# RTU Open Control Class Itinerary

- Tech Tools Overview
- RTU Open Operation
- RTU Open Factory-Installed
- RTU Open Field-Installed
- Communicating Sensors
- Universal Protocol Converter (UPC)
- Integration into competitor front ends

# Tech Tools Kit (USB-TKIT)

## Hardware + Software

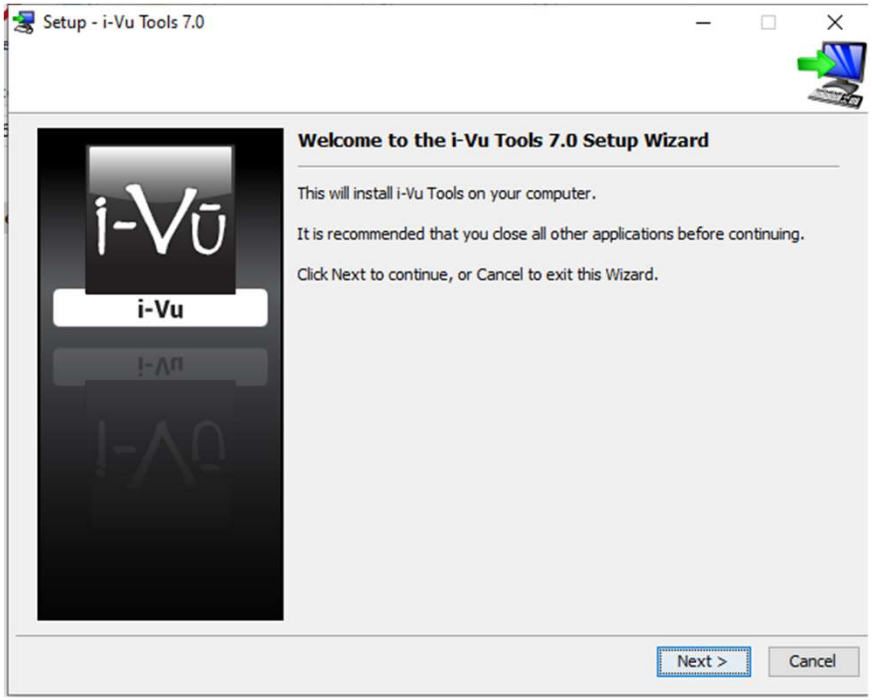
(USB-L)

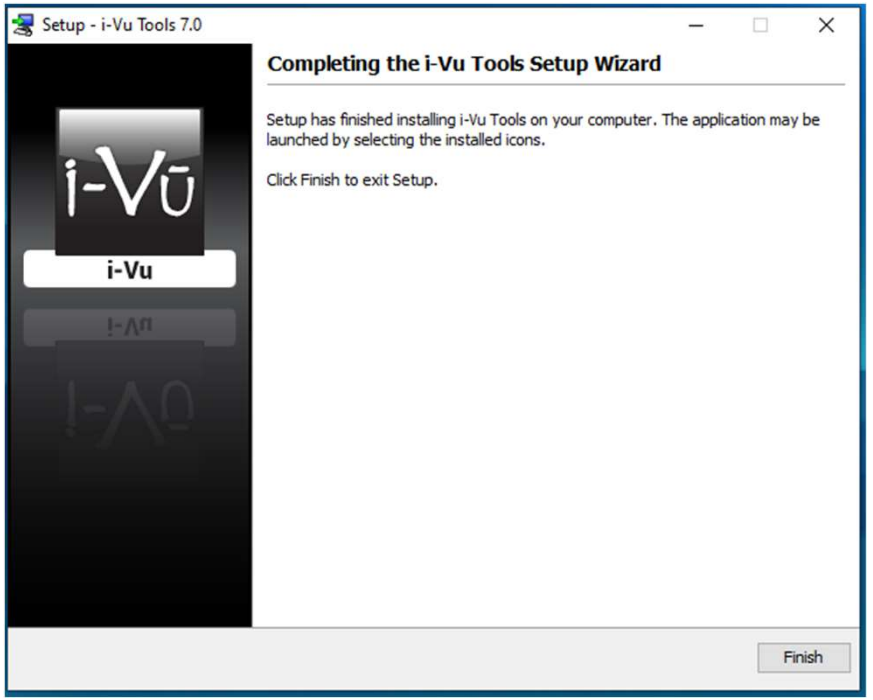
- Field Assistant.exe
- EquipmentBuilder.exe
- Snap.exe
- ViewBuilder.exe
- Virtual BACView.exe

Plus more…

(CIV-OPNTOOLS)

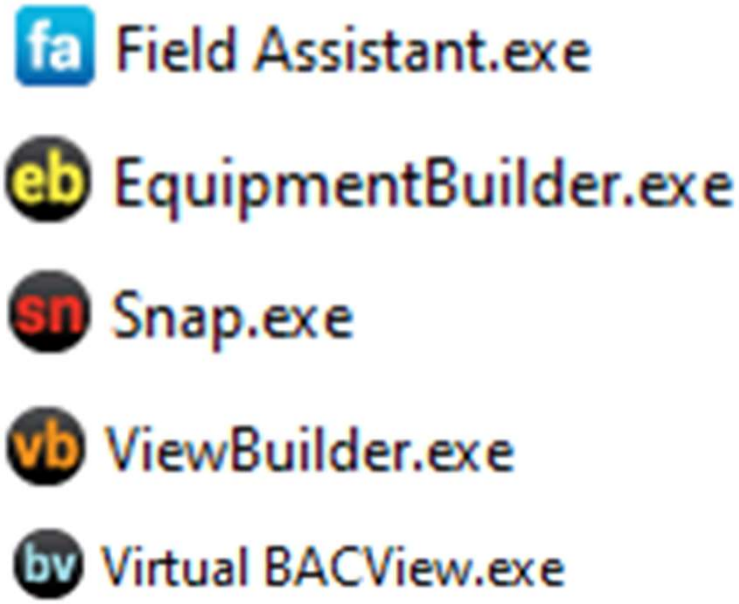
# i-Vu Tools Set Up



# i-Vu Tools Set Up (Cont'd)

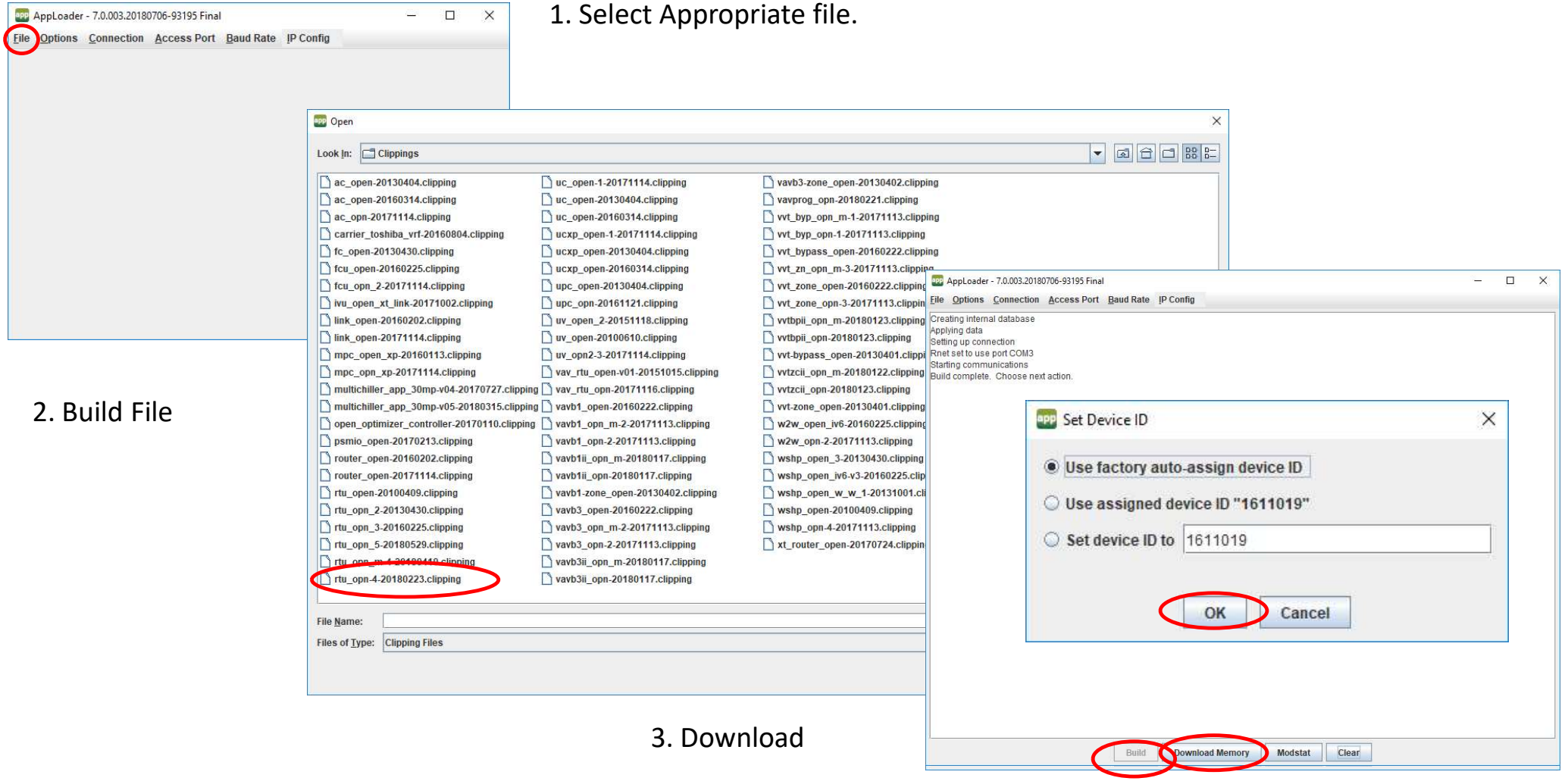
Automatically Installed:




Other Programs on Disc:

- Alarm Pop-up
- BBMD Config
- MS/TP Capture Tool
- AppLoader
- Test & Balance
- LonWorks Integration Tool

# AppLoader


AppLoader - 7.0.003.20180706-93195 Final
File Options Connection Access Port Baud Rate IP Config
1. Select Appropriate file.
Open
Look In: Clippings
ac_open-20130404.clipping
ac_open-20160314.clipping
ac_opn-20171114.clipping
carrier_toshiba_vrf-20160804.clipping
fc_open-20130430.clipping
fcu_open-20160225.clipping
fcu_opn_2-20171114.clipping
ivu_open_xt_link-20171002.clipping
link_open-20160202.clipping
link_open-20171114.clipping
mpc_open_xp-20160113.clipping
mpc_opn_xp-20171114.clipping
multichiller_app_30mp-v04-20170727.clipping
multichiller_app_30mp-v05-20180315.clipping
open_optimizer_controller-20170110.clipping
psmio_open-20170213.clipping
router_open-20160202.clipping
router_open-20171114.clipping
rtu_open-20100409.clipping
rtu_opn_2-20130430.clipping
rtu_opn_3-20160225.clipping
rtu_opn_5-20180529.clipping
rtu_opn-4-20180223.clipping
uc_open-1-20171114.clipping
uc_open-20130404.clipping
uc_open-20160314.clipping
ucxp_open-1-20171114.clipping
ucxp_open-20130404.clipping
ucxp_open-20160314.clipping
upc_open-20130404.clipping
upc_opn-20161121.clipping
uv_open_2-20151118.clipping
uv_open-20100610.clipping
uv_opn2-3-20171114.clipping
vav_rtu_open-v01-20151015.clipping
vav_rtu_opn-20171116.clipping
vavb1_open-20160222.clipping
vavb1_opn_m-2-20171113.clipping
vavb1_opn-2-20171113.clipping
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vavb1ii_opn-20180117.clipping
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vavprog_opn-20180221.clipping
vvt_byp_opn_m-1-20171113.clipping
vvt_byp_opn-1-20171113.clipping
vvt_bypass_open-20160222.clipping
vvt_zn_opn_m-3-20171113.clipping
vvt_zone_open-20160222.clipping
vvt_zone_opn-3-20171113.clipping
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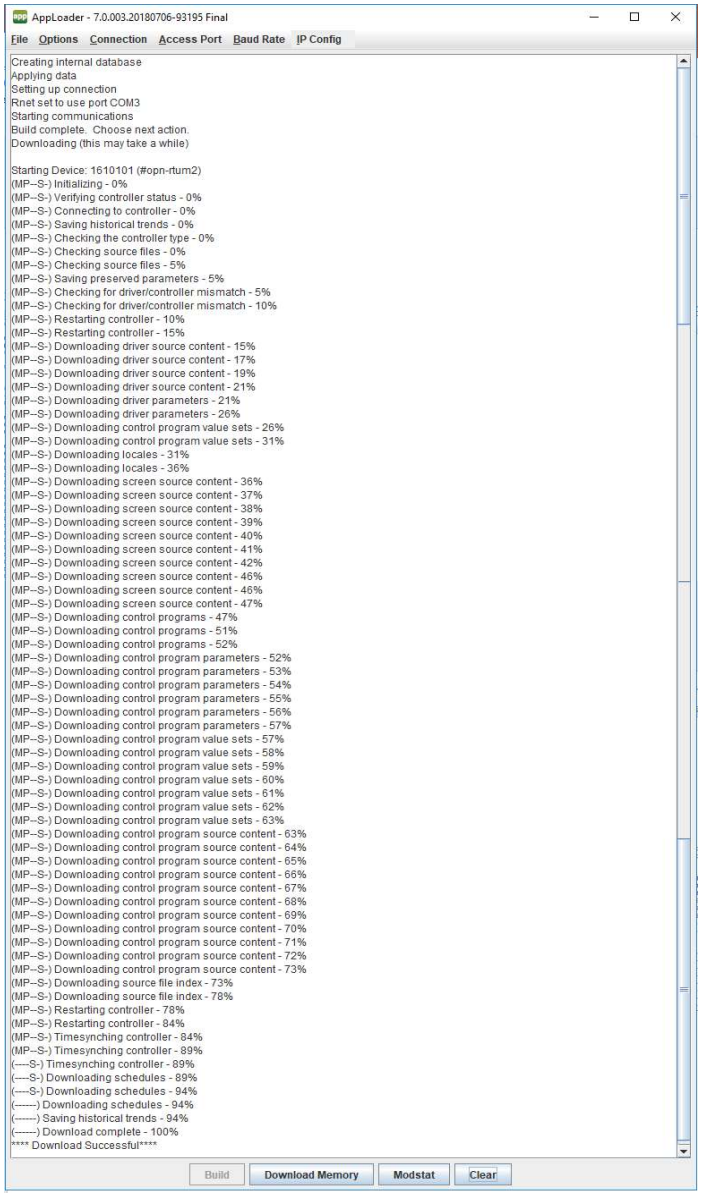
vvtzcii_opn_m-20180122.clipping
vvtzcii_opn-20180123.clipping
vvt-zone_open-20130401.clipping
w2w_open_iv6-20160225.clipping
w2w_opn-2-20171113.clipping
wshp_open_3-20130430.clipping
wshp_open_iv6-v3-20160225.clip
wshp_open_w_w_1-20131001.cl
wshp-open-20100409.clipping
wshp_opn-4-20171113.clipping
xt_router_open-20170724.clippin
File Name:
Files of Type: Clipping Files
AppLoader - 7.0.003.20180706-93195 Final
File Options Connection Access Port Baud Rate IP Config
Creating internal database
Applying data
Setting up connection
Rnet set to use port COM3
Starting communications
Build complete. Choose next action.
Set Device ID
Use factory auto-assign device ID
Use assigned device ID "1611019"
Set device ID to 1611019
OK
Cancel
Build
Download Memory
Modstat
Clear
2. Build File
3. Download

# AppLoader Download

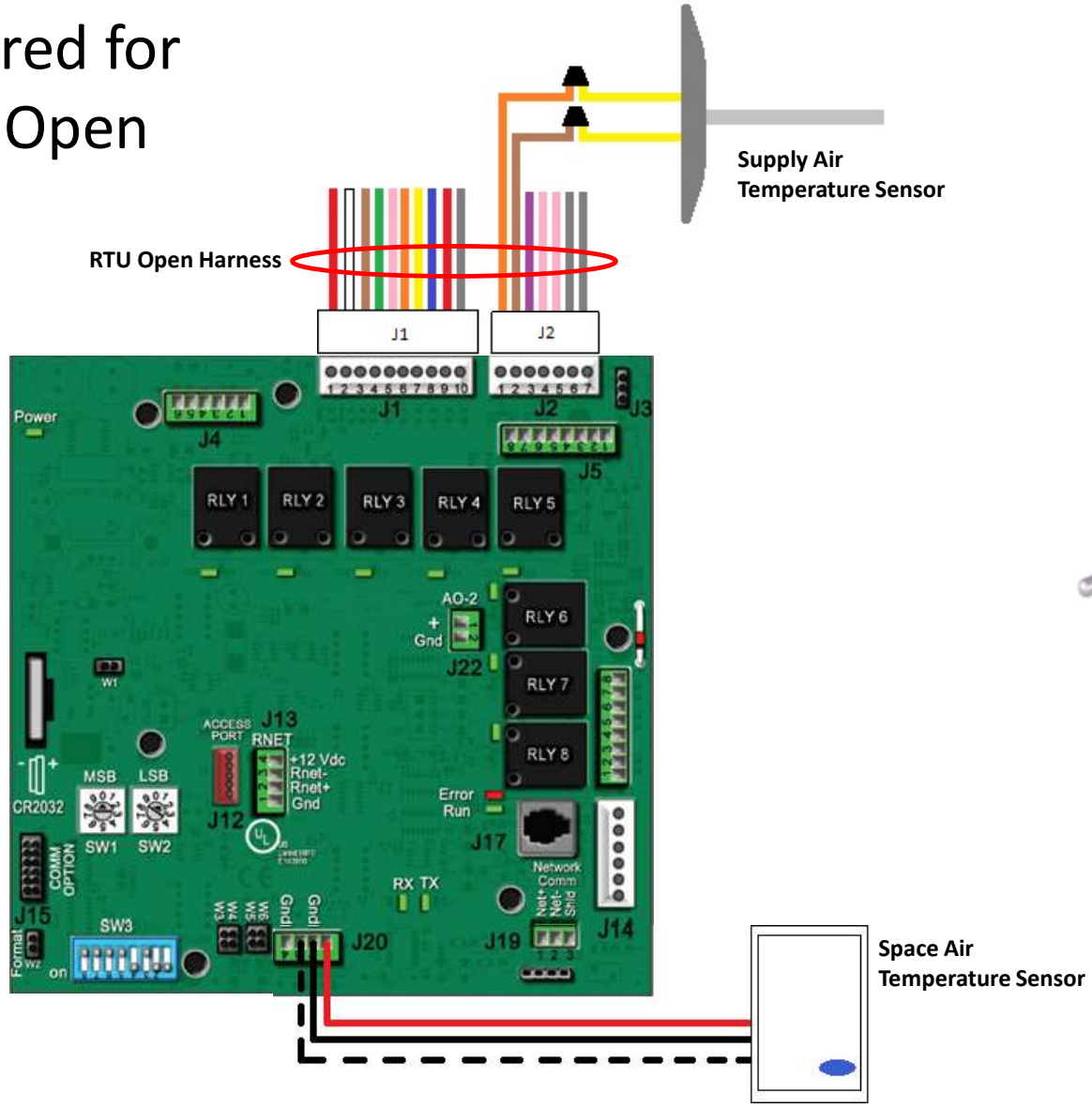
- Gets controller back to factory condition of version of program loaded.
- Checks first if hardware can handle software
- Downloads drivers, control programs, graphics…

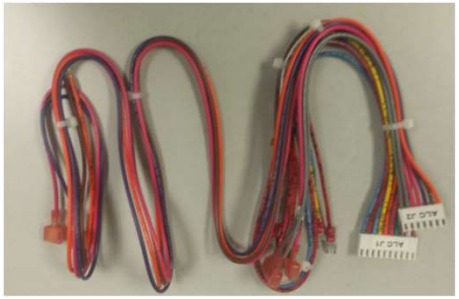


# What is RTU Open?

- Product-Integrated Control (PIC)
- Constant Volume Equipment Controller
- 8 Digital Outputs
- 2 Analog Outputs
- 6 Analog Inputs
- 5 Digital Inputs
- Native BACnet Protocol
- Can be Factory-Installed on most Small to Medium RTU’s
- Can be Field-Installed on Electro-Mechanical Package Units and Splits

# Required for RTU Open



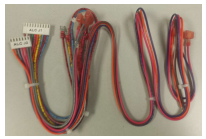
RTU Open Harness
OPN-RTUHRN

Supply Air Temperature Sensor
NSB-10K-4-D-


Space Temperature Sensors

# What do you get when Factory-Installed?

- RTU Open Controller



- RTU Open Harness

- Supply Air Temperature Sensor

- Space Temperature Sensor (Not Included)

Minimum Requirement

- Humidimizer
- Economizer

# Factory-Installed Economizer

Unit w/ RTU-Open Option

- Comes with RTU-Open Installed
- Comes with SAT installed
- Comes with Economizer II and OAT sensor installed

Unit w/ Electro-Mechanical Controls Option

- RTU-Open must be field installed
- SAT must be field installed
- Comes with Economizer X or IV

Economizer X (W7220) uses proprietary enthalpy sensors and damper actuator which are communicating. Cannot be used with other control systems.

# Case Study #1 Verizon Shockoe Richmond, VA

- Customer needed BACnet compliant 10- and 5-Ton units with Economizers for a job to be integrated into existing front-end System. Wanted them fast!!
- Decided to get units with Electro-Mechanical Controls because lead time was shorter and add Carrier RTU-Open control in field.

Unit w/ RTU-Open Option

- Comes with RTU-Open Installed
- Comes with SAT installed
- Comes with Economizer II and OAT sensor installed

Unit w/ Electro-Mechanical Controls Option

- RTU-Open must be field installed
- SAT must be field installed
- Comes with Economizer X

Economizer X (W7220) uses proprietary enthalpy sensors and damper actuator which are communicating. Useless for other control systems.

Customer added RTU-Open and Supply Air Temperature Sensor, opted to leave Economizer X in place. Lost control and ability to configure economizer through BACnet front end.

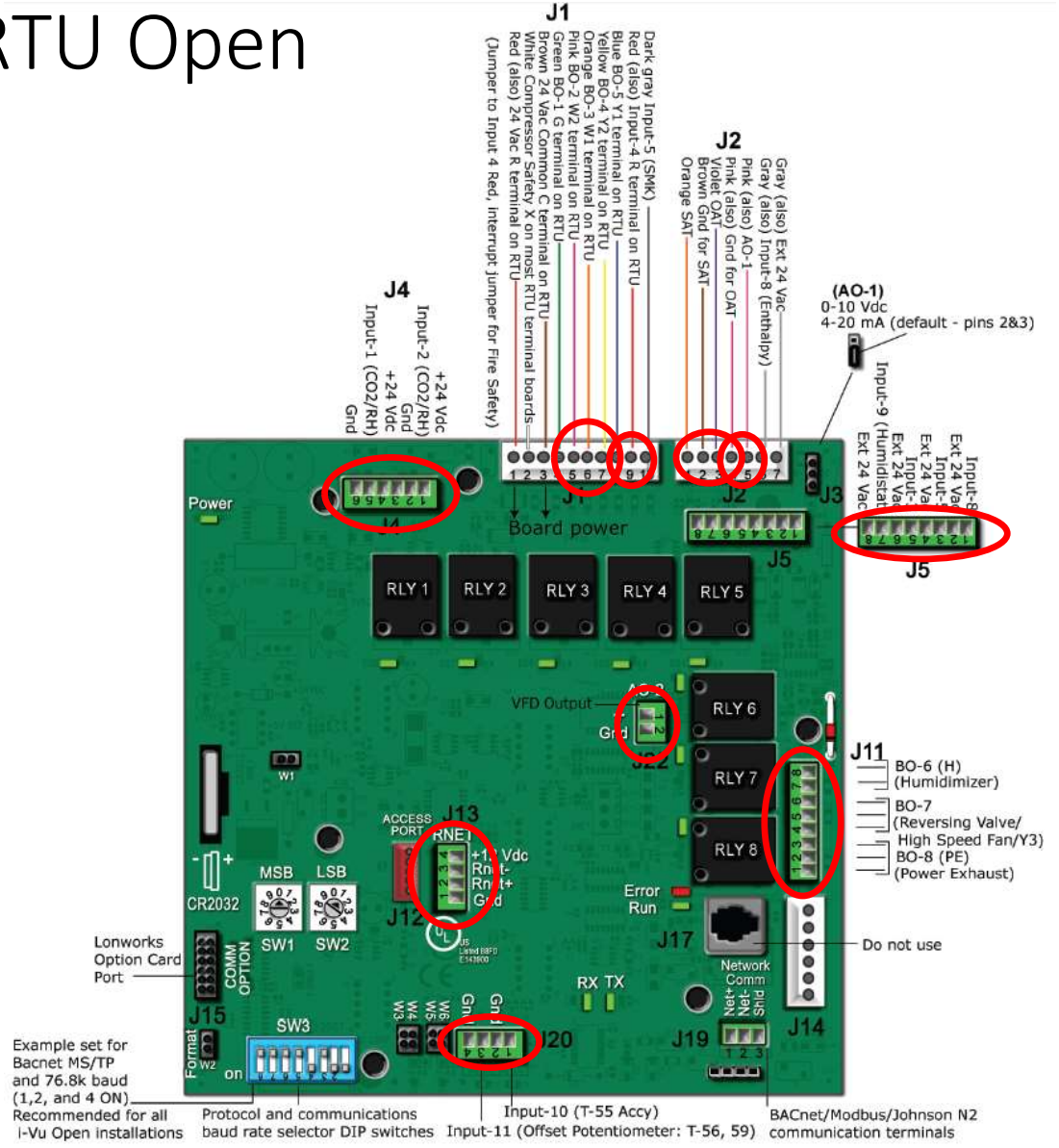
# Factory-Installed RTU Open

ComfortLink Units do not use RTU Open. Use UPC.

* 48/50HC with Energy Recovery Ventilator comes with ComfortLink Controller. UPC not a Factory Option.

| Weather Series | | Gas & Electric (Tons) | Heat Pump (Tons) | Target Descriptor |
|---|---|---|---|---|
| WeatherExpert™ |  48/50N | 75 – 150 | - | Ultra High Performance/ Feature Life Cycle Cost |
| |  48/50LC | 3 – 23 | - | |
| WeatherMaster® |  48/50P | 30 – 100 | - | High Performance Payback / High |
| |  48/50HC-Q | 3 – 25 * | 3 – 10 | |
| |  ecoblue technology 48/50GC | 3 - 5 | - | |
| WeatherMaker® |  48/50A | 20 – 60 | - | Value Base Performance Base Features |
| |  48/50TC-Q | 3 – 27.5 | 3 – 20 | |
| |  48/50FC ecoblue technology | 3 - 5 | - | |
| |  48/50KC | 3 - 5 | 3 - 5 | |

# RTU Open




## Binary Outputs

| | |
|---|---|
| BO-1 | Fan (G) (Dedicated) |
| BO-2 | Heat 2 (W2) (Dedicated) |
| BO-3 | Heat 1 (W1) (Dedicated) |
| BO-4 | Cool 2 (Y2) (Dedicated) |
| BO-5 | Cool 1 (Y1) (Dedicated) |
| BO-6 | Humidi-MiZer (Dedicated) |
| BO-7 | RV / High Speed Fan / Y3 |
| BO-8 | Powered Exhaust (Dedicated) |

## Analog Outputs

| | |
|---|---|
| AO-1 | Economizer (Dedicated) |
| AO-2 | VFD (48/50LC*B) (Dedicated) |

## Inputs

| | | |
|---|---|---|
| Input 1 | AI | Indoor CO2 / Outdoor CO2 / Relative Humidity |
| Input 2 | AI | Duct Static Pressure (48/50LC*B) |
| Input 4 | BI | Safety Chain (Dedicated) |
| Input 6 | AI | Supply Air Temperature (Dedicated) |
| Input 7 | AI | Outside Air Temperature (Dedicated) |
| Input 10 | AI | T55 (10K Thermistor) (Dedicated) |
| Input 11 | AI | T56 (100K Potentiometer Adjust) (Dedicated) |
| Input 3 | BI | Compressor Safety |
| Input 5 | BI | Fire Shutdown |
| Input 8 | BI | Enthalpy Switch |
| Input 9 | BI | IGC Input |

Inputs 3, 5, 8, & 9
- Fan Status
- Filter Status
- Remote Occupancy
- Door Contact

## Rnet

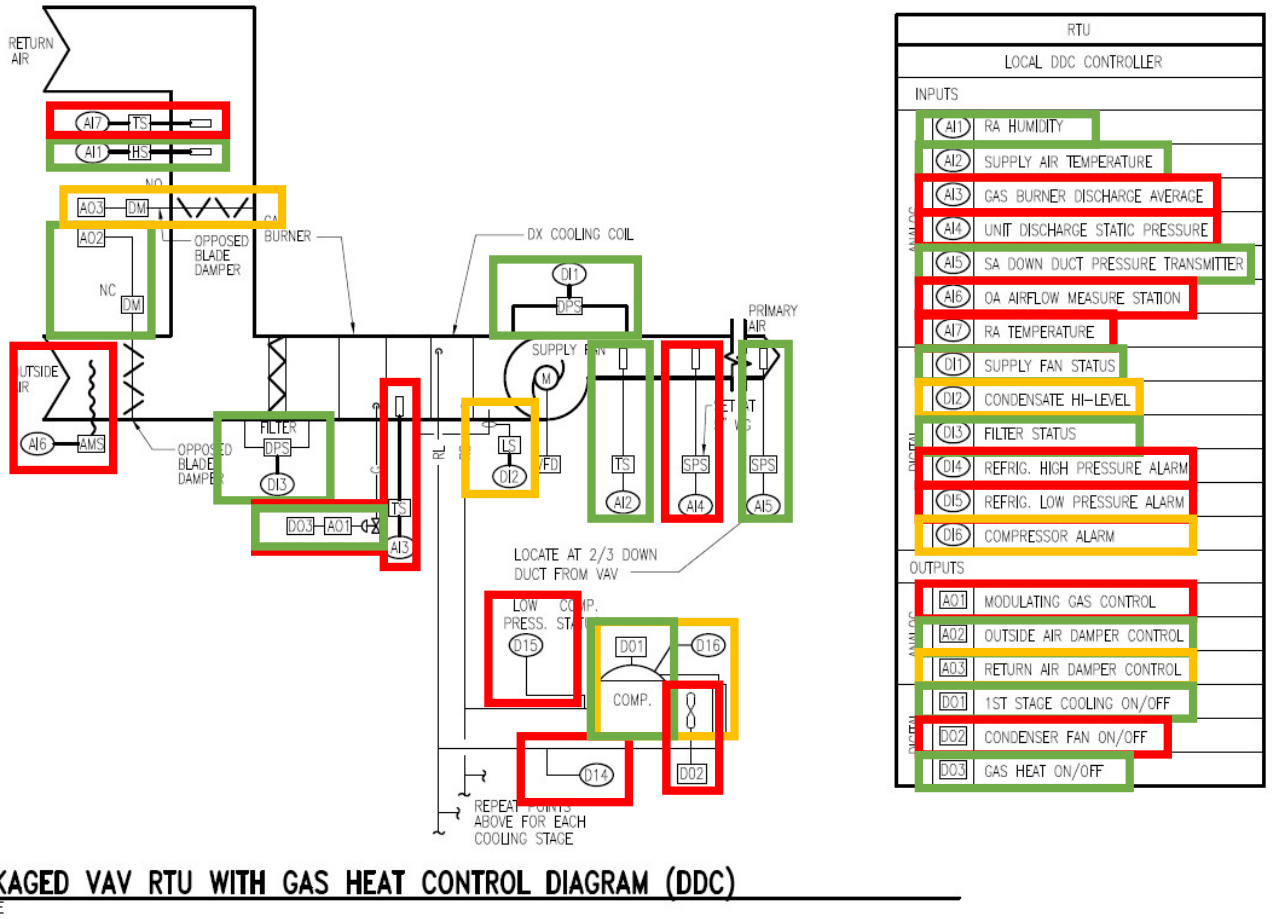
Space Sensors

# Case Study #2: Earthcore Industries Buildout Plan

- Aaon Spec – Chesapeake Virginia
- Single Zone YAC and 6-Ton VAV YAC with (4) VAV Terminal units with Electric Heat

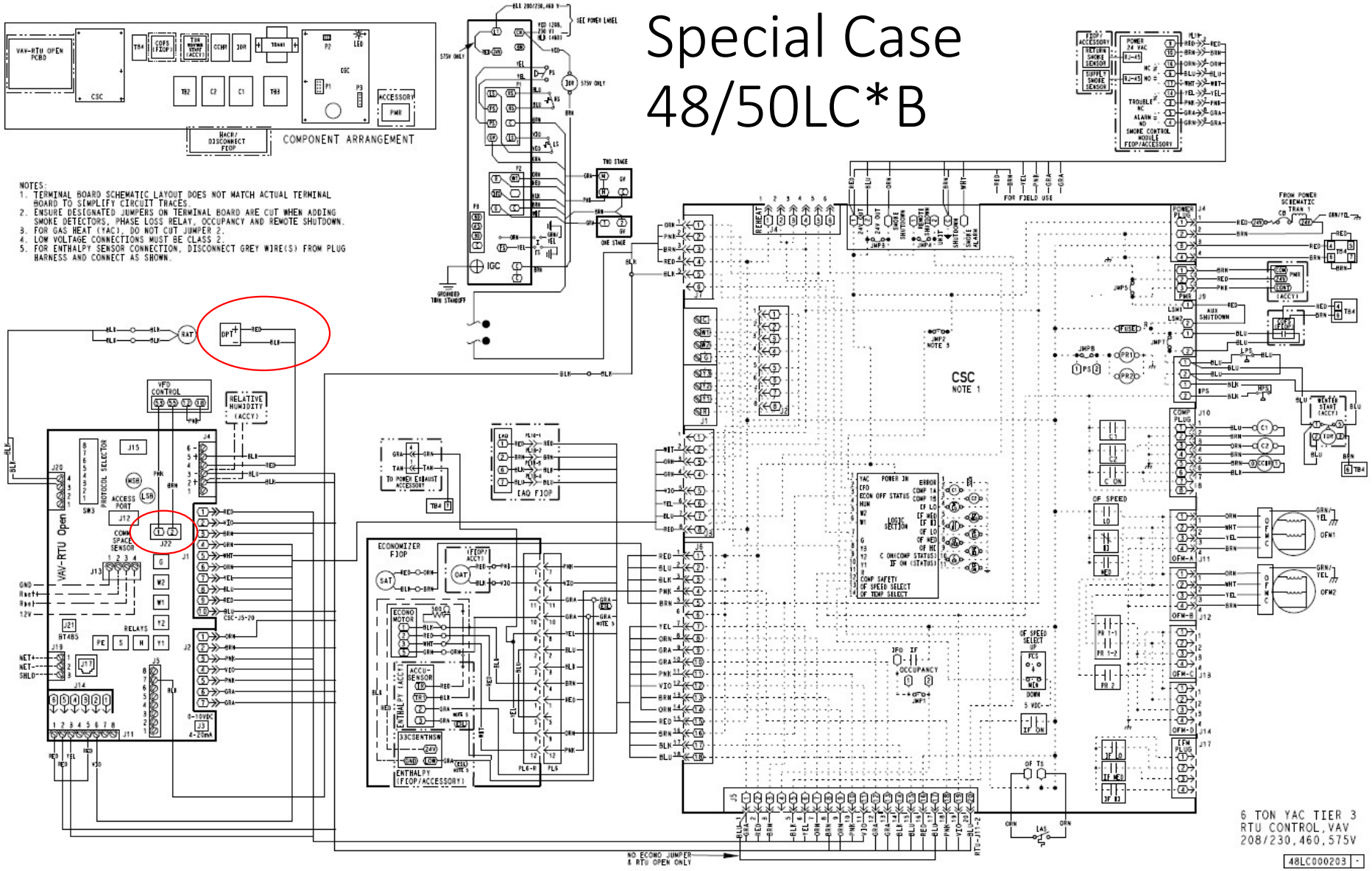
- Aaon Unit is Loaded Up
- Can we meet points list requested?

- Call to Engineer




PACKAGED VAV RTU WITH GAS HEAT CONTROL DIAGRAM (DDC)
NO SCALE

# Special Case 48/50LC*B



# Case Study #3: Andrews Joint Base

- Spec Called for Small VAV units to be used with VAV terminal boxes in a military PX

## Problems

- LC*B are the only Packaged units that Carrier offers below 20 Tons
- LC*B will not work stand alone. Must establish Airside Linkage with Carrier Open Zoning controls (VAV or VVT) to work at all.
- Salesman quoted LC*B units without packaging them with VAV Zoning Controls
- Contractor supplied VAV boxes with Siemens VAV Controllers.

## Solution:

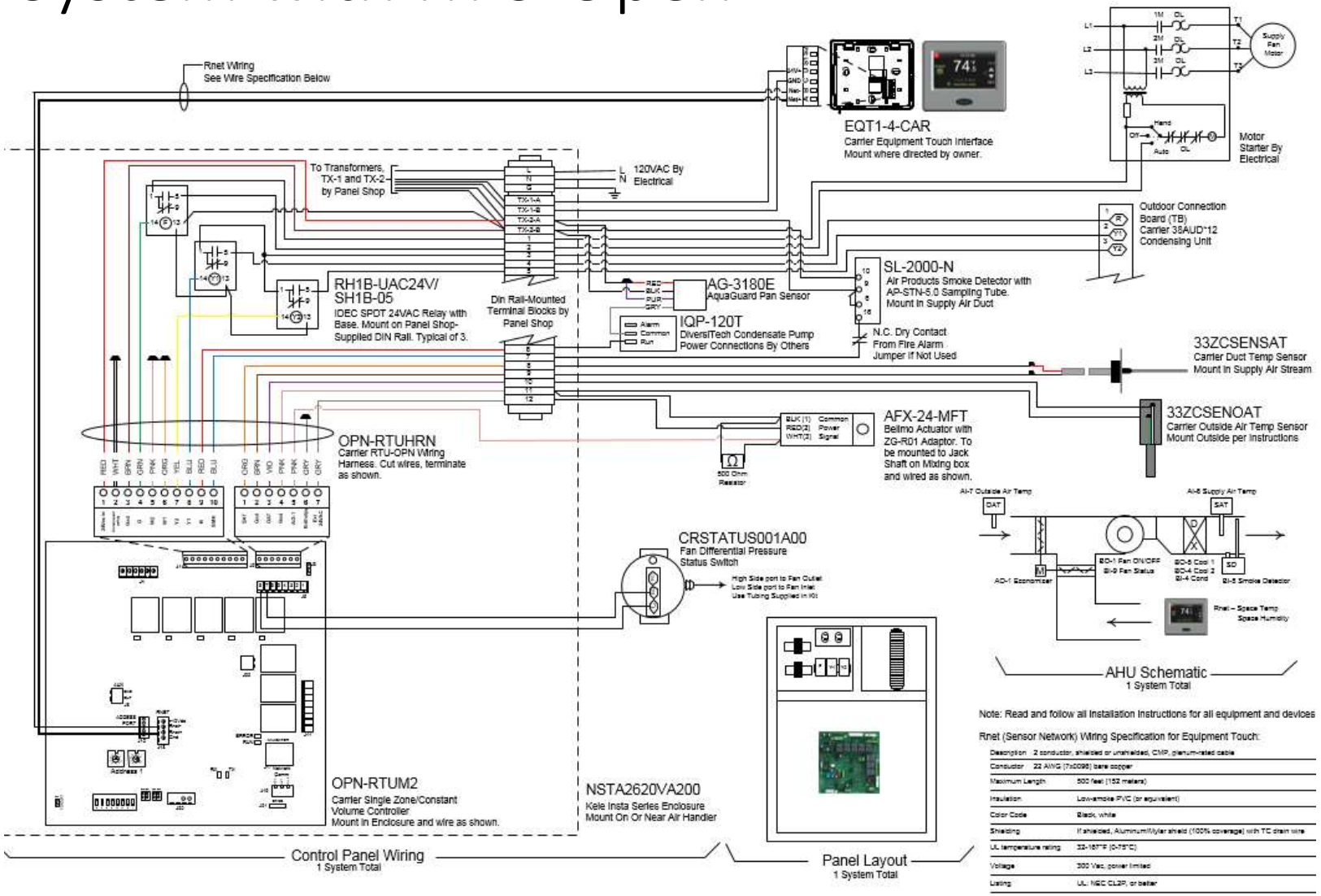
NONE

Note: LC*B Package units have been updated to work with third party VAV boxes and stand-alone.

## Update

Now using AppLoader, we can download newest programming and drivers to allow unit to work with these third-party controllers.

# Split System with RTU Open

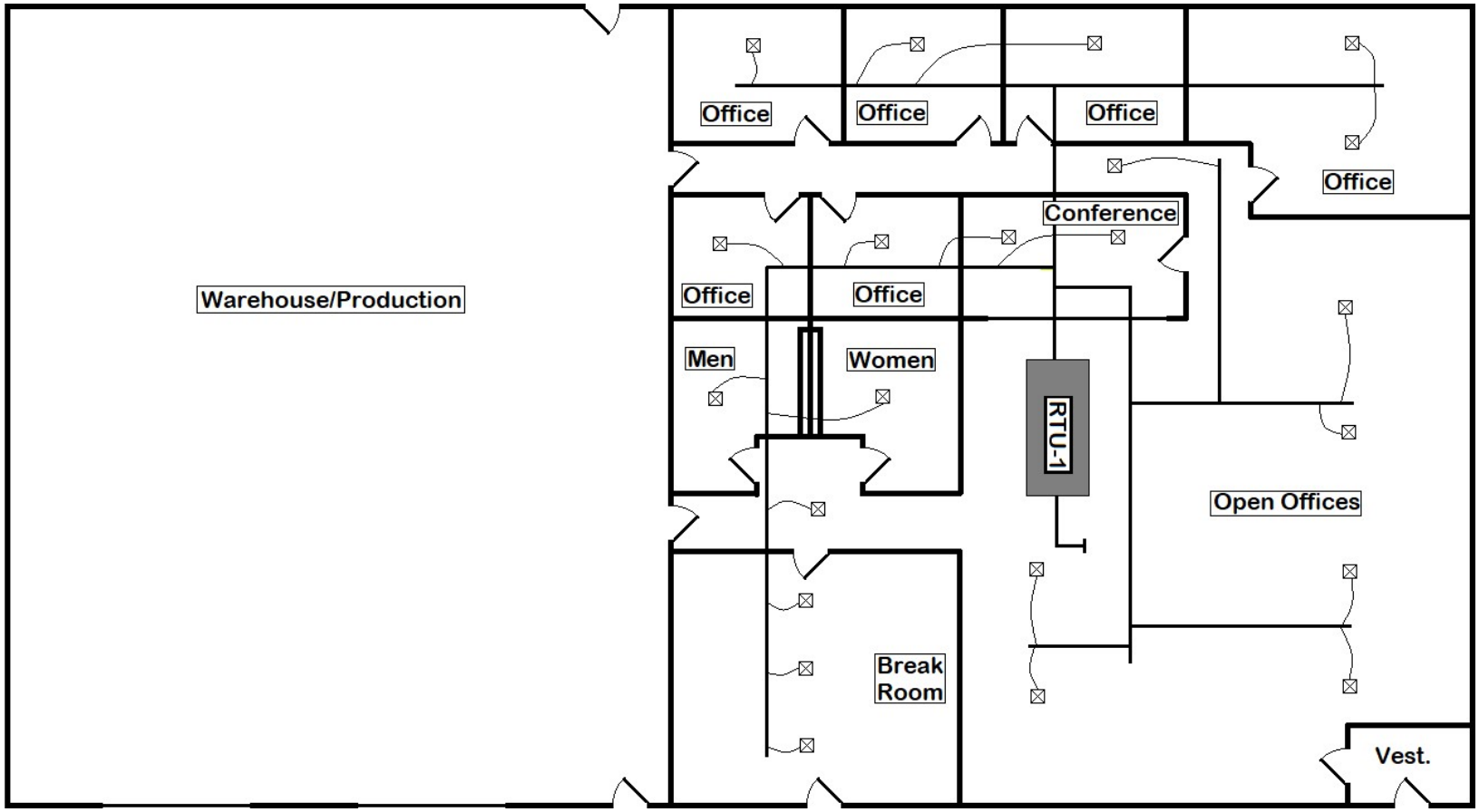



Note: Read and follow all Installation Instructions for all equipment and devices

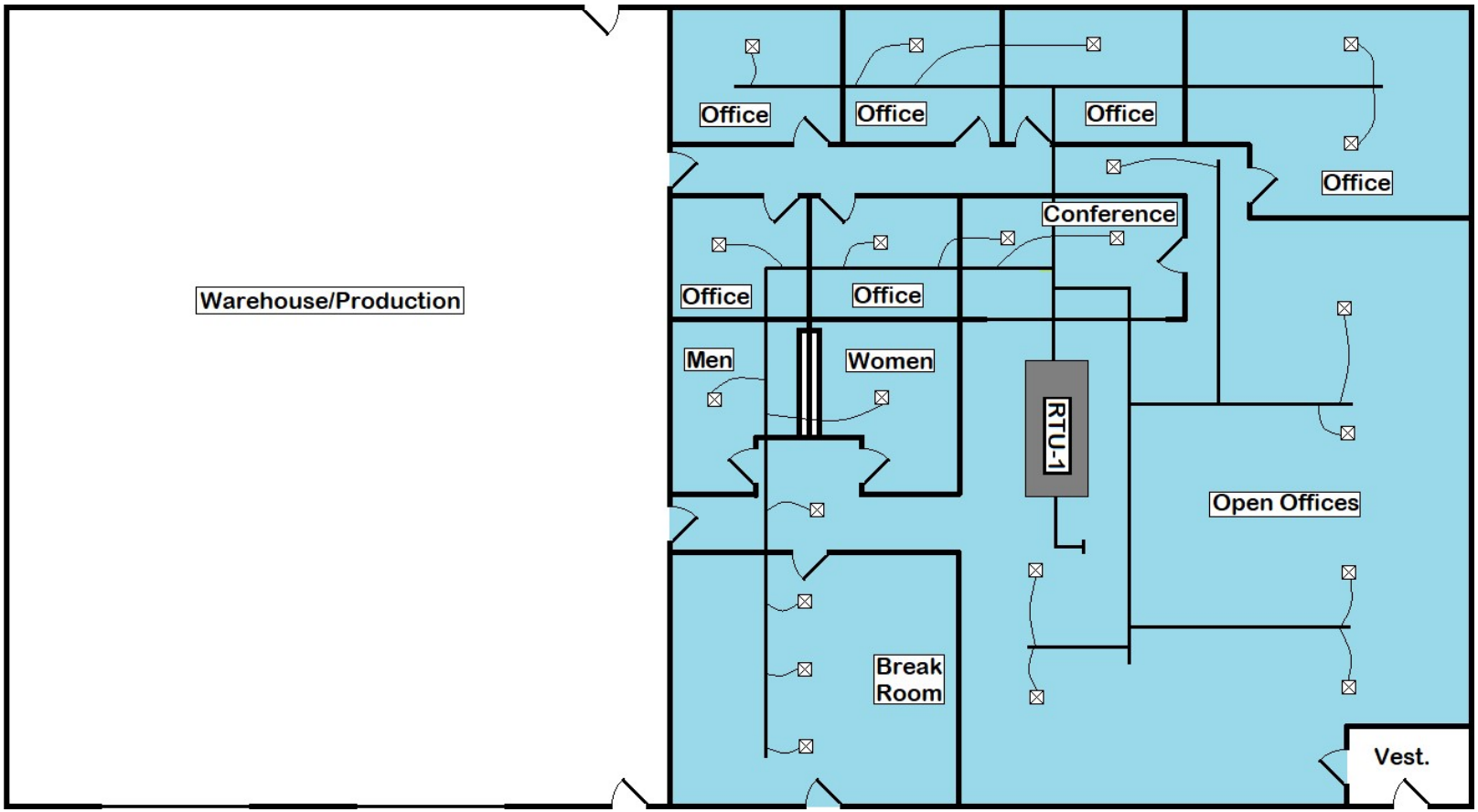
Rnet (Sensor Network) Wiring Specification for Equipment Touch:

| | |
|---|---|
| Description | 2 conductor, shielded or unshielded, CMP, plenum-rated cable |
| Conductor | 22 AWG [7x0095] bare copper |
| Maximum Length | 500 feet [152 meters] |
| Insulation | Low-smoke PVC (or equivalent) |
| Color Code | Black, white |
| Shielding | If shielded, Aluminum/Mylar shield (100% coverage) with TC drain wire |
| UL temperature rating | 32-167°F (0-75°C) |
| Voltage | 300 Vac, power limited |
| Listing | UL; NEC CL2P, or better |

# Training Building Shell

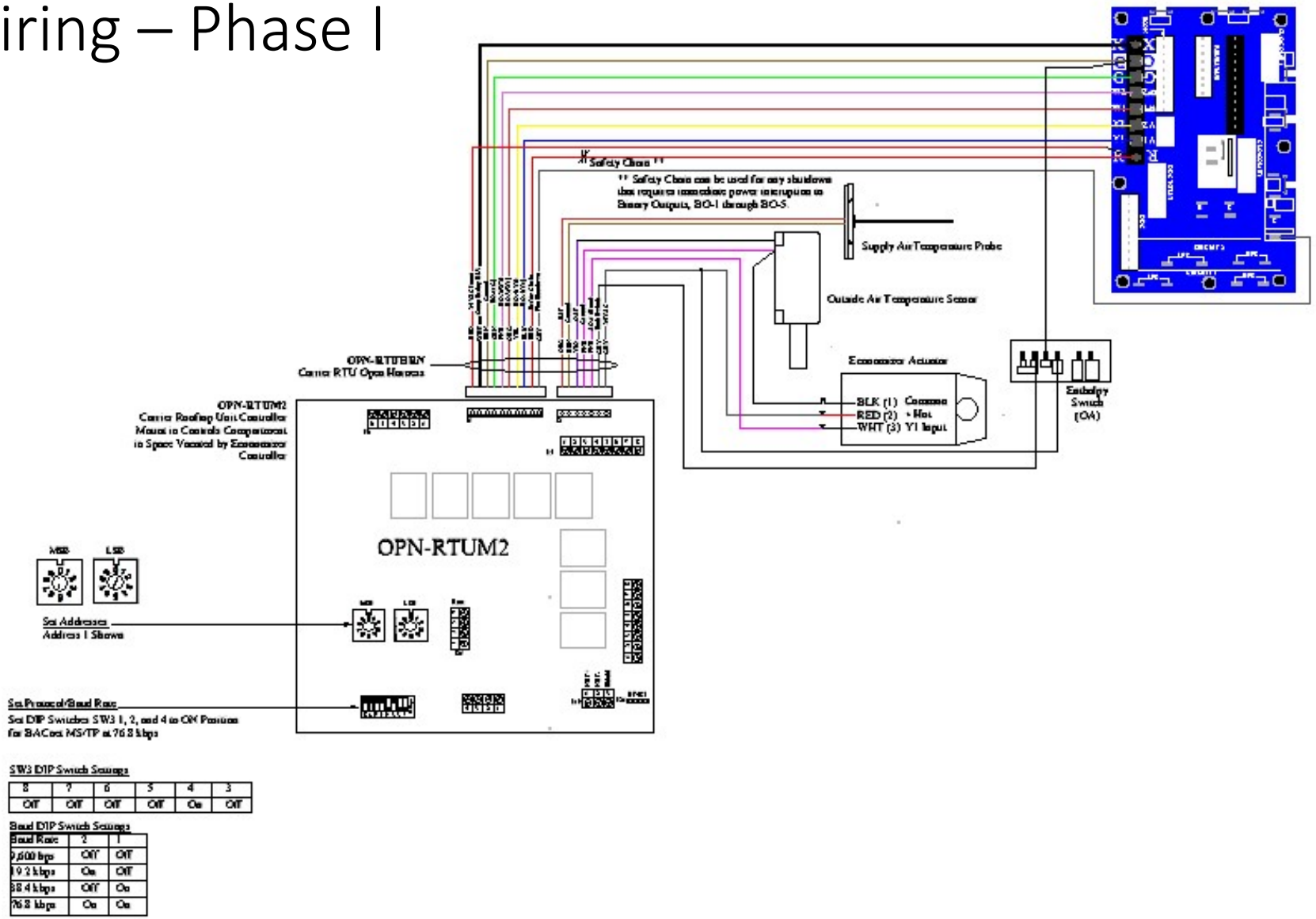


# Training Building Phase I




- SAV Unit with Humidimizer
- Differential Enthalpy Economizer
- Powered Exhaust
- Smoke Detector
- Fan Status Switch
- Filter Status Switch
- BACnet Capable

# Factory Wiring – Phase I



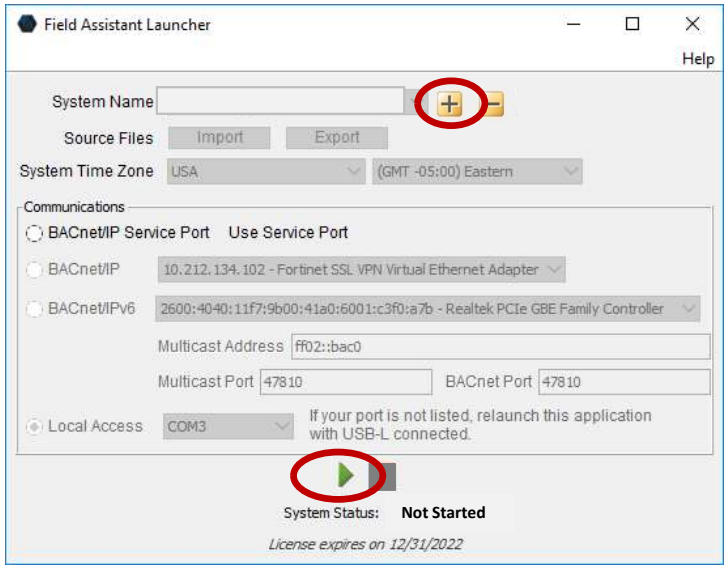

SW3 DIP Switch Settings

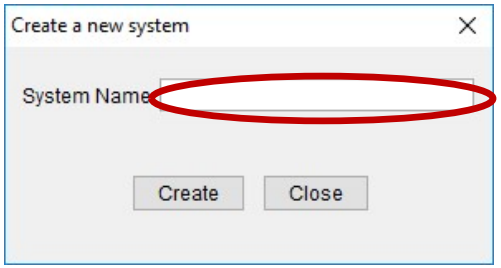
| 8 | 7 | 6 | 5 | 4 | 3 |
|---|---|---|---|---|---|
| OFF | OFF | OFF | OFF | On | OFF |

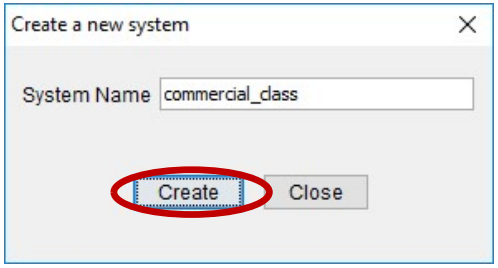
Baud DIP Switch Settings

| Baud Rate | 2 | 1 |
|---|---|---|
| 9,600 bps | OFF | OFF |
| 19.2 kbps | On | OFF |
| 38.4 kbps | OFF | On |
| 76.8 kbps | On | On |

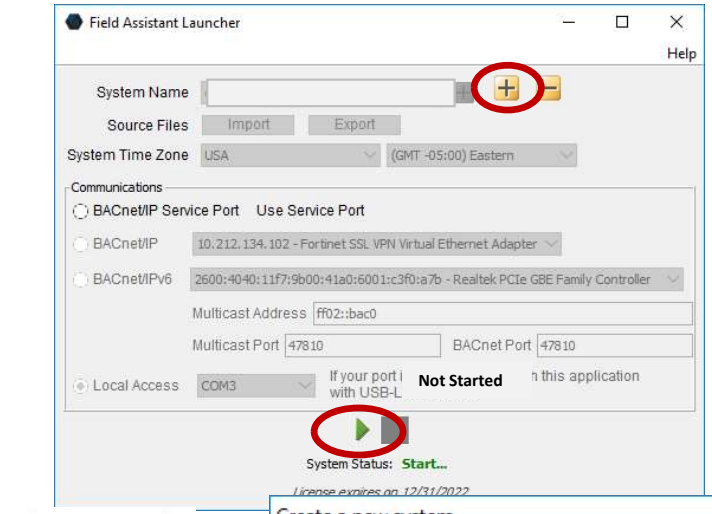
# Create Database/ Download Controller

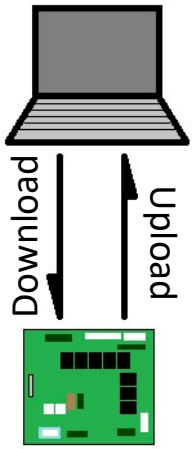


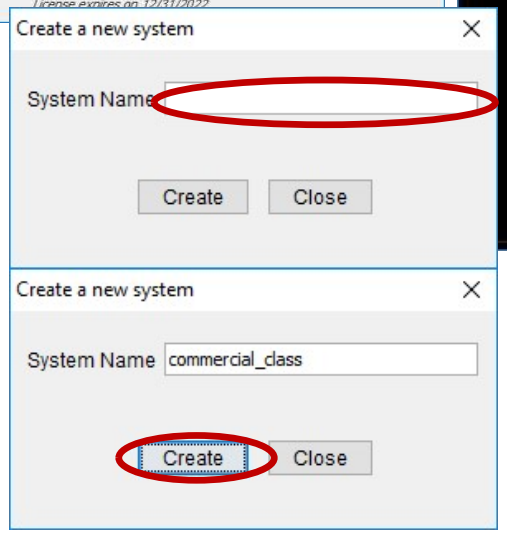



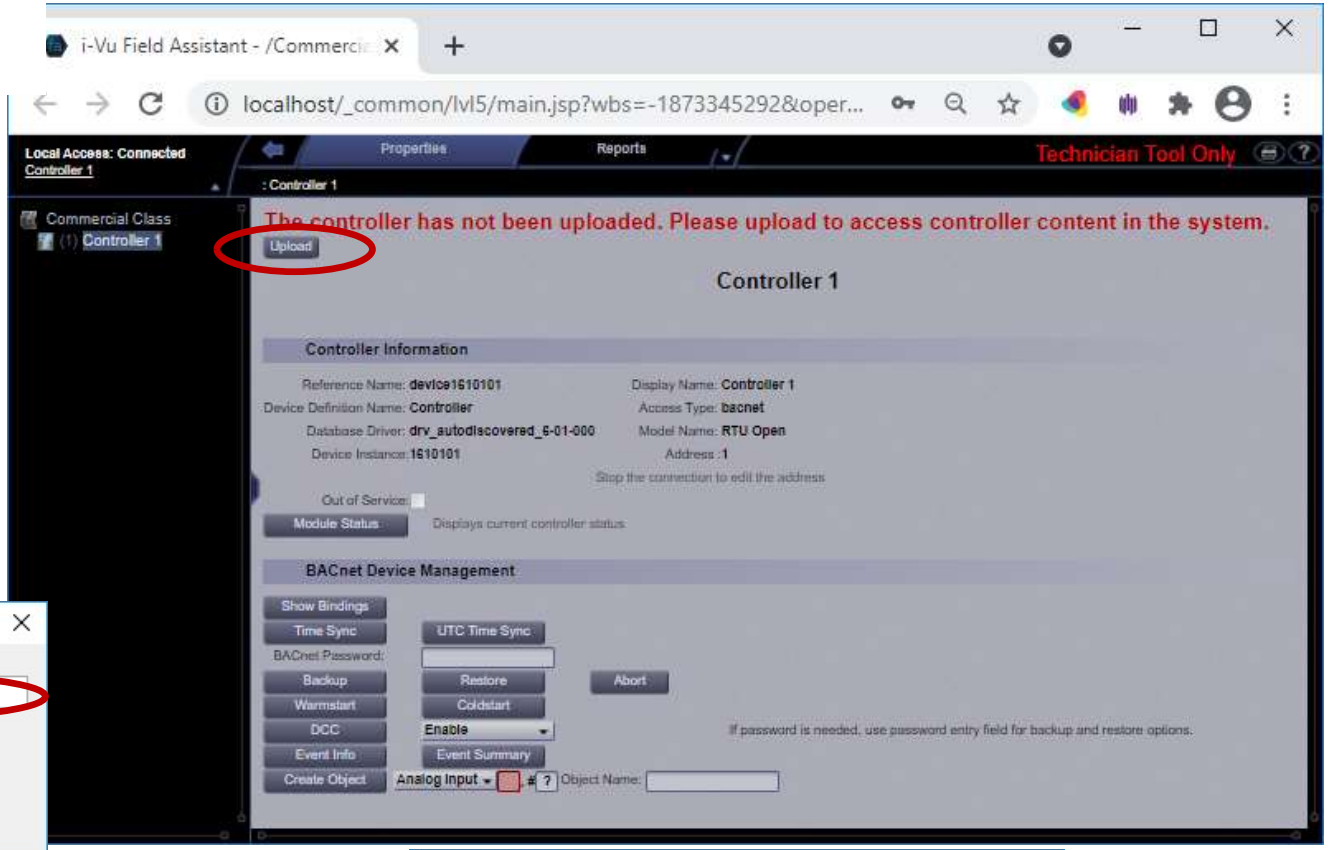



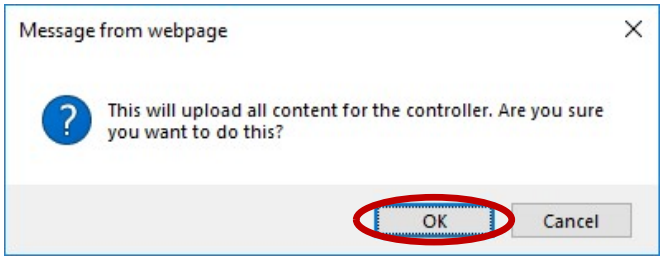
# Create Database/ Download Controller



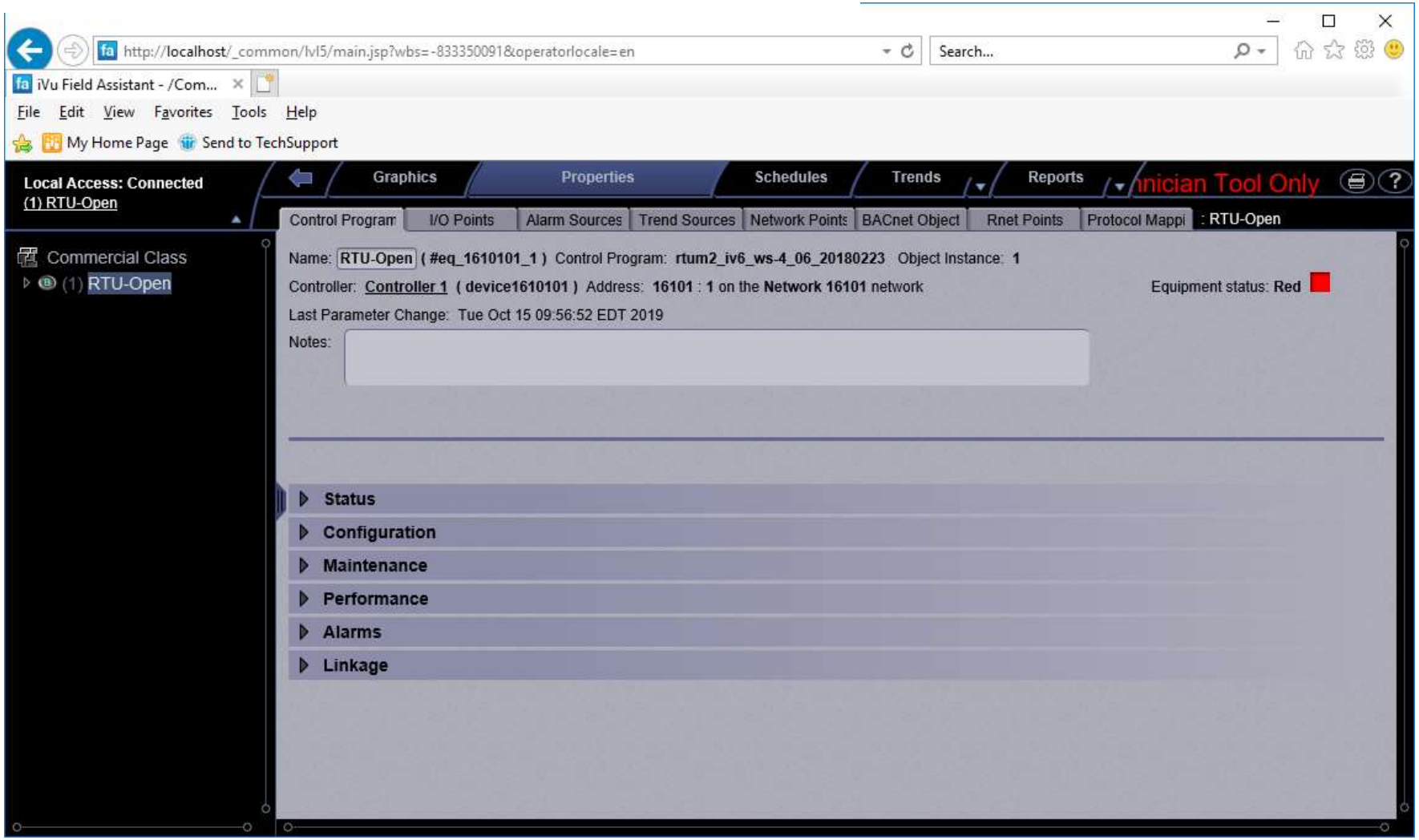



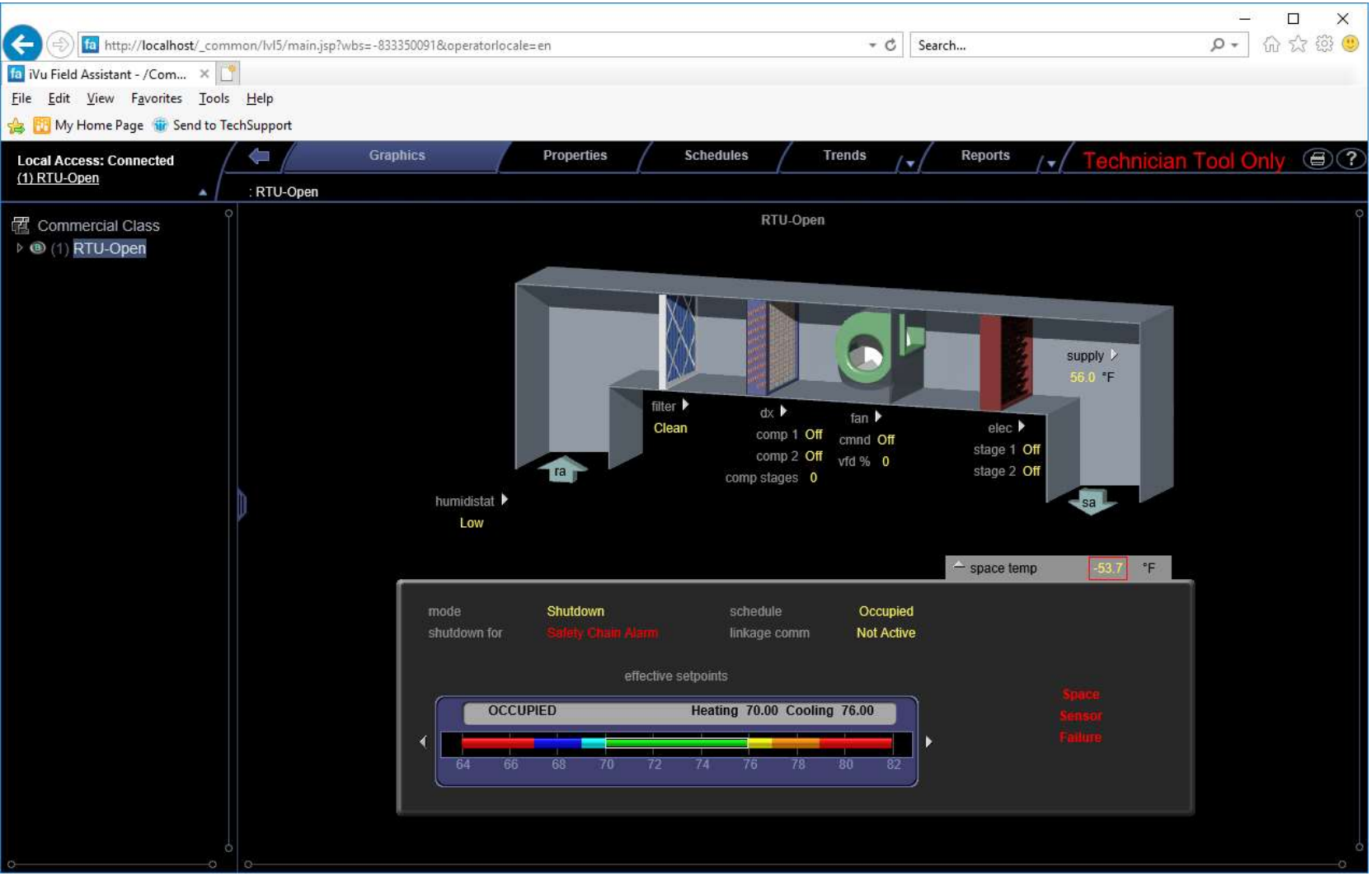



# Properties Page (unconfigured)



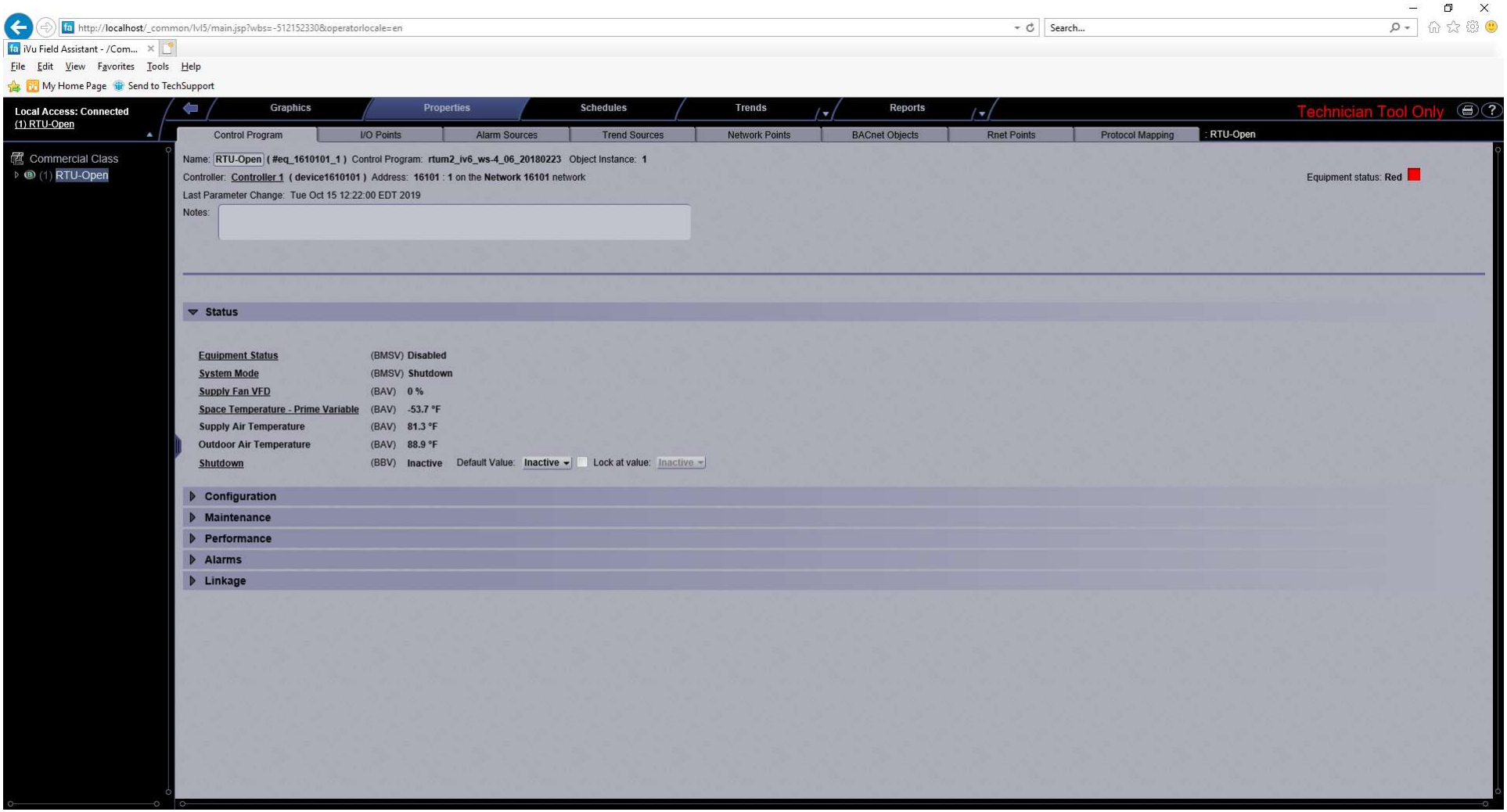
# Graphics Page (unconfigured)




Things to Note:

- No Economizer
- Humidistat
- Filter Status
- 2 Stages Compressor
- Fan: VFD
- Heat: Electric 2 Stage
- Mode: Shutdown
- Shutdown for: Safety Chain Alarm
- Schedule: Occupied
- Occupied Setpoints
- Linkage Comm: Not Active
- Space Temperature Failure

# Properties Page / Status (unconfigured)



# Service Configuration

Properties/Configuration/Service Configuration

**Unit Type**

- Heat/Cool
- LC WeatherExpert (Default)
- HP O/B Ctrl
- HP Y1/W1 Ctrl

**Economizer Exists**

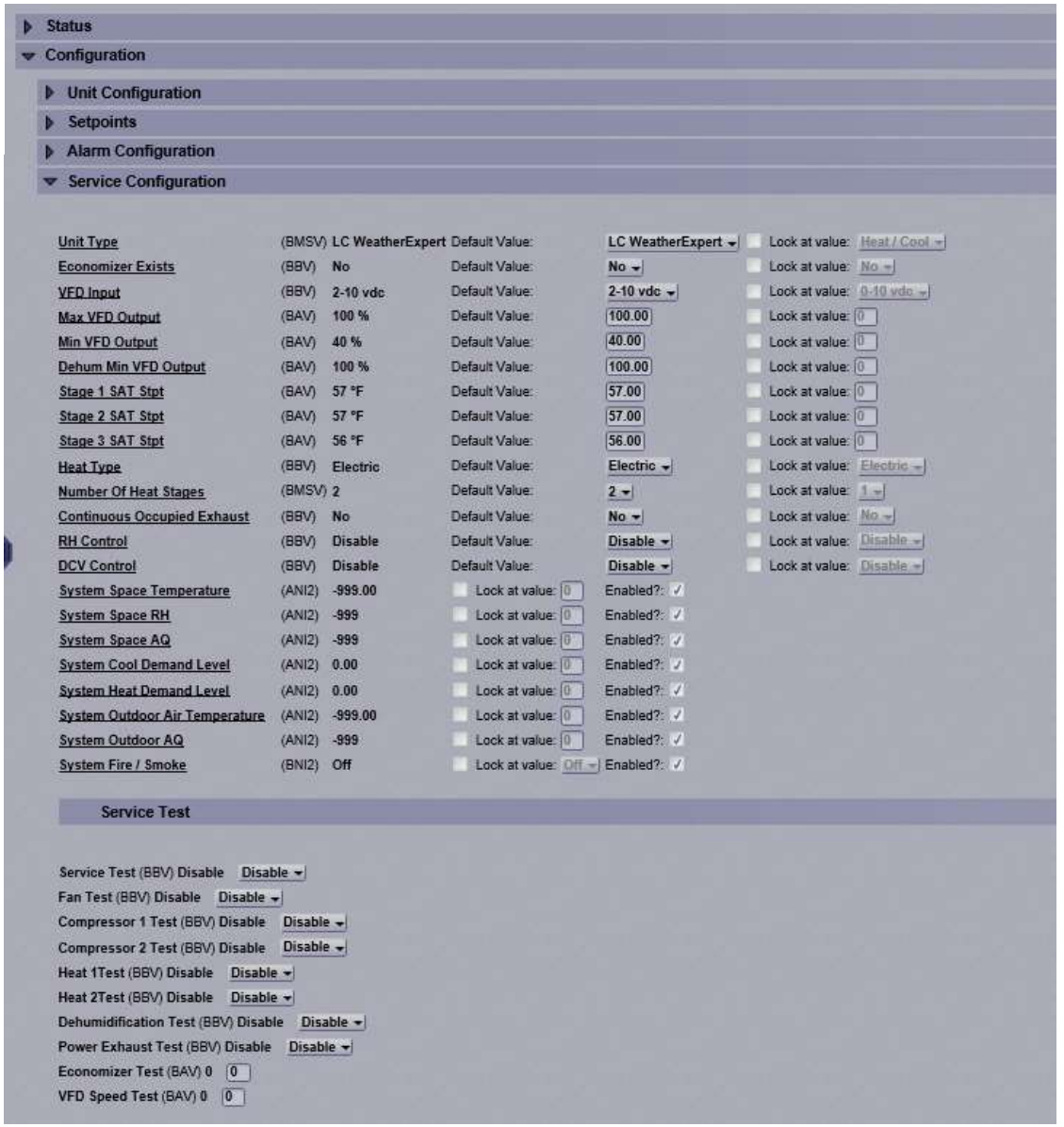
- No (Default)
- Yes

**Fan Control**

- Single Speed
- Two Speed
- Variable Speed (Default)

**Heat Type**

- Electric (Default)
- Gas



# Service Configuration

Properties/Configuration/Service Configuration

**Continuous Occupied Exhaust**

- No (Default)
- Yes

**RH Control**

- Disable (Default)
- Enable

**DCV Control**

- Disable (Default)
- Enable

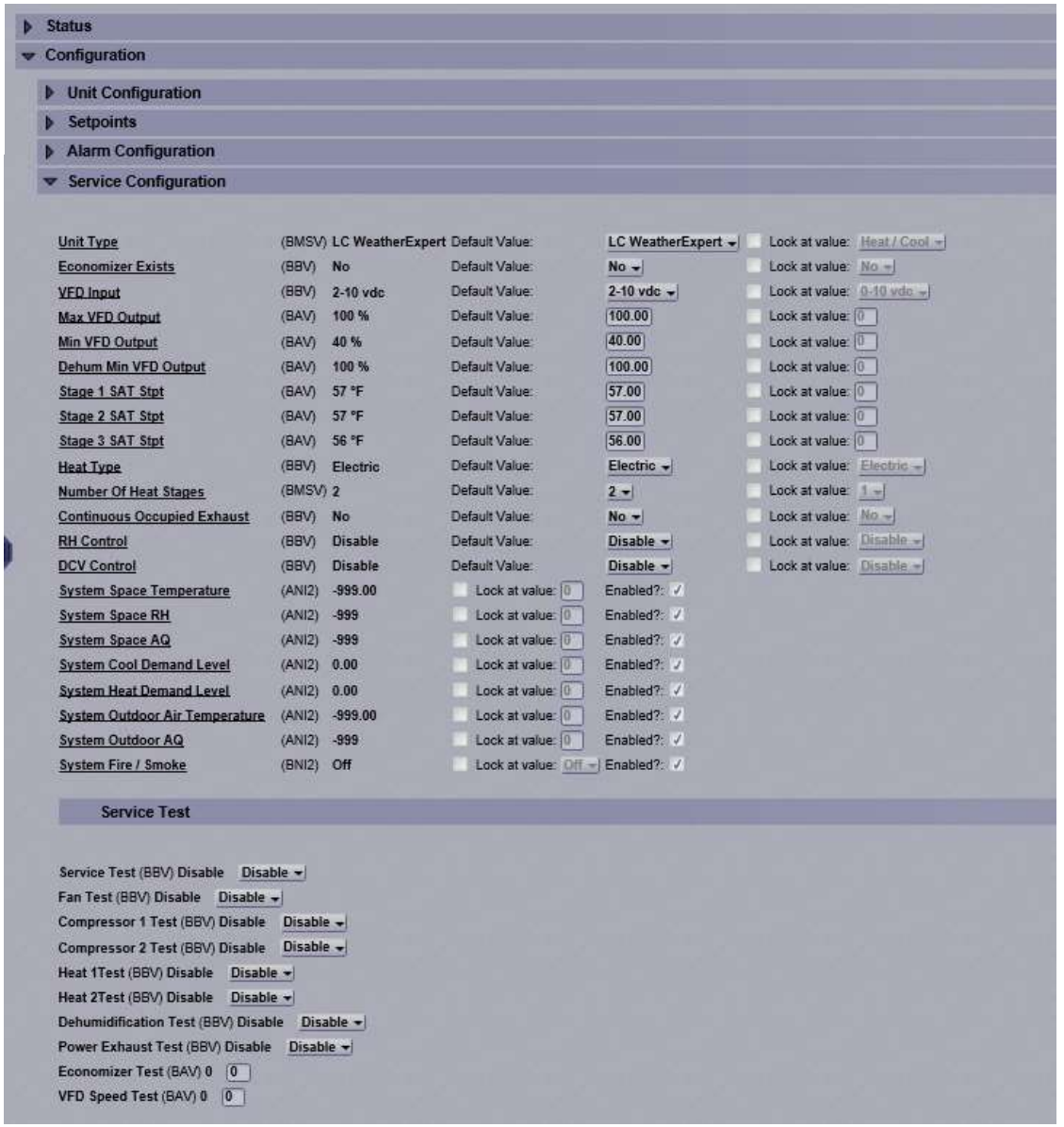
**Heat Type**

- Electric (Default)
- Gas

**System Inputs**

Allows information to be accessed from other controllers

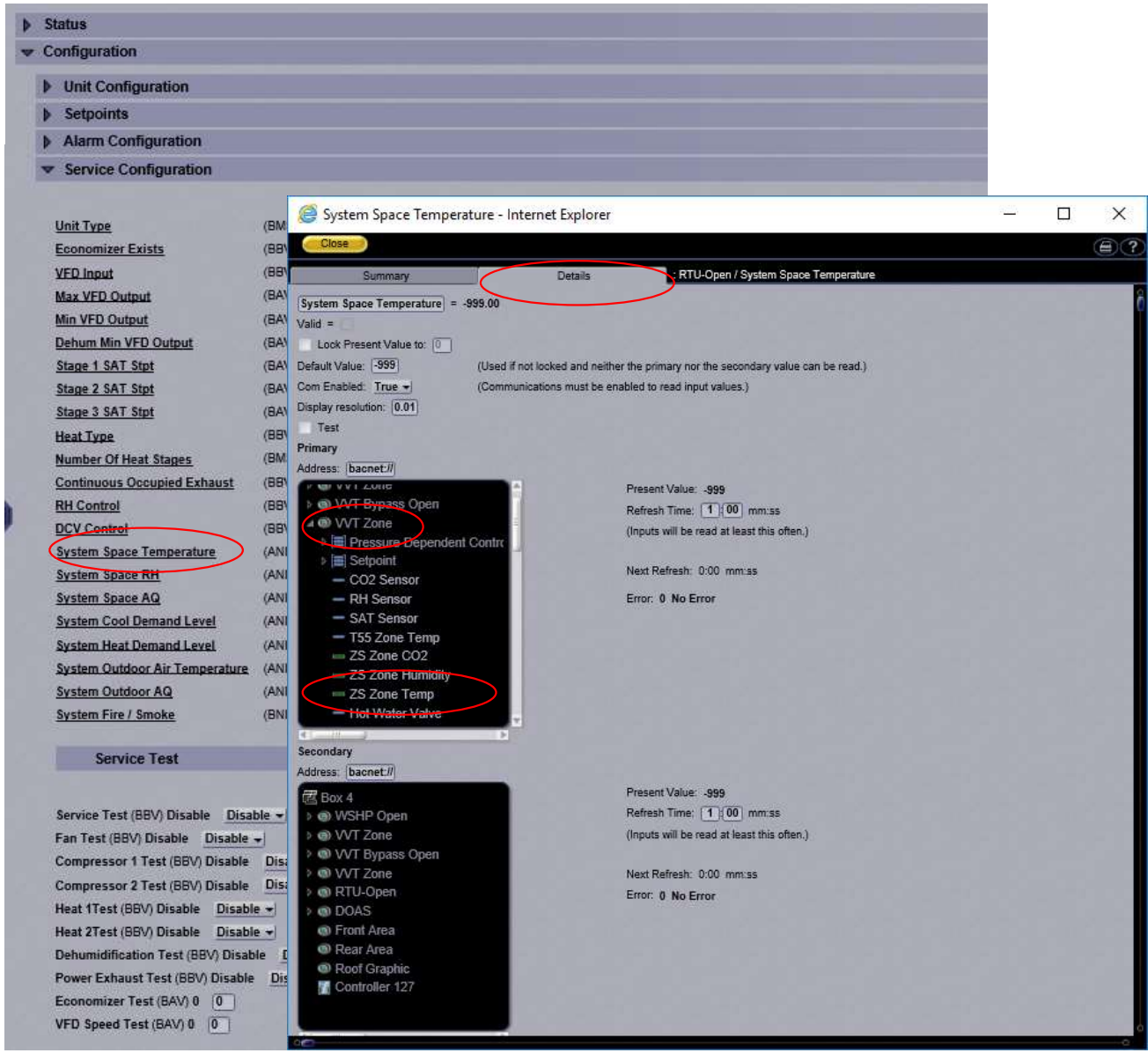
**Service Test**



# System Inputs

Properties/Configuration/Service Configuration

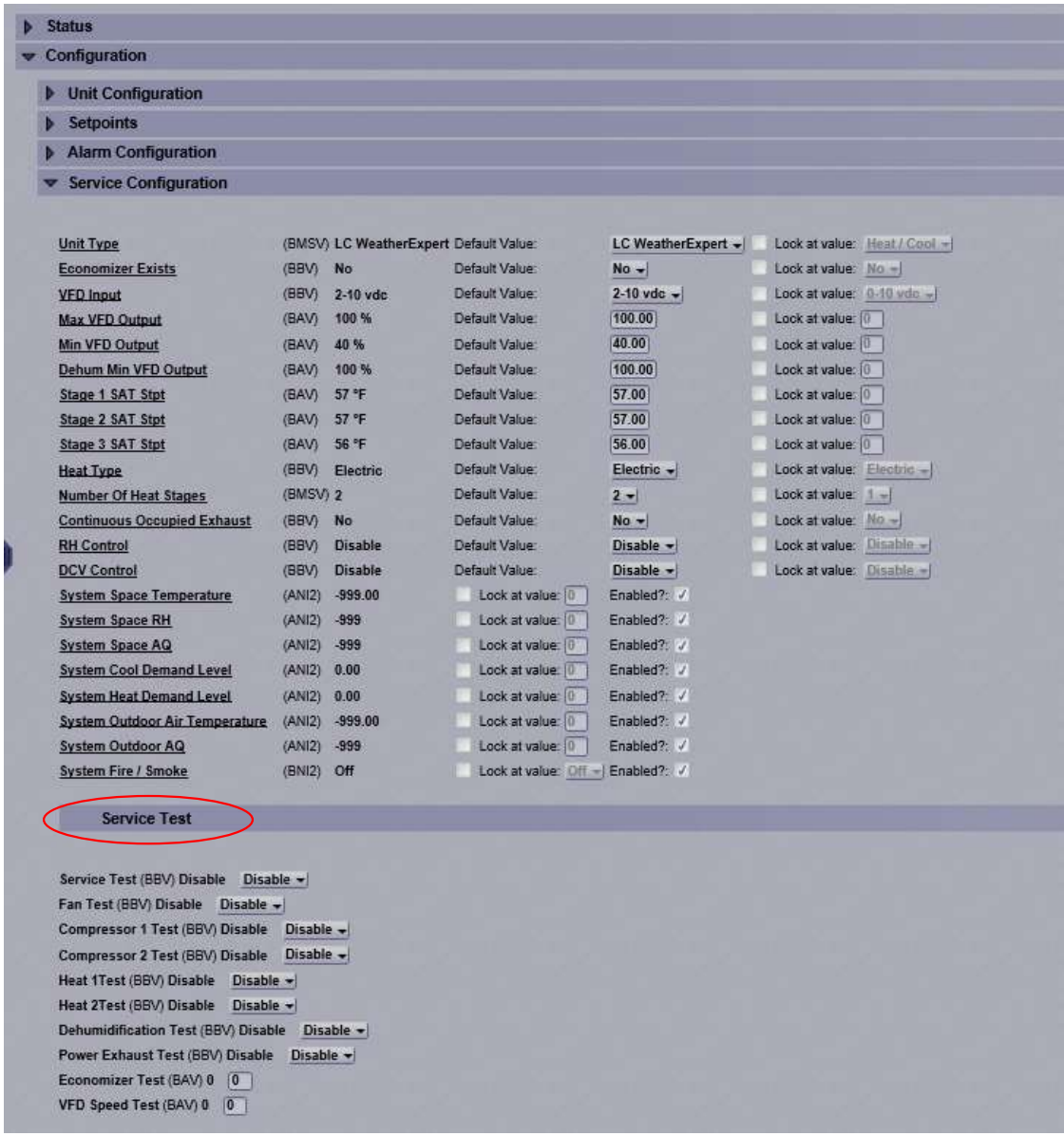
- Allows information to be accessed from other controllers
- Have to have other controllers on MS/TP Communications Bus
- Can share sensors through system
- Can get System Fire/Smoke Signal



# Service Test

Properties/Configuration/Service Configuration

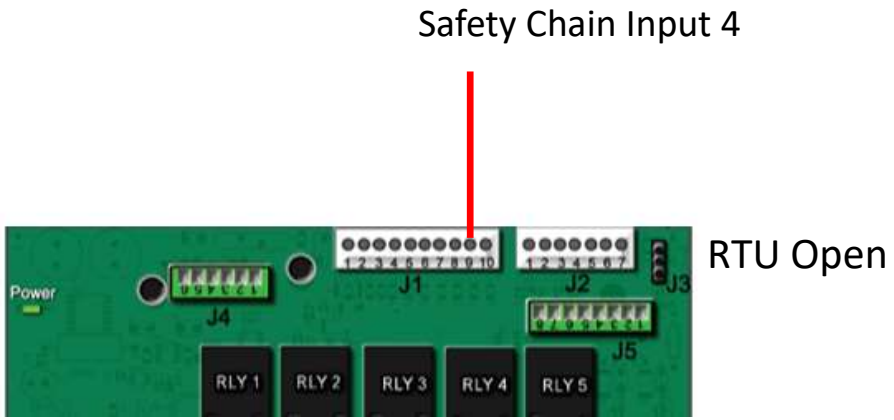
- Allows you to test outputs from controller
- Minimum On and Off Timers will be ignored
- Outputs that can be tested will be dependent on your configuration
- Always start by enabling Service Test

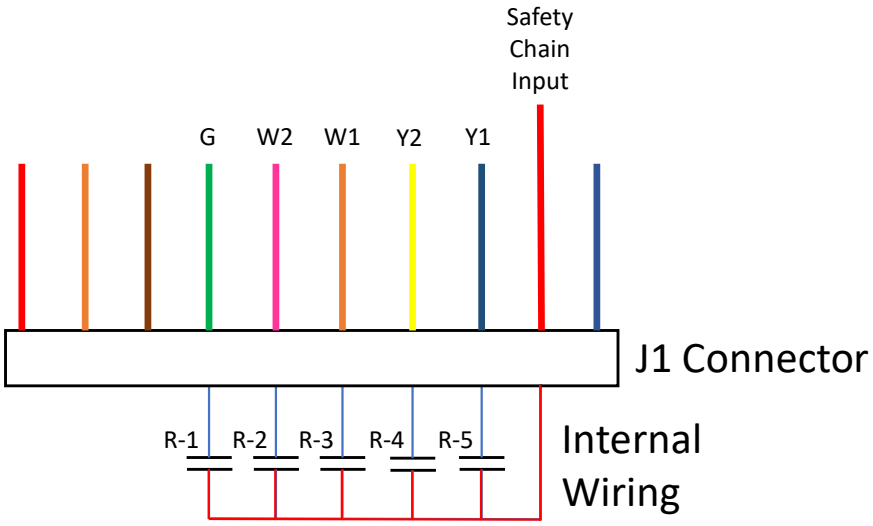


# Graphic after Service Configuration

# Safety Chain

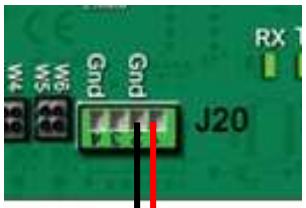
- Must Have 24V on Safety Chain Input to get voltage out of the relays
- Can be broken for any condition for which you want the unit outputs to shut down immediately



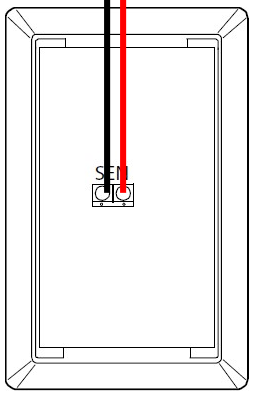



# Space Temperature Sensor

Simplest Option – 10K Type III (CP/MCI)

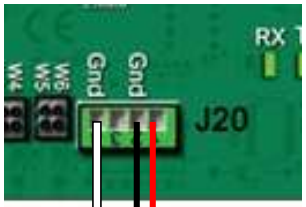



RTU Open

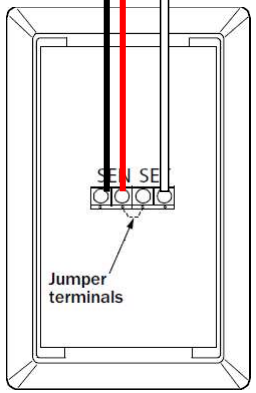



T55 (33ZCT55SPT)
Sensor and Override


or

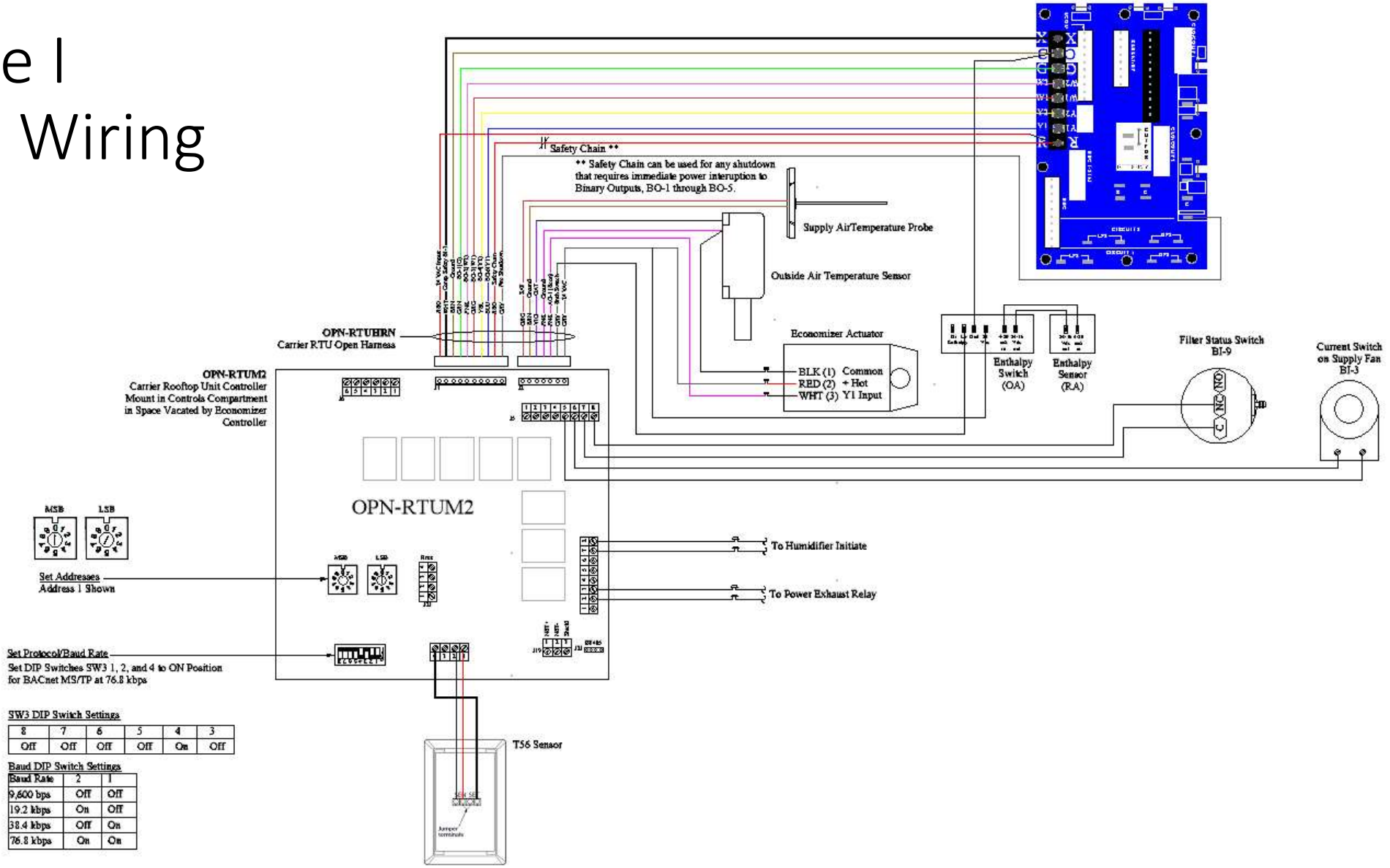



RTU Open




T56 (33ZCT56SPT)
Sensor, Override and Adjust

# Phase I
# Field Wiring

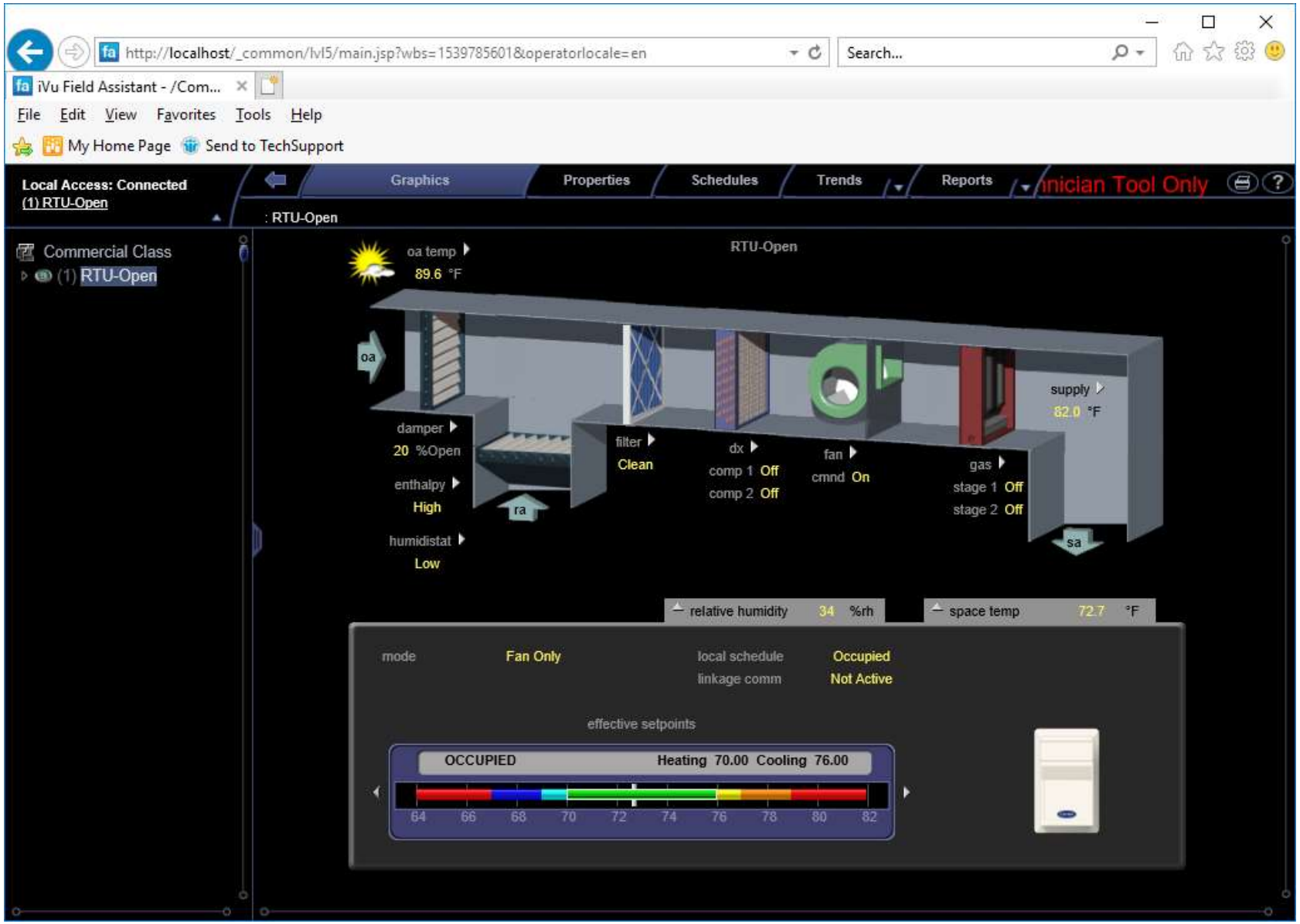



SW3 DIP Switch Settings

| 8 | 7 | 6 | 5 | 4 | 3 |
|---|---|---|---|---|---|
| Off | Off | Off | Off | On | Off |

Baud DIP Switch Settings

| Baud Rate | 2 | 1 |
|---|---|---|
| 9,600 bps | Off | Off |
| 19.2 kbps | On | Off |
| 38.4 kbps | Off | On |
| 76.8 kbps | On | On |


http://localhost/_common/lvl5/main.jsp?wbs=1539785601&operatorlocale=en
Search...
iVu Field Assistant - /Com...
File Edit View Favorites Tools Help
My Home Page
Send to TechSupport
Local Access: Connected
(1) RTU-Open
Graphics
Properties
Schedules
Trends
Reports
inician Tool Only
: RTU-Open
Commercial Class
(1) RTU-Open
RTU-Open
oa temp
89.6 °F
oa
damper
20 %Open
enthalpy
High
humidistat
Low
ra
filter
Clean
dx
comp 1 Off
comp 2 Off
fan
cmnd On
gas
stage 1 Off
stage 2 Off
supply
82.0 °F
sa
relative humidity 34 %rh
space temp 72.7 °F
mode Fan Only
local schedule Occupied
linkage comm Not Active
effective setpoints
OCCUPIED Heating 70.00 Cooling 76.00
64 66 68 70 72 74 76 78 80 82

# Unit Configuration

Properties/Configuration/Unit Configuration

**Fan Mode**

- Auto
- Continuous (Default)
- Always On

**Power Fail Restart Delay**

**Fan Off Delay**

**Minimum/Maximum Cooling/Heating SAT**

**Vent Dmpr Pos / DCV Min Pos**

**Service Alarm Timers**

- Supply Fan
- Compressor 1
- Compressor 2
- Filter

**Door Alarm Delay**

**Space Temperature Sensor Configuration**

- Pushbutton Override
- Setpoint Adjustment
- Setpoint Adjustment Range

# Unit Configuration

Properties/Configuration/Unit Configuration

**Lockout Temperatures**

- Cooling
- Economizer
- Heating

**Pre Occupancy Purge**

**Purge Time**

**Unocc Free Cool**

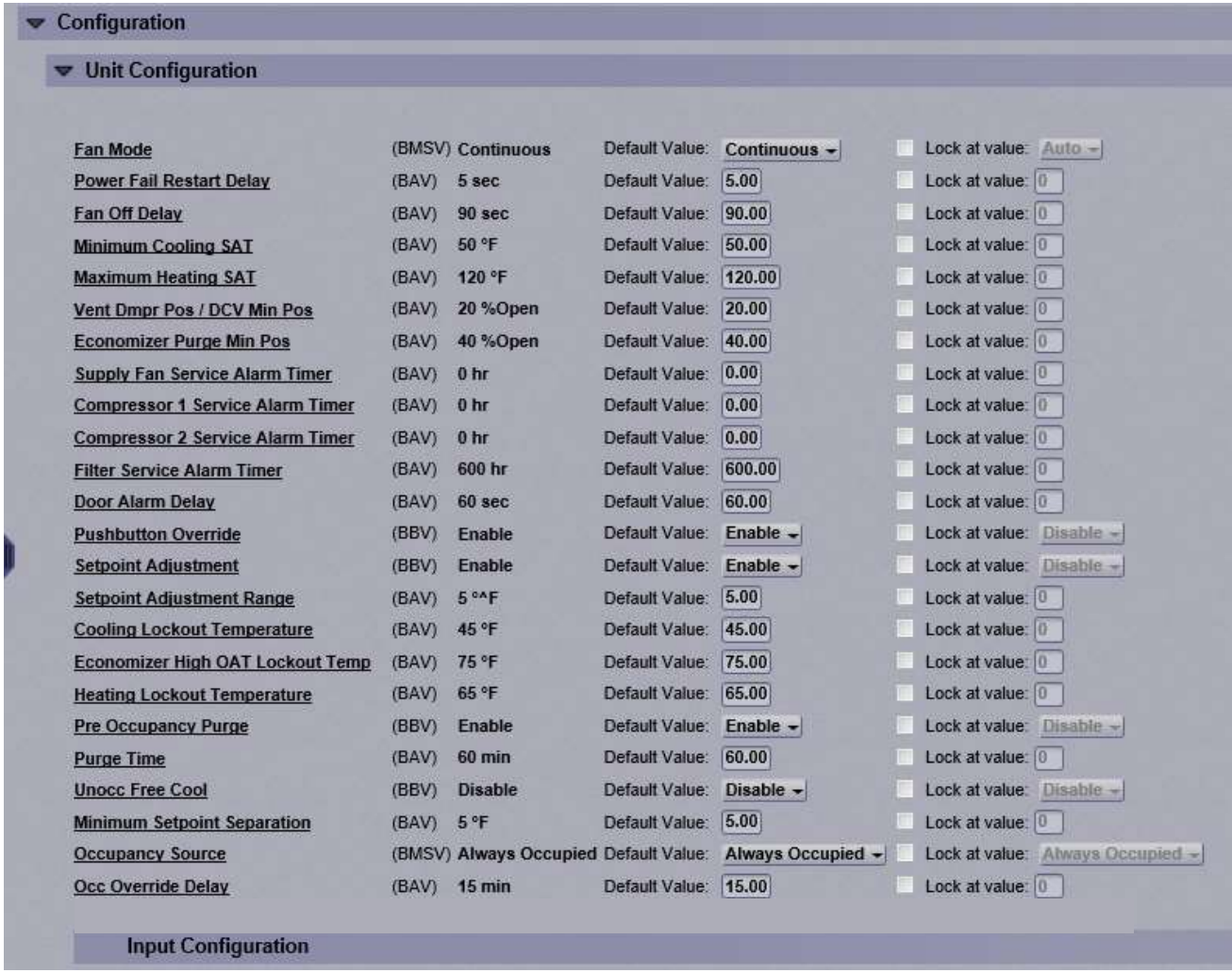
**Minimum Setpoint Separation**

**Occupancy Source**

- Always Occupied
- BACnet Schedule
- BAS On/Off
- Remote Occ Input

**Occ Override Delay**

When motion sensor used, this is the amount of time the equipment will remain occupied after motion is no longer sensed.



# Input Configuration

Properties/Configuration/Input Configuration

**Inputs 1 & 2**

- No Sensor (Default)
- IAQ Sensor
- OAQ Sensor
- Space RH Sensor

**Input 3 Function**

- Compressor Safety (Default)

**Input 5 Function**

- Fire Shutdown (Default)

**Input 8 Function**

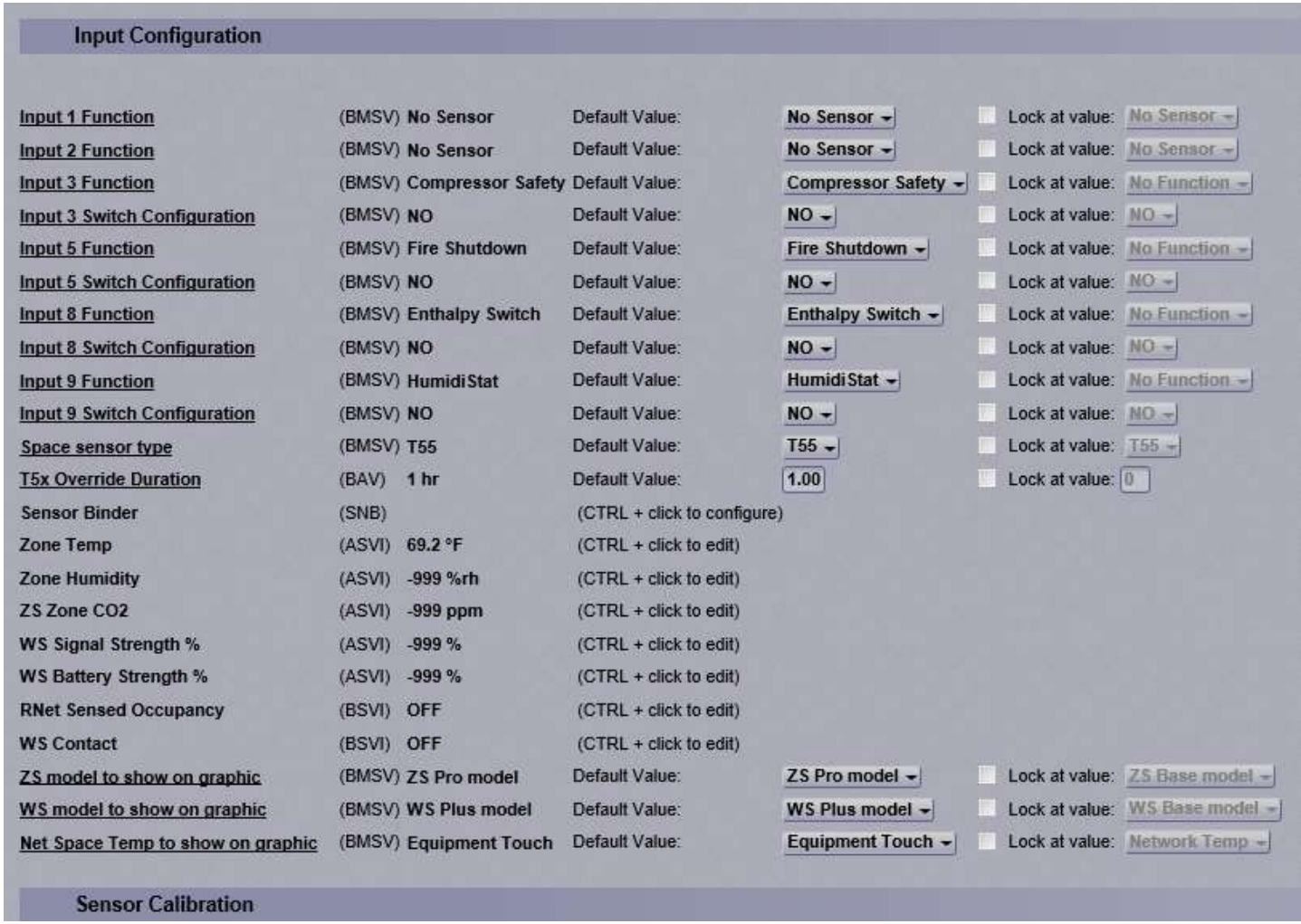
- Enthalpy Switch (Default)

**Input 9 Function**

- HumidiStat (Default)

**Input 3, 5, 8 & 9 Function**

- No Sensor
- Default
- Fan Status
- Filter Status
- Remote Occupancy
- Door Switch



# Input Configuration

Properties/Configuration/Input Configuration

**Space Sensor Type**

- T55
- T56
- SPT
- None
- ZS Sensor
- WS Sensor

**T5x Override Duration**

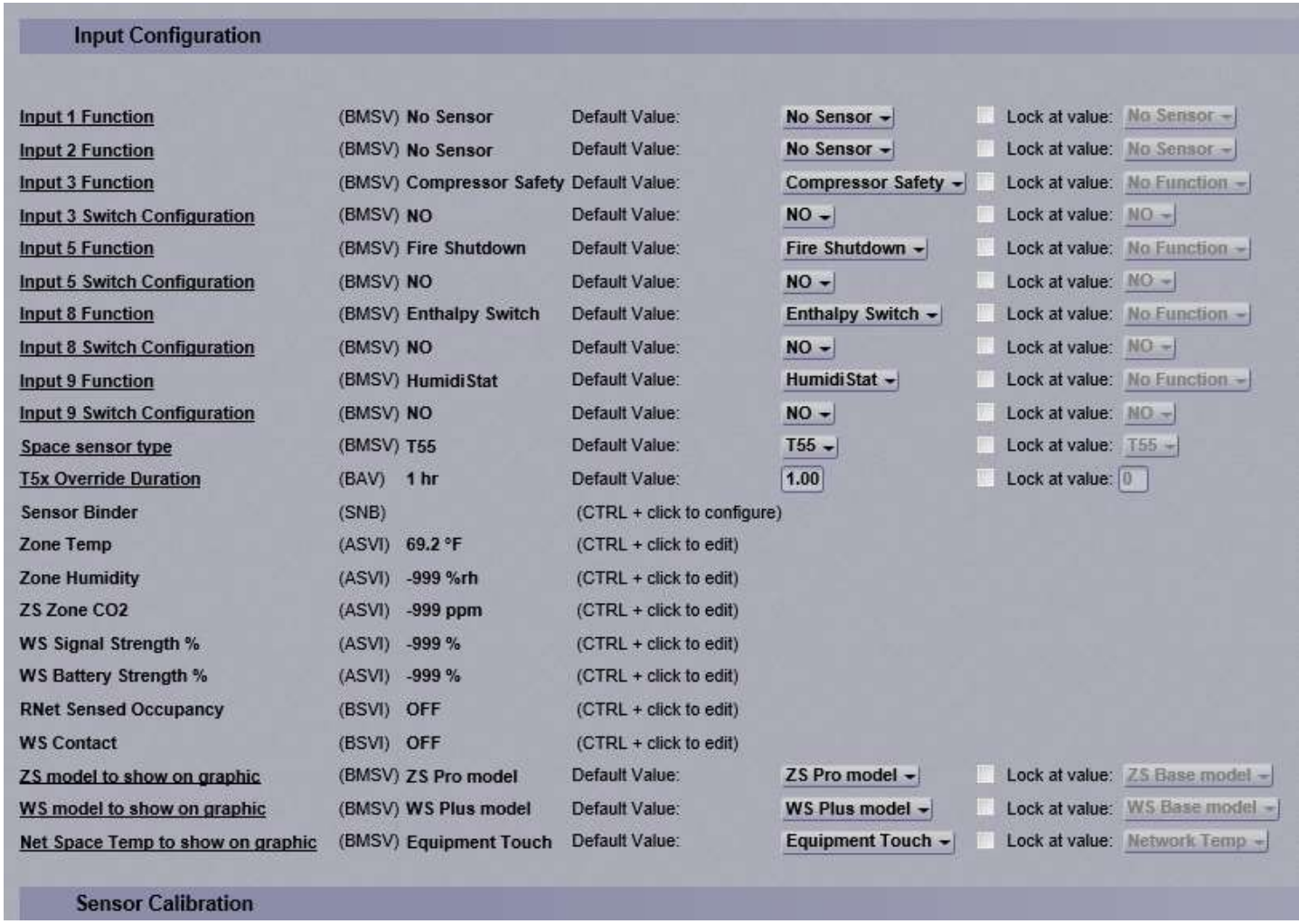
**ZS Sensor Binder**

Next Slide

**ZS model to show on graphic**

**WS model to show on graphic**

**Net Space Temp to show on graphic**



# ZS2 – Zone Sensors (Rnet)

**ZS Standard**


ZS2-CAR
ZS2-C-CAR
ZS2-H-CAR
ZS2-HC-CAR
ZS2-V-BNK
ZS2-HV-BNK

**ZS Plus**


ZS2PL-CAR
ZS2PL-C-CAR
ZS2PL-H-CAR
ZS2PL-HC-CAR
ZS2PL-V-BNK
ZS2-HV-BNK

**ZS Pro**


ZS2P-CAR
ZS2P-C-CAR
ZS2P-H-CAR
ZS2P-HC-CAR

**ZS Pro-M**


ZS2P-M-CAR
ZS2P-CM-CAR
ZS2P-HM-CAR
ZS2P-HCM-CAR

**ZS Pro-F**

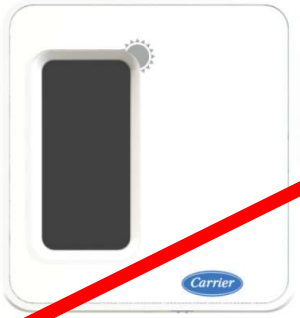

ZS2PF-CAR
ZS2PF-C-CAR
ZS2PF-H-CAR
ZS2PF-HC-CAR

# Wireless Sensors

RG-902 Wireless Adaptor

WS-ML-902 Wireless Motion & Lux Sensor


WS-THMDOF-C-902 Wireless Pro-F Sensor




WS2-T C-902 Wireless Standard Sensor


WS2-TO-C-902 Wireless Plus Sensor

WS-S-902 Wireless Door Window Sensor

# Sensor Network (Rnet)

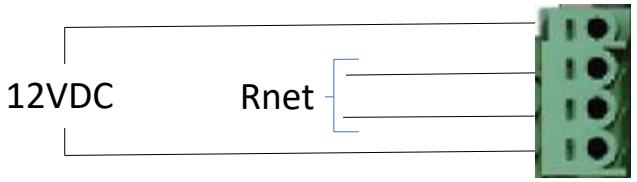
**Rnet wiring specifications**

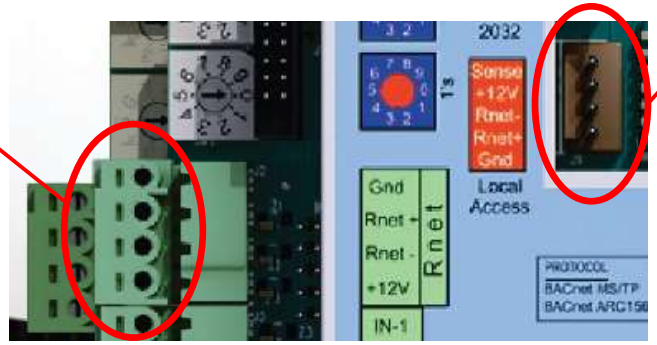
The Rnet communicates at a rate of 115 kbps and should be wired in a daisy-chain, star, or hybrid configuration.

**NOTE** Use the specified type of wire and cable for maximum signal integrity.

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

Rnet Connection
Connection for ZS and WS Wireless Sensors and for Equipment Touches



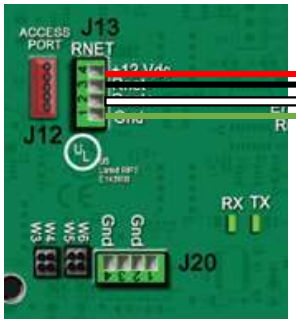




Brown Plug – Connection for USB-L Allows Access to Clip Files, Install Programs and to use Field Assistant

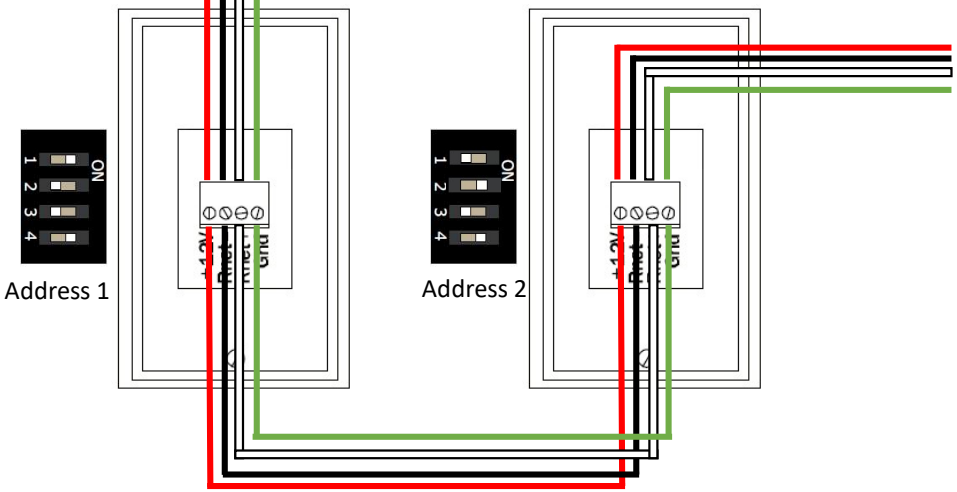
Can have as many as 5 sensors per program on Rnet.
PIC's have only one program. Can only have 5 sensors on its Rnet.
Programmable controllers can use three separate programs (if capable) for a total of 15 sensors on Rnet.

# Wiring ZS Sensors

RTU Open



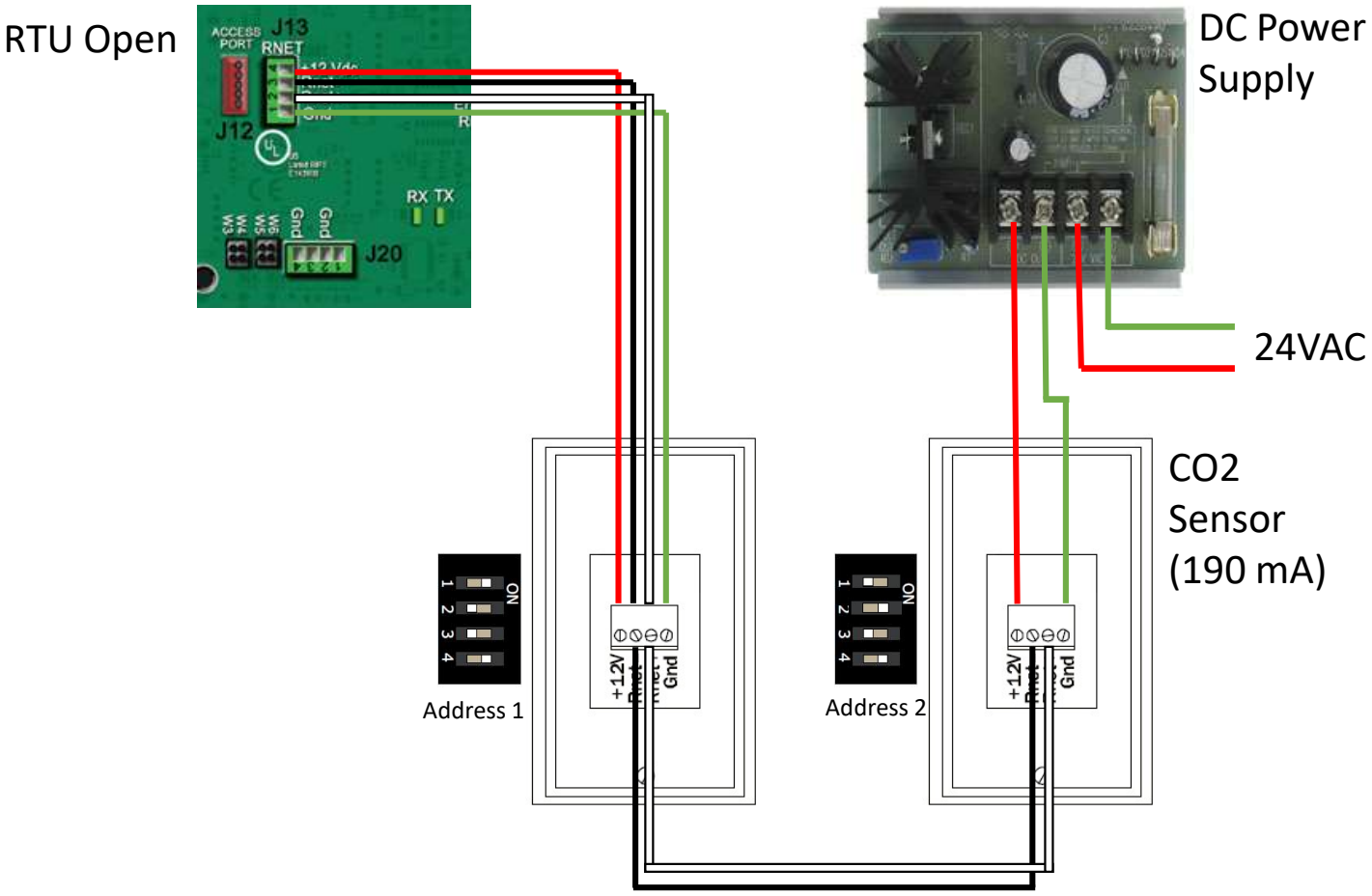





Up to 5 Total ZS Sensors
Must be addressed

# Wiring ZS Sensors Special Case

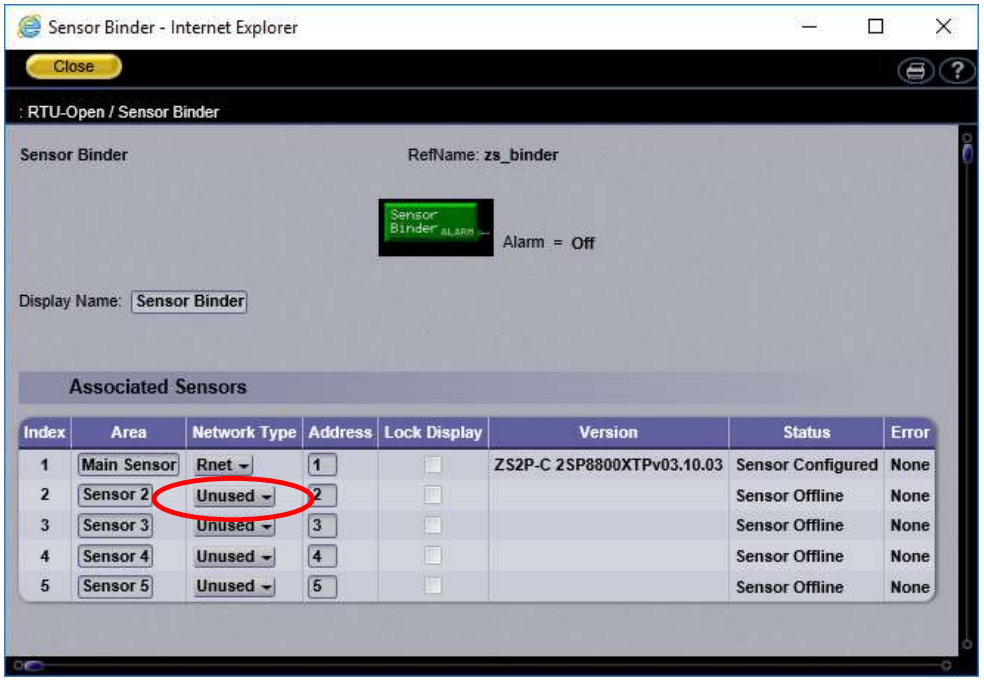
When using multiple sensors and any one of the sensors has a CO2 sensor

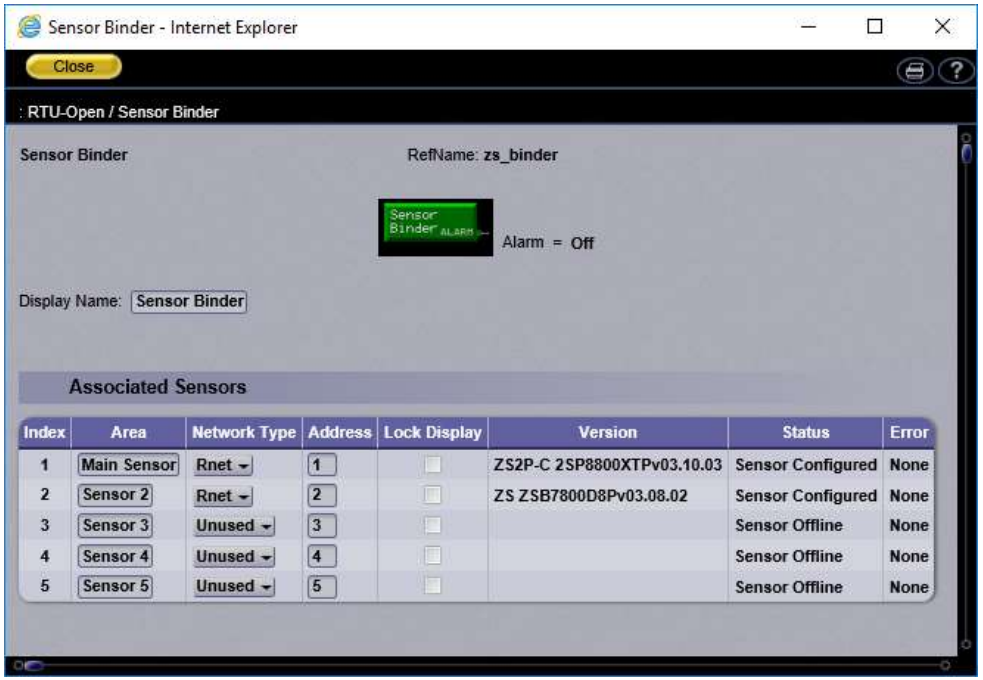


# Input Configuration – ZS Sensor

Properties/Configuration/Input Configuration

| | | | |
|---|---|---|---|
| Sensor Binder | (SNB) | | (CTRL + click to configure) |
| Zone Temp | (ASVI) | 74.2 °F | (CTRL + click to edit) |
| Zone Humidity | (ASVI) | -999 %rh | (CTRL + click to edit) |
| ZS Zone CO2 | (ASVI) | -999 ppm | (CTRL + click to edit) |
| WS Signal Strength % | (ASVI) | -999 % | (CTRL + click to edit) |
| WS Battery Strength % | (ASVI) | -999 % | (CTRL + click to edit) |
| RNet Sensed Occupancy | (BSVI) | OFF | (CTRL + click to edit) |
| WS Contact | (BSVI) | OFF | (CTRL + click to edit) |

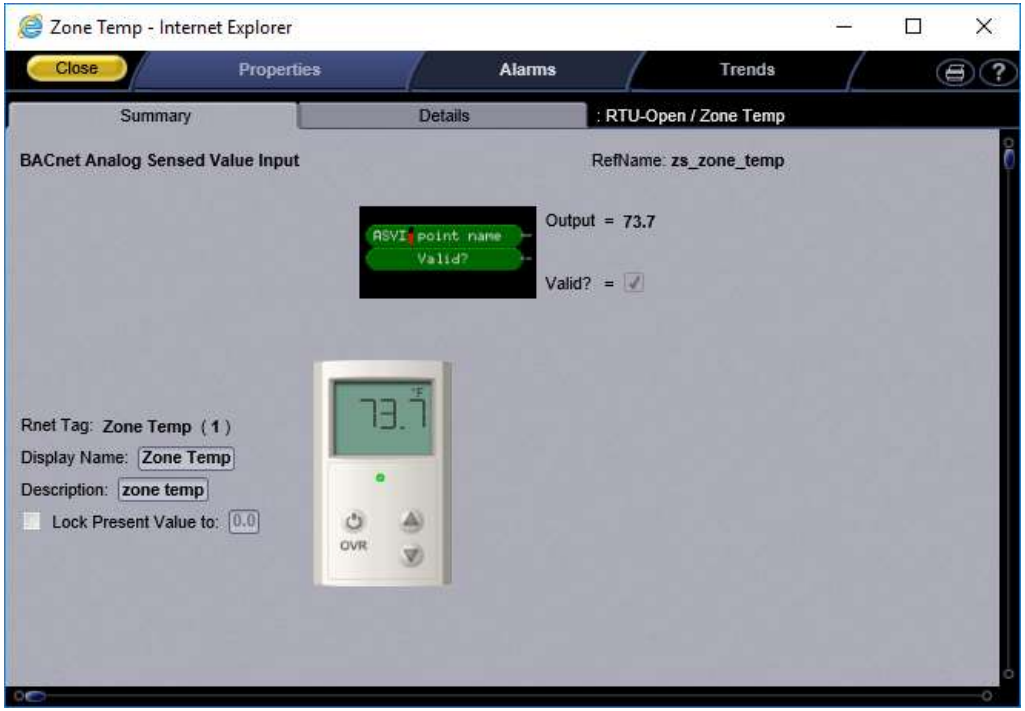


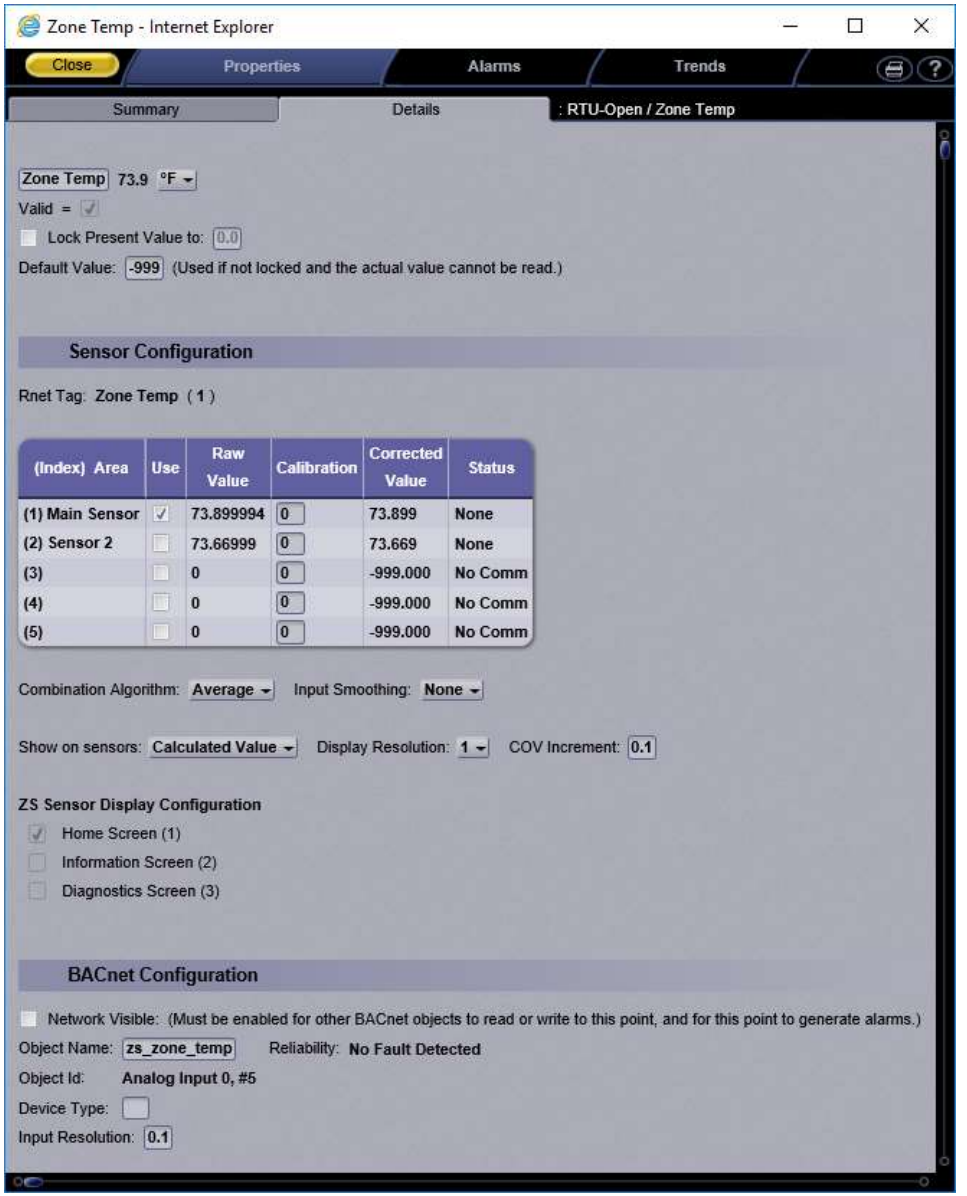



# Input Configuration – ZS Sensor

Properties/Configuration/Input Configuration

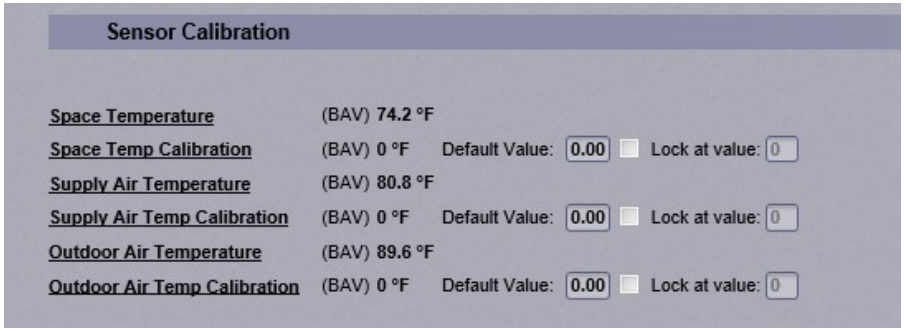
| | | | |
|---|---|---|---|
| Sensor Binder | (SNB) | | (CTRL + click to configure) |
| Zone Temp | (ASVI) | 74.2 °F | (CTRL + click to edit) |
| Zone Humidity | (ASVI) | -999 %rh | (CTRL + click to edit) |
| ZS Zone CO2 | (ASVI) | -999 ppm | (CTRL + click to edit) |
| WS Signal Strength % | (ASVI) | -999 % | (CTRL + click to edit) |
| WS Battery Strength % | (ASVI) | -999 % | (CTRL + click to edit) |
| RNet Sensed Occupancy | (BSVI) | OFF | (CTRL + click to edit) |
| WS Contact | (BSVI) | OFF | (CTRL + click to edit) |



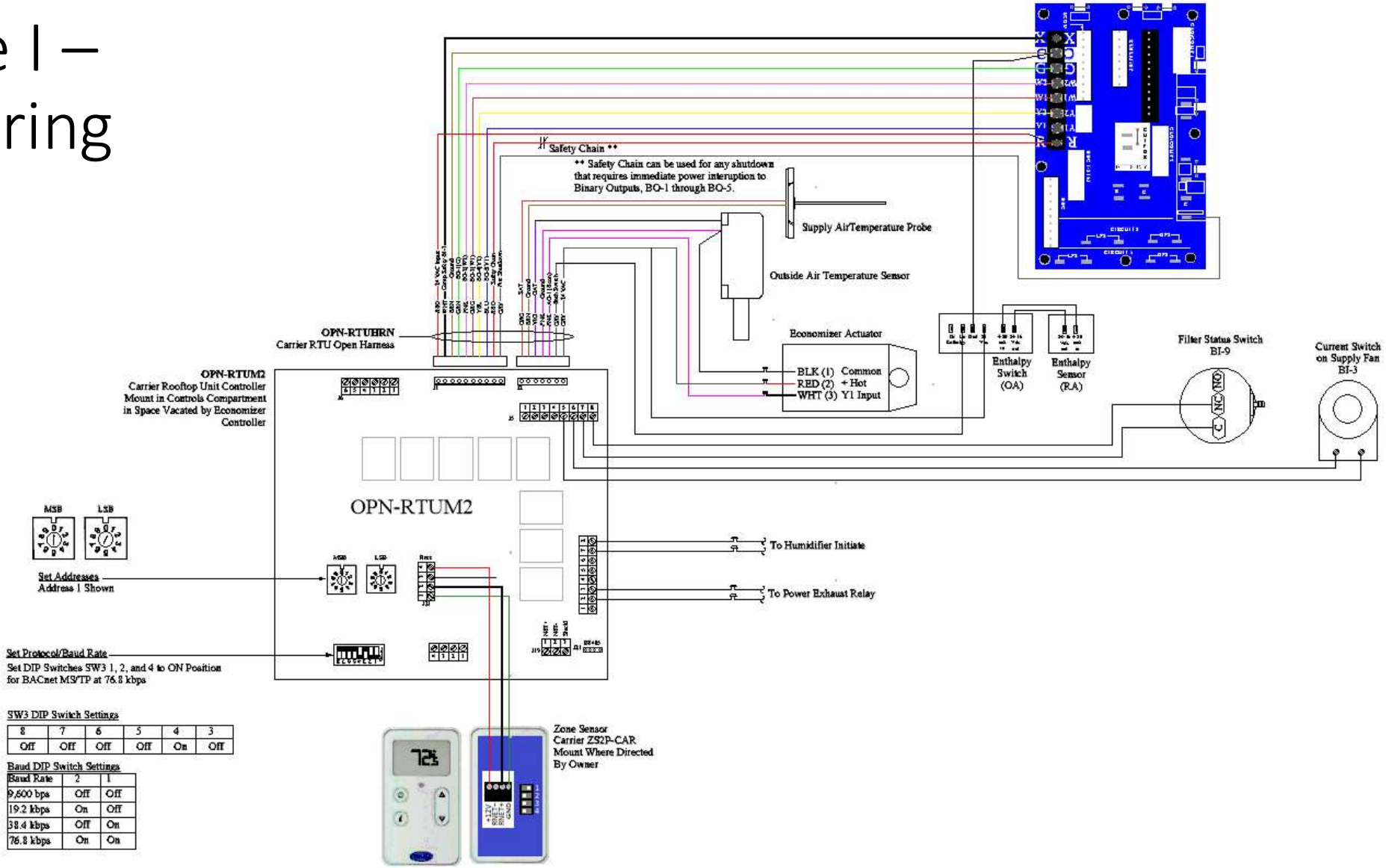
# Sensor Calibration

Properties/Configuration/Unit Configuration/Sensor Calibration




Allows you to calibrate temperature sensors

# Phase I – ZS Wiring




| 8 | 7 | 6 | 5 | 4 | 3 |
|---|---|---|---|---|---|
| Off | Off | Off | Off | On | Off |

| Baud Rate | 2 | 1 |
|---|---|---|
| 9,600 bps | Off | Off |
| 19.2 kbps | On | Off |
| 38.4 kbps | Off | On |
| 76.8 kbps | On | On |

# Setpoints

Properties/Configuration/Setpoints

Values

Occupied Setpoints

Unoccupied Setpoints

Click on bar you want to look at / change

**Optimal Start**

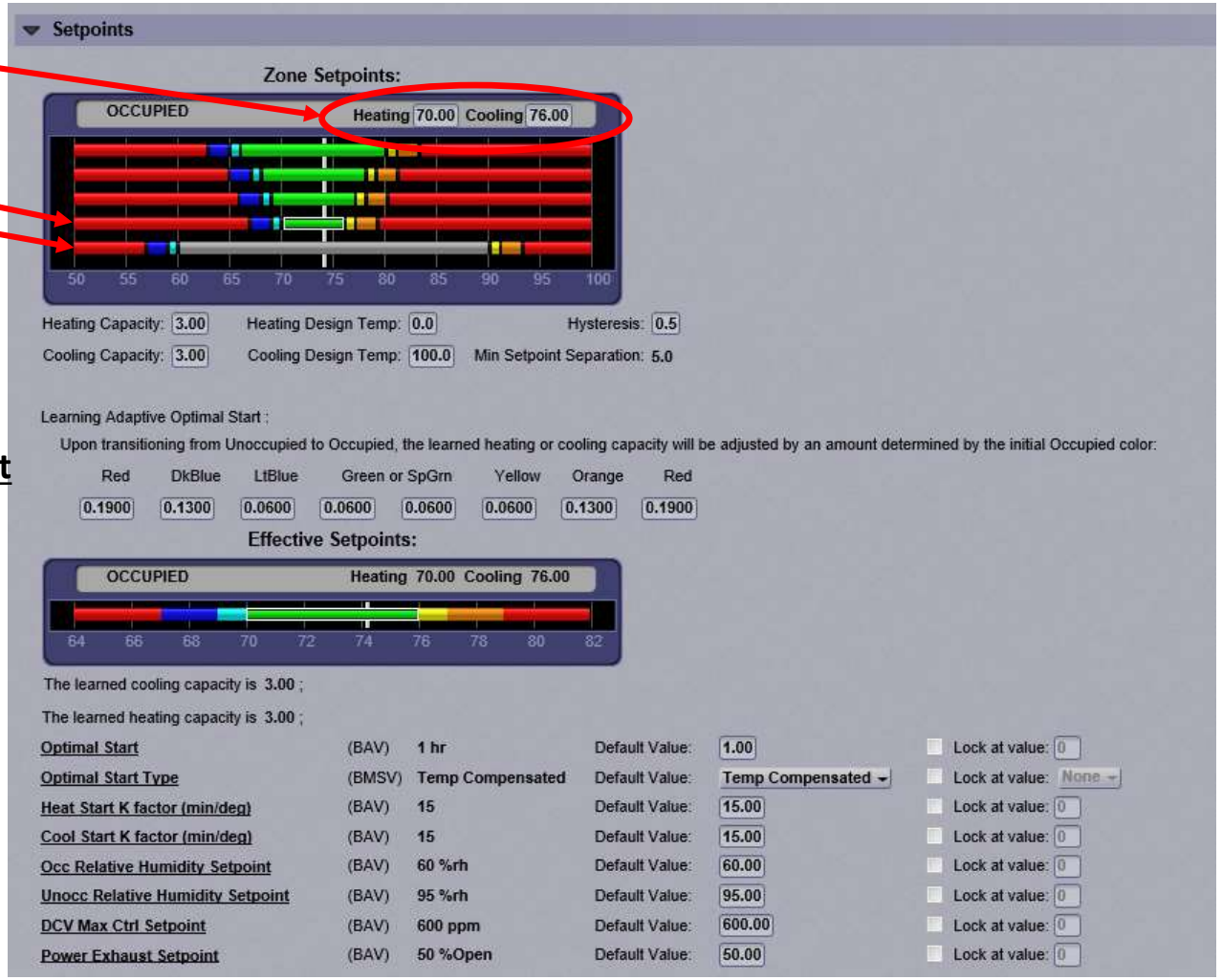
Next Slide

**Occupied/Unoccupied Relative Humidity Setpoint**

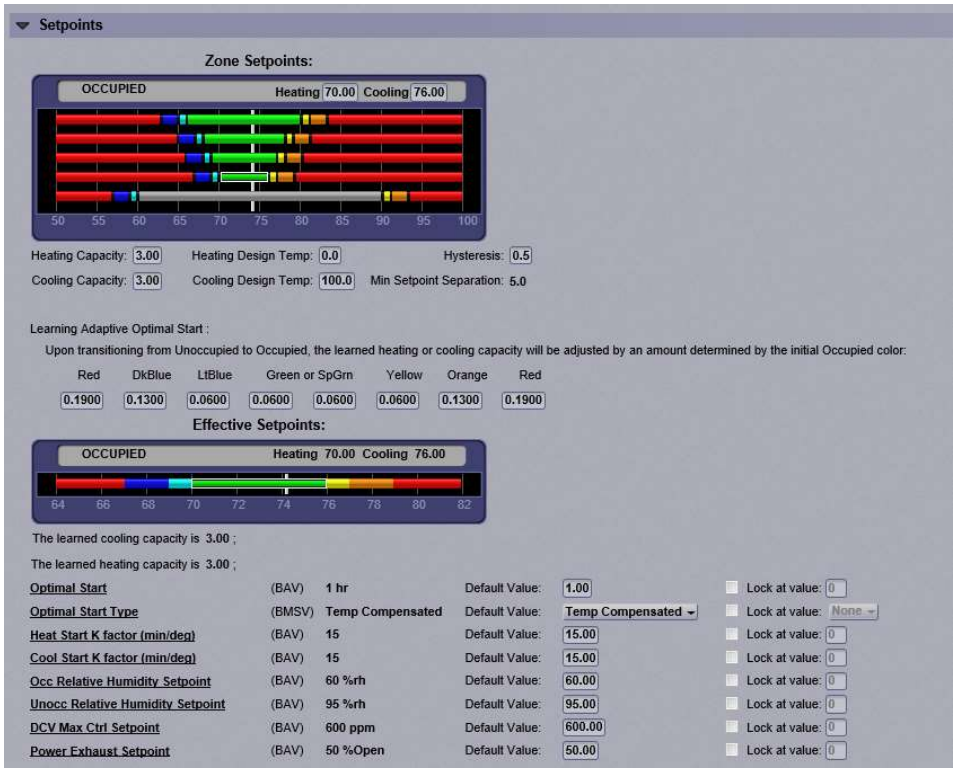
**DCV Max Ctrl Setpoint**

- Value is difference between Space/RA CO2 and OA CO2
- If no OA CO2 Sensor present will use default of 400 ppm
- On this screen setpoint would be 1000 ppm

**Power Exhaust Setpoint**



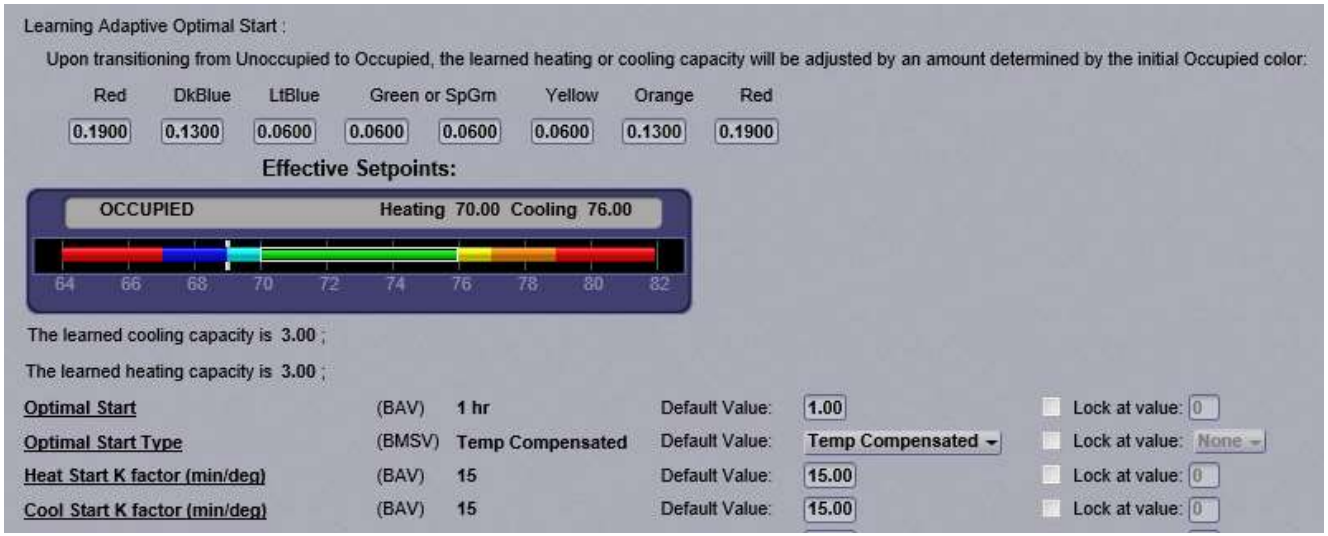
# Color Codes




| Color | | Condition |
|---|---|---|
| | **Green** | Temperature is within the Occupied Low and High Setpoint |
| | **Grey** | Temperature is within the Unoccupied Low and High Setpoint |
| | **Light Blue** | Temperature is less than 2°F below the Occupied Low Setpoint |
| | **Dark Blue** | Temperature is more than 2°F below the effective Low Setpoint but less than 4°F below the effective Low Setpoint |
| | **Yellow** | Temperature is less than 2°F above the effective High Setpoint |
| | **Orange** | Temperature is more than 2°F above the effective High Setpoint but less than 4°F above the effective High Setpoint |
| | **Red** | Temperature is more than 4°F above or below the effective setpoints |

# Optimal Start

Properties/Configuration/Setpoints




**Optimal Start**

Number of hours before occupancy that Optimal Start may begin

**Optimal Start Type**

- None
- Temp Compensated (Default)
- Learning Adaptive

**Heat Start K factor (min/deg)**
**Cool Start K factor (min/deg)** } TC Only

**None**

Unit will not change to occupied setpoints until the scheduled time. Setpoints do not ramp but change immediately

**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.

# Alarm Configuration

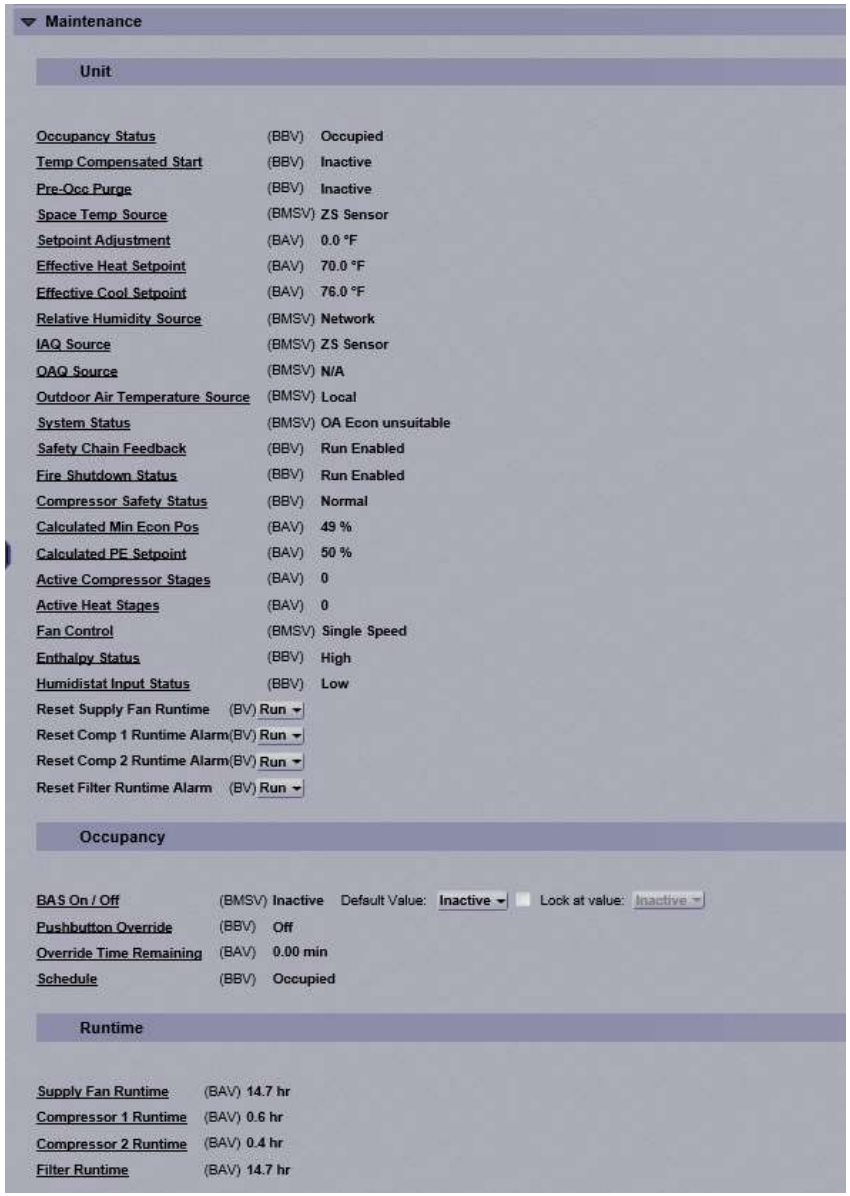
Properties/Control Program/Configuration/Alarm Configuration

- Can set up Space and Supply Air Temperature, Space Humidity and CO2 Alarms.
- Importance really depends on where alarm will be sent.
- Can set up what Alarms and Maintenance reminders can be seen on ZS Sensors.

# Maintenance

Properties/Control Program/Maintenance

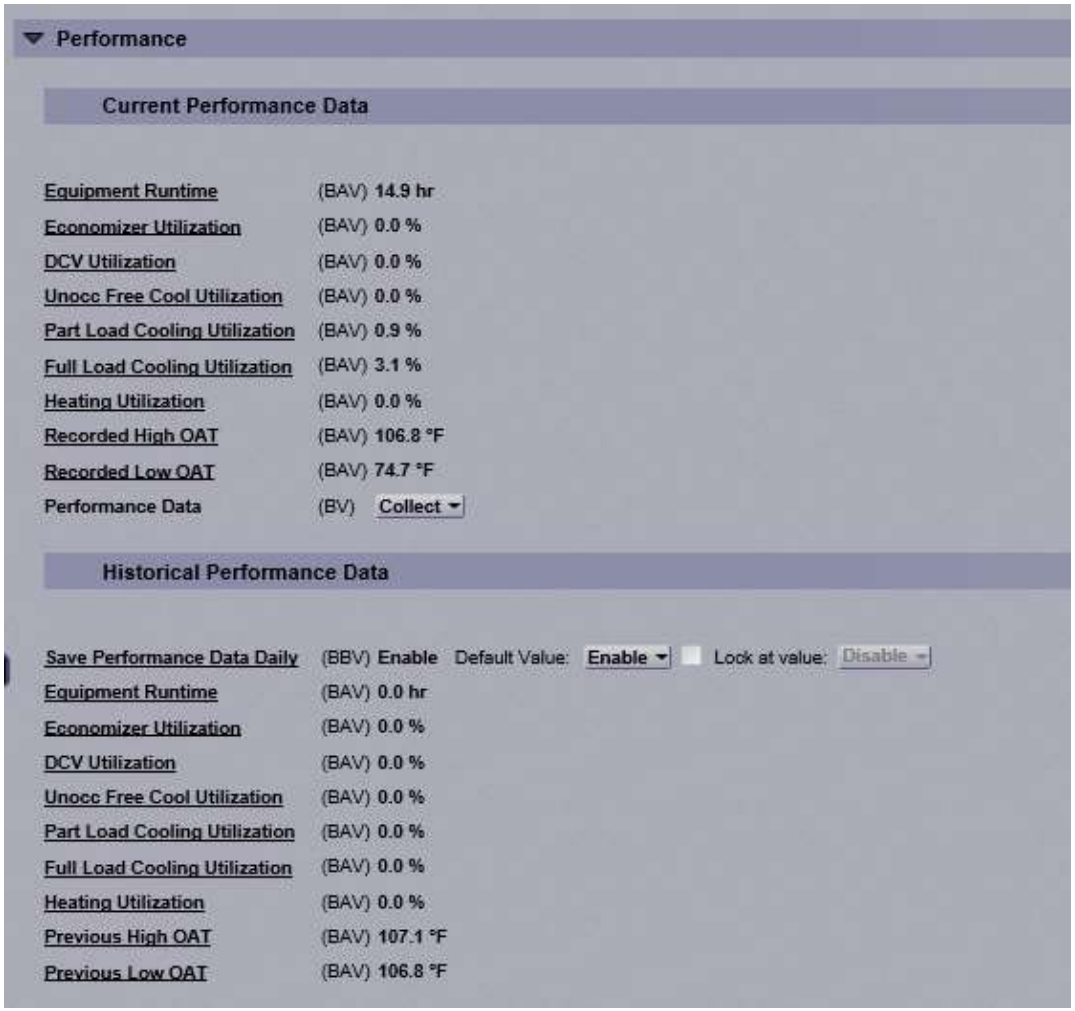
Allows you to look at system information.



# Performance

Properties/Control Program/Performance

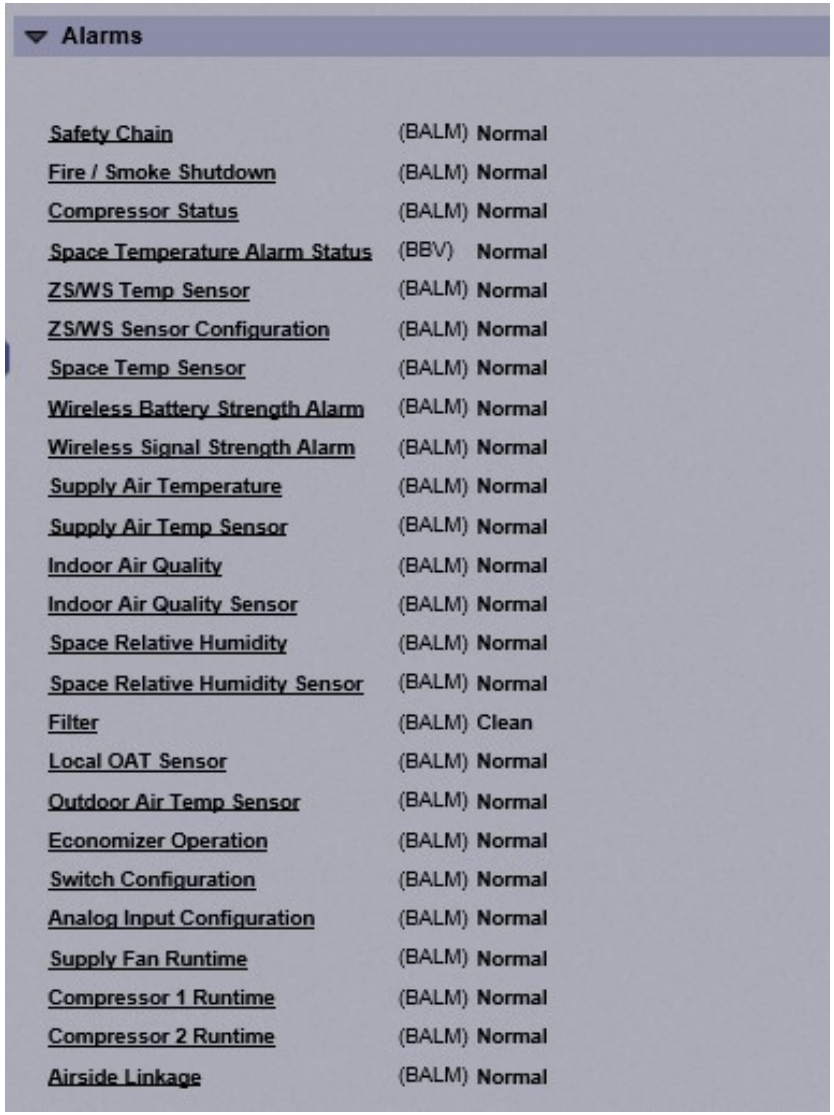
Gives current and historical performance information about the controller



# Alarms

Properties/Control Program/Alarms

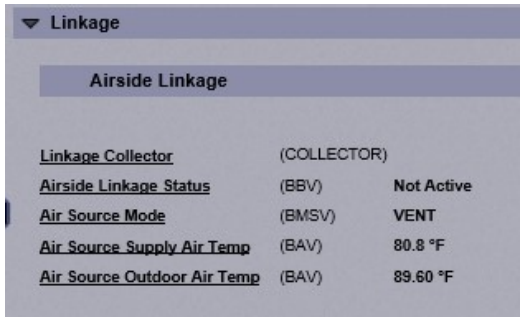
At a glance, you can see status of controller alarms



# Linkage

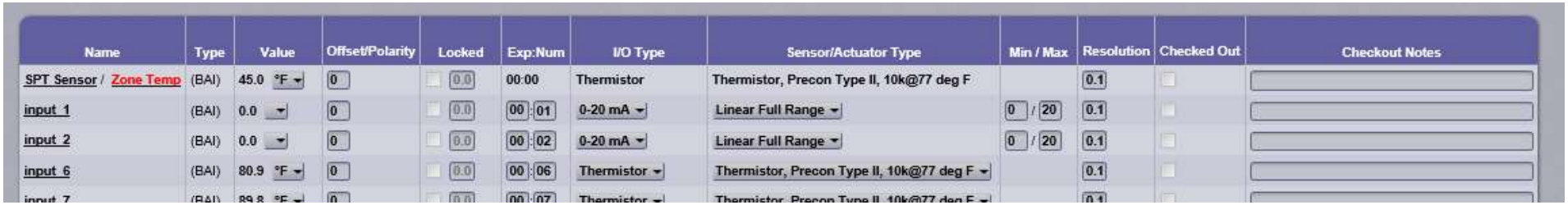
Properties/Control Program/Linkage

- Linkage involves zoning systems.
- Open VAV and VVT controllers can link with RTU Open to control RTU Open Equipment
- Linkage is set up at zone controller.



# Other Tabs under Properties Tab


**I/O Points** Allows I/O to be configured if necessary



| Name | Type | Value | Offset/Polarity | Locked | Exp:Num | I/O Type | Sensor/Actuator Type | Min / Max | Resolution | Checked Out | Checkout Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SPT Sensor / Zone Temp | (BAI) | 45.0 °F | 0 | 0.0 | 00:00 | Thermistor | Thermistor, Precon Type II, 10k@77 deg F | | 0.1 | | |
| input_1 | (BAI) | 0.0 | 0 | 0.0 | 00:01 | 0-20 mA | Linear Full Range | 0 / 20 | 0.1 | | |
| input_2 | (BAI) | 0.0 | 0 | 0.0 | 00:02 | 0-20 mA | Linear Full Range | 0 / 20 | 0.1 | | |
| input_6 | (BAI) | 80.9 °F | 0 | 0.0 | 00:06 | Thermistor | Thermistor, Precon Type II, 10k@77 deg F | | 0.1 | | |
| input_7 | (BAI) | 89.8 °F | 0 | 0.0 | 00:07 | Thermistor | Thermistor, Precon Type II, 10k@77 deg F | | 0.1 | | |

**Alarm Sources** Allows you to set up alarm priority, where it's sent, if it needs acknowledgement

**Trend Sources** Allows you to set up configure points for trending; how often data sampled, COV

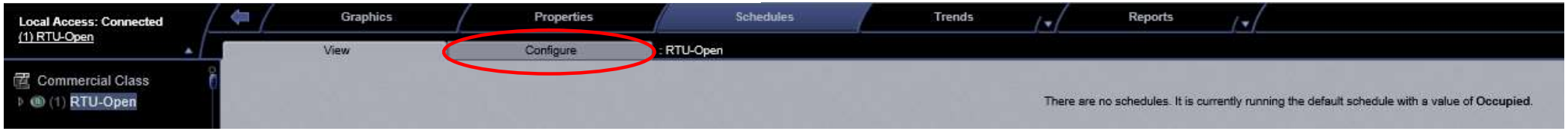
**Network Points** Allows you to configure System Network points

**BACnet Objects** Lists all points with BACnet addresses / visibility

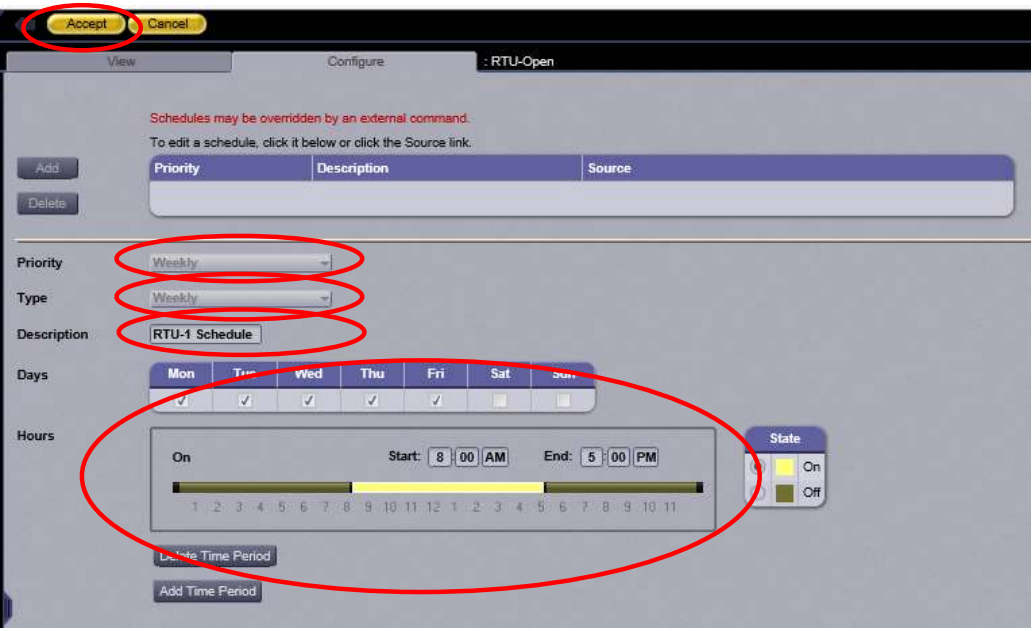
**Rnet Points** Allows you to see all Rnet points

**Protocol Mapping** Same as BACnet Objects for N2, Modbus and LON

# Schedules

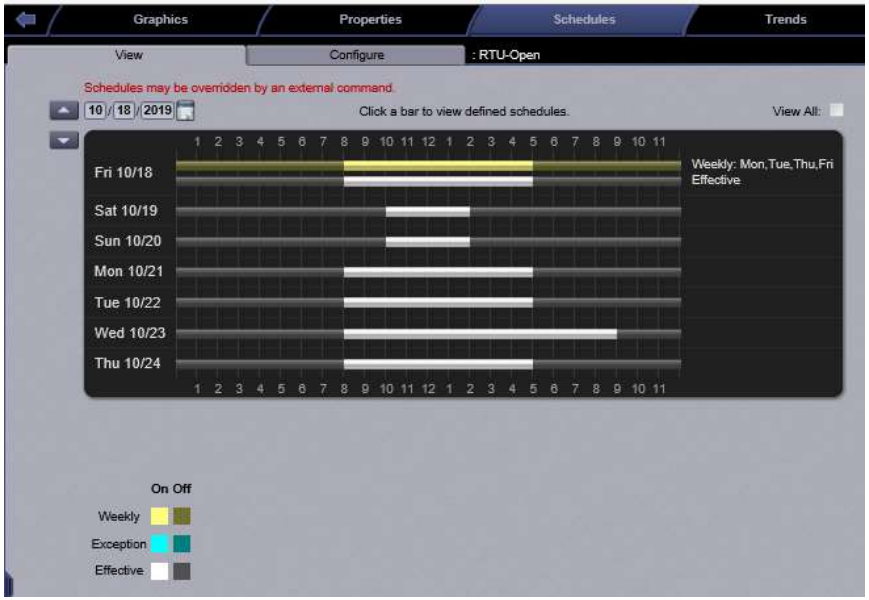

Local Access: Connected
(1) RTU-Open
Graphics
Properties
Schedules
Trends
Reports
View
Configure
: RTU-Open
Commercial Class
(1) RTU-Open
There are no schedules. It is currently running the default schedule with a value of Occupied.


View
Configure
: RTU-Open
Schedules may be overridden by an external command.
To edit a schedule, click it below or click the Source link.
Add
Delete
Priority
Description
Source


Accept
Cancel
View
Configure
: RTU-Open
Schedules may be overridden by an external command.
To edit a schedule, click it below or click the Source link.
Add
Delete
Priority
Description
Source
Priority
Weekly
Type
Weekly
Description
RTU-1 Schedule
Days
Mon
Wed
Thu
Fri
Sat
Hours
On
Start: 8 00 AM
End: 5 00 PM
State
On
Off
Add Time Period


View
Configure
: RTU-Open
Schedules may be overridden by an external command.
10 / 18 / 2019
Click a bar to view defined schedules.
View All:
Fri 10/18
Sat 10/19
Sun 10/20
Mon 10/21
Tue 10/22
Wed 10/23
Thu 10/24
Weekly: Mon,Tue,Thu,Fri
Effective
On Off
Weekly
Exception
Effective

# Schedules

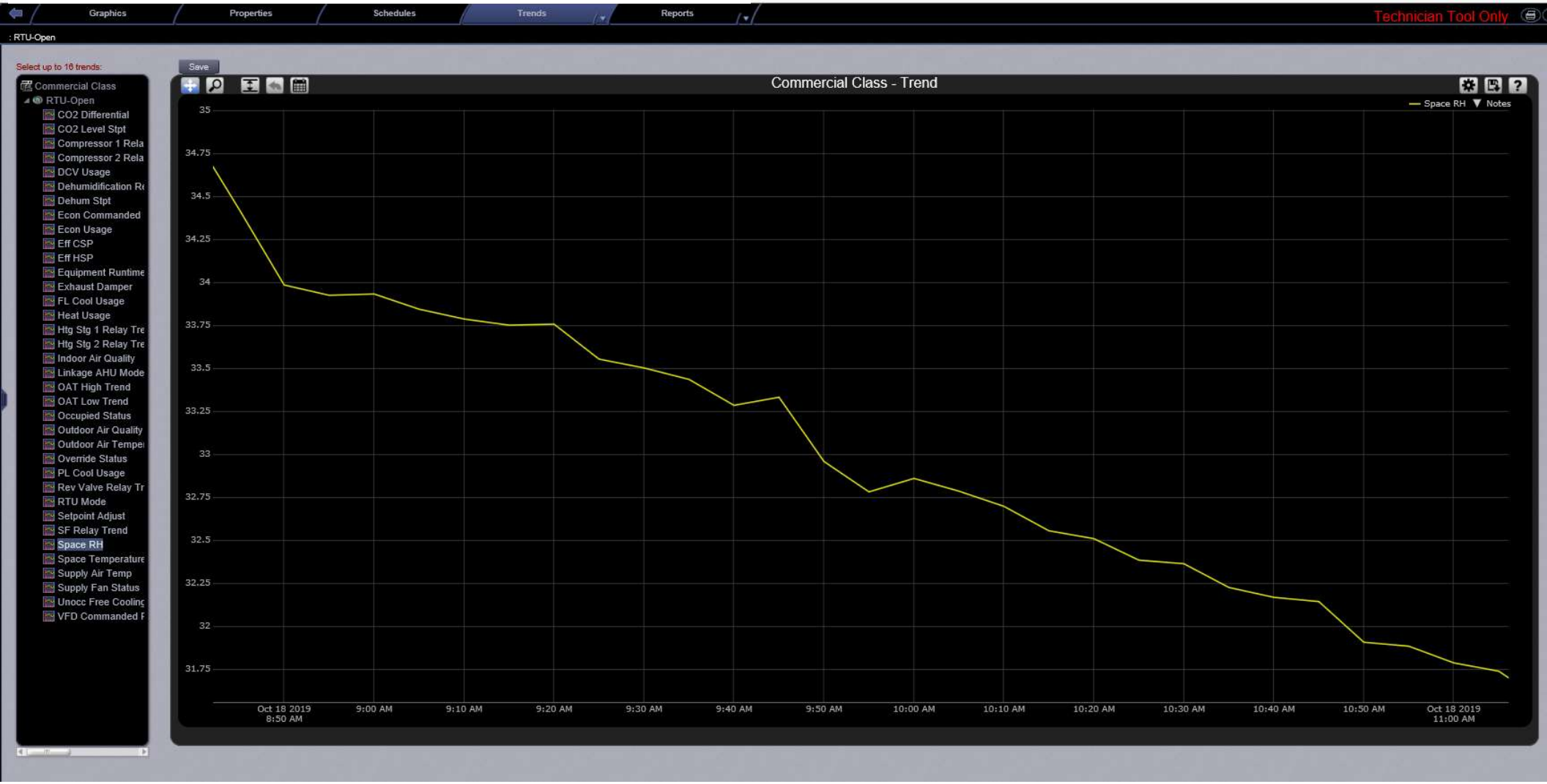



Weekly Schedules can be add on top of one another.

This Schedule is the same except we added separate weekly schedules to allow system to remain occupied until 9 PM on Wednesday and a separate schedule to occupy equipment from 10 AM until 2 PM on Saturday and Sunday

Schedules can be added as exceptions to weekly schedule based on a Date, a range of Dates, or Wildcards

# Trends


Graphics
Properties
Schedules
Trends
Reports
Technician Tool Only
: RTU-Open
Select up to 16 trends:
Save
Commercial Class
RTU-Open
CO2 Differential
CO2 Level Stpt
Compressor 1 Rela
Compressor 2 Rela
DCV Usage
Dehumidification R
Dehum Stpt
Econ Commanded
Econ Usage
Eff CSP
Eff HSP
Equipment Runtime
Exhaust Damper
FL Cool Usage
Heat Usage
Htg Stg 1 Relay Tre
Htg Stg 2 Relay Tre
Indoor Air Quality
Linkage AHU Mode
OAT High Trend
OAT Low Trend
Occupied Status
Outdoor Air Quality
Outdoor Air Tempe
Override Status
PL Cool Usage
Rev Valve Relay Tr
RTU Mode
Setpoint Adjust
SF Relay Trend
Space RH
Space Temperature
Supply Air Temp
Supply Fan Status
Unocc Free Cooling
VFD Commanded F
Commercial Class - Trend
Space RH
Notes
35
34.75
34.5
34.25
34
33.75
33.5
33.25
33
32.75
32.5
32.25
32
31.75
Oct 18 2019
8:50 AM
9:00 AM
9:10 AM
9:20 AM
9:30 AM
9:40 AM
9:50 AM
10:00 AM
10:10 AM
10:20 AM
10:30 AM
10:40 AM
10:50 AM
Oct 18 2019
11:00 AM

# Reports


Graphics
Properties
Schedules
Trends
Reports
Technician Tool Only
View
Options
: RTU-Open : Equipment / Locked Values
Run
Save report as:
PDF
XLS
CSV
Locked Values
Location: Box 4 / New / RTU-Open
Run Date: 10/18/2019 1:16:36 PM
Location
Control Program
Name
Locked Value
/Box 4/New
RTU-Open
input_6
75.0 °F
Zone Temp
72 °F

# Documentation

Carrier
CONTROLS EXPERT

## Commissioning Sheet

i-Vu

| Project Information | | | |
|---|---|---|---|
| Name: | | | |
| Address: | | | |
| City/State/Zip: | | | |
| Project #: | | IP Address: | |

| Technician | Date | Total Hrs |
|---|---|---|
| | | |

| Unitary Type | | Device Type |
|---|---|---|
| Cooling Type | None | RTU-Open |
| Heating Type | None | Version |
| Suplimental Heat Type | None | 20100409 |

| Room Sensor | | Temp Sensors | | Safeties | |
|---|---|---|---|---|---|
| **Type** | | **Outdoor Air Sensor** | | **Fan Status** | |
| Verified | | Reading | | Verified | |
| Calibrated | | **Supply Air Sensor** | | **Fire Shutdown** | |
| Override | | Reading | | Verified | |
| Display | | **Return Air Sensor** | | **Safety Chain Input** | |
| Sen Offset | | Reading | | Verified | |
| **Indoor RH** | | **Space Sensor** | | | |
| Reading | | Reading | | Verified | |
| Setpoint | | Other | | Other Sensors | |
| **Indoor CO2** | | **Filter Status** | | **Enthalpy** | |
| Reading | | Verified | | Reading | |
| Setpoint | | **Remote Occupancy** | | **Duct Pressure** | |
| **Outdoor CO2** | | Verified | | Reading | |
| Reading | | **Door Contact** | | **Enthalpy** | |
| Setpoint | | Verified | | Reading | |

General Notes / Punch List:

| Unitary Information | | | |
|---|---|---|---|
| Brand: | TRANE | | |
| Model#: | | | |
| Serial#: | | | |
| Unit Tag#: | | Volts/Phase: | |

| Baud Rate | Dip Switch Address | Protocol |
|---|---|---|
| | | |

| Device Number | | | |
|---|---|---|---|
| | | | |

| Set points | | | |
|---|---|---|---|
| Occupied Heating | | Occupied Relative Humidity | |
| Occupied Cooling | | UnOccupied Relative Humidity | |
| UnOccupied Heating | | DCV Max Control Setpoint | |
| UnOccupied Cooling | | Power Exhaust Setpoint | |
| Setpoint Adjust | | Optimal Start Time | |

| Time Schedules | | |
|---|---|---|
| From | To | DOW |
| | | M T W Th F S Su H |
| | | M T W Th F S Su H |

| Equipment Verification | | | | |
|---|---|---|---|---|
| **Fan** | **Locked** | **Verified** | **Locked** | **Verified** |
| | | | | |
| **Cooling** | Setpoint: | | SAT Temp: | |
| | | | Verified? | |
| **Heating** | Setpoint: | | SAT Temp: | |
| | | | Verified? | |
| **Economizer** | **Locked** | **Verified** | **Locked** | **Verified** |
| | 100% | | 20% | |
| **Power Exhaust** | **Selected** | **Working** | | |
| | | | | |

# Touch Interfaces

Allow for Configuration, Scheduling, Setting Setpoints, Viewing Alarms and Some Trending


Equipment Touch

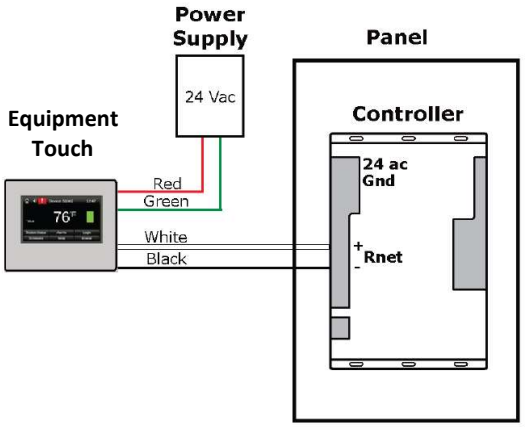

System Touch

# Touch Interfaces

Allow for Configuration, Scheduling, Setting Setpoints, Viewing Alarms and Some Trending


Equipment Touch

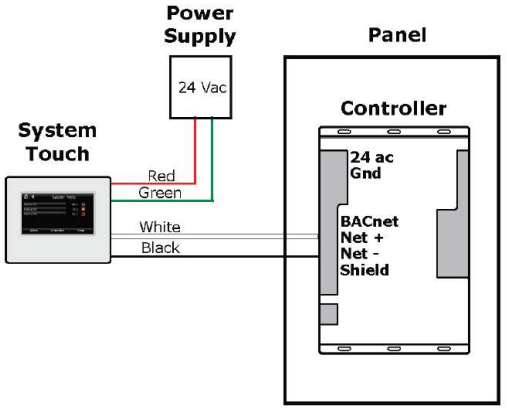
- Interfaces with one controller
- Has on-board Temperature and Humidity Sensors
- Sits on Rnet Sensor Bus





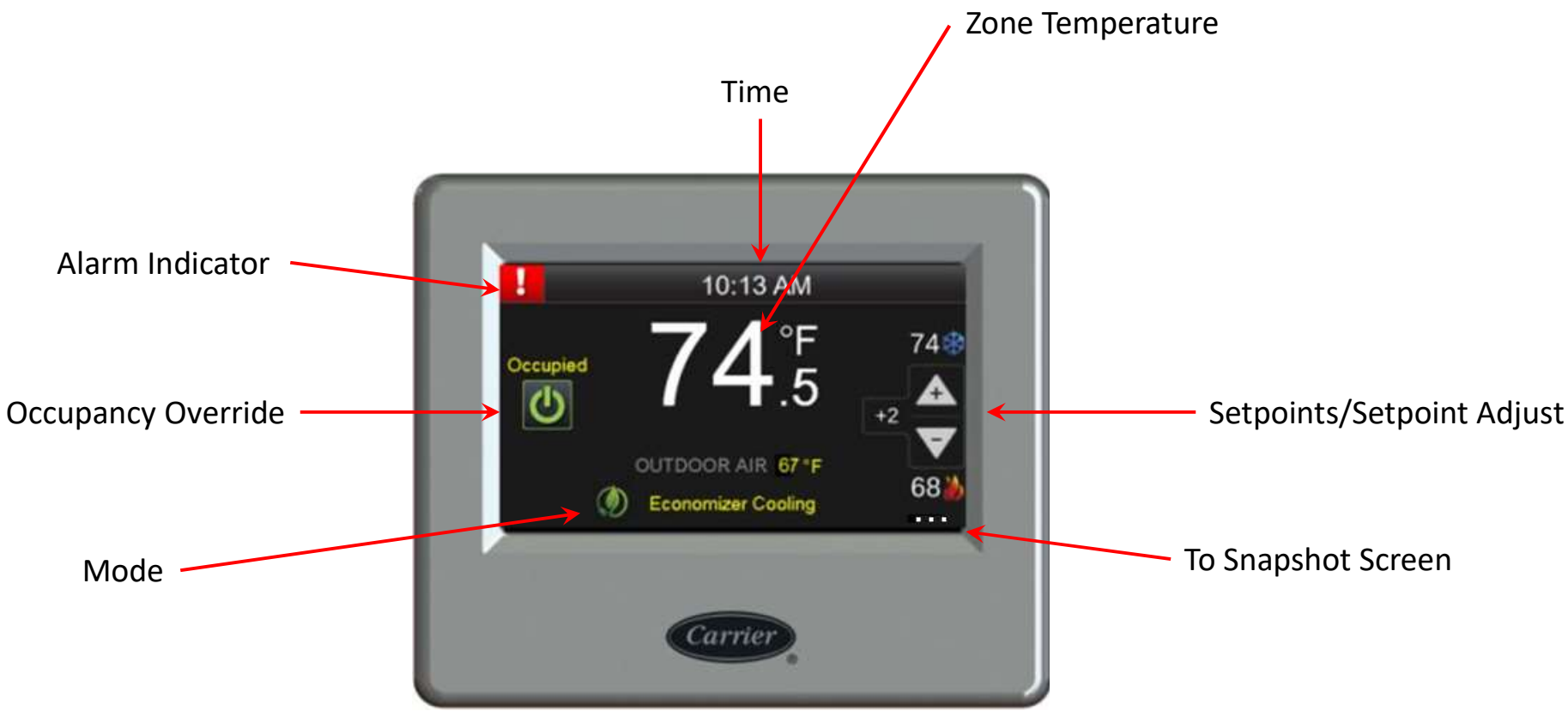
System Touch

- Interfaces with all controllers on Network (actually works best with ~ 10 controllers)
- Has on-board Temperature and Humidity Sensors
- Sits on MS/TP Communications Bus



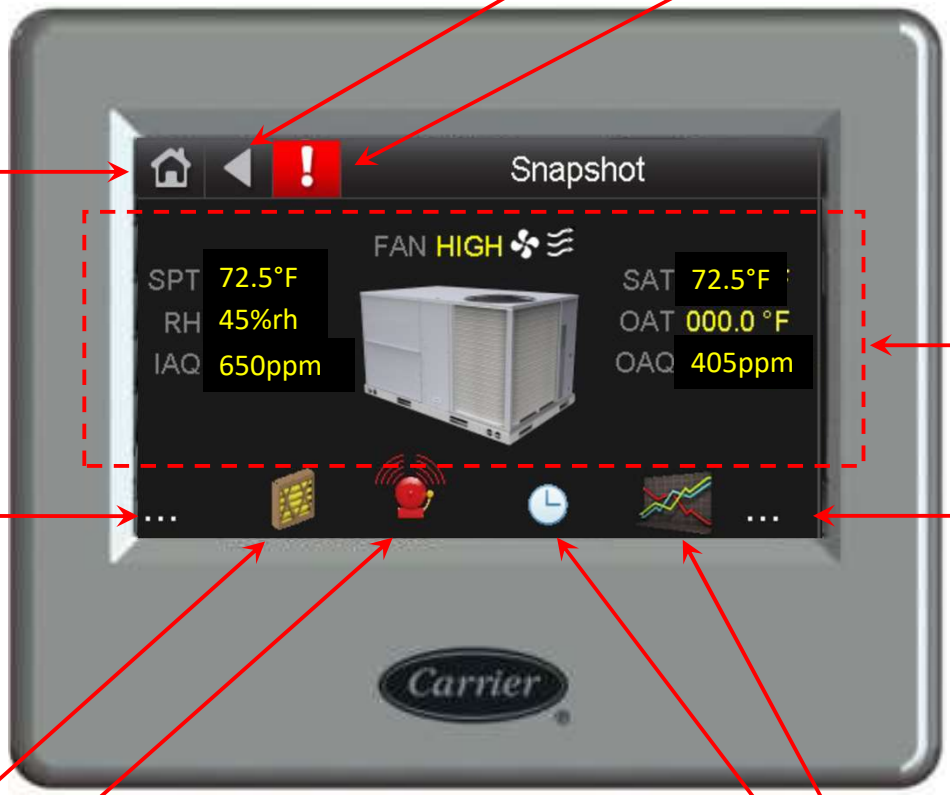
# Equipment Touch

Home Screen



# Touch Interfaces

## Snapshot Screen




To Previous Screen

Alarms

To Home Screen

Unit Information
What is shown, can be configured

Back To Home Screen

To RTU Properties Menu Screen

Filter Status

Alarm Status

Trends

Schedules

# Touch Interfaces

## RTU Properties Menu


Login with the password:

admin

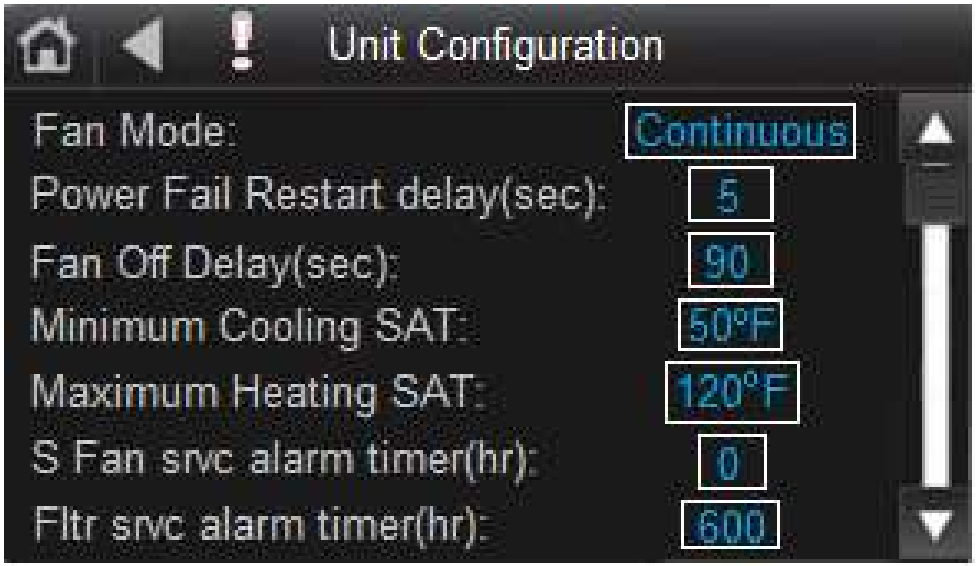
# Touch Interfaces

## RTU Properties Menu


- Status
- Unit Configuration
- Setpoints
- Alarm Configuration
- Maintenance
- Performance
- Alarms
- Startup Wizard
- ET Show/Hide Config
- ET System
- Touchscreen Setup

# Touch Interfaces

## Unit Configuration Menu





- Fan Mode
- Power Fail Restart Delay
- Fan Off Delay
- Minimum Cooling SAT
- Maximum Cooling SAT
- S Fan srvc alarm timer
- Fltr srvc alarm timer
- Pushbutton Override:
- Setpoint Adjustment
- Setpt Adj Range
- Cooling Lockout Temp
- Preoccupancy Purge
- Purge Time
- Unocc Free Cool

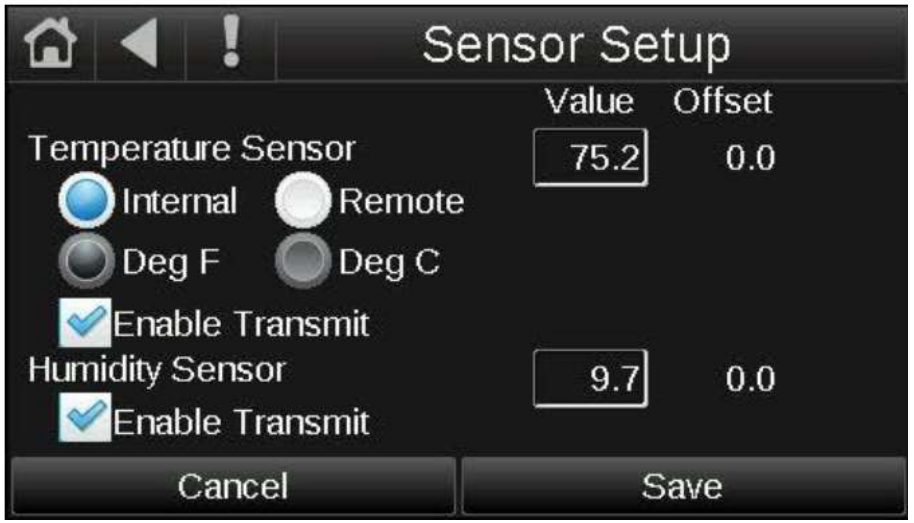
# Touch Interfaces

## Start Up Wizard Menu

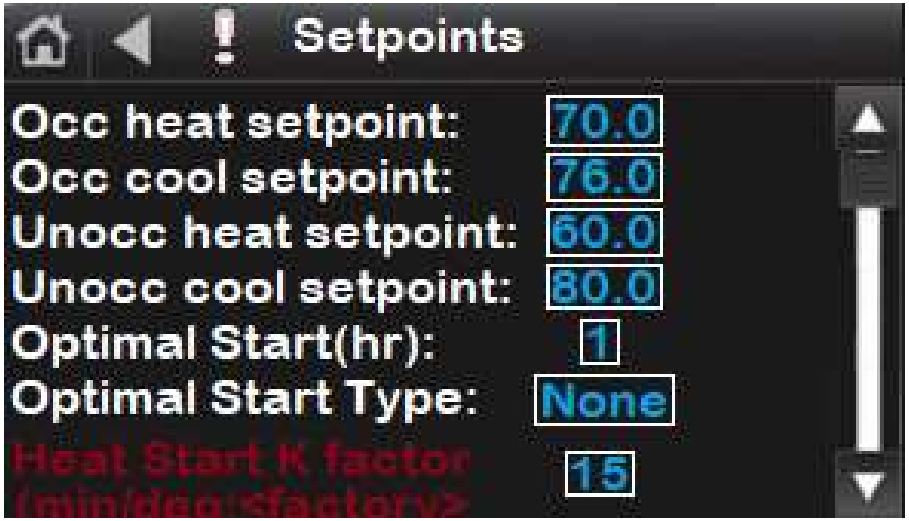

Indication that more info is available

- Unit Type
- Heat Type
- Heat Stages
- Compressor Stages
- Fan Control
- Economizer Exists
- Economizer High OAT Lockout Temp
- Vent Dmpr Pos / DCV Min Pos
- Economizer Purge Min Pos
- Low Fan Econ Min Pos
- Space Sensor Type
- RH Control
- DCV Control
- DCV Max Damper Pos
- Reversing Valve Output
- HP Rev Cycle Lockout Temp
- Occupancy Source
- Input 1 Function
- Input 2 Function
- Input 3 Function
- Input 5 Function
- Input 5 Switch Config
- Input 8 Function
- Input 9 Function

# Using Onboard Sensors

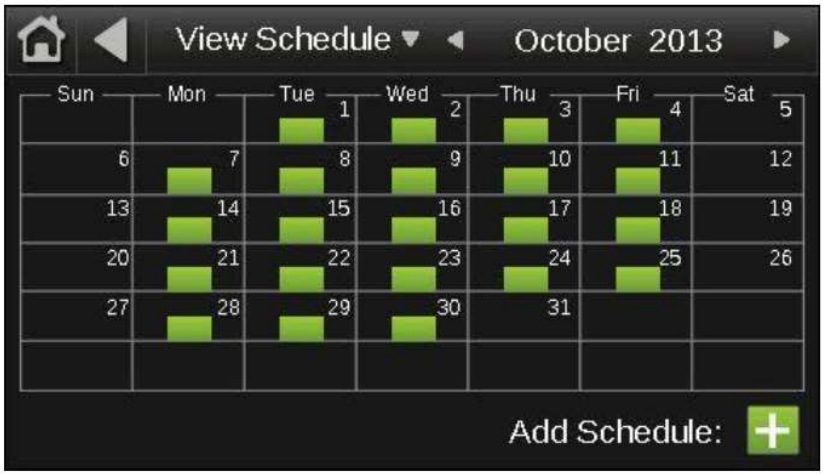



# Setpoints




- Occ heat setpoint
- Occ cool setpoint
- Unocc heat setpoint
- Unocc cool setpoint
- Optimal Start(hr)
- Heat Start K factor (min/deg)<factory>
- Cool Start K factor (min/deg)<factory>
- Occ Relative Humidity Setpoint
- Unocc Relative Humidity Setpoint
- DCV Max Ctrl Setpoint

# Schedules



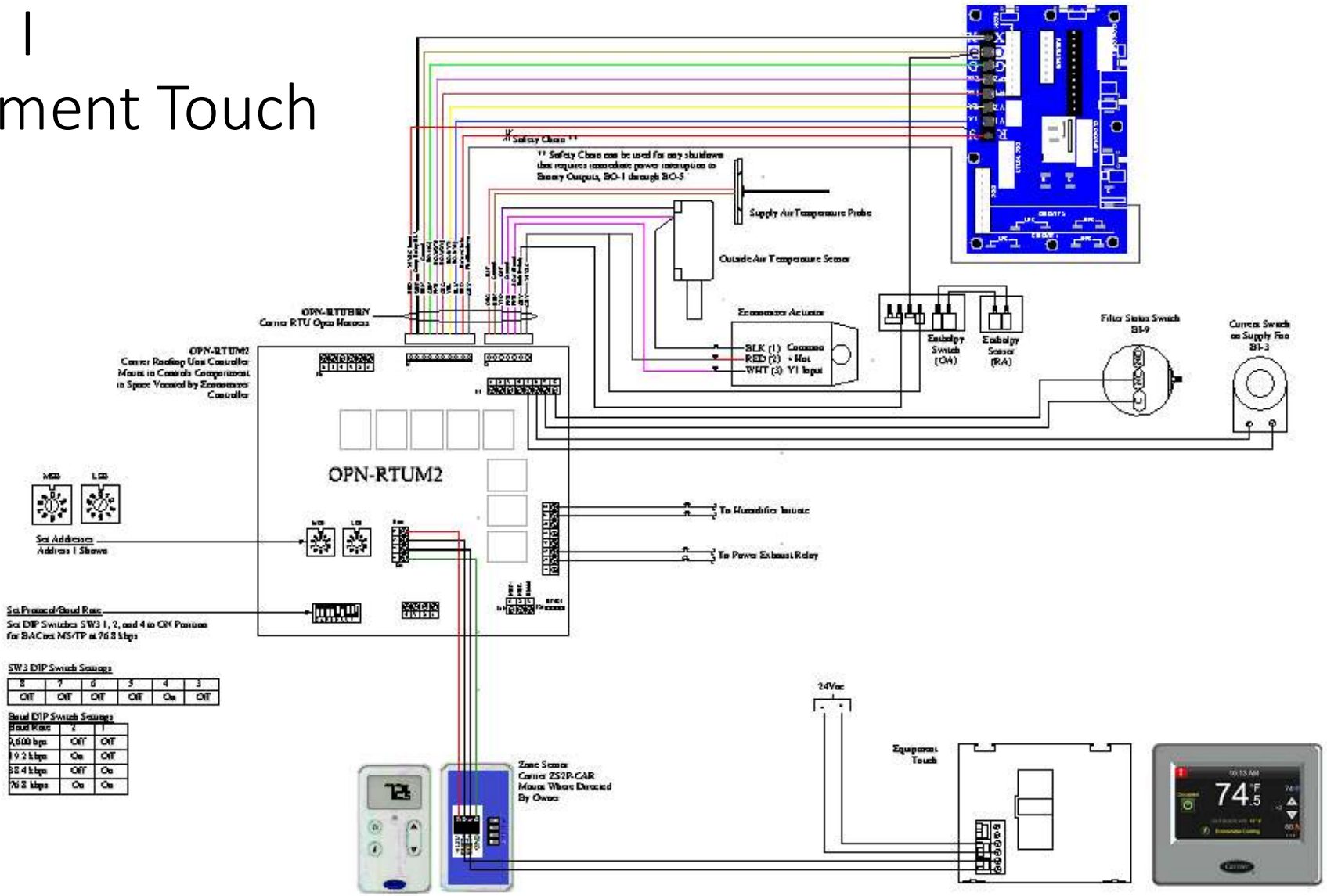

- Week View
- Month View


- Dated
- Weekly
- Continuous

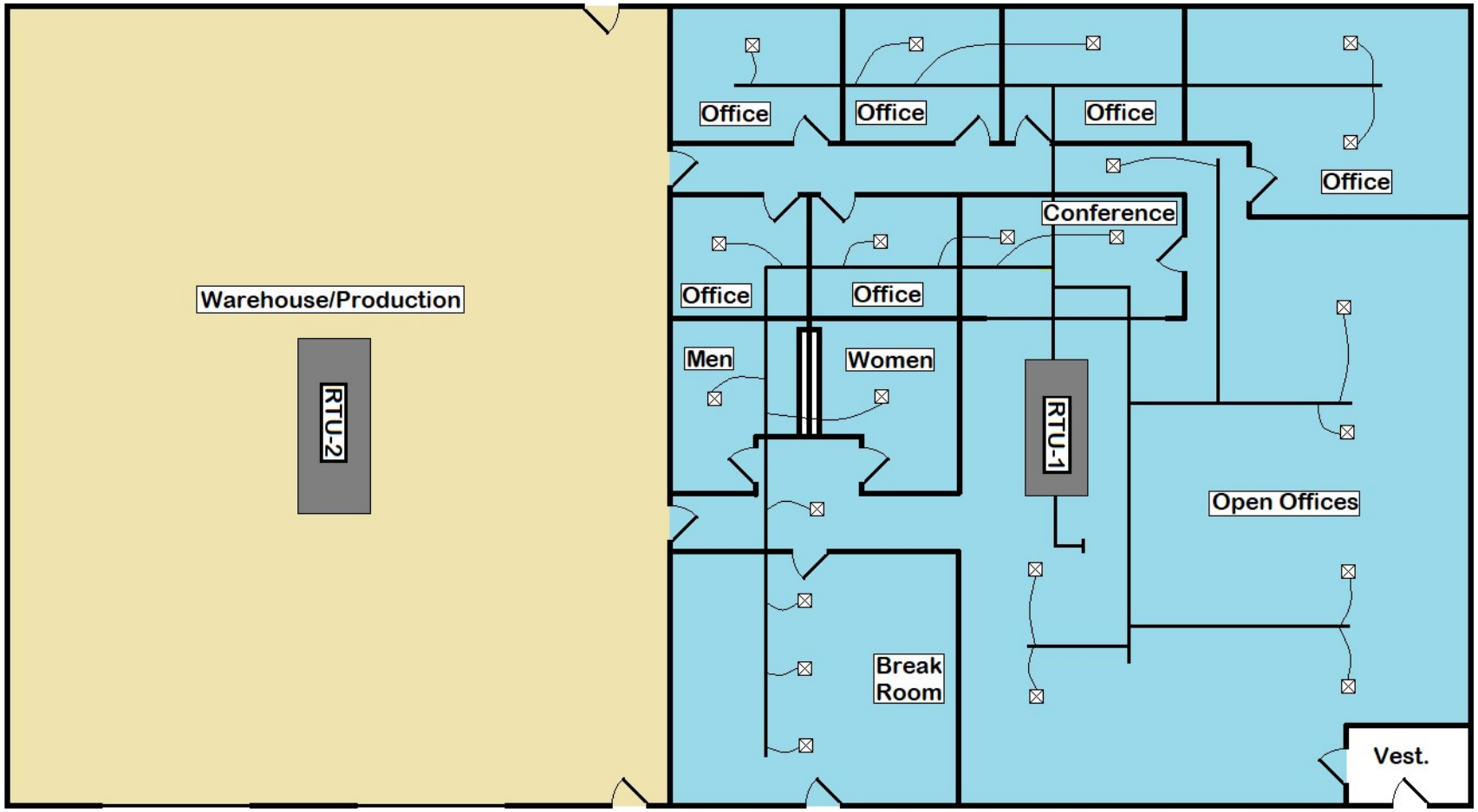
# Updating Equipment Touch Firmware

- Create Folder on USB Drive (FATXX) called Touch:
- Download Latest Update from HVAC Partners and copy to “Touch” Folder
- Plug USB Drive into bottom of Touch Device
- Go To Touchscreen Setup and click “Reload Firmware”
- After process, Home Screen will come back. Remove USB Drive.

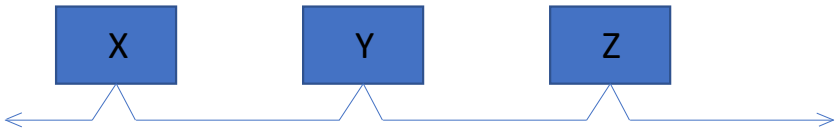
# Phase I
# Equipment Touch



# Training Building Phase II



# BACnet & MS/TP




- Must Speak the Same Language
- Must Speak at the Same Speed
- Must Have a Unique Address

- Carrier CCN
- Johnson N2
- ModBus
- LON

BACnet – Building Automation Control Network

Protocol rules apply to:

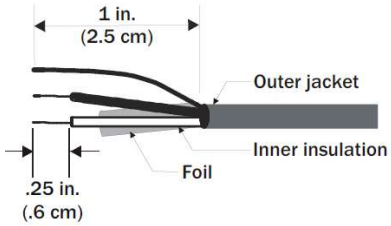
- Electrical Signaling
- Addressing
- Network Access (Master/Slave, Peer-to-Peer)
- Error Checking
- Flow Control
- Message Sequencing, Segmentation, Checkpointing
- Presentation Format (Compression, Encryption)
- Message Format

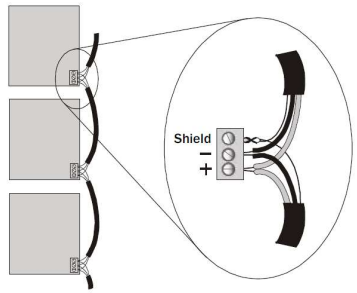
## BACnet Applications

- HVAC control
- Fire detection and alarm
- Lighting control
- Security
- "Smart" elevators
- Utility company interface

# MS/TP Wire Specifications

| | |
|---|---|
| Description | Single twisted pair, low capacitance, CL2P, 22 AWG (7x30), TC foam FEP, plenum rated cable |
| Conductor | 22 or 24 AWG stranded copper (tin plated) |
| Insulation | Foamed FEP<br>0.015 in. (0.381 mm) wall<br>0.060 in. (1.524 mm) O.D. |
| Color code | Black/White |
| Twist lay | 2 in. (50.8 mm) lay on pair<br>6 twists/foot (20 twists/meter) nominal |
| Shielding | Aluminum/Mylar shield with 24 AWG TC drain wire |
| Jacket | **SmokeGard** (SmokeGard PVC)<br>0.021 in. (0.5334 mm) wall<br>0.175 in. (4.445 mm) O.D.<br><br>**Halar** (E-CTFE)<br>0.010 in. (0.254 mm) wall<br>0.144 in. (3.6576 mm) O.D. |
| DC resistance | 15.2 Ohms/1000 feet (50 Ohms/km) nominal |
| Capacitance | 12.5 pF/ft (41 pF/meter) nominal conductor to conductor |
| Characteristic impedance | 100 Ohms nominal |
| Weight | 12 lb/1000 feet (17.9 kg/km) |
| UL temperature rating | **SmokeGard**<br>167°F (75°C)<br><br>**Halar**<br>-40 to 302°F (-40 to 150°C) |
| Voltage | 300 Vac, power limited |
| Listing | UL: NEC CL2P, or better |




| Wiring specifications | | Recommended vendors & part numbers | | | |
|---|---|---|---|---|---|
| **Wire type** | **Description** | **Connect Air International** | **Belden** | **Ramcorp** | **Contractors Wire & Cable** |
| MS/TP or ARCNET network (RS-485) | 22 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. | W221P-2227 | – | 25160PV | CLP0520LC |
| MS/TP or ARCNET network (RS-485) | 24 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. | W241P-2000FB | 82841 | 25120-OR | – |
| Rnet | 4 conductor, unshielded, CMP, 18 AWG, plenum rated. | W184C-2099BLB | 6302UE | 21450 | CLP0442 |
| Power - 24 Vac | 2 conductor, CM, 18 AWG, unshielded. | W181P-2051 | 5300UE | 21251 | CLP0440 |
| Analog & discrete sensor wiring < 100 ft | Single twisted pair, unshielded, CM, 22AWG, plenum rated. | W221P-2005 | 6500UE | 21281 | CLP0410 |
| Analog & discrete sensor wiring 100–500 ft | Single twisted shielded pair, CM, 22AWG, plenum rated. | W221P-2044 | 6500FE | 21280 | CLP0520 |

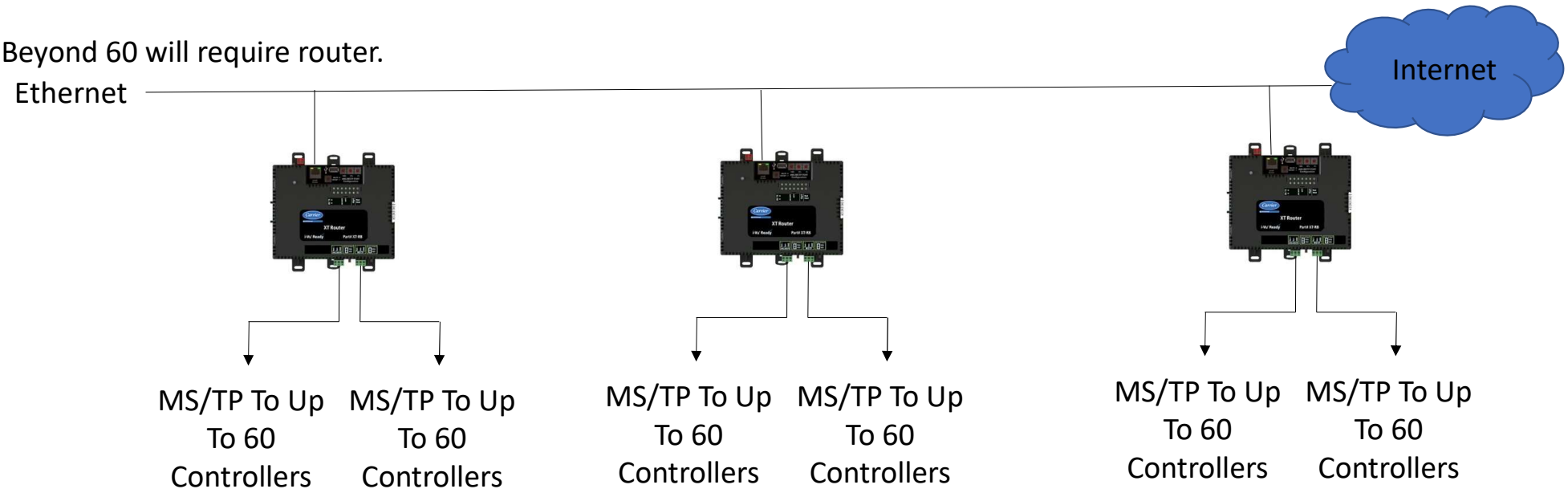
# Bus Limitations

MS/TP Networks

Each MS/TP can handle up to 60 controllers at speed of 76.8 kbps.

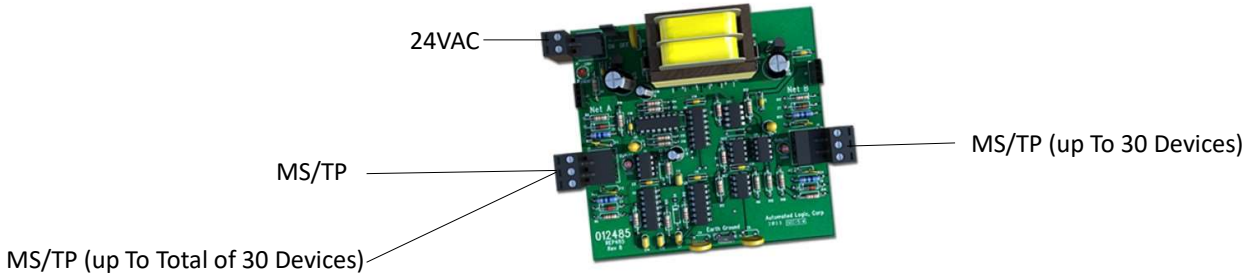
| Baud Rate | Recommended maximum number of controllers per network |
|---|---|
| 76.8 kbps | 60 |
| 38.4 kbps | 30 |
| 19.2 kbps/9600 bps | 15 |

Beyond 60 will require router.



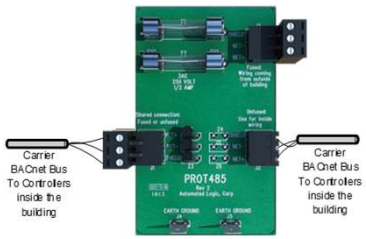
# Network Accessories

- Repeaters (REP485)
  - Required after every 31 controllers
  - Required after 2000 feet
  - Information cannot pass through more than 4 repeaters

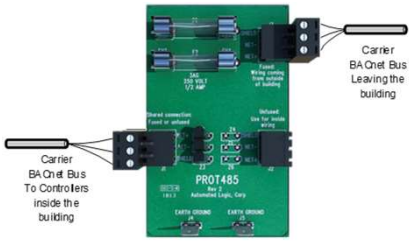



- Biasing Terminators (BT485)
  - Required at ends of MS/TP segments
  - Required at each side of Repeaters
  - Resistor (TERM485) can be used where no receptacle

- Protection Module (PROT485)
  - Recommended whenever MS/TP enters/leaves building
  - Recommended within 500 feet of every controller.



PROT 485 – Inside a Building



485 PROT Between Buildings

# Sample Network

# i-Vu - Networks

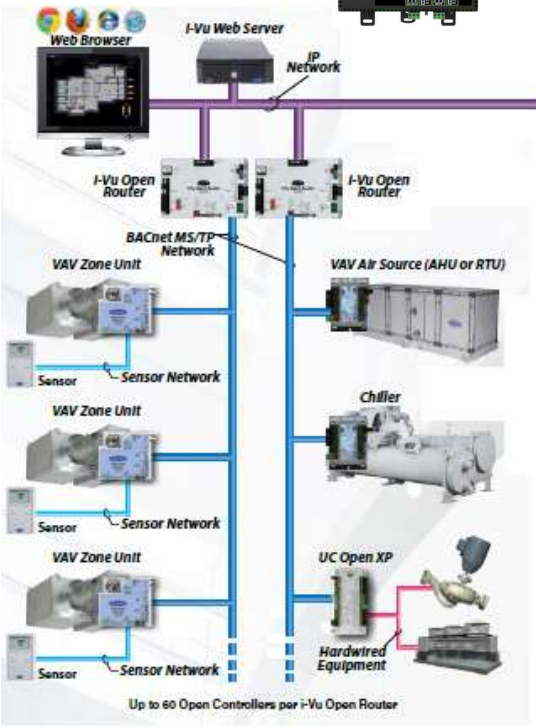
comfort | excellence
Carrier Enterprise
Mid-Atlantic Region

**CIV-OR**
**i-Vu Open Router**

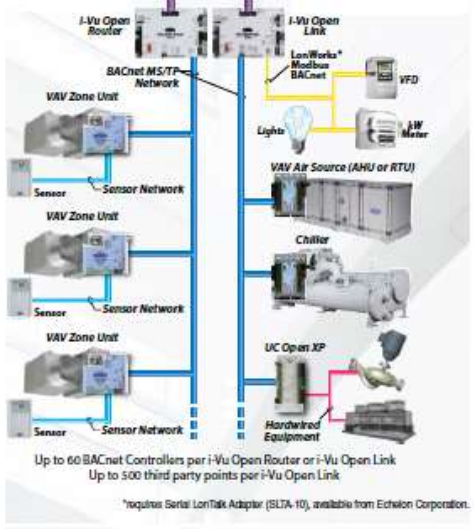
**CIV-CR**
**i-Vu CCN Router**

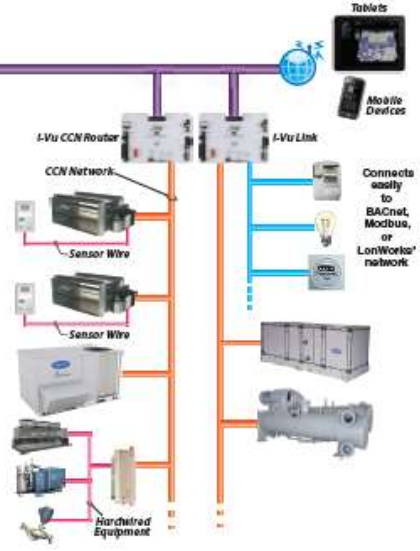
**CIV-OL**
**i-Vu Open Link**

**CIV-L**
**i-Vu Link**








Open Controls only
Up to 60 Controllers

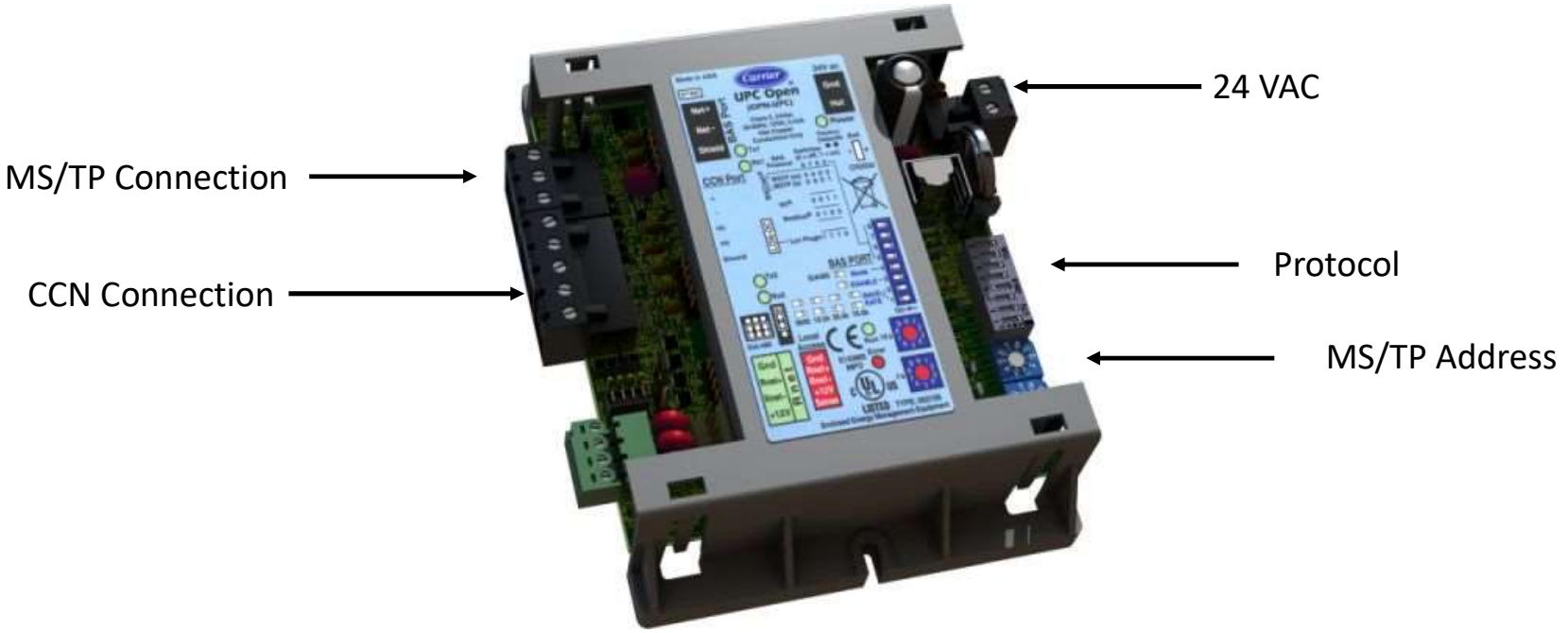
CCN Only
Up to 140 Devices
Trending
Time Schedules

i-Vu Open Controls
Up to 60 Open Controller
and 3rd Party Devices on
* BACnet
* Modbus
* LonWorks
Up to 500 Points

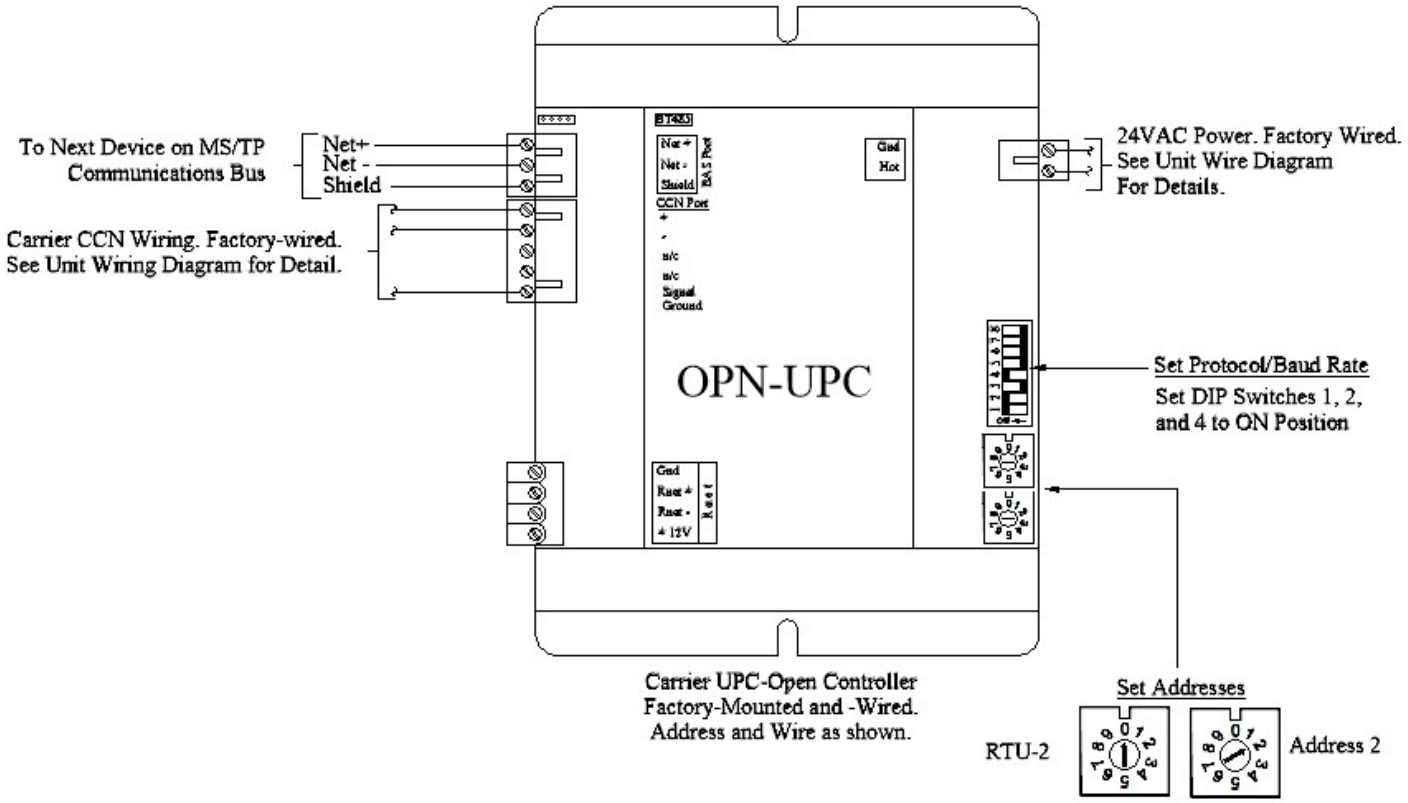
CCN Devices
Up to 140 CCN Controllers
and 3rd Party Devices on
* BACnet
* Modbus
* LonWorks
140 Devices
Up to 500 Points

# Universal Protocol Converter (UPC)

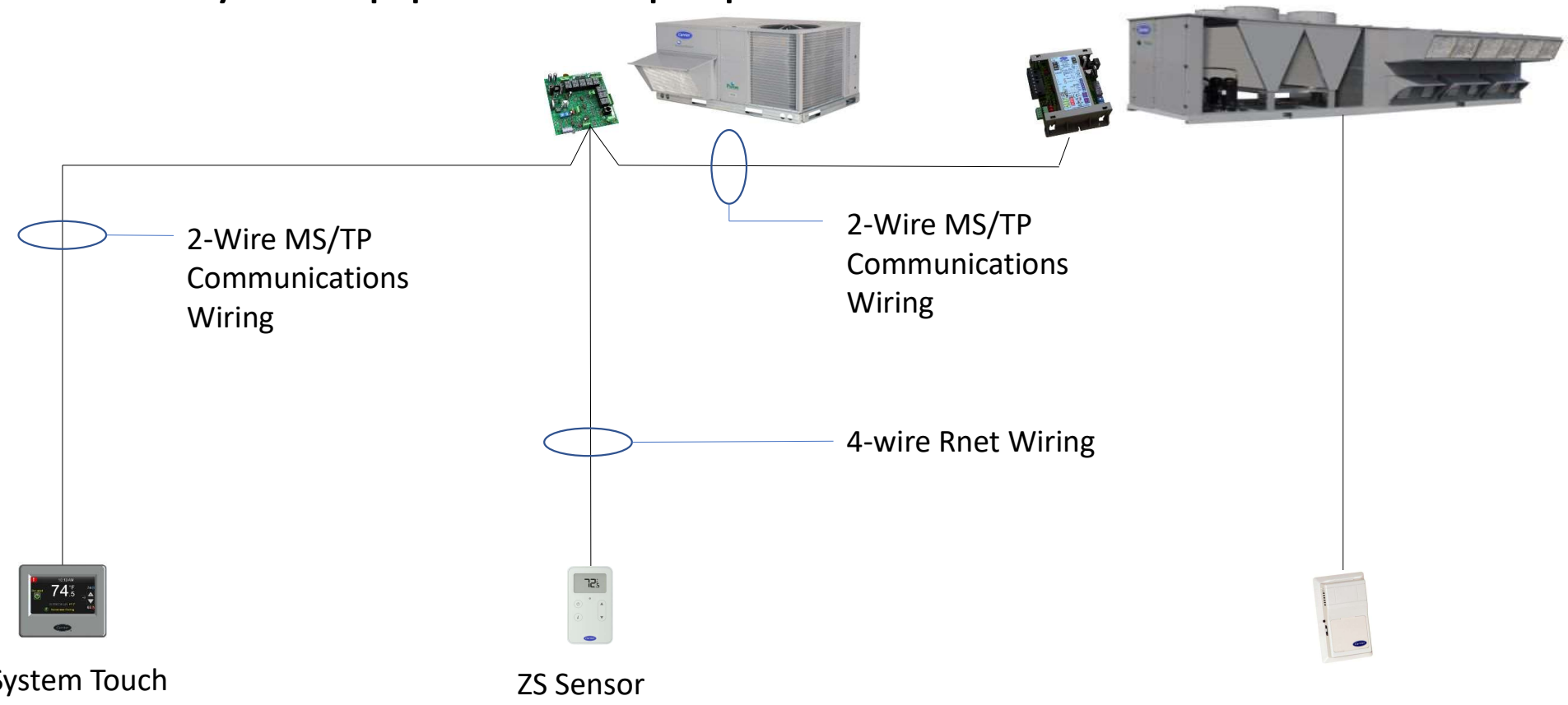
Allows us to bring Carrier Proprietary DDC (CCN) into the BACnet World

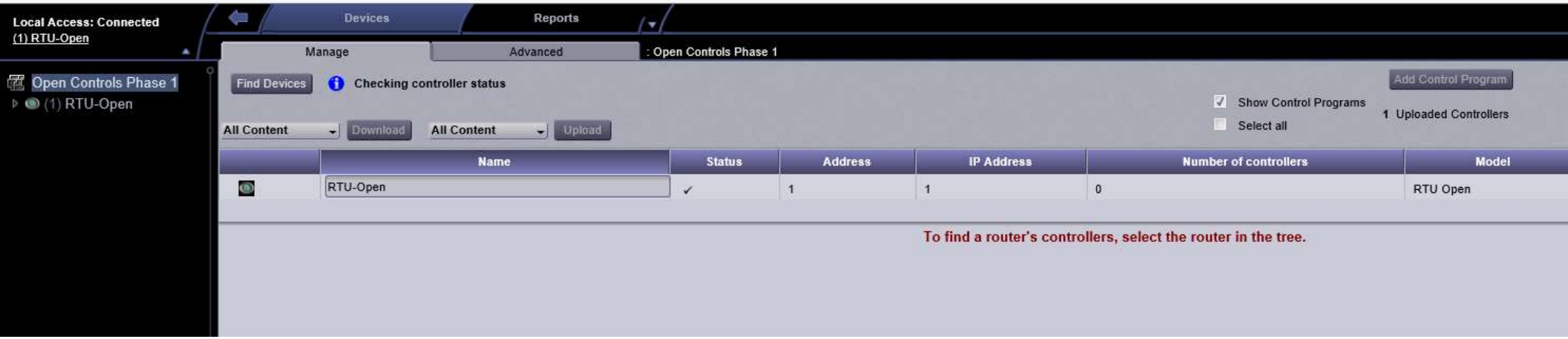


# Phase II – Unit UPC Factory Wiring



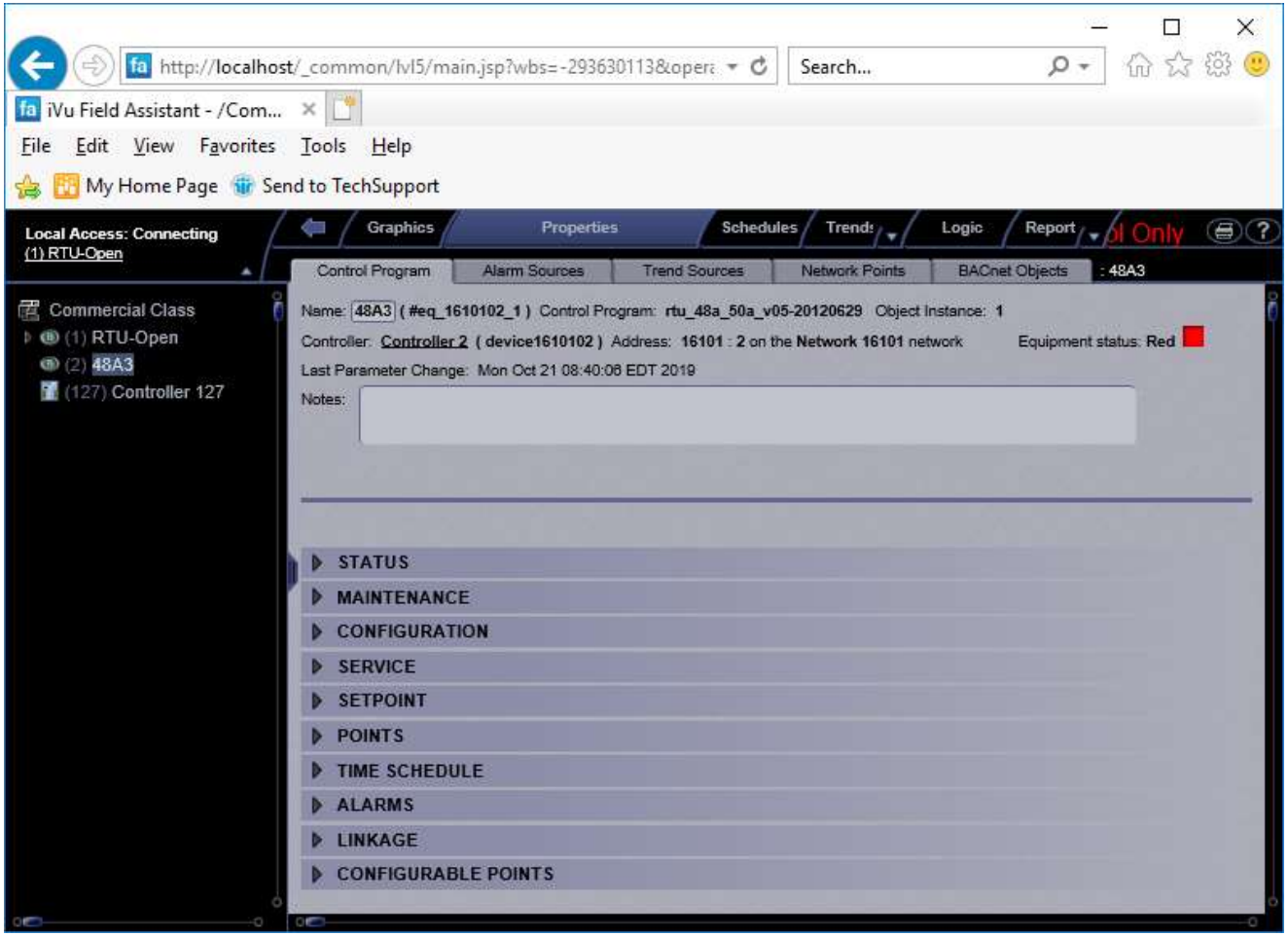
# Unitary + Applied Equipment




Local Access: Connected
(1) RTU-Open
Devices
Reports
Manage
Advanced
: Open Controls Phase 1
Open Controls Phase 1
(1) RTU-Open
Find Devices
Checking controller status
Add Control Program
Show Control Programs
Select all
1 Uploaded Controllers
All Content
Download
All Content
Upload
Name
Status
Address
IP Address
Number of controllers
Model
RTU-Open
1
1
0
RTU Open
To find a router's controllers, select the router in the tree.


Local Access: Connected
(1) RTU-Open
Devices
Reports
Manage
Advanced
: Open Controls Phase 1
Open Controls Phase 1
(1) RTU-Open
(2) Controller 2
(127) Controller 127
Find Devices
Show Control Programs
Select all
1 Upl
+2 Uplo
All Content
Download
All Content
Upload
Name
Status
Address
IP Address
Number of controllers
Controller 2
Upload All Content
2
2
0
Controller 127
Upload All Content
127
127
0
RTU-Open
Download Parameters
1
1
0
To find a router's controllers, select the router in the tree.

# Adding Another Controller to System



# Configuring UPC Open

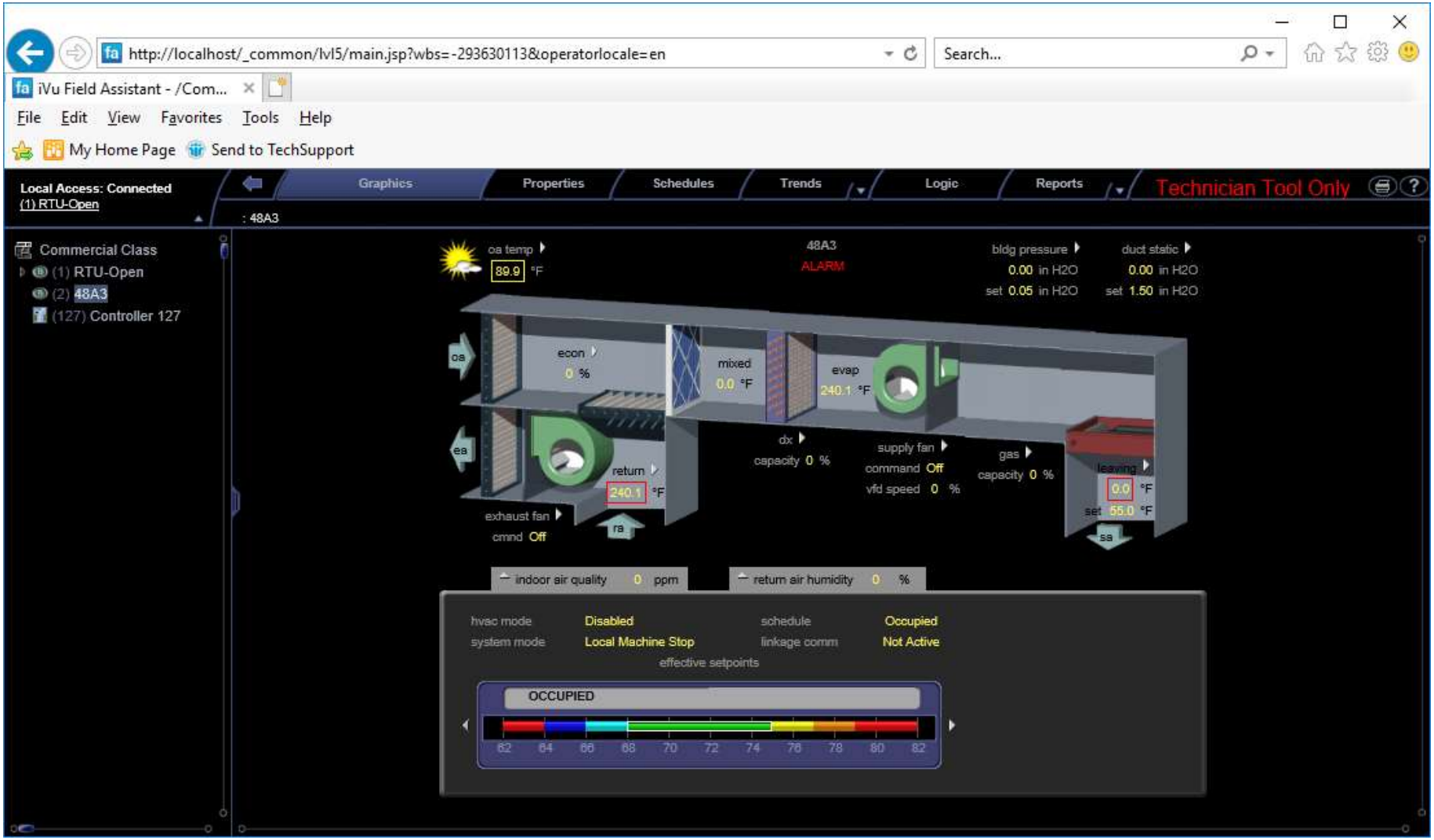
**Navigation:** i-Vu® / Field Assistant: **Properties** > **Control Program** > **Status**
BACview®: **CCN**

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

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

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

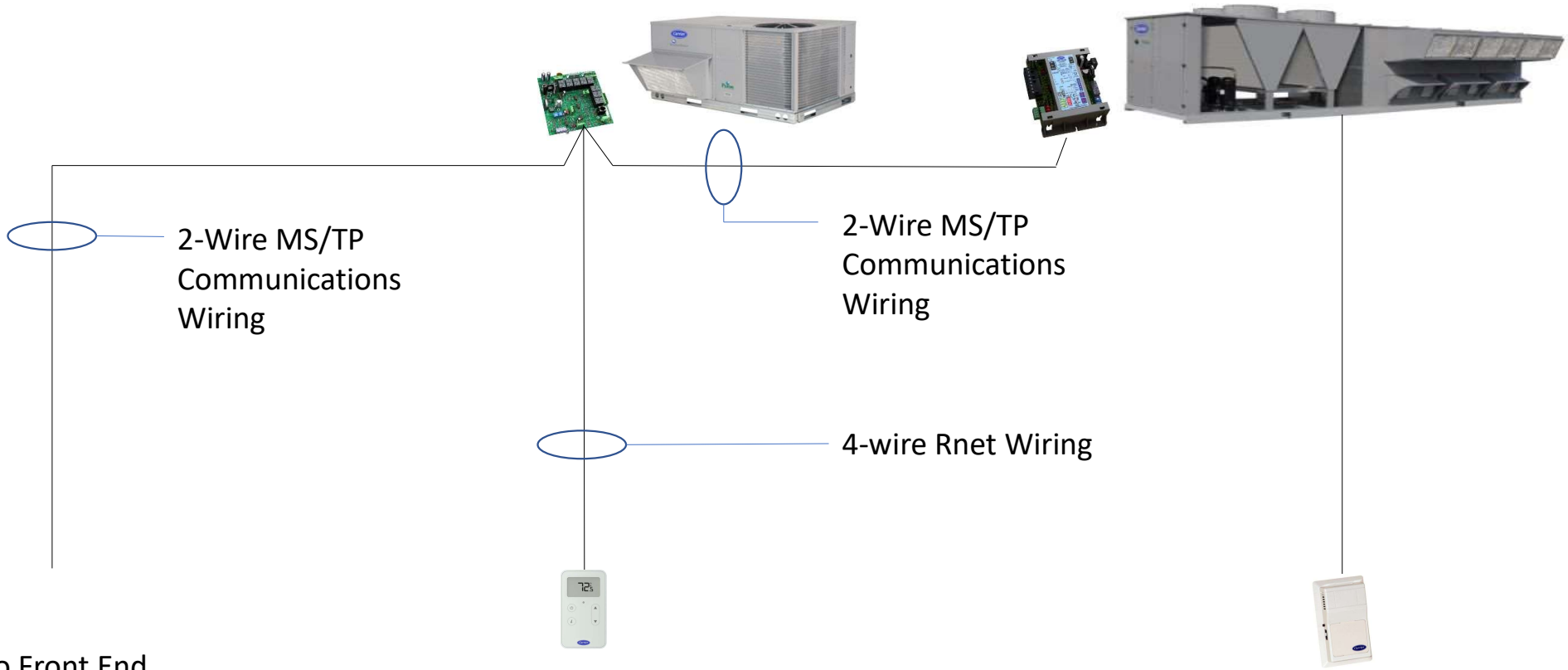
# UPC Graphic


http://localhost/_common/lvl5/main.jsp?wbs=-293630113&operatorlocale=en
Search...
iVu Field Assistant - /Com...
File Edit View Favorites Tools Help
My Home Page
Send to TechSupport
Local Access: Connected
(1) RTU-Open
Graphics
Properties
Schedules
Trends
Logic
Reports
Technician Tool Only
: 48A3
Commercial Class
(1) RTU-Open
(2) 48A3
(127) Controller 127
oa temp
89.9 °F
48A3
ALARM
bldg pressure
0.00 in H2O
set 0.05 in H2O
duct static
0.00 in H2O
set 1.50 in H2O
oa
econ
0 %
mixed
0.0 °F
evap
240.1 °F
ea
return
240.1 °F
exhaust fan
cmnd Off
ra
dx
capacity 0 %
supply fan
command Off
vfd speed 0 %
gas
capacity 0 %
leaving
0.0 °F
set 55.0 °F
sa
indoor air quality 0 ppm
return air humidity 0 %
hvac mode Disabled
system mode Local Machine Stop
schedule Occupied
linkage comm Not Active
effective setpoints
OCCUPIED
62 64 66 68 70 72 74 76 78 80 82

# Logic


Local Access: Connected
(1) RTU-Open
Graphics
Properties
Schedules
Trends
Logic
Reports
: 48A3
Commercial Class
(1) RTU-Open
(2) 48A3
(127) Controller 127
Enable?
No
Reset?
Single Point Linkage - Demand Limit 1
Demand Level
System Cool D
System Heat D
Valid?
Inactive
Active Demand
Enable?
Demand Level Map Select:
Map Open Dmd Lvls 1&2 or 2&3.
Map 1
Single Point Linkage - OAT 1
OAT Master Sensor
NO
System Outside
Valid?
System Outside Air Temp
OATPresVal
Enable?
SPT Sensor 4
SPT Sensor Val

# Third Party Integration



# RTU Open BACnet Integration

**48---50LHTCQ---01T**

48/50TC04–30, 50TCQ04–24
48/50HC04–28, 50HCQ04–12
48/50LC04–26
Factory Installed Option
RTU Open
Multi–Protocol Controller

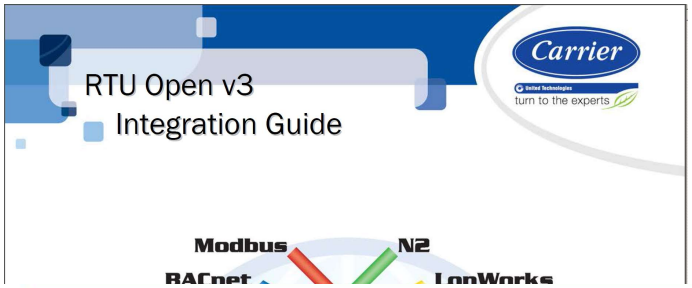
Carrier
turn to the experts

## Controls, Start–Up, Operation and Troubleshooting

TABLE OF CONTENTS



| Point Name | Point Access | Units | Default Value | BACnet Info | | Modbus Info | |
|---|---|---|---|---|---|---|---|
| | | | | BACnet Point Name | BACnet Object ID | Modbus Register Type | Modbus Register # |
| Occupancy Source | R/W | 1=Always Occupied<br>2=BACnet Schedule<br>3=BAS On/Off<br>4=Remote Occ Input | 1 | occ_source | MSV:1002 | | |
| Space sensor type | R/W | 1=T55<br>2=T56<br>3=SPT Sensor<br>4=None | 1 | spt_type | MSV:9001 | | |
| Space Temp Source | R | 1=Sensor Failure<br>2=SPT Sensor<br>3=T55 / T56<br>4=Network<br>5=Airside Linkage<br>6=Locked Value | | spt_status | MSV:2003 | | |
| Unit Type | R/W | 1=Heat / Cool<br>2=LC WeatherExpert<br>3=HP O/B Ctrl<br>4=HP Y1/W1 Ctrl | 2 | unit_type | MSV:9018 | | |
| ZS Temp Sensor | R | 0=Normal<br>1=Alarm | | zst_sensor_fail | BV:7051 | | |
| Economizer Operation | R | 0=Normal<br>1=Fault Detected | | econ_opr | BV:7054 | | |
| Space Temperature Alarm Status | R | 0=Normal<br>1=Alarm | | spt_alrm_status | BV:7056 | | |
| SPT Sensor | R | °F | | zone_temp_zone_temp | AI:1 | | |
| SPT Sensor | R | min | | zone_temp_override_time_remaining | AV:1 | | |
| input_10 | R | °F | | ai_10 | AI:1010 | | |
| Factory Test Analog 1 Control | R/W | % | 0 | ao1_fac_test | AV:91001 | | |
| Economizer High OAT Lockout | | | | | | | |




## Appendix A: Network Points List for RTU Open

### Network points list for BACnet and Modbus

| Point Name | Point Access | Units | Default Value | BACnet | | Modbus | |
|---|---|---|---|---|---|---|---|
| | | | | BACnet Point Name | BACnet Object ID | Modbus Register Type | Modbus Register # |
| Active Heat Stages | R | | | heat_run | AV:2003 | Input Register (Float) | 33 |
| Effective Cool Setpoint | R | °F | | eff_cl_stpt | AV:3005 | Input Register (Float) | 55 |
| High Space Temperature | R | 0=Normal<br>1=Alarm | | spt_hi_alarm | BV:7011 | Discrete Input | 35 |
| Low Space Temperature | R | 0=Normal<br>1=Alarm | | spt_lo_alarm | BV:7012 | Discrete Input | 39 |
| Input_6 | R | °F | | ai_6 | AI:1006 | | |
| Supply Fan Relay State | R | 0=Off<br>1=On | | sfan | BV:2001 | Discrete Input | 23 |
| Supply Fan Status | R | 0=Off<br>1=On | | sfan_status | BV:1003 | Discrete Input | 24 |
| Economizer Output | R | %Open | | econ_output | AV:2022 | Input Register (Float) | 51 |
| Outdoor Air Quality Sensor | R | 0=Normal<br>1=Alarm | | oaq_fail | BV:7006 | Discrete Input | 41 |
| DCV Max Vent Damper Pos | R/W | %Open | 50 | iaq_dpr_max | AV:9011 | Holding Register (Float) | 47 |
| Space Temperature - Prime Variable | R | °F | | space_temp | AV:2007 | Input Register (Float) | 107 |
| HP Rev Cycle Lockout Temp | R/W | °F | -3 | hp_rev_cycle_lockout | AV:9004 | Holding Register (Float) | 71 |
| System Outdoor Air Temperature | R/W | °F | -999 | system_oat | AV:1901 | Holding Register (Float) | 119 |
| Economizer Purge Min Pos | R/W | %Open | 40 | econ_purge_min | AV:9029 | Holding Register (Float) | 75 |
| Active Compressor Stages | R | | | comp_run | AV:2020 | Input Register (Float) | 31 |
| System Mode | R | 1=Off<br>2=Fan Only<br>3=Economizer Cooling<br>4=Cooling<br>5=Heating<br>6=Dehumidification<br>7=Test | | run_status | MSV:2002 | Input Register (Signed) | 1 |

# UPC BACnet Integration

Carrier
United Technologies

**Weathermaker®**
**48/50A2,A3,A4,A5020-060**
**Single Package Large Rooftop Units**
**with *Comfort*Link Version 8.x Controls**

## Controls, Start-Up, Operation, Service and Troubleshooting

**CONTENTS**

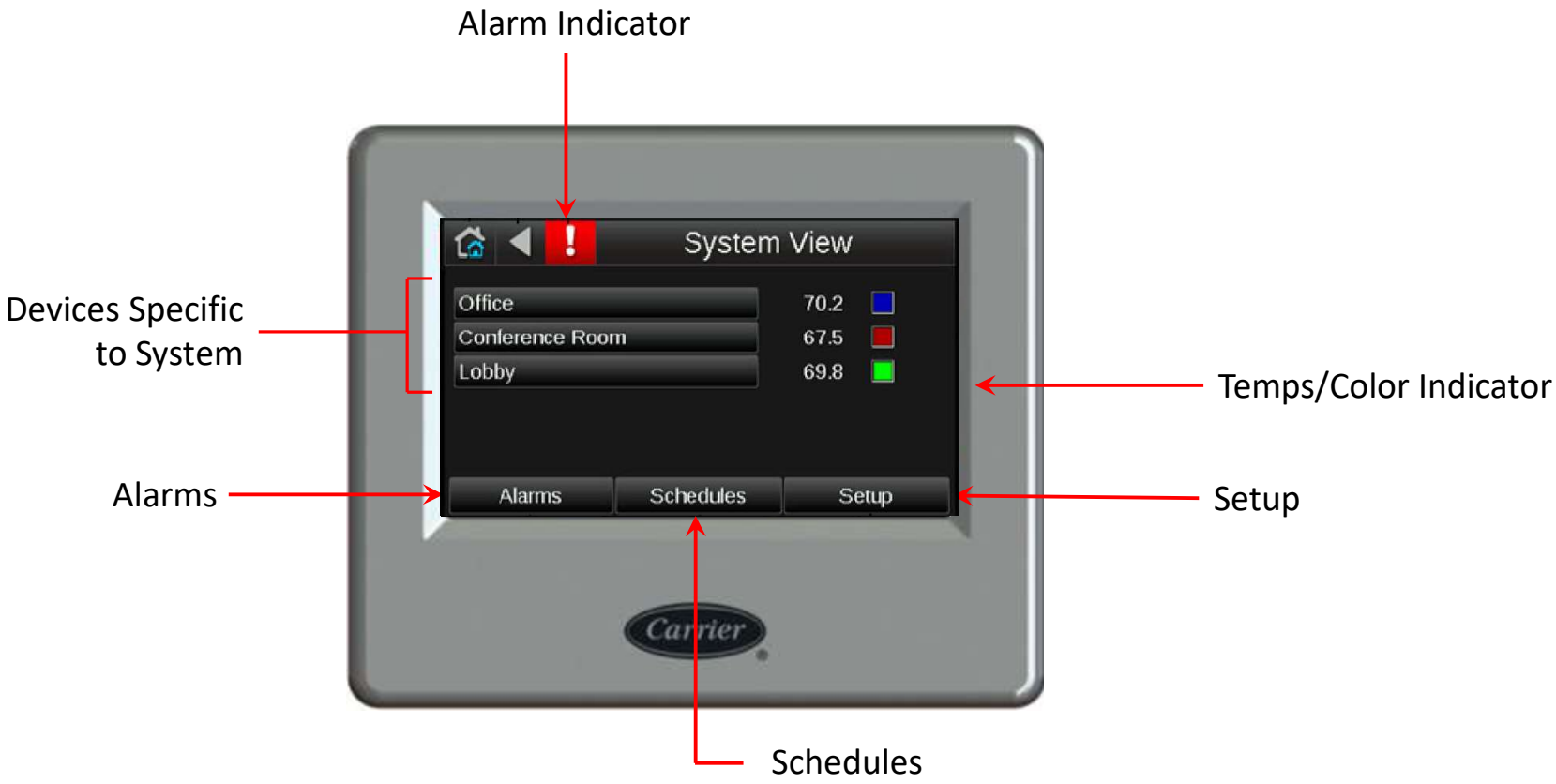


**NETWORK POINTS LIST**

| POINT DESCRIPTION | CCN POINT NAME | READ/ WRITE | UNITS | DEFAULT VALUE | RANGE | BACNET OBJECT ID | BACNET OBJECT NAME |
|---|---|---|---|---|---|---|---|
| Active Demand Limit | DEM_LIM | W | % | n/a | 0-100 | AV:9 | dem_lim_1 |
| Air Temp Lvg Supply Fan | SAT | R | °F | n/a | n/a | AV:10 | sat_1 |
| Alarm State | ALM | R | n/a | n/a | n/a | BV:9 | alm_1 |
| BP PID Evaluation Time Level | BPPERIOD | W | min | 1 | 0-10 | AV:16 | bpperiod_1 |
| BP Setpoint Offset | BPSO | W | in H2O | 0.05 | 0-0.5 | AV:17 | bpso_1 |
| BP Threshold Adjustment | BPZ_GAIN | W | n/a | 1 | 0.1-10 | AV:18 | bpz_gain_1 |
| Building Pressure | BP | R | in H2O | n/a | n/a | AV:1070 | bldg_static_press_1 |
| Building Pressure Setp. | BPSP | W | in H2O | 0.05 | -0.5 | AV:3070 | bldg_press_stpt_1 |
| Capacity Clamp Mode | CAPMODE | R | n/a | n/a | n/a | BV:10 | capmode_1 |
| Capacity Load Factor | SMZ | R | % | n/a | n/a | AV:22 | smz_1 |
| Capacity Threshold Adj | Z_GAIN | W | n/a | 1 | 0-10 | AV:23 | z_gain_1 |
| CEM AN1 10K temp J5,1-2 | CEM10K1 | W | °F | n/a | -280 | AV:12 | cem10k1_1 |
| CEM AN1 4-20 ma J5,1-2 | CEM4201 | W | mA | n/a | 0-20 | AV:11 | cem4201_1 |
| CEM AN2 10K temp J5,3-4 | CEM10K2 | W | °F | n/a | -280 | AV:14 | cem10k2_1 |
| CEM AN2 4-20 ma J5,3-4 | CEM4202 | W | mA | n/a | 0-20 | AV:13 | cem4202_1 |
| Cir A Discharge Pressure | DP_A | R | psig | n/a | n/a | AV:1601 | discharge_press_a_1 |
| Cir A Sat. Condensing Temperature | SCTA | R | °F | n/a | n/a | AV:1602 | sat_cond_temp_a_1 |
| Cir A Sat. Suction Temperature | SSTA | R | °F | n/a | n/a | AV:1603 | sat_suction_temp_a_1 |
| Cir A Suction Pressure | SP_A | R | psig | n/a | n/a | AV:1600 | suction_press_a_1 |
| Cir B Discharge Pressure | DP_B | R | psig | n/a | n/a | AV:1605 | discharge_press_b_1 |
| Cir B Sat. Condensing Temperature | SCTB | R | °F | n/a | n/a | AV:1606 | sat_cond_temp_b_1 |
| Cir B Sat. Suction Temperature | SSTB | R | °F | n/a | n/a | AV:1607 | sat_suction_temp_b_1 |
| Cir B Suction Pressure | SP_B | R | psig | n/a | n/a | AV:1604 | suction_press_b_1 |

# System Touch

System Screen

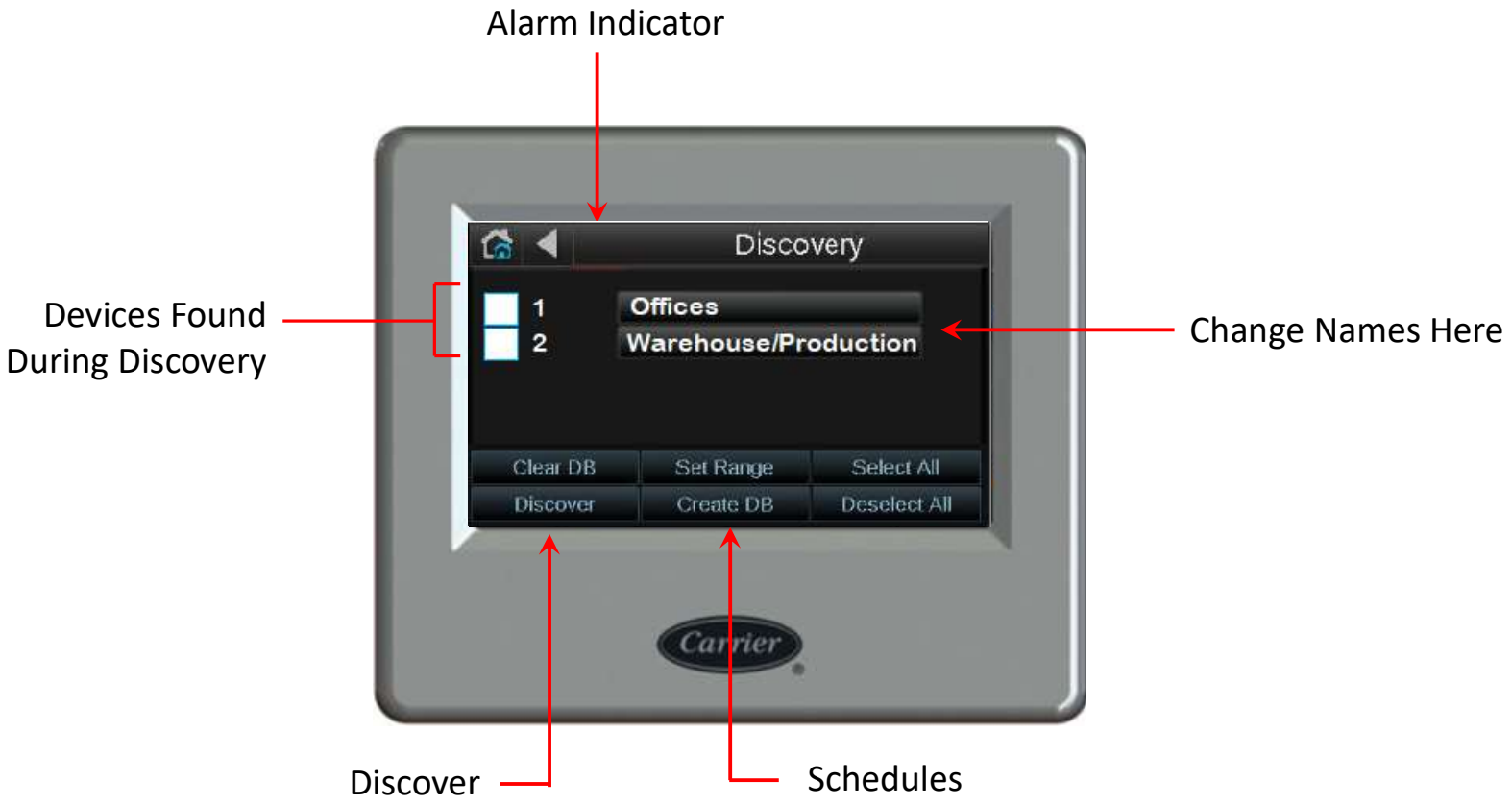


# System Touch

Discovery

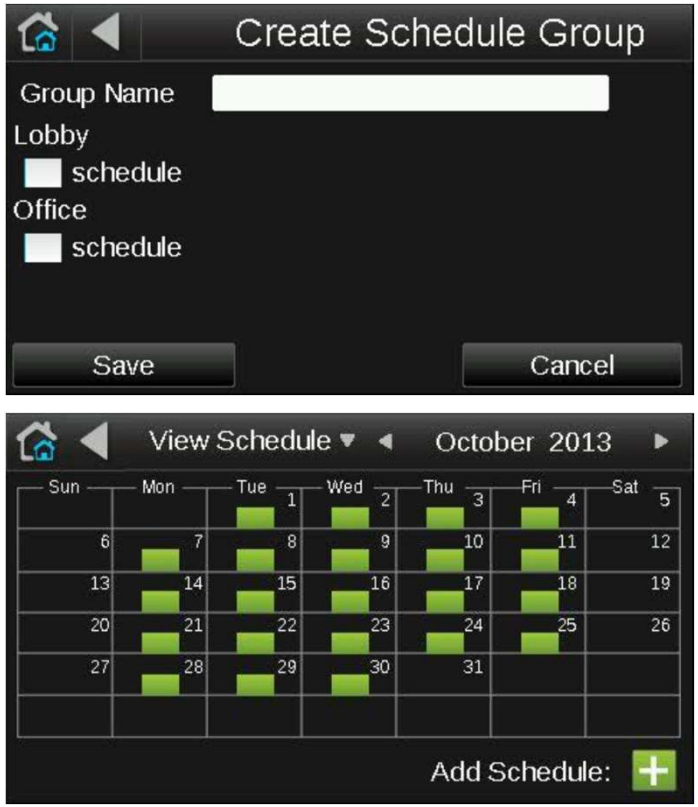

# System Touch

Discovery



# System Touch

Schedules



Thank You