

Honeywell

TR50 Indoor Air Quality Sensor



User Guide

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Version Information

Tools	Version
Niagara Tools	4.10
	4.11
	4.12
Niagara IRM Tools	BEATS_IP_MSTP_SIT_4.10.5.2.9.20.0
	BEATS_IP_MSTP_SIT_4.11.0.2.9.20.0
	BEATS_IP_MSTP_SIT_4.12.0.2.9.20.0
	BEATS_IP_MSTP_SIT_4.12.2.2.9.20.0
Niagara Smart Sensor Tools	SmartSensor_SIT_4.10.5.0.6.8
	SmartSensor_SIT_4.11.0.0.6.8
	SmartSensor_SIT_4.12.0.0.6.8
	SmartSensor_SIT_4.12.2.0.6.8
Optimizer Controller Firmware	2.0.7.43

Reference documents

TR50 IAQ Sensor Datasheet	31-00565M
TR50 IAQ Sensor Mounting Instructions	31-00566M

Quick Start

- Before installing the TR50 Sensor device, make sure the wiring is done correctly. (Refer to the [Before Installation](#) on page 5 for detailed information.)
- Check Thresholding default settings and how to change it as per site requirements (Refer to the [GETTING STARTED](#) chapter for detailed information.)
- Address setting should be done on the device, as per required protocols, before connecting it to the controller. (Refer to the [Configuration](#) chapter for detailed information.)
- The TVOC parameter takes at least 48 hours to stabilize, once the TR50 device is power up. (Refer to the [Operations](#) chapter for detailed information.)

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INTRODUCTION TO TR50

1.1 Introduction

The TR50 IAQ (Indoor Air Quality) Sensor is an advanced, configurable device for commercial buildings. It monitors 5 parameters

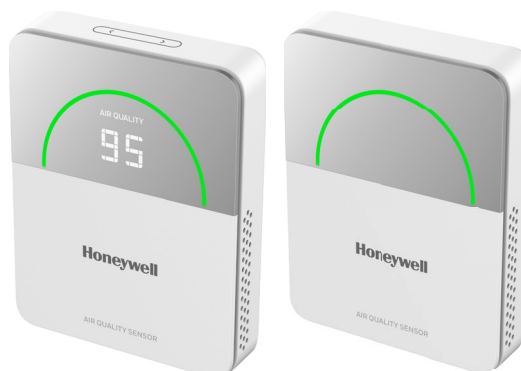
- Temperature (T)
- Relative Humidity (RH)
- Carbon Dioxide (CO₂)
- Particulate Matter (PM1.0, PM2.5 and PM10)
- Total Volatile Organic Compound (TVOC)

This TR50 IAQ Sensor device communicates using the Modbus, BACnet MS/TP, or Sylk™ protocol and easily integrates with the building management system.

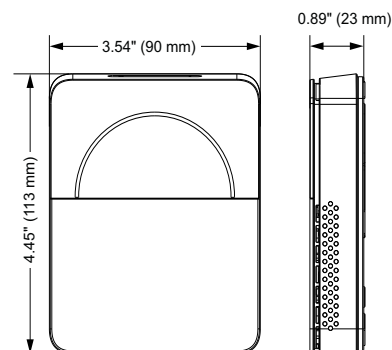
The algorithm built into the device can calculate comprehensive air quality level and display AQI (Air Quality Index) number in LCD and corresponding color with LED ring. The device is packaged with numerous presets suitable for most commercial building requirements, enabling a quick and easy initial setup.

The TR50 IAQ Sensor device has two display modes:

- With Display (With Touch Button)
- Without Display (Without Touch Button)



1.2 Dimensions



All the dimensions shown are in inches (mm).

1.3 Intended audience and assumed knowledge

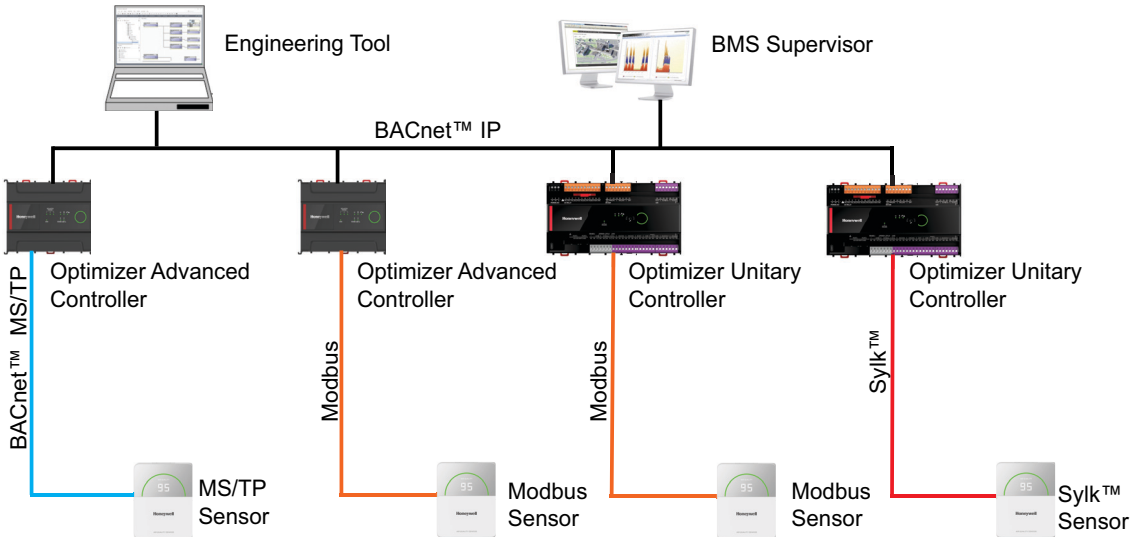
This User Guide provides information about the Getting Started, Configuration details, and Operations of the TR50 IAQ Sensor to the system integrator, technicians, and end-users. All the electrical engineers and technicians working with the product must have basic training on HVAC Sensors, Smart sensors, and Room Controllers and their application.

1.4 Specification

Parameter	Description
Detection Parameters	- Temperature (T) - Relative Humidity (RH) - Carbon Dioxide (CO₂) - Particulate Matter (PM1.0, PM2.5 and PM10) - Total Volatile Organic Compound (TVOC)
Power Supply	Direct: 24 VAC/VDC $\pm$ 20 % Sylk™: Honeywell Sylk™ Technology
Operating Temperature	32 to 122 °F (0 to 50 °C)
Operating Humidity	0-95 % RH, non-condensing
Storage Temperature	-40 to 150 °F (-40 to 65.5 °C)
Communication	BACnet MS/TP, Modbus over RS-485, or Sylk™
Net weight	0.42 lbs. (189 grams)
Power Consumption	TR50-5D-X : 24 VAC 3.8 VA, 24 VDC, 1.5 W TR50-5N : 24 VAC 3.8 VA, 24 VDC, 1.4 W TR50-3D-X : 24 VAC 3.2 VA, 24 VDC/Sylk™, 0.9 W TR50-3N : 24 VAC 3.2 VA, 24 VDC/Sylk™, 0.8 W
Dimensions	3.54 inches (90 mm) x 4.45 inches (113 mm) x 0.89 inches (23 mm)

1.5 System Architecture

There are many flexible ways a TR50 IAQ Sensor can be integrated into a BMS as shown below:



1.6 Ordering Information

Part Number	Sensors	Communication Protocol	Display	Power	Brand
TR50-5D	Temperature, Humidity, CO ₂ , PM2.5 and TVOC	BACnet™, Modbus, Sylk™	Yes	24 VAC/VDC	Honeywell
TR50-5N	Temperature, Humidity, CO ₂ , PM2.5 and TVOC	BACnet™, Modbus, Sylk™	No	24 VAC/VDC	Honeywell
TR50-3D	Temperature, Humidity and CO ₂	BACnet™, Modbus, Sylk™	Yes	24 VAC/VDC or Sylk™	Honeywell
TR50-3N	Temperature, Humidity and CO ₂	BACnet™, Modbus, Sylk™	No	24 VAC/VDC or Sylk™	Honeywell
TR50-5D-U	Temperature, Humidity, CO ₂ , PM2.5 and TVOC	BACnet™, Modbus, Sylk™	Yes	24 VAC/VDC	Unbranded
TR50-3D-U	Temperature, Humidity and CO ₂	BACnet™, Modbus, Sylk™	Yes	24 VAC/VDC or Sylk™	Unbranded

2.1 Important Safety Information and Installation Precautions

Read the below instructions carefully for safety and installation.

Local codes and practices

Always install equipment in accordance with the National Electric Code and a in manner acceptable to the local authority having jurisdiction.



Electrostatic sensitivity

This product and its components may be susceptible to Electrostatic Discharge (ESD). Use appropriate ESD grounding techniques while handling the product. When possible, always run the product by its non-electrical components.

High voltage safety test

Experienced electricians, at first contact, always assume that hazardous voltages may exist in any wiring system. A safety check using a known, reliable voltage measurement or detection device should be made immediately before starting work and when work resumes.



Lightning and high-voltage danger

Most electrical injuries involving low-voltage wiring result from sudden, unexpected high voltages on usually low-voltage wiring. Low-voltage wiring can carry hazardous high voltages under unsafe conditions. Never install or connect wiring or equipment during electrical storms. Improperly protected wiring can have a fatal lightning surge for many miles. All outdoor wiring must be equipped with adequately grounded and listed signal circuit protectors, which must comply with local, applicable codes. Never install wiring or equipment while standing in water.



Wiring and equipment separations

Install all the wiring and controllers to minimize the possibility of accidental contact with other potentially hazardous and disruptive power and lighting wiring. Never place 24 VAC or communications wiring near other bare power wires, lightning rods, antennas, transformers, or steam or hot water pipes. Never place the wire in any conduit, box, channel, duct, or other enclosure containing power or lighting circuits. Always provide adequate separation of communications and another electrical wiring according to code. Keep wiring and controllers at least six feet from large inductive loads (power distribution panels, lighting ballasts, motors, etc.). Failure to follow these guidelines can introduce electrical interference and cause the system to operate erratically.



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2.1.1 Before Installation

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and the product to ensure the product is suitable for your application.
3. TR50 IAQ Sensor must be installed and mounted only by authorized and trained personnel.
4. When performing any work (installation, mounting, start-up), all manufacturer instructions, particularly the TR50 IAQ Sensor_Mounting Instruction_31-00566M-02, are to be observed.
5. It is recommended to keep the device at room temperature for at least 24 hours before applying power. This allows any condensation resulting from low shipping/storage temperatures to evaporate.
6. After installation is complete, check out product operation as provided in these instructions.

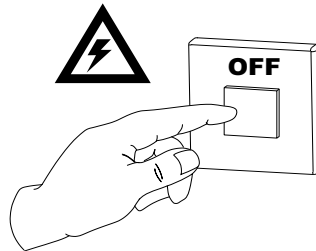
Note: All wiring must agree with applicable codes, ordinances, and regulations as specified in installation wiring diagrams.

2.1.2 Restricting Access to Network

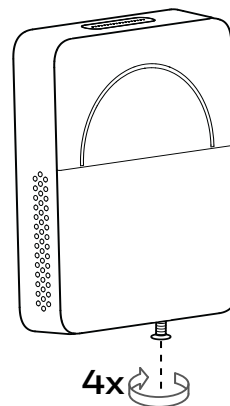
Prevent unauthorized access to the network (e.g., BACnet MS/TP, Modbus, or Sylk™) that the Smart Sensor uses. With any system, preventing physical access to the network and equipment reduces the risk of unauthorized interference. When using open protocols such as Modbus or BACnet MS/TP, care should be taken to ensure that the physical network is protected from unauthorized access.

2.2 Steps to Install TR50 Sensor

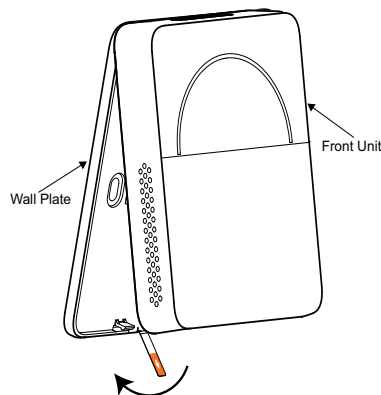
1. Switch OFF the power supply before initiating the TR50 IAQ Sensor installation.



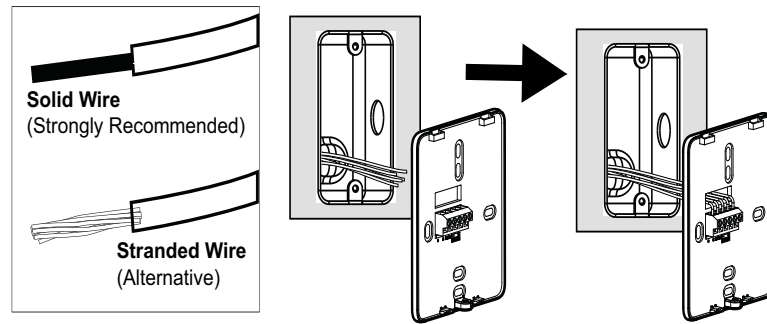
2. Loosen the bottom screw by turning it anticlockwise with the help of a screwdriver.



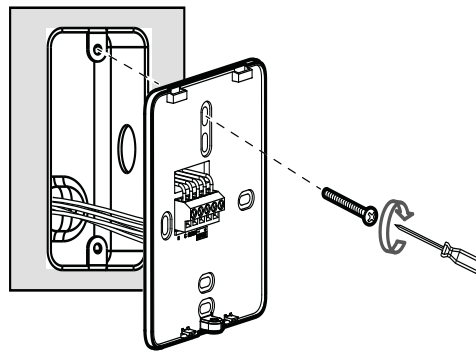
3. Separate the front unit and wall plate by pulling out the tape from the bottom to do the wiring.



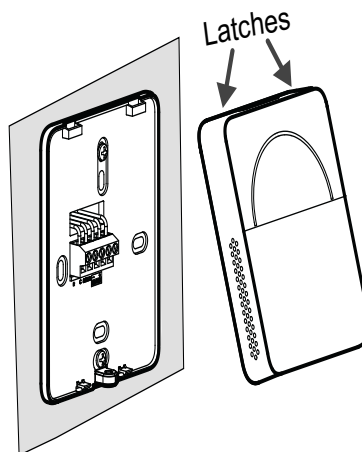
4. Pull the cables through the junction box and do wiring. Refer [Wiring Connections](#) section for wiring details.



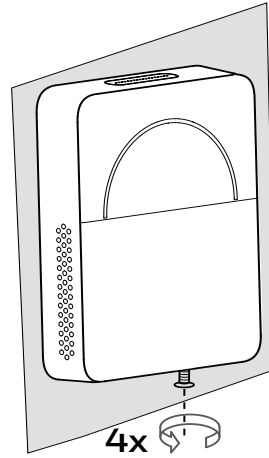
5. Fix the wall plate with the help of two screws to the Junction box.



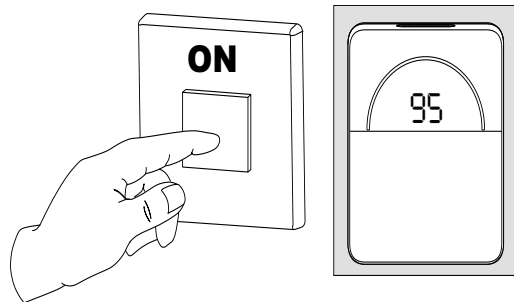
6. Attach the front unit to the wall plate, making sure the latches on each side are well matched.



7. Tighten the bottom screw to fix the front unit and wall plate.



8. Switch ON the power supply to start IAQ TR50 Sensor device.



2.3 Wiring Connections

For wiring details of the RS-485 via communication BACnet, Modbus and Sylk™ to a plant or unitary controller, see the latest TR50 IAQ Sensor_Mounting Instruction_31-00566M-02.

2.3.1 Sylk™ Wiring

Recommended maximum distance from controller to any Sylk™ device			
Quality and type of device ^a	Single twisted pair, non-shielded, stranded or solid ^b		Standard thermostat wire, (non-twisted), shielded or non-shielded, stranded or solid ^{c,d}
	18-22 AWG	24 AWG	18-24 AWG
TR50-5D 1.5 W TR50-5N 1.4 W TR50-3D 0.9 W TR50-3N 0.8 W	500 ft (150 m)	400 ft (120 m)	100 ft (30 m)

^a For Spyders, use the Resource Usage View in the Spyder Tool to determine maximum number of devices. For Comfort-Point™ Open controllers, there is a maximum power consumption 1.6 W

Note: When the Sylk™ Bus load is above 1 W, the interval report time must be specified carefully.

^b As a rule of thumb, single twisted pair (2 wires per cable only), thicker gauge, non-shielded cable yields best results for longer runs.

^c 98.4 ft (30 m) distance for standard thermostat wire is conservative, but meant to reduce the impact of any sources of electrical noise (including but not limited VFDs, electronic ballasts, etc). Shielded cable is recommended only if there is a need to reduce the effect of electrical noise.

^d These distances also apply for shielded twisted pair.

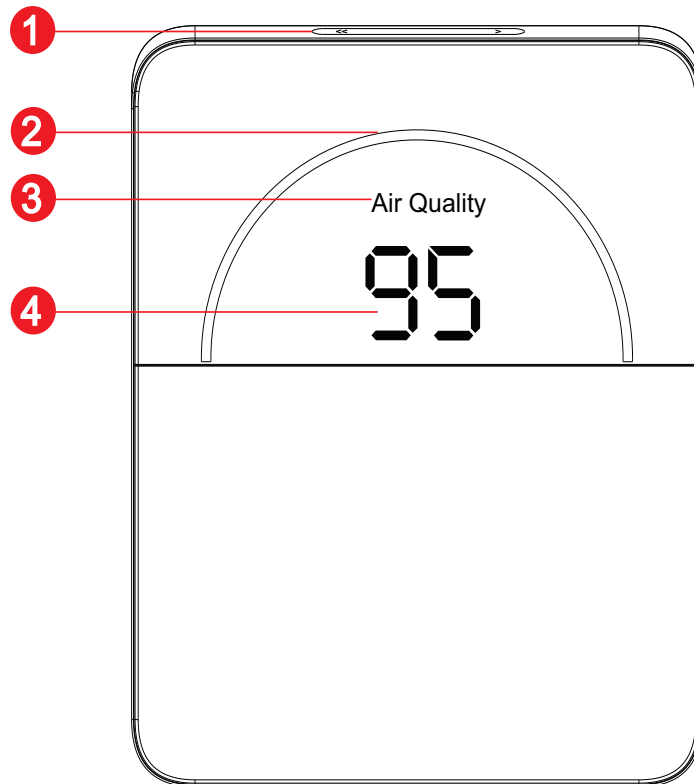
2.2 Power Up the Sensor

Once the TR50 IAQ Sensor device is installed and powered, the device gets started and shows firmware version number “x.x.x.x” as per the latest updated firmware and the parameter values are displayed on the LCD.

3.1 Home Screen - User Interface

The TR50 IAQ Sensor user interface contains

1. Touch Button
2. LED Status Color Ring
3. Parameter Description
4. Mono display



3.1.1 Touch Button

A Touch Button is available on the top of the TR50 IAQ Sensor device to change the parameters. Swipe the touch button or click left/right button to change the parameters.



3.1.2 LED Ring Behavior / Indication

The LED light behavior can be configured into two modes:

- Color Mode
- Neutral Mode

These two modes indicate LED behavior, air quality, sensor reading, or sensor health.

Color Mode:



LED Behavior	Air Quality Level	Sensor Reading Level	Sensor Health
Green	Good	Good	-
Yellow	Medium	Medium	-
Red	Poor	Poor (For CO ₂ , PM2.5 and TVOC)	Sensor Failure

Neutral Mode: With Display/ Without Display

The LED behavior of Neutral mode Temperature readings are shown below:



LED Behavior	Air Quality Level	Sensor Reading Level	Sensor Health
White on	Good	Good	-
White Breath	Medium	Medium	-
White Blink	Poor	Poor (For CO2, PM2.5 and TVOC)	Sensor Failure

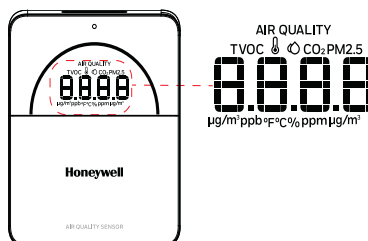
Threshold settings of LED color rings:

Air Quality Parameters*	Green (Good)	Yellow (Medium)	Red (Poor)
Air Quality Score	>80	40-80	<40
Temperature	65 °F to 86 °F	65 °F to 86 °F	
Humidity	10 % to 80 %	10 % or 80 %	
CO ₂	<1000 ppm	1000-1400 ppm	>1400 ppm
TVOC	<250 ppb	250-350 ppb	>350 ppb
PM 2.5	<35 µg/m ³	35-55 µg/m ³	>55 µg/m ³

* These threshold parameters can be configured as per requirement. For example, TVOC parameter threshold can be configured as Good (<500 ppb), medium (500 to 1500 ppb), poor (>1500 ppb), as per UBA study by the German Federal Environmental Agency. User will need to configure the two parameters; for example: CfgAlarmTVOCHighLimit =500 CfgAlarmTVOCHighHigh Limit =1500. There is a time delay (default 60 seconds) to stabilize the change between different color.

3.1.3 Parameter Description

The TR50 IAQ Sensor device will show 5 different parameter readings on the LCD display.



The following table provides an overview of all the available segments of the TR50 IAQ Sensor with its parameter names and units.

Segments	Parameter Name	Units
	Temperature	°F (°C)
	Humidity	%
	Carbon Dioxide	PPM
	Particular Matter	µg/m ³
	Total Volatile Organic Compound	PPB

3.1.4 Mono Display

The Mono segment display on the TR50 IAQ Sensor is used to show the air quality sensor parameter values.

3.2 Display Parameter

The Display Parameter of TR50 IAQ Sensor have 2 different modes

- Auto Mode
- Manual Mode

3.2.1 Auto Mode

After the installation and configuration, the display will show the parameter values per cycle time. The default time for the cycle to change the parameter is 5 seconds. If the SKU does not have PM2.5 and TVOC in the device, or installer configure to hide the parameters, the display will jump to next parameters.

When the TR50 device is powered on, the LCD display brightness will be in normal mode and the LCD display will be changed to dim/dark mode in seconds that is pre-setting.

3.2.2 Manual Mode

Under the manual mode the installer will configure the required parameters. The cycle time to display the parameters can be set manually from the range of 3-10 seconds or swipe the touch button to change the parameters.

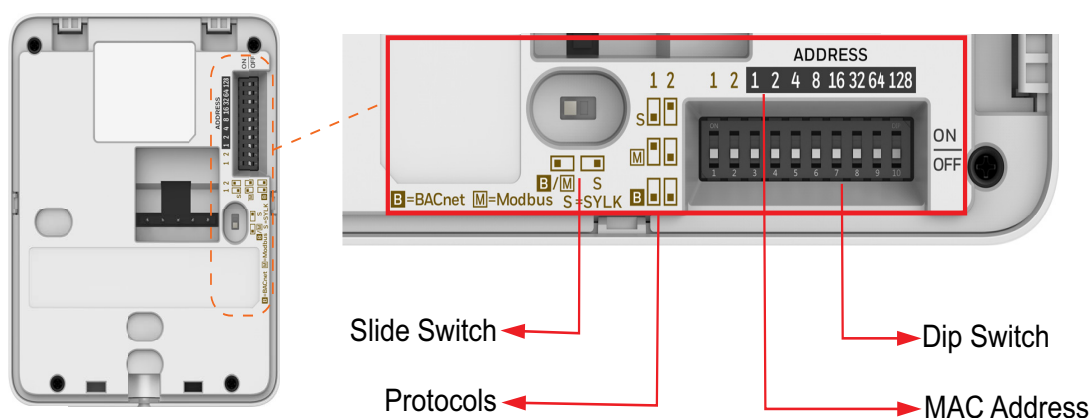
When the TR50 device is powered on, the LCD display brightness will be in normal mode and the LCD display will be changed to dim/dark mode in seconds that is pre-setting.

4.1 Topologies used to connect TR50 IAQ Sensor

To configure the TR50 IAQ Sensor, the device must be connected to plant or unitary controller. Before configuring the device, complete the dip switch configuration and connect the device to plant controller or unitary controller through RS-485 cables and connect your supervisor's workstation (Laptop or PC) to the same network. For more details see the [System Architecture](#).

4.2 Dip Switch Configuration

The Dip switches are used to change the communication protocols as per the selected networks.

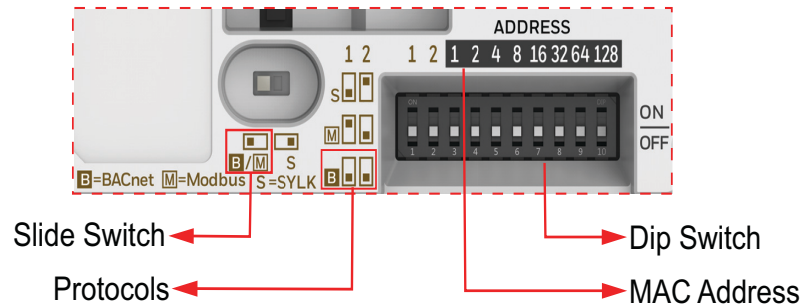


4.2.1 BACnet Mode

Slide Switch: The slide switch is set to LEFT to work in BACnet network mode.

DIP Switch (Protocol selection): The BACnet protocol switch is set to OFF for both 1 and 2 address.

DIP Switch (Address settings): The Auto MAC address for the BACnet mode is all ON/OFF.

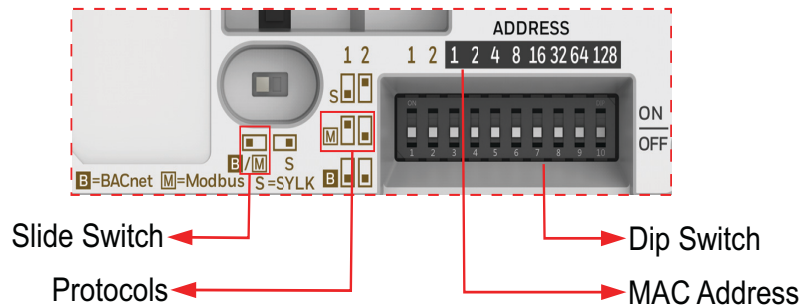


4.2.2 Modbus Mode

Slide Switch: The slide switch is set to LEFT to work in Modbus network mode.

DIP Switch (Protocol selection): The Modbus protocol switch is set to ON for address 1 and OFF for address 2.

DIP Switch (Address settings): The Modbus device address range is between 1 to 247 and it can be configured manually through the DIP Switches.

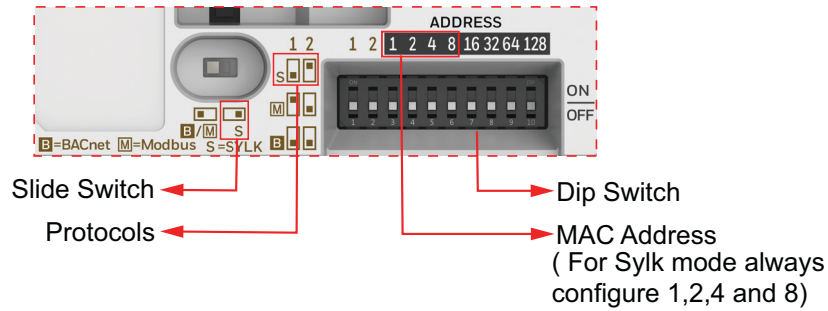


4.2.3 Sylk™ Mode

Slide Switch: The slide switch is set to RIGHT to work in Sylk™ network mode.

DIP Switches (Protocol selection): The Sylk™ protocol switch is set to OFF for address 1 and ON for address 2.

DIP Switches (Address settings): For the Sylk™ device address always configure “1,2,4 and 8” address. Do not configure “16 to 128” address.



Default Address = 1	1	2	4	8		1	2	4	8
Default: 1	☒	☐	☐	☐					
Address: 1	☒	☐	☐	☐		Address: 9	☒	☐	☐
Address: 2	☐	☒	☐	☐		Address: 10	☐	☒	☐
Address: 3	☐	☐	☒	☐		Address: 11	☐	☐	☒
Address: 4	☐	☐	☐	☒		Address: 12	☐	☐	☒
Address: 5	☒	☐	☐	☐		Address: 13	☐	☒	☐
Address: 6	☐	☒	☐	☐		Address: 14	☒	☐	☐
Address: 7	☐	☐	☒	☐		Address: 15	☐	☒	☐
Address: 8	☐	☐	☐	☒					

4.3 RS-485 Configuration

4.3.1 PreRequisites:

- Power source (24 VAC/VDC) to connect TR50 device and controller
- RS-485 cables
- Controller

Before configuring the device, make sure the power supply is Switched OFF.

Refer to the [Wiring Connections](#) section on page 9 for details regarding RS-485 wiring.

4.4 BACnet Configuration

4.4.1 PreRequisties

Adjust the switches on the back of the device to enable the BACnet mode.
Refer [Dip Switch Configuration](#) for more details.

4.4.2 Automatic MAC Address

The TR50 IAQ Sensor device support automatic MAC address when DIP switch address is put to all OFF or all ON.

By default, all the DIP switch address are OFF, so the MAC address will be assigned automatically.

Below are the default MAC address details. Engineers can assign MAC address manually via DIP address switch.

- **Default MAX Master:** 35
- **Default Min MAC:** 1
- **Default Max MAC:** 30

4.4.3 BACnet Device Instance ID

By default, the TR50 IAQ Sensor device will use MAC address as BACnet device instance to benefit initial device discovery process for TR50 commissioning.

After TR50 device is discovered, commissioning engineer take the responsibility to assign a unique BACnet device instance across inter-network. For more details about device discovery and device ID refer Honeywell Spyder Model 5, 7 and Optimizer Unitary System Engineering Guide - 31-00282 (Smart Sensor section.)

4.4.4 Auto Baud Rate

The TR50 IAQ Sensor device will be running in adaptive baud rate mode.

The adaptive baud rate will work in the first 4 minutes after the device is powered ON. Choose a valid baud rate (9600, 38400, 19200, 57600, 76800, 115200). If the valid baud rate cannot be found in this period, device will look in flash for the baud rate found last time, if failed again, use default 38400.

4.4.5 BACnet Points

Use the BACnet MS/TP network to discover and add the TR50 IAQ Sensor device.

After the device is discovered, different BACnet points will be created as per SKUs. These points are used to configure below sections as desired.

- Changing Parameter values

- Out of Range reading
- Alarm set values
- LCD Brightness

4.4.5.1 Input Points

Point Name	BACnet Instance	Read/Write	Type	Range
SS_AI_SensorReading_Temp	1	Read	Analog Input	32-122 °F (0-50 °C)
SS_AI_SensorReading_Humi	2	Read	Analog Input	0-100 %
SS_AI_SensorReading_CO ₂	3	Read	Analog Input	0-9999 ppm
SS_AI_SensorReading_PM2.5	4	Read	Analog Input	0-5000 ug/m ³
SS_AI_SensorReading_TVOC	5	Read	Analog Input	8-2820 ppb 16-5640 ug/m ³
SS_AI_AIR_QUALITY_SCORE	6	Read	Analog Input	0-100
SS_AI_SensorReading_PM1.0	7	Read	Analog Input	0-5000 ug/m ³
SS_AI_SensorReading_PM10	8	Read	Analog Input	0-5000 ug/m ³

4.4.5.2 Temperature Configuration Points

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
CfgAlarmTempLowLimit	1	R/W	Analog Value	65 °F (18 °C)	32 °F (0 °C) <= PRESENT VALUE of cfgAlarmTempLowLimit <= PRESENT VALUE of cfgAlarmTempHighLimit
CfgAlarmTempHighLimit	2	R/W	Analog Value	86 °F (30 °C)	PRESENT VALUE of cfgAlarmTempLowLimit <= PRESENT VALUE of cfgAlarmTempHighLimit <= 122 °F (50 °C)
CfgAlarmTempDeadband	3	R/W	Analog Value	1 °F (1 °C)	0 °F (0 °C) <= PRESENT VALUE of cfgAlarmTempDeadband
CfgAlarmTempTimeDelay	4	R/W	Analog Value	60 sec	0 sec <= PRESENT VALUE of cfgAlarmTempTimeDelay
SS_MV_OutofRange_Temp	1	R/W	Multi State Value	1	1: Normal 2: Off normal
CfgTempSensorOffset	281	R/W	Analog Value	0	-9 to 9 °F (-5 to 5 °C)
CfgAlarmTempLimitEnable	21	R/W	Multi State Value	4	1: Temp Low Limit And High Limit Disable 2: Temp Low Limit Enable 3: Temp High Limit Enable 4: Temp Low Limit And High Limit Enable

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
cfgDisplayUnitTemp	101	R/W	Multi State Value	1	1: Degrees Fahrenheit (°F) 2: Degrees Celsius (°C)

4.4.5.3 Humidity Configuration Points

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
CfgAlarmHumiLowLimit	51	R/W	Analog Value	10 %	0 <= PRESENT VALUE of cfgAlarmHumiLowLimit <= PRESENT VALUE of cfgAlarmHumiHighLimit
CfgAlarmHumiHighLimit	52	R/W	Analog Value	80 %	PRESENT VALUE of cfgAlarmHumiLowLimit <= PRESENT VALUE of cfgAlarmHumiHighLimit <=100
CfgAlarmHumiDeadband	53	R/W	Analog Value	2	0 <= PRESENT VALUE of cfgAlarmHumiDeadband
CfgAlarmHumiTimeDelay	54	R/W	Analog Value	60 sec	0 <= PRESENT VALUE of cfgAlarmHumiTimeDelay
SS_MV_OutofRange_Humi	2	R/W	Multi State Value	1	1: Normal 2: Off normal
cfgAlarmHumiLimitEnable	22	R/W	Multi State Value	4	1: Humidity Low Limit And High Limit Disable 2: Humidity Low Limit Enable 3: Humidity High Limit Enable 4: Humidity Low Limit And High Limit Enable
cfgHumiSensorOffset	282	R/W	Analog Value	0	-10 to 10

4.4.5.4 CO₂ Configuration Points

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
CfgAlarmCO ₂ HighLimit	101	R/W	Analog Value	1000 ppm	0 <= PRESENT VALUE of cfgAlarmCO ₂ HighLimit <= PRESENT VALUE of cfgAlarmCO ₂ HighHighLimit
CfgAlarmCO ₂ HighHighLimit	102	R/W	Analog Value	1400 ppm	PRESENT VALUE of cfgAlarmCO ₂ HighLimit <= PRESENT VALUE of cfgAlarmCO ₂ HighHighLimit <= 9999
CfgAlarmCO ₂ Deadband	103	R/W	Analog Value	100	0 <= PRESENT VALUE of cfgAlarmCO ₂ Deadband

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
CfgAlarmCO ₂ TimeDelay	104	R/W	Analog Value	60 sec	0 <= PRESENT VALUE of cfgAlarmCO ₂ TimeDelay
cfgCO ₂ SensorOffset	283	R/W	Analog Value	0	-1000 <= PRESENT VALUE of cfgCO ₂ SensorOffset <=1000 Tips of configuring cfgCO ₂ SensorOffset: 1. There must be an interval of 3 minutes between the two times calibrations of CO ₂ written into TR50, and less than this interval writing operation will cause failure. 2. TR50 can only accept the CO ₂ sensor offset value which meets requirement that CO ₂ sensor reading + offset value > 400 ppm
SS_MV_OutOfRange_CO ₂	3	R/W	Multi State Value	1	1: Normal 2: Over high limit 3: Over highhigh limit
CfgAlarmCO ₂ LimitEnable	23	R/W	Multi State Value	4	1: CO ₂ High Limit And High High Limit Disable 2: CO ₂ High Limit Enable 3: CO ₂ High High Limit Enable 4: CO ₂ High Limit And High High Limit Enable

4.4.5.5 PM2.5 Configuration Points

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
CfgAlarmPM2.5HighLimit	151	R/W	Analog Value	35 ug/m ³	0<= PRESENT VALUE of cfgAlarmPM2.5HighLimit <= PRESENT VALUE of cfgAlarmPM2.5HighHigh-Limit
cfgAlarmPM2.5HighHigh-Limit	152	R/W	Analog Value	55 ug/m ³	PRESENT VALUE of cfgAlarmPM2.5 HighLimit <= PRESENT VALUE of cfgAlarmPM2.5 HighHigh-Limit <=5000
CfgAlarmPM2.5Deadband	153	R/W	Analog Value	5	0 <= PRESENT VALUE of cfgAlarmPM2.5Deadband
CfgAlarmPM2.5TimeDelay	154	R/W	Analog Value	60 s	0 <= PRESENT VALUE of cfgAlarmPM2.5TimeDelay
CfgPM2.5SensorOffset	284	R/W	Analog Value	0	

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
SS_MV_OutOfRange_PM2.5	4	R/W	Multi State Value	1	1: Normal 2: Over high limit 3: Over high limit
CfgAlarmPM2.5LimitEnable	24	R/W	Multi State Value	4	1: PM2.5 High Limit And High High Limit Disable 2: PM2.5 High Limit Enable 3: PM2.5 High High Limit Enable 4: PM2.5 High Limit And High High Limit Enable
CfgPM1.0SensorOffset	287	R/W	Analog Value	0	
CfgPM10SensorOffset	288	R/W	Analog Value	0	

4.4.5.6 TVOC Configuration Points

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
CfgAlarmTVOCHighLimit	201	R/W	Analog Value	250 ppb 500 ug/m ³	8 ppb <= PRESENT VALUE of cfgAlarm TVOCHighLimit <= PRESENT VALUE of cfgAlarmTVOCHigh-HighLimit 16 ug/m ³ <= PRESENT VALUE of cfgAlarmTVOCHigh-Limit <= PRESENT VALUE of cfgAlarm TVOCHighHighLimit
CfgAlarmTVOCHighHighLimit	202	R/W	Analog Value	350 ppb 700 ug/m ³	PRESENT VALUE of cfgAlarmTVOCHighLimit <= PRESENT VALUE of cfgAlarmTVOCHigh-HighLimit <=2820 ppb PRESENT VALUE of cfgAlarmTVOCHighLimit <= PRESENT VALUE of cfgAlarmTVOCHigh-HighLimit <=5640 ug/m ³
CfgAlarmTVOCDeadband	203	R/W	Analog Value	20 ppb 40 ug/m ³	0 ppb <= PRESENT VALUE of cfgAlarm TVOCDeadband 0 ug/m ³ <= PRESENT VALUE of cfgAlarm TVOCDeadband
CfgAlarmTVOCTimeDelay	204	R/W	Analog Value	60 sec	0 <= PRESENT VALUE of cfgAlarmTVOCTime Delay
CfgTVOCSensorOffset	285	R/W	Analog Value	0	
SS_MV_OutOfRange_TVOC	5	R/W	Multi State Value	1	1: Normal 2: Over high limit 3: Over high limit

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
CfgAlarmTVOCLimitEnable	25	R/W	Multi State Value	4	1: TVOC High Limit And High High Limit Disable 2: TVOC High Limit Enable 3: TVOC High High Limit Enable 4: TVOC High Limit And High High Limit Enable
cfgDisplayUnitTVOC	102	R/W	Multi State Value	1	1: Parts Per Billion 2: Micrograms Per Cubic Meter

4.4.5.7 Configuration Points

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
SS_MV_AQI_level	6	R	Multi State Value	1	1: Good 2: Moderate 3: Unhealthy
cfgAQIUnhealthyScore	251	R/W	Analog Value	40	0 ≤ PRESENT VALUE of cfgAQIUnhealthyScore ≤ PRESENT VALUE of cfgAQIModerateScore
cfgAQIModerateScore	252	R/W	Analog Value	80	PRESENT VALUE of cfgAQIUnhealthyScore ≤ PRESENT VALUE of cfgAQIModerateScore ≤ 100
CfgAlarmAQIDeadband	253	R/W	Analog Value	2	0 ≤ PRESENT VALUE of cfgAlarmAQIDeadband
CfgAlarmAQITimeDelay	254	R/W	Analog Value	60 s	0 ≤ PRESENT VALUE of cfgAlarmAQITimeDelay
CfgAlarmAQILimitEnable	26	R/W	Multi State Value	4	1: AQI Moderate Limit And Unhealthy Limit Disable 2: AQI Moderate Limit Enable 3: AQI Unhealthy Limit Enable 4: AQI Moderate And Unhealthy Limit Enable

4.4.5.8 User Interface Configuration

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
cfgLedRingBrightness	301	R/W	Analog Value	50	40-100
CfgLedRingDimBrightness	302	R/W	Analog Value	10	10-40
CfgLcdBrightness	321	R/W	Analog Value	80	40-100
CfgLcdDimBrightness	322	R/W	Analog Value	40	10-40
CfgLcdAutoCycleTime	341	R/W	Analog Value	5 s	3-10 s
cfgLedRingLcdTimeoutTime	361	R/W	Analog Value	0 s	0 s, 10-30 s
cfgLedRingLcdDimTime	362	R/W	Analog Value	10 s	3-10 s
CfgIsParaDisplayed	381	R/W	Analog Value	TR50-5D: 63 TR50-3D: 15	For TR50-5D, cfgIsDisplayed_AQI: Bit 0 cfgIsDisplayed_-Temp: Bit 1 cfgIsDisplayed_Humi: Bit 2 cfgIsDisplayed_-CO ₂ : Bit 3 cfgIsDisplayed_PM2.5 - Bit 4 cfgIsDisplayed_TVOC: Bit 5 For TR50-3D, cfgIsDisplayed_AQI: Bit 0 cfgIsDisplayed_-Temp: Bit 1 cfgIsDisplayed_Humi: Bit 2 cfgIsDisplayed_-CO ₂ : Bit 3
cfgLedRingLcdEnable	21	R/W	Binary Value	1	0: Off 1: On
CfgLedRingColorOption	61	R/W	Multi State Value	1	1: Color mode 2: Neutral mode

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
CfgLcdParameterSwitch	81	R/W	Multi State Value	1	For TR50-5D, 1: Auto cycling (default) 2: Manual + AQI (as the static page) 3: Manual + Temperature (as the static page) 4: Manual + Humidity (as the static page) 5: Manual + CO₂ (as the static page) 6: Manual + PM2.5 (as the static page) 7: Manual + TVOC (as the static page) 8: Manual + no static page For TR50-3D, 1: Auto cycling (default) 2: Manual + AQI (as the static page) 3: Manual + Temperature (as the static page) 4: Manual + Humidity (as the static page) 5: Manual + CO₂ (as the static page) 6: Manual + no static page
CfgAlarmIndicatorEnable	41	R/W	Multi State Value	4	1: Disable 2: cfgOutOfRange-AlarmIndicator Enable 3: cfgSensor FailureAlarm IndicatorEnable 4: cfgOutOfRange-AlarmIndicator Enable & cfg SensorFailure AlarmIndicator Enable

4.4.5.9 BACnet Configuration Points

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
MstpHeaderCrcErrCount	500	R	Analog Value	-	
MstpDataCrcErrCount	501	R	Analog Value	-	
CfgIsMstpBadCrcClear	41	R/W	Binary Value	1	0: Uncleared 1: Cleared

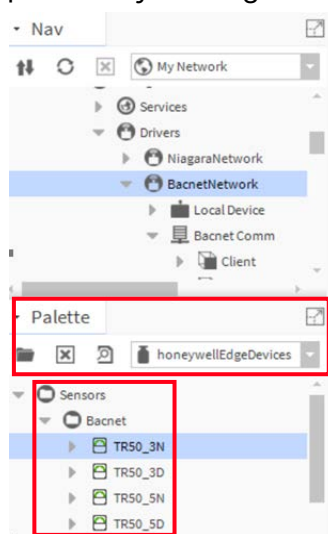
4.4.5.10 Alarm Points

Point Name	BACnet Instance	Read/Write	Type	Default Value	Range
cfgIsAlarmLocalDetectionEnable	1	R/W	Binary Value	1	0: Disable 1: Enable

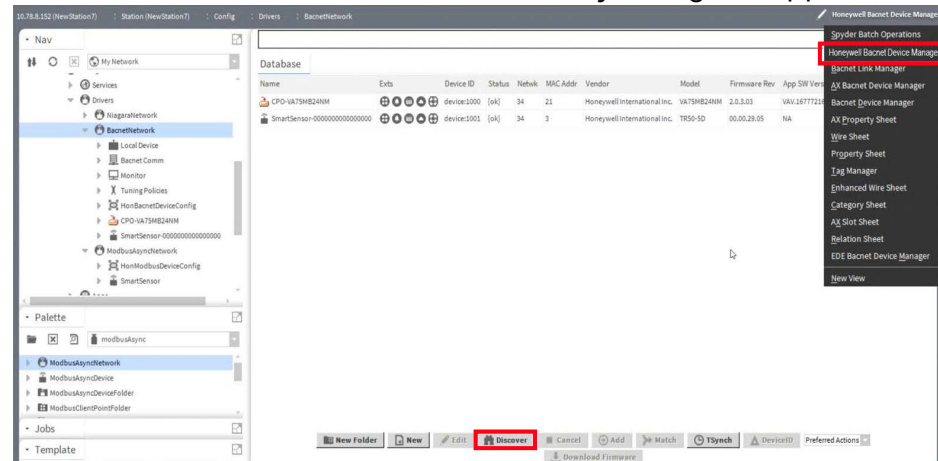
4.4.6 Configure TR50 Bacnet Device via Niagara

Follow the below steps to configure the TR50 Bacnet device in Niagara:

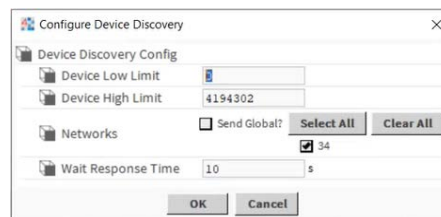
- Step 1. Install Niagara SmartSensor Tools, that copy all the jar files to Niagara installation module folder.
- Step 2. From the palette, open honeywellEdgeDevices > Sensors > Bacnet folder



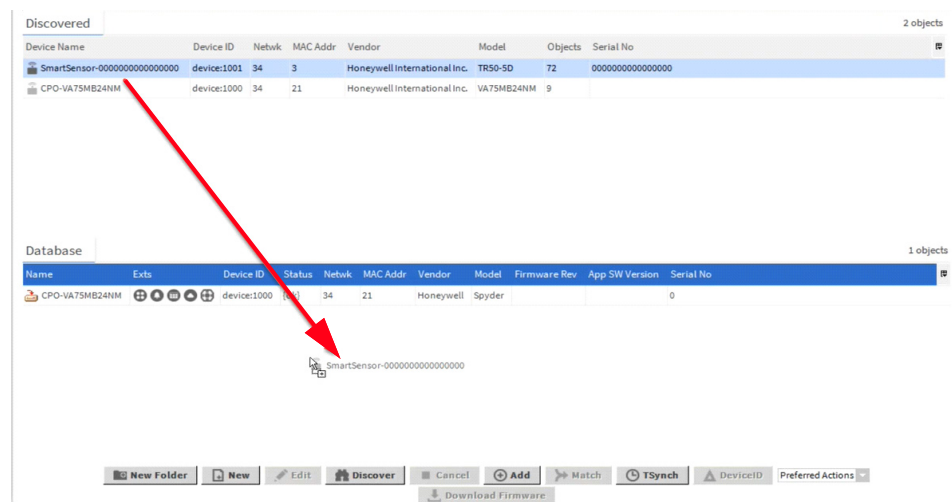
- Step 3. Select the **Honeywell Bacnet Device Manager** from the top right corner and click **Discover**. The Device Discovery dialog box appears.



- Step 4. Click **Ok** to discover the device.



- Step 5. Drag and drop the TR50 device to the database or select the TR50 device and click **Add**. The **Add** dialog box appears.



Step 6. Change the device ID and name as required and click Ok.

Name	Type	Device ID	Netwk	MAC Addr	Enabled	Use Cov	Use Cov f
SmartSensor-0000000000000000	Hon Bacnet Smart Sensor Device	device:1001	34	3	true	false	false

Name: SmartSensor-0000000000000000

Type: Hon Bacnet Smart Sensor Device

Device ID: device: 1001

Netwk: 34 [0-65535]

MAC Addr: 3

Enabled: ☒ true

Use Cov: ☐ false

Use Cov Property: ☐ false

Max Cov Subscriptions: MAX

Buttons: OK, Cancel

Step 7. The device gets added to the database.

Discovered 2 objects

Device Name	Device ID	Netwk	MAC Addr	Vendor	Model	Objects	Serial No
SmartSensor-0000000000000000	device:1001	34	3	Honeywell International Inc.	TR50-SD	72	0000000000000000
CPO-VA75MB24NM	device:1000	34	21	Honeywell International Inc.	VA75MB24NM	9	

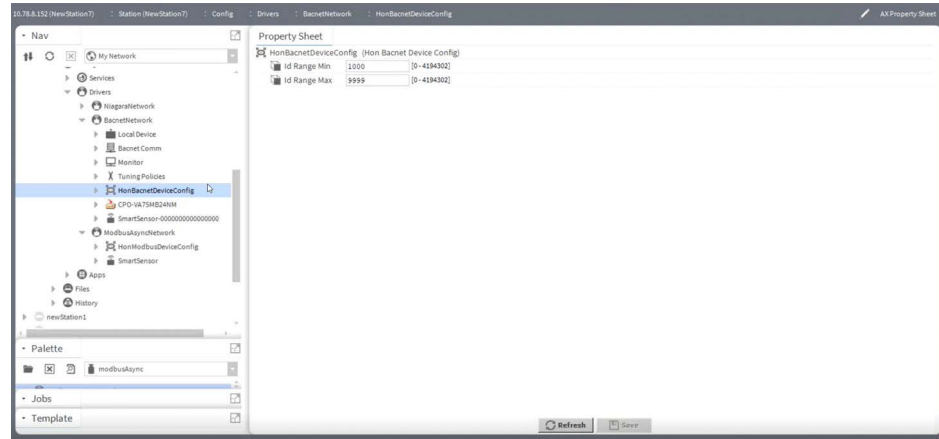
Database 2 objects

Name	Exts	Device ID	Status	Netwk	MAC Addr	Vendor	Model	Firmware Rev	App SW Version	Serial No
CPO-VA75MB24NM	+	device:1000	[ok]	34	21	Honeywell	Spyder			0
SmartSensor-0000000000000000	+	device:1001	[ok]	34	3	Honeywell International Inc.	TR50-SD	00.00.29.05		0000000000000000

Buttons: New Folder, New, Edit, Discover, Cancel, Add, Match, TSynch, DeviceID, Preferred Actions, Download Firmware

Follow the below steps to change the Min and Max device instance ranges:

- Step 1. Navigate to BacnetNetwork > HonBacnetDeviceConfig and open the AX property sheet of **HonBacnetDeviceConfig**.



- Step 2. Set the required Min and Max ID range and click Save.

4.4.7 Configure TR50 Bacnet Device via CPO

Follow the below steps to create a Bacnet device TR50 sensor:

- Step 1. Right-click a project node and click **New Controller**. The **New Controller** dialog box appears.
- Step 2. Select **MS/TP** as the Model type.
- Step 3. In **Model name**, select a required unitary controller or TR50 sensor from the drop-down list.
- Step 4. In **Sub model**, select a sub model from the drop-down list. The sub model list changes according to the main model selected in the previous field.
- Step 5. In the **Controller name** box, type a name for the device.
- Step 6. In the **Device id** list, enter a device ID.
Every device you add in the project must be assigned with a unique device ID as per the BACnet standard. The device ID is a number can be picked between the range from 1 to 4194302.
If a number is assigned for a device, then the same number cannot be assigned for another device in the same project.
- Step 7. In the **Application version** list, select an application version.
- Step 8. In the **Plant controller** list, select the controller to which the unitary controller or TR50 sensor must be associated.
- Step 9. In the **Channel name** list, select the channel type to which the unitary controller or TR50 sensor must be associated.
- Step 10. Click **Create**.

Follow the below steps to configure TR50 Bacnet device in CPO:

- Step 1. Create a CPO Universal Unitary controller, as per the above steps.
- Step 2. In the **Controller Properties** tab, click the required **Controller Address** to be assigned to the controller.
- Step 3. Create datapoints.
- Step 4. In the right-pane, click the **IO Terminal Assignment** tab.
- Step 5. Click **Add Sylk Device** and select the required wall module type. The **Add Sylk Device** dialog box appears.
- Step 6. In the **Device Type** list, click the required TR50 wall module variant.
- Step 7. In the **Templates** list, select a template based on the requirement.
- Step 8. In the **Address** list, select an address from the drop-down list. Set the same address manually on the TR50 sensor using dip switch.
- Step 9. Click **Finish**.

4.4.8 BACnet Controller Compatibility of TR50

BACnet MS/TP controller compatibility is shown in the below table.

Product Name	OS Number	Data Communication	Firmware Download	Notes
WEB-8000	WEB-8000	Y	Y	
CIPer Model 30	WEB-C3036EPVBNH	Y	Y	
Optimizer Advanced	N-ADV-133-H	Y	Y	
Optimizer IP VAV	WEB-VA75IB24NM			
Optimizer MS/TP VAV	WEB-VA75MB24NM			
Optimizer IP Unitary	RL1644ES24NM			
Optimizer MSTP Unitary	RL1644MS24NM			
Compact VAV	VA423B24N			
Plant Controller	CPO-PC500	Y	Y	
Plant Controller	CPO PC400	Y	Y	
ACM	ACM	Y	N	
IQ4E	IQ4E-2040u531000	N	N	
IQ4NC	IQ4NC-1040U5010	Y	N	
PCD1	PCD1.M2220-C15	N	N	

4.5 Modbus Configuration

4.5.1 Baud Rate

Modbus supports automatic baud rate and manual baud rate configuration, it can support the following baud rate: 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200.

4.5.1.1 Auto Baud Rate

The default for the first startup is Auto Baud rate. This detection process will last 5 minutes after TR50 start to detect there is data communication from Modbus master. If there is no right baud rate matched during this 5 minutes, TR50 will work as the last-detected baud rate, or default to 19200 Bps.

4.5.1.2 Manual Baud Rate

After the default Auto Baud rate matches, please configure `cfgModbus Auto Baud rate Enable` register to false, this will make TR50 work as manual Baud rate, then configure desired baud rate.

4.5.2 Modbus Serial Port Settings

- **Data Bits:** 8
- **Stop Bits:** 1
- **Parity:** None/Even/odd (**Default:** Even)

4.5.3 Modbus Configuration Register Table Modbus Sensor

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	112	R/W	V	cfgHand- ling Com- mand	3N/ 3D/ 5N/5D	int16	16	0-3	-	0
Device	Holding	Setup	2000	R/W	NV	cfgBau- drate	3N/ 3D/ 5N/5D	enum /int16	16	0: 1200 baud 1: 2400 baud 2: 4800 baud 3: 9600 baud 4: 14400 baud 5: 19200 baud 6: 38400 baud 7: 57600 baud 8: 115200 baud	-	5
Device	Holding	Setup	2001	R/W	NV	cfgPar- ity	3N/ 3D/ 5N/5D	enum /int16	16	0: none 1: odd 2: even	-	2
Device	Holding	Setup	2002	R/W	NV	cfgStop- Bits	3N/ 3D/ 5N/5D	int16	16	1-2	1	1
Device	Holding	Setup	2010	R/W	NV	cfgTemp Senso- rOffset	3N/ 3D/ 5N/5D	signed /int16	16	-9 to 9 °F (- 5 to 5 °C)	0.1	0
Device	Holding	Setup	2011	R/W	NV	cfgHumi Senso- rOffset	3N/ 3D/ 5N/5D	signed /int16	16	-10 to 10	1	0

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	2012	R/W	NV	cfgCO ₂ SensorOffset	3N/ 3D/ 5N/5D	signed /int16	16	-1000 <= cfgCO ₂ SensorOffset <= 1000 Tips of configuring cfgCO ₂ SensorOffset: 1. There must be an interval of 3 minutes between the two times calibrations of CO ₂ written into TR50, and less than this interval writing operation will cause failure. 2. TR50 can only accept the CO ₂ sensor offset value which meets requirement that CO ₂ sensor reading + offset value > 400 ppm	1	0
Device	Holding	Setup	2013	R/W	NV	cfg- PM2.5 SensorOffset	5N/5D	signed /int16	16	-	1	0
Device	Holding	Setup	2014	R/W	NV	cfgTVOC SensorOffset	5N/5D	signed /int16	16	-	1	0
Device	Holding	Setup	2015	R/W	NV	cfg- PM1.0 SensorOffset	5N/5D	signed /int16	16	-	1	0
Device	Holding	Setup	2016	R/W	NV	cfg- PM10 SensorOffset	5N/5D	signed /int16	16	-	1	0

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	2030	R/W	NV	cfgAlarmTempLowLimit	3N/ 3D/ 5N/5D	signed /int16	16	32 °F (0°C) ≤ cfgAlarmTempLowLimit ≤ cfgAlarmTempHighLimit	1	65 °F (18 °C)
Device	Holding	Setup	2031	R/W	NV	cfgAlarmHumiLowLimit	3N/ 3D/ 5N/5D	int16	16	0 ≤ cfgAlarmHumiLowLimit ≤ cfgAlarmHumiHighLimit	1	10 %
Device	Holding	Setup	2032	R/W	NV	cfgAlarmCO2HighLimit	3N/ 3D/ 5N/5D	int16	16	0 ≤ cfgAlarmCO2HighLimit ≤ cfgAlarmCO2HighHighLimit	1	1000 ppm
Device	Holding	Setup	2033	R/W	NV	cfgAlarmPM2.5HighLimit	5N/5D	int16	16	0 ≤ cfgAlarmPM2.5HighLimit ≤ cfgAlarmPM2.5HighHighLimit	1	35 ug/ m ³
Device	Holding	Setup	2034	R/W	NV	cfgAlarmTVOCHighLimit	5N/5D	int16	16	8 ppb ≤ cfgAlarmTVOCHighLimit ≤ cfgAlarmTVOCHighHighLimit 16 ug/m ³ ≤ cfgAlarmTVOCHighLimit ≤ cfgAlarmTVOCHighHighLimit	1	250 ppb 500 ug/ m ³
Device	Holding	Setup	2035	R/W	NV	cfgAQIModerateScore	3N/ 3D/ 5N/5D	int16	16	cfgAQIUnhealthyScore ≤ cfgAQIModerateScore ≤ 100	1	80

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	2050	R/W	NV	cfgAlarm TempHigh Limit	3N/ 3D/ 5N/5D	signed /int16	16	cfgAlarm- TempLow Limit <= cfgAlarm TempHigh- Limit <= 122 °F cfgAlarm- TempLow Limit <= cfgAlarm TempHigh- Limit <= 50 °C	1	86 °F (30 °C)
Device	Holding	Setup	2051	R/W	NV	cfgAlarm Humi- High Limit	3N/ 3D/ 5N/5D	int16	16	cfgAlarm- HumiLow Limit <= cfgAlarm HumiHigh- Limit <= 100	1	80 %
Device	Holding	Setup	2052	R/W	NV	cfgAlarm CO ₂ High- High- Limit	3N/ 3D/ 5N/5D	int16	16	cfgAlarm- CO ₂ High- Limit <= cfgAlarm- CO ₂ High HighLimit <= 9999	1	1400 ppm
Device	Holding	Setup	2053	R/W	NV	cfgAlarm PM2.5Hi gh High- Limit	5N/5D	int16	16	cfgAlarm- PM2.5High Limit <= cfgAlarm PM2.5High High Limit <= 5000	1	55 ug/ m ³
Device	Holding	Setup	2054	R/W	NV	cfgAlarm TVOCHi gh High- Limit	5N/5D	int16	16	cfgAlarmT- VOCHigh Limit <= cfgAlarm TVOCHigh- High Limit<=282 0 ppb cfgAlarmT- VOCHigh Limit <= cfgAlarm TVOCHigh- High Limit <= 5640 ug/ m3	1	350 ppb 700 ug/ m ³
Device	Holding	Setup	2055	R/W	NV	cfgAQI Unhealt hy Score	3N/ 3D/ 5N/5D	int16	16	0<= cfgAQI- Unhealthy Score <= cfgAQI Moderate- Score <= 100	1	40

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	2070	R/W	NV	cfgAlar mTemp Dead- band	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarm- Temp Deadband	1	1 °F (1 °C)
Device	Holding	Setup	2071	R/W	NV	cfgAlar mHumi Dead- band	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarm- Humi Deadband	1	2
Device	Holding	Setup	2072	R/W	NV	cfgAlar m CO ₂ Dea dband	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarm- CO ₂ Deadband	1	100
Device	Holding	Setup	2073	R/W	NV	cfgAlar m PM2.5 Dead- band	5N/5D	int16	16	0 <= cfgAlarm- PM2.5 Deadband	1	5
Device	Holding	Setup	2074	R/W	NV	cfgAlar mTVOC Dead- band	5N/5D	int16	16	0 <= cfgAlarmT- VOC Deadband	1	20 ppb 40 ug/ m ³
Device	Holding	Setup	2075	R/W	NV	cfgAlar- mAQI Dead- band	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlar- mAQI Deadband	1	2
Device	Holding	Setup	2090	R/W	NV	cfgAlar mTemp TimeDe- lay	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarm- Temp TimeDelay	1	60 s
Device	Holding	Setup	2091	R/W	NV	cfgAlar mHumi TimeDe- lay	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarm- Humi TimeDelay	1	60 s
Device	Holding	Setup	2092	R/W	NV	cfgAlar mCO ₂ TimeDe- lay	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarm- CO ₂ TimeDelay	1	60 s
Device	Holding	Setup	2093	R/W	NV	cfgAlar m PM2.5Ti me Delay	5N/5D	int16	16	0 <= cfgAlarm- PM2.5 TimeDelay	1	60 s
Device	Holding	Setup	2094	R/W	NV	cfgAlar mTVOC TimeDe- lay	5N/5D	int16	16	0 <= cfgAlarmT- VOC TimeDelay	1	60 s
Device	Holding	Setup	2095	R/W	NV	cfgAlar- mAQI TimeDe- lay	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlar- mAQI TimeDelay	1	60 s

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	2110	R/W	NV	cfg_OOR Sensor- Fail Alarm Indica- torEn	3D/5D	enum /int16	16	1: Disable 2: cfgOut- OfRange AlarmIndi- catorEnable 3: cfgSen- sorFailure AlarmIndi- catorEnable 4: cfgOut- OfRange AlarmIndi- catorEn- able & cfgSensor- Failure AlarmIndi- catorEnable	1	4
Device	Holding	Setup	2130	R/W	NV	cfgIs- Para Dis- played	3D/5D	int16	16	For TR50- 5D, cfgIsDis- played_AQI: Bit 0 cfgIsDis- played_- Temp: Bit 1 cfgIsDis- played_Hu- mi: Bit 2 cfgIsDis- played_- CO ₂ : Bit 3 cfgIsDis- played_PM 2.5: Bit 4 cfgIsDis- played_T- VOC: Bit 5 For TR50- 3D, cfgIsDis- played_AQI: Bit 0 cfgIsDis- played_- Temp: Bit 1 cfgIsDis- played_Hu- mi: Bit 2 cfgIsDis- played_- CO ₂ : Bit 3	1	15/63

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	2150	R/W	NV	cfgTempAlarmLimitEnable	3N/ 3D/ 5N/5D	enum /int16	16	1: Temp Low Limit And High Limit Disable 2: Temp Low Limit Enable 3: Temp High Limit Enable 4: Temp Low Limit And High Limit Enable	1	4
Device	Holding	Setup	2151	R/W	NV	cfgHumidityAlarmLimitEnable	3N/ 3D/ 5N/5D	enum /int16	16	1: Humidity Low Limit And High Limit Disable 2: Humidity Low Limit Enable 3: Humidity High Limit Enable 4: Humidity Low Limit And High Limit Enable	1	4
Device	Holding	Setup	2152	R/W	NV	cfg-CO ₂ AlarmLimitEnable	3N/ 3D/ 5N/5D	enum /int16	16	1: CO ₂ High Limit And High High Limit Disable 2: CO ₂ High Limit Enable 3: CO ₂ High High Limit Enable 4: CO ₂ High Limit And High High Limit Enable	1	4

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	2153	R/W	NV	cfg- PM2.5Al arm Lim- itEnable	5N/5D	enum /int16	16	1: PM2.5 High Limit And High High Limit Disable 2: PM2.5 High Limit Enable 3: PM2.5 High High Limit Enable 4: PM2.5 High Limit And High High Limit Enable	1	4
Device	Holding	Setup	2154	R/W	NV	cfgTVOC Alarm- Limit Enable	5N/5D	enum /int16	16	1: TVOC High Limit And High High Limit Disable 2: TVOC High Limit Enable 3: TVOC High High Limit Enable 4: TVOC High Limit And High High Limit Enable	1	4
Device	Holding	Setup	2155	R/W	NV	cfgAQI- Alarm Lim- itEnable	3N/ 3D/ 5N/5D	enum /int16	16	1: AQI Mod- erate Limit And Unhealthy Limit Dis- able 2: AQI Mod- erate Limit Enable 3: AQI Unhealthy Limit Enable 4: AQI Mod- erate And Unhealthy Limit Enable	1	4
Device	Holding	Setup	3000	R/W	NV	cfgLe- dRing Colo- rOption	3N/ 3D/ 5N/5D	int16	16	1: Color mode 2: Neutral mode	1	1
Device	Holding	Setup	3001	R/W	NV	cfgLe- dRing Bright- ness	3N/ 3D/ 5N/5D	int16	16	40-100	1	50

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	3002	R/W	NV	cfgLe- dRing Dim- Bright- ness	3D/5D	int16	16	10-40	1	10
Device	Holding	Setup	3020	R/W	NV	cfgLc- dAuto Cycle- Time	3D/5D	int16	16	3-10 s	1	5 s
Device	Holding	Setup	3021	R/W	NV	cfgLcd Bright- ness	3D/5D	int16	16	40-100	1	80

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	3022	R/W	NV	cfgLcd Parame- ter Switch	3D/5D	enum /int16	16	For TR50-5D, 1: Auto cycling (default) 2: Manual + AQI (as the static page) 3: Manual + Temperature (as the static page) 4: Manual + Humidity (as the static page) 5: Manual + CO₂ (as the static page) 6: Manual + PM2.5 (as the static page) 7: Manual + TVOC (as the static page) 8: Manual + no static page For TR50-3D, 1: Auto cycling (default) 2: Manual + AQI (as the static page) 3: Manual + Temperature (as the static page) 4: Manual + Humidity (as the static page) 5: Manual + CO₂ (as the static page) 6: Manual + no static page	1	1
Device	Holding	Setup	3023	R/W	NV	cfgLcd Dim- Bright- ness	3D/5D	int16	16	10-40	1	40

Category	Reg Type	Setup/ Runtime	Addr	Dir	Non- Volatile	Name	SKU	Type/ Unit	Bits Num	Range	Scale	Default
Device	Holding	Setup	3030	R/W	NV	cfgLe- dRing LcdDim- Time	3D/5D	int16	16	3-10 s	1	10 s
Device	Holding	Setup	3031	R/W	NV	cfgLe- dRing LcdTim- eout Time	3D/5D	int16	16	0 s, 10-30 s	1	0 s
Device	Coil	Setup	4000	R/W	NV	cfg Tem- perature Unit	3N/ 3D/ 5N/5D	bit/ bool- ean	1	- Fahren- heit: 0 - Celsius: 1	-	Fahren- heit
Device	Coil	Setup	4001	R/W	NV	cfgDis- play Unit- Temp	3D/5D	bit/ bool- ean	1	- Fahren- heit: 0 - Celsius: 1	-	Fahren- heit
Device	Coil	Setup	4004	R/W	NV	cfgTV0- CUnit	5N/5D	bit/ bool- ean	1	- ppb: 0 - ug/m ³ : 1	-	ppb
Device	Coil	Setup	4005	R/W	NV	cfgDis- play Unit- TVOC	5D	bit/ bool- ean	1	- ppb: 0 - ug/m ³ : 1	-	ppb
Device	Coil	Setup	4020	R/W	NV	cfgLe- dRing LcdEn- able	3N/ 3D/ 5N/5D	bit/ bool- ean	1	ON or OFF	-	ON/1
Device	Coil	Setup	5000	R/W	NV	cfgMod- bus Auto- Baud rateEn- able	3N/ 3D/ 5N/5D	bool	1	TRUE or FALSE	-	TRUE
Device	Coil	Setup	5001	R/W	V	cfgMod- bus FrameC ntClear	3N/ 3D/ 5N/5D	bool	1	TRUE or FALSE	-	TRUE
Device	Coil	Setup	5040	R/W	NV	cfgLocal Detec- tion Enable	3N/ 3D/ 5N/5D	bool	1	TRUE or FALSE	-	TRUE

4.5.4 Modbus Sensor Reading Status Register Table

Category	Reg type	Setup /Run time	Addr	Dir	Non-Volatile	Name	SKU	Type /Unit	Default Unit	Bits Num	Range	Scale	Default
Disp Values	Input	run-time	1	R	V	Temperature	3N/ 3D/ 5N/ 5D	int16	°F	16	32-122 °F 0-50 °C	0.1	
Disp Values	Input	run-time	2	R	V	Humidity	3N/ 3D/ 5N/ 5D	int16	% RH	16	0-100	0.1	
Disp Values	Input	run-time	3	R	V	CO ₂	3N/ 3D/ 5N/ 5D	int16	ppm	16	0-9999	1	
Disp Values	Input	run-time	4	R	V	Particulates PM2.5	5N/ 5D	int16	ug/m ³	16	0-5000	1	
Disp Values	Input	run-time	5	R	V	TVOC	5N/ 5D	int16	ppb	16	8-2820 ppb 16-5640 ug/m ³	1	
Disp Values	Input	run-time	14	R	V	Particulates PM1	5N/ 5D	int16	ug/m ³	16	0-5000	1	
Disp Values	Input	run-time	24	R	V	Particulates PM10	5N/ 5D	int16	ug/m ³	16	0-5000	1	
Disp Values	Input	run-time	30	R	V	Air-quality score	3N/ 3D/ 5N/ 5D	int16	signed	16	0-100	1	
Device	Input	run-time	80	R	NV	TAG Identifier Data	3N/ 3D/ 5N/ 5D	string	string	64	"SS-TR50"	-	
Device	Input	run-time	96	R	NV	Host-FirmwareVersion	3N/ 3D/ 5N/ 5D	int32	signed/ int32	32	00 00 00 01 99 99 99 99	-	
Device	Input	run-time	98	R	NV	BLE-FirmwareVersion	3N/ 3D/ 5N/ 5D	int32	signed/ int32	32	00 00 00 01 99 99 99 99	-	

Category	Reg type	Setup /Run time	Addr	Dir	Non-Volatile	Name	SKU	Type /Unit	Default Unit	Bits Num	Range	Scale	Default
Device	Input	run-time	114	R	V	Host-FirmwareUpdat-eStatus	3N/3D/5N/5D	int16	enum/int16	16	0: OTA provision_OK 1: firmware Signature verification failed 2: firmware update failed. 3: firmware update in progress.(After rcv Handling cmd 02) 4: reserved. 5: signature validation failed. 6: flash access failed. 9: OTA Provisional status. 90: OTA downloading status. 91: OTA downloaded status.	-	
Device	Input	run-time	115	R	V	BLE-FirmwareUpdat-eStatus	3N/3D/5N/5D	int16	enum/int16	16	0: OTA provision OK 1: firmware Signature verification failed 2: firmware update failed. 3: firmware update in progress.(After rcv Handling cmd 02) 4: reserved. 5: signature validation failed. 6: flash access failed. 90: OTA downloading status. 91: OTA downloaded status.	-	
Device	Input	run-time	200	R	V	Mod-bus-BadFrame-Count	3N/3D/5N/5D	int32	int32	32		-	0
Device	Input	run-time	202	R	V	Mod-bus-ReceivedFrame-Count	3N/3D/5N/5D	int32	int32	32		-	0

Category	Reg type	Setup /Run time	Addr	Dir	Non-Volatile	Name	SKU	Type /Unit	Default Unit	Bits Num	Range	Scale	Default
Device	Input	run-time	210	R	V	Data-BaseRevision	3N/3D/5N/5D	int32	int32	32		-	0
Device	Input	run-time	1000	R	NV	SSModel-Name	3N/3D/5N/5D	string	string	128	TR50-3N, TR50-3D, TR50-5N, TR50-5D	-	
Device	Input	run-time	1030	R	NV	SSSerial-Number	3N/3D/5N/5D	string	string	128	"0000000000000000"	-	

4.5.5 Modbus Runtime Register Table

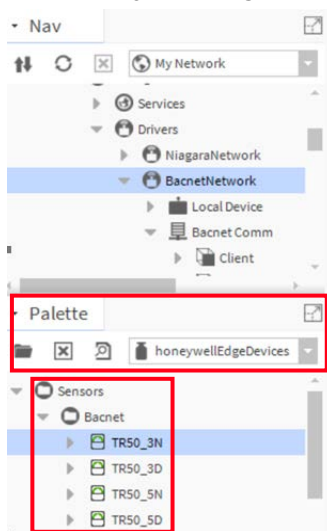
Category	Reg type	Setup /Run time	Addr	Dir	Non-Volatile	Name	SKU	Type / Unit	Default Unit	Bits Num	Range	Scale	Default
Device	Input	run-time	100	R	V	Temperature-FailureAlarm	3N/3D/5N/5D	signed/int16	-	16	Error code: 0: no fault detected 64: fail_ntc_short_0 65: fail_ntc_open_0 66: fail_ntc_short_1 67: fail_ntc_open_1 68: fail_ntc_short_2 69: fail_ntc_open_2	1	0
Device	Input	run-time	101	R	V	Humidity-FailureAlarm	3N/3D/5N/5D	signed/int16	-	16	Error code: 0: no fault detected 12: communication_failure	1	0
Device	Input	run-time	102	R	V	CO2-Failure-Alarm	3N/3D/5N/5D	signed/int16	-	16	Error code: 0: no fault detected 12: communication_failure 70: fail_storage	1	0

Category	Reg type	Setup /Run time	Addr	Dir	Non-Volatile	Name	SKU	Type / Unit	Default Unit	Bits Num	Range	Scale	Default
Device	Input	run-time	103	R	V	PM2.5_Failure-Alarm	5N/5D	signed/int16	-	16	Error code: 0: no fault detected 12: communication_failure 71: fail_low_fan_speed 72: fail_high_fan_speed 73: fail_pd 74: fail_ld	1	0
Device	Input	run-time	104	R	V	TVOC_Failure-Alarm	5N/5D	signed/int16	-	16	Error code: 0: no fault detected 12: communication_failure	1	0
Device	Hold-ing	run-time	2200	R/W	V	TempOutOf-Range	3N/3D/5N/5D	enum/int16	-	16	1: Normal 2: Off normal	-	1
Device	Hold-ing	run-time	2201	R/W	V	Humi-OutOf-Range	3N/3D/5N/5D	enum/int16	-	16	1: Normal 2: Off normal	-	1
Device	Hold-ing	run-time	2202	R/W	V	CO2OutOfRange	3N/3D/5N/5D	enum/int16	-	16	1: Normal 2: Over high limit 3: Over high-high limit	-	1
Device	Hold-ing	run-time	2203	R/W	V	PM2.5OutOf-Range	5N/5D	enum/int16	-	16	1: Normal 2: Over high limit 3: Over high-high limit	-	1
Device	Hold-ing	run-time	2204	R/W	V	TVO-COOutOf-Range	5N/5D	enum/int16	-	16	1: Normal 2: Over high limit 3: Over high-high limit	-	1
Device	Hold-ing	run-time	2205	R	V	AQIlevel	3N/3D/5N/5D	enum/int16	-	16	1: Good 2: Moderate 3:Unhealthy	-	1

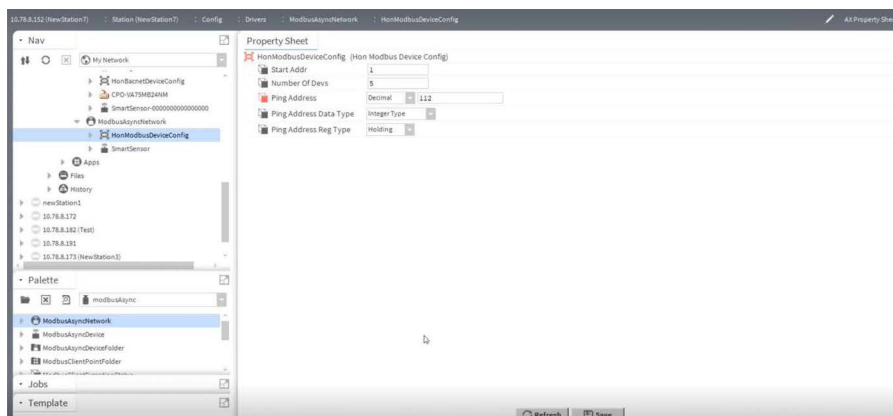
4.5.6 Configure TR50 Modbus Device via Niagara

Follow the below steps to configure the TR50 Modbus device in Niagara:

- Step 1. Install Niagara SmartSensor Tools, that copy all the jar files to Niagara installation module folder.
- Step 2. From the palette, open honeywellEdgeDevices > Sensors > Bacnet folder

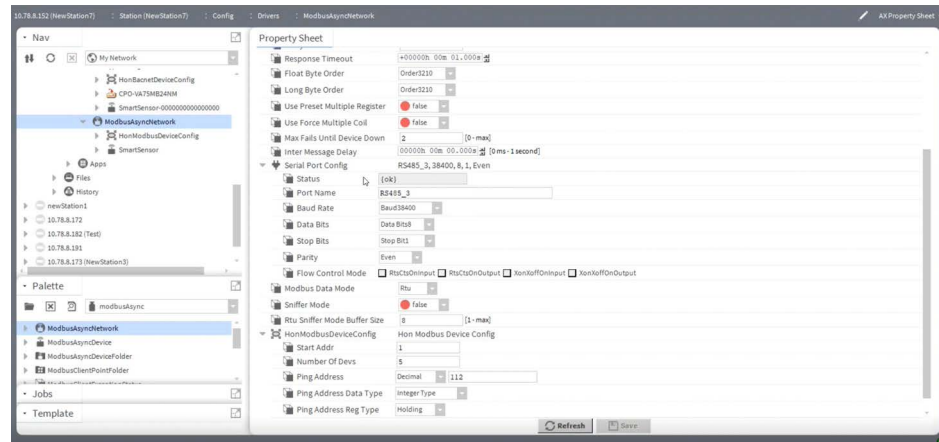


- Step 3. Navigate to Config > Drivers > ModbusAsyncNetwork, double-click the HonModbusDeviceConfig, and open the AX Property Sheet view.



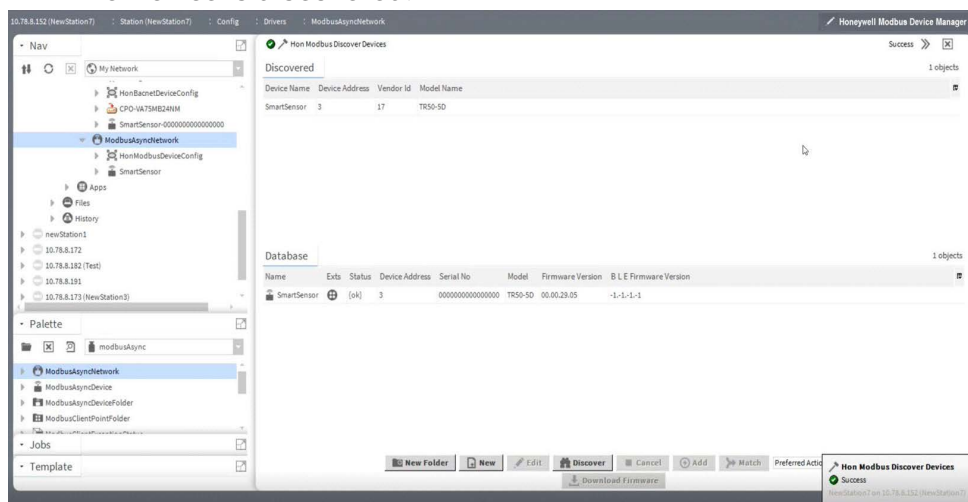
- Step 4. Set the Number of Devs to 5, Ping Address to Decimal and 112, and click Save.

- Step 5. Open the AX Property Sheet view of ModbusAsyncNetwork and set the Port Name and Baud Rate according to the connected Modbus Smart Sensor.

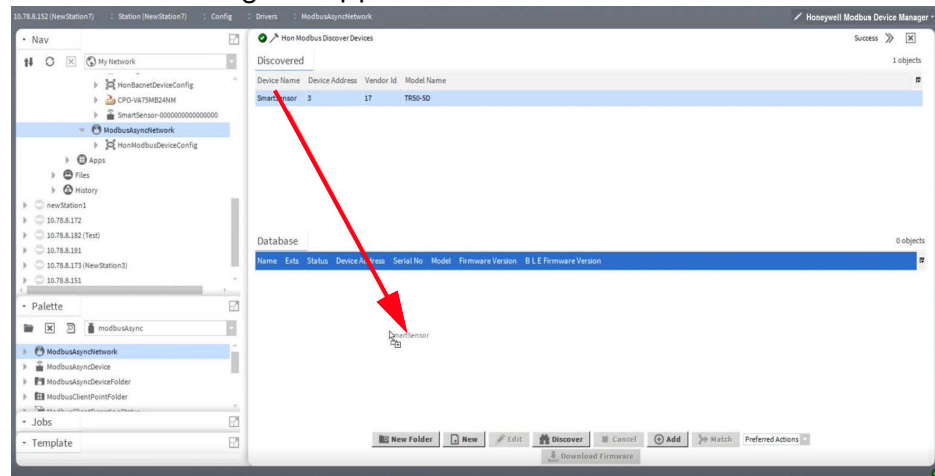


- Step 6. Set the Parity to Even and click Save.

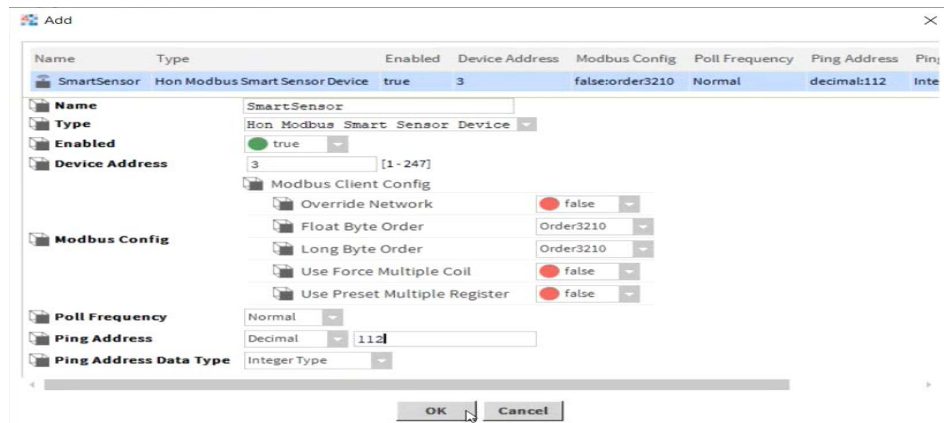
- Step 7. Select the Honeywell Modbus Device Manager from the top right corner and click Discover. The Device is discovered.



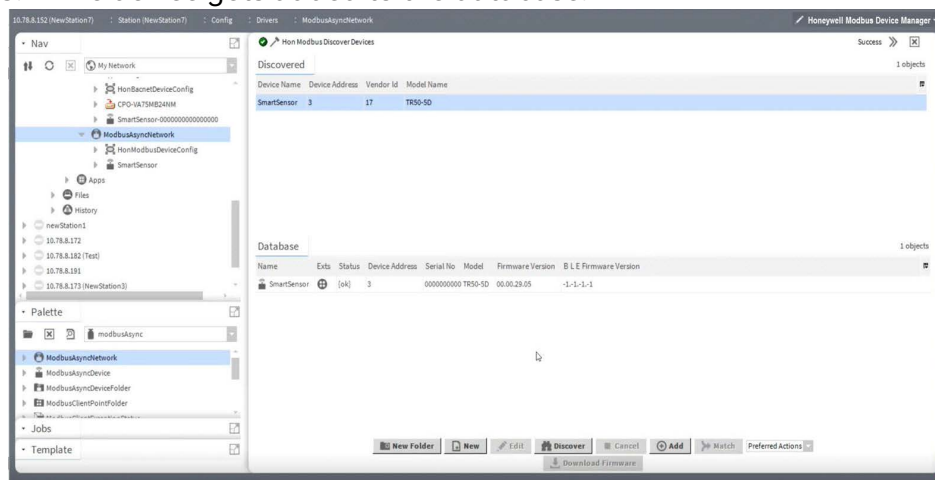
- Step 8. Drag and drop the TR50 device to database or select the TR50 device and click Add.
The Add dialog box appears.



- Step 9. Set the ping address to Decimal and 122 and click Ok.



- Step 10. The device gets added to the database.



4.5.7 Configure TR50 Modbus Device via CPO

Follow the below steps to create a Modbus device TR50 sensor:

- Step 1. Under **System View**, right-click the project and click **New Controller**.
- Step 2. In **Model type**, click Others.
- Step 3. In **Model name**, select **MODBUS** or **TR50** from the drop-down list.
- Step 4. In the **Controller** name box, type a name for the Modbus.
- Step 5. Select a Device from the list.
- Step 6. In **Description**, enter a description of the Modbus if required. Otherwise, leave blank.
- Step 7. In **Parent Controller**, select a controller from the drop-down list to be act as a parent controller of the Modbus device or TR50.
- Step 8. In **Channel name**, select a Modbus channel.
- Step 9. Click **Create**.
The TR50 sensor is created.

Follow the below steps to create a Modbus device TR50 sensor datapoints:

The Modbus datapoints supports four datapoints namely Coil, Discrete Input, Holding Register, and Input Register.

- Step 1. In the **System View**, click the **Controller** tab.
The project tree is displayed.
- Step 2. Right-click **Modbus Controller** and select **Create Modbus Points**.
The **CreateModbusPoints** dialog box appears.
- Step 3. Type the **Number of points** to be created in the Modbus device.
- Step 4. Type the **Object Name** for the corresponding point type. The Object Name can contain underscore (_) and hyphen (-). Use the appropriate name as provided in the Modbus point binding template. This helps to import the binding details from the template precisely.
- Step 5. Click **OK**.

The Modbus datapoints are created under the plant.

These points must be bound with the plant controller's datapoints. Make sure that you select the correct point type for binding.

4.5.8 Modbus RTU Controller Compatibility of TR50

The below table shows the Modbus controller compatibility of TR50.

Product Name	OS Number	Data Communication	Firmware Download	Notes
WEB-8000	WEB-8000	Y	Y	
CIPer Model 30	WEB-C3036EPVBNH	Y	Y	
Optimizer Advanced	N-ADV-133-H	Y	Y	
Optimizer IP VAV	WEB-VA75IB24NM	Y	Y	
Optimizer MSTP VAV	WEB-VA75MB24NM	Y	Y	
Optimizer IP Unitary	RL1644ES24NM	Y	Y	
Optimizer MSTP Unitary	RL1644MS24NM	Y	Y	
Compact VAV	VA423B24N	–	–	
Plant Controller	CPO-PC500	Y	N	
Plant Controller	CPO PC400	Y	N	
ACM	ACM	Y	N	
Trend IQ4E	IQ4E-2040u531000	Y	N	
Trend IQ4NC	IQ4NC-1040U5010	N	N	
Saia PCD1	PCD1.M2220-C15	Y	N	

4.6 Sylk™ Configuration

4.6.1 Configure TR50 Sylk device via Niagara

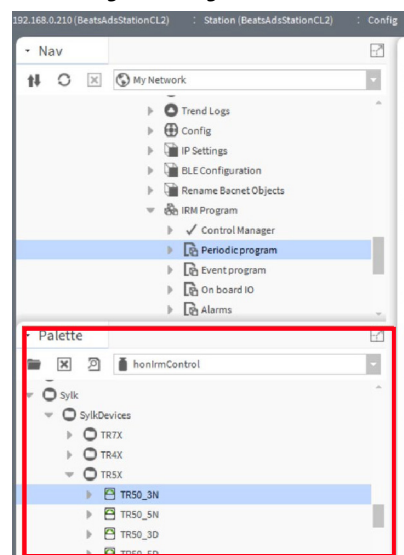
The TR50 Sylk configuration has three options:

- Sensor Reading
- Sensor Alarm
- Sensor Failure

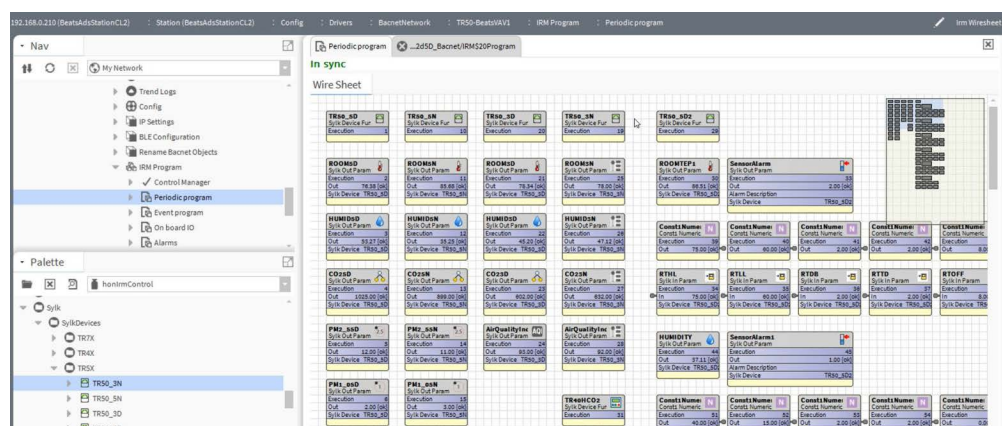
4.6.1.1 Sensor Reading

Steps to obtain Sensor Reading:

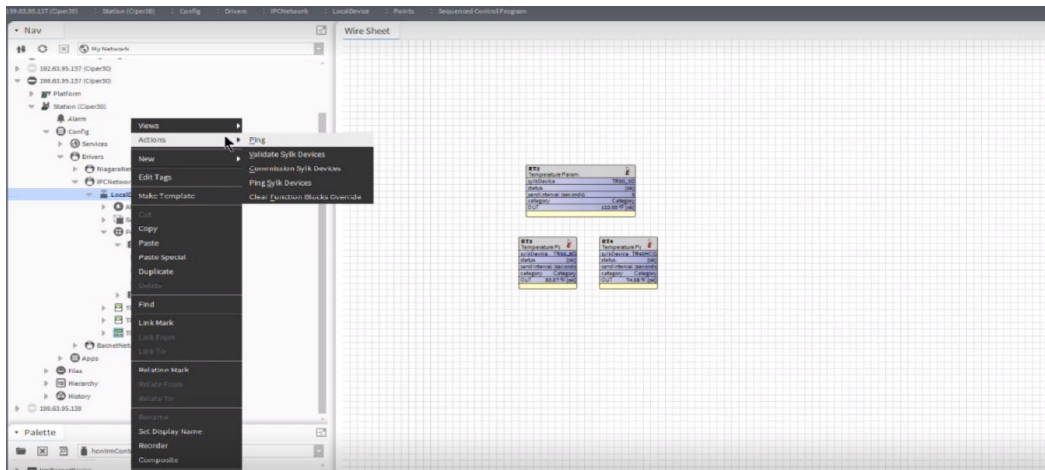
Step 1. Navigate to **Palette < Sylk < Sylk™ Devices < TR50**.



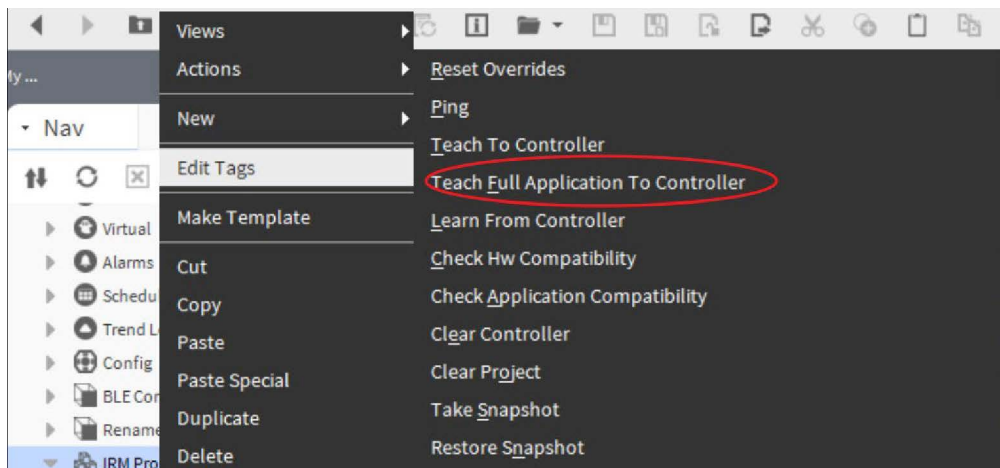
Step 2. **Drag & Drop the TR50 Parameters** (Temperature, Humidity, CO₂, PM 1, PM2.5, PM10, TVOC and Air Quality Index) linked with the objects into the IRM Periodic Program **wire sheet**.



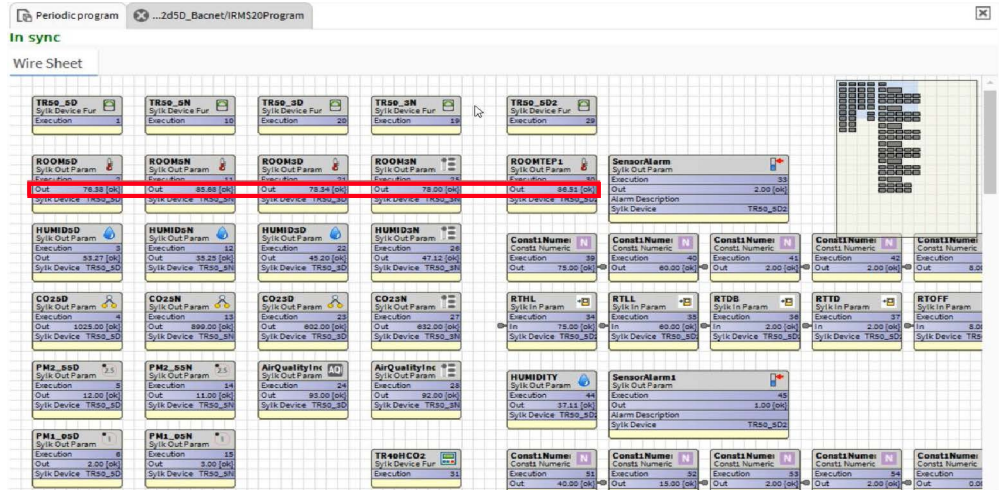
Step 3. Right click **Local Devices** < **Actions** < **Commission Sylk devices**.



Note: The above commission process is done as per the CIPer Model 30 commission sylk™ device method. If the commission has to be done via Optimizer controller, then the user has to **Teach Full Application To Controller**.



Step 4. Once the commission is successful, the parameters in the wire sheet will present the sensor values as shown below.



4.6.1.2 Sensor Alarm

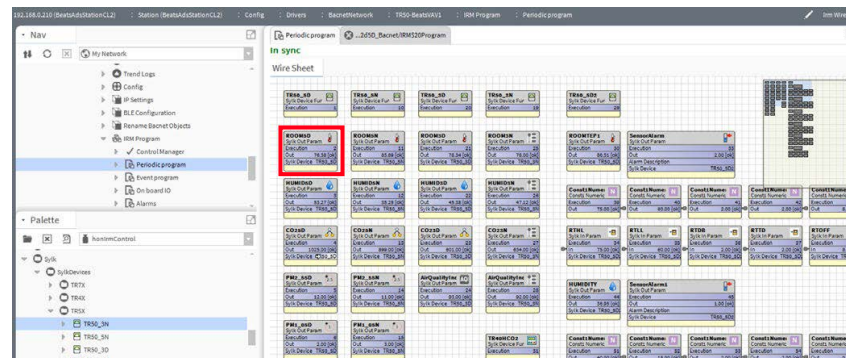
To activate alarms in the controller, there are two scenarios.

1. TR50 can detect the alarm locally and the alarm value can be given to the controller.
2. User can disable the local alarm in the TR50 and then write the alarm value from the controller to the TR50.

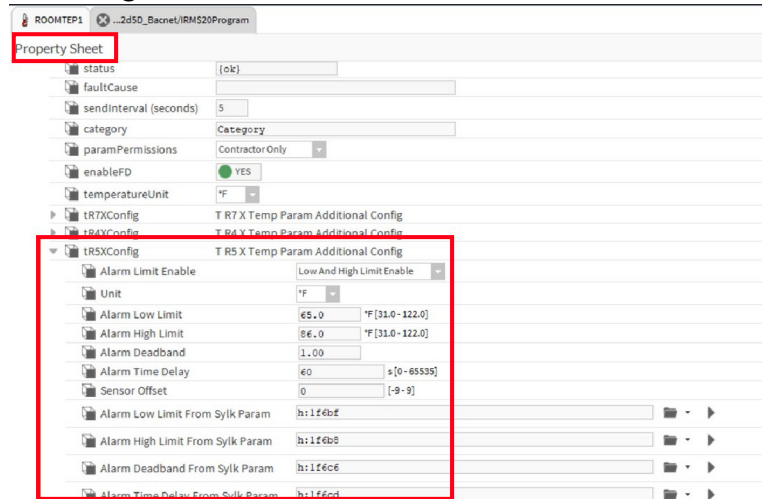
Note: When more than one device is present in a single zone, User can disable the local alarm in the TR50 and then write the alarm value from the controller to the TR50.

Follow the below steps to configure the Alarm locally and give the value to the controller:

Step 1. Double click on the TR50 **Sensor Parameter**.



- Step 2. On the Property sheet navigate to **Sylk Config Data** and expand **TR50Config**.



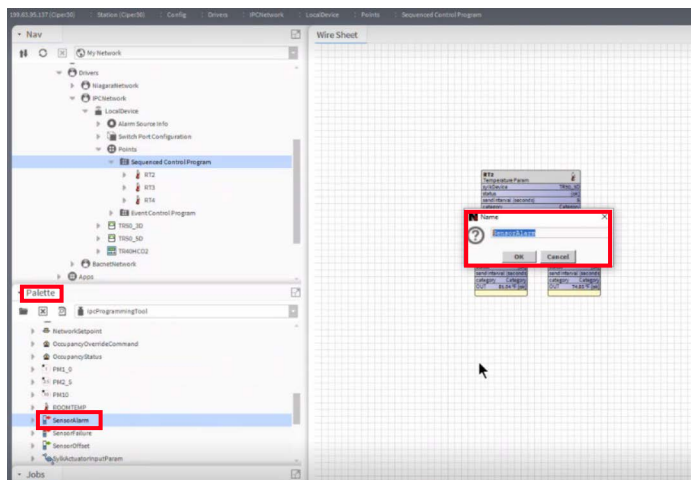
The first property under tR5xConfig is the alarm limits. By default, both low limit and high limits are enabled, and user can configure these limits as a fixed value or dynamic linkable value.

Fixed Values: The values will be directly returned to the TR50 for calculation.

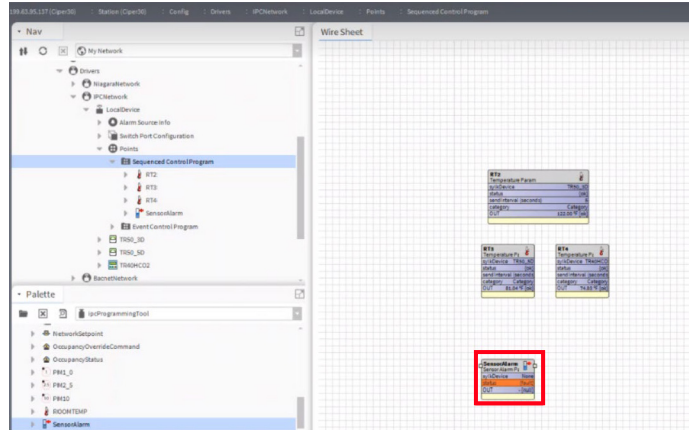
Linkable Values: The controller value will be linked to the linkable Parameter, so that dynamically based on current logical condition the user can change the low limit and high limit values.

- Step 3. After configuring the alarm limits, the alarm value will be detected in the TR50.

- Step 4. From the Palette drag & drop the **Sensor Alarm** to the wire sheet and click **OK**.



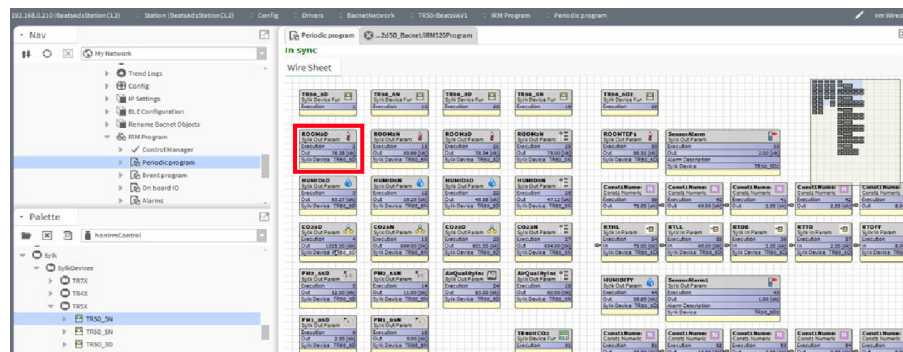
Step 5. Below **Sensor Alarm** Parameter shows the value coming from the TR50 into the controller.



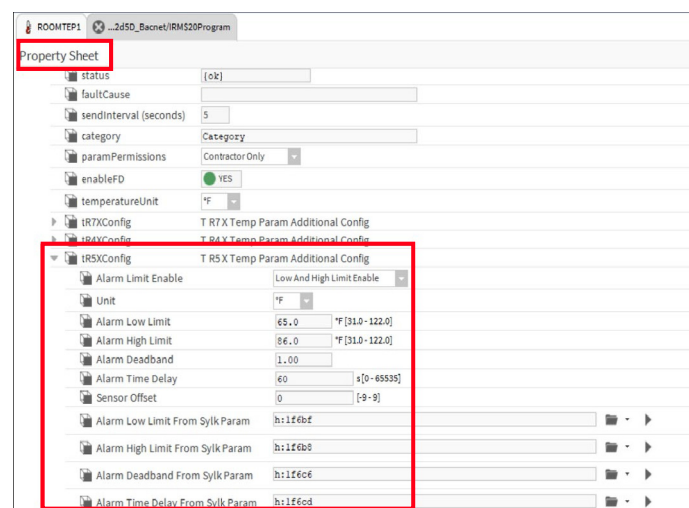
By using the sensor alarm parameter user can know the alarm status in the TR50 device.

Follow the below steps to write the alarm value from the controller to the TR50:

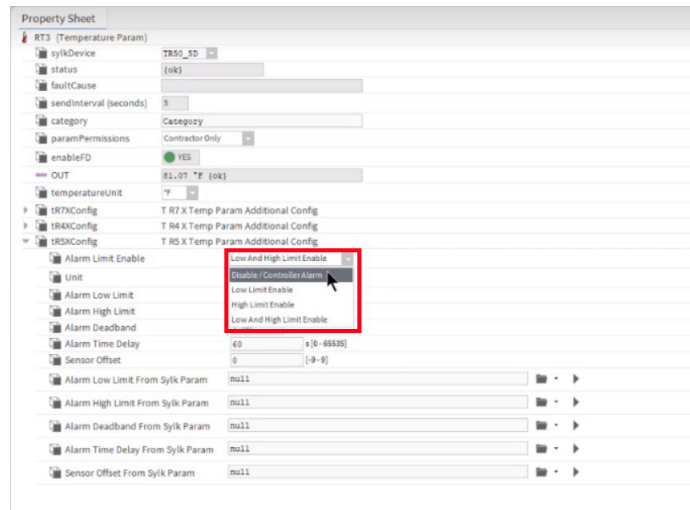
Step 1. Double click on the **TR50 Sensor Parameter**.



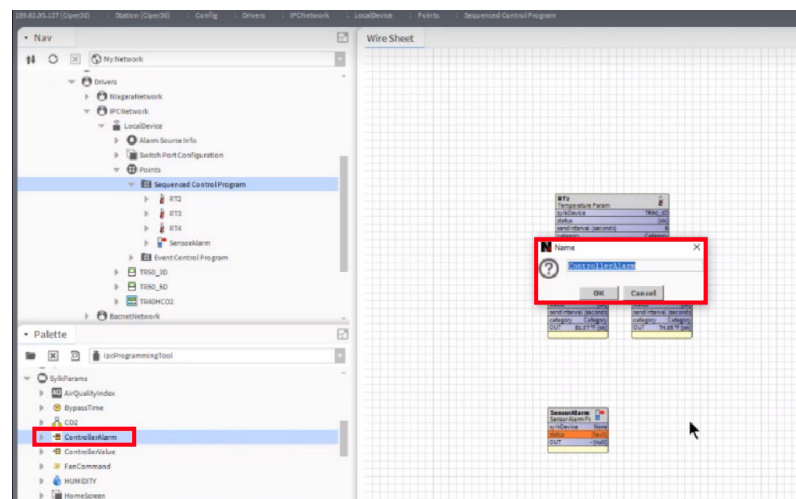
Step 2. On the Property sheet navigate to **Sylk Config Data** and expand **TR50Config**.



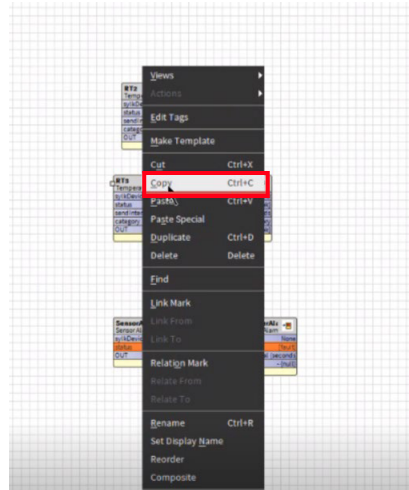
Step 3. Disable the **Alarm Limit** and click **Save**.



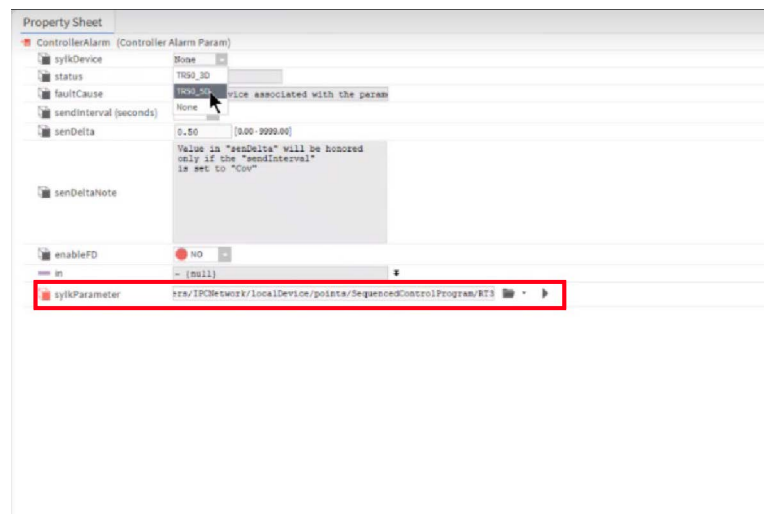
Step 4. Drag-drop the **Controller Alarm** from the **Palette** into the wire sheet and click **OK**.



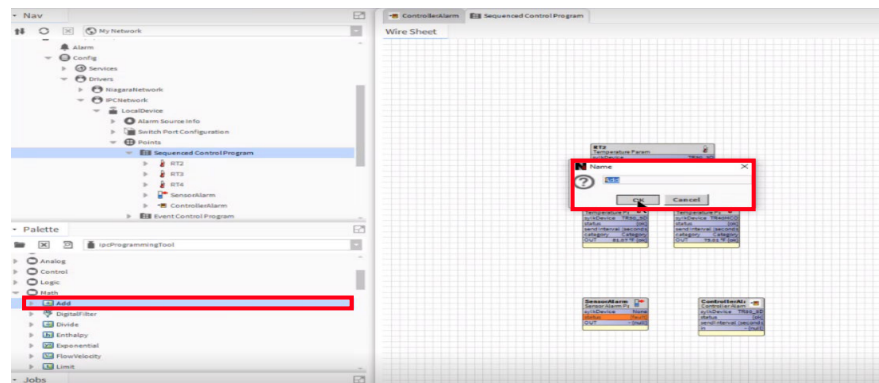
Step 5. Select and copy the TR50 **Sensor Parameter** link.



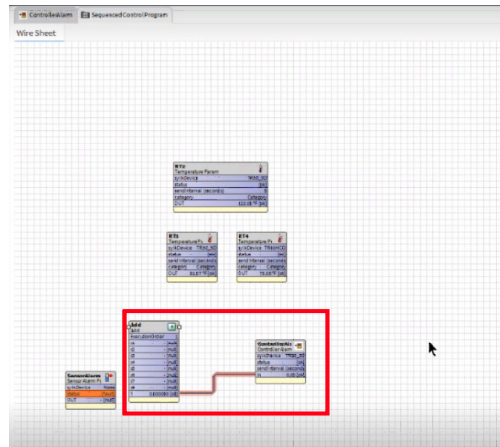
Step 6. Double click the **Controller Alarm** and paste the link under **Sylk Parameter**.



Step 7. Drag-drop any logic slot or Math slot from the **Palette** into the wire sheet and click **OK**.



Step 8. Link the Controller Alarm to the added slot.



By the above process, user can write back the alarm value into the TR50 from the controller. Based on the values, the LED will blink red, yellow, and green.

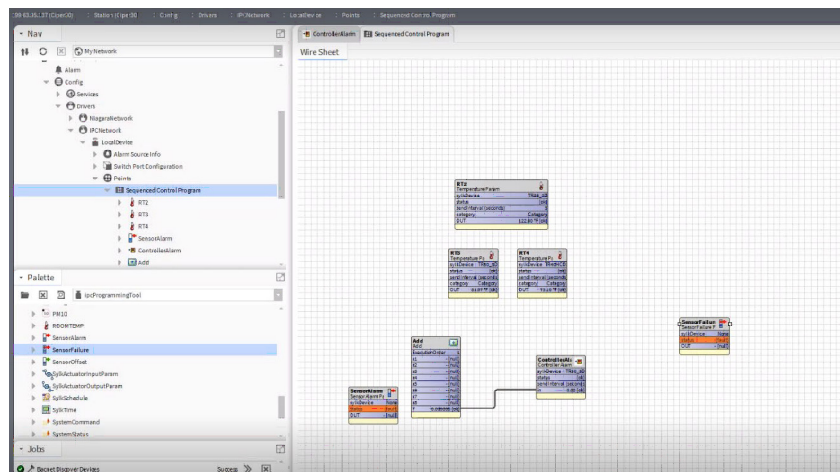
4.6.1.3 Sensor Failure

The sensor failure monitors the current state of the sensors. If there are any physical failures of the sensors, the different states will be reported using the sensor failure.

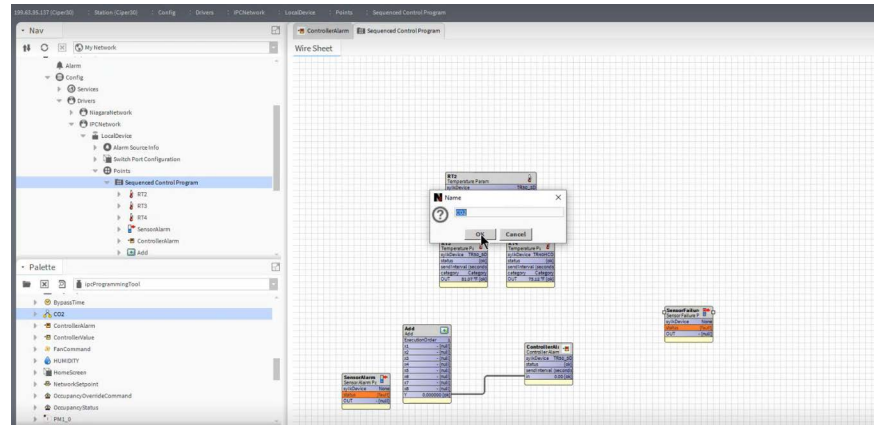
Add a sensor failure and link the respective parameter which user wants to monitor for the sensor failure.

Follow the below steps to do link(s) and monitor sensor failure:

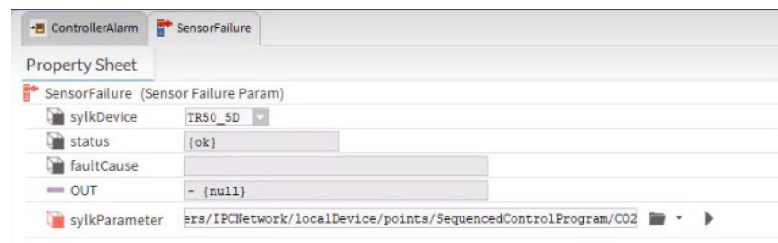
Step 1. From the **Palette**, Drag & drop the **Sensor Failure** into the wire sheet.



Step 2. From the **Palette**, add a **CO₂ Parameter** and click **OK**.



Step 3. Copy the CO₂ parameter property and paste in the Sylk parameter under sensor failure, click **Save**.



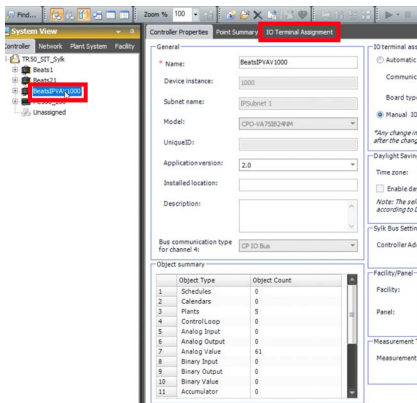
Note: Make sure the sylkTM device is same in the sensor failure as per the parameter.

When there is a physical failure in the CO₂ sensor, this sensor failure functional block will report the state in the application.

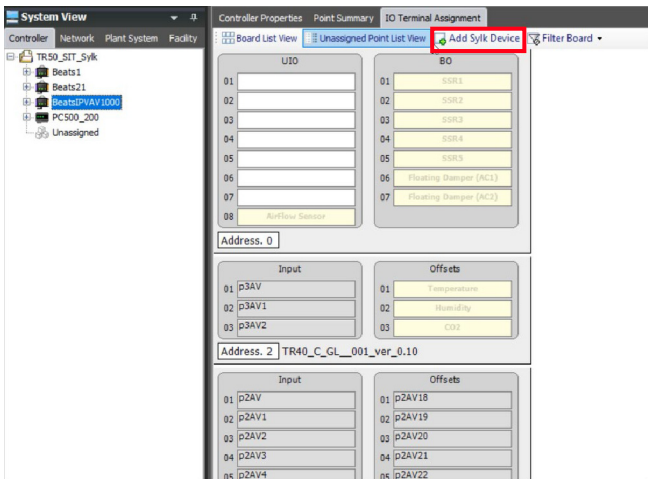
4.6.2 Configure the TR50 Sylk device via CPO

Steps to configure the TR50 Sylk device in CPO studio:

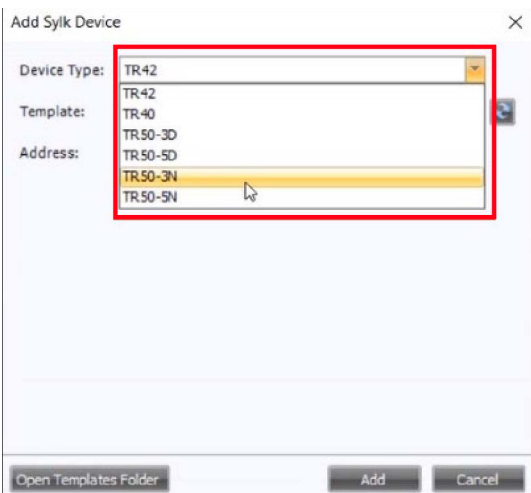
- Step 1. Connect the controller to the workstation and open CPO Studio.
- Step 2. Create the project and select **Terminal Assignment**.



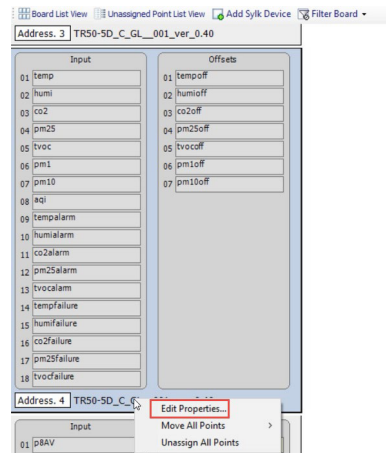
- Step 3. Under Terminal Assignment, click **Add Sylk Device**.



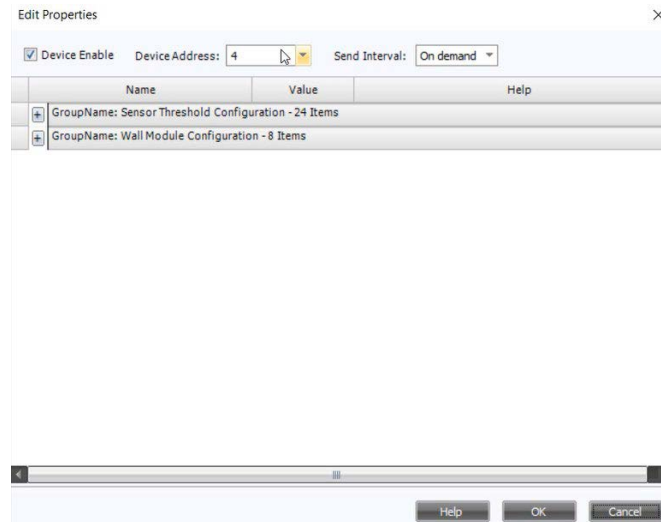
- Step 4. Select the required SKUs from the drop-down list and click **Add**.



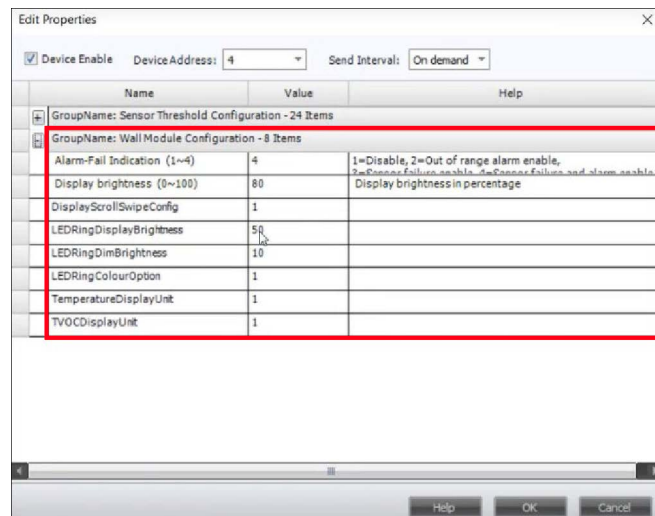
Step 5. Select the template and right click to **Edit Properties**.



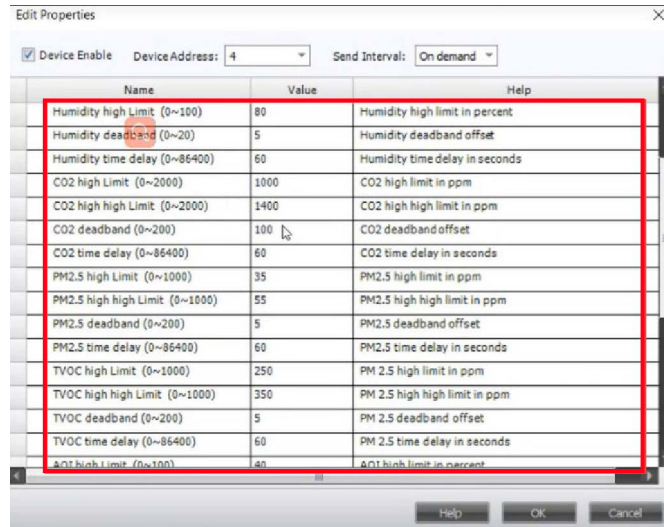
Step 6. Under Edit Properties, user can configure **Sensor Threshold Configuration** and **Wall Module Configuration**.



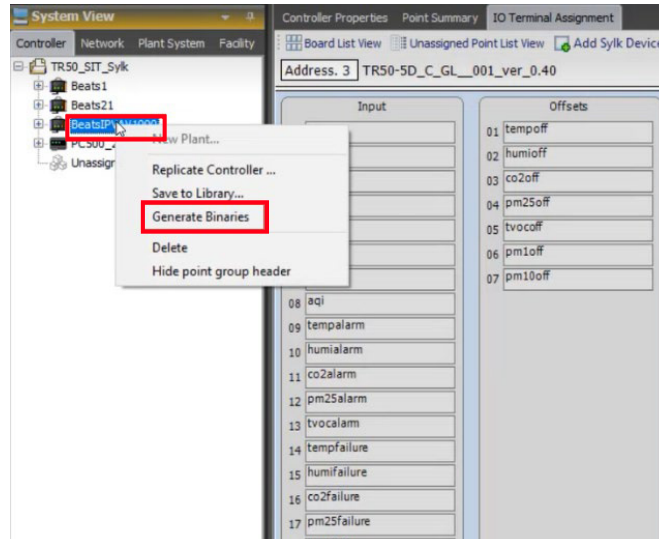
Wall Module configuration is about the LED and display parameters as shown below.



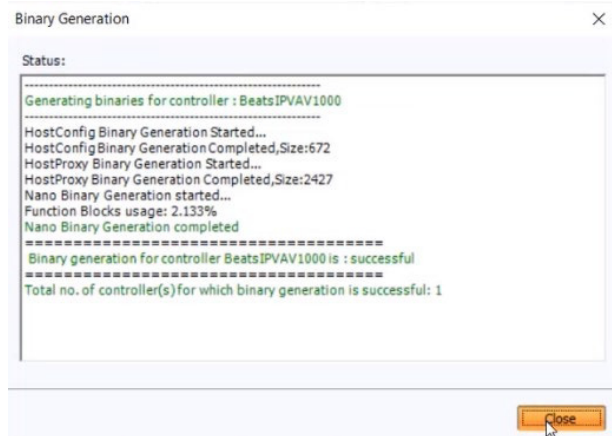
Sensor Threshold Configuration is about sensors alarming related parameters.



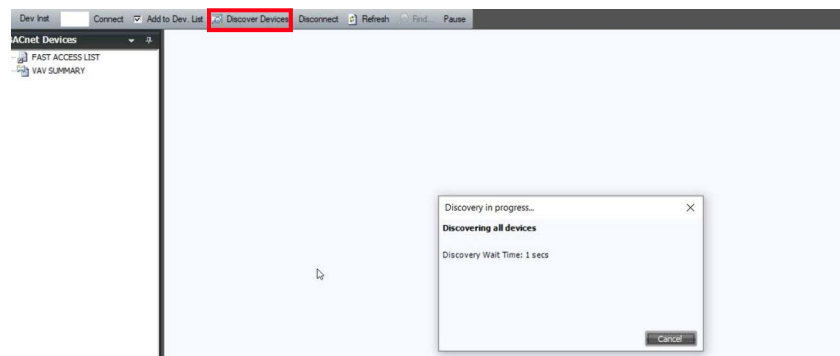
Step 7. Once the configuration is done, Right click on the controller and select **Generate Binaries**.



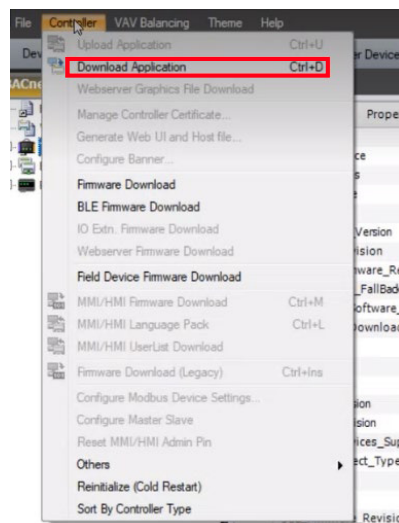
Step 8. Close the tab once the Generate Binaries is successful.



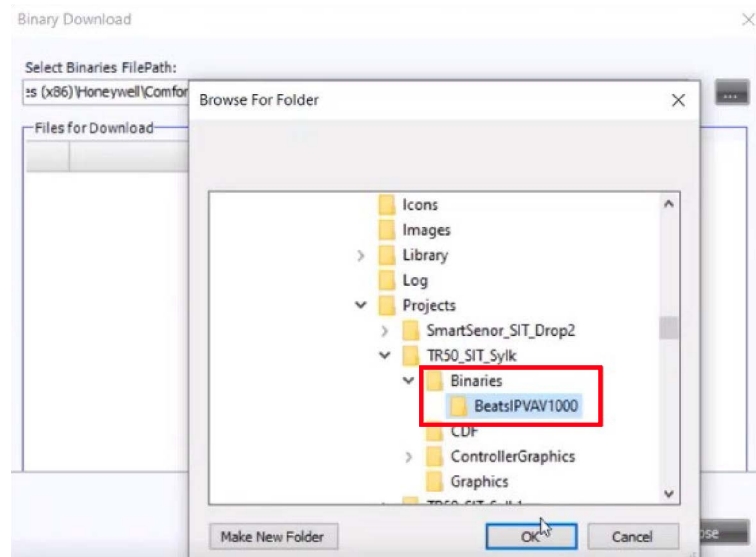
Step 9. Open the CPO online tool and discover the controller.



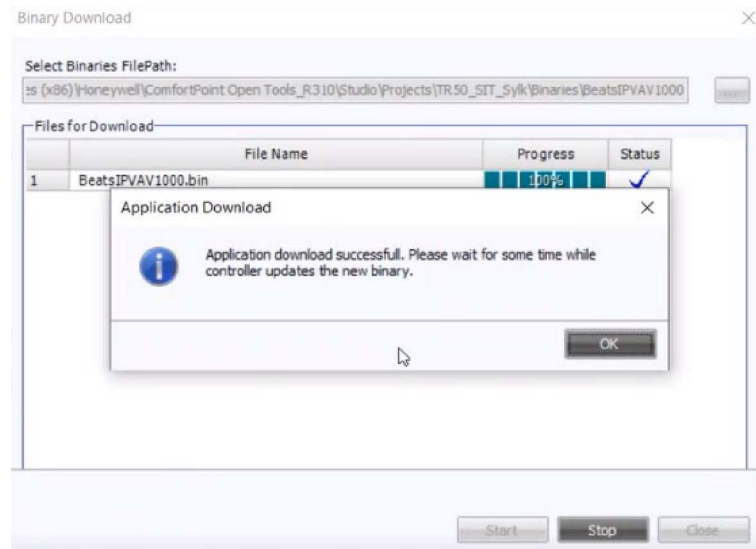
Step 10. Once the controller is discovered select the controller and download the binaries.



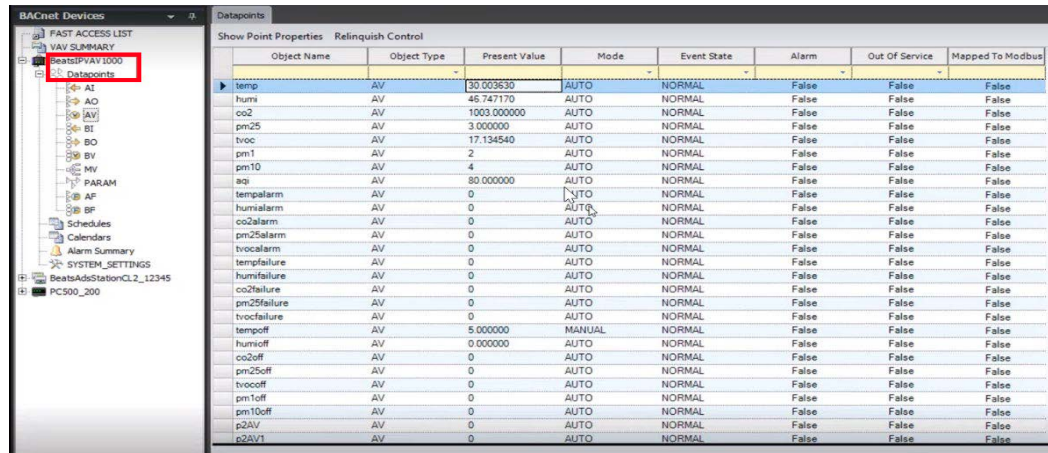
Step 11. From the local folder select the **controller binaries** and click **OK**.



Step 12. After few seconds the download will be successful.



Step 13. Once the application is successful, select the **datapoints** and user can write, configure the sensor parameters.



The screenshot shows the 'BACnet Devices' application window. On the left, a tree view under 'FAST ACCESS LIST' shows 'Datapoints' selected. The main window displays the 'Show Point Properties' dialog for 'Relinquish Control'. The table below lists various sensor parameters.

Object Name	Object Type	Present Value	Mode	Event State	Alarm	Out Of Service	Mapped To Modbus
temp	AV	30.003530	AUTO	NORMAL	False	False	False
hum1	AV	46.747170	AUTO	NORMAL	False	False	False
co2	AV	1003.000000	AUTO	NORMAL	False	False	False
pm25	AV	3.000000	AUTO	NORMAL	False	False	False
tvoc	AV	17.134540	AUTO	NORMAL	False	False	False
pm1	AV	2	AUTO	NORMAL	False	False	False
pm10	AV	4	AUTO	NORMAL	False	False	False
aqi	AV	80.000000	AUTO	NORMAL	False	False	False
tempalarm	AV	0	AUTO	NORMAL	False	False	False
hum1alarm	AV	0	AUTO	NORMAL	False	False	False
co2alarm	AV	0	AUTO	NORMAL	False	False	False
pm25alarm	AV	0	AUTO	NORMAL	False	False	False
tvocalarm	AV	0	AUTO	NORMAL	False	False	False
tempfailure	AV	0	AUTO	NORMAL	False	False	False
hum1failure	AV	0	AUTO	NORMAL	False	False	False
co2failure	AV	0	AUTO	NORMAL	False	False	False
pm25failure	AV	0	AUTO	NORMAL	False	False	False
tvocfailure	AV	0	AUTO	NORMAL	False	False	False
tempoff	AV	5.000000	MANUAL	NORMAL	False	False	False
hum1off	AV	0.000000	AUTO	NORMAL	False	False	False
co2off	AV	0	AUTO	NORMAL	False	False	False
pm25off	AV	0	AUTO	NORMAL	False	False	False
tvocoff	AV	0	AUTO	NORMAL	False	False	False
pm1off	AV	0	AUTO	NORMAL	False	False	False
pm10off	AV	0	AUTO	NORMAL	False	False	False
p2AV	AV	0	AUTO	NORMAL	False	False	False
p2AV1	AV	0	AUTO	NORMAL	False	False	False

4.6.3 Sylk Controller Compatibility of TR50

The below table shows the Sylk™ controller compatibility of TR50.

Product Name	OS Number	Data Communication	Firmware Download	Notes
WEB-8000	WEB-8000	-	-	it doesn't have Sylk interface
CIPer Model 30	WEB-C3036EPVBNH	Y	N	
Optimizer Advanced	N-ADV-133-H	-	-	
Optimizer IP VAV	WEB-VA75IB24NM	Y	Y	
Optimizer MSTP VAV	WEB-VA75MB24NM	Y	Y	
Optimizer IP Unitary	RL1644ES24NM	Y	Y	
Optimizer MSTP Unitary	RL1644MS24NM	Y	Y	
Compact VAV	VA423B24N	Y	N	
Plant Controller	CPO-PC500	-	-	Does not have Sylk interface
Plant Controller	CPO PC400	-	-	Does not have Sylk interface
ACM	ACM	-	-	Does not have Sylk interface
IQ4E	IQ4E-2040u531000	N	N	
IQ4NC	IQ4NC-1040U5010	-	-	Does not have Sylk interface
PCD1	PCD1.M2220-C15	-	-	Does not have Sylk interface

5.1 About Status LED Ring

The LED status ring colors are configured for data points to indicate the conditions of the parameters that may require control. The TR50 IAQ sensor helps to view and manage the parameter readings through LED ring. This LED ring is available in both with and without display modes. See the [LED Ring Behavior / Indication](#) section on page 11 for more details.

5.2 TVOC Sensor Reading

- When the TR50 device is powered up out of the box, it takes at least 48 hours to stabilize the TVOC sensor without power interruption,
- In addition, whenever the device is powered off, the TVOC sensor needs some time to baseline its data. The longer the device is powered off, the more time is needed to complete this baseline process. Normally it can complete between a couple of minutes to 2 hours.

An effective TVOC reading will occur after the stabilization and baseline time.

5.3 PM 1 and PM 10 Sensor Reading

TR50 provides independent sensor measurement channel for PM1 and PM10, and is not calculated out of PM2.5

5.4 Temperature Unit Change

Temperature units from °F to °C can be changed by long pressing the middle of the touch button for 5 seconds. This change applies only to TR50-3D and TR50-5D.



5.5 Factory Reset

1. Power up the sensor.
2. Wait for 5 seconds, LED halo ring indicates Air quality level.
3. Using 3 or more fingers, press the entire button for 10 seconds.
4. LED ring will blink quickly with the cycle of Green, Red, Green, Red, Green, Red-...
5. Remove your fingers from button area.
6. LED ring will stay with White ON.
7. Click middle button once within 5 seconds.
8. LED ring will be White ON and LCD display "0000" (Only for TR50-5D and TR50-3D)
9. Wait until the device runs "Reset to Factory Default" and then reboot.
10. Wait a moment, Smart Sensor will light LED.
11. Complete "Reset".

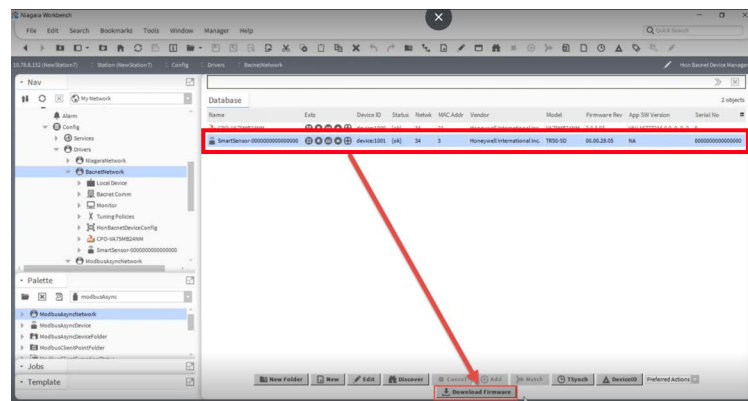
5.6 Firmware Download of TR50 via Niagara

5.6.1 Firmware Download of TR50 via controller

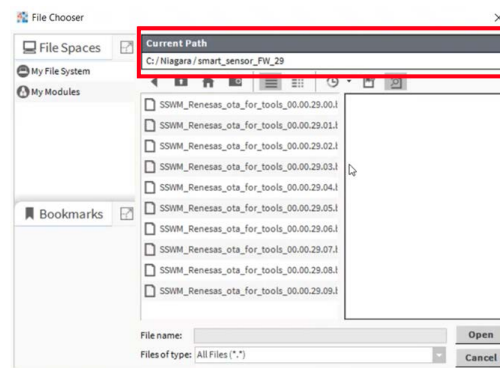
The controller can be integrated with the TR50 device using BACnet and Modbus networks.

Follow the below steps to download the TR50 firmware on a controller connected to the BACnet network:

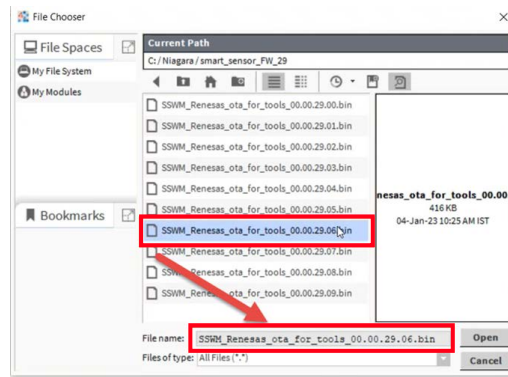
- Step 1. Navigate to the **Hon Bacnet Device Manager** view.
- Step 2. Select the smart sensor device from the database and click **Download Firmware**.



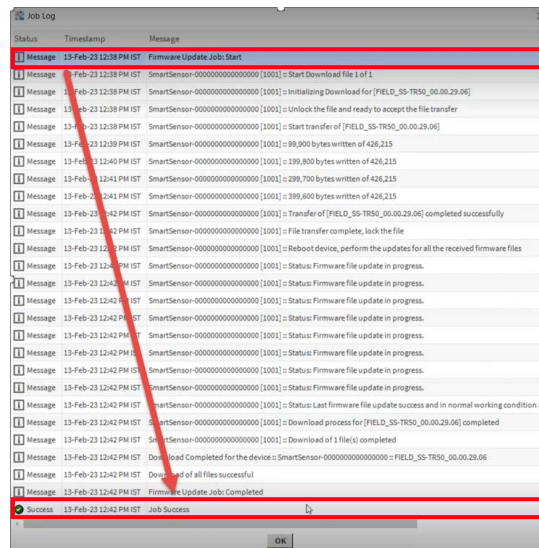
- Step 3. Select the latest firmware file from the local folder.



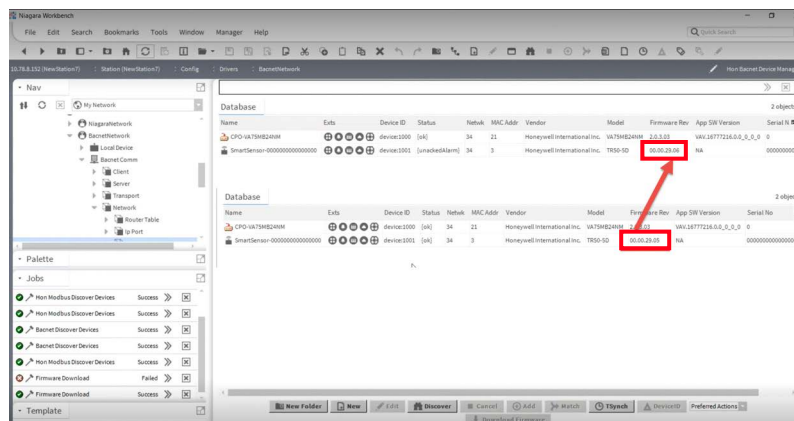
Step 4. Select the latest firmware version and click open.



Step 5. The download process starts, and the firmware download is successful.



Step 6. The smart sensor is updated with the latest firmware version.

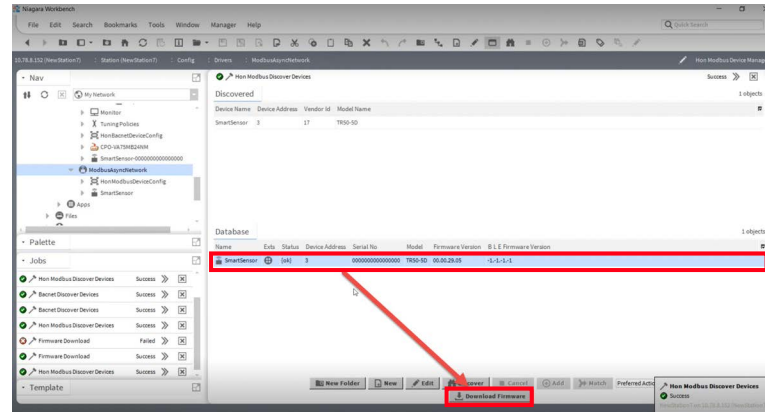


Note: In TR50, the firmware download works for peripherals and BLE downloads.

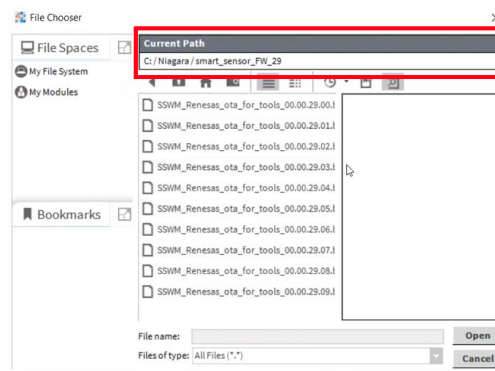
Follow the below steps to download the TR50 firmware on a controller connected to the Modbus network:

Step 1. Navigate to the **Hon Modbus Device Manager** view.

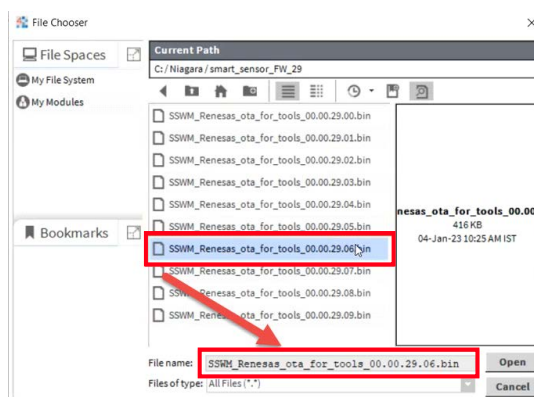
Step 2. Select the smart sensor device from the database and click **Download Firmware**.



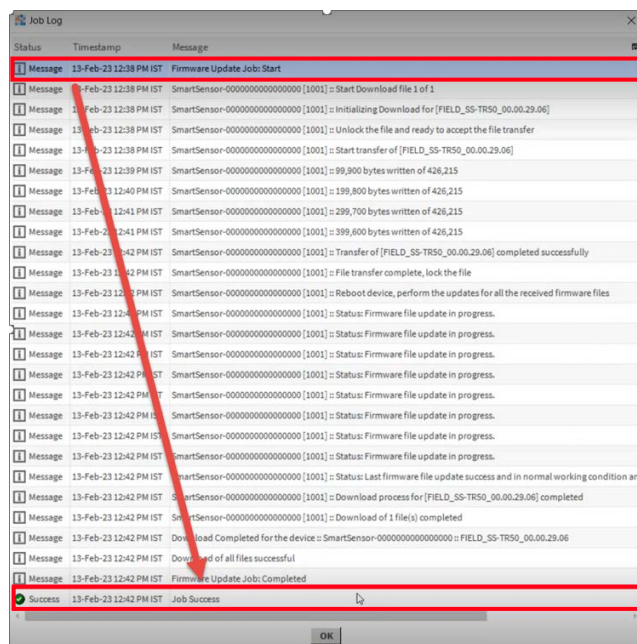
Step 3. Select the latest firmware file from the local folder.



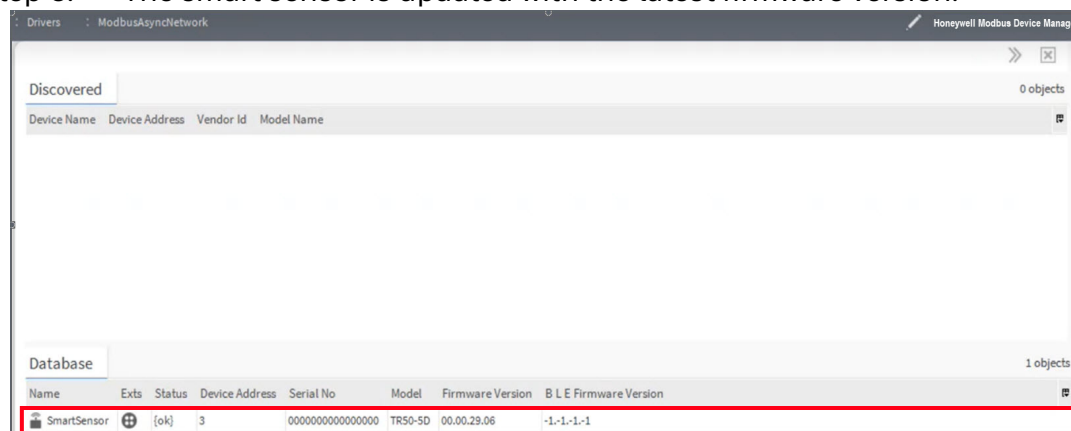
Step 4. Select the latest firmware version and click open.



Step 5. The download process starts, and the firmware download is successful.



Step 6. The smart sensor is updated with the latest firmware version.



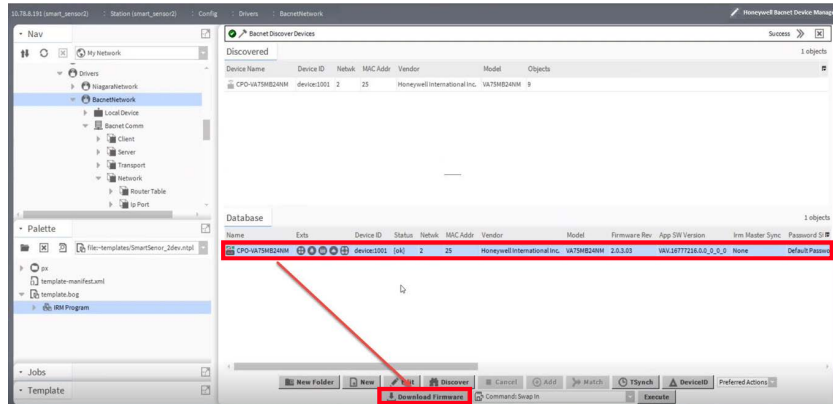
5.6.2 Firmware Download of TR50 (Unitary controller)

The Unitary controller can be integrated with the Modbus TR50 device using the BACnet network.

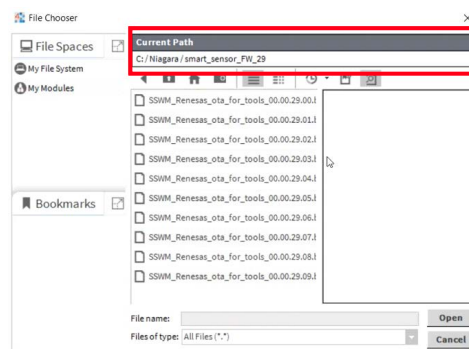
Follow the below steps to download the TR50 firmware on a unitary controller connected to the BACnet network:

Step 1. Navigate to the **Hon Bacnet Device Manager** view.

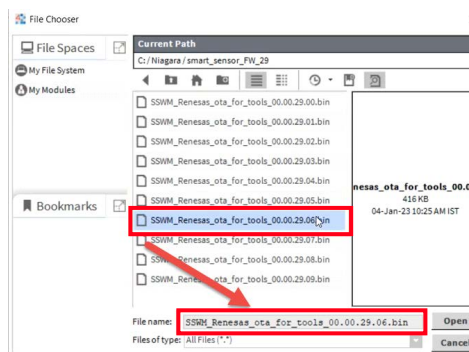
Step 2. Select the unitary controller from the database and click **Download Firmware**.



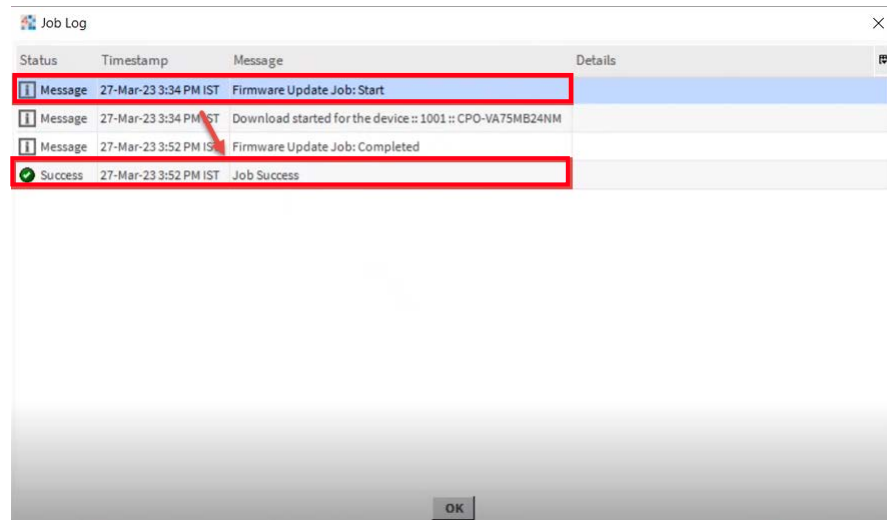
Step 3. Select the latest firmware file from the local folder.



Step 4. Select the latest firmware version and click open.



Step 5. The download process starts, and the firmware download is successful.

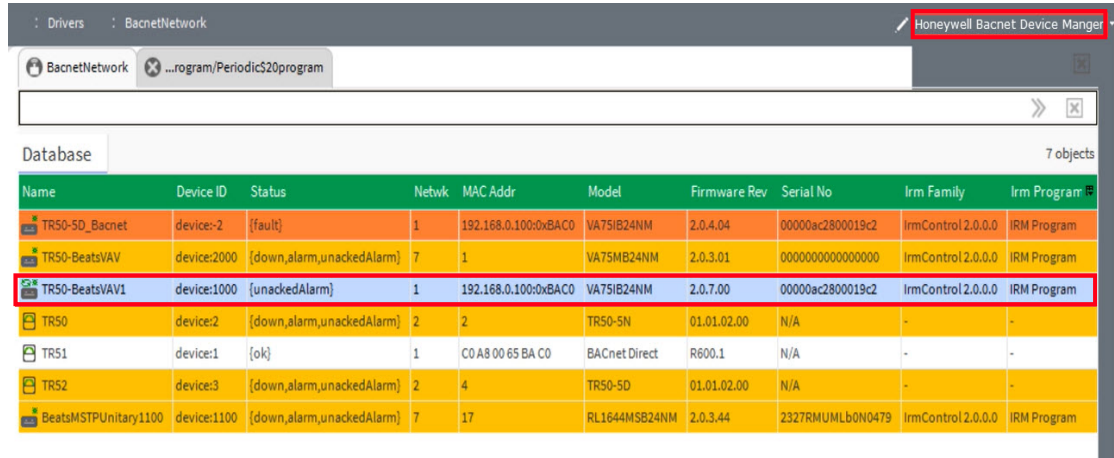


Step 6. Check the periodic program available under the IRM program to verify the latest firmware version.

5.6.3 Firmware Download of Sylk via Niagara

Follow the below steps to download the TR50 firmware which is on the Sylk bus for a unitary controller connected to the Sylk network:

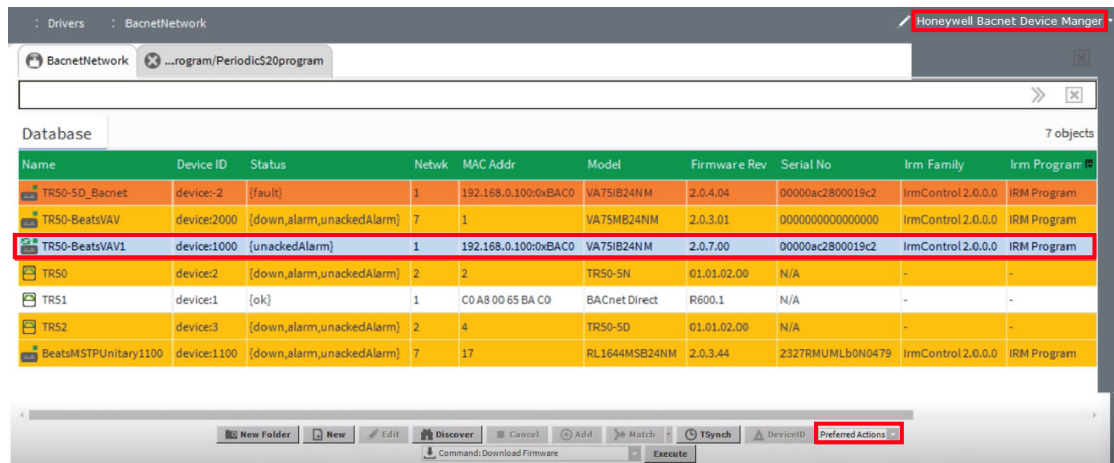
Step 1. Navigate to **Hon BACnet Device Manager** and select the controller in the database.



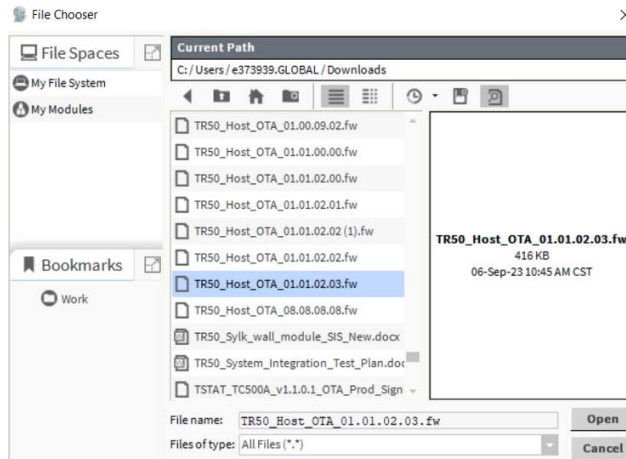
The screenshot shows the Honeywell Bacnet Device Manager interface. The 'Database' tab is selected, displaying a table of 7 objects. The row for 'TR50-BeatsVAV1' is highlighted with a red border.

Name	Device ID	Status	Netwk	MAC Addr	Model	Firmware Rev	Serial No	Irm Family	Irm Program
TR50-SD_Bacnet	device:2	{fault}	1	192.168.0.100:0xBAC0	VA75IB24NM	2.0.4.04	00000ac2800019c2	IrmControl 2.0.0.0	IRM Program
TR50-BeatsVAV	device:2000	{down,alarm,unackedAlarm}	7	1	VA75MB24NM	2.0.3.01	0000000000000000	IrmControl 2.0.0.0	IRM Program
TR50-BeatsVAV1	device:1000	{unackedAlarm}	1	192.168.0.100:0xBAC0	VA75IB24NM	2.0.7.00	00000ac2800019c2	IrmControl 2.0.0.0	IRM Program
TR50	device:2	{down,alarm,unackedAlarm}	2	2	TR50-5N	01.01.02.00	N/A	-	-
TR51	device:1	{ok}	1	C0 A8 00 65 BA C0	BACnet Direct	R600.1	N/A	-	-
TR52	device:3	{down,alarm,unackedAlarm}	2	4	TR50-5D	01.01.02.00	N/A	-	-
BeatsMSTPUnitary1100	device:1100	{down,alarm,unackedAlarm}	7	17	RL1644MSB24NM	2.0.3.44	2327RMUMLb0N0479	IrmControl 2.0.0.0	IRM Program

Step 2. Under **Hon Program** view, from the Preferred Actions drop & down list select **Download Firmware** button.



Step 3. Choose the TR50 firmware file from the folder and click **Open**.



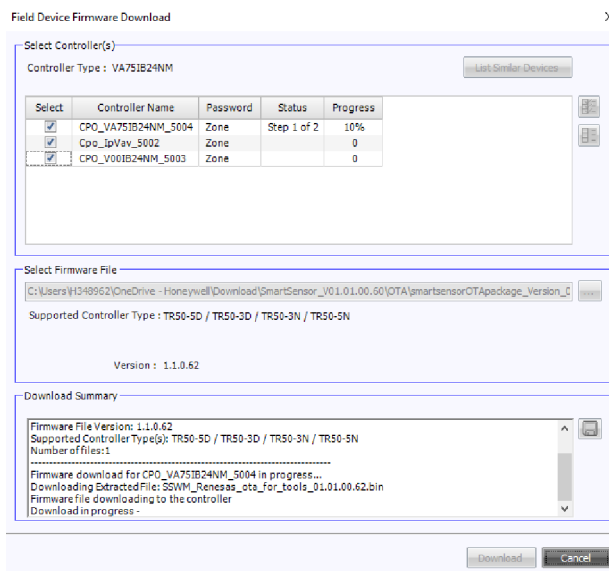
Step 4. The firmware download process will start and the firmware will be downloaded after few minutes.



5.7 Firmware Download of TR50 via CPO (Modbus, BACnet and Sylk)

Follow the below steps to download the TR50 firmware on CPO tool connected to the Modbus network:

- Step 1. On the left pane, under BACnet Devices, select a CPO-MSTP VAV or IP-VAV controller where the field device is connected.
- Step 2. On the tool menu bar, click **Controller > Field Device Firmware Download**.
The Field Device Firmware Download window appears.



In the **Select Controller (S)** box, the selected Edge VAV controller appears. If similar devices are available in the network, click **List Similar Devices**. You can select multiple devices and perform a bulk firmware download.

- Step 3. In the **Select Firmware File** box, click the browse button, navigate to the location where the TR50 sensor firmware is stored, select the file, and click **Open**.

Once the file is selected, all supported models of the TR50 sensors and the version number of the selected firmware are displayed in **Supported Controller Type**.

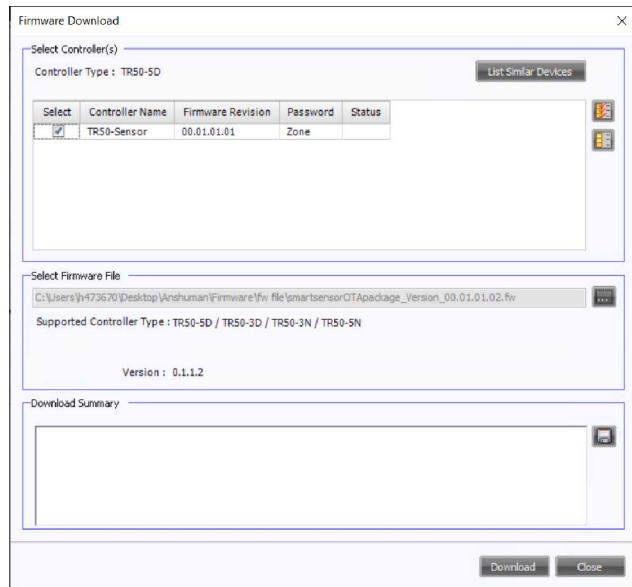
- Step 4. Click **Download**.
The Firmware Download pop-up message appears, read the message, and click **Yes**.

The **Download Summary** box displays the download activities. If the download is completed for all devices, then the Firmware Download Result message appears at the end. You can cancel the download while the downloading is in progress by clicking the Cancel button.

The download does not begin if an unsupported firmware file is selected. If multiple devices are selected for the bulk download, then the download will occur sequentially not parallel.

Follow the below steps to download the TR50 firmware on CPO tool connected to the BACnet network:

- Step 1. On the left pane, under BACnet Devices, select the field device whose firmware is needed to be downloaded.
- Step 2. On the tool menu bar, click **Controller > Firmware Download**. The Firmware Download window appears.



In the **Select Controller (S)** box, the selected TR50 sensor appears. If similar devices are available in the network, click **List Similar Devices**. You can select multiple devices and perform a bulk firmware download.

- Step 3. In the **Select Firmware File** box, click the browse button, navigate to the location where the TR50 sensor firmware is stored, select the file, and click **Open**.

Once the file is selected, all supported models of the TR50 sensors and the version number of the selected firmware are displayed in **Supported Controller Type**.

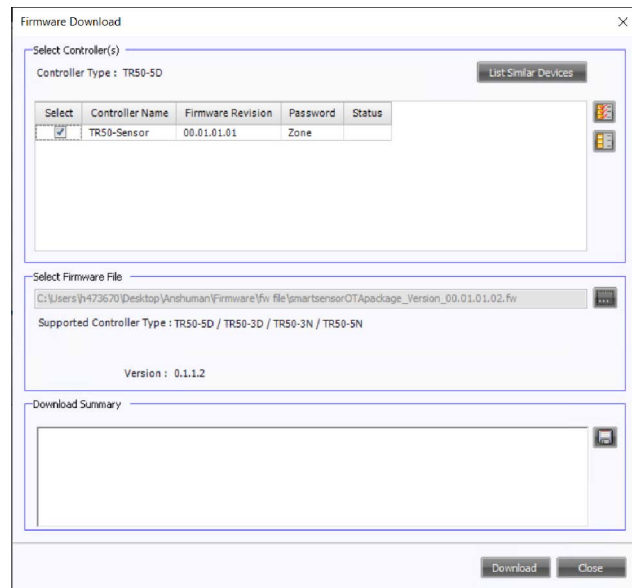
- Step 4. Click **Download**. The Firmware Download pop-up message appears, read the message, and click **Yes**.

The **Download Summary** box displays the download activities. If the download is completed, then the Firmware Download Successful message appears at the end. You can cancel the download while the downloading is in progress by clicking the Cancel button.

The download does not begin if an unsupported firmware file is selected. If multiple devices are selected for the bulk download, then the download will occur sequentially not parallelly.

Follow the below steps to download the TR50 firmware on CPO tool connected to Sylk device:

- Step 1. On the left pane, under Sylk Devices, select the field device whose firmware is needed to be downloaded.
- Step 2. On the tool menu bar, click **Controller > Firmware Download**. The Firmware Download window appears.



In the **Select Controller (S)** box, the selected TR50 sensor appears. If similar devices are available in the network, click **List Similar Devices**. You can select multiple devices and perform a bulk firmware download.

- Step 3. In the **Select Firmware File** box, click the browse button, navigate to the location where the TR50 sensor firmware is stored, select the file, and click **Open**.

Once the file is selected, all supported models of the TR50 sensors and the version number of the selected firmware are displayed in **Supported Controller Type**.

- Step 4. Click **Download**. The Firmware Download pop-up message appears, read the message, and click **Yes**.

The **Download Summary** box displays the download activities. If the download is completed, then the Firmware Download Successful message appears at the end. You can cancel the download while the downloading is in progress by clicking the Cancel button.

The download does not begin if an unsupported firmware file is selected. If multiple devices are selected for the bulk download, then the download will occur sequentially not parallelly.

CORRECTION AND CALIBRATION

This chapter provides TR50 sensor offset functionality and sensor calibration information.

6.1 Sensor Offset

The sensor offsets allow the user to fine tune each sensor reading to match their known good instrument reading.

TR50 provide the following sensor offset configuration items,

#	Configuration Items	Comments
1	cfgTempSensorOffset	Offset for temperature sensor, this value will be added to the sensor chip raw value within TR50 device itself, then TR50 will provide the final value.
2	cfgHumiSensorOffset	Offset for humidity sensor, this value will be added to the sensor chip raw value within TR50 device itself, then TR50 will provide the final value.
3	cfgPM2.5SensorOffset	Offset for PM2.5 sensor, this value will be added to the sensor chip raw value within TR50 device itself, then TR50 will provide the final value.
4	cfgPM1.0SensorOffset	Offset for PM1 sensor, this value will be added to the sensor chip raw value within TR50 device itself, then TR50 will provide the final value.
5	cfgPM10SensorOffset	Offset for PM10 sensor, this value will be added to the sensor chip raw value within TR50 device itself, then TR50 will provide the final value.
6	cfgTVOCSensorOffset	Offset for TVOC sensor, this value will be added to the sensor chip raw value within TR50 device itself, then TR50 will provide the final value.

#	Configuration Items	Comments
7	cfgCO2SensorOffset	Offset for CO2 sensor, TR50 will provide the final value. Tips of configuring cfgCO2SensorOffset: 1. There must be an interval of 3 minutes between the two times calibrations of CO2 written into TR50, and less than this interval writing operation will cause failure. 2. TR50 can only accept the CO2 sensor offset value which meets requirement that CO2 sensor reading + offset value > 400 ppm

6.2 Temperature and Humidity Standard

The manufacturer already calibrates the temperature and humidity sensor; it does not need re-calibration in its life.

TR50 offers manual temperature and humidity sensor correction options. After the TR50 device is powered on for more than 60 minutes, record the temperature and humidity value continuously for the next 30 minutes, then use the synchronous average value for correction with offset parameters.

6.3 CO₂ Calibration Standard

The manufacturer already calibrates the CO₂ sensor. The CO₂ sensor includes two field calibration features, FRC and ASC, to realize high initial and long-term accuracy. Forced recalibration (FRC) enables restoring the highest accuracy with the assistance of a CO₂ reference value immediately. FRC is typically applied to compensate for drifts originating from the sensor assembly process, transportation, or other extensive stresses. Automatic self-calibration (ASC) ensures the highest long-term stability of the CO₂ sensor without the need for manual action steps from the user. The automatic self-calibration algorithm assumes that the sensor is exposed to an atmospheric CO₂ concentration of 400 ppm at least once per week.

TR50 offers manual CO₂ sensor correction options. After the TR50 device is powered on for more than 30 minutes, record the CO₂ value continuously for the next 30 minutes, then use the synchronous average value for correction with offset parameters.

6.4 TVOC Calibration Standard (According to Ethanol Volatilization)

TVOC sensor is already calibrated in manufacture. It can also continuously correct after initial baseline stabilization when powered on. TVOC sensor value will be stable to more accuracy at least 48 hours power on.

TR50 offers manual TVOC sensor correction options. After the TR50 device is powered on for more than 30 minutes, record the TVOC value continuously for the next 30 minutes, then use the synchronous average value for correction with offset parameters.

6.5 PM1.0, PM2.5, and PM10 Calibration Standard (According to GRIMM Technology)

The manufacturer already calibrates the PM sensor; it does not need re-calibration in its life.

TR50 offers manual PM sensor correction options. After the TR50 device is powered on for more than 30 minutes, record the PM1.0, PM2.5 and PM10 value continuously for the next 30 minutes, then use the synchronous average value for correction with offset parameters.

MAINTENANCE AND TROUBLESHOOTING

7.1 Maintenance

Regular maintenance is required in everyday use environments to ensure accurate IAQ Sensor data. Depending on the environment, maintenance is done every 3 to 6 months. Public places with a high concentration of dust, dry seasons, pollen seasons, and poor environmental cleanliness can shorten maintenance.

General maintenance includes: cleaning the TR50 IAQ Sensor using a vacuum cleaner to remove dust inside.

7.2 Troubleshooting

If a fault occurs in a typical use environment, see the below troubleshooting table. Contact the dealer or manufacturer if the defect cannot be fixed.

Fault Condition	Troubleshooting
PM1.0, PM2.5, and PM10 data are abnormal; the deviation is too large, and the value is too high or too low.	Check whether debris or dust is in the sensor housing or the air inlet and outlet.
The CO ₂ data is abnormal; the value is too high or too low.	The CO₂ sensor has a self-calibration function inside. Usually, the self-calibration will return CO₂ values to normal. Self-calibration conditions: The CO₂ concentration is around 400 ppm for at least 4 hours every 24 periods. The self-calibration environment should last for one week.

Fault Condition	Troubleshooting
TVOC's deviation is too large (high or low).	TVOC in the environment needs to be stabilized for at least 48 hours after the sensor is powered ON. TVOC data deviation may be large within a short time after power is ON. TVOC baseline deviation may result in large data deviation. The equipment can be placed outside the window or outdoors for at least 24 hours when the outdoor air is good and clear, allowing TVOC to retrace its baseline.
Temperature and humidity deviation is too large, the value is too high or low.	Check whether the environmental factors surrounding the IAQ Sensor have any influence, such as direct sunlight, close to the heating or air conditioning air outlets, etc.
Temperature and humidity deviation is too large; value does not change for a long time.	The sensor can be powered off and back on to see if the reading returns to normal. Contact the dealer or manufacturer if the sensor value cannot be recovered.
Communication interruption RS-485 (MODBUS RTU)	Check if the power supply is normal and the RS-485 terminal is loose. Check whether the RS-485 communication line is accidentally cut. Check for an inductive load with electromagnetic interference near the equipment or RS-485 communication line, such as a water pump.
RS-485/Sylk™ Bus communication abnormal	Check the slide switch is in correct position, check the DIP switch protocol is also correct.
LCD doesn't display any information	Check the power supply is normal, check the device SKU is LCD display modes.
LCD display 9999	Check the sensor value is more than 9999.
LCD display Err.	Check the sensor is working correct.
LED ring dark	Check the power supply is normal
LED ring blink	Check the sensor is working correct.
Touch button no any feedback	Check the touch area is clean and dry. Check the finger is dry and no any ESD risk.
Noise or smell or fire from device	Check the power supply is normal.
Device reboot automatic	Check the software revision is updated, check the Sylk™ Bus load is normal.
No TVOC and PM sensor data	Check the device SKU only have Temperature Humidity and CO ₂ .

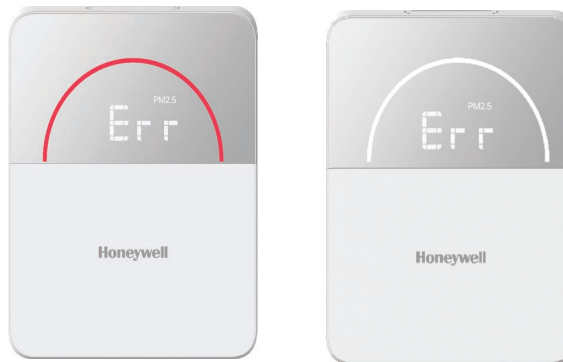
7.3 Error Code

7.3.1 Error Code With Display

In case of any sensor failure alarm for **TR50-5D** and **TR50-3D**, the display will show the sensor name and Err, until the user change it manually. For example, in case of PM2.5 sensor failure, the display will show the error code as Err^{PM2.5}. If more than one sensor fails, the display will switch among those failure sensors.

The below figure indicates the Error Code for Color mode and Neutral Mode.

- **Color Mode:** Indicates Red LED ring with Error Code.
- **Neutral Mode:** Indicates White LED ring (Blink) with Error Code.



7.3.2 Error Code Without Display

In case of any sensor failure alarm for **TR50-5N** and **TR50-3N**, LED ring will blink as per color and neutral modes.

The below figure indicates the Error Code for Color mode and Neutral Mode.

- **Color Mode:** Indicates Red LED ring.
- **Neutral Mode:** Indicates White LED ring (Blink).



CERTIFICATION AND REGULATION

8.1 Waste Electrical and Electronic Equipment (WEEE)

WEEE: Waste Electrical and Electronic Equipment Directive	
	• At the end of the product life, dispose of the packaging and product in an appropriate recycling center. • Do not dispose of the device with the usual domestic refuse. • Do not burn the device.

8.2 FCC Part 15 compliant

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

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference caused by undesired operation.

8.3 Power Supply Guidelines and Requirements

TR50 IAQ Sensor uses 24 VAC/VDC power from a UL Listed Class- 2 transformer or IEC 61558 listed transformer.



WARNING:

TR50 is a half-wave rectifier device. If we connect it with another half-wave rectifier device or use the same transformer, TR50 risks being damaged by short with C, COM, GND or other equivalent connections.

8.4 Standards and Compliances

Parameter	Description
RoHS	IEC63000
CE	EN 60730-1 EN 60730-2-9
UL	UL 60730-1 UL 60730-2-9
ISED	ICES-003 issue 7

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