unocc Relative Humidity Setpoint	R/W	%rh	95	unocc_dehum_stpt	AV:3012
Vent Dmpr Pos / DCV Min Pos	R/W	%Open	20	econ_min	AV:9005
DEHUM - Relay 6	R/W	0=Off 1=On	0	relay_6	BO:2006
EXH - Relay 7	R/W	0=Off 1=On	0	relay_7	BO:2007
UO-01 - Relay 1	R/W	0=Off 1=On	0	relay_1	BO:2001
W1 - Relay 4	R/W	0=Off 1=On	0	relay_4	BO:2004
W2 - Relay 5	R/W	0=Off 1=On	0	relay_5	BO:2005
Y1 - Relay 2	R/W	0=Off 1=On	0	relay_2	BO:2002
Y2 - Relay 3	R/W	0=Off 1=On	0	relay_3	BO:2003
Air Temperature Sensor Failure/Fault	R	0=Normal 1=Fault	—	fdd_fault_air_temperature	BV:0
Airside Linkage	R	0=Normal 1=Alarm	—	air_linkage_fail	BV:7030
Compressor 1 Relay State	R	0=Off 1=On	—	comp_1	BV:2005
Compressor 1 Runtime	R	0=Normal 1=Alarm	—	comp1_rntm_alarm	BV:7014
Compressor 1 Test	R/W	0=Disable 1=Enable	Inactive (0)	comp1_test	BV:81005
Compressor 2 Relay State	R	0=Off 1=On	—	comp_2	BV:2004
Compressor 2 Runtime	R	0=Normal 1=Alarm	—	comp2_rntm_alarm	BV:7015
Compressor 2 Test	R/W	0=Disable 1=Enable	Inactive (0)	comp2_test	BV:81004
Continuous Occupied Exhaust	R/W	0=No 1=Yes	Inactive (0)	occ_exh	BV:9002
Damper not modulating	R	0=Normal 1=Fault	—	fdd_fault_damper_not_mod	BV:0
DCV Control	R/W	0=Disable 1=Enable	Inactive (0)	dcv_enable	BV:1027
Dehumidification	R	0=Inactive 1=Active	—	dehum	BV:2006
Dehumidification Test	R/W	0=Disable 1=Enable	Inactive (0)	dehum_test	BV:81006
Door Contact Status	R	0=Off 1=On	—	door_contact_status	BV:1010
Economizer Exists	R/W	0=No 1=Yes	Inactive (0)	econ_exist	BV:99001
Economizer Operation	R	0=Normal 1=Fault Detected	—	econ_opr	BV:7054
Economizer Operation	R	0=Normal 1=Fault	—	econ_opr_2	BV:0
Economizing when it should not	R	0=Normal 1=Fault	—	fdd_fault_economizer_should_not	BV:0
Enable CEC Title 24	R/W	0=Disable 1=Enable	Inactive (0)	ena_t24	BV:9050
Enthalpy (BACnet)	R/W	0=High 1=Low	Active (1)	oae	BV:1901
Enthalpy Status	R	0=High 1=Low	—	enthalpy_status	BV:1002
Excess Outdoor Air	R	0=Normal 1=Fault	—	fdd_fault_excess_outdoor_air	BV:0
Factory Test	R/W	0=Off 1=On	Inactive (0)	fac_test_enable	BV:91000
Factory Test Relay 1 Control	R/W	0=Off 1=On	Inactive (0)	uo01_fac_test	BV:91001

APPENDIX I — BACNET POINTS (cont)

BACnet Points List (cont)

POINT NAME	POINT ACCESS	UNITS	DEFAULT VALUE	BACnet POINT NAME	BACnet OBJECT ID
Factory Test Relay 2 Control	R/W	0=Off 1=On	Inactive (0)	relay2_fac_test	BV:91002
Factory Test Relay 3 Control	R/W	0=Off 1=On	Inactive (0)	relay3_fac_test	BV:91003
Factory Test Relay 4 Control	R/W	0=Off 1=On	Inactive (0)	relay4_fac_test	BV:91004
Factory Test Relay 5 Control	R/W	0=Off 1=On	Inactive (0)	relay5_fac_test	BV:91005
Factory Test Relay 6 Control	R/W	0=Off 1=On	Inactive (0)	relay6_fac_test	BV:91006
Factory Test Relay 8 Control	R/W	0=Off 1=On	Inactive (0)	relay8_fac_test	BV:91008
Failed to Close	R	0=Normal 1=Fault	—	econ_fdd_failed_to_close	BV:0
Failed to Fully Open	R	0=Normal 1=Fault	—	econ_fdd_failed_to_fully_open	BV:0
Failed to Open	R	0=Normal 1=Fault	—	econ_fdd_failed_to_open	BV:0
Filter	R	0=Clean 1=Dirty	—	filter_alarm	BV:7017
Filter Status	R	0=Clean 1=Dirty	—	filter_status	BV:1004
Fire / Smoke Shutdown	R	0=Normal 1=Alarm	—	fire_alarm	BV:7007
Fire Shutdown Status	R	0=Run Enabled 1=Shutdown	—	firedown_status	BV:1005
Gas Valve	R	0=Normal 1=Alarm	—	igc_alarm	BV:7050
Heat 1 Test	R/W	0=Disable 1=Enable	Inactive (0)	heat1_test	BV:81003
Heat 2 Test	R/W	0=Disable 1=Enable	Inactive (0)	heat2_test	BV:81002
Heat Stage 1 Relay State	R	0=Off 1=On	—	heat_1	BV:2003
Heat Stage 2 Relay State	R	0=Off 1=On	—	heat_2	BV:2002
Heat Type	R/W	0=Electric 1=Gas	Inactive (0)	heat_type	BV:99002
High Space Temperature	R	0=Normal 1=Alarm	—	spt_hi_alarm	BV:7011
HP Aux Heat Exists	R/W	0=No 1=Yes	Inactive (0)	hpauxht_config	BV:77701
Humidistat Input Status	R	0=Low 1=High	—	humstat_status	BV:1006
IGC Override	R	0=Off 1=Active	—	igcovr_status	BV:1022
Indoor Air Quality (Space CO2)	R	0=Normal 1=Alarm	—	iaq_alarm	BV:7005
Indoor Air Quality Sensor (Space CO2 Sensor)	R	0=Normal 1=Alarm	—	iaq_sensor_fail	BV:7039
Inhibit Occupied Standby (T24) from this zone?	R/W	0=No 1=Yes	Inactive (0)	os_inhib	BV:9052
Invalid Sensor	R	0=Normal 1=Fault	—	econ_fdd_invalid_sensor	BV:0
Local OAT Sensor	R	0=Normal 1=Alarm	—	loc_oat_sensor_fail	BV:7003
Low Space Temperature	R	0=Normal 1=Alarm	—	spt_lo_alarm	BV:7012
Manual Purge OFF	R/W	0=Off 1=On	Active (1)	sys_man_purge_bv_off	BV:87870
Manual Purge ON	R/W	0=Off 1=On	Inactive (0)	sys_man_purge_bv_on	BV:87871
Not Economizing When It Should	R	0=Normal 1=Fault	—	fdd_fault_not_economizer	BV:0
Occupancy Contact	R	0=Off 1=On	—	occ_contact_status	BV:1007
Occupancy Status	R	0=Unoccupied 1=Occupied	—	occ_status	BV:2008
Occupied Standby (T24)	R/W	0=Disable 1=Enable	Inactive (0)	occ_stndby	BV:9051
Occupied Standby (T24)	R	0=Off 1=On	—	occ_stdby_status	BV:2503
Occupied Standby Delay (T24)	R	0=Inactive 1=Active	—	os_delay	BV:9057

APPENDIX I — BACNET POINTS (cont)

BACnet Points List (cont)

POINT NAME	POINT ACCESS	UNITS	DEFAULT VALUE	BACnet POINT NAME	BACnet OBJECT ID
Outdoor Air Quality Sensor (Outdoor Air CO2 Sensor)	R	0=Normal 1=Alarm	—	oaq_fail	BV:7006
Outdoor Air Temp Sensor	R	0=Normal 1=Alarm	—	oat_fail	BV:7029
Power Exhaust Exists	R/W	0=No 1=Yes	Inactive (0)	pexh_config	BV:77702
Power Exhaust Relay State	R	0=Off 1=On	—	pexh	BV:2010
Power Exhaust Test	R/W	0=Disable 1=Enable	Inactive (0)	pexh_test	BV:81008
Presence Sensor (T24)	R	0=Off 1=On	—	presense_sensor_status	BV:2502
Reset Comp 1 Runtime Alarm	R/W	0=Run 1=Clear	Inactive (0)	comp1_rntm_clr	BV:7514
Reset Comp 2 Runtime Alarm	R/W	0=Run 1=Clear	Inactive (0)	comp2_rntm_clr	BV:7515
Reset Filter Alarm	R/W	0=Off 1=On	Inactive (0)	filter_rntm_clr	BV:7517
Reset Supply Fan Runtime Alarm	R/W	0=Run 1=Clear	Inactive (0)	sfan_rntm_clr	BV:7510
RH Control	R/W	0=Disable 1=Enable	Inactive (0)	rh_enable	BV:1025
SA Tempering	R/W	0=Disable 1=Enable	Inactive (0)	sa_tempering_en	BV:83016
Safety Chain	R	0=Normal 1=Alarm	—	safety_alarm	BV:7024
Safety Chain Feedback	R	0=Off 1=Run Enabled	—	safety_status	BV:1009
Schedule	R/W	0=Unoccupied 1=Occupied	0	schedule	BV:8000
Service Test	R/W	0=Disable 1=Enable	Inactive (0)	test_enable	BV:81000
Setpoint Adjustment	R/W	0=Disable 1=Enable	Active (1)	stpt_adj_enable	BV:1013
Shutdown	R/W	0=Inactive 1=Active	Inactive (0)	shutdown	BV:9001
Space Relative Humidity	R	0=Normal 1=Alarm	—	sprh_alarm	BV:7018
Space Relative Humidity Sensor	R	0=Normal 1=Alarm	—	sprh_sensor_fail	BV:7022
Space Temp Sensor	R	0=Normal 1=Alarm	—	spt_fail	BV:7001
Space Temperature Alarm Status	R	0=Normal 1=Alarm	—	spt_alrm_status	BV:7056
Standby Offset Motion	R	0=Off 1=On	—	stdby_offset_motion_status	BV:2504
Stuck Open	R	0=Normal 1=Fault	—	econ_fdd_stuck_open	BV:0
Supply Air Temp Sensor	R	0=Normal 1=Alarm	—	loc_sat_sensor_fail	BV:7020
Supply Air Temperature	R	0=Normal 1=Alarm	—	sat_alarm	BV:7004
Supply Fan Failure	R	0=Normal 1=Alarm	—	sfan_fail_alarm	BV:7008
Supply Fan in Hand	R	0=Normal 1=Alarm	—	sfan_hand_alarm	BV:7009
Supply Fan Runtime	R	0=Normal 1=Alarm	—	sfan_rntm_alarm	BV:7010
Supply Fan Status	R	0=Off 1=Running	—	sfan_status	BV:1003
Switch Configuration	R	0=Normal 1=Alarm	—	di_cfg_alarm	BV:7025
System is Shut Down	R	0=No 1=Yes	—	shutdown_status	BV:2011
Unocc Free Cool	R/W	0=Disable 1=Enable	Inactive (0)	ntfc_ena	BV:80001
ZS Sensor Configuration	R	0=Normal 1=Alarm	—	zs_config_fail	BV:7055
ZS Temp Sensor	R	0=Normal 1=Alarm	—	zst_sensor_fail	BV:7051

APPENDIX I — BACNET POINTS (cont)

BACnet Points List (cont)

POINT NAME	POINT ACCESS	UNITS	DEFAULT VALUE	BACnet POINT NAME	BACnet OBJECT ID
Air Source Mode	R	1=Off 2=Warmup 3=Heating 4=Cooling 5=Freecool 6=Pressure 7=Evac 8=Vent	—	link_ahu_mode	MSV:2005
BAS On / Off	R/W	1=Inactive 2=Occupied 3=Unoccupied	1	keypad_ovrde	MSV:1001
Compressor Stages	R/W	1=One Stage 2=Two Stages	2	comp_stages	MSV:91003
Economizer	R	1=Normal 2=Failed to Fully Open 3=Failed to Open 4=Failed to Close 5=Stuck Open	—	econ_fdd_result	MSV:2011
Economizer	R	1=Normal 2=Failed to Fully Open 3=Failed to Open 4=Failed to Close 5=Stuck Open 6=Invalid Sensor	—	econ_fdd_result_2	MSV:0
Economizer	R	1=Normal 2=Failed to Fully Open 3=Failed to Open 4=Failed to Close 5=Stuck Open 6=Invalid Sensor	—	econ_fdd_result_2_zs	MSV:0
Economizer FDD Data 1	R	1=No Data 2=Normal 3=Failed to Fully Open 4=Failed to Open 5=Failed to Close 6=Stuck Open 7=Invalid Sensor	—	econ_fdd_result_2_data_1	MSV:0
Economizer FDD Data 2	R	1=No Data 2=Normal 3=Failed to Fully Open 4=Failed to Open 5=Failed to Close 6=Stuck Open 7=Invalid Sensor	—	econ_fdd_result_2_data_2	MSV:0
Economizer FDD Data 3	R	1=No Data 2=Normal 3=Failed to Fully Open 4=Failed to Open 5=Failed to Close 6=Stuck Open 7=Invalid Sensor	—	econ_fdd_result_2_data_3	MSV:0
Economizer FDD Data 4	R	1=No Data 2=Normal 3=Failed to Fully Open 4=Failed to Open 5=Failed to Close 6=Stuck Open 7=Invalid Sensor	—	econ_fdd_result_2_data_4	MSV:0
Economizer FDD Data 5	R	1=No Data 2=Normal 3=Failed to Fully Open 4=Failed to Open 5=Failed to Close 6=Stuck Open 7=Invalid Sensor	—	econ_fdd_result_2_data_5	MSV:0
Equipment Status	R	1=Disabled 2=Test 3=Run	—	mode_status	MSV:2001
Fan Mode	R/W	1=Auto 2=Continuous 3=Always On	2	fan_mode	MSV:9032

APPENDIX I — BACNET POINTS (cont)

BACnet Points List (cont)

POINT NAME	POINT ACCESS	UNITS	DEFAULT VALUE	BACnet POINT NAME	BACnet OBJECT ID
Input 4 Function	R/W	1=No Function 2=Fire Shutdown 3=Fan Status 4=Filter Status 5=Remote Occupancy 6=Door Contact 7=Humidistat 8=Occ Stdby (T24) 9=Presence Sensor (T24) 10=Stdby Offset Motion 11=No Function 12=IGC Override	1	di4_function	MSV:81004
Input 4 Switch Configuration	R/W	1=NO 2=NC	1	di4_type	MSV:81014
Input 5 Function	R/W	1=No Function 2=Fire Shutdown 3=Fan Status 4=Filter Status 5=Remote Occupancy 6=Door Contact 7=Humidistat 8=Occ Stdby (T24) 9=Presence Sensor (T24) 10=Stdby Offset Motion	1	di5_function	MSV:81005
Input 5 Switch Configuration	R/W	1=NO 2=NC	1	di5_type	MSV:81015
Input 6 Function	R/W	1=No Function 2=Fire Shutdown 3=Fan Status 4=Filter Status 5=Remote Occupancy 6=Door Contact 7=Humidistat 8=Occ Stdby (T24) 9=Presence Sensor (T24) 10=Stdby Offset Motion	1	di6_function	MSV:81006
Input 6 Switch Configuration	R/W	1=NO 2=NC	1	di6_type	MSV:81016
Input 7 Function	R/W	1=No Function 2=Fire Shutdown 3=Fan Status 4=Filter Status 5=Remote Occupancy 6=Door Contact 7=Humidistat 8=Occ Stdby (T24) 9=Presence Sensor (T24) 10=Stdby Offset Motion 11=Enthalpy Switch	1	di7_function	MSV:81007
Input 7 Switch Configuration	R/W	1=NO 2=NC	1	di7_type	MSV:81017
Manual Purge	R/W	1=OFF 2=ON 3=INACTIVE	3	sys_man_purge_msv	MSV:87873
Number Of Heat Stages	R/W	1=1 2=2 3=0	2	heat_stages	MSV:91004
Occupancy Source	R/W	1=Always Occupied 2=BACnet Schedule 3=BAS On/Off 4=Remote Occ Input	1	occ_source	MSV:1002
Occupied Standby Mode (T24)	R	1=Inactive 2=Fan Off 3=Fan Off & Econ Cls 4=Heating 5=Cooling 6=Fan Running	—	occ_stndby_status	MSV:9055
Occupied Standby Source (T24)	R	1=Sensor Failure 2=Local 3=Network 4=ZS Sensor 5=Locked Value	—	os_snsd_occ_source	MSV:9056

APPENDIX I — BACNET POINTS (cont)

BACnet Points List (cont)

POINT NAME	POINT ACCESS	UNITS	DEFAULT VALUE	BACnet POINT NAME	BACnet OBJECT ID
Optimal Start Type	R/W	1=None 2=Temp Compensated 3=Learning Adaptive	2	start_type	MSV:2009
Space Sensor Type	R/W	1=T55 2=N/A 3=N/A 4=None 5=ZS Sensor 6=N/A	1	spt_type	MSV:9001
Space Temp Source	R	1=Sensor Failure 2=N/A 3=T55 4=Network 5=Airside Linkage 6=Locked Value 7=ZS Sensor 8=N/A	—	spt_status	MSV:2003
System Mode	R	1=Off 2=Fan Only 3=Economizer Cooling 4=Cooling 5=Heating 6=Dehumidification 7=Test 8=Shutdown 9=Unocc Free Cooling 10=Fire Shutdown 11=IAQ Override 12=Pre-occ Purge 13=IGC Override 14=Manual Purge	—	run_status	MSV:2002
Unit Type	R/W	1=Heat/Cool 2=N/A 3=N/A 4=HP Y1/W1 CTRL	1	unit_type	MSV:9018

LEGEND

AO — Analog Output
AV — Analog Value
BO — Binary Output
BV — Binary Value
MSV — Multi-State Value
R — Read only
R/W — Read/Write

APPENDIX J — EQUIPMENT TOUCH WIZARD

The TV-RTU controller has a built in startup wizard accessible from the Equipment Touch device. This wizard can be used to set up the TV-RTU for the specific rooftop unit the controller is install on. To utilize the startup wizard follow the steps below.

The Equipment touch APP can be used in the same manor to access and utilize the startup wizard.

Initial Setup

1. On the **'Home'** screen select the '**Login**' icon (Key Hole) and enter the factory password (Touch).
2. Select the '**Menu**' icon (Gold Gear).
3. On the '**Menu**' screen select the '**Startup**' icon (Key Chain). The '**Startup**' icon will navigate to the '**Unit Type**' screen which will have a base configuration preset from the factory.
4. Follow the intuitive self guided setup process and complete each startup screen.
5. On the **'Summary'** screens review the configuration settings.
6. On the **'Save'** screen, set to Yes to write configuration to controller.

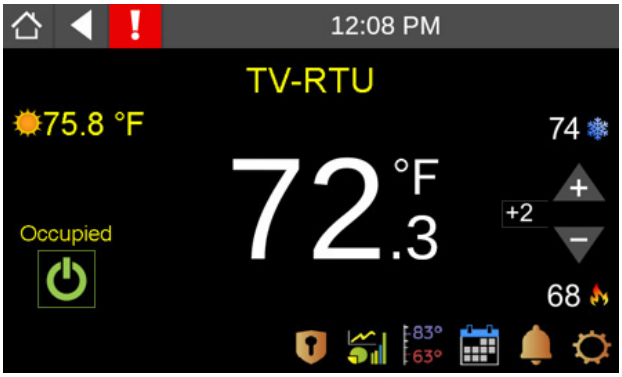
Unconfigured or Replacement

1. On the '**Home**' screen select the '**Login**' icon (Key Hole) and enter the factory password (Touch).
2. Select the '**Menu**' icon (Gold Gear).
3. On the '**Menu**' screen select the '**Startup**' icon (Key Chain). The '**Startup**' icon will navigate to the **'Unit Type**' screen.
4. Set '**Unit Type**' to the appropriate base configuration for the unit. The '**Unit Type**' is initially shown as 'Unconfigured.'
5. Follow the intuitive self guided setup process and complete each startup screen.
6. On the '**Summary**' screens review the configuration settings.
7. On the '**Save**' screen, set to Yes to write configuration to controller.

NOTE: The JumpTo buttons (Unit, Fan, Htg, Clg, Summary) will become available to revisit a previous section as the setup process is progressing.

See Table N for further instructions and display examples.

Table N — Quick Start for Configuration

SCREEN NAME	DISPLAY	DETAILS
STANDBY	 Not an interactive screen, touch Home icon to advance to **Home** screen.	Screen displays after the Inactivity Timer expires (default is 5 minutes). Displays: Controlling Temperature Current Setpoints OA (outside air) Temperature Occupancy

APPENDIX J — EQUIPMENT TOUCH WIZARD (cont)

Table N — Quick Start for Configuration (cont)

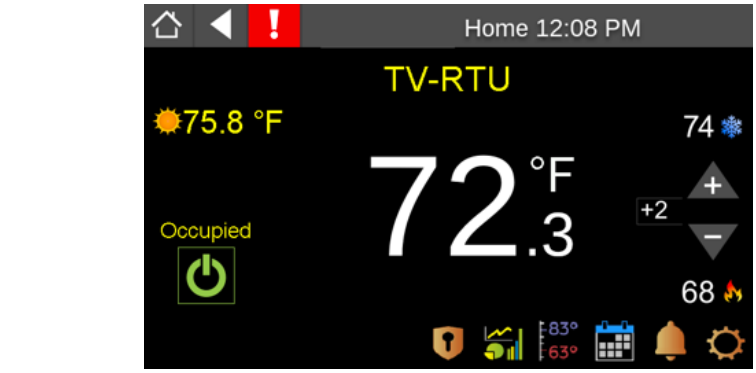
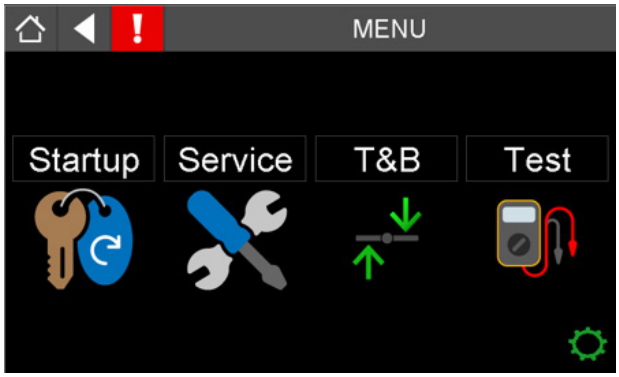
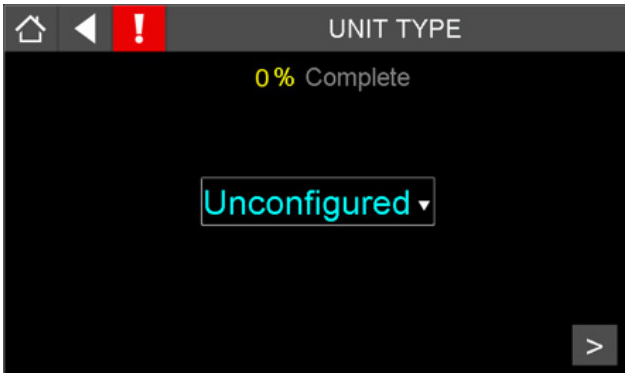
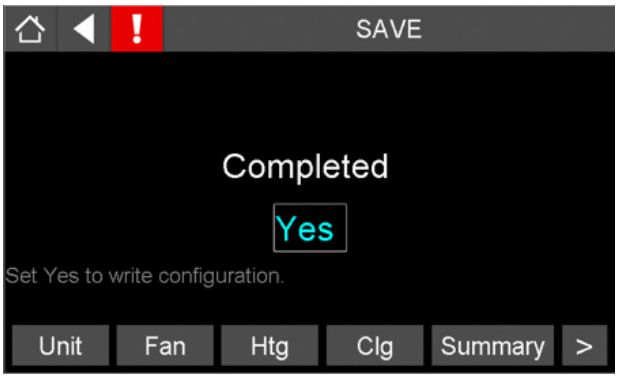
SCREEN NAME	DISPLAY	DETAILS
HOME	 **Login**: Log in as **User**, **Admin**, or **Factory**. **Trends** **Setpoints**: Must be logged in as **Admin**. **Schedule** **Alarms** **Menu** **System**: Must be logged in as **Admin**. NOTE: Access is limited to certain depending on user level.	Screen displays after the Inactivity Timer expires. (Default is 5 minutes). Displays: Controlling Temperature Current Setpoints OA Temperature Occupancy
MENU	 Click on **Startup** to begin the configuration process. The new “Persona” design of the Equipment Touch files (Startup Wizard, Service Tech, T&B, Test) are designed to provide an intuitive, self-guided experience for the setup process by the technician. The process is designed to provide mistake proofing for the simplest experience to get the unit configured and running. The **Startup Wizard** uses rules for each product type and only offers allowed configurations and options for that factory unit. The unit may still be configured, as always, using Property Pages in i-Vu® or Field Assistant.	**Startup** - allows startup technician to configure unit for startup. The screens will intuitively guide the simplified/abbreviated startup configuration of the unit. **Service** - allows service technician to access advanced configurations, calibrations, status, monitoring, etc. of the unit. **T and B** - allows the test and balance agent to access a simplified interface for T and B. **Test** - allows technician to utilize **Service** Test mode. Navigates to: 

Table N — Quick Start for Configuration (cont)

SCREEN NAME	DISPLAY	DETAILS
UNIT TYPE	 **Unit Type options:** • Unconfigured = Default Setting • DX 1 Stg = 1 Stage Cooling Only • DX 2 Stgs = 2 Stage Cooling Only • DX 1 Stg EH 1 Stg = 1 Stage Cooling 1 Stage Electric Heat • DX 1 Stg EH 2 Stgs = 1 Stage Cooling, 2 Stage Electric Heat • DX 2 Stgs EH 1 Stg = 2 Stage Cooling, 1 Stage Electric Heat • DX 2 Stgs EH 2 Stgs = 2 Stage Cooling, 2 Stage Electric Heat • DX 1 Stg Gas 1 Stg = 1 Stage Cooling, 1 Stage Gas Heat • DX 1 Stg Gas 2 Stgs = 1 Stage Cooling, 2 Stage Gas Heat • DX 2 Stgs Gas 1 Stg = 2 Stage Cooling, 1 Stage Gas Heat • DX 2 Stgs Gas 2 Stgs = 2 Stage Cooling, 2 Stage Gas Heat • HP 1 Stg = 1 Stage Cooling, Heat Disabled • HP 2 Stgs = 2 Stage Cooling, Heat Disabled • HP 1 Stg HT 1 Stg = 1 Stage Cooling, 1 Stage Heat Pump Heating • HP 1 Stg HT 2 Stgs w/ Aux Electric Heat = 1 Stage Cooling, 1 Stage Heat Pump Heating, 1 Stage Electric (aux) Heat • HP 2 Stgs HT 1 Stg = 2 Stage Cooling, 1 Stage Heat Pump Heating • HP 2 Stgs HT 2 Stgs w/ Aux Electric Heat = 2 Stage cooling, 1 Stage Heat Pump Heating, 1 Stage Electric (aux) Heat Note: If heat type is gas, then Input 4 will be configured as IGC Override.	% Complete - Indicates progress of the Startup Wizard process. Unit Type - The type of unit the TV-RTU is controlling.
SAVE	 Click on > and complete all Startup Wizard requirements on each screen. After all the startup settings have been configured, set to Yes to write to the TV-RTU controller.	

APPENDIX K — MENU ICONS

ICON	DESCRIPTION
	Unoccupied
	Occupied
	Linkage Not Active
	Linkage Active
	Default
	Off
	Fan Only
	Economizer Cooling
	Cooling
	Heating

ICON	DESCRIPTION
	Dehumidification
	Test
	Shutdown
	Unocc Free Cooling
	Fire Shutdown
	IAQ Override
	Pre-occ Purge
	IGC Override
	Manual Purge

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

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