Honeywell

Indoor Air Quality Sensor

TR50

User Guide

Disclaimer

This document contains Honeywell proprietary information. Information contained herein is to be used solely for the purpose submitted, and no part of this document or its contents shall be reproduced, published, or disclosed to a third party without the express permission of Honeywell International Inc.

While this information is presented in good faith and believed to be accurate, Honeywell disclaims the implied warranties of merchantability and fitness for a purpose and makes no express warranties except as may be stated in its written agreement with and for its customer.

In no event is Honeywell liable to anyone for any direct, special, or consequential damages. The information and specifications in this document are subject to change without notice.

Other Trademarks

Third-party brands and names are the property of their respective owners.

Microsoft®, Win32, Windows®, Windows XP, Windows Vista, Windows 7, Windows 8, and Visual Studio are registered trademarks of Microsoft Corporation in the United States and other countries. Other products and company names mentioned herein may be the trademarks of their respective owners.

Examples of companies, organizations, products, domain names, e-mail addresses, logos, people, places, and events are fictitious. No association with any real company, organization, product, domain name, e-mail address, logo, person, place, or event is intended or should be inferred.

Support and Other Contacts

For technical assistance or further information, call your nearest Honeywell office.

Revisions

Document Version	Published
09	10-11-2023

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 Installation Chapter for detailed information).
- Check Thresholding default settings and how to change it as per site requirements (Refer Getting started chapter for detailed information).
- Address setting should be done on the device (as per required protocols) before connecting it to any controller. (Refer Configuration chapter for detailed information).
- The TVOC parameter take at least 48 hours to stablize once the TR50 device is power up. (Refer operations chapter for detailed information).

TABLE OF CONTENTS

CHAPTER

1 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

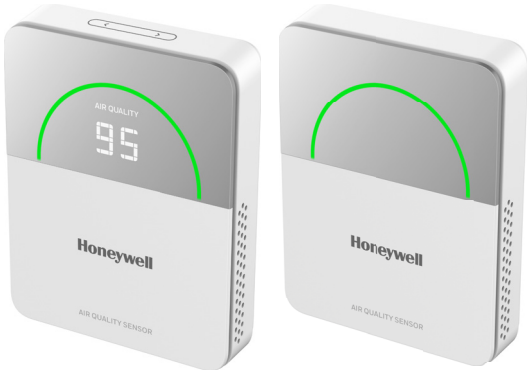
- Temperature (T)
- Relative Humidity (RH)
- Carbon Dioxide (CO_2)
- Particular Matter (PM1.0, PM2.5 and PM10)
- Total Volatile Organic Compound (TVOC)

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

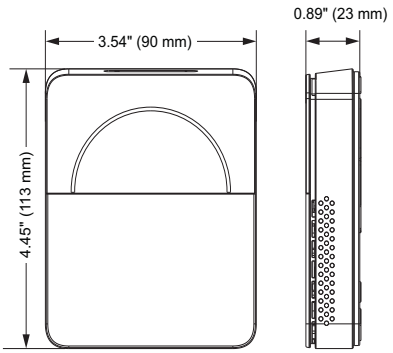
The algorithm built into the device can calculate comprehensive air quality level and display AQI (Air Quality Index) number in LCD and corresponding color with LED ring. The device is packaged with numerous presets suitable for most commercial building requirements, enabling a quick and easy initial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

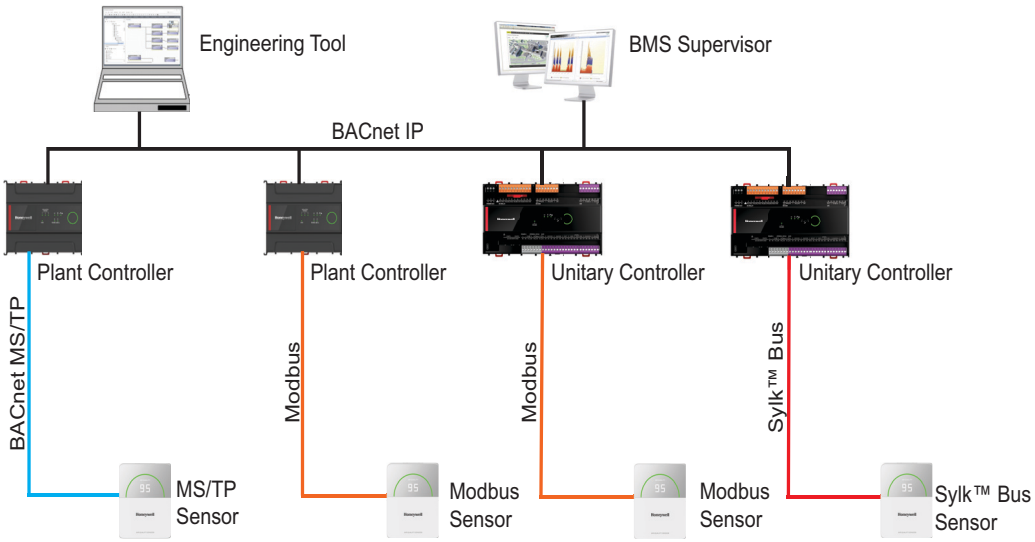
This User Guide provides information about the Getting Started, Configuration details, and Operations of the TR50 IAQ Sensor to the system integrator, technicians, and end-users. All the electrical engineers and technicians working with the product must have basic training on HVAC Sensors, Smart sensors,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

1.4 Specification

Parameter	Description
Detection Parameters	- Temperature (T) - Relative Humidity (RH) - Carbon Dioxide (CO_2) - Particular Matter (PM1.0, PM2.5 and PM10) - Total Volatile Organic Compound (TVOC)
Power Supply	**Direct :** 24 VAC/VDC ± 20 % **Sylk™ Bus :** Honeywell Sylk™ Bus 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 MSTP, Modbus over RS-485, or Sylk™ Bus
Net weight	189 grams (0.42 lbs.)
Power Consumption	**TR50-5D :** 24 VAC 3.8 VA, 24 VDC, 1.5 W **TR50-5N :** 24 VAC 3.8 VA, 24 VDC, 1.4 W **TR50-3D :** 24 VAC 3.2 VA, 24 VDC/Sylk™ Bus, 0.9 W **TR50-3N :** 24 VAC 3.2 VA, 24 VDC/Sylk™ Bus, 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	Modbus + BACnet + Sylk™	Yes	24 VAC/VDC	Honeywell
TR50-5N	Temperature, Humidity, CO_2, PM2.5 and TVOC	Modbus + BACnet + Sylk™	No	24 VAC/VDC	Honeywell
TR50-3D	Temperature, Humidity and CO_2	Modbus + BACnet + Sylk™	Yes	24 VAC/VDC or Sylk™	Honeywell
TR50-3N	Temperature, Humidity and CO_2	Modbus + BACnet + Sylk™	No	24 VAC/VDC or Sylk™	Honeywell
TR50-5D-U	Temperature, Humidity, CO_2, PM2.5 and TVOC	Modbus + BACnet + Sylk™	Yes	24 VAC/VDC	Unbranded
TR50-3D-U	Temperature, Humidity and CO_2	Modbus + BACnet + Sylk™	Yes	24 VAC/VDC or Sylk™	Undranded

CHAPTER

2 INSTALLATION

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.

Warning

By using this Honeywell literature, you agree that Honeywell will have no liability for any damages arising from your use or modification to the literature. You will defend and indemnify Honeywell, its affiliates, and subsidiaries from and against any liability, cost, or damages, including attorneys' fees, arising out of or resulting from any modification to the literature by you.

The material in this document is for information purposes only. The content and the product it describes are subject to change without notice. Honeywell makes no representations or warranties to this document. In no event shall Honeywell be liable for technical or editorial omissions or mistakes in this document, nor shall it be liable for any damages, direct or incidental, arising out of or related to the use of this document. No part of this document may be reproduced in any form or by any means without prior written permission from Honeywell.

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 Mounting Instructions (31-00566M-01), 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.

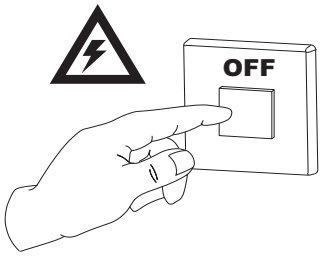
Note: All wiring must agree with applicable codes, ordinances, and regulations as specified in installation wiring diagrams.

2.1.2 Restricting Access to Network

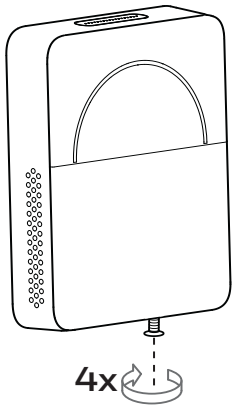
Prevent unauthorised access to the network (e.g., BACnet MSTP, Modbus, or Sylk™ bus) that the Smart Sensor uses. With any system, preventing physical access to the network and equipment reduces the risk of unauthorised interference. When using open protocols such as Modbus or BACnet MSTP, care should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

2.2 Steps to Install TR50 Sensor

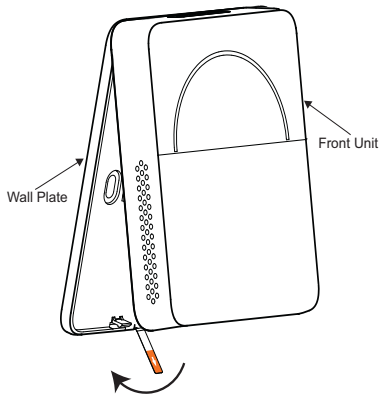
1. Switch OFF the power supply before initiating the TR50 IAQ Sensor installation.



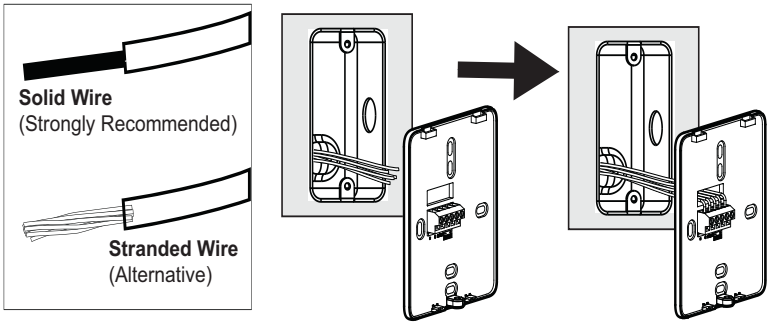
2. Loosen the bottom screw by turning it anticlockwise with the help of a screwdriver.



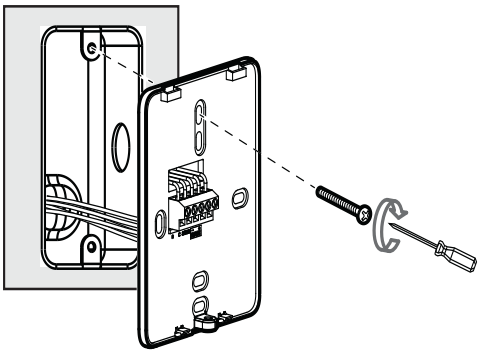
3. Separate the front unit and wall plate by pulling out the tape from the bottom to do the wiring.



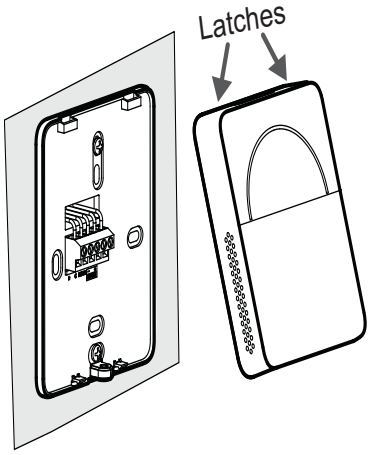
4. Pull the cables through the junction box and do wiring. Refer Wiring Connections section for wiring details.



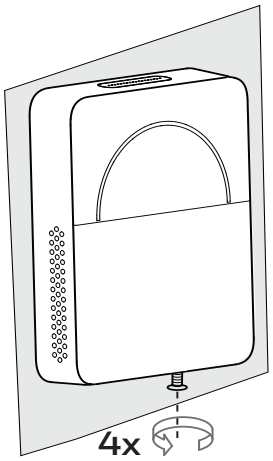
5. Fix the wall plate with the help of two screws to the Junction box.



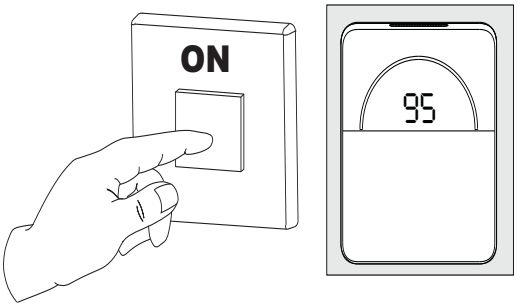
6. Attach the front unit to the wall plate, making sure the latches on each side are well matched.



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 RS-485 via communication BACnet, Modbus and Sylk™ Bus through plant or unitary controller refer hard copy of the latest Mounting Instructions (31-00566M-02).

2.3.1 Sylk™ Bus Wiring

Recommended maximum distance from controller to any Slyk 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 The 30 m distance for standard thermostat wire is conservative, but meant to reduce the impact of any sources of electrical noise (including but no limited VFDs, electronic ballasts, etc). Shielded cable 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 Device

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.

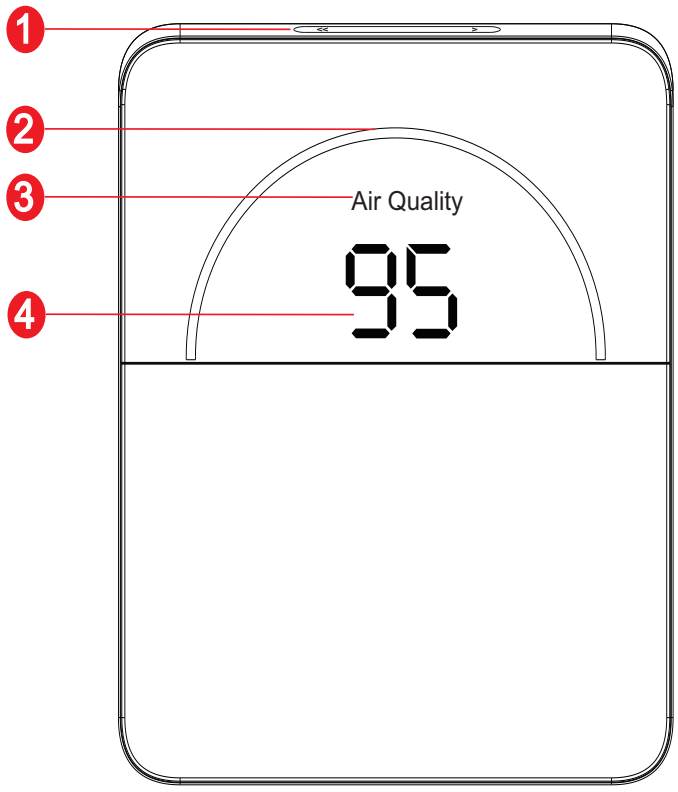
CHAPTER

3 GETTING STARTED

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 indicates 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

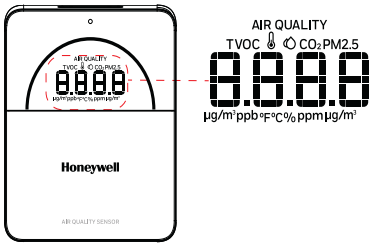
Threshold settings of LED color rings:

Air Quality Parameters*	Green (Good)	Yellow (Medium)	Red (Poor)
Air Quality Score	>80	40-80	<40
Temperature	------	<65 °F or >86 °F	
Humidity	------	<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 (<500ppb), medium(500-1500ppb),poor(>1500ppb) as per UBA study by the German Federal Environmental Agency. Just need to set the following two parameters (Take BACnet point as an example): CfgAlarmTVOCHighLimit =500 CfgAlarmTVOCHighHigh Limit =1500. There will be 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 provide an overview of all the available segments of the TR50 IAQ Sensor device with its parameter names and units.

Segments	Parameter Name	Units
	Temperature	^{O}C (^{O}F)
	Humidity	%
CO_2	Carbon Dioxide	PPM
PM2.5	Particular Matter	$\mu g/m^3$
TVOC	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 don't 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.

CHAPTER

4 CONFIGURATION

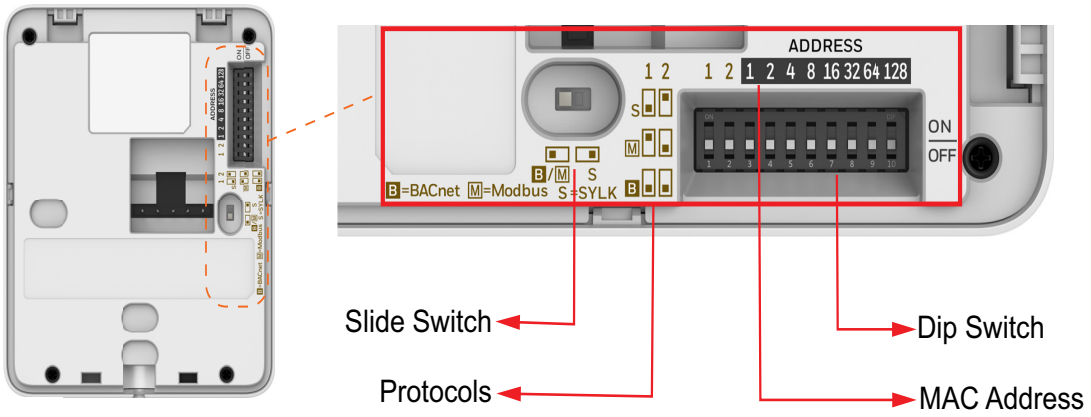
4.1 Topologies used to connect TR50 IAQ Sensor

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 refer System Architecture on page 3.

4.2 Dip Switch Configuration

The Dip switch is used to change the communication protocols as per the selected networks.

The below figure describes the different switch how to communicate the networks:

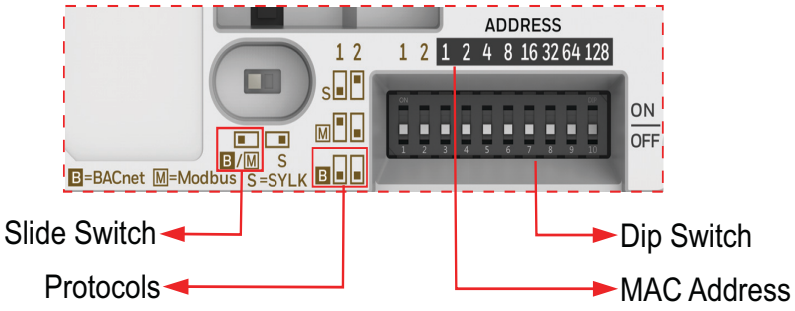


4.2.1 BACnet Mode

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.

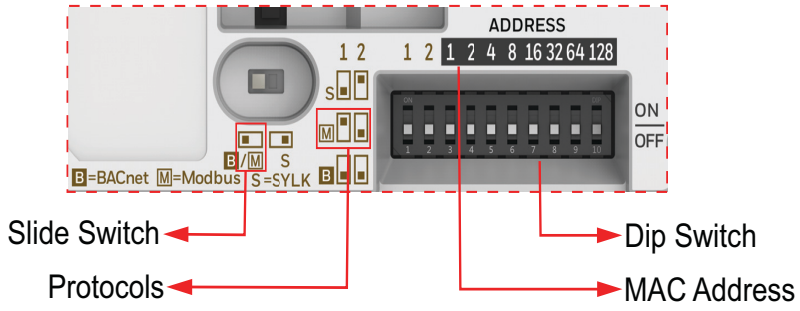


4.2.2 Modbus Mode

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/OFF or 1/2 address.

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

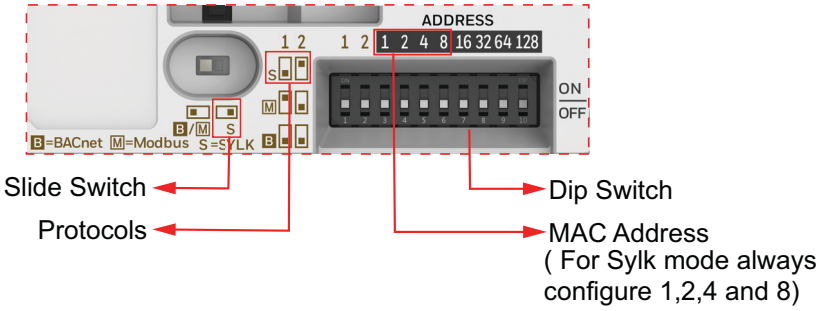


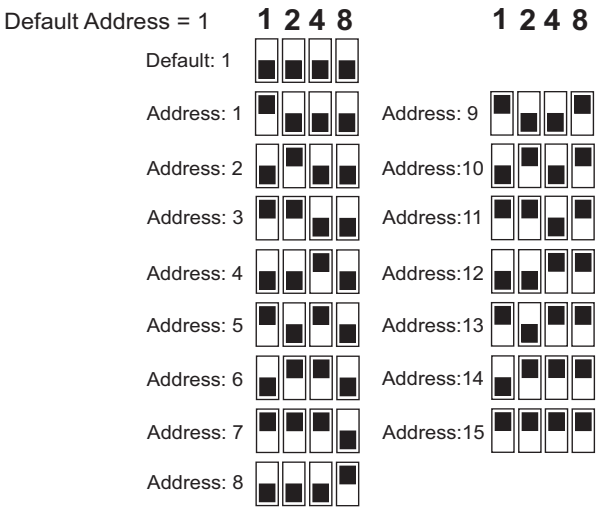
4.2.3 Slyk™ Bus Mode

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

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

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





4.3 RS-485 Configuration

4.3.1 Pre-Requisites:

- Power Source (24 VAC/VDC) to connect TR50 device and Plant controller/ Unitary controller
- RS-485 cables
- Plant controller/ Unitary controller

Before configuring the device make sure the power supply is Switch OFF.

Refer Wiring Connections section on page 9 for details about RS-485 wiring.

4.4 BACnet Configuration

4.4.1 Pre-Requisties

Adjust the switches on the back of the device to enable the device to operate in 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 Niagara Engineering Guide 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 power ON. Choose a valid baud rate (9600, 38400, 19200, 57600, 76800, 115200). If the valid baud rate can not 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 MSTP 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 (^{o}F) 0-50 (^{o}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(^{o}F) 18(^{o}C)	32^{o}F <= PRESENT VALUE of cfgAlarmTempLowLimit <= PRESENT VALUE of cfgAlarmTempHighLimit 0^{o}C <= PRESENT VALUE of cfgAlarmTempLowLimit <= PRESENT VALUE of cfgAlarmTempHighLimit
CfgAlarmTempHighLimit	2	R/W	Analog Value	86(^{o}F) 30(^{o}C)	PRESENT VALUE of cfgAlarmTempLowLimit <= PRESENT VALUE of cfgAlarmTempHig Limit<= 122^{o}F PRESENT VALUE of cfgAlarmTempLowLimit <= PRESENT VALUE of cfgAlarmTempHighLimit<= 50^{o}C
CfgAlarmTempDeadband	3	R/W	Analog Value	1(^{o}F) 1(^{o}C)	0(^{o}F) <= PRESENT_VALUE of cfgAlarmTempDeadband 0(^{o}C) <= PRESENT_VALUE of cfgAlarmTempDeadband
CfgAlarmTempTimeDelay	4	R/W	Analog Value	60(s)	0(s) <= PRESENT_VALUE of cfgAlarmTempTimeDelay

Point Name	BACnet Instance	Read/ Write	Type	Default Value	Range
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 (^{o}F) -5 to 5 (^{o}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
cfgDisplayUnitTemp	101	R/W	Multi State Value	1	1: Degrees Fahrenheit (^{o}F) 2: Degrees Celsius (^{o}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 ofcfgAlarmHumiDead band
CfgAlarmHumiTimeDelay	54	R/W	Analog Value	60(s)	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 CO_2 Configuration Points

Point Name	BACnet Instance	Read/ Write	Type	Default Value	Range
Cfg Alarm CO_2 High Limit	101	R/W	Analog Value	1000(ppm)	0 <= PRESENT VALUE of cfg Alarm CO_2 High Limit <= PRESENT VALUE of cfg Alarm CO_2 High High Limit
Cfg Alarm CO_2 High High Limit	102	R/W	Analog Value	1400(ppm)	PRESENT VALUE of cfgAlarmCO2HighLimit <= PRESENT VALUE of cfg Alarm CO_2 High High Limit <= 9999
Cfg Alarm CO_2 Deadband	103	R/W	Analog Value	100	0 <= PRESENT VALUE of cfg Alarm CO_2 Deadband
Cfg Alarm CO_2 Time Delay	104	R/W	Analog Value	60(s)	0 <= PRESENT VALUE of cfg Alarm CO_2 Time Delay
cfg CO_2 Sensor Offset	283	R/W	Analog Value	0	-1000 <= PRESENT VALUE of cfg CO_2 Sensor Offset <=1000 Tips of configuring cfg CO_2 Sensor Offset: 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
Cfg Alarm CO_2 Limit Enable	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 HighHighLimit <=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	
SS_MV_OutOfRange_PM2.5	4	R/W	Multi State Value	1	1: Normal 2: Over high limit 3: Over highhigh 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 cfgAlarmTVOCHighLimit <= PRESENT VALUE of cfgAlarmTVOCHighHighLimit 16(ug/m3) <= PRESENT VALUE of cfgAlarmTVOCHighLimit <= PRESENT VALUE of cfgAlarmTVOCHighHighLimit
CfgAlarmTVOCHighHighLimit	202	R/W	Analog Value	350(ppb) 700(ug/m^3)	PRESENT VALUE of cfgAlarmTVOCHighLimit <= PRESENT VALUE of cfgAlarmTVOCHighHighLimit <=2820(ppb) PRESENT VALUE of cfgAlarmTVOCHighLimit <= PRESENT VALUE of cfgAlarmTVOCHighHighLimit <=5640(ug/m3)
CfgAlarmTVOCDeadband	203	R/W	Analog Value	20(ppb) 40(ug/m^3)	0(ppb) <= PRESENT VALUE of cfgAlarmTVOCDeadband 0(ug/m3) <= PRESENT VALUE of cfgAlarmTVOCDeadband
CfgAlarmTVOCTimeDelay	204	R/W	Analog Value	60(s)	0 <= PRESENT VALUE of cfgAlarmTVOCTimeDelay
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 highhigh 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_CO2 - 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_CO2 - 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 + Tempera-ture (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 + Tempera-ture (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:cfgOutOfRangeAlarm IndicatorEnable 3:cfgSensorFailureAlarm IndicatorEnable 4:cfgOutOfRangeAlarm IndicatorEnable && cfgSensorFailureAlarm IndicatorEnable

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

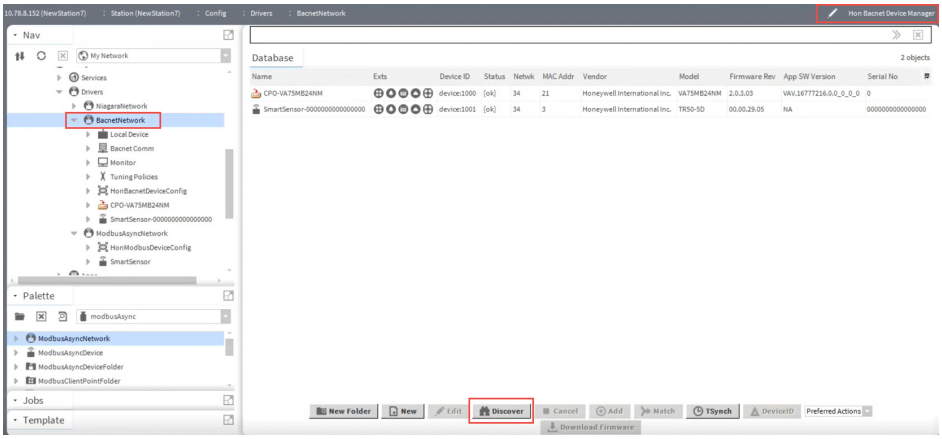
Point Name	BACnet Instance	Read/ Write	Type	Default Value	Range
cfgIsAlarmLocalDetectionEnable	1	R/W	Binary Value	1	0: Disable 1: Enable

4.4.6 Configure TR50 Bacnet Device via Niagara

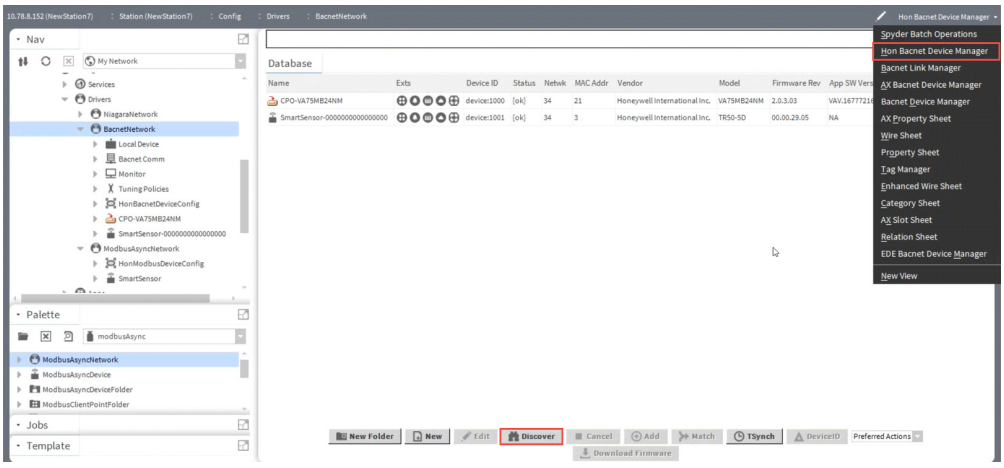
Follow the below steps to configure the TR50 Bacnet device in Niagara:

Step 1. Add a BacnetNetwork.

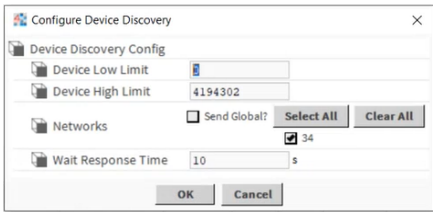
Step 2. Navigate to Config > Drivers and double-click on BacnetNetwork.



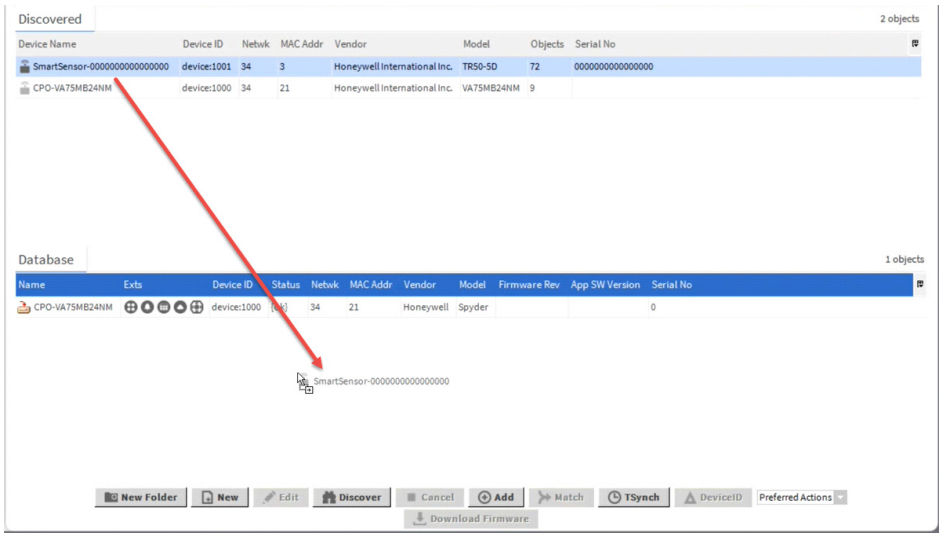
Step 3. Select the Hon Bacnet Device Manager from the top right corner and-click Discover.
The Configure Device Discovery dialog box appears.



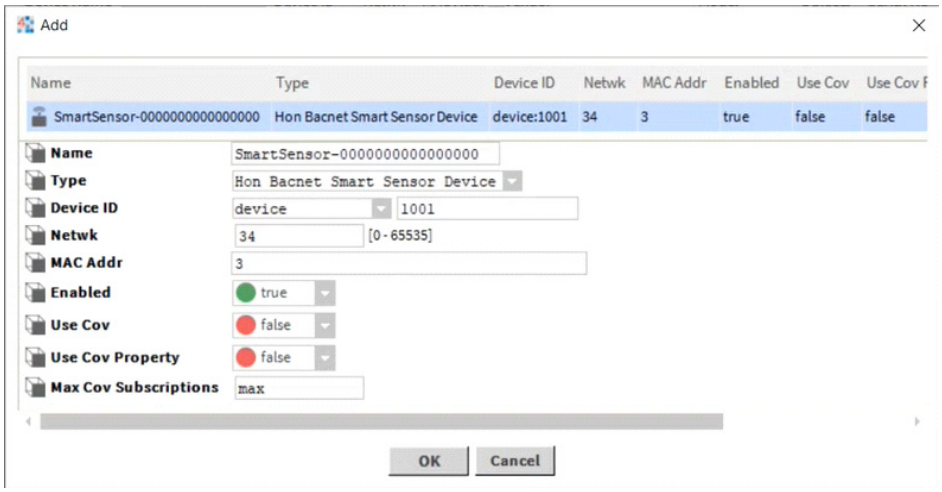
Step 4. Click Ok to discover the device.



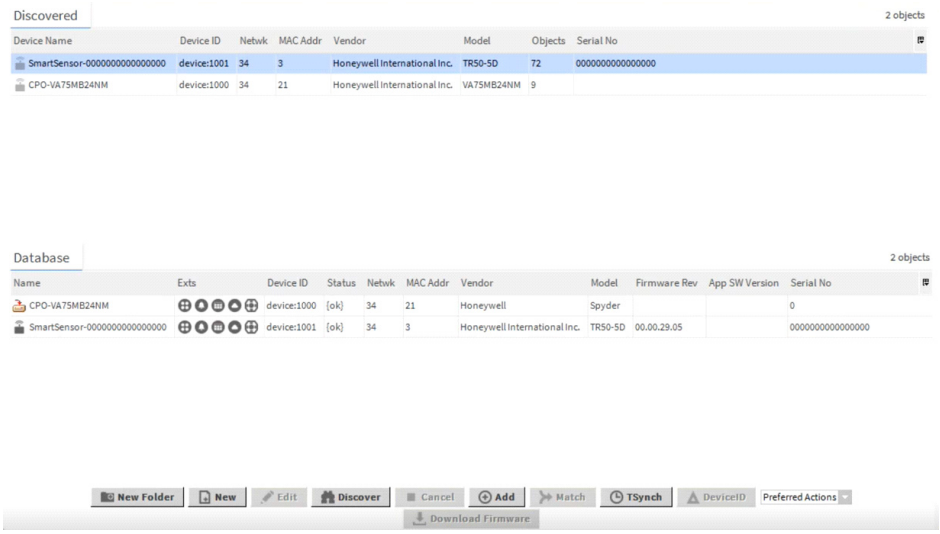
Step 5. Drag and drop the TR50 device to the database or select the TR50 device and click Add.
The Add dialog box appears.



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

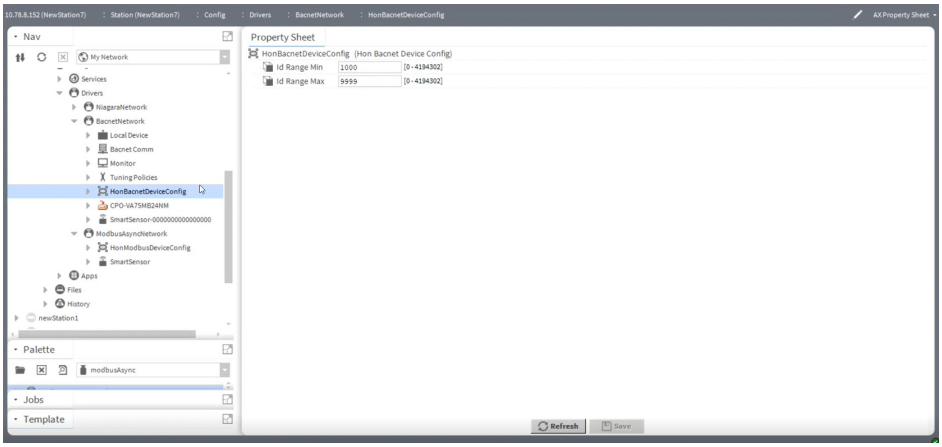


Step 7. The device gets added to the database.



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 **MSTP** as the Model type.

Step 3. In **Model name**, select a required unitary controller/MSTP based controller /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 plant controller to which the unitary controller/MSTP based controller /TR50 sensor must be associated.

Step 9. In the **Channel name** list, select the channel type to which the unitary controller/MSTP based controller /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
CIPer 30	WEB-C3036EPVBNH	Y	Y	
BEATS Optimizer IP VAV	WEB-VA75I24NM	-	-	
BEATS Optimizer MSTP VAV	WEB-VA75M24NM	-	-	
BEATS Optimizer IP Unitary (FCU)	RL1644ES24NM	-	-	
BEATS Optimizer MSTP Unitary (FCU)	RL1644MS24NM	-	-	
BEATS Compact VAV	CPO-VA423B24N	-	-	
CPO Plant Controller	CPO-PC500	Y	Y	
CPO Plant Controller	CPO PC400	Y	Y	
Alerton ACM	ACM	Y	N	
Trend IQ4E	IQ4E-2040u531000	N	N	
Trend IQ4NC	IQ4NC-1040U5010	Y	N	
Saia 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 baudrate : 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 cfgModbusAutoBaudrate 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

Setup/ Runtime	Addr	Dir	Non-Volatile	Name	SKU	Type/Unit	Bits Num	Range	Default
Setup	112	R/W	V	cfgHandling Command	3N/ 3D/ 5N/5D	int16	16	0-3	0
Setup	2000	R/W	NV	cfgBaudrate	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
Setup	2001	R/W	NV	cfgParity	3N/ 3D/ 5N/5D	enum/ int16	16	0: none 1: odd 2: even	2
Setup	2002	R/W	NV	cfgStopBits	3N/ 3D/ 5N/5D	int16	16	1-2	1
Setup	2010	R/W	NV	cfgTempSensor Offset	3N/ 3D/ 5N/5D	signed/ int16	16	-9 to 9(^{o}F) -5 to 5(^{o}C)	0
Setup	2011	R/W	NV	cfgHumiSensor Offset	3N/ 3D/ 5N/5D	signed/ int16	16	-10 to 10	0
Setup	2012	R/W	NV	cfgCO_2Sensor Offset	3N/ 3D/ 5N/5D	signed/ int16	16	-1000 <= cfgCO2SensorOffset <= 1000Tips 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	0
Setup	2013	R/W	NV	cfgPM2.5Sensor Offset	5N/5D	signed/ int16	16	-	0
Setup	2014	R/W	NV	cfgTVOCSensor Offset	5N/5D	signed/ int16	16	-	0
Setup	2015	R/W	NV	cfgPM1.0Sensor Offset	5N/5D	signed/ int16	16	-	0
Setup	2016	R/W	NV	cfgPM10Sensor Offset	5N/5D	signed/ int16	16	-	0

Setup/ Runtime	Addr	Dir	Non-Volatile	Name	SKU	Type/Unit	Bits Num	Range	Default
Setup	2030	R/W	NV	cfgAlarmTemp LowLimit	3N/ 3D/ 5N/5D	signed/ int16	16	32°F<= cfgAlarmTempLow Limit <= cfgAlarmTempHighLimit 0°C <= cfgAlarmTempLowLimit <= cfgAlarmTem-pHighLimit	65 °F 18 °C
Setup	2031	R/W	NV	cfgAlarmHumiLow Limit	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmHumiLow-Limit <= cfgAlarmHumi-HighLimit	10%
Setup	2032	R/W	NV	cfgAlarm CO_2HighLimit	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmCO2High-Limit <= cfgAlarm-CO2HighHighLimit	1000ppm
Setup	2033	R/W	NV	cfgAlarmPM2.5 HighLimit	5N/5D	int16	16	0 <= cfgAlarmPM2.5High-Limit <= cfgAlarm-PM2.5HighHighLimit	35ug/m^3
Setup	2034	R/W	NV	cfgAlarmTVOC HighLimit	5N/5D	int16	16	8 ppb <= cfgAlarmT-VOCHighLimit <= cfgAlarmTVOCHighHigh-Limit 16 ug/m3<= cfgAlarmT-VOCHighLimit <= cfgAlarmTVOCHighHigh-Limit	250 ppb 500 ug/ m^3
Setup	2035	R/W	NV	cfgAQIModerate Score	3N/ 3D/ 5N/5D	int16	16	cfgAQIUnhealthy-Score<=cfgAQIModerate-Score<=100	80
Setup	2050	R/W	NV	cfgAlarmTemp HighLimit	3N/ 3D/ 5N/5D	signed/ int16	16	cfgAlarmTempLowLimit <= cfgAlarmTempHighLimit <= 122°F cfgAlarmTempLowLimit <= cfgAlarmTempHighLimit <= 50°C	86°F 30 °C
Setup	2051	R/W	NV	cfgAlarmHumi HighLimit	3N/ 3D/ 5N/5D	int16	16	cfgAlarmHumiLowLimit <= cfgAlarmHumiHighLimit <= 100	80%
Setup	2052	R/W	NV	cfgAlarm CO_2HighHigh Limit	3N/ 3D/ 5N/5D	int16	16	cfgAlarmCO2HighLimit <= cfgAlarmCO2HighHigh-Limit <= 9999	1400ppm
Setup	2053	R/W	NV	cfgAlarmPM2.5 HighHighLimit	5N/5D	int16	16	cfgAlarmPM2.5HighLimit <= cfgAlarmPM2.5High-HighLimit <= 5000	55ug/m^3
Setup	2054	R/W	NV	cfgAlarmTVOC HighHigh Limit	5N/5D	int16	16	cfgAlarmTVOCHighLimit <= cfgAlarmTVOCHigh-HighLimit<=2820 ppb cfgAlarmTVOCHighLimit <= cfgAlarmTVOCHigh-HighLimit<=5640ug/m3	350 ppb 700 ug/ m^3
Setup	2055	R/W	NV	cfgAQIUnhealthy Score	3N/ 3D/ 5N/5D	int16	16	0<= cfgAQIUnhealthyScore <= cfgAQIModerateScore <= 100	40
Setup	2070	R/W	NV	cfgAlarmTemp Deadband	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmTempDead-band	1(°F) 1(°C)
Setup	2071	R/W	NV	cfgAlarmHumi Deadband	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmHumiDead-band	2

Setup/ Runtime	Addr	Dir	Non-Volatile	Name	SKU	Type/Unit	Bits Num	Range	Default
Setup	2072	R/W	NV	cfgAlarm CO_2Deadband	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmCO2Deadband	100
Setup	2073	R/W	NV	cfgAlarmPM2.5 Deadband	5N/5D	int16	16	0 <= cfgAlarmPM2.5Deadband	5
Setup	2074	R/W	NV	cfgAlarmTVOC Deadband	5N/5D	int16	16	0 <= cfgAlarmTVOCDeadband	20(ppb) 40(ug/m3)
Setup	2075	R/W	NV	cfgAlarmAQIDead band	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmAQIDeadband	2
Setup	2090	R/W	NV	cfgAlarmTempTime Delay	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmTempTimeDelay	60(s)
Setup	2091	R/W	NV	cfgAlarmHumiTime Delay	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmHumiTimeDelay	60(s)
Setup	2092	R/W	NV	cfgAlarmCO_2 TimeDelay	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmCO2Time Delay	60(s)
Setup	2093	R/W	NV	cfgAlarmPM2.5 TimeDelay	5N/5D	int16	16	0 <= cfgAlarmPM2.5TimeDelay	60(s)
Setup	2094	R/W	NV	cfgAlarmTVOC TimeDelay	5N/5D	int16	16	0 <= cfgAlarmTVOCTimeDelay	60(s)
Setup	2095	R/W	NV	cfgAlarmAQITime Delay	3N/ 3D/ 5N/5D	int16	16	0 <= cfgAlarmAQITime Delay	60(s)
Setup	2110	R/W	NV	Cfg_OORSensor FailAlarmIndicator En	3D/5D	enum/ int16	16	1:Disable 2:cfgOutOfRangeAlarmIndicatorEnable 3:cfgSensorFailureAlarmIndicatorEnable 4:cfgOutOfRangeAlarmIndicatorEnable && cfgSensorFailureAlarmIndicat orEnable	4
Setup	2130	R/W	NV	cfgIsParaDisplayed	3D/5D	int16	16	For TR50-5D, cfgIsDisplayed_AQI - Bit 0 cfgIsDisplayed_Temp - Bit 1 cfgIsDisplayed_Humi - Bit 2 cfgIsDisplayed_CO2 - 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_CO2 - Bit 3	15/63

Setup/ Runtime	Addr	Dir	Non-Volatile	Name	SKU	Type/Unit	Bits Num	Range	Default
Setup	2150	R/W	NV	cfgTempAlarm LimitEnable	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	4
Setup	2151	R/W	NV	cfgHumiAlarm LimitEnable	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	4
Setup	2152	R/W	NV	cfgCO_2AlarmLimit Enable	3N/ 3D/ 5N/5D	enum/ int16	16	1:CO2 High Limit And High High Limit Disable 2:CO2 High Limit Enable 3:CO2 High High Limit Enable 4:CO2 High Limit And High High Limit Enable	4
Setup	2153	R/W	NV	cfgPM25Alarm LimitEnable	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	4
Setup	2154	R/W	NV	cfgTVOCAlarm LimitEnable	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	4
Setup	2155	R/W	NV	cfgAQIAlarmLimit Enable	3N/ 3D/ 5N/5D	enum/ int16	16	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
Setup	3000	R/W	NV	cfgLedRingColor Option	3N/ 3D/ 5N/5D	int16	16	1: Color mode 2: Neutral mode	1
Setup	3001	R/W	NV	cfgLedRing Brightness	3N/ 3D/ 5N/5D	int16	16	40-100	50
Setup	3002	R/W	NV	cfgLedRingDim Brightness	3D/5D	int16	16	10-40	10
Setup	3020	R/W	NV	cfgLcdAutoCycle Time	3D/5D	int16	16	3-10(s)	5(s)
Setup	3021	R/W	NV	cfgLcdBrightness	3D/5D	int16	16	40-100	80

Setup/ Runtime	Addr	Dir	Non-Volatile	Name	SKU	Type/Unit	Bits Num	Range	Default
Setup	3022	R/W	NV	cfgLcdParameterSwitch	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
Setup	3023	R/W	NV	cfgLcdDimBrightness	3D/5D	int16	16	10-40	40
Setup	3030	R/W	NV	cfgLedRingLcdDimTime	3D/5D	int16	16	3-10(s)	10s
Setup	3031	R/W	NV	cfgLedRingLcdTimeoutTime	3D/5D	int16	16	0(s), 10-30(s)	0(s)
Setup	4000	R/W	NV	cfgTemperatureUnit	3N/ 3D/ 5N/5D	bit/boolean	1	-Fahrenheit: 0 -Celsius: 1	Fahrenheit
Setup	4001	R/W	NV	cfgDisplayUnitTemp	3D/5D	bit/boolean	1	-Fahrenheit: 0 -Celsius: 1	Fahrenheit
Setup	4004	R/W	NV	cfgTVOCUnit	5N/5D	bit/boolean	1	-ppb: 0 -ug/m^3: 1	ppb
Setup	4005	R/W	NV	cfgDisplayUnitTVOC	5D	bit/boolean	1	-ppb: 0 -ug/m^3: 1	ppb
Setup	4020	R/W	NV	cfgLedRingLcdEnable	3N/ 3D/ 5N/5D	bit/boolean	1	ON or OFF	ON/1
Setup	5000	R/W	NV	cfgModbusAutoBaudrateEnable	3N/ 3D/ 5N/5D	bool	1	TRUE or FALSE	TRUE
Setup	5001	R/W	V	cfgModbusFrameCntClear	3N/ 3D/ 5N/5D	bool	1	TRUE or FALSE	TRUE
Setup	5040	R/W	NV	cfgLocalDetectionEnable	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
DispValues	Input	run time	1	R	V	Temperature	3N/ 3D/ 5N/ 5D	int16	^oF	16	32-122(^oF) 0-50(^oC)	0.1	
DispValues	Input	run time	2	R	V	Humidity	3N/ 3D/ 5N/ 5D	int16	%RH	16	0-100	0.1	
DispValues	Input	run time	3	R	V	CO_2	3N/ 3D/ 5N/ 5D	int16	ppm	16	0-9999	0.1	
DispValues	Input	run time	4	R	V	Particulates PM2.5	5N/ 5D	int16	ug/m^3	16	0-5000	1	
DispValues	Input	run time	5	R	V	TVOC	5N/ 5D	int16	ppb	16	8-2820(ppb) 16-5640(ug/m^3)	1	
DispValues	Input	run time	14	R	V	Particulates PM1	5N/ 5D	int16	ug/m^3	16	0-5000	1	
DispValues	Input	run time	24	R	V	Particulates PM10	5N/ 5D	int16	ug/m^3	16	0-5000	1	
DispValues	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	Defau lt Unit	Bits Num	Range	Scale	Default
Device	Input	run time	114	R	V	Host FirmwareUpdateStatus	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 recv Handling cmd 02) 4:reserved. 5:signature validation failed. 6:flash access failed. 9:OTA Provisional status. 90:OTA down-loading status. 91:OTA downloaded status.	-	
Device	Input	run time	115	R	V	BLE FirmwareUpdateStatus	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 recv Handling cmd 02) 4:reserved. 5:signature validation failed. 6:flash access failed. 90:OTA downloading status. 91:OTA down-loaded status.	-	
Device	Input	run time	200	R	V	Modbus BadFrameCount	3N/ 3D/ 5N/ 5D	int32	int32	32		-	0
Device	Input	run time	202	R	V	ModbusReceviedFrame Count	3N/ 3D/ 5N/ 5D	int32	int32	32		-	0
Device	Input	run time	210	R	V	Data BaseRevision	3N/ 3D/ 5N/ 5D	int32	int32	32		-	0

Category	Reg type	Setup /Run time	Addr	Dir	Non-Volatile	Name	SKU	Type/ Unit	Defau lt Unit	Bits Num	Range	Scale	Default
Device	Input	run time	1000	R	NV	SSMod elName	3N/ 3D/ 5N/ 5D	string	string	128	"TR50-3N", "TR50-3D", "TR50-5N", "TR50-5D"	-	
Device	Input	run time	1030	R	NV	SSSeri alNum ber	3N/ 3D/ 5N/ 5D	string	string	128	"000000000000 0000"	-	

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	Tem-pera-ture_Fail ureAlarm	3N/ 3D/ 5N/ 5D	sign ed/ int16	-	16	Error code: 0: no fault detected 64: fail_ntc_sho rt_0 65: fail_ntc_ope n_0 66: fail_ntc_sho rt_1 67: fail_ntc_ope n_1 68: fail_ntc_sho rt_2 69: fail_ntc_ope n_2	1	0
Device	Input	run time	101	R	V	Humidi ty_Failu reAlarm	3N/ 3D/ 5N/ 5D	sign ed/ int16	-	16	Error code: 0: no fault detected 12: commu nication_ failure	1	0
Device	Input	run time	102	R	V	CO2_ Failure Alarm	3N/ 3D/ 5N/ 5D	sign ed/ int16	-	16	Error code: 0: no fault detected 12: commu nication_ failure 70: fail_storage	1	0

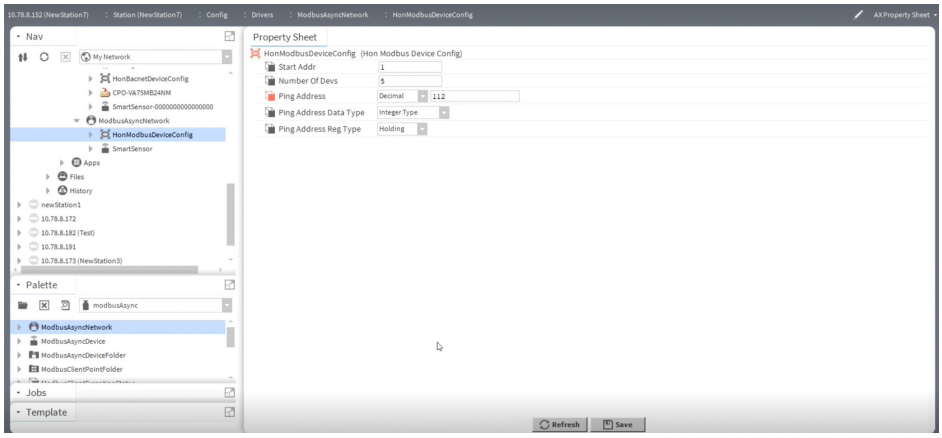
Category	Reg type	Setup /Run time	Addr	Dir	Non-Volatile	Name	SKU	Type / Unit	Default Unit	Bits Num	Range	Scale	Default
Device	Input	run time	103	R	V	PM2.5_ Failure Alarm	5N/ 5D	sign ed/ int16	-	16	Error code: 0: no fault detected 12: commu nication_ failure 71: fail_low_ fan_speed 72: fail_high_ fan_speed 73: fail_pd 74: fail_ld	1	0
Device	Input	run time	104	R	V	TVOC_ Failure Alarm	5N/ 5D	sign ed/ int16	-	16	Error code: 0: no fault detected 12: commu nication_ failure	1	0
Device	Hold ing	run time	2200	R/ W	V	Temp OutOf Range	3N/ 3D/ 5N/ 5D	enu m/ int16	-	16	1: Normal 2: Off nor mal	-	1
Device	Hold ing	run time	2201	R/ W	V	Humi OutOf Range	3N/ 3D/ 5N/ 5D	enu m/ int16	-	16	1: Normal 2: Off nor mal	-	1
Device	Hold ing	run time	2202	R/ W	V	CO2Out OfRange	3N/ 3D/ 5N/ 5D	enu m/ int16	-	16	1: Normal 2: Over high limit 3: Over highhigh limit	-	1
Device	Hold ing	run time	2203	R/ W	V	PM2.5O utOf Range	5N/ 5D	enu m/ int16	-	16	1: Normal 2: Over high limit 3: Over highhigh limit	-	1
Device	Hold ing	run time	2204	R/ W	V	TVOC OutOf Range	5N/ 5D	enu m/ int16	-	16	1: Normal 2: Over high limit 3: Over highhigh limit	-	1
Device	Hold ing	run time	2205	R	V	AQILevel	3N/ 3D/ 5N/ 5D	enu m/ 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:

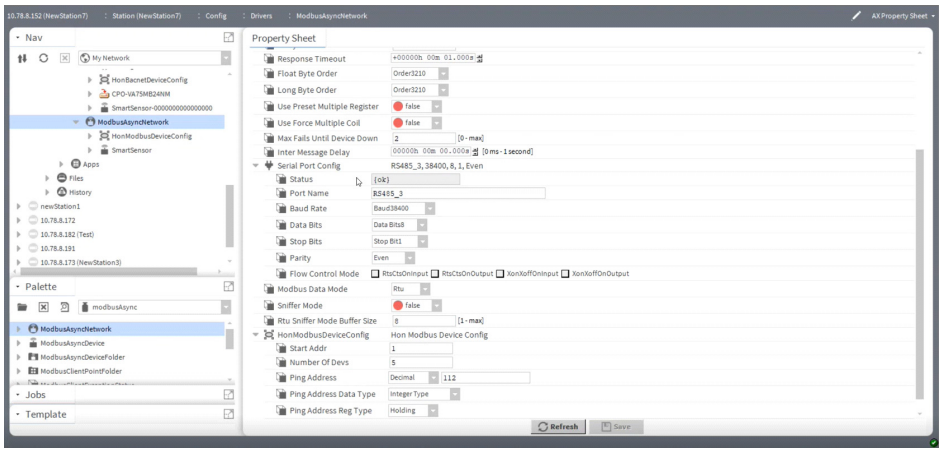
Step 1. Add a ModbusAsyncNetwork.

Step 2. Navigate to Config > Drivers > ModbusAsyncNetwork, double-click the HonModbusDeviceConfig, and open the AX Property Sheet view.



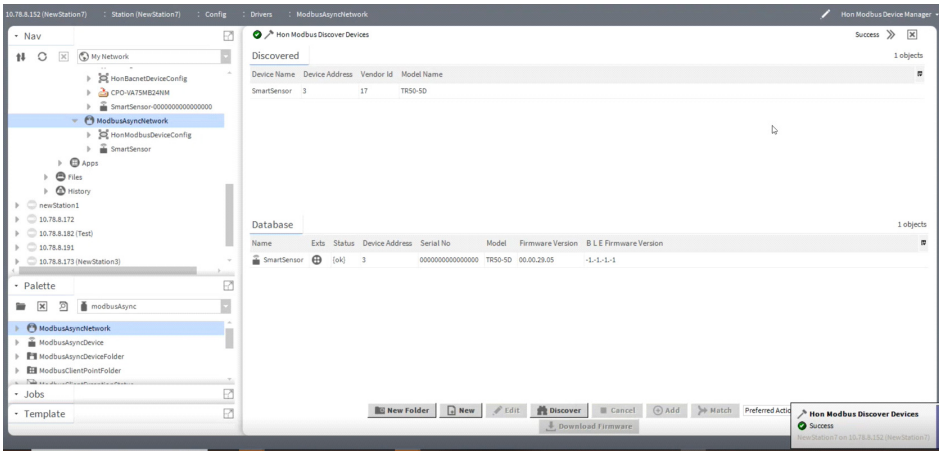
Step 3. Set the Number of Devs to 5, Ping Address to Decimal and 112, and click Save.

Step 4. Open the AX Property Sheet view of ModbusAsyncNetwork and set the Port Name and Baud Rate according to the connected Modbus Smart Sensor.

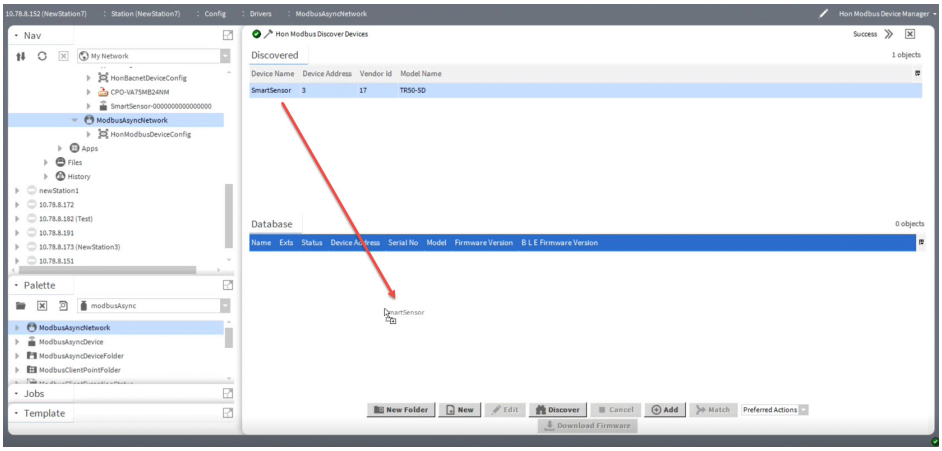


Step 5. Set the Parity to Even and click Save.

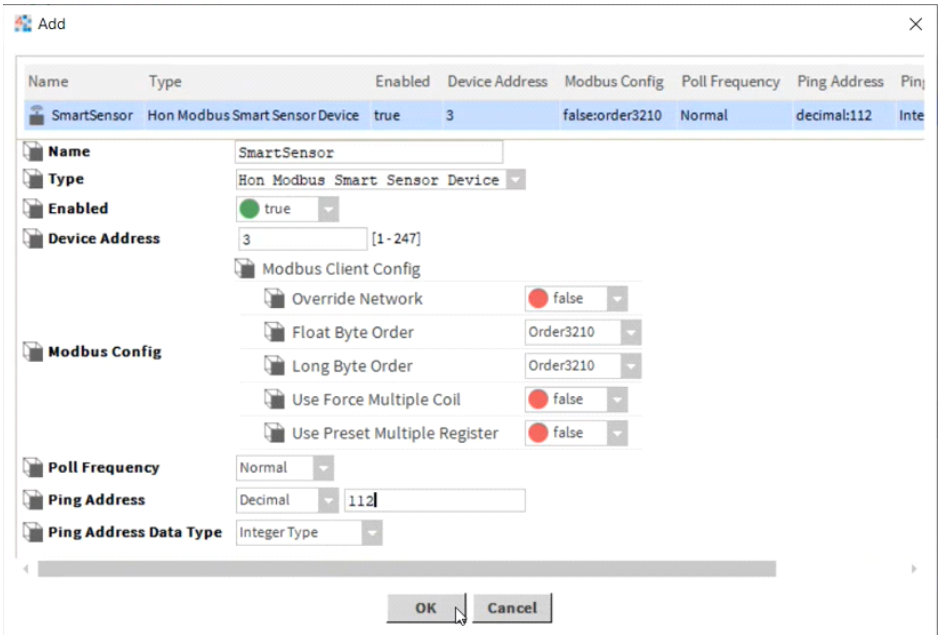
Step 6. Select the Hon Modbus Device Manager from the top right corner and click Discover.
The Device is discovered.



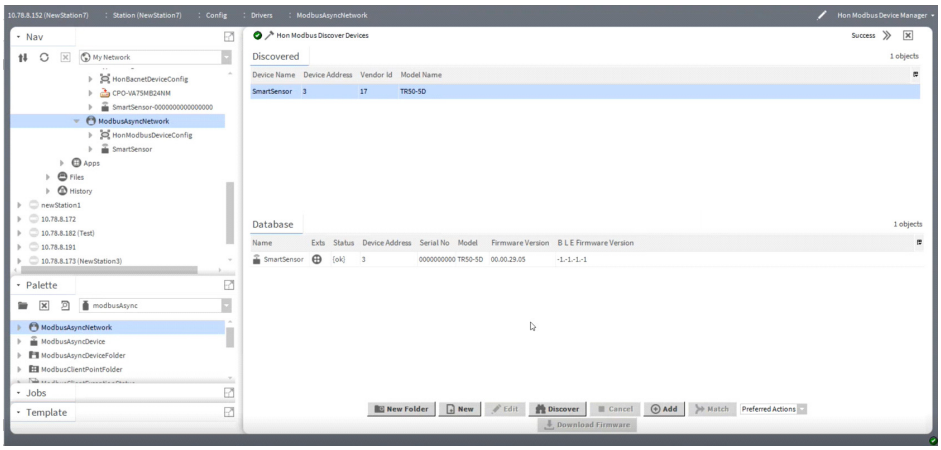
Step 7. Drag and drop the TR50 device to database or select the TR50 device and click Add.
The Add dialog box appears.



Step 8. Set the ping address to Decimal and 122, and click Ok.



Step 9. 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
CIPer 30	WEB-C3036EPVBNH	Y	Y	
BEATS Optimizer IP VAV	WEB-VA75I24NM	Y	Y	
BEATS Optimizer MSTP VAV	WEB-VA75M24NM	Y	Y	
BEATS Optimizer IP Unitary (FCU)	RL1644ES24NM	Y	Y	
BEATS Optimizer MSTP Unitary (FCU)	RL1644MS24NM	Y	Y	
BEATS Compact VAV	CPO-VA423B24N	N	N	
CPO Plant Controller	CPO-PC500	Y	Y	
CPO Plant Controller	CPO PC400	Y	N	Legacy CPO plant controller doesn't support Modbus firmware update.
Alerton 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™ Bus Configuration

4.6.1 Configure TR50 Sylk device via Niagara

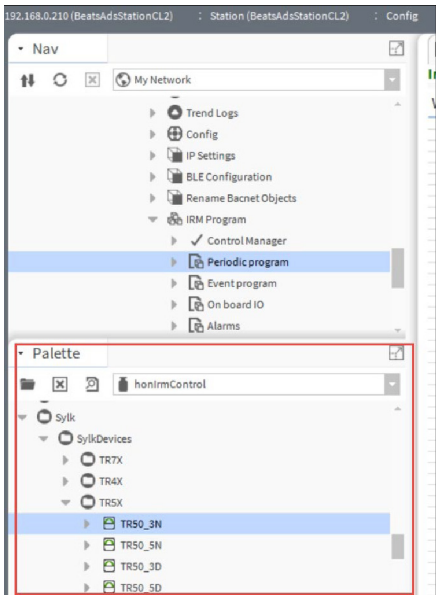
The TR50 Sylk configuration has three options:

- Sensor Reading
- Sensor Alarm
- Sensor Failure

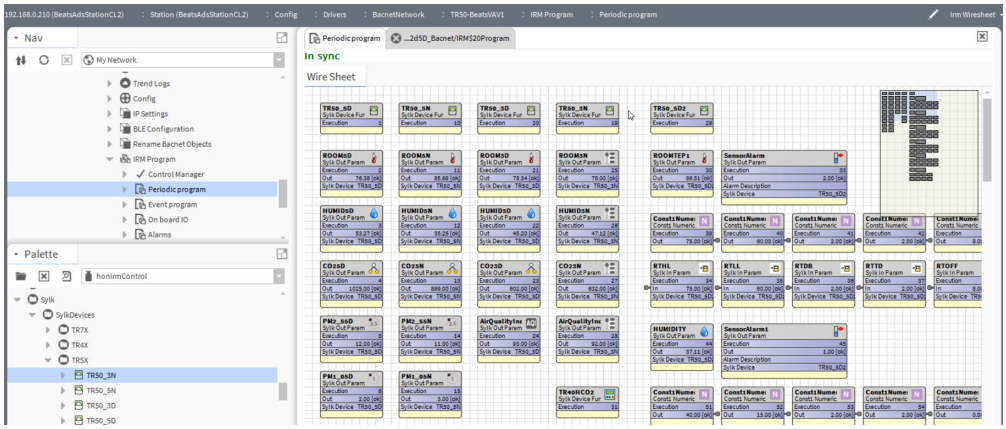
4.6.1.1 Sensor Reading

Steps to obtain Sensor Reading:

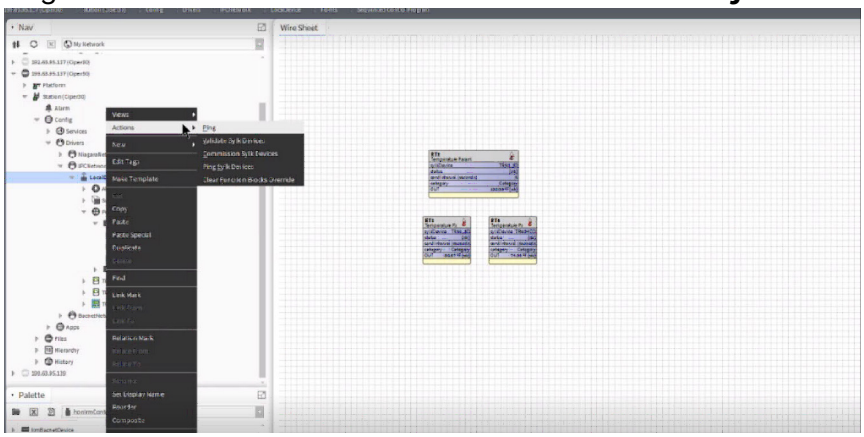
Step 1. Navigate to **Palette < Sylk < Slyk Devices < TR5X**.



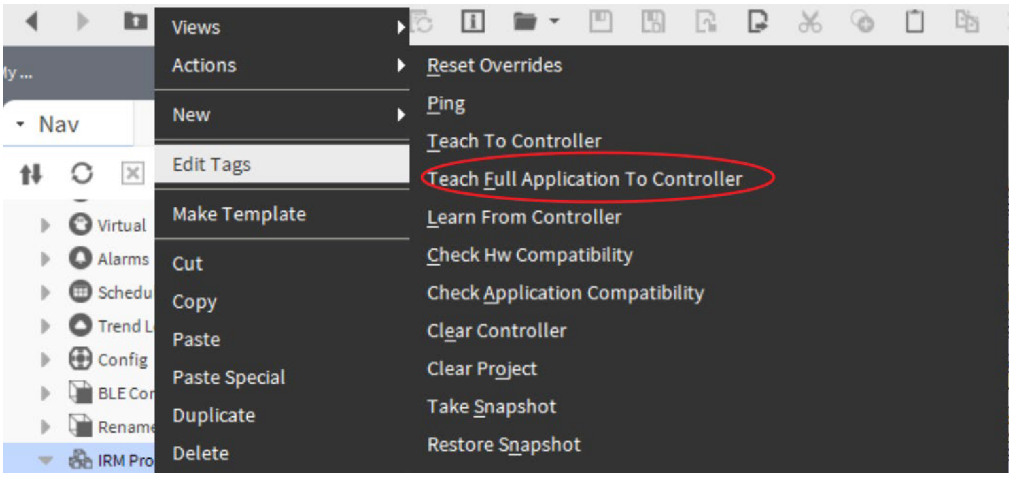
Step 2. **Drag-Drop** the **TR50 Parameters** linked with the devices into the IRM Periodic Program **wire sheet**.



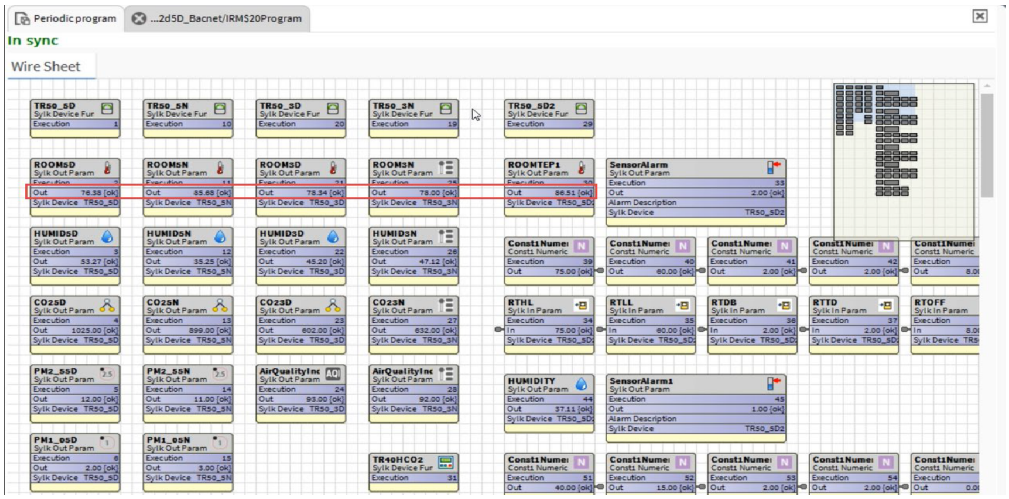
Step 3. Right click **Local Devices < Actions < Commission Sylk devices**.



Note: *The above commission process is done as per the CIPer 30 commission sylk device method. If the commission has to be done via Beats 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

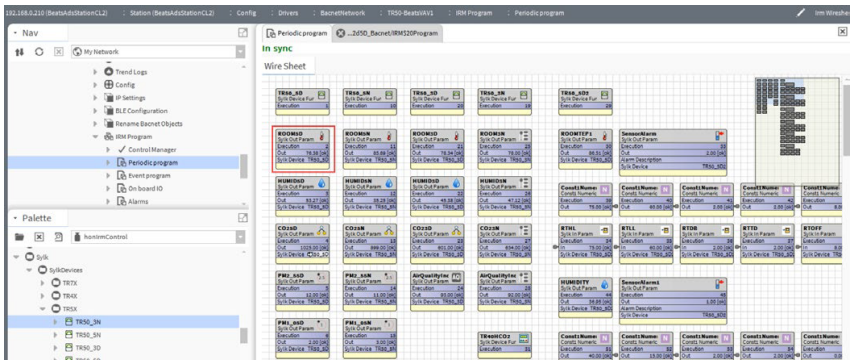
There are two scenarios to do alarming in the controller.

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.

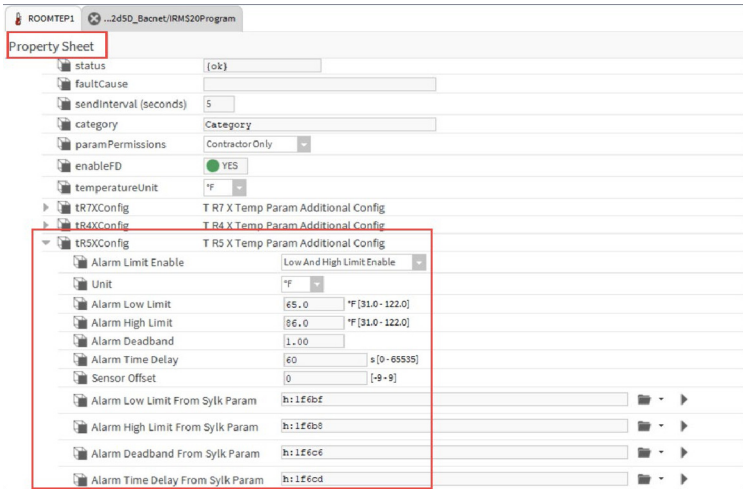
The second scenario will be useful when there is more than one device in a single zone.

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 **tR5xConfig**.



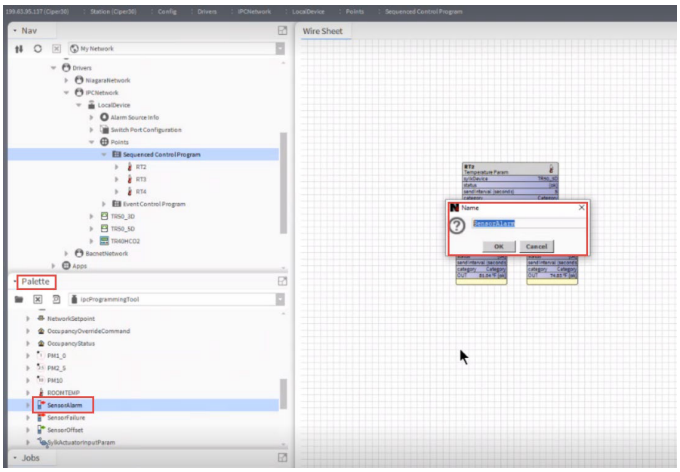
The first property under tR5xConfig is the alarm limits. By default, both low limit and high limits are enabled, and user can configure these limits as a fixed value or dynamic linkable value.

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

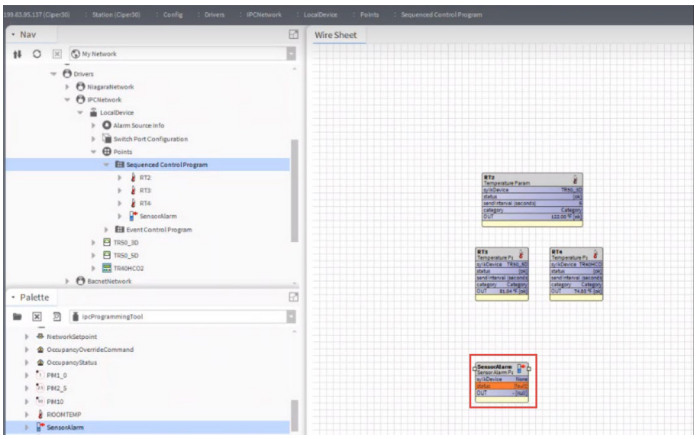
Linkable Values: The controller value will be linked to the linkable Parameter, so that dynamically based on current logical condition the user can change the low limit and high limit values.

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**.



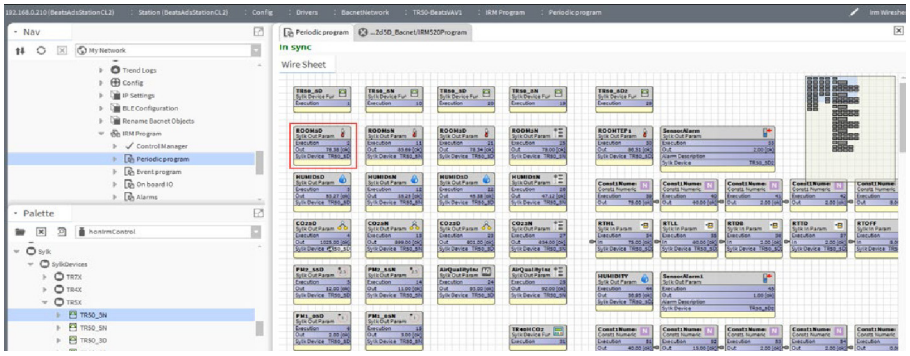
Step 5. Below **Sensor Alarm** Parameter shows the value coming from the TR50 into the controller.



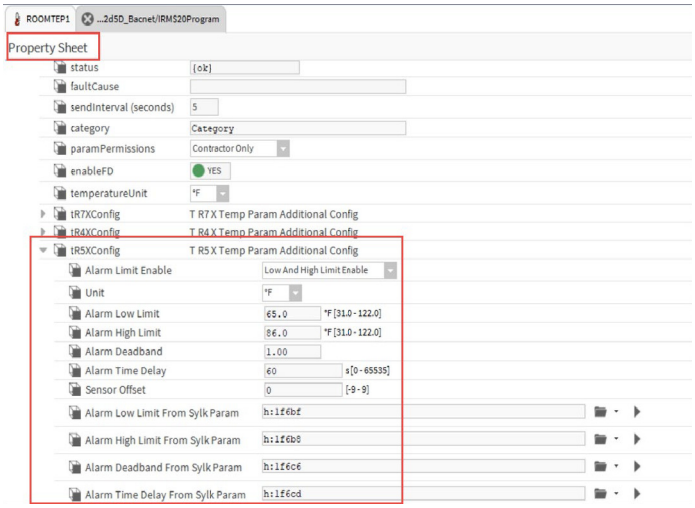
By using the sensor alarm parameter user can know the alarm status in the TR50 device.

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

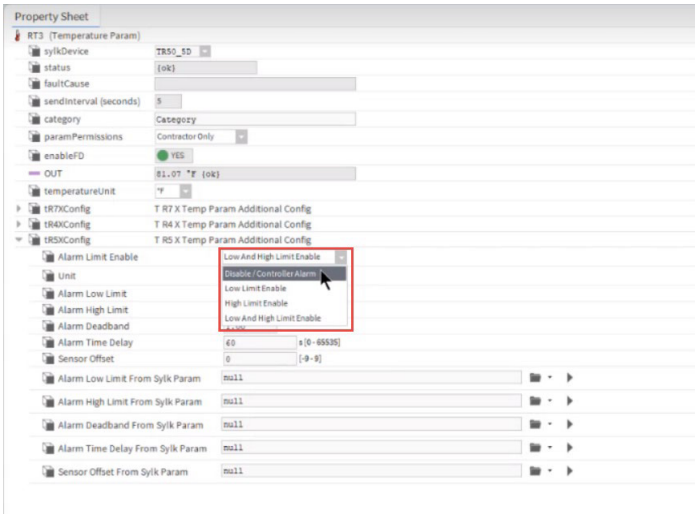
Step 1. Double click on the TR50 **Sensor Parameter**.



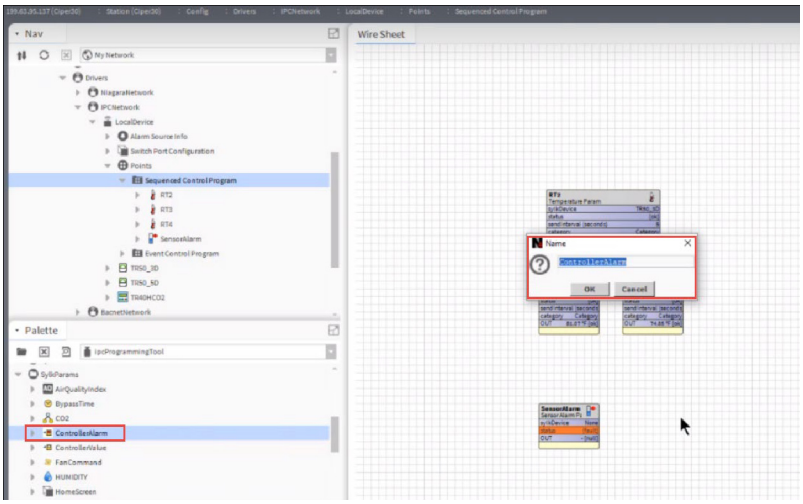
Step 2. On the Property sheet navigate to **Sylk Config Data** and expand **tR5xConfig**.



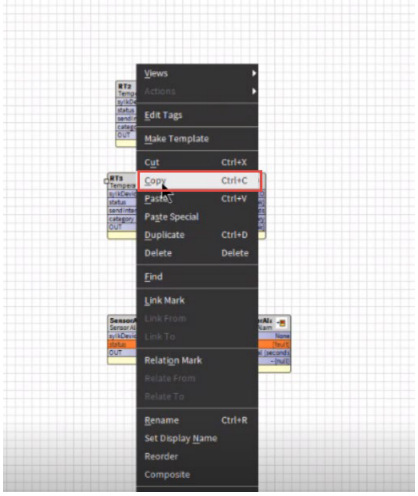
Step 3. Disable the **Alarm Limit** and click **Save**.



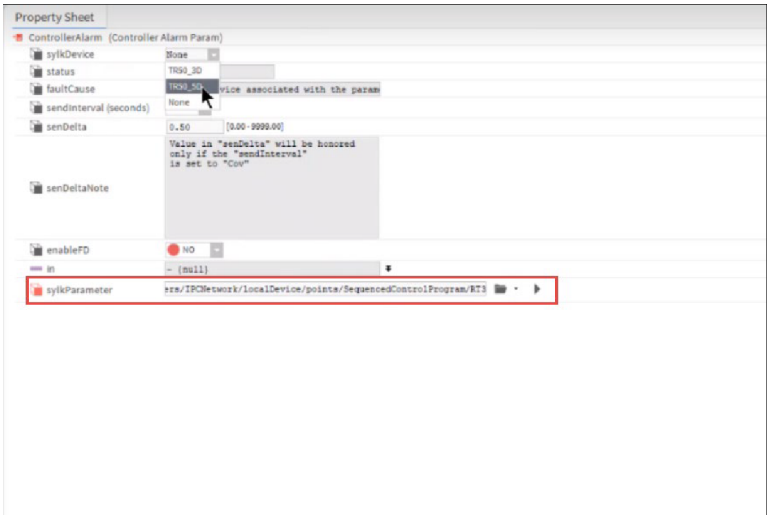
Step 4. Drag-drop the **Controller Alarm** from the **Palette** into the wire sheet and click **OK**.



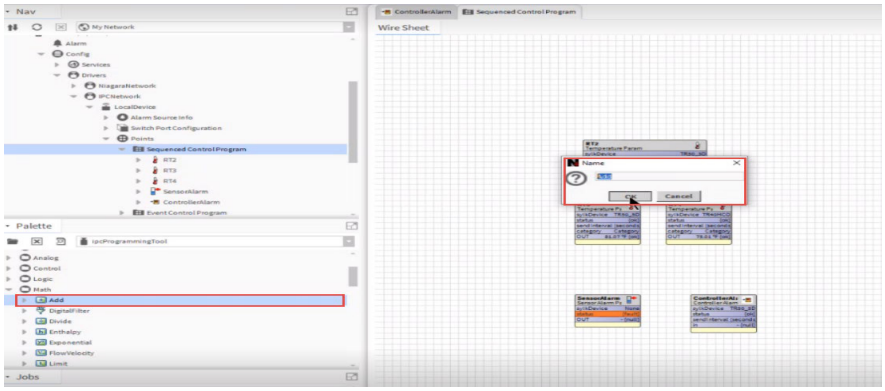
Step 5. Select and copy the TR50 **Sensor Parameter** link.



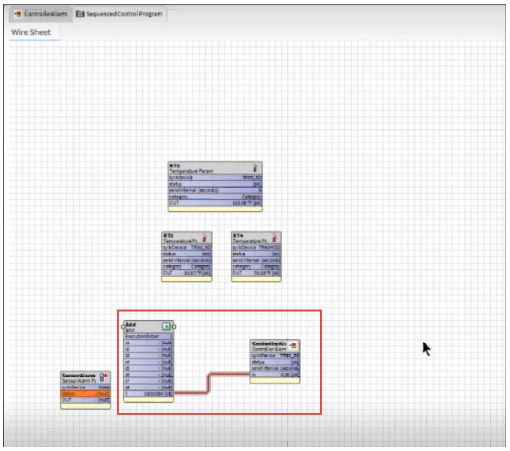
Step 6. Double click the **Controller Alarm** and paste the link under **Sylk Parameter**.



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.

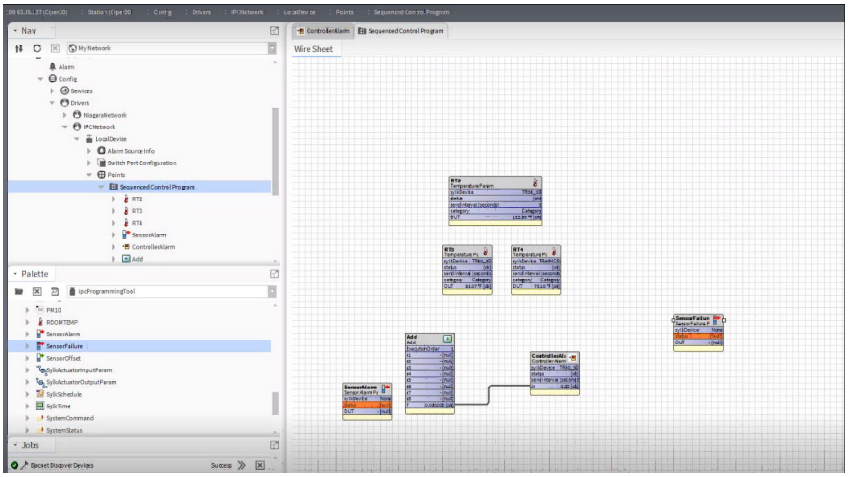
4.6.1.3 Sensor Failure

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

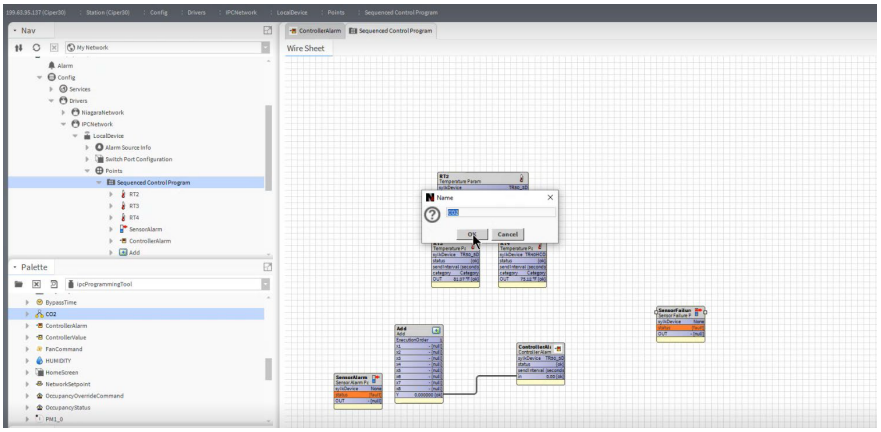
Add a sensor failure and link the respective parameter which user want to monitor for the sensor failure.

Follow the below steps to do linkage and monitor sensor failure:

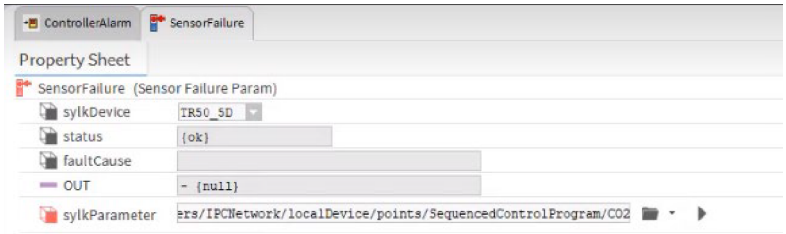
Step 1. From the **Palette**, Drag and drop the **Sensor Failure** into the wire sheet.



Step 2. From the **Palette**, add a **CO_2 Parameter** and click **OK**.



Step 3. Copy the CO_2 parameter property and paste in the Sylk parameter under sensor failure, click **Save**.



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

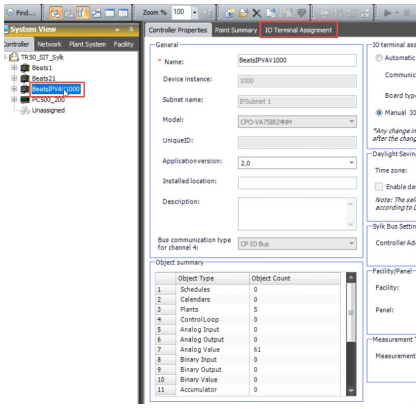
When there is a physical failure in the CO_2 sensor, this sensor failure functional block will report the state in the application.

4.6.2 Configure the TR50 Sylk device via CPO

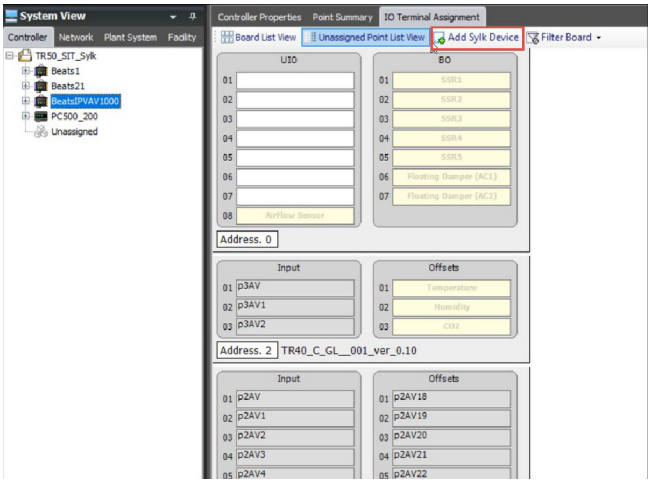
Steps to configure the TR50 Sylk device in CPO studio:

Step 1. Connect the controller to the workstation and open CPO Studio.

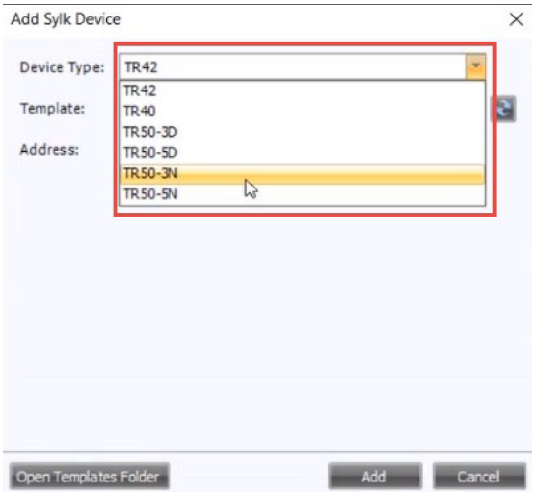
Step 2. Create the project and select **Terminal Assignment**.



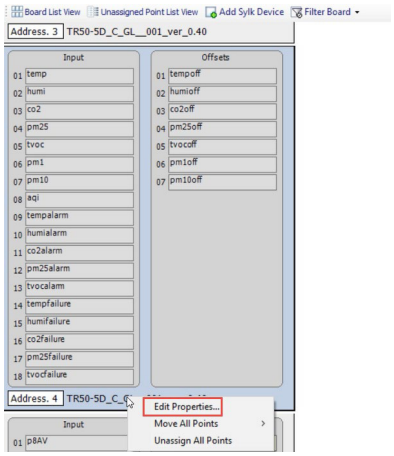
Step 3. Under Terminal Assignment, click **Add Sylk Device**.



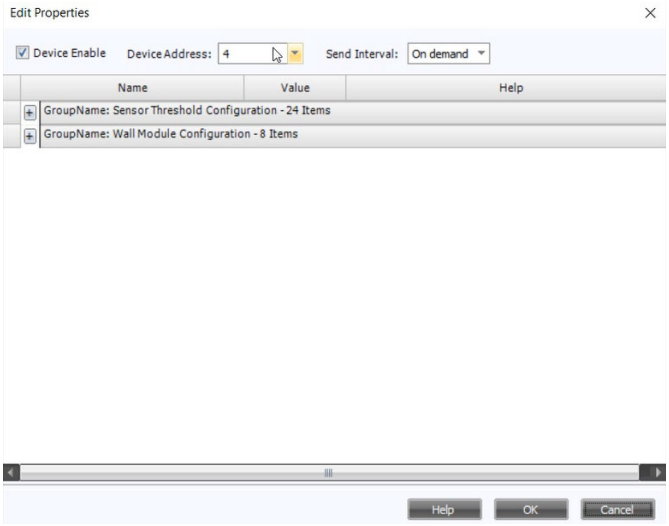
Step 4. Select the required SKUs from the drop-down list and click **Add**.



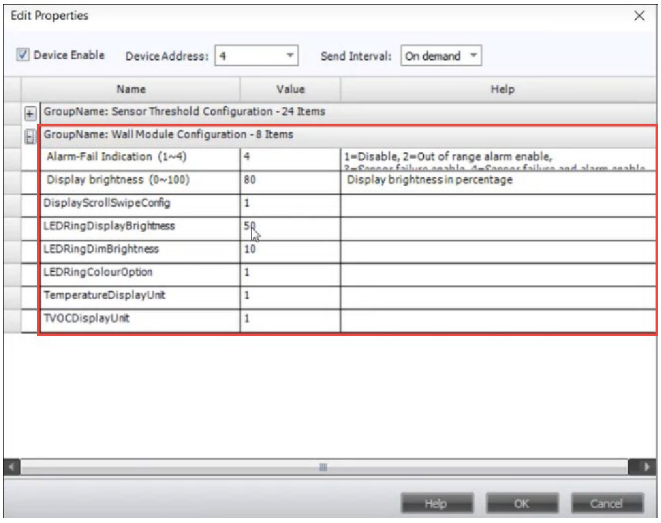
Step 5. Select the template and right click to **Edit Properties**.



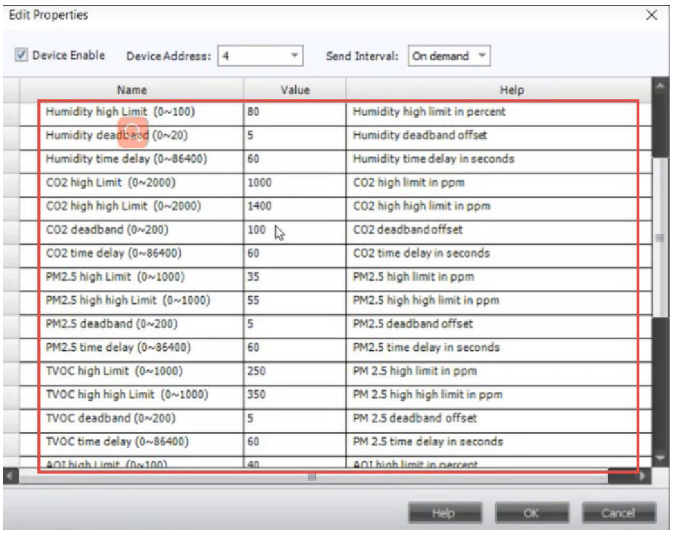
Step 6. Under Edit Properties, user can configure **Sensor Threshold Configuration** and **Wall Module Configuration**.



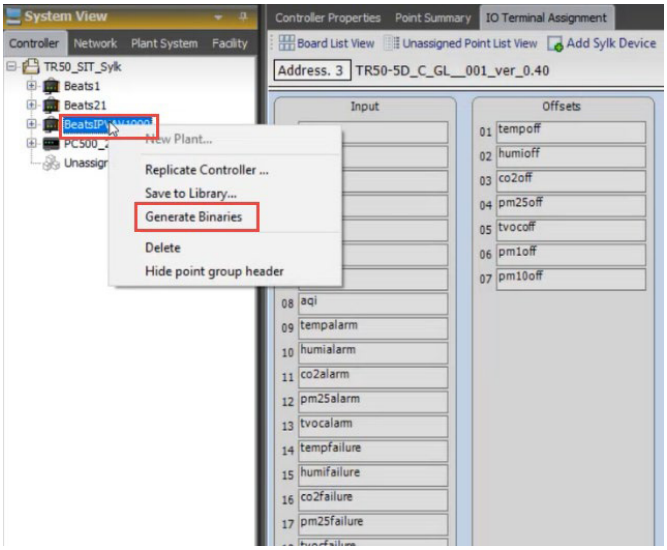
Wall Module configuration is about the LED and display parameters as shown below.



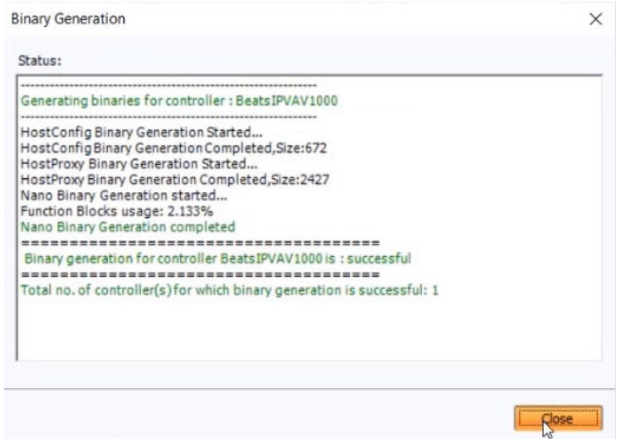
Sensor Threshold Configuration is about sensors alarming related parameters.



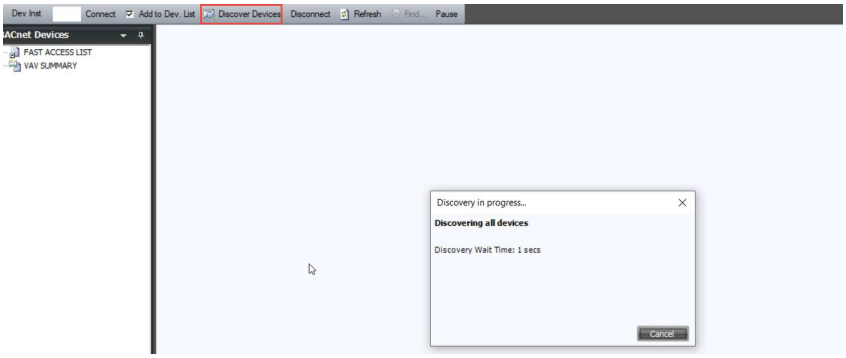
Step 7. Once the configuration is done, Right click on the controller and select **Generate Binaries**.



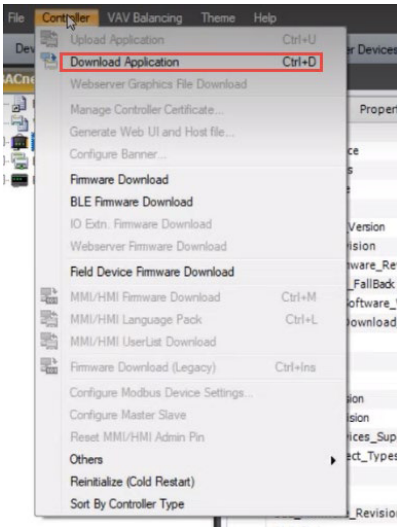
Step 8. Close the tab once the Generate Binaries is successful.



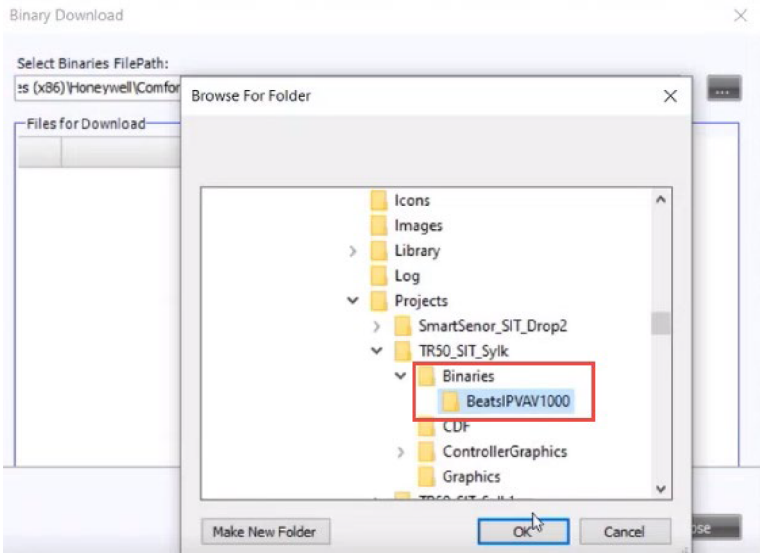
Step 9. Open the CPO online tool and discover the controller.



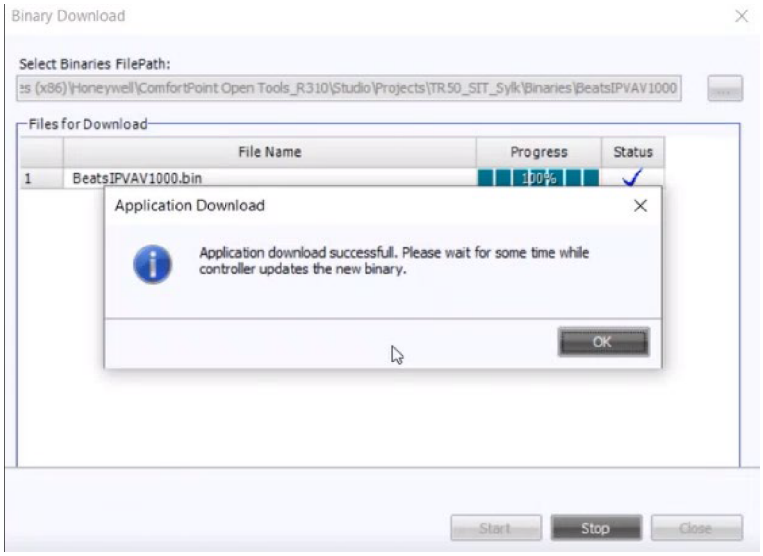
Step 10. Once the controller is discovered select the controller and download the binaries.



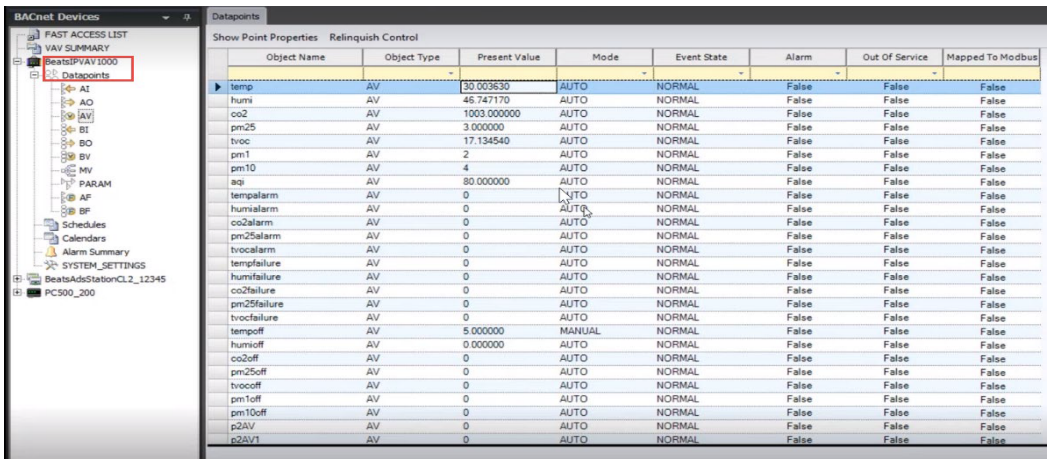
Step 11. From the local folder select the **controller binaries** and click **OK**.



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.



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
CIPer 30	WEB-C3036EPVBNH	Y	N	
BEATS Optimizer IP VAV	WEB-VA75I24NM	Y	Y	
BEATS Optimizer MSTP VAV	WEB-VA75M24NM	Y	Y	
BEATS Optimizer IP Unitary (FCU)	RL1644ES24NM	Y	Y	
BEATS Optimizer MSTP Unitary (FCU)	RL1644MS24NM	Y	N	
BEATS Compact VAV	CPO-VA423B24N	Y	N	
CPO Plant Controller	CPO-PC500	-	-	it doesn't have Sylk interface
CPO Plant Controller	CPO PC400	-	-	it doesn't have Sylk interface
Alerton ACM	ACM	-	-	it doesn't have Sylk interface
Trend IQ4E	IQ4E-2040u531000	N	N	
Trend IQ4NC	IQ4NC-1040U5010	-	-	it doesn't have Sylk interface
Saia PCD1	PCD1.M2220-C15	N	N	

CHAPTER

5 OPERATIONS

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. IAQ Sensor TR50 device helps to view and manage the parameter readings through LED ring. This LED ring is available in both with display and without display modes. Refer 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 long if 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.

So only after this stabilization and baseline time the TVOC reading is effective.

5.3 PM 1 and PM 10 Sensor Reading

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

5.4 Temperature Unit Change

Temperature units from ^{O}F to ^{O}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 device.
2. Wait for 5 seconds, LED halo ring indicate Air quality level.
3. Hold whole button area for 10 seconds by your 3 or more fingers.
4. LED ring will blink quickly with the cycle of Green-Red-Green-Red-Green-Red-...
5. Remove your finger 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 run "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

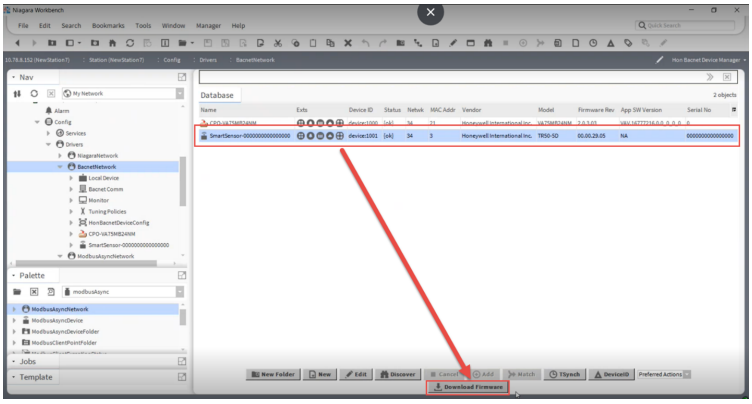
5.6.1 Firmware download of TR50 (Plant controller)

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

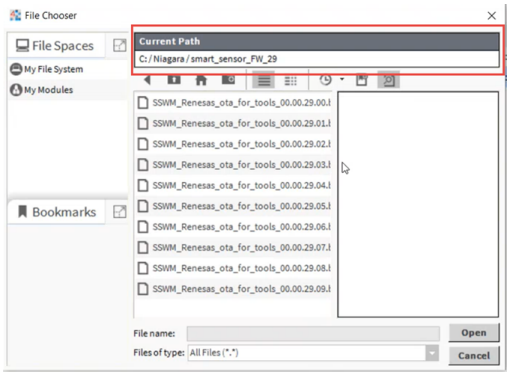
Follow the below steps to download the TR50 firmware on a plant controller connected to the Bacnet network:

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

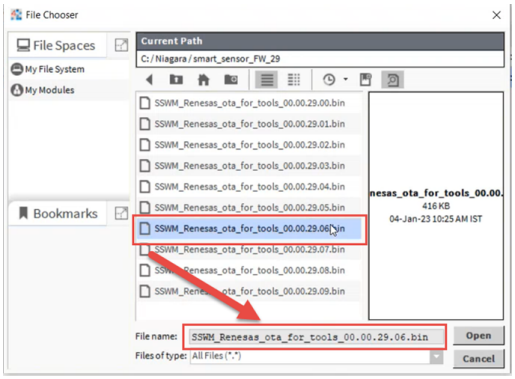
Step 2. Select the smart sensor device from the database and click Download Firmware.



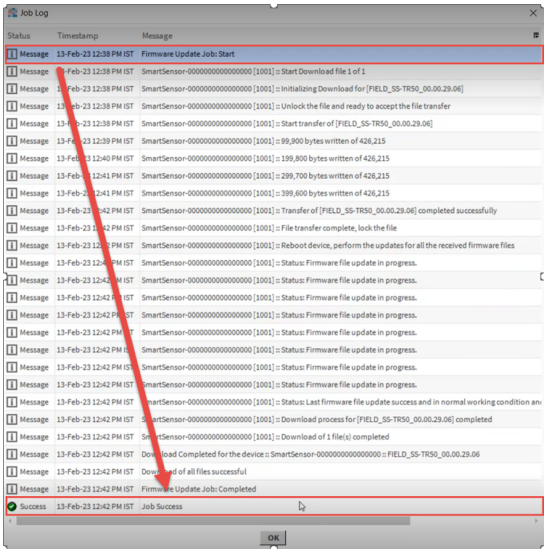
Step 3. Select the latest firmware files from the local folder.



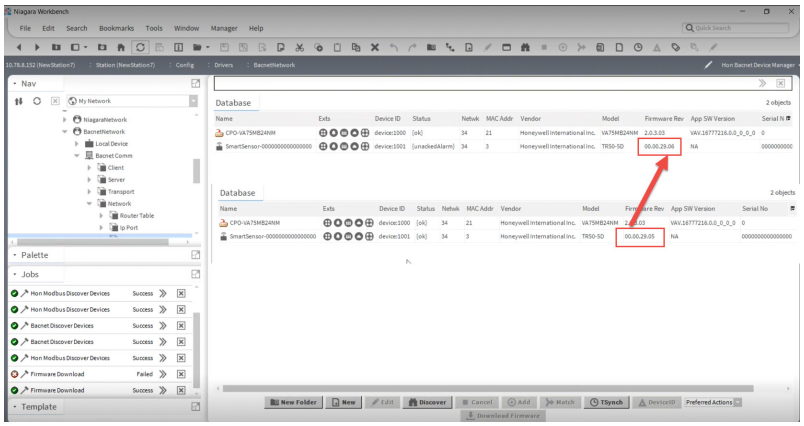
Step 4. Select the latest firmware version and click open.



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



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

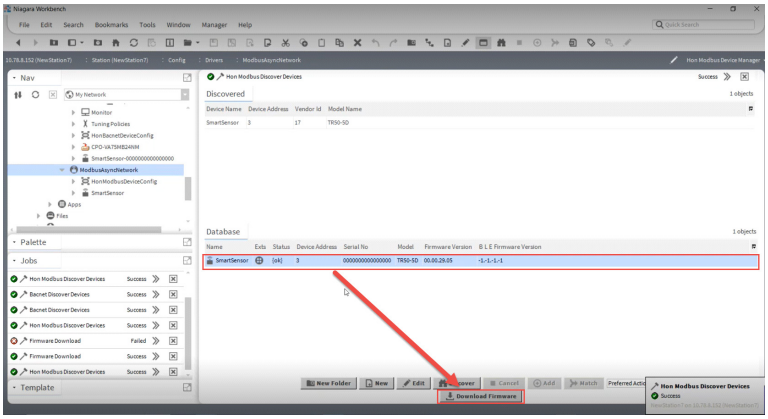


Note: *In TR50, the firmware download works for peripheral and BLE downloads.*

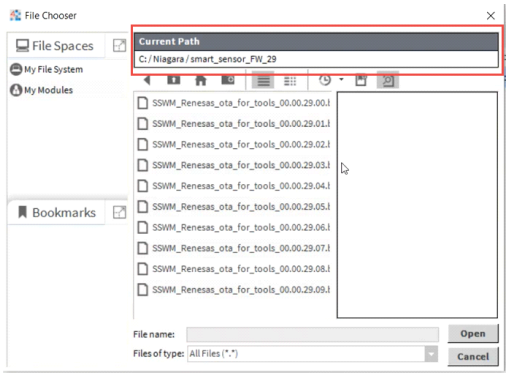
Follow the below steps to download the TR50 firmware on a plant controller connected to the Modbus network:

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

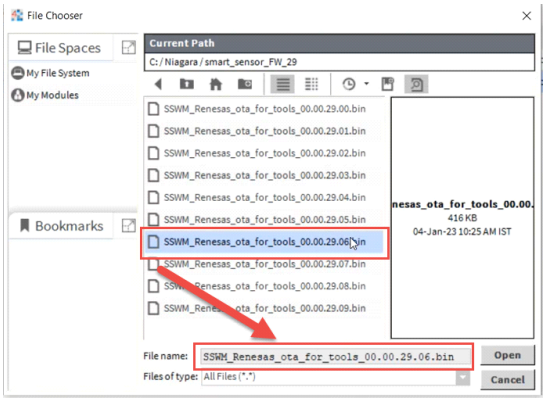
Step 2. Select the smart sensor device from the database and click Download Firmware.



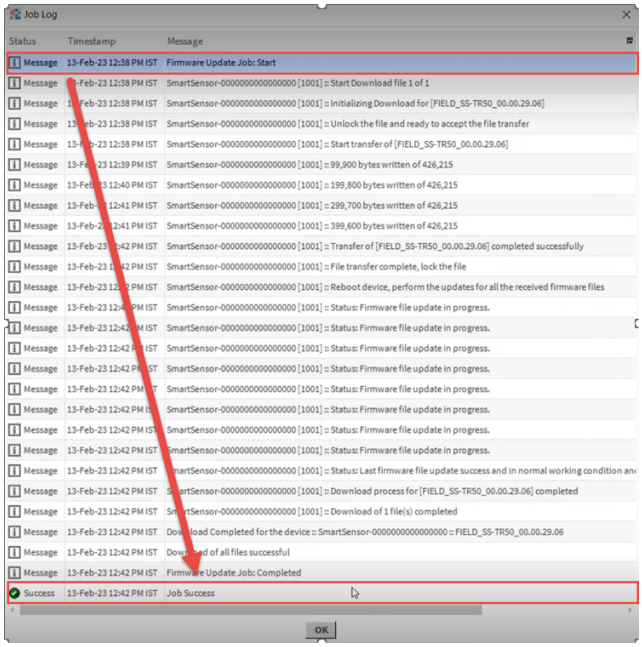
Step 3. Select the latest firmware files from the local folder.



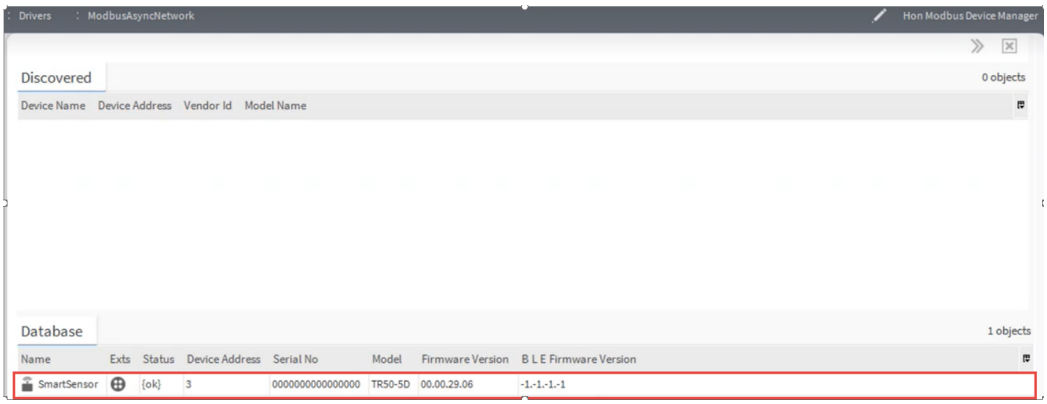
Step 4. Select the latest firmware version and click open.



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



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



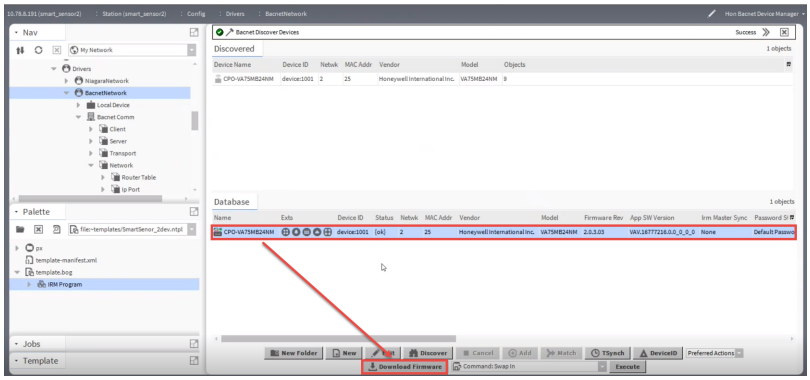
5.6.2 Firmware Download of TR50 (Unitary controller)

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

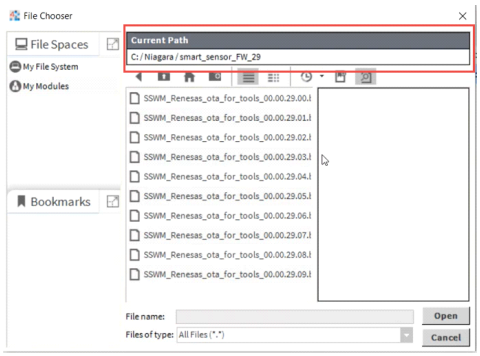
Follow the below steps to download the TR50 firmware on a unitary controller connected to the Bacnet network:

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

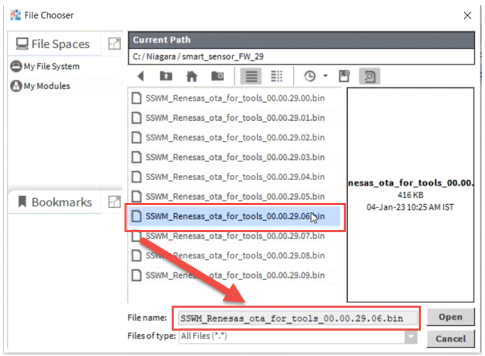
Step 2. Select the unitary controller from the database and click Download Firmware.



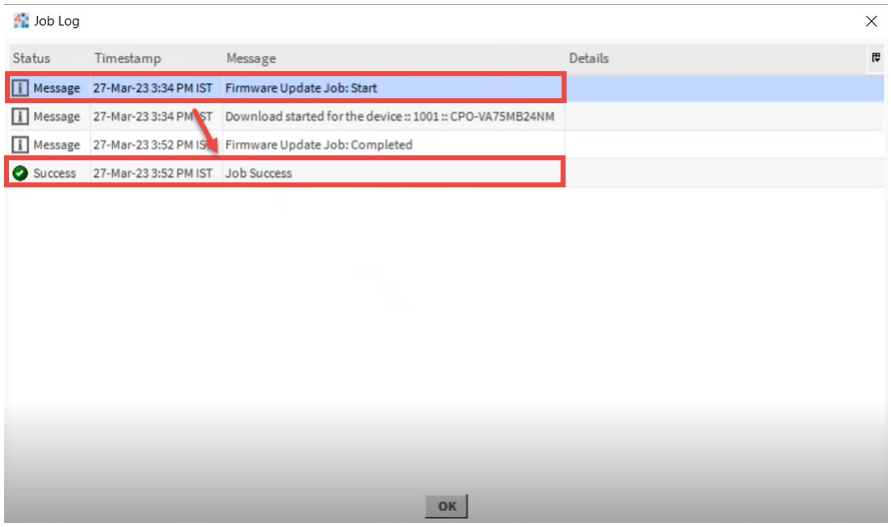
Step 3. Select the latest firmware files from the local folder.



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



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

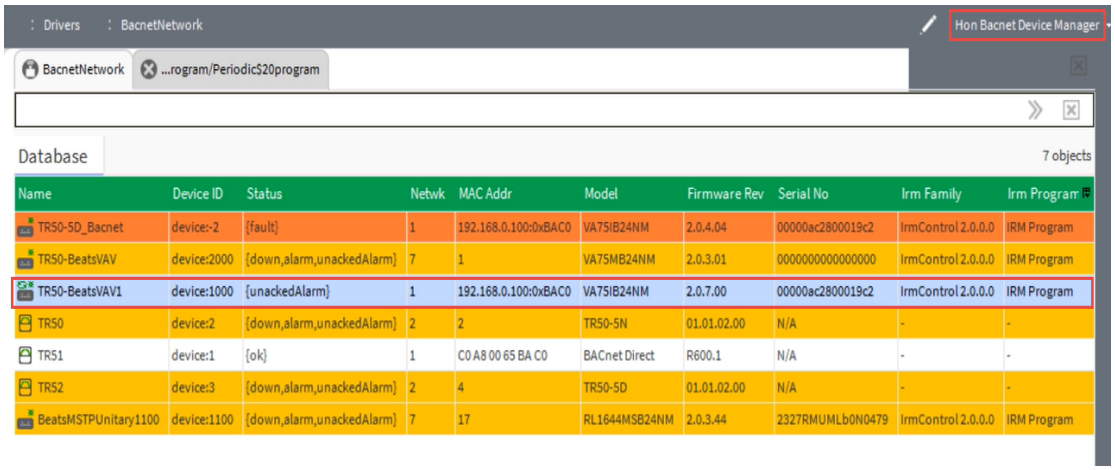


Step 6. Check the periodic program available under the IRM program to verify the latest firmware version.

5.6.3 Firmware Download of Sylk via Niagara

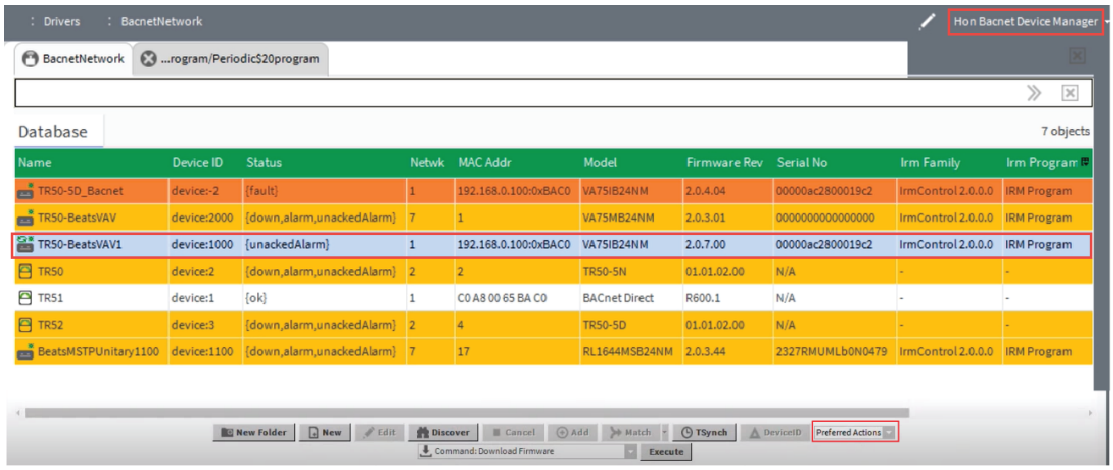
Follow the below steps to download the TR50 firmware on a unitary controller connected to the Sylk network:

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



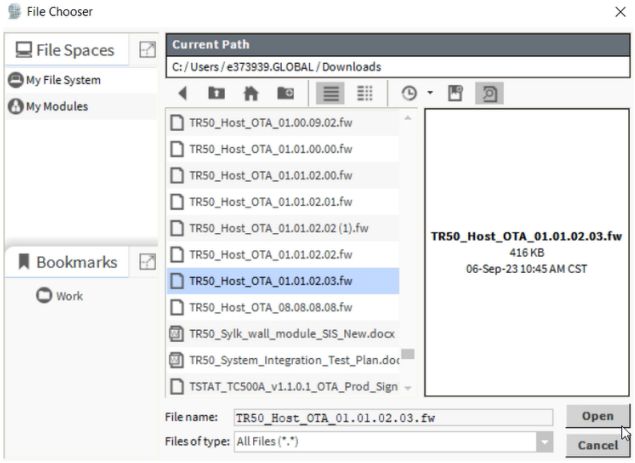
Name	Device ID	Status	Netwk	MAC Addr	Model	Firmware Rev	Serial No	Irm Family	Irm Program
TR50-5D_Bacnet	device:-2	{fault}	1	192.168.0.100:0xBAC0	VA75IB24NM	2.0.4.04	00000ac2800019c2	IrmControl 2.0.0.0	IRM Program
TR50-BeatsVAV	device:2000	{down,alarm,unackedAlarm}	7	1	VA75MB24NM	2.0.3.01	0000000000000000	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 **HonProgram view**, from the Preferred actions drop-down list select **Download Firmware** button.



Name	Device ID	Status	Netwk	MAC Addr	Model	Firmware Rev	Serial No	Irm Family	Irm Program
TR50-5D_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 3. Choose the TR50 firmware files from the folder and click **Open**.



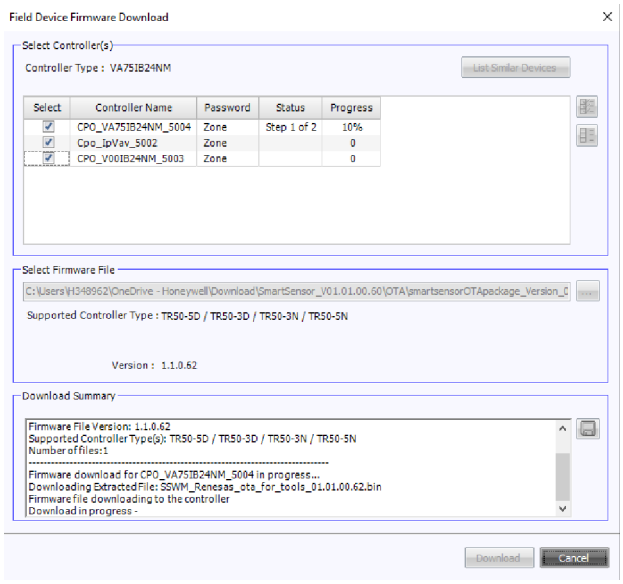
Step 4. The firmware download process will start and the firmware will be downloaded after few minutes.

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**.

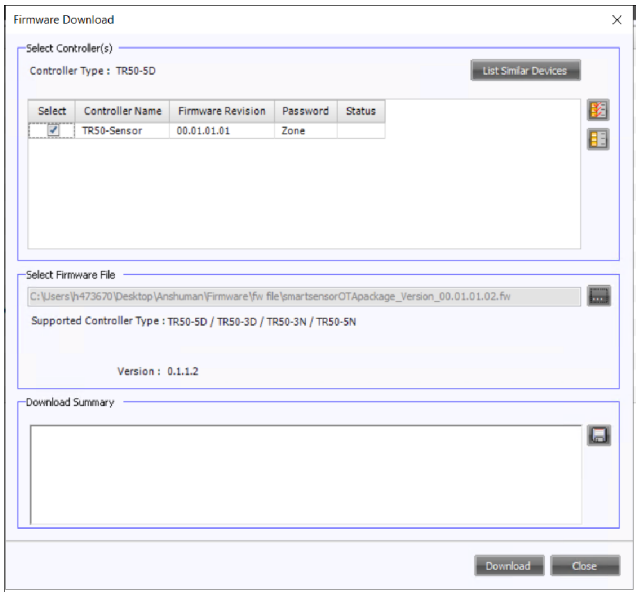
The **Download Summary** box displays the download activities. If the download is completed for all devices, then the Firmware Download Result message appears at the end. You can cancel the download while the downloading is in progress by clicking the Cancel button.

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**.

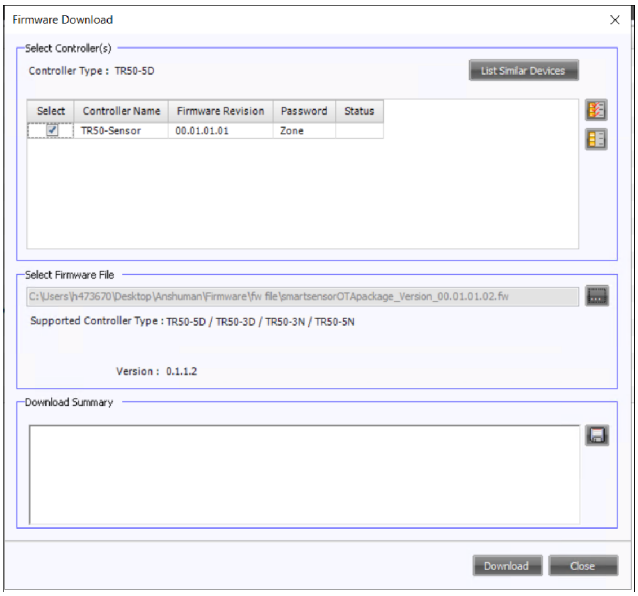
The **Download Summary** box displays the download activities. If the download is completed, then the Firmware Download Successful message appears at the end. You can cancel the download while the downloading is in progress by clicking the Cancel button.

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.

CHAPTER

6 CORRECTION AND CALIBRATION

This chapter provide 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, than 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, than 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, than 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, than 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, than 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, than 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 > 400ppm

6.2 Temperature and Humidity Standard

The manufacturer already calibrates the temperature and Humidity sensor; it doesn't need re-calibration in its life year.

TR50 offers manual temperature and humidity sensor correction options. After the TR50 device is powered on for more than 60 mintues, 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 CO_2 Calibration Standard

The manufacturer already calibrates the CO_2 sensor. The CO_2 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 CO_2 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 CO_2 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 CO_2 concentration of 400 ppm at least once per week.

TR50 offers manual CO_2 sensor correction options. After the TR50 device is powered on for more than 30 mintues, record the CO_2 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 mintues, 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 doesn't need re-calibration in its life year.

TR50 offers manual PM sensor correction options. After the TR50 device is powered on for more than 30 mintues, 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.

CHAPTER

7 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 CO_2 sensor has a self-calibration function inside. Usually, the self-calibration will return CO_2 values to normal. **Self-calibration conditions:** The CO_2 concentration is around 400 ppm for at least 4 hours every 24 periods. The self-calibration environment should last for one week.
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.

Fault Condition	Troubleshooting
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^{TM} 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^{TM} 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

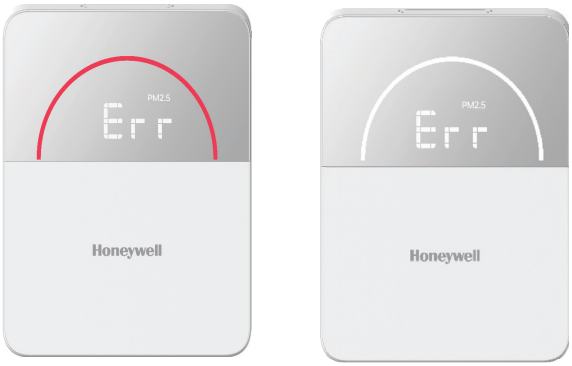
7.3.1 Error Code With Display

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.



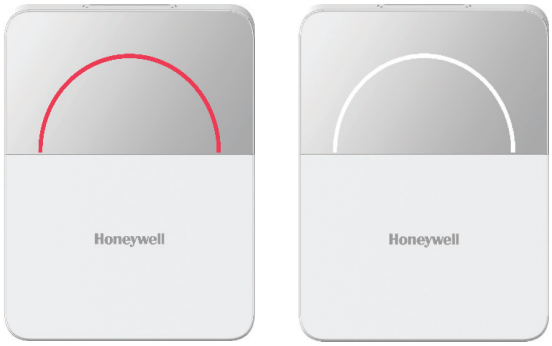
7.3.2 Error Code Without Display

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).



CHAPTER

8 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

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

Honeywell Building Technologies

715 Peachtree Street NE

Atlanta, GA 30308

building.honeywell.com

31-00567M-01
11/23