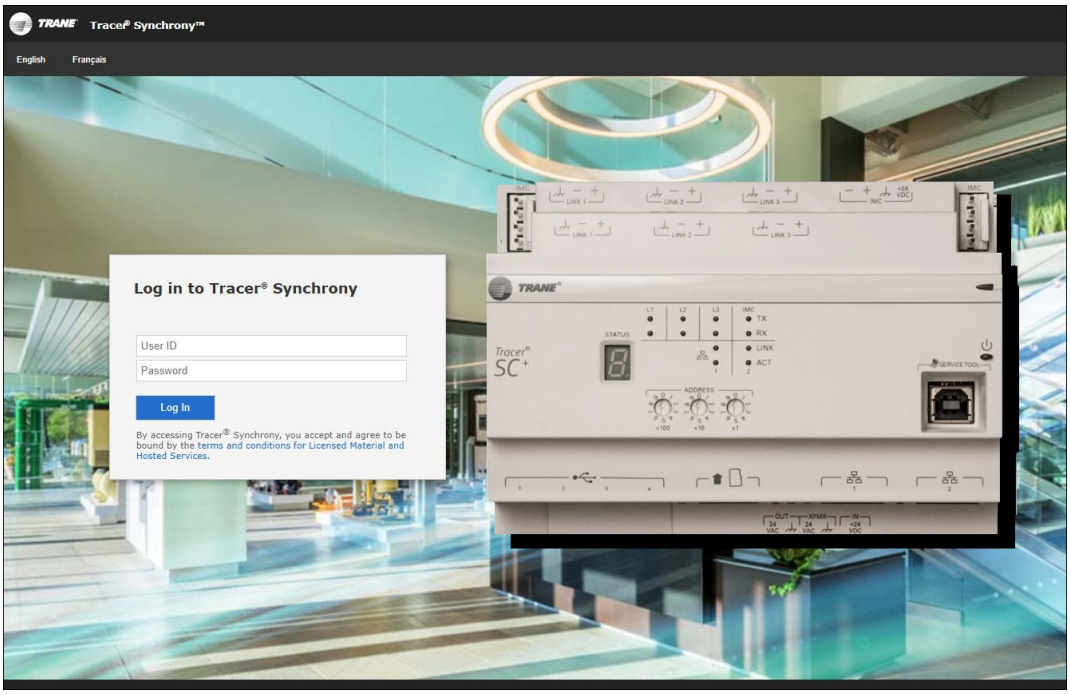
Installation, Operation, and Maintenance

Tracer® SC+ System Controller

with the Tracer® Synchrony User Interface



⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

October 2025

BAS-SVX077T-EN

TRANE TECHNOLOGIES

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury.

Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

⚠ WARNING

Follow EHS Policies!

Failure to follow instructions below could result in death or serious injury.

- **All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Trane personnel should always follow local regulations.**

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Trademarks

Factory Training

Factory training is available through Trane University™ to help you learn more about the operation and maintenance of your equipment. To learn about available training opportunities, contact Trane University™.

Online: www.trane.com/traneuniversity

Email: traneuniversity@trane.com

Revision History

Updates to user interface screens throughout the document.

Table of Contents

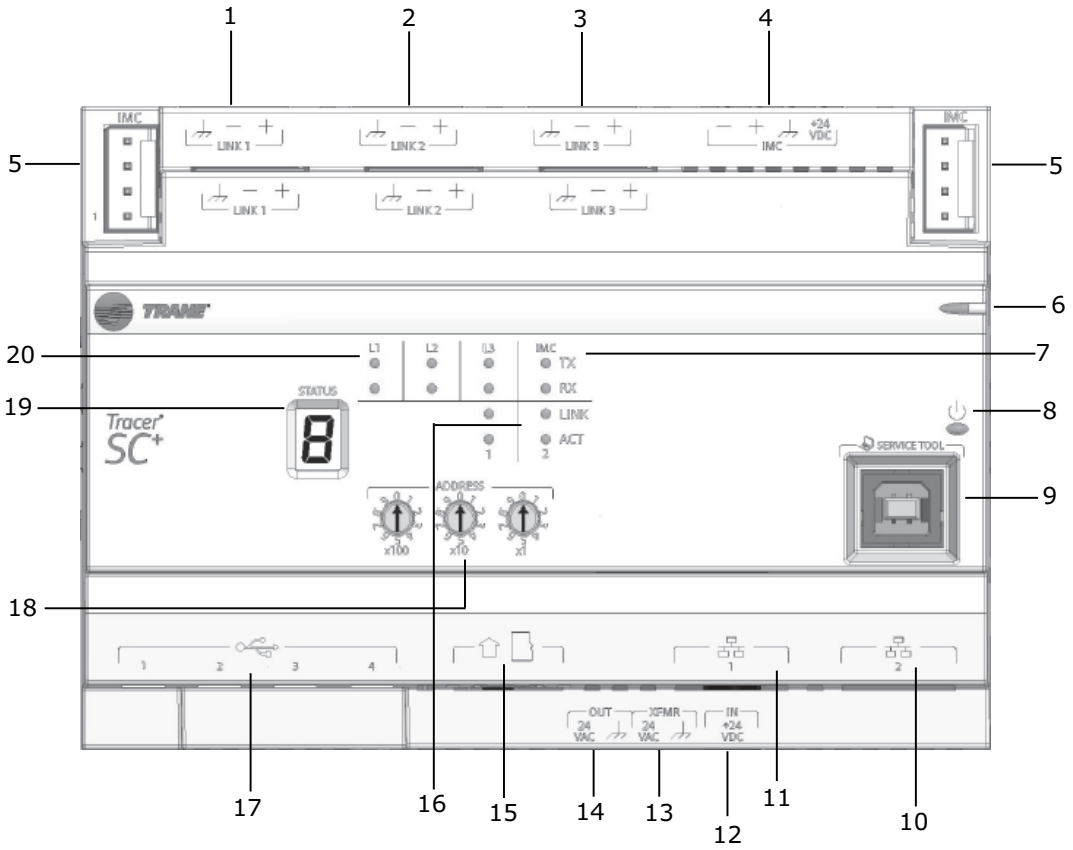
Overview

The Tracer® SC+ system controller combined with the Tracer® Synchrony™ user-interface, serves as the central coordinator for all individual equipment devices on a Tracer building automation system. Tracer Synchrony provides an easy and convenient way for building operators to access their building automation system. Access is available from any personal computer or mobile device, including remote locations.

Tracer® SC+ Components

The Tracer SC+ system controller is equipped with the components shown in the following figure. The table that follows provides descriptions.

Figure 1. Tracer SC+ components



Callout Number in Figure	Tracer® SC+ Components Description
1	Communication Link 1: RS-485 port configurable for BACnet MS/TP or Modbus RTU
2	Communication Link 2: RS-485 port configurable for BACnet MS/TP or Modbus RTU
3	Communication Link 3: RS-485 port configurable for BACnet MS/TP or Modbus RTU
4	4–pin IMC terminal block port
5	IMC pin connection
6	Status LED
7	IMC LEDs
8	Power button
9	USB service tool port

Callout Number in Figure	Tracer® SC+ Components Description
10	Ethernet network connection 2: supports TCP/IP, BACnet/IP, BACnet/SC and Modbus TCP communication
11	Ethernet network connection 1: supports TCP/IP, BACnet/IP, BACnet/SC and Modbus TCP communication
12	24 Vdc power adapter port: supports external 24Vac/dc power adapter
13	24 Vac input
14	24 Vac output
15	Micro SD card slot: support for backups (up to 10 backup files, FIFO)
16	Ethernet LEDs
17	USB 2.0 ports: support for Tracer USB LonTalk® module, WiFi, Isolated Comm 3 (CM3I), and USB mass storage, USB Cellular Module
18	Rotary switches
19	7–segment display
20	RS-485 communication link LEDs

Tracer® SC+ Accessories

Table 1. Hardware and bundles

Description	Order number	Global Part	Installation Literature
Tracer SC+ Hardware	X13651695001	KIT18461	X39641320001

Table 2. Accessories

Description	Order number	Global Part	Installation Literature
PM014 power supply	X13651538010	MOD01702	BAS-SVX33*-EN
Plugin power supply	X13770352001	PLU1323	N/A
Tracer USB LonTalk module	X13651698001	KIT18458	X39641325001
Trane BACnet Terminator (TBT)	X1365152401	MOD01786	N/A
Trane Wi-Fi module	X13651743001	MOD03121	BAS-SVN042*-EN
Micro SD card	X13690281001	KIT18459	N/A
BR2032 lithium Battery	N/A	N/A	N/A
Trane USB Cellular Module	BMCL100US0100000	N/A	BAS-SVN213*-EN
Tracer Communication Module CM3I	X13651812001	50 mA	BAS-SVN236*-EN

Table 3. Enclosures

Description	Order number	Global Part	Installation Literature
Medium Enclosure (120 Vac, 1 outlet)	X13651559010	N/A	X3964118001
Medium Enclosure (120 Vac, 3 outlet)	X13651699001	N/A	X3964118001
Medium Enclosure (230 Vac, 0 outlet)	X13651560010	N/A	X3964118001

Table 4. Software licenses

Description	Order number	Global Part	Installation Literature
15 DEV core APP License	BMCF000AAA0DB00	N/A	N/A
CPC APP License	BMCF000AAA0BH00	N/A	N/A
240 DEV demo License	BMCF000AAA0DA00	N/A	N/A

Table 4. Software licenses (continued)

Description	Order number	Global Part	Installation Literature
1 YEAR SMP	BMCF000AAA0EA00	N/A	N/A
3 YEAR SMP	BMCF000AAA0EB00	N/A	N/A
5 YEAR SMP	BMCF000AAA0EC00	N/A	N/A
Expired SMP	BMCF000AAA0ED00	N/A	N/A
Tracer® SC+ VRF License	BMCF000AAA0BI00	N/A	N/A
API Builder License	BMCF000AAA0BN00	N/A	N/A
Modbus Server License	BMCF000AAA0BT00	N/A	N/A
Demand Management License	BMCF000AAA0BJ00	N/A	N/A
Legacy Comm 3-4 License	BMCF000AAA0BM00	N/A	N/A

Medium/Large Enclosure (Optional)

Table 5. Medium/Large enclosure

Type	Details	Order number
Medium Enclosure, 120 Vac with 1 outlet	Tracer DIN-mounted controller	X13651559010
Medium Enclosure, 120 Vac with 3 outlets	Tracer DIN-mounted controller	X13651699001
Medium Enclosure, 230 Vac with 0 outlet	Tracer DIN-mounted controller	X13651560010
Large Enclosure, 120 Vac	Tracer DIN-mounted controller with solid door	X1365155201
Large Enclosure, 120 Vac	Tracer DIN-mounted controller with display-capable door	X1365155301
Large Enclosure, 230 Vac Dual Transformer	Tracer DIN-mounted controller with solid door	X1365155401
Large Enclosure, 230 Vac Dual Transformer	Tracer DIN-mounted controller with display-capable door	X1365155501

LON Integration

The Tracer® USB LonTalk® module provides a USB2.0 to LonTalk/IP-FT or LON-FT interface for the Tracer SC+ system controller. Up to two Tracer USB LonTalk module (order number: X13651698001) are supported. Plug the USB cable from the module into any one of the four ports on Tracer SC+. Tracer SC+ will make the adapters available for use with no setup required. A maximum of 120 LON devices can be installed per adapter. LON services Identify and Wink are available through the Tracer Synchrony user interface during the discovery/installation process or from the LonTalk tab of Unit Controllers on the Devices page.

Optional BR2032 Battery

The following procedure describes how to install or replace A BR2032 (coin cell) type battery into the Tracer® SC+ controller. This is the recommended compatible battery.

NOTICE

Risk of Battery Exploding!

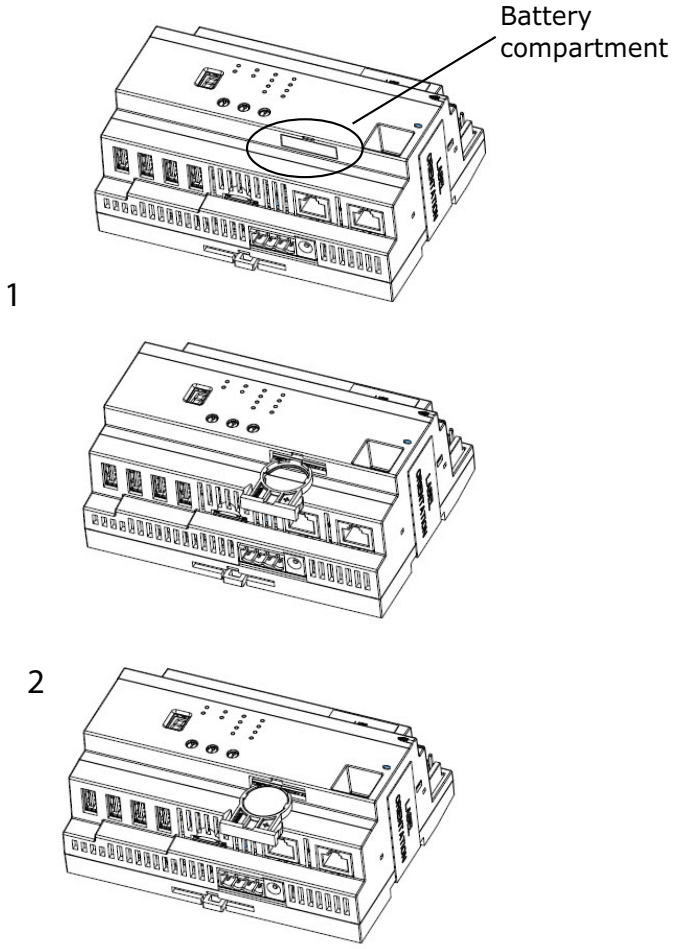
Failure to follow instructions below could cause the battery to explode resulting in equipment damage.
Do NOT use a non compatible battery with the controller! It is critical that a compatible battery be used.

To install the BR2032 battery:

Note: *To maintain the current date and time in the controller,* ***do not*** *power down the device when installing the battery. If not possible, power up the device as soon as possible after installation.*

1. Using a flathead screwdriver, pry open the battery compartment on the front of the controller. You may feel some resistance as it is fairly tight.
2. Insert a BR2032 battery in the battery compartment. Securely (but gently) close the battery compartment.

Figure 2. Installing the battery into Tracer SC+



Tracer® SC+ Power Supply

The Tracer SC+ controller can be powered in one of the following three ways.

- 24 Vac at 30 VA Class 2 Transformer with 4–position terminal block.
  - Output: 600 mA at 24 Vdc at 50°C
- Tracer Plugin power supply with single barrel connector.
  - Output: 0.75 A maximum at 24 Vdc at 50°C. Polarity: outer ground, inner 24 Vdc
- PM014 power supply module through inter-module-communication bus (IMC).
  - Output: 1.4 A maximum at 24 Vdc at 70°C. Refer to the *Power Supply Module PM014, Installation, Operation, and Maintenance* (BAS-SVX33*-EN).

Direct Current Requirements for SC+ and Peripherals

The Tracer SC+ output is 24 Vdc.Table 6, p. 16 provides the current draw per component for DC power budgeting.

Table 6. 24 Vdc current draw per component on a Tracer SC+ controller

Component	Current Draw
SC+ controller	150 mA
See below "USB Port Power Requirements," p. 16	See below "USB Port Power Requirements," p. 16
New WCI (see note)	10 mA
XM30	120 mA
XM32	100 mA

Notes:

- *New WCI part numbers: X13790901030 (Field Installed Indoor), X13790941030 (Field Installed Outdoor), X13790902030 (Service Indoor Flush), X13790903030 (Factory Indoor), and X13790904030 (Factory Indoor Flush).*
- *The XM70 and XM90 require 24 Vac. Do not wire the XM70 and XM90 to the SC+ power source.*

Tracer SC+ DC Power Budget

Depending on the power source, Tracer SC+ has a maximum current available for peripheral devices. Perform a power budget if you have more than three external devices connected through the IMC.

- AC Powered
  - The preferred power method is to provide 24 Vac from a transformer. Using the values from Table 6, p. 16, calculate the current draw for all the components connected to the SC+. If the total exceeds 600 mA, use a PM014 module or a plug-in power supply.
- Tracer Plug-in power supply
  - Using the values from Table 6, p. 16, calculate the current draw for all the components connected to the SC+. The total cannot exceed 0.75 A. If the sum exceeds 750 mA, use a PM014 module.
- PM014 powered
  - Using the values from Table 6, p. 16, calculate the power draw for all the components connected to the SC+. The total cannot exceed 1.4 A (1400 mA).

USB Port Power Requirements

The table below states the 5 Vdc and 24 Vdc power available for all four USB Ports. For 5 Vdc, no single port can support a sustained load 500 mA, or 510 mA intermittent. Overloading a port, or ports may cause the USB load switch to shutdown. The USB load switch will shutdown very quickly during a direct short circuit.

Table 7. USB ports current draw

Component	5 Vdc Current Draw	24 Vdc Current Draw
Each USB Port	500 mA Max	125 mA
Trane Wi-Fi Module (X13651743001)	250 mA	63 mA
Trane U60 LON Adapter	110 mA	28 mA
Trane USB Cellular Module (Version, USA)	500 mA	125 mA
Trane Isolated Comm 3 Module CM3I (X13651812001)	50 mA	13 mA

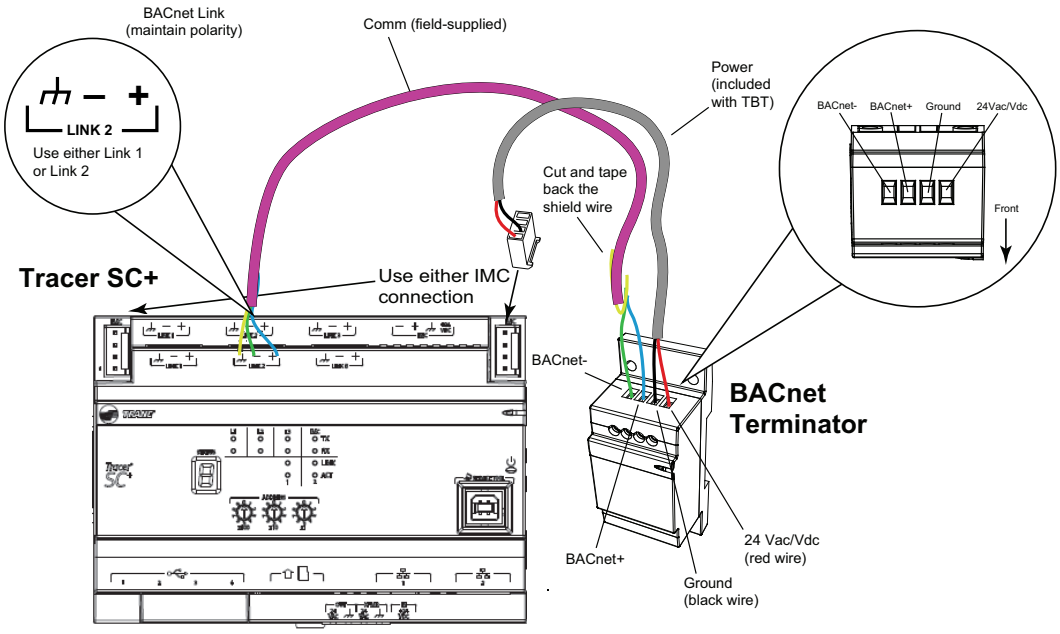
Notes:

- *Total for all 4 ports: 1000 mA at 50°C or colder, 500 mA at 70°C.*
- *USB 5 Vdc power is converted from the SC+ 24 Vdc power. Thus, 24 Vdc Current Draw column should be used in power supply calculations. The PM014 option should be considered if design uses the USB Ports.*

Tracer® BACnet® Terminator

A Tracer BACnet terminator is placed at the end of each communication link in order to decrease communication signal degradation. Refer to the *BACnet® MS/TP Wiring and Link Performance, Installation, Operation, and Maintenance* (BAS-SVX51*-EN).

Figure 3. BACnet terminator (wiring)



Licensing and Hardware

The number of devices that are supported is limited by the number within the application license. The maximum amount is 240 devices in a single license.

To utilize the expanded communications functionality for multi-SC+ facilities, the following are required:

- One Tracer® SC+ with an Application license
- One or more Tracer SC+s with a Base license.

License Type	Intelligent Services Ready	Multi SC+ Ready	BAS App
Application V5.0 +	Up to 240 devices	Yes	Up to 240 devices
Base V5.0 +	Up to 240 devices	Yes	N/A

Licensing

Tracer® SC+ product licenses enable Tracer SC+ applications and determine the number of devices that can be installed onto a Tracer SC+ system. There are four types of licenses available: Tracer SC+ Base license, Tracer SC+ Core license, Tracer SC+ CPC license, Tracer SC+ VRF license, and a Tracer SC+ Demo license.

Tracer® SC+ Base License

This license is applied to every Tracer SC+ ordered at the factory. The Base license includes connectivity for up to 240 devices for TIS and is Multi-SC+ Ready. This license does not enable any of the control applications (VAS, Area, CPC, VRF, TGP2) that are required to control a building.

Tracer® SC+ Core Application License

This license enables the control applications and increases the number of supported devices up to a maximum of 240. A single Tracer SC+ Core license is created by combining multiple, stackable application licenses through the BAS registration site. When installed, the Tracer SC+ Core license will overwrite the Tracer SC+ Base license and will enable the control applications for the number of devices specified in the Tracer SC+ Core license.

Tracer® SC+ CPC License

This license enables the Chiller Plant Control (CPC) application. It adds this capability to the Tracer SC+ Core Application license.

Tracer® SC+ VRF License

This license enables the use of Trane®/Mitsubishi Electric VRF systems in Tracer SC+. It adds this capability to the Tracer SC+ Core Application License. Trane®/Mitsubishi Electric VRF devices are installed via XML/IP protocol. The SC+ counts each VRF device towards the maximum number of devices. The VRF Remote Controller (Smart ME) does not count for a device license when installed with auto-install template.

Tracer® SC+ Demo License

This license provides ALL features for up to 240 devices, but time is limited to five days runtime. A power recycle is required after the five days runtime has been exceeded.

Table 8. Tracer® SC+ licensing overview

Key Licenses	Capability	Notes
Tracer SC+ Base	Support for up to 240 devices.	Does not enable control applications (VAS, Area, CPC, VRF, TGP2).
Tracer SC+ Core Application	Support for up to 240 devices (number of devices specified in the Core Application license).	Enables control applications, overwrites the Base license.
Tracer SC+ CPC	Enables the CPC application.	CPC capability is added to the Core Application license.
Tracer SC+ VRF	Enables communication with Trane®/Mitsubishi Electric VRF devices.	Includes data for Indoor units, Outdoor units, Branch Controllers and Remote Controllers. VRF capability is added to the Core Application license.
Tracer SC+ Demo	Provides all features for up to 240 devices for 5 days runtime.	A power recycle is required after runtime has exceeded 5 days.

You can obtain licenses from: http://www.basregistration.trane.com/Registration/ControlsLicensing.htm. You will need either the Tracer SC+ hardware serial number (see label on Tracer SC+) or the product order number.

To License your Tracer SC+:

1. Browse to the license file from www.basregistration.trane.com.
2. Download the file to the Tracer SC+. The file upload dialog box appears.
3. Click once on the selected file and then click open to move the file path into the Locate File field.
4. Click import license file to complete the licensing process.

Software Maintenance Plans

Tracer® Synchrony requires a Software Maintenance Plan (SMP) in order to upgrade to the latest release. The purchase of a software maintenance plan entitles the owner to software updates for the duration of the agreement. The License Expiration Date can be found on the Product License page. If the current license applied is expired, attempts to upgrade will be rejected.

Tracer® SC+ Facilities

A Tracer SC+ facility is defined as a collection of one or more Tracer SC+ controllers. A single building or campus can contain more than one Tracer SC+ facility.

An Application or App SC+ is a Tracer SC+ controller that has had one or more Application Licenses applied to it. The typical deployment of an App SC+ is for actively controlling a system.

A Base SC+ is a Tracer SC+ controller that has not had an Application License applied to it. The typical deployment of a Base SC+ is for passively monitoring a system (through web UI or Trane Intelligent Services) OR adding capacity to a Multi-Tracer SC + facility.

A Single Tracer SC+ facility has the following characteristic:

- It is either an App SC+ or a Base SC+.

A Multi-Tracer SC+ facility has the following characteristics:

- It can have at most one App SC+.
- It can optionally have one or more Base SC+s.
- It can support a maximum of 240 controllers, although the practical limitation may be lower due to the combination of Tracer SC+ controllers and protocol.

The following table shows the maximum device capability for the communication type and the facility type. However, observe the following when configuring your facility:

- Do not exceed Individual link limitations.
  - BACnet MS/TP 60 per link (App or Base Tracer SC+)
  - Modbus® RTU 30 per link (App SC+ only)
  - LonTalk® 120 per link (App SC+ only)
- Three links can be configured as BACnet MS/TP, COMM 3/4, or Modbus RTU.
- Do not exceed the maximum of 240 total devices per facility.

Note: *In a Multi-Tracer SC+ installation, LonTalk, Modbus TCP, and Modbus RTU controllers must all be installed in the App SC +.*

Table 9. Device capability

Communication Type	Single SC+	Multi SC+
Air-Fi® Wireless	Up to 120 devices	Up to 240 devices
BACnet MS/TP	Up to 180 devices	Up to 240 devices
BACnet/IP	Up to 240 devices	Up to 240 devices
BACnet/SC	Up to 240 devices	Up to 240 devices
COMM 3/4[a]	Up to 240 devices	Up to 240 devices
LonTalk	Up to 240 devices (when using two Tracer USB LonTalk modules)	Up to 240 devices (when using two Tracer USB LonTalk modules)[b]
Modbus TCP	Up to 240 devices	Up to 240 devices[b]
Trane VRF (XML/IP)	Up to 240 devices	Up to 240 devices[b]
Modbus RTU	Up to 90 devices	Up to 90 devices[b]

Note: *See Tracer SC+ System Controller Installation, Operation, and Maintenance guide BAS-SVX077*-EN for point limits.*

[a] Prior to Tracer SC+ v6.0, a BMTB is required for communication to COMM 3/4.
[b] Must be installed on the Application SC+.

Note: *Trane Air-Fi® sensors do not count against the device limits listed above. For more information, see the Air-Fi Wireless System, Installation, Operation, and Maintenance (BAS-SVX40*-EN).*

Figure 4. Example of a single SC+ facility configuration

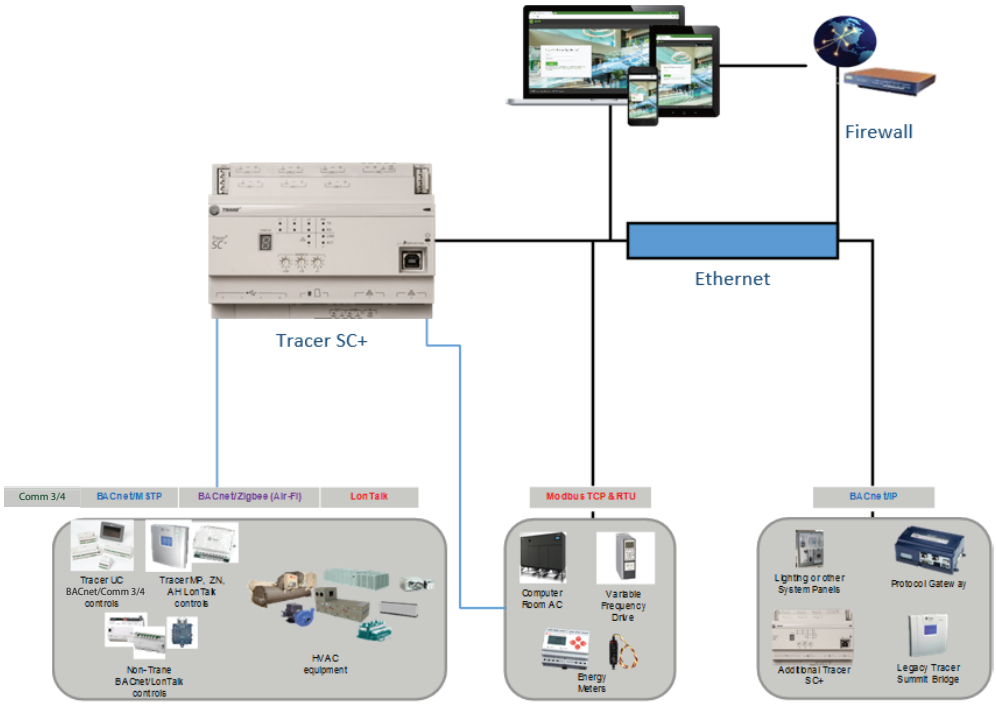


Table 10. Point limits

Point Type[a]	Limit	Point Type[b]	Limit
Analog Input	15000	API	1000
Analog Output	15000	Modbus Client	1000
Analog Value	15000	Modbus Server[c]	10000
Binary Input	15000		
Binary Output	15000		
Binary Value	15000		
Multistate Input	15000		
Multistate Output	15000		
Multistate Value	15000		

(a) Includes SC+ local points, application points, and non-BACnet equipment points.
(b) Count towards Point Type Max Limits.
(c) First 500 points included in Core. 500 points per stackable license.

Setup Requirements

The following are required for setup and normal operation.

Scenario 2: Multi-Tracer® SC+ Facility

Note: *A Multi-Tracer facility can include a combination of Tracer SC+ and Tracer SC controllers.*

- One Tracer SC+ must have an application license in order to install equipment and facilitate control.
- Additional Tracer SC+s do not require a license.
- BACnet IP support on all Ethernet ports (including Wi-Fi client).
- Tracer SC+ Device IDs must be unique.

- BACnet MS/TP port network number should not exceed 4190. If the BACnet network number exceeds 4190, Tracer SC+ will not be able to propose a Device ID for the unit controllers and they will need to be installed with the the Device ID number previously assigned to it.
- Tracer SC+s on separate subnets must have one BACnet Broadcast Management Device (BBMD) per subnet.
- UDP ports must be the same across all SC+s in the facility.

Note: *Both the Tracer Application SC+ and the Tracer Base SC+ must be configured to communicate to each other over BACnet IP. They can reside on the same network subnet or on a separate subnet.*

Scenario 1: Single Tracer SC+ Facility

Note: *A Multi-Tracer facility can include a combination of Tracer SC+ and Tracer SC controllers.*

- Tracer® SC+ must have an application license in order to install equipment and facilitate control.
- BACnet IP support on all Ethernet ports (including Wi-Fi client).
- BACnet MS/TP port network number cannot exceed 4193.

Scenario 2: Multi-Tracer SC+ Facility

Note: *A Multi-Tracer facility can include a combination of Tracer SC+ and Tracer SC controllers.*

- One Tracer SC+ must have an application license in order to install equipment and facilitate control.
- Additional Base Tracer SC+s do not require a license.
- BACnet IP support on all Ethernet ports (including Wi-Fi client).
- Tracer SC+ Device IDs must be unique.
- BACnet MS/TP port network number cannot exceed 4193.
- Tracer SC+s on separate subnets must have one BACnet Broadcast Management Device (BBMD) per subnet.
- UDP ports must be the same across all SC+s in the facility.

Note: *Both the Tracer Application SC+ and the Tracer Base SC+ must be configured to communicate to each other over BACnet IP. They can reside on the same network subnet or on a separate subnet.*

Scenario 3: Trane Intelligent Services

- No additional license required.
- Trane Intelligent Services are enabled in Tracer SC+ by default. To opt out, edit the settings under the Intelligent Services tab on the Identification and Communications page.
- Configure Tracer SC+ Ethernet port 1 or 2 to communicate to the internet.

Software and Service Tools

Specific software and service tools are required for your computer or mobile device, in order to perform all of the functions available with Tracer® Synchrony.

Supported Web Browsers for Tracer® Synchrony

The most recent version of web browsers are tested with each new firmware release and will provide the best user experience. Utilization of other operating systems and browsers may work, but this is not recommended/supported. Operating systems and web browsers should always be maintained and kept up to date.

Microsoft® Windows

- Google Chrome
- Mozilla Firefox
- Microsoft Edge

Apple® Mac OS

- Google Chrome
- Mozilla Firefox
- Safari

Apple® iOS/iPadOS

- Google Chrome
- Mozilla Firefox
- Safari

Android

- Google Chrome
- Mozilla Firefox

Service Tools

Two service tools are required for the support of unit controllers and for additional functions on systems using Tracer® Synchrony:

The Tracer® TU Service Tool

- For configuring BACnet unit controllers.
- For creating TGP2 programs in Tracer® Synchrony.
- For creating, editing, and publishing graphics to the Tracer® Synchrony with Tracer® Graphics Editor.
- As an additional way to backup and restore data to Tracer® Synchrony.
- For downloading Tracer® SC+ software updates.

The Rover™ Service Tool

- For configuring LonTalk® unit controllers.
- For configuring a LonTalk® network using the Rover service tool in active mode (Tracer® Synchrony is not a network manager).
- For creating TGP programs for the Tracer® MP580/581 programmable controller.
- Version 7.3 and higher is required for Tracer® SC+.

Tracer® Synchrony Offsite Programming

Offsite programming is available with Tracer® Synchrony and the Tracer® TU service tool (V10.0 or higher). One or more physical Tracer® SC+s (with an appropriate software license) are required to support this functionality. Refer to the *Offsite Facility Definition Programming Guide*, (BAS-SVP025*-EN), for more information.

Tracer® TU supports Tracer® SC+ hardware capabilities and the following additional communication links:

- Two (2) LonTalk® links that can display up to 240 LonTalk® devices on the Device Navigation Tree in Tracer® TU. LonTalk® devices are identified by Neuron ID.

  Note: *Tracer® SC+ can support up to 240 LonTalk® devices when two (2) USB LON adapters are attached to a Tracer® SC + with a Core license.*

- Three (3) RS-485 links that can be configured for BACnet MS/TP or Modbus RTU.
- A Wi-Fi interface that enables Wi-Fi access to Tracer® Synchrony.

Additional Facility Configuration capabilities include:

- Tracer® TU Facility Configuration supports templates for all equipment types recognized by Tracer® Synchrony. Therefore, Tracer® TU and Tracer® Synchrony support the same set of controllers. All offline devices in a Facility Configuration with valid templates will auto-install when transferred to Tracer® SC+. The additional templates can be converted from Tracer® SC templates or built manually in Tracer® TU.
- The additional link types included with Tracer® SC+ (a second LonTalk® link and three RS-485 links) are displayed and available when Tracer® TU is connected to a Tracer® SC+. They are also displayed on the Resolution screen in Tracer® TU. You can select all of these links when configuring a Tracer® SC+ with a Core license. However, the LonTalk® links are not available for a Tracer® SC+ with a Base license.

Making a Direct Connection Between a Computer and a Tracer® SC+

This section explains how to access the Tracer Synchrony user interface from your computer through a direct connection. Trane recommends that you make a direct connection from your computer to your Tracer SC+:

- To set up your computer for browsing to the Tracer Synchrony user interface before connecting the Tracer SC+ to a building network.
- Anytime you want to service a Tracer system and do not have access to the customer network.

Connecting your Computer Directly to a Tracer SC+

1. Press the power button on the Tracer SC+.

   All LEDs illuminate and the following sequence flashes on the 7–segment display: 8, 7, 9, 5, 4, L, dancing dash pattern. The dancing dashes persist while the Tracer SC+ is operating normally.

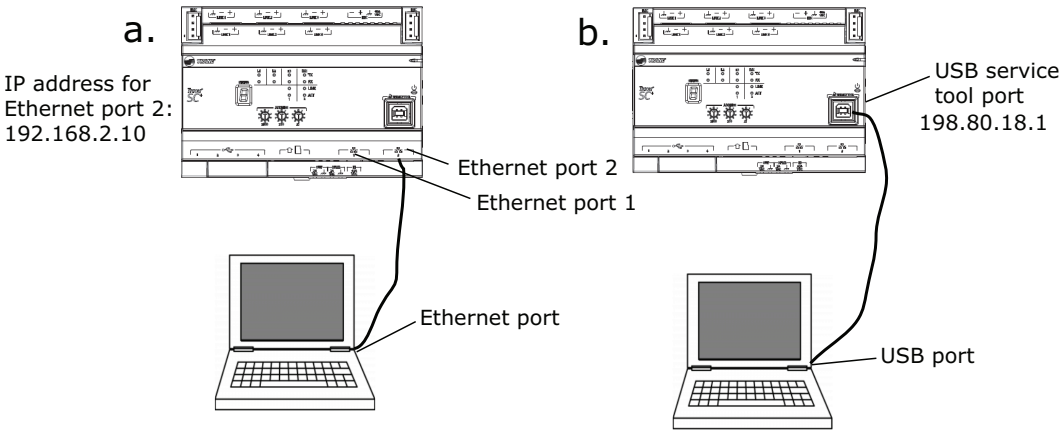
2. Connect either of the following (refer to Figure 5, p. 24).

   a. A USB 2.0 A to B cable from a USB port on your computer to the USB service tool port on the Tracer SC+. On a web browser, enter 198.80.18.1 in the address bar and then the credentials for the site. The first time you connect to the Tracer SC+, it must be done through a USB connection.

   Important: *Do not make multiple connections to Tracer SC+ using the USB cable. For example, avoid a simultaneous connection to the Tracer Synchrony user interface and Tracer TU. Disconnect the cable between devices to enable the USB Driver to recognize the next software device's request.*

   b. An Ethernet straight-through or crossover cable from the Ethernet port on your computer to Ethernet port 2 on the Tracer SC+. The Ethernet ports must be enabled on the Installation> Identification and Communications> IP Configuration tab. (Continue with procedures for "Setting the IP Address on your Computer," p. 24).

Figure 5. Direct connection between computer and a Tracer SC+ (prior to LAN connection)



Setting the IP Address on your Computer

Follow this procedure if you are using an Ethernet connection. It describes how to set the Internet Protocol (IP) address on a computer that uses a Microsoft Windows 7 operating system. You may need to modify the process if you are using another compatible operating system.

Note: *If multiple Tracer® SC+s are to be on the same network, each one must have a unique IP address.*

To set the IP address on your computer:

1. From the Start menu, Type in Network Connections, then click the View Network Connections link.
2. Right-click the appropriate network name for your computer and then click properties.

   The **Local Area Connection Properties** dialog box appears.
3. Click the Networking tab. Click either Internet Protocol Version 4 (TCP/IPv4) or Internet Protocol Version 6 (TCP/IPv6), and then click Properties.
4. Click the **Properties** button.

   The **Internet Protocol (TCP/IP) Properties** dialog box appears.
5. Click **Use the following IP address**. Enter the following:

   IP address (if connecting to Ethernet Port 2): 192.168.2.100

   Note: *This is the recommended address for the computer. Ethernet Port 2 on the Tracer SC+ has a factory address of 192.168.2.10. As long as both computer and Tracer SC+ addresses have the same subnet, 192.168.2, any number between 1 and 254 can be used for the last segment of the address.*

   Subnet mask: 255.255.255.0

   Gateway: Leave blank.
6. Click **OK**.

Configuring a New Tracer® SC+

This section describes how to configure basic settings on a new Tracer SC+. These procedures can be performed prior to connecting the Tracer SC+ to the building network.

Note: *This section is intended for installer/programmers. If your job role is that of a building operator, proceed to* *"The User Interface," p. 36*.

Setting Rotary Addresses on the Tracer SC+

The Tracer SC+ has a set of three rotary switches on the front of the device, which are used to set the BACnet Device ID. The rotary switch range is 1 to 419. Zero (0) cannot be used because it is the default value assigned to the device at the factory.

Note: *If you set the rotary switch values to a number between 001 and 419, the Tracer SC+ device ID and the BACnet MS/TP numbers will be calculated from that number.*

To set the rotary switch values, use a 1/8 inch slotted screwdriver to turn the three rotary switches on the Tracer SC+ to a unique number between 001 and 419.

Device ID Assignment for BACnet MS/TP Devices

For BACnet MS/TP devices, Tracer SC+ calculates the device ID using the BACnet MS/TP network number and the 3-digit unit controller rotary switch value.

- The Tracer SC+ BACnet MS/TP network number
- The unit controller rotary switch value (1 to 127)

Example: The Tracer SC+ BACnet network number for MS/TP link 1 is 11 and the 3-digit rotary switch value of the unit controller is 001. Assigned device ID = 11001.

Table 11. Calculating the BACnet device ID

Tracer SC+ BACnet network number (11)	1	1			
Unit controller rotary switch value (001)			0	0	1
BACnet Device ID: 11001	1	1	0	0	1

For BACnet MS/TP Network numbers higher than 4190, **Tracer SC+ will not be able to follow this scheme** and will not propose a Device ID for the unit controller. The controller can be installed with the Device ID number previously assigned to it.

Device ID Assignment for BACnet IP Devices

For devices connecting over BACnet IP, Tracer SC+ calculates the device ID with the following:

- The BACnet network number for the BACnet IP link. (This number can be changed by the user).
- The unit controller rotary switch value. (The Tracer SC+ rotary address is not used to calculate BACnet IP device IDs).

The following table shows this process using a Tracer UC600 unit controller:

Table 12. Calculating the BACnet IP device ID

BACnet network number Eth port 1 (1)		1			
Unit controller rotary switch value (42)			0	4	2
BACnet IP Device ID: 01042	0	1	0	4	2

Note: *It is very important to avoid duplication of BACnet network numbers or device IDs.*

Device Assignment for Tracer® SC+ Base

For unit controllers installed using a Tracer SC+ (base), the Tracer SC+ (app) calculates the device ID using the BACnet network number of the Tracer SC+(base) MS/TP link and the rotary switch value of the unit controller.

The example in the following table illustrates this process.

Table 13. Calculating the Tracer SC+ (base) device ID

BACnet network number of the SC+ (base) MS/TP link 1 (22)	2	2			
Unit controller rotary switch value (001)			0	0	1
Unit controller device ID set by the Tracer SC+(app): 22001	2	2	0	0	1

Device ID Assignment for Air-Fi® Devices

For devices connecting over an Air-Fi® network, Tracer SC+ calculates the device ID using the BACnet network number and the rotary switch value of the wireless device.

The example in the following table illustrates this process.

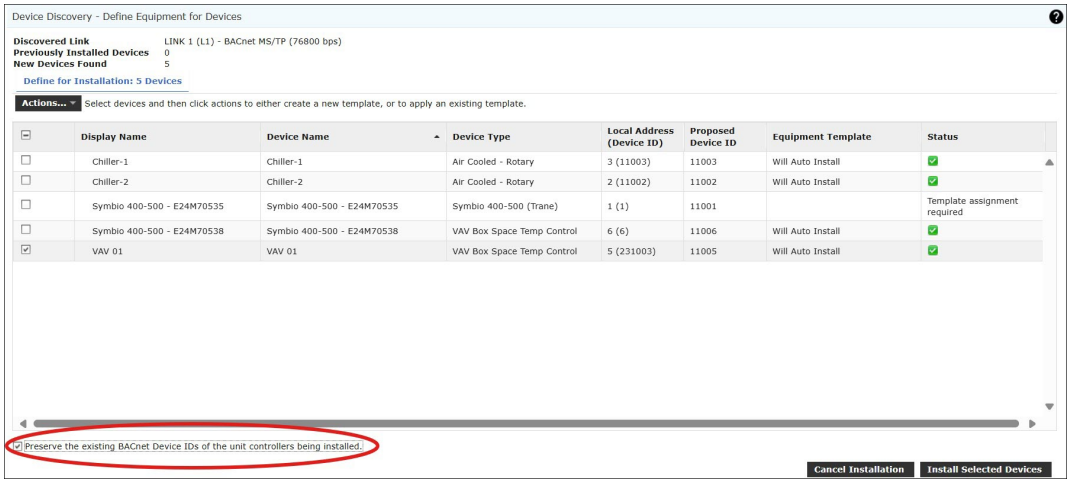
Table 14. Calculating the Air-Fi device ID

BACnet network number of Tracer SC+ Air-Fi® network (13)	1	3			
Wireless unit controller rotary switch value (001)			0	0	1
Wireless unit controller Device ID set by Tracer SC+(app): 13001	1	3	0	0	1

Customizing BACnet Device IDs

For complex BACnet addressing schemes or prescribed job specifications, custom device IDs may be required. You can customize the device IDs of Tracer unit controllers by using the Tracer TU service tool. During the device installation process in Tracer SC+, select the Preserve the predefined BACnet device ID of the unit controllers being installed checkbox (see the following figure). As a result, the installed devices will retain their device IDs. This feature applies to Trane and non-Trane BACnet devices.

Figure 6. Customize BACnet device IDs (Device Discovery page)



Logging into Tracer® Synchrony for the First time

Tracer Synchrony is the user interface for the Tracer SC+ controller. The first time you connect to the SC+ must be done through a USB connection. See “Making a Direct Connection Between a Computer and a Tracer® SC+,” p. 24.

Initial Login

1. Log into Tracer Synchrony by:
   - Launching the web Browser on your PC and navigating to the Tracer Synchrony by entering its IP address in the web browser address field.
     – 198.80.18.1 (using USB)
   - Or click the **Tracer SC+ Via USB** desktop icon that appeared on your PC desktop screen when you installed Tracer TU.

   The Tracer Synchrony Login screen will appear.

2. At the Tracer Synchrony Login page, enter the user ID and password (case-sensitive):
   - User ID: Trane
   - Password: Tracer
3. Click **login**. The End User License Agreement appears.
4. Accept the agreement and click **continue**. The **Change Password** page appears.
5. Enter the old password and the new password, and then confirm the password. Click **Change Password**. The **Tracer Synchrony Initial Setup** page appears.

Tracer Synchrony Initial Setup

The **Tracer SC+ Initial Setup** page is designed as a quick start for basic configuration. The page automatically launches after logging on to Tracer Synchrony for the first time.

Important: *This page will not appear again. You can use the Installation page to change any of the settings, except for system units, at any time after the initial log in is completed.*

The following items are configurable from the **Tracer SC+ Initial Setup** page:

Date and Time

- The date and time from your PC are used for the Tracer SC+.
- You can manually change the date and time.
- The time zone setting configures the appropriate daylight savings time.

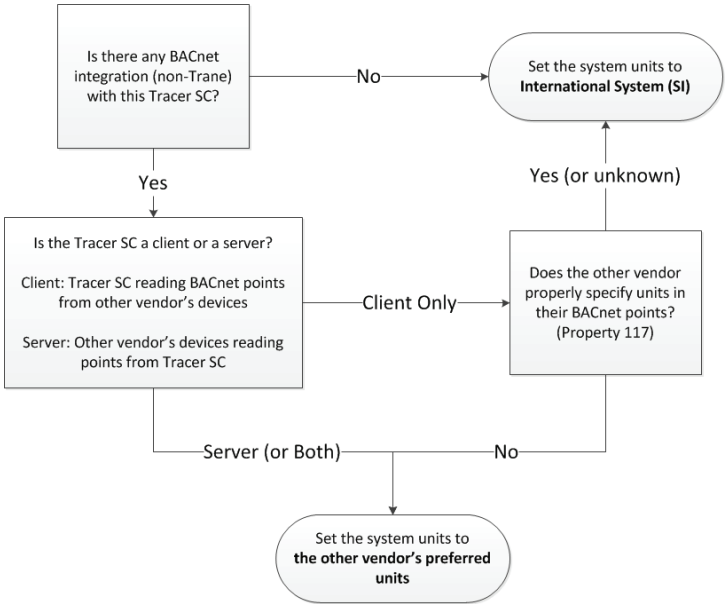
BACnet Identification

- Enter a unique name for the Tracer SC+ in the BACnet device field.
- The rotary switch settings are used to calculate the device ID for the Tracer SC+ and the network numbers for MS/TP Port 1 and MS/TP Ports 1 and 2.
- If the Tracer SC+ is intended to be a BACnet broadcast management device (BBMD), select the checkbox that assigns it as a BBMD. For information about BBMDs, see “BACnet Network Communication,” p. 108.
- If BACnet unit controllers will be supported on the Tracer system, select the baud rate for the appropriate links. Select 78600 bps for Trane unit controllers.

System Units

- System units are associated with internal Tracer SC+ data that is communicated to unit controllers and other Tracer SC+ system controllers. The system unit choices are the International System of Units (SI), inch-pound (IP), or a customized mix of the two.
- System units can only be changed by Technical Support after this page is saved.

Figure 7. System unit selection for Tracer® SC+ and unit controllers



Saving the Initial Setup Configuration

To save the Tracer SC+ Initial Setup page configuration:

1. Click **save**. The Saving Initial Setup confirmation screen appears.
2. Click **continue** to save the new settings. The Tracer SC+ will restart.

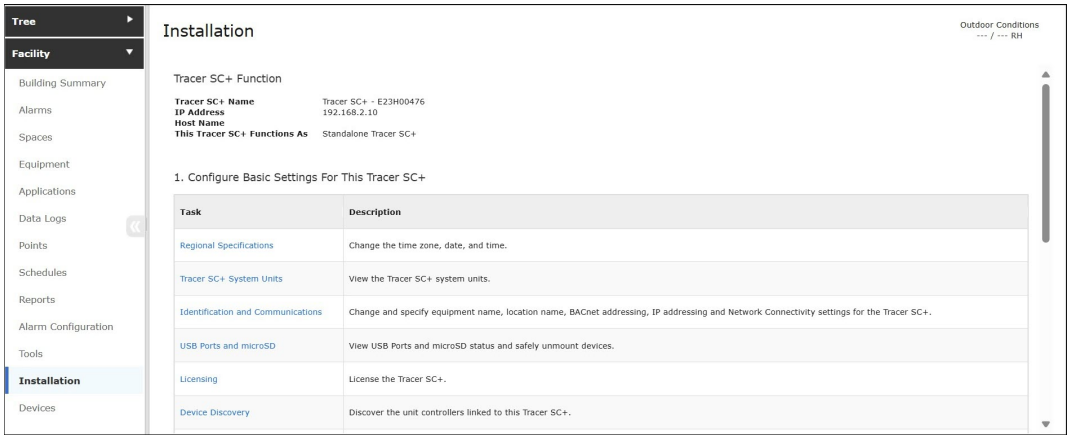
Note: *To log in again, you need only your user ID and password.*

The Installation Page

Basic settings are configured on the **Installation** page.

For help with user interface navigation, see "The User Interface," p. 36.

Figure 8. Tracer® Synchrony Installation page



Configuring Basic Settings for the Tracer SC+

These settings are for regional specifications, system units, communications, licensing, and device discovery. Except for Device Discovery, these settings were configured during initial configuration. Some of these settings can be edited.

Regional Specifications

This link contains language, time zone, and date and time selections that were made during initial configuration.

About Date and Time synchronization:

Regional settings and the date and time for Tracer SC+ are shown on this page.

Edit — Click to make changes to the current configurations, and then click **Save**.

In Edit mode, the following fields appear:

- **Edit Date and Time Acquisition Method**
  - **Set the date and time automatically from the Trane Server** — Uses NTP built into the Trane server.

    Note: *Must have a successful connection to the Trane server. Connections can be tested on the Intelligent Services tab on Identification and Communication page.*
  - **Set the date and time manually, BACnet Time Synchronization allowed**.
  - **Set the date and time manually, no BACnet Time Synchronization allowed** (Synchronization may not happen for several minutes).

    Note: *BACnet Time Synchronization is in regard to what is being sent to the SC+, not what it sends out on its links.*
  - **Set the date and time by synchronizing with a network server** (Synchronization may not happen for several minutes).
  - **Set the date and time by synchronizing with a network acquired by DHCP on...** — The button description will update based off active connection. If the Tracer SC+ is set up for DHCP, it will do a search for NTP servers. If no NTP servers are found or if the Tracer SC+ does not have a DHCP interface, this button will be disabled. If an NTP server(s) is found via DHCP, they will be listed.
- **NTP Server** — Enter the IPv4, IPV6 or NTP Server name.
- **Edit Time Zone** — This is time zone for the selected geographical location. To change, select from the drop-down list.

In addition, Tracer SC+ provides time synchronization for downstream unit controllers. Time synchronization occurs automatically upon initial installation, during a power cycle, and daily at 3:00 a.m.

Tracer SC+ System Units

This link enables you to view the system units that were selected for the Tracer SC+ during initial installation. They cannot be edited.

Identification and Communication

The Identification and Communications page allows you to view and edit configurations for the Tracer SC+ Identification, IP Configuration, Intelligent Services, Network Connectivity and SSL, BACnet Configuration including BACnet/SC, Cellular Module Configuration, and VRF XML Configuration.

USB Ports and microSD

On this page you can view the USB ports and microSD for your Tracer SC+. In addition, you can enable and disable individual USB ports and safely unmount mass storage devices from the USB ports and microSD.

Licensing

This link opens the Product License page, which allows you to browse for and install a Tracer SC+ license.

Device Discovery

This link opens the Discover Devices page, in which you can discover newly installed unit controllers.

Air-Fi® Networks and Sensors

Configure all Air-Fi® Networks and Configure sensors connected directly to Tracer SC+ without a unit controller. See “Appendix J: Connecting Air-Fi® Wireless Sensors to Tracer® SC+,” p. 221 and “Appendix K: Opening an Air–Fi® Network with Synchrony,” p. 224.

Expansion Modules

Tracer® SC+ supports the XM30, XM32, XM70, and XM90 expansion modules. Any combination of XMs can be used on a single SC+ (32 terminations maximum).

Expansion Module Configuration via Tracer Synchrony

Expansion modules must be physically installed on the Tracer SC+ controller. Expansion modules connected before the Tracer SC+ is powered on will be automatically discovered. To install, navigate to the Installation page and select Expansion Module page. From this page, expansion modules can be installed, deleted and added manually. After expansion modules are installed, software points can then be referenced to the terminations.

Important: *Do not add or remove an expansion module while the Tracer SC+ is powered on. Doing so may result in a reboot.*

Example: How do I configure an XM30 for the Facility Outdoor Air Temperature?

1. Create a new analog input (AI) from the Analog Points page.
2. Select the preferred I/O termination from the XM30 as the referrence.
3. Set the proper point units.
4. Set the proper XM calibration type and settings.
5. Save the new point.
6. Navigate to Installation>Outdoor Air Conditions.
7. Click the reference icon next to Outdoor Air Temperature.
8. Select the custom point created previously in the above steps.

Configuring Facility Settings

A facility can consist of one or more Tracer SC+ controllers. These settings are used for a single Tracer SC+ facility or the Application SC+ in a Multi-Tracer SC+ facility.

Location and Contacts

For entering the facility name and contact information for the facility owner and service provider.

Facility Defaults for User Preferences

The Facility Defaults page shows the formats in which the system displays data. This page is divided into two sections: Regional Preferences and Data Display Units.

Outdoor Air Conditions

Outdoor Air Conditions shows the status of the Outdoor Air Temperature and Outdoor Air Humidity. The data can be pointed to specific data source and place in Service or Out of Service.

Application Defaults

For setting the alarm capacity for each Tracer SC+ and setpoints to be used by area and variable air systems. Settings can be changed and updated to all existing areas and variable air systems using those setpoints.

SMTP Settings

Use to set up your Simple Mail Transfer Protocol (SMTP) so that events can be routed to users by e-mail.

Priority Levels

Priority levels establish a strategy used by the system to avoid conflicting control by giving precedence to applications with a higher level of priority. Priority levels are set up in user administration. They are numbered 1 through 16, with 1 highest and 16 lowest.

Login Page

On the Login page you can upload language packs and personalize your login page by adding background images.

Setting Up a Trane Wi-Fi Network

Tracer® SC+ supports the Trane Wi-Fi module. The Trane Wi-Fi module kit (equipped with a USB cable) enables communication among devices on a Wi-Fi network. The module can be used one of two ways:

- Host mode — Tracer SC+ serves as the local wireless network for other Wi-Fi devices. use this mode:
  - On a site where an IT department or a wireless network is not available.
  - To connect to the Tracer 10-inch Display.

- Client mode — Tracer SC+ connects to an existing wireless network (typically managed by the customer). Requires the same permissions as any other Wi-Fi device to access the network.

Note: *BACnet IP is also supported through Wi-Fi in either Host mode or Client mode.*

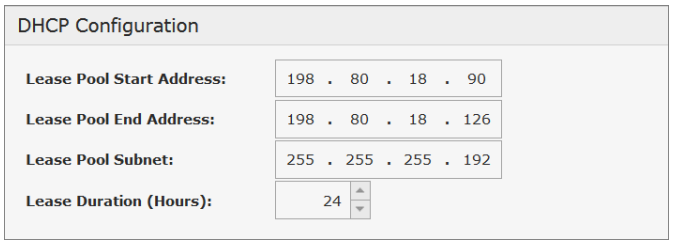
When the Wi-Fi adapter is connected for the first time, Tracer SC+ will automatically host a wireless access point with no configuration required. Use the following credentials:

- Default SSID: Trane Wifi <serial number of Tracer SC+>
- Default password (to join the hosted network): tracerwifi
- Default IP address: 198.80.18.65

Setup a Wi-Fi Network (Host Mode)

1. Navigate to the Wireless Configuration section from the left navigation bar: **Installation > Identification and Communications > IP Configuration.**
2. Click **Edit**. In the **Wi-Fi Network** section, select the check box to enable the network connection, then click **Save**. You are now able to set up the Wi-Fi connection. Select the **Setup Wi-Fi** button. The **Wi-Fi Setup** dialog opens.
3. In the **Mode** section, select **Host (Access Point)**.
4. Enter the IP Address for the Tracer SC+ Wif-Fi interface (default is 198.80.18.65).
5. Enter an address for the Subnet Mask (default is 255.255.255.192).
6. Click **Next**.
7. Enter a Network Name (SSID) — default is Tracer WiFi <serial number of Tracer SC+>.
8. Enter a Password (default is tracerwifi).
9. Define the Channel of the hosted Wi-Fi network (default is 6).
10. Define the DHCP configuration. This establishes the range of IP address the Tracer SC+ will assign to clients that join the hosted network and the duration of each lease. Defaults are shown in Figure 9, p. 32.

Figure 9. DHCP Configuration (Host Mode)



11. Click **Finish**.

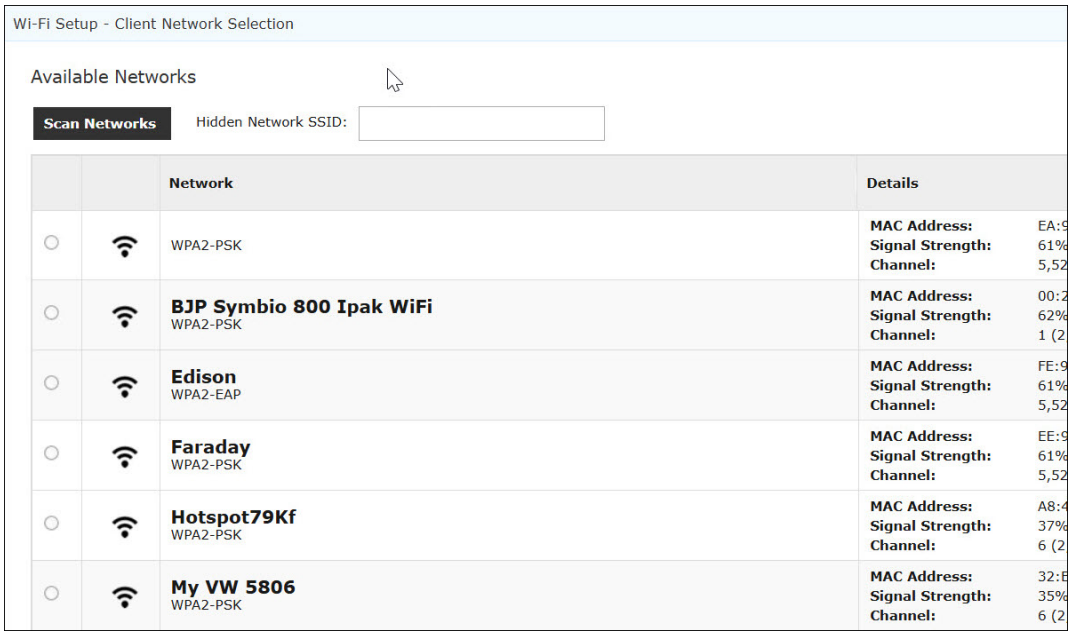
    To join the newly created Tracer® SC+ Host network, connect your computer to the created Wi-Fi network and enter the password (default is tracerwifi). Once you have joined, type the IP address of the Tracer SC+ in a web browser. Then, enter a valid user ID and password to interface with Tracer Synchrony.

Setup a Wi-Fi Network (Client Mode)

1. Navigate to the Wireless Configuration section from the left navigation bar: **Installation > Identification and Communications > IP Configuration.**
2. Click **Edit**. In the **Wi-Fi Network** section, select the check box to enable the network connection, then click **Save**. You are now able to set up the Wi-Fi connection. Select the **Setup Wi-Fi** button. The **Wi-Fi Setup** dialog opens.
3. In the **Mode** section, select **Client Mode (Station)** .
4. Select the type of wireless network addressing used by the network the Tracer SC+ will join (default: DHCP).

   If **Static**, Enter the IP address, Subnet mask and gateway to be used by the Tracer SC+ on the wireless network.
5. Click **Next**.
6. In the list of Available Networks, select the preferred network (Figure 10, p. 33).

Figure 10. Select a host network



To manually configure a connection to a non-broadcasting wireless network, enter the SSID of the hidden network. Tracer Synchrony will refresh and the hidden network will appear in the list of Available Networks.

7. Click **Next**.
8. Choose the appropriate Security Type. Available options are Open, WPA and WPA2 Personal, WPA and WPA2 Enterprise, and Manual.
9. In the Client Security Settings dialog, enter a valid username and password for the client network. (The Security and Authentication fields are populated by default with those of the selected network.)
10. Click **Finish**.

Trane USB Cellular Module

Tracer® SC+ supports the Trane USB Cellular Module, which provides connectivity for the following two use cases:

- Trane Connect Remote Access.
- Trane Intelligent Services data collection (The Trane USB Cellular Module creates a private connection over the Verizon cellular network from the Tracer SC+ to the Trane cloud. The Trane USB Cellular Module **DOES NOT** have a public IP address – which greatly improves security compared to traditional cellular router implementations).

Note: *The modem SIM card was inserted and activated at the factory prior to shipment and cannot be moved to another module.*

Setting Up a Trane USB Cellular Module

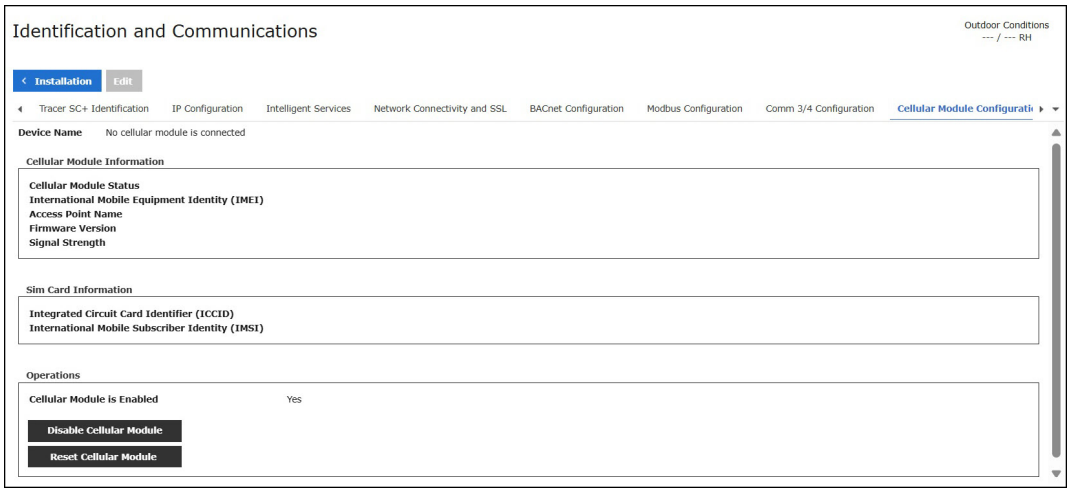
Enable the USB port where the cell modem will be connected.

1. Enable the USB port where the cell modem will be connected — Navigate to **Installation > USB Ports and microSD**.
2. Click **Enable** for the port that will be used. (Only USB port 1 is enabled by default.)
3. Connect the Trane USB Cellular Module to the USB port that you enabled in step 1. The Trane USB Cellular Module will be automatically configured once it is connected to an enabled USB port.

Changing the Configuration of the Trane USB Cellular Module

1. Navigate to **Installation > Identification and Communications**.
2. Click the **Cellular Module Configuration** tab.
3. Under the operations section, enable or disable the modem or reset to factory defaults.

Figure 11. Cellular module configuration



Upgrading the Trane USB Cellular Module Firmware

1. Navigate to **Tools > Firmware Upgrade** (take note of the current firmware version and the firmware version installed on the Trane Cellular Module).
2. In the Cellular Module section, select an upload option:
   a. Upload modem firmware file to Tracer SC+ and install it on the Cellular Module.
   b. Upload modem firmware file to Tracer SC+ (to transfer the file at a later time).
   c. Upload firmware located on Tracer SC+ to Cellular Module.
3. Click **Upload**. Verify that the firmware version installed on the Cellular Module has been updated.

Figure 12. Firmware Upgrade (Cellular Module)

Note: *If required for troubleshooting, the Trane USB Cellular Module DNS server addresses are 10.126.1.11 and 10.126.1.12. DNS addresses are obtained automatically from the network carrier.*

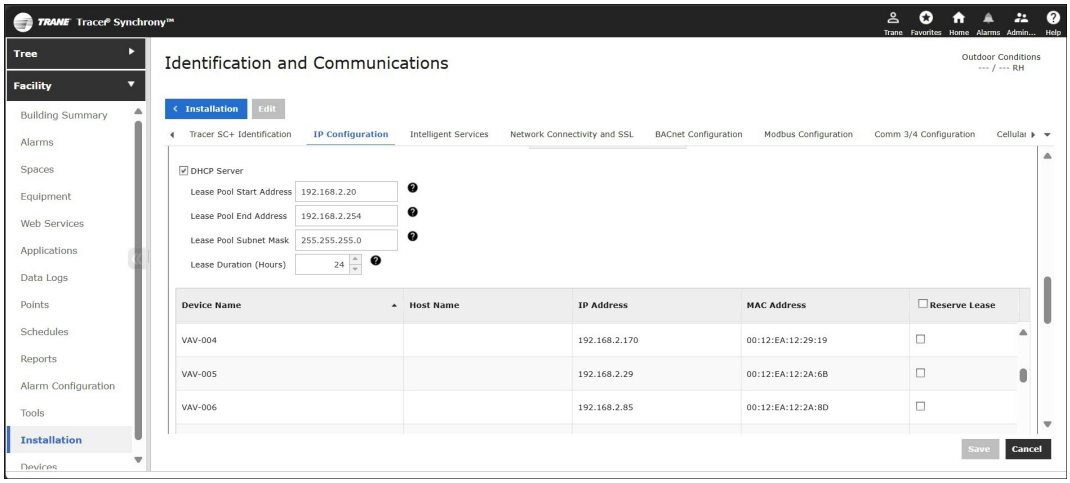
DHCP Server – Ethernet Port 2

Beginning at Tracer SC+/Synchrony version 6.1, the user can enable the DHCP server on Ethernet Port 2. The intended use for that DHCP server is to simplify the device addressing for the downstream BACnet/IP controllers, including the Symbio family of controllers. Port 2 is not intended to be the DHCP server for the customer network.

Note: *The connected devices must be configured for DHCP addressing to accept an address from the server.*

1. Navigate to **Installation > Identification and Communications**.
2. In the Ethernet 2 section, the DHCP server is normally disabled by default.
3. Select **Edit**.
4. Select the checkbox to enable the DHCP server.
   a. Edit the Lease Pool Start Address, as applicable.
   b. Edit the Lease Pool End Address, as applicable.
   c. Edit the Lease Pool Subnet Mask, as applicable.
   d. Edit the Lease Duration, as applicable.
5. Select **Save**.
6. With the BACnet/IP devices connect, use the **Edit** mode to select device addresses as **reserved**, in which case the Tracer SC+ will associate the MAC and IP address of the selected devices.

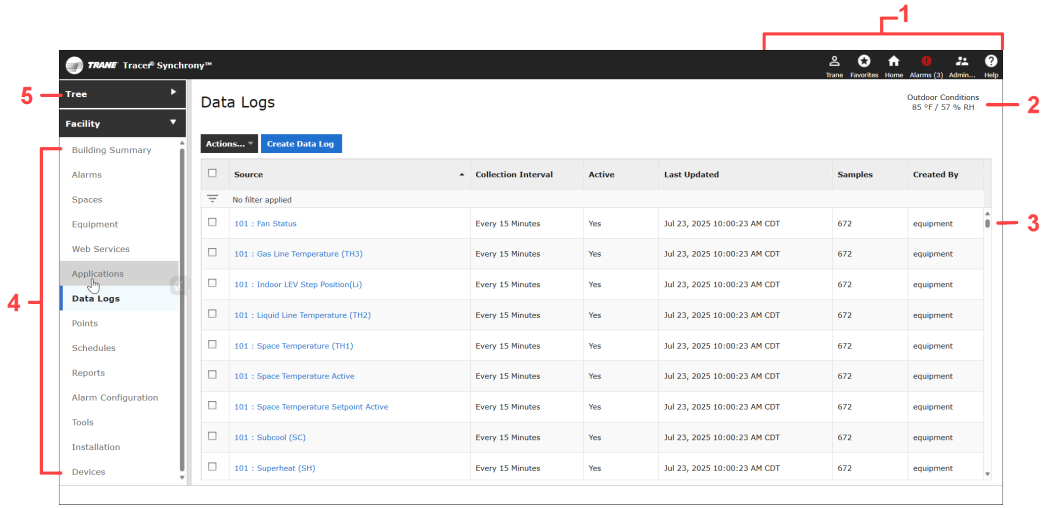
Figure 13. DCHP Server on Ethernet Port 2



The User Interface

The Tracer® Synchrony user interface provides an easy way for users to set up, operate, and modify a building automation system. The home page contains system status information and links to navigate to all areas of the system. The navigational elements are described in the following table.

Table 15. Navigating the user interface

Number	Button/Menu Functions	Description
		
1	Global Navigation Bar	This is visible on every page. From left to right, the bar contains: • (User) — Click to logout, view or edit preferences, or change your password. • **Favorites —**Click this button to save frequently Tracer Synchrony UI pages. • **Home —**Click this button at anytime to return to your home page. • **Alarms —**Shortcut to the **Alarms** page. If a new alarm or event has been detected by the system since the **Alarms** page, the **Alarms** icon flashes. • **Admin...** Provides access to roles and users. – Appears only if the user has administrative privileges. – A role is a collection of access rights to equipment, functions, and applications. Users are assigned to roles. The role assignment determines a users access rights. – Six pre-defined user roles exist in the Tracer® SC+. These roles can be used as is, or as a basis to create additional roles. Roles define the extent to which a user is allowed to perform specific functions. – Each user is assigned a role. If you make a change to a role, all users assigned to that role will have their permissions changed, as prescribed by the updated role. • — Click to open a help topic that pertains only to the information on the page in view. When the help topic is opened, click **show** to access the entire Tracer Synchrony help system.
2	Outdoor Conditions	Shows current outdoor temperature and humidity.
3	Internal Scroll Bar	An internal scroll bar is available for pages that contain long lists of data and multiple sections.
4	Left Navigation Menu	Contains a list of menu items that are linked to features, applications, and equipment.
5	Navigation Tree	A customized view of user-selected elements in the HVAC system. You can group, order, name elements, and assign custom graphics to the tree nodes according to your preferences.

Applying Table Filters

Table filtering allows you to see only selected data by setting up rules and conditions. The option to filter tables is available on the following pages:

- Alarms

- Data Logs
- Spaces
- Area, VAS, Chiller Plant (Alarms Tab)

To apply a table filter:

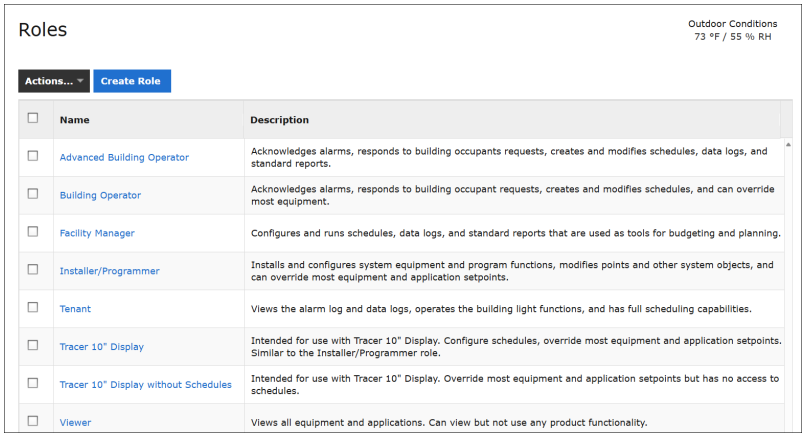
1. From one of the above mentioned pages, click the filter icon. The Filter dialog box appears.
2. From the **Column** drop-down list, select a column on which to base your filter.
3. From the **Condition** drop-down list, select a condition.
4. In the **Value** field, enter a value that the selected Column and Condition will filter.
5. Click Filter. The table displays results based on the applied filter.
6. Click the + button to add a rule. Up to three rules can be added to a filter.
7. Use the **Match** drop-down list to include all rules or any rules.

   To remove the filter, click **Clear filter** located directly above the first entry in the table in which you are viewing.

The Navigation Tree

The navigation tree contains the logically ordered and grouped content of all the elements of your HVAC system. The navigation tree populates automatically when spaces, systems, points, and equipment are installed. A navigation tree provides an alternate way to navigate through the user interface. The navigation tree consists of nodes, display text, and icons. You build the tree by choosing display text for nodes, arranging the nodes, and assigning associated graphics. The graphics represent equipment and areas of the facility.

Figure 14. The navigation tree



Using the Navigation Tree

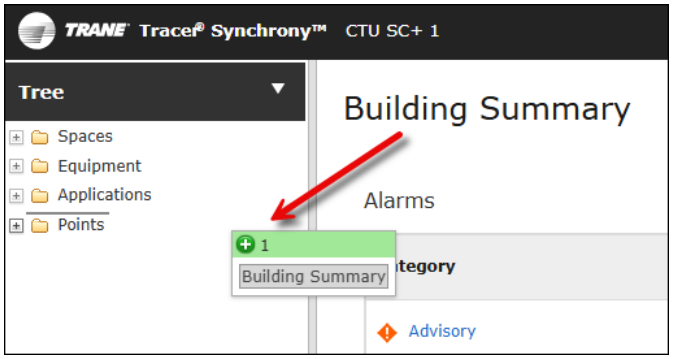
Click the arrow icon on the navigation tree to expand the tree and display the contents. The navigation tree can be customized according to your preferences and facility needs. The tree must be unlocked before any changes can be made. Click the lock icon located at the bottom of the tree.

Note: *To save edits made to the navigation tree, you must lock the tree by clicking the lock icon.*

Drag a Tracer® Synchrony Component onto the Tree

You can create nodes on the tree by dragging them from the title of a Tracer Synchrony component onto the tree. Click and drag a component from the Tracer Synchrony page onto the tree. An image representing the component appears red, then green when it glides over a valid area. Depending on where you locate the dropped image, the new node will appear under the node you drop it onto. To save your changes, lock the navigation tree by clicking the lock icon.

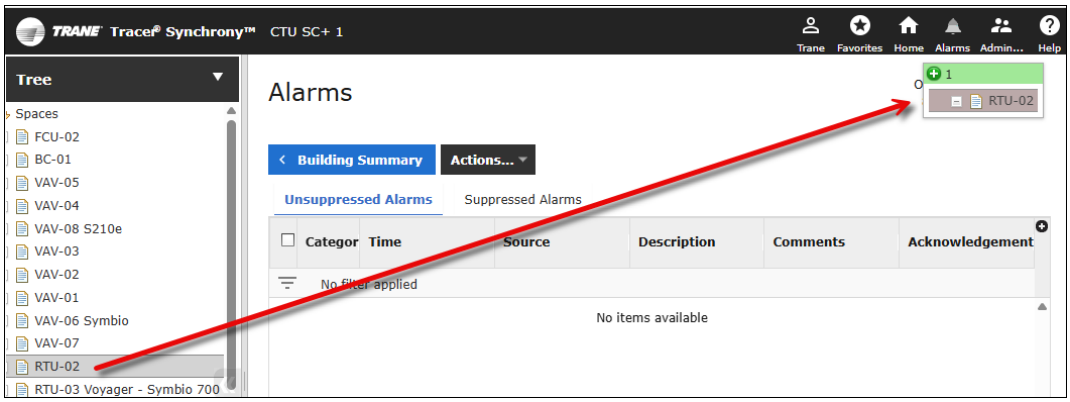
Figure 15. Dragging a Tracer Synchrony component onto the tree



Drag a Tree Component onto the Home Button

Click and drag a component from the navigation tree as shown in the following figure, or from the title of an Tracer® Synchrony component on the page to the Home button. To save your changes, lock the navigation tree by clicking the icon.

Figure 16. Dragging components from the tree



Drag Tree Nodes to Other Locations

Nodes can be dragged and dropped to other locations on the tree. When a node is dropped onto another node that is currently not a folder, the node icon will then appear as a folder icon. Multiple nodes can be selected at the same time by clicking on multiple nodes. To save your changes, lock the navigation tree by clicking the icon.

Rename Tree Nodes

Nodes on the tree can be renamed directly within the tree. Rename a node by **slow** clicking on the tree node while in unlocked mode. Slow is defined as two clicks on the same node spaced between 1 and 5 seconds apart. This places the name of the node in edit mode, in which the old name can be deleted and the new one entered. To save your changes, lock the navigation tree by clicking the lock icon.

Add a Custom Graphics Node to the Tree

1. Click the custom graphics icon located on the edit bar.
2. The **Add a Custom Graphics Node to the Tree** dialog box appears.
3. Select a graphic from list. (A filtering option is available for your convenience).
4. Click **Next**.
5. If the graphic is associated with a template, a tree with all the devices on Tracer Synchrony is displayed. You can then select the equipment with which to associate the graphic. If the graphic is not associated with a template, a pane with the ability to save the graphic is displayed.
6. Save the graphic (template or otherwise).

Edit a Node on the Tree

1. Click to select one or more nodes on the tree.
2. Click the edit icon located on the edit bar.
3. The **Edit Nodes** dialog box appears.
4. Select an action: Modify custom graphic assignment, or Reset custom node labels to default.
5. Follow the instructions in the dialog box to complete the action.

Add a Custom Folder to the Tree

1. Click the add folder icon located on the edit bar.
2. A new folder appears at the bottom of the tree, or below a selected node.
3. Click once on the folder to place in edit mode; rename the folder.

Delete a Node from the Tree

1. Select a node or folder on the tree (text displays in bold when properly selected).

2. Click the delete icon located on the edit bar.
3. The selected item is deleted.

Undo a Change to the Tree

While editing the tree, you can undo a change by clicking on the undo icon . Actions can be undone back to the point where the tree was unlocked for editing. The undo icon will be active only when there are actions that can be undone.

Redo a Previously Undone Change to the Tree

While editing the tree, you can redo a previously undone change by clicking on the redo icon . The redo stack is cleared once a new operation is performed. The redo icon will be active only when there are actions that can be redone.

Reset the Tree to Standard Configuration

You can reset the tree to its standard configuration by clicking on the reset icon .

User Accounts and Administration

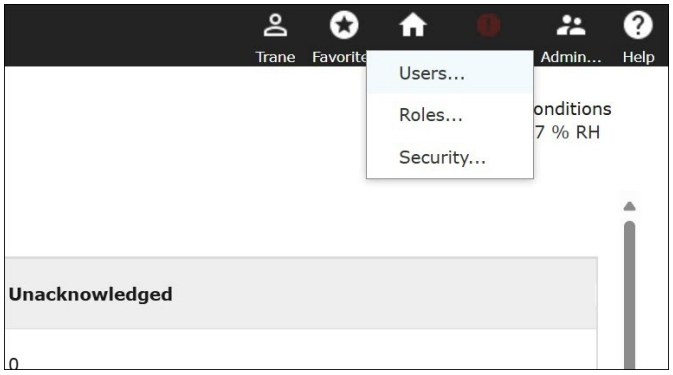
User accounts hold the necessary information required for a user to interface with the system. Administrative rights grant the user the ability to manage user accounts, create and delete users and reset passwords. There must be at least one administrator of the system (the last administrator cannot be deleted.)

Each system user can be setup with a unique user ID and a role assignment that dictates the level of access to systems, equipment, tools and more.

User administrator functions are accessed from the global navigation bar located on the upper right corner of the screen as shown in the following figure. These functions include setting up and editing new users and roles, and establishing secure passwords.

Note: *The Admin selection only appears on the global navigation bar if the user has administrative privileges.*

Figure 17. Accessing administrative functions



Best Practices for User Accounts

Trane recommends establishing at least two user accounts that grant administrative access: One for Trane technicians, and the second account reserved for the customer.

Trane technician user account

- To be used primarily for service and troubleshooting
- The account should grant full access to everything in the system including administrative
- access.
- Account user should be assigned Installer/Programmer role
- Tracer® SC includes this user account for initial setup and programming (by default)

Customer user account

- At least one account should be set up that grants administrative access in order to create and manage other users in the system.
  - Should be assigned a role appropriate for daily tasks.
- An additional Super User account can be set up that is responsible for monitoring all equipment and applications in the system.
  - Account user should be assigned the Installer/Programmer role with administrative access.

Creating a New User

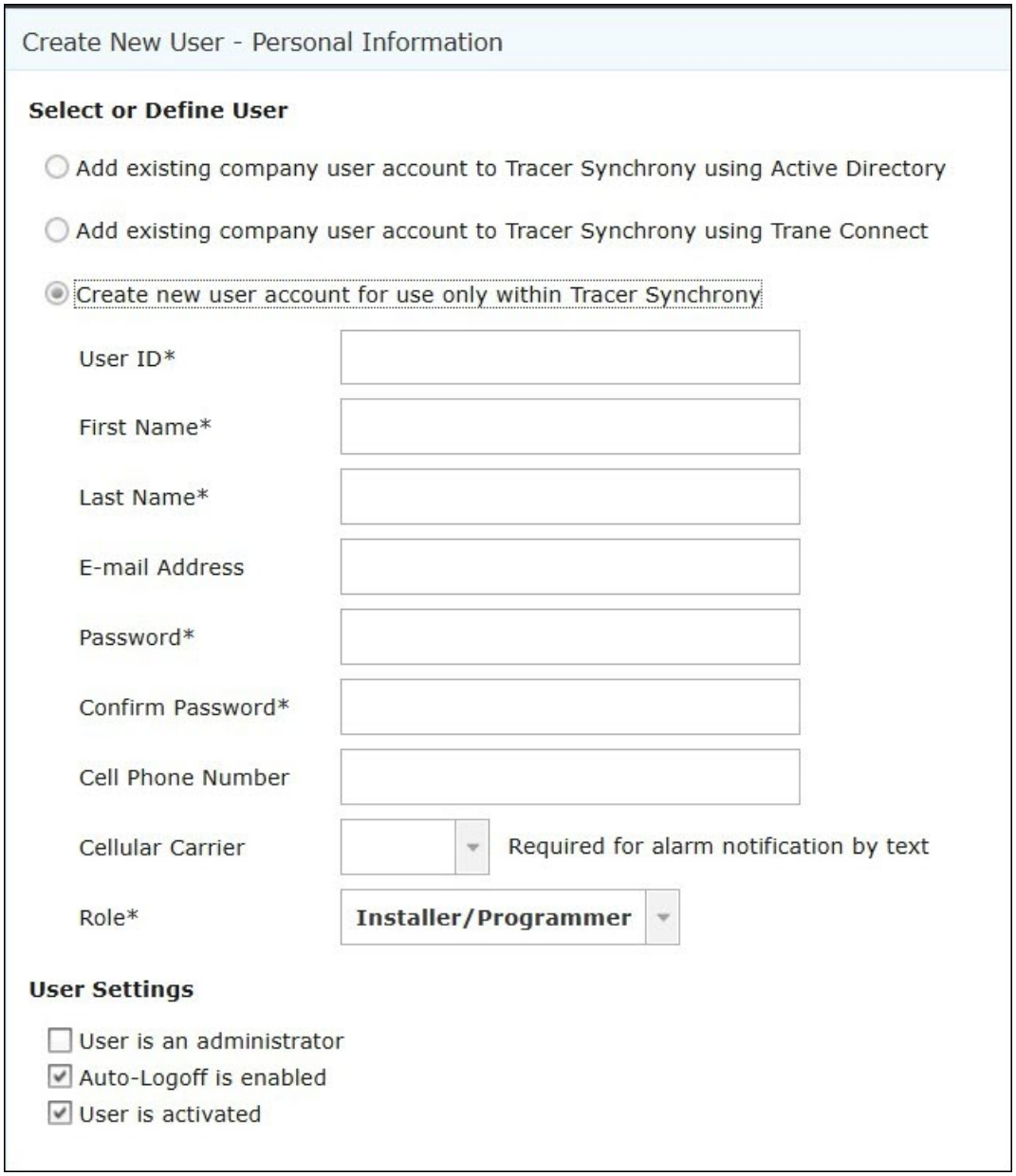
The following is a high-level procedure designed to provide you with the basic navigational steps. For more detailed instructions while creating a new user, click the help icon located on the global navigation bar.

To create a new user:

1. From the global navigation bar, click **Admin > Users**, which opens the **Users** page.
2. Click the **Create User** button. The **Personal Information** page appears.
3. Select the appropriate radio button: Existing company user account with Active Directory, or new user for Tracer®

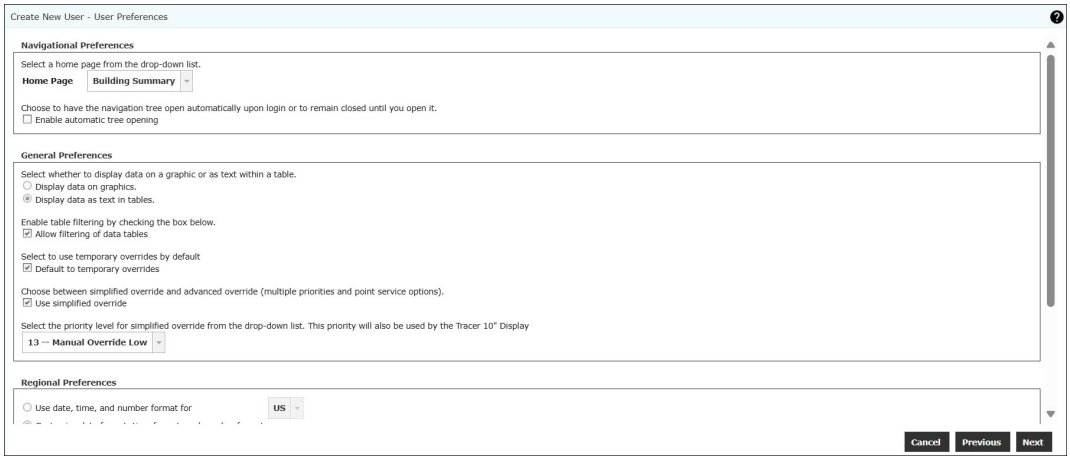
Synchrony. Enter the requested information in the fields. Fields with an asterisk (*) are required. Click **Next**.

Figure 18. Create new user (personal information)



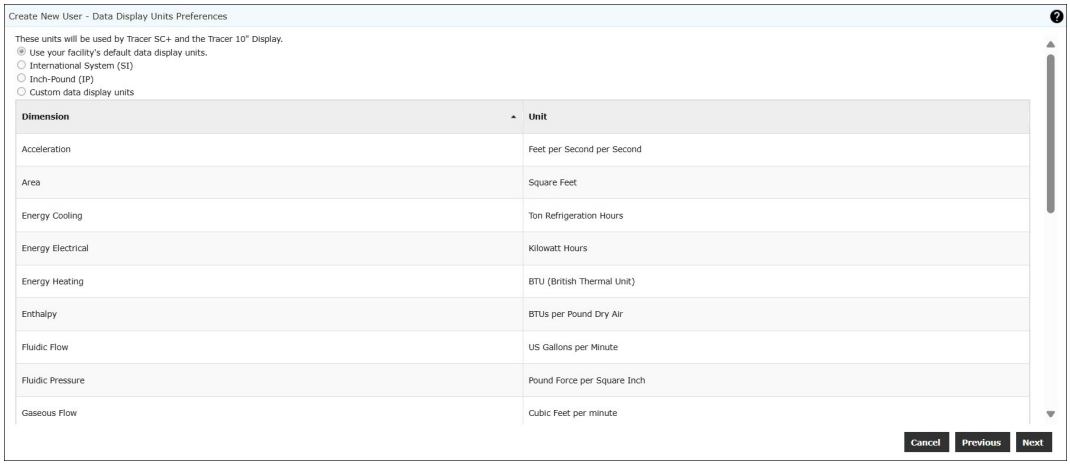
4. On the **Preferences** page, determine how certain attributes on the Tracer Synchrony user interface will appear. Click **Next**.

Figure 19. Create new user (preferences)



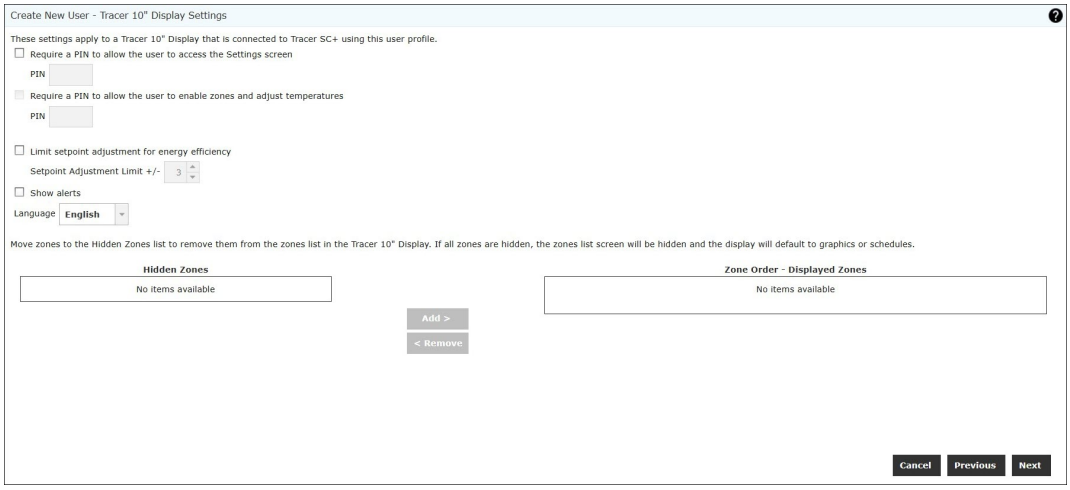
5. On the **Data Display Units Preferences** page, determine the unit type in which data will be displayed. Click **Next**.

Figure 20. Create new user (data display units)



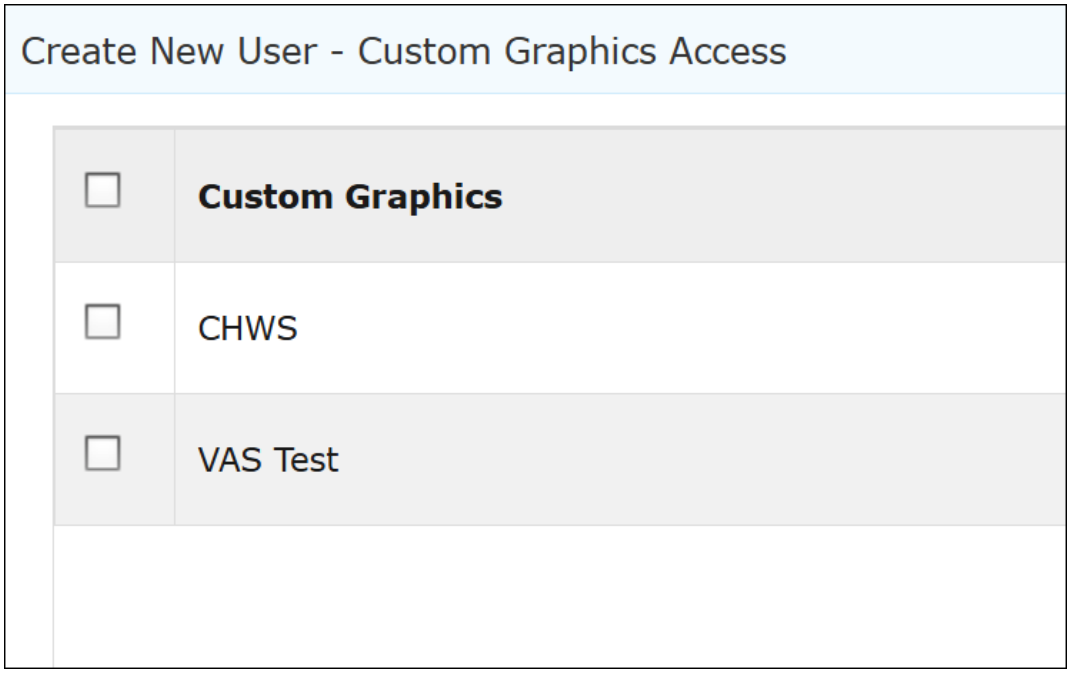
6. On the **10-inch Display Settings** page, define the Tracer 10-inch Display settings. Click **Next**.

Figure 21. Create new user (Tracer 10-inch display settings)



7. On the **Custom Graphics Access** page, select the custom graphics that the user will be able to access. Click **Next**.

Figure 22. Create new user (custom graphics)



8. On the **Summary** page, review your selections. Click **Finish** to save the new user.

Active Directory Setup

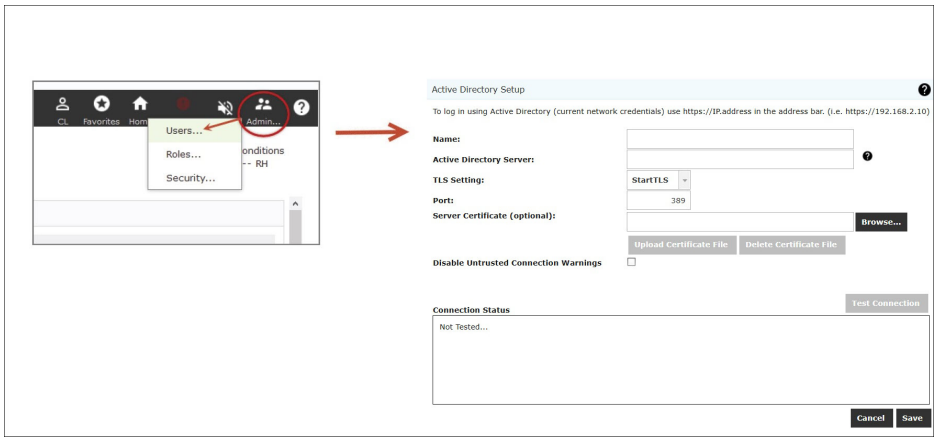
Active Directory allows users to log into Tracer Synchrony using a company system password.

To set up Active Directory:

1. From the global menu bar, click **Admin...>Users.** The Users page displays.
2. Click Active Directory Setup, which opens the associated dialog box (see the following figure).
3. Complete the fields in the dialog box:
   a. Name — Enter the name of the Active Directory host (company name, for example).
   b. Active Directory Server — Enter the URL of the Active Directory host (activedirectory.example.com for example).
   c. TLS Setting — Select the Transport Lay Security (TLS) connection. Available options are StartTLS and LDAPS.
   d. Port — Enter the Active Directory Host port number. Acceptable value range is 0 through 65535.

   Note: *The **Test Connection** button allows you to test the Active Directory setup. The setup can be saved even if the test connection fails.*
4. Create a new user. Select the appropriate Active Directory radio button for user type. Enter the user ID and and network domain. A password is not required because the company credentials will be used.
5. To access Tracer Synchrony from a web browser: enter an Active Directory user (https:// must be used followed by the IP address). For example, https://IPaddress.com. In the Log in dialog box, enter the user name and password that was entered in the Active Directory setup instructions.
6. Click **Log in**.

Figure 23. Active Directory setup



Trane Connect User Setup

Starting with Tracer Synchrony v6.2, a Trane Connect Single Sign On(SSO) option was added to utilize Trane Connect's authentication to pass through into Synchrony. A Synchrony Trane Connect user must be created first to match the user's Trane Connect login.

To set up Trane Connect User:

1. From the global menu bar, click **Admin...>Users**. The Users page displays.
2. Click Trane Connect Setup, which opens the associated dialog box.
3. Complete the fields in the dialog box:

- Trane Connect ID – This will be what is used to log into Trane Connect. It must match for the SSO to work.
- Personal Information – Enter in user's personal information.
- Role – Set the desired Synchrony role for the Trane Connect User

Creating a New Role

Roles are assigned to users to govern the level of permission they have to access the applications and equipment in Tracer SC +. There are eight predefined roles to choose from. Custom roles can be created to provide the exact level of access required. (The predefined roles cannot be edited or deleted).

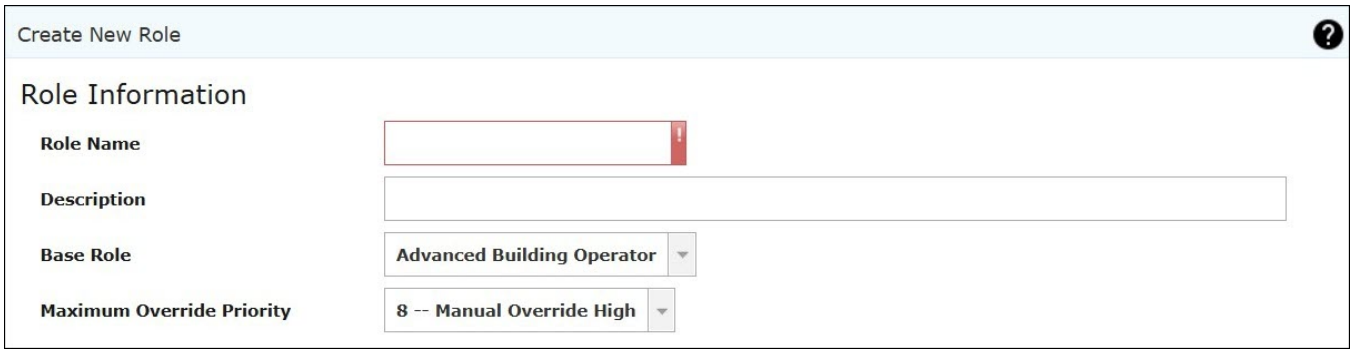
The following is a high-level procedure designed to provide you with the basic navigational steps. For more detailed instructions while creating a new role, click the help icon located on each user interface page.

To create a new role:

1. From the global navigation bar, click **Admin > Roles**, which opens the **Roles** page.
2. Click the **Create role** button. The **Role Information** page appears.
3. Complete the fields, and then click **Next**.

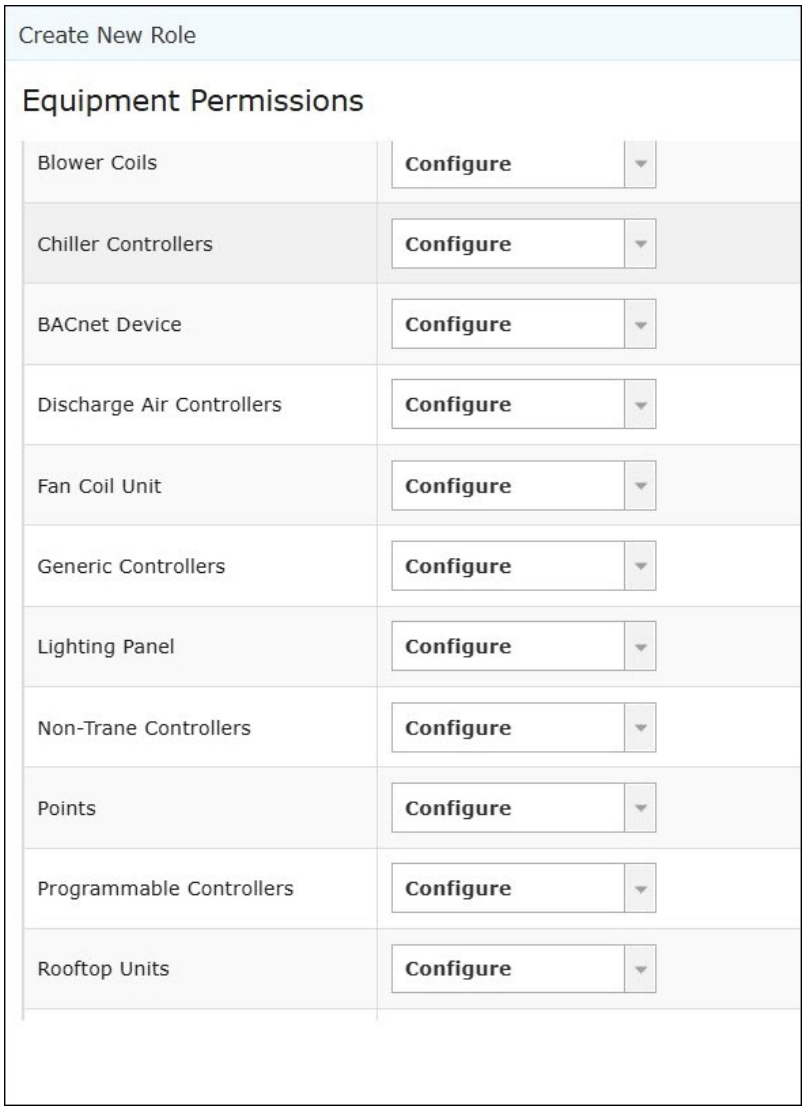
   The Base Role is a template that is used as a starting point for defining access to the system. The maximum override priority will dictate the level of control granted to the user. The higher the precedence given to the user's overrides in the system.

Figure 24. Create new role (information)



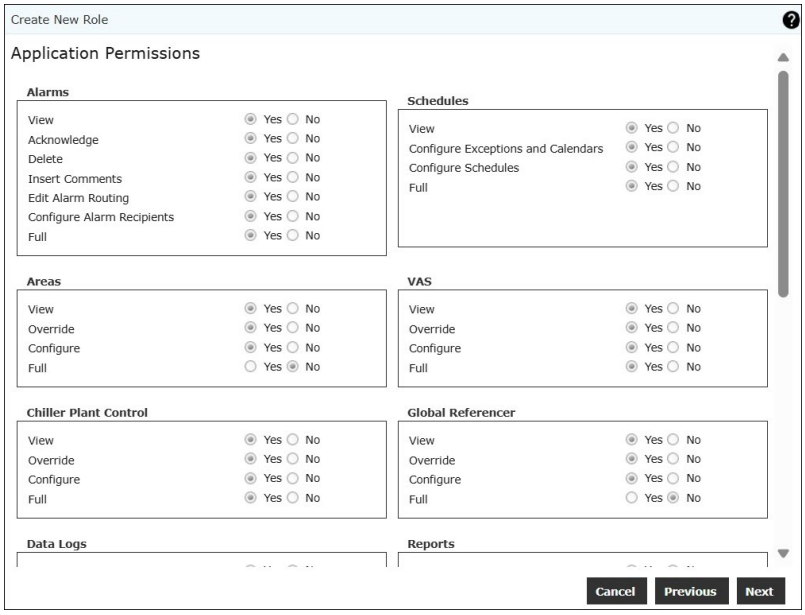
4. On the **Equipment Permissions** page, determine the permission levels for equipment. Click **Next**.

Figure 25. Create new role (equipment permissions)



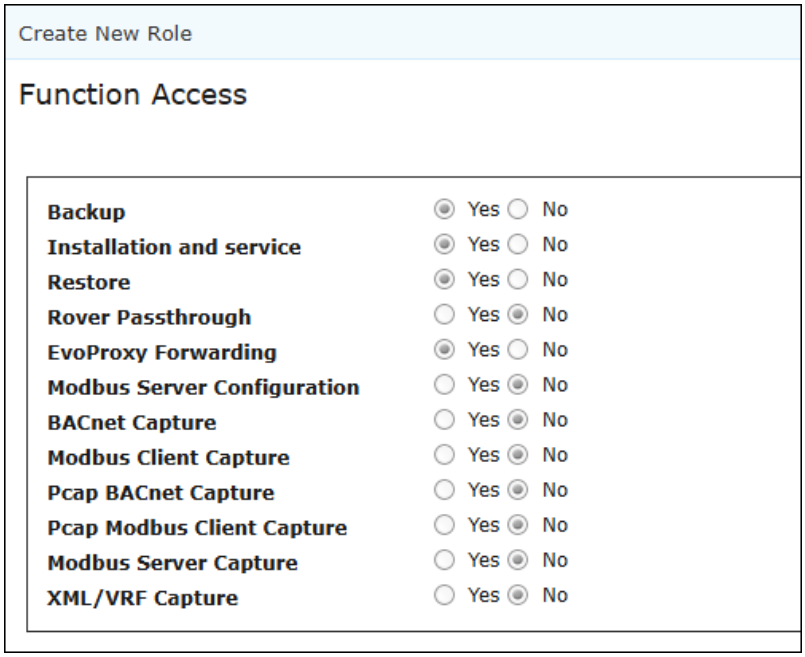
5. On the **Application Permissions** page, determine the application permission levels. Click **Next**.

Figure 26. Create new role (application permissions)



6. On the **Function Access** page, select the functions that users in this role will have access to.
   User responsible for configuration and programming for Tracer SC should have access to Installation and Service.

Figure 27. Create new role (function access)



7. On the **Summary** page, review your selections. Click **Finish** to save the new role.

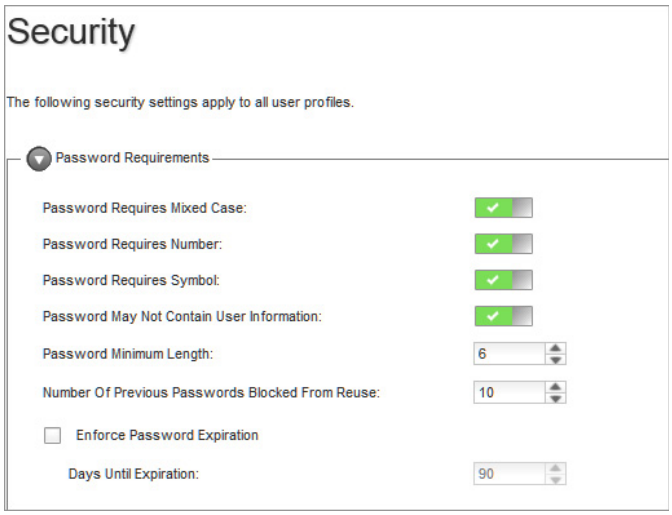
User Security

Tracer Synchrony administrators determine password requirements for all users on this page. As an administrator, you can select or deselect to activate the following options:

- **Password Requires Mixed Case** — Must contain at least one lower case or upper case letter.
- **Password Requires Number** — Must contain at least one number.
- **Password Requires Symbol** — Must contain at least one symbol such as %, $, #, @.
- **Password May Not Contain User Information** — Cannot contain the user ID name.
- **Password Minimum Length** — The minimum number of required characters is 6. Use the spinner box to select a number.
- **Number of Previous Passwords Blocked From Reuse** — Users are prohibited from creating a new password by reusing their most previous password. This can be extended beyond the most previous for heightened security. The valid range is 1 to 75. Use the spinner box to select a number.
- **Enforce Password Expiration** — Select this check box to require users to create a new password when their current passwords expire.

  Note: *The following words are prohibited from use as part of the user password: Trane, Tracer, Admin, Password.*
- **Days Until Expiration** — Use the spinner box to select the maximum number of days that passwords are valid until a new one must be created. Valid range is 7 to 365.

Figure 28. Password security setup



Remote Access to a Tracer BAS

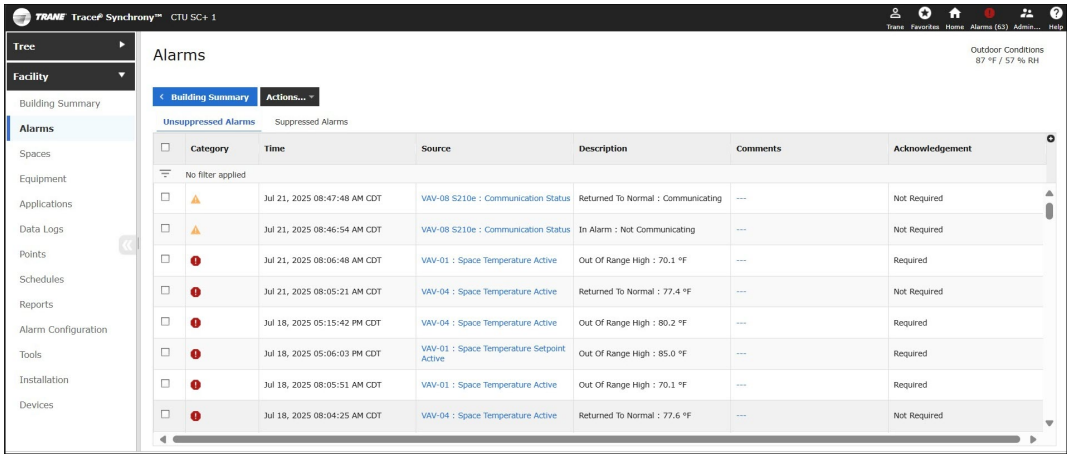
Trane recommends using Trane Connect Remote Access, a pre-engineered, secure IT technology, for remote access. For more information about Trane Connect Remote Access, refer to the *Intelligent Services Software Interface for Trane Connect Remote Access, User Guide* (BAS-SVU22*-EN). If the Tracer BAS does not have access to the internet, a Tracer Cellular router, or Trane USB Cellular Module can be used. For more information about the cellular router solution, including ordering information and remote access, refer to the *Trane Cellular Router Solution, Installation, Operation, and Maintenance* (BAS-SVX067*-EN).

Alarms

The alarm handling capabilities of Tracer® SC+ allow users to receive, view, acknowledge, and make comments on building alarms and events. BACnet standard requires alarms and events. An alarm is used to indicate an abnormal condition such as a sensor failure. An event is something that is expected to happen in a system, such as a chiller shutting down because it was no longer needed. Trane Tracer uses categories to classify the alarms; however, third party BAS systems still use the events. If a critical alarm exists an alarm icon flashes in the global navigation bar, which remains visible in the right corner of every page on the user interface.

The Unsuppressed Alarms tab contains a list of all unsuppressed alarms that have been detected by the system. Data displayed includes when and where the event occurred and whether operator acknowledgment is required. The Suppressed Alarms tab lists all unnecessary alarms that are suppressed. Suppressed alarms will not be annunciated or routed to e-mail recipients.

Figure 29. Alarms log



Alarm Configuration

Alarm configuration consists of:

- Assigning or creating categories (previously called severities).
- Assigning or creating notification classes.
- Routing alarm e-mail.
- Enable audible alarm notification.
- Creating alarm message templates.
- Creating Alarm Suppression.

Click Alarm Configuration from the left navigation menu to open the Alarm Configuration page.

Alarm Categories

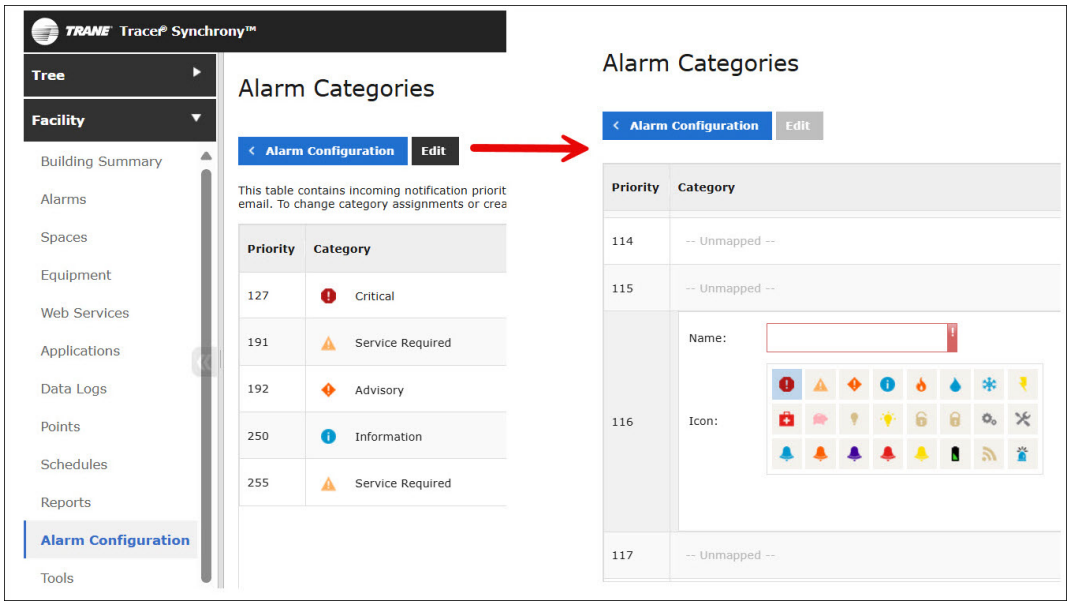
You can categorize alarms to determine how they appear in the Alarm log. A category can be assigned to a priority number 0-255. You can create additional categories and select an accompanying icon. Benefits of customizing alarm categories include the ability to send a specific alarm to a specific person, and to differentiate critical equipment alarms from others.

Creating Alarm Categories

1. Click **Alarm Configuration>Alarm Categories.**The Alarm Categories page opens.
2. Click **Edit**. The table expands to show a list of priorities. (The smaller the number, the higher the priority).
3. Click on a row that is labeled Unmapped, and then click **Create Category**.
4. Select an existing category from the drop-down list or click Create Category to enter a new name and select an icon. Click Save.

   Note: *Be mindful of the priority you are mapping. For example, you might want a category for a Chiller's transition to the alarm state to be mapped to a higher priority opposed to a Chiller's return to normal state.*

Figure 30. Creating or editing alarm categories



Edit an Alarm Category

1. From the **Alarm Categories** page, click the **edit** button.
2. Click on the specific category and then click **Edit Category**.
3. To change the icon, click on the existing icon to expand icon choices. To change the name, type a new one in the Name field. Click the **Save** button located within the category.
4. Repeat the above steps if you have additional categories to edit.
5. Click the **Save** button located at the bottom right corner of the page after all your edits have been made.

Unmap an Alarm Category

1. From the Alarm Categories page, click the edit button.
2. Click on a specific category and then click Unmap Category. This will remove the category from any notification classes to which it has been mapped.
3. Repeat the above steps if you have additional categories to unmap.
4. Click the Save button located at the bottom right corner of the page after all your edits have been made.

Alarm Message Templates

Alarm message templates allow you to control the amount of data to match the recipients device. As an example, cellular text has a character limit. Templates allow you to assign a factory-default template as an e-mail or a cellular template. Custom templates can also be created. Templates that have been assigned will be used to draft the alert message that will be sent to the user through the selected messaging service (e-mail or cellular text).

To create an alarm message template:

1. On the Alarm Configuration page, click **Alarm Message Templates**.
2. On the Alarm Message Templates page, click **Create Template**. The **Create Message Template** dialog opens.
3. Enter a name in the **Alarm Message Name** field. For example, Comm Loss.
4. Enter a description in the **Description** field. For example, Send this message when Comm Loss occurs.
5. In the **Alarm Message Subject** field, enter a short message that briefly describes the specifics of the event. You can also use terms by selecting from the Place Holders list, then click the **Add** button.

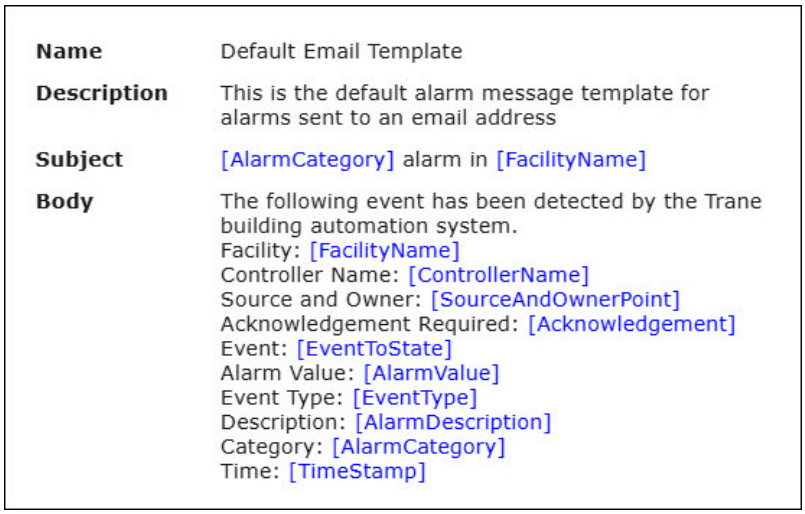
Note: *When a message is delivered the Place Holders will display corresponding values at the time the message was generated. For example, the Facility Name place holder will display the name of the facility as defined in the system controller.*

6. In the Alarm Message Body, compose a message that corresponds to the alarm message name and description. Use place

holders to indicate important details that should be included in the message (See the following figure).

7. Click **Save**.

Figure 31. Example of an Alarm Message template (template body)



To assign a message template:

1. On the Alarm Configuration page, click **Alarm Message Templates**.
2. Select a message template from the list, then click the **Actions** button and select **Assign**. The **Assign Message Templates** dialog opens.

   Note: *The Actions button is displayed only if the user has Alarm configuration permission.*
3. Determine the user or users to which the template will be assigned, then select whether the message will be transmitted by e-mail or cellular.
4. Click **Save**. A confirmation dialog box appears. Click **Save Assignments**.

To delete a message template:

1. Select a message template from the list, then click the **Actions** button and select **Delete**. The **Delete Confirmation** dialog opens.

   Note: *The Actions button is displayed only if the user has Alarm configuration permission.*
2. Click **Delete** to confirm.

Notification Classes

When a device has a problem or a fault, such as when the present value of a property rises above a predetermined level, a notification class object defines where a device will send an alarm and the priority of that alarm.

Tracer SC+ and Tracer unit controllers have their own list of notification classes used for alarm routing. The notification classes in Tracer SC+ are used for points and applications in Tracer SC+ only and cannot be assigned to a point in a BACnet unit controller. Likewise, each unit controller uses its own list of notification classes to route alarms.

The most common notification classes are:

- HVAC-Critical
- HVAC-Service Required
- HVAC-Warning
- HVAC-Information

Create or Edit Notification Classes

Create notification classes at the Tracer Synchrony user interface after you have created alarm categories.

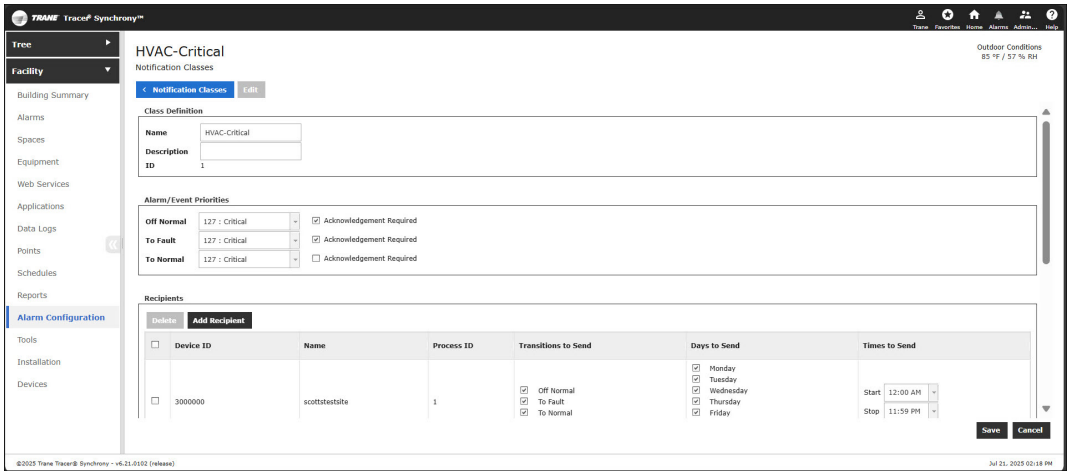
1. From the Tracer Synchrony left navigation menu, click **Alarm Configuration > Notification Classes.** The **Notification Classes** page opens.

2. To view or edit a notification class click on the class name, which opens the definitions page (see the following figure). To make changes, click **Edit**. To create a class, click **Create Notification Class**.

   Note: *The following instructions also apply to creating a notification class.*

   1. In the **Class Definition** section edit or enter a name for the notification class, and a description (optional).
   2. In the **Alarm/Event Priorities**, select an alarm priority/category for each transition and whether or not acknowledgment is required. The state of a point is determined by its internal logic. When a point changes from its current state to another state, a transition has occurred and an event is generated by the point. A point is always in one of the following three states:
      - **Off Normal**: Indicates that the object is functioning correctly, but the value is outside the user-defined range.
      - **To Fault**: Indicates that the object is not functioning correctly and the value is unreliable.
      - **To Normal**: Indicates that the object is functioning correctly and the value is within the user-defined range.
3. In the Recipients section select which transitions will be sent to the listed recipients, and the days and the time of day in which they will be notified
4. Click **Save**.

Figure 32. Create or edit notification classes



Routing Alarm E-mail

Alarm routing consists of rules (or routes), in which alarms are be sent by way of e-mail to specified users. The alarm routing list shows where and when specified alarms will be routed. It is best practice to set up alarm e-mail routing after alarm categories and notification classes have been created. Use the **Actions** button to edit or delete routing rules.

To initiate alarm e-mail routing, routing rules must be configured.

An event routing rule dictates that events mapped to a specified severity value be sent to a specified operator. The rule contains a routing schedule that specifies when e-mails are sent.

Routing rules are created on the **Create Routing Rule** page. After saving a routing rule, it appears on the **Routing Event E-mail** page.

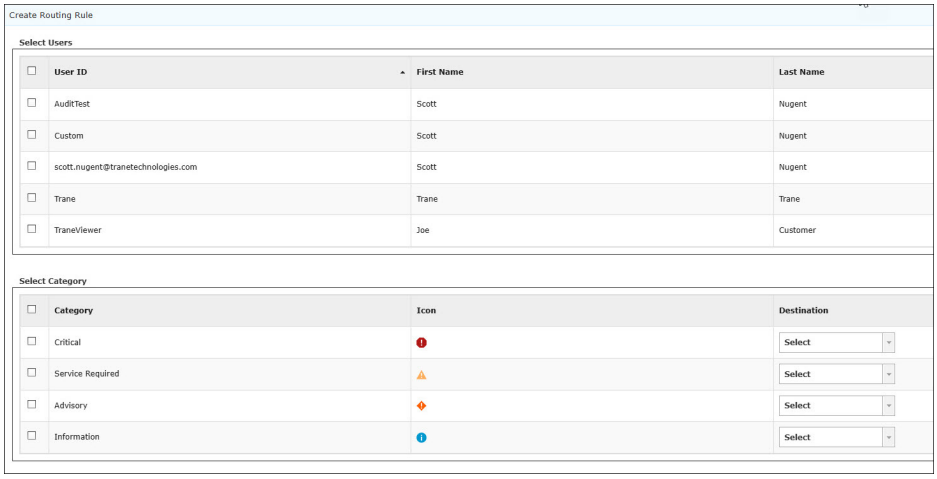
Adding a Routing Rule

1. From the left navigation menu, click **Alarm Configuration>Routing Alarm E-mail**. From the **Routing Alarm E-mail** page, click **Add Routing Rule.** The **Create Routing Rule** page appears as shown in the following figure.
2. In the **Select User** section, select the users who will be notified about specified alarms.

Note: *E-mail addresses are specified in Tracer Synchrony user profiles.*

3. In the **Select Category** section, select alarm categories that the users will be notified about.
4. In the **Set Routing Schedule** section, specify the days and times in which users will be notified of new alarms.
5. Click **Save**. The **Routing Event E-mail** page appears, which shows the routing rules that you just created.

Figure 33. Create a routing rule

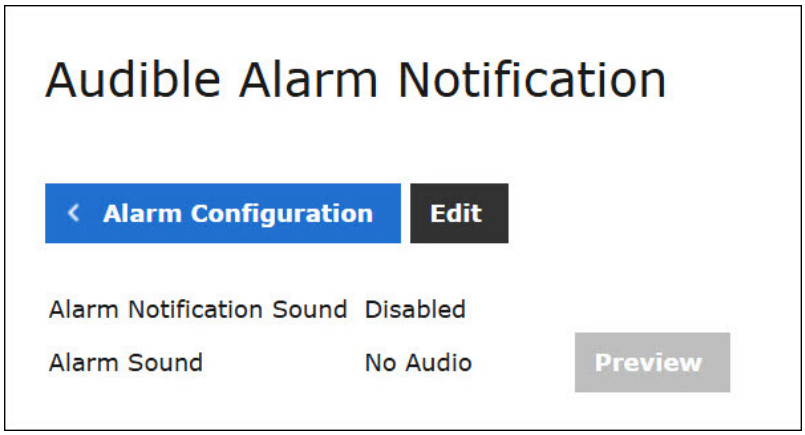


Enabling Audible Alarm Notification

Audible alarm notification enables an audio alarm in which alarm acknowledgement is required. The default audible sound is **ding**. Custom audio files can be configured and cannot exceed 500 kB. Supported formats are mp3 and wav.

1. From the Alarm Configuration page, click **Audible Alarm Notification**, then click **Edit**.
2. Select to enable (or disable) the **Alarm Notification Sound**.
3. Use the radio buttons to select default audio or custom audio. For custom audio, use the browse feature to make a selection.
4. Click **Save**.

Figure 34. Audible Alarm Notification



Mass Point Edit

Alarm Mass point allows you to edit the alarm configuration for multiple equipment points in one action.

1. Select one point at a time with the Point tab, or select one point in multiple equipment from the search tab. The search function is dynamic — it displays all possible options immediately after you begin keying in data. Points must be the same type (AO, AI, BI, etc.) to have the same properties.
2. Click the Add button in the tree to move the points to the Selected Items tree.
3. Click Next. The Edit Point Alarming Properties dialog box opens.
4. Configure the alarm conditions and notifications for the selected points. Click Finish to save.

Figure 35. Mass point edit configuration

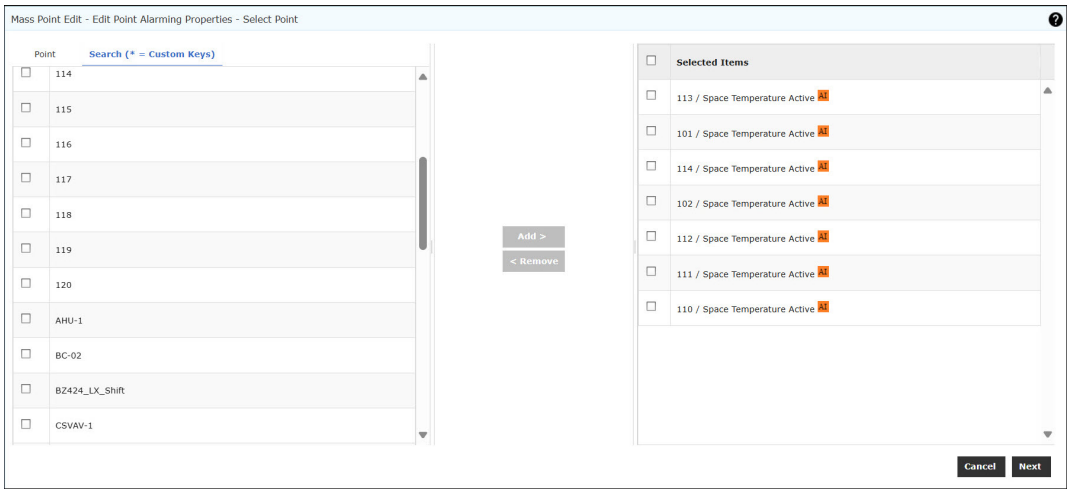
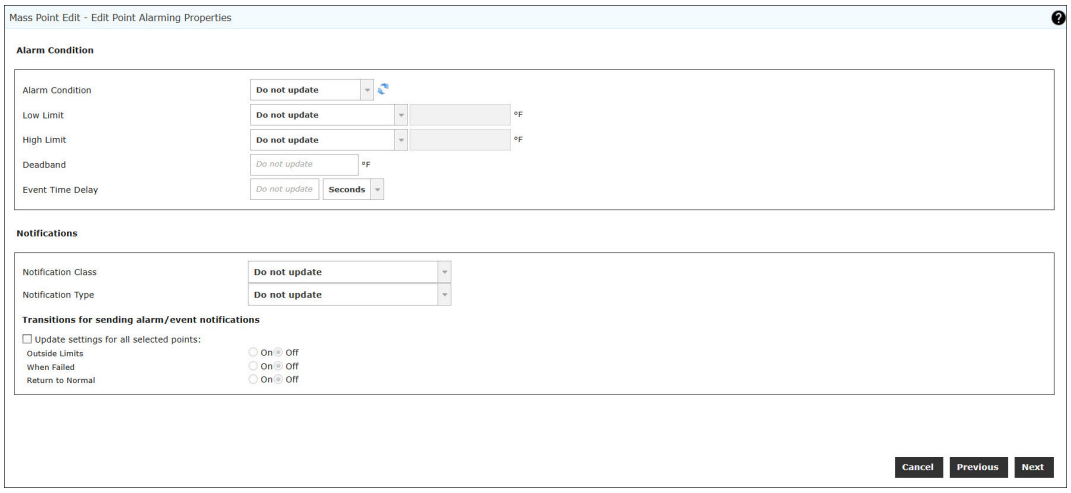


Figure 36. Mass point edit configuration, continued



Alarm Suppression

Alarm Suppression allows you to suppress unnecessary alarms. If an alarm occurs at the source (piece of equipment upstream) and the load (piece of equipment downstream), the alarm at the load is probably caused by the alarm at the source. The alarms at the load will be suppressed to favor the alarm at the root cause so that the operator focuses at the problem at the source. Suppressed alarms will not be annunciated or routed to email recipients.

Adding a New Alarm Suppression Instance

1. From Alarm configuration page, select Alarm Suppression > Create Alarm Suppression.
2. Enter the **Name** and **Description** for the alarm suppression.
3. Select one of the following Rule option:
   a. Suppress Alarms when the following rules are true.
   b. Suppress Alarms when the following rules are false.
4. Select **Create Rule** button, to create rule for source.
5. In **Configure Rule** popup, select the type of rule. Each type will allow for a different comparison.
   - **Point to the value of a Property**
   - **Point-to-Point Differential**
   - **Point to Value Deadband**

- **Point to Point Percentage**

Note: *The rule type can be edited after the rule is created.*

6. Select the point, operation, value and time that will be evaluated. On the right side, you can edit or delete the rule.
7. Click on **Add condition** button to add more conditions within a rule and click **Next** button.
8. After the rules for Source are defined, select the downstream equipment (loads) for which alarms need to be suppressed. From the **Selection Tree**, select the one or more point/property in downstream equipment.
9. Click the Add button to move to Selected Items.
10. Click Finish button to create the Alarm Suppression instance.

Notes:

- *An Alarm Suppression instance can have multiple rules and each rule can have multiple conditions.*
- *Life Safety Alarms and Events (BACnet priorities 0-63) will not be suppressed.*
- *After alarm suppression instance is created, please verify and make sure alarms are suppressed as desired and the rules are setup correctly.*

Figure 37. Create alarm suppression — create rules for sources

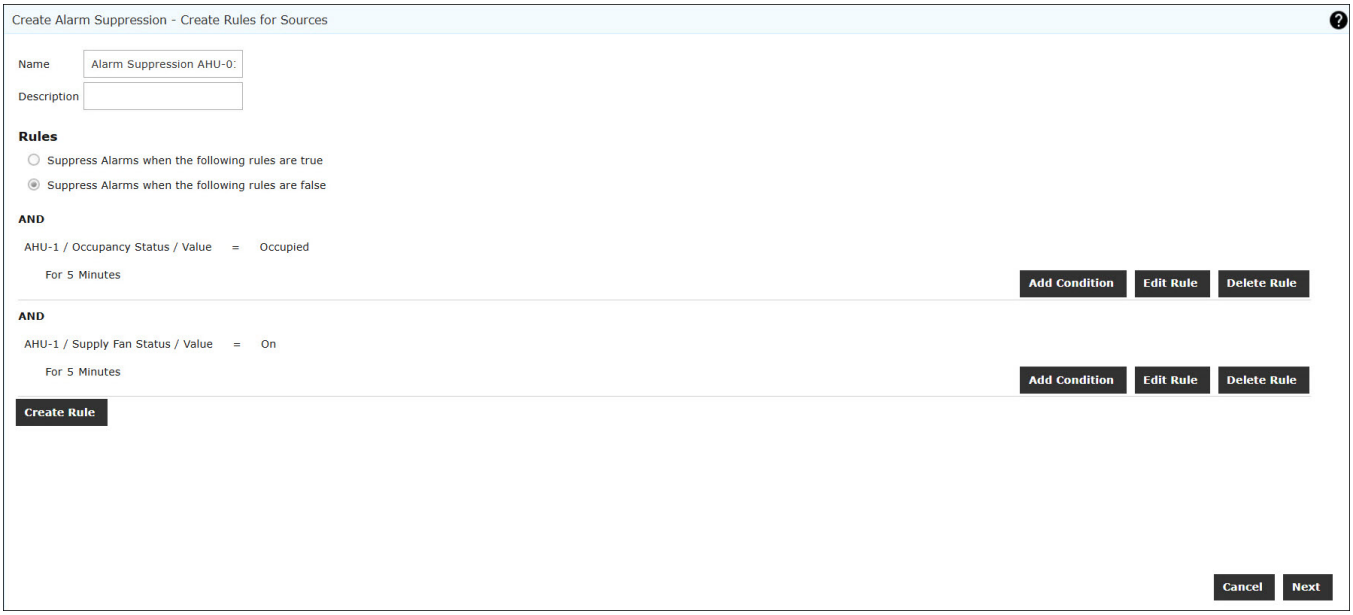
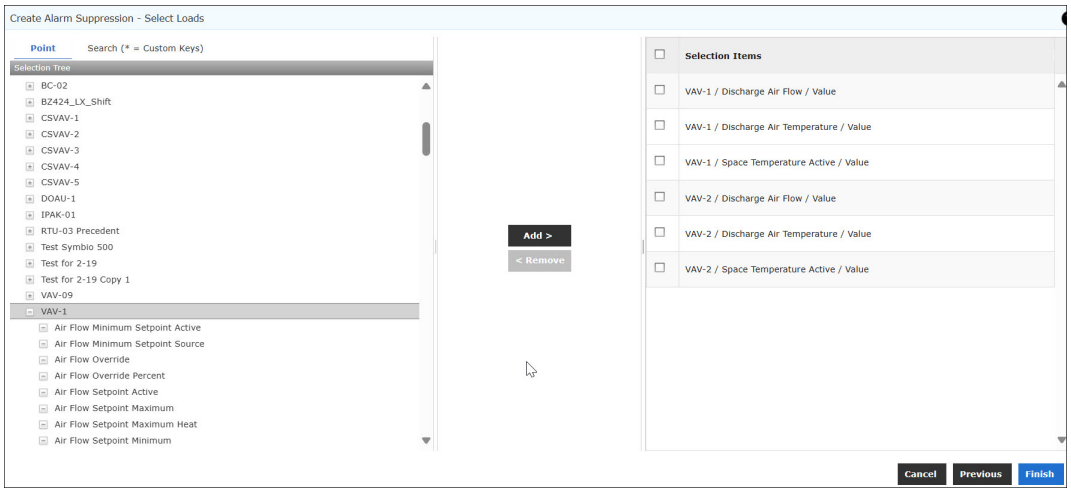


Figure 38. Create alarm suppression — select loads



Alarm Setup in Point Configuration

In Tracer Synchrony, each point can be configured to generate alarms under specific conditions (refer to “Points,” p. 70).

Configuring System-defined Points

Use the following procedure to configure system-defined points:

1. From the left navigation menu, select **Equipment** or **Spaces**. The **Equipment** or **Spaces** list page appears.
2. Select the preferred equipment from the **name** column, which opens the status page.
3. Select the **Details** tab, which displays all the system-defined points.
4. Select the name of the point that you want to set up for alarming, which opens the point status page.
5. On the point status page, select the **Configuration** tab.
6. Configure the point and then click **Save**.

Configuring User-defined Points

Use the following procedure to configure user-defined points:

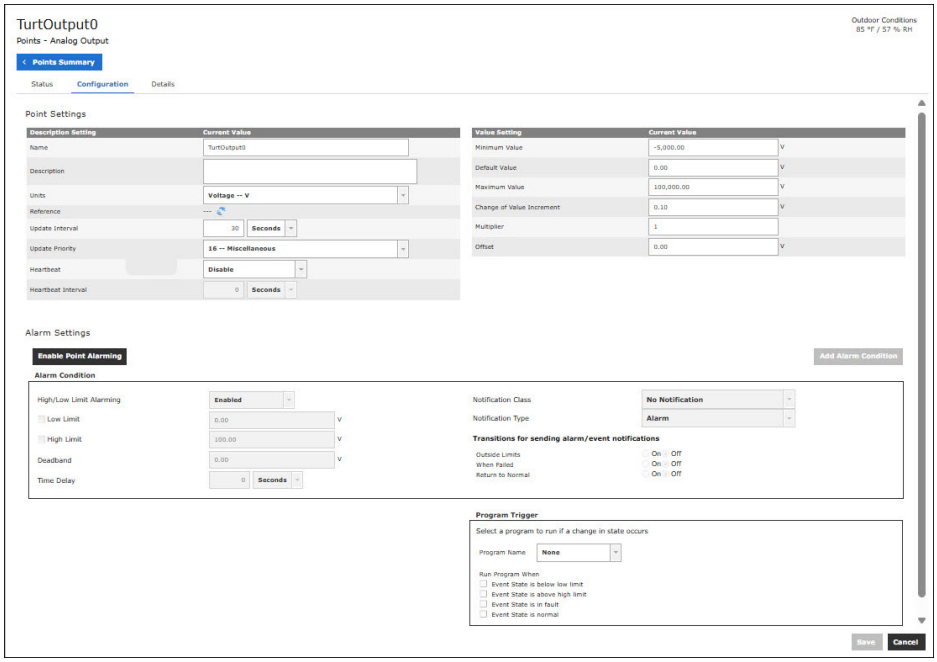
1. From the left navigation menu, select **Points**, and then select Analog, Binary, or Multistate, then select the point type (input, output, value). The selected points list page appears.
2. Select the name of the point that you want to set up for alarming, which opens the point status page.
3. On the point status page, select the **Configuration** tab**.**
4. Configure the point and click **Save**.

Analog Point Configuration

On the Analog Point Configuration page, you define the conditions that generate alarms for analog points.

Note: *The following figure and the content below show the contents of the analog output configuration page. For help with other point types, refer to the Synchrony online help.*

Figure 39. Analog point configuration



Point Settings

- **Name** — Enter a name for the point.
- **Description** — Enter a detailed description of the point function. This is an optional configuration.

- **Units** — The type of measurement that the point is configured to read. This property, along with the user preferred units, determines the type of units that a user sees on the screen. For example, if Units is configured for temperature and the user preference for temperature is Celsius (°C), then all relevant point information is shown in °C units.
- **Reference** — Click the reference icon to select a point reference or XM termination.
- **Update Interval** — The update interval defines the frequency at which the point requests the value of its reference. To configure the update interval, select the amount of time and a time unit. The suggested minimum interval is 10 seconds.
- **Minimum Value** — Enter a minimum value for the point before it will enter a fault state. The point value is capable of reporting a value below the minimum value, but any referenced value sent by the point will be capped at the minimum value. The system will not allow users to override a point at a value less than the minimum value. Third party systems are typically not affected by these parameters while performing overrides.
- **Default Value** — This is the default value of the point. The point reverts to this value if the point is not in control by another application or overridden by the user (priority array is empty).
- **Maximum Value** — Enter a maximum value for the point before it will enter a fault state. The point value is capable of reporting a value above the maximum value, but any referenced value sent by the point will be capped at the maximum value. The system will not allow users to override a point at a value greater than the maximum value. Third party systems are typically not affected by these parameters while performing overrides.
- **Change of Value Increment** — The Change of Value Increment triggers the point to send the new current value to all subscriptions. When exceeded, and there is a change of value (COV) subscription for the point, the point sends the recipient of the subscription the new point value. For example, if the COV increment is set at 1.0 and the current value changes by 0.8, notification is not sent. However, if the current value changes by 1.1 since the last update, the point will send the new value to all subscriptions. The change of value increment can also be changed by modifying the threshold of an analog point data log.
- **Multiplier** — The multiplier value reads the referencer value of the point and then multiplies it by the current multiplier value.
- **Offset** — The offset value is added to the raw point value. If the offset is positive, the value will be added to the referenced value. If the offset is negative, the value will be subtracted from the referenced value.

Alarm Settings: Alarm Condition

- **Enable/Disable Point Alarming** — Click this button to enable or disable point alarming. Point alarming must be enabled in order to configure alarm conditions. Disabling point alarming turns off all alarming functionality for the point (limits, failures, transitions).
- **Add Alarm Condition**: Click this button to create secondary alarm conditions that occur in situations outside the primary alarm conditions. It works in conjunction with the High/Low Limits Alarming feature. For example, a space temperature setpoint is configured to go into alarm if the temperature drops below 65 degrees. However, if you do not want the alarm to be activated when the space is unoccupied, High/Low Limits Alarming prevents this from occurring. But there is still a need for an alarm if the space temperature drops below 50 degrees. Therefore, you can create additional alarm conditions to trigger an alarm when the space drops below 50 degrees.
- **High/Low Limits Alarming** — This feature detects whether the value of the point exceeds the range defined by the high and low limits. The limits can be enabled or disabled. If disabled, the point value range will have no high or low limit; therefore, an alarm will not be triggered. Disabling limits is useful when the space is unoccupied. When the Outside Limits Calculation is enabled, and the value of the point exceeds the high or low limit, the point will transition to the OFF-Normal state (In Alarm). When High/Low Limits Alarming is disabled, the point will not transition to the OFF-Normal (In Alarm) state if the point's value exceeds the limits.
- **Low Limit**: A value lower than the low limit generates an alarm.
- **High Limit:** A value higher than the high limit generates an alarm.
- **Deadband**: This value is set to prevent rapid transition between states, which generates nuisance alarms. The deadband functions as follows:
  - If an alarm condition exists because the low limit has been exceeded, the value must be greater than the low limit plus the deadband to return to normal operating conditions.
  - If an alarm condition exists because the high limit has been exceeded, the value must be less than the high limit minus the deadband to return to normal operating conditions.
- **Time Delay**: If an alarm condition exists, time delay is the amount of time to elapse before an alarm is generated.
- **Notification class**: Select the notification class.

  Notify type: If **alarm** is selected, the point will appear in the **All Items in Alarm** site report if the point is in **Outside Limits** when the report is run.

- **Outside Limits**: If **On** is selected, an alarm generates when the **Low Limit** or **High Limit**, as specified in Alarm Condition, is exceeded.
- **When Failed**: If **On** is selected, an alarm generates if the **Minimum Value** or the **Maximum Value**, as set in the Point Settings section, is exceeded.
- **Return to Normal**: If **On** is selected, an alarm generates when point status returns to normal.

Alarm Settings: Program Trigger

Program Trigger is not affected by the Add Alarm Condition feature.

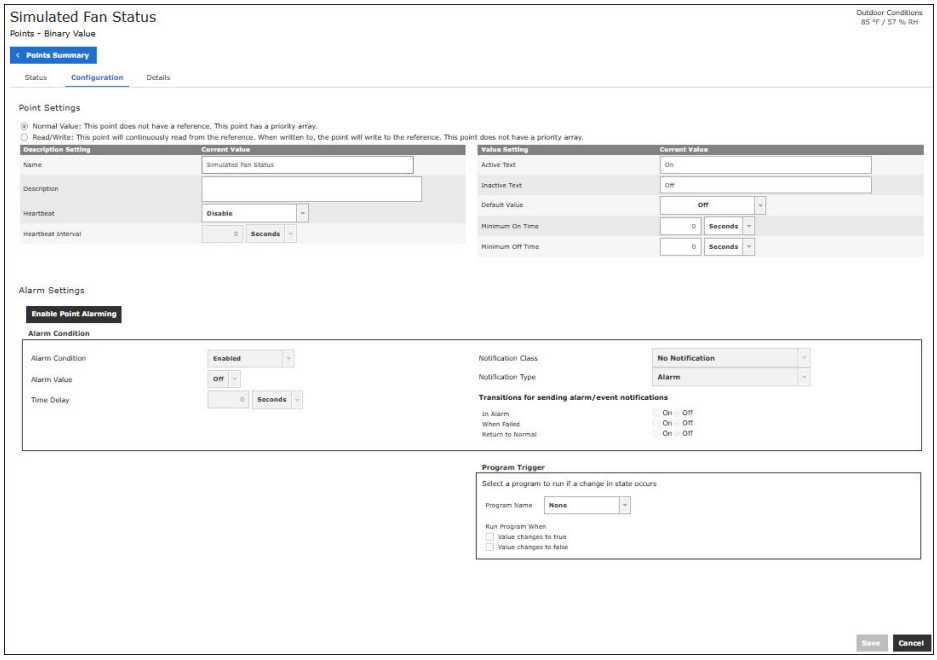
- **Program Name**: If selected, the associated TGP program will run when the selected event state occurs.
- **Run Program When:** The selected program will run when a specific event state is selected.

Binary Point Configuration

On the Binary Point Configuration page, you define the conditions that generate alarms for binary points.

Note: *The following figure and the content below show the contents of the binary value configuration page. For help with other point types, refer to the Tracer Synchrony online help.*

Figure 40. Binary value configuration



Point Settings

- **Heartbeat —** Use the drop-down list to enable or disable this function.
- **Heartbeat Interval** — Enter the maximum amount of time in which the point must receive a command. If the point is not commanded within this interval, the point will enter a fault state.
- **Active Text** — This text appears when the binary point is true.
- **Inactive Text** — This text appears when the binary point is false.
- **Default Value** — This is the default value of the point. The point reverts to this value if the point is not in control by another application or overridden by the user (priority array is empty).
- **Minimum On Time** — This is the minimum time that the point must remain on when it transitions from Off to On before it will respond to an Off command. Configuring this value to zero disables the minimum on timer. Select an amount of time and a time unit.
- **Minimum Off Time** — This is the minimum time that the point must remain off when it transitions from On to Off before it will respond to an on command. Configuring this value to zero disables the minimum off timer. Select an amount of time and a time unit.

Alarm Settings: Alarm Condition

- **Enable/Disable Point Alarming** — Click this button to enable or disable point alarming. Point alarming must be enabled in order to configure alarm conditions. Disabling point alarming turns off all alarming functionality for the point (limits, failures, transitions).
- **Alarm Condition** — To conditionally enable/disable high/low limit alarming set a reference to a Binary or Multistate point and select the states that will enable alarming. When the value of the reference matches the defined states, alarming is enabled. The point reference for alarming is limited to points that reside within the controller, there is no off-box referencing.
- **Alarm Value**: Defines the alarm state (either active or inactive).
- **Time Delay**: If an alarm condition exists, time delay is the amount of time to elapse before an alarm is generated. **Example** — When the point value matches the alarm value continuously for the event time delay, the binary point event state will transition to an alarm. When the alarm state does not match the value of the point continuously for the event time delay, the event state transitions to normal.

Alarm Settings: Event Notification

- **Notification class**: Select the class where notification will be sent to. Classes are set up in event routing. If you select **No Notification**, the event or alarm will not be sent to the alarm manager when the point enters an alarm or fault condition.
- **Notification Type**: If alarm is selected, the point will appear in the **All Items in Alarm** site report if the point is **In Alarm** when the report is run.
- **In Alarm**: Identifies the state that will initiate an event.
- **When Failed**: If **On** is selected, an alarm generates if no valid value exists (point in fault).
- **Return to Normal**: If **On** is selected, an alarm generates if the point returns to its non-alarm state.

Alarm Settings: Program Trigger

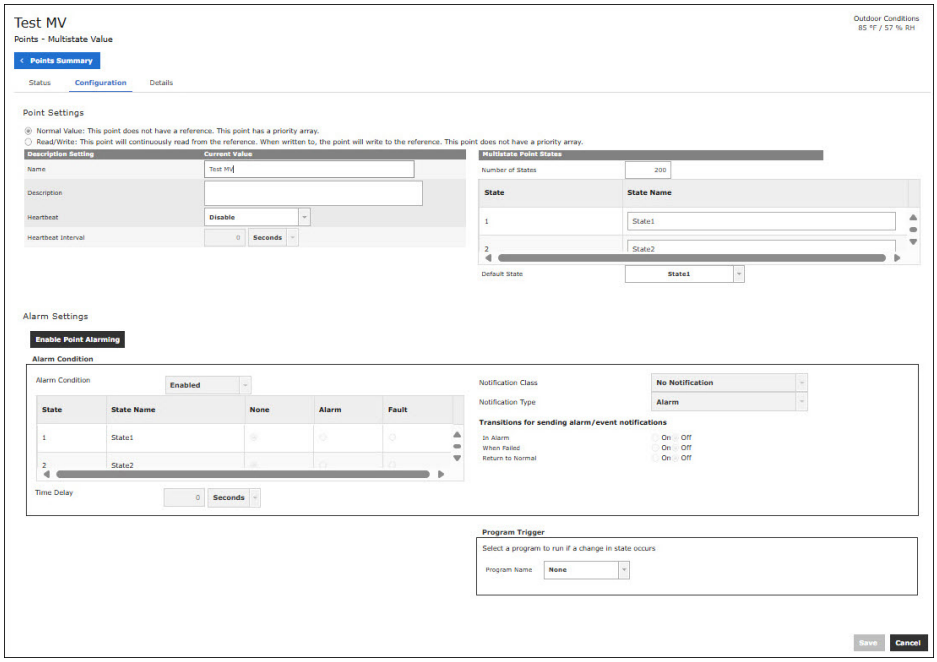
- **Program Name**: If selected, the associated TGP program will run when the selected event state occurs.
- **Run Program When:** The selected program will run when a specific event state is selected.

Multistate Point Configuration

On the Multistate Point Configuration page, you define the conditions that generate alarms for multistate points.

Note: *The following figure and the content below show the contents of the multistate value configuration page. For help with other point types, refer to the Tracer Synchrony online help.*

Figure 41. Multistate value configuration



Point Settings: Multistate Point Values:

- **Reference** — Select a referencer for the point by clicking the referencer icon. Referencers obtain values and state status from another source within the system, such as the fan-speed selector switch on a thermostat. Any multistate point can be referenced. However, when the **use values entered below instead of states** check box is selected only an analog point can be referenced. See note below.
- **Heartbeat —** Use the drop-down list to enable or disable this function.
- **Heartbeat Interval** — Enter the maximum amount of time in which the point must receive a command. If the point is not commanded within this interval, the point will enter a fault state.
- **Number of States** — Shows the number of states for the point.
- **State name** — Enter a descriptive state name in this field.
- **Default State** — Select a default state for the point. The point reverts to the default state if is not controlled by another application or is overridden by the user.

Alarm Settings: Alarm Condition

- **Enable/Disable Point Alarming** — Click this button to enable or disable point alarming. Point alarming must be enabled in order to configure alarm conditions. Disabling point alarming turns off all alarming functionality for the point (limits, failures, transitions).
- **Alarm Condition —** To conditionally enable/disable high/low limit alarming set a reference to a Binary or Multistate point and select the states that will enable alarming. When the value of the reference matches the defined states, alarming is enabled. The point reference for alarming is limited to points that reside within the controller, there is no off-box referencing.
- **None**— If the state condition is set to none, the event state will not enter into alarm or fault when the point state is equal to the state condition.
- **Alarm**— If the state condition is set to alarm, the event state will transition to alarm when the state matches this state for the event time delay.
- **Fault**— If the state condition is set to fault, the event state will transition to fault when the state matches this state for the event time delay.
- **Time Delay** — This is the amount of time that must elapse when the point is out of range before the point will enter an alarm or fault condition. Time delay also applies when a point is returned to a normal condition.

Alarm Settings: Event Notification

- **Notification class**: Select a notification class where the event or alarm will be sent. Classes are set up in event routing. If **No Notification** is selected, the event or alarm will not be sent to the alarm manager when the point enters an alarm or fault condition.
- **Notification Type**: If **Alarm** is selected, the point will appear in the **All Items in Alarm** site report if the point is **In Alarm** when the report is run.
- **In Alarm**: Select whether to be notified or not when the point goes into alarm.
- **When Failed**: Select whether notification will be sent when the point enters into a fault state.
- **Return to Normal**: Select whether notification will be sent when the event state of the point transitions from a non-normal state to a normal state.

Alarm Settings: Program Trigger

- **Program Name**: If selected, the associated TGP program will run when the selected event state occurs.

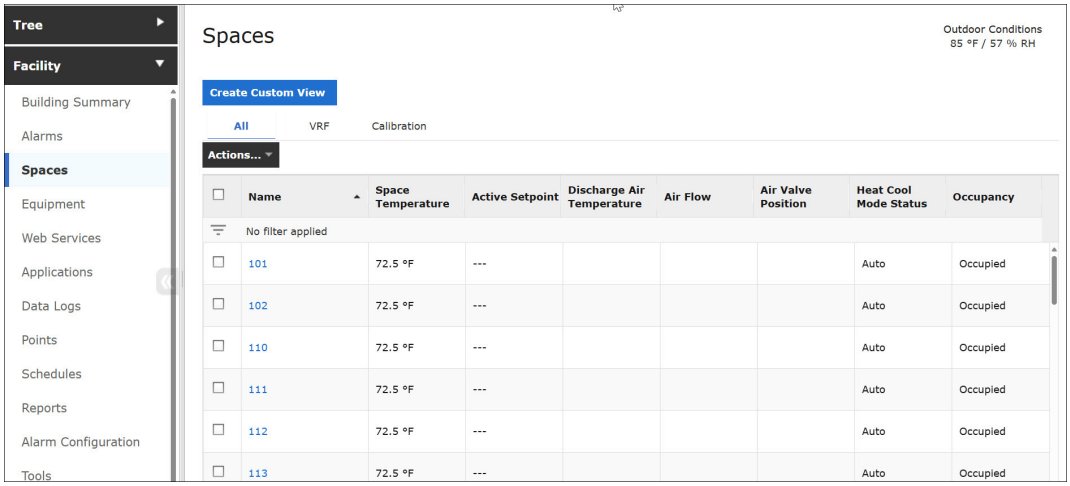
Spaces

Spaces refer to equipment that controls a single space, such as:

- Variable-air-volume (VAV) boxes
- Fan coils
- Unit ventilators
- CV Rooftops
- Variable Refrigerant Flow (VRF) indoor units

The Spaces page contains the most frequently needed data for equipment of these types. The Actions menu allows you to simultaneously override some settings on multiple equipment selections. The VRF tab lists only VRF indoor units and the Actions menu allows specific VRF overrides for multiple devices.

Figure 42. Spaces page



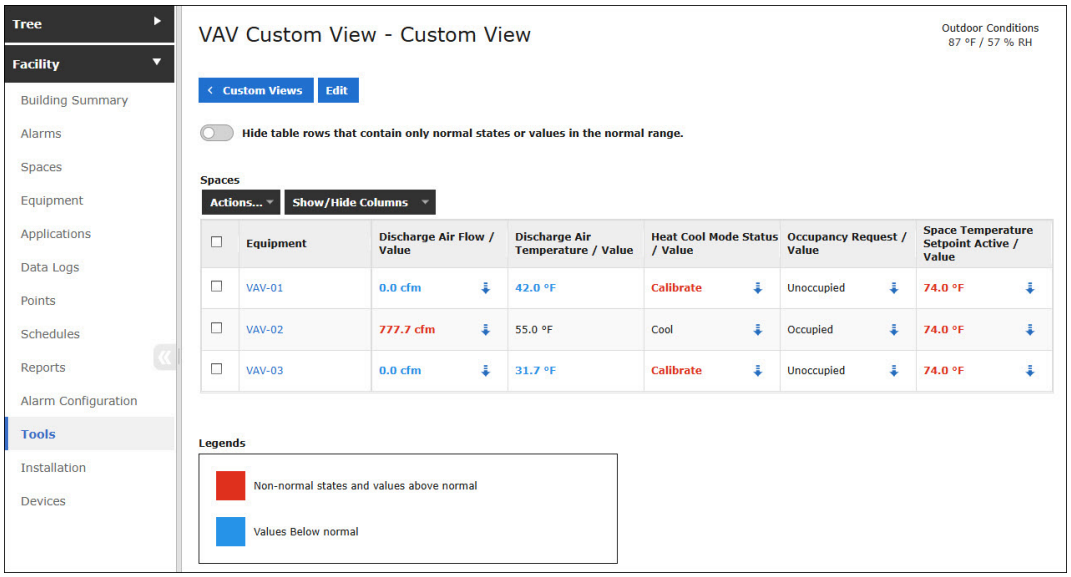
Custom Views of Spaces

Custom views for spaces allow you to manage point values of equipment that are serving a space. A maximum of five custom views can be created on the Spaces page. Based on conditional display setting value, above-range or non-normal states are shown in red and values below range are shown in blue. From the **Actions** button, following selections are available:

- Override Occupancy — Select to override occupancy on the space.
- Override Space Temperature Setpoint — Select to override the space temperature setpoint.
- Enable Local Setpoint — Select to enable the predefined local setpoint.
- Disable Local Setpoint — Select to disable the local setpoint.

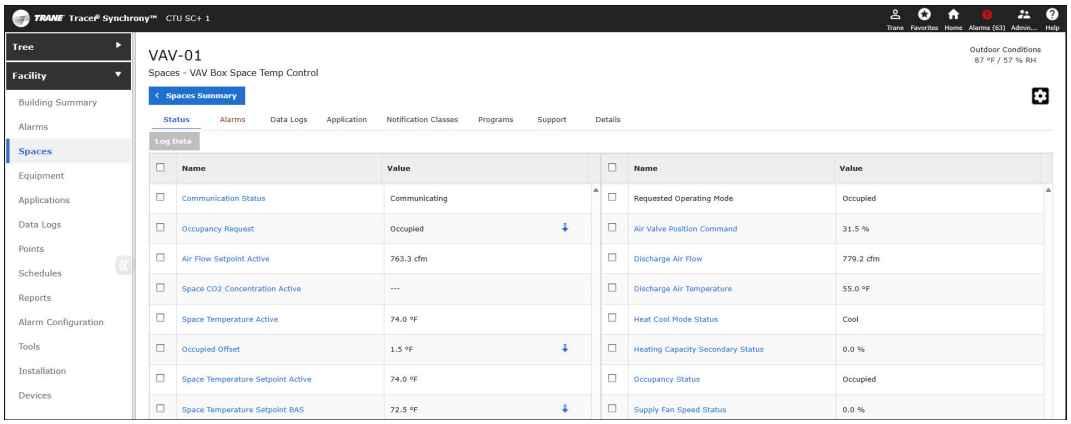
Note: *Individual overrides can be done by clicking the blue downward arrow.*

Figure 43. Custom view spaces



To view a status page for a specific space, click an item in the **Name** column of the Spaces page. The following figure shows an example of a spaces status page.

Figure 44. Spaces status page



Graphic and Status Page Point Display Configuration

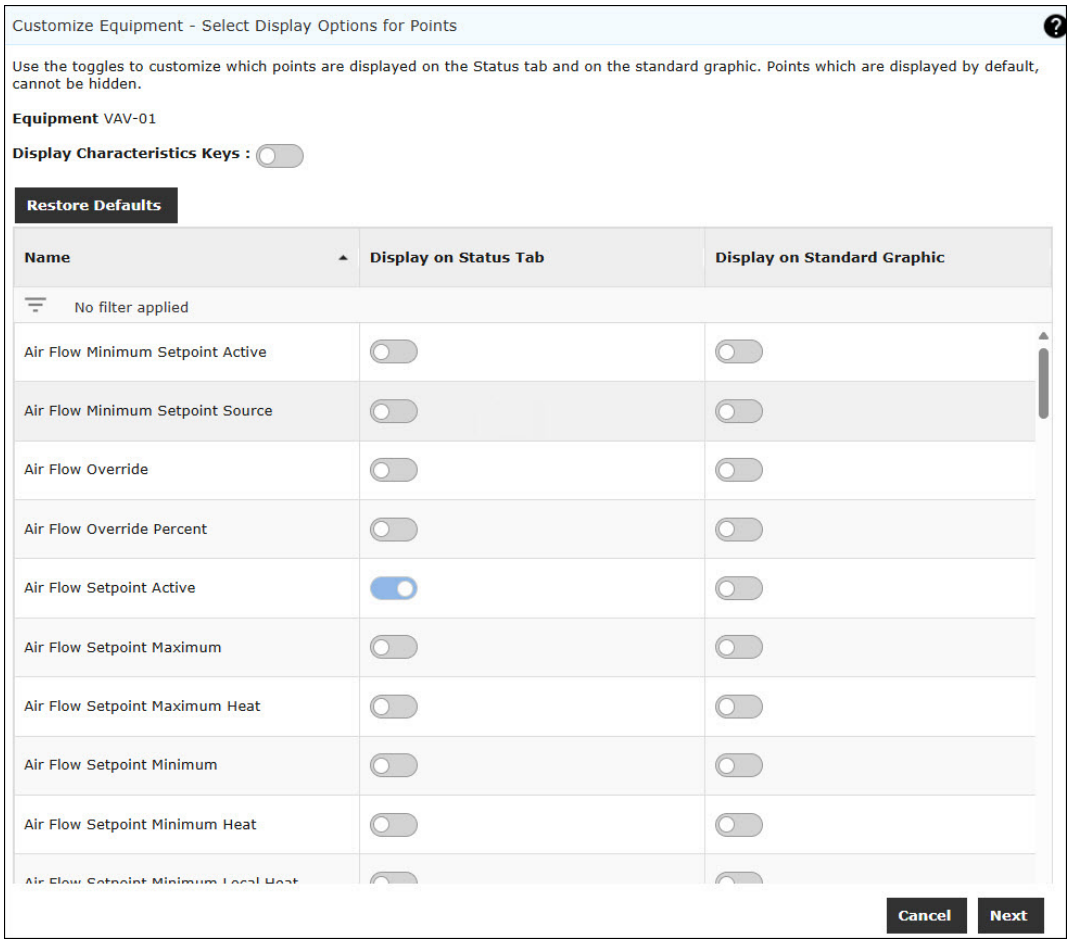
Both the Graphic and Status pages can be configured to display additional points available on the controller.

To customize a standard graphic or a status table:

1. Click the settings icon located at the top right of a Space status page. The **Customize Equipment — Select Display Options for Points** dialog box opens.
2. Click the toggle buttons to the right for the points that you want displayed on the Status tab or the Standard Graphic tab.
3. Click the toggle buttons to the left to remove points from the display.

   Note: *Points that are displayed by default cannot be hidden.*
4. Click **Next**. The **Customize Equipment — Apply Display Options to Equipment** dialog box opens.
5. Use the radio buttons to select whether your selections will apply to the current space or multiple spaces (equipment).
6. Click **Finish**.

Figure 45. Selecting display options for points



Equipment

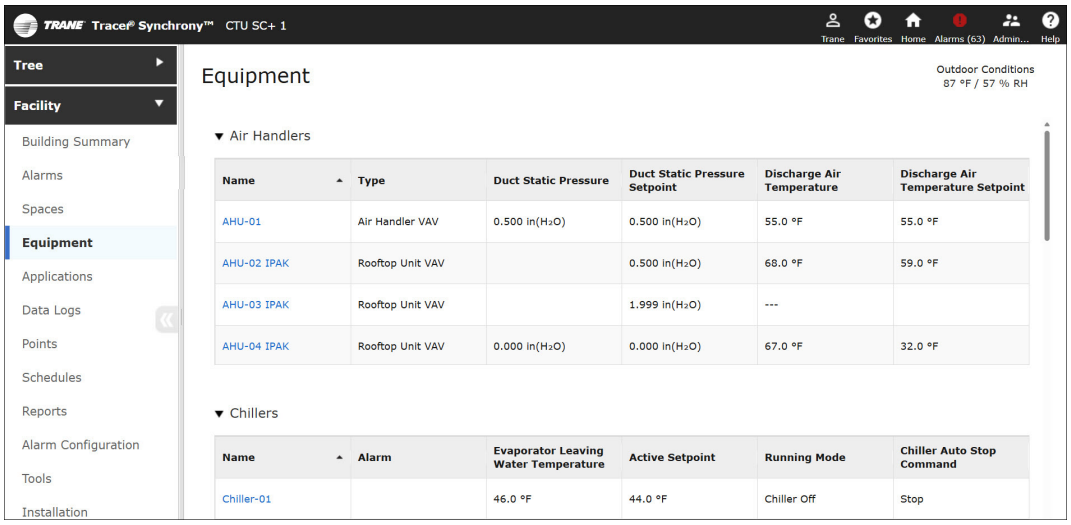
Equipment is the function and role, or software representation, of the physical devices in the Building Automation System (BAS). All devices that are not installed as Spaces are represented as equipment upon installation, which makes them available to view and control by the BAS.

The following are examples of equipment:

- Air handling units (AHUs) — including rooftop, commercial self-contained, and built-up units (modular climate changers) — that are either of the following types:
  - Constant-volume AHUs, which perform space temperature control using a constant airflow
  - Variable-air-volume AHUs, which modulate the supply air, based on static or space temperature control
- Generic (equipment not classified as spaces or AHUs) and programmable controllers:
  - Lighting control panels
  - Communicating CO_2 sensors
  - Field-programmable controllers: MP580/581, UC400 programmable, MP501 with generic-mode configuration, MP503
- Variable Refrigerant Flow (VRF)
  - Outdoor units
  - Branch controllers
  - Remote controllers
- Support
  - Variable frequency drives (VFDs)
  - Pump
  - Fan
  - Cooling tower

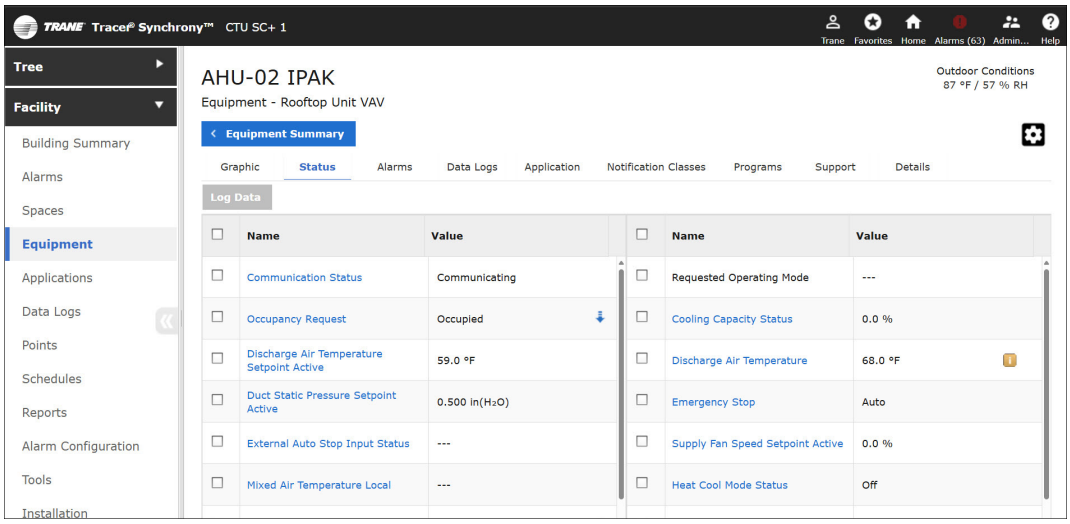
The **Equipment** list page contains the most frequently needed data for each piece of equipment of these types.

Figure 46. Equipment list page



To view a status page for a specific piece of equipment, click an item in the name column of the Equipment list page. The following figure shows an example of an equipment status page. On the Equipment Status page you can navigate to Alarms, Data Logs, and Applications that are specific to the equipment by clicking on the individual tabs. New data logs can be created by clicking the **Log Data** button.

Figure 47. Equipment status page



Web Services

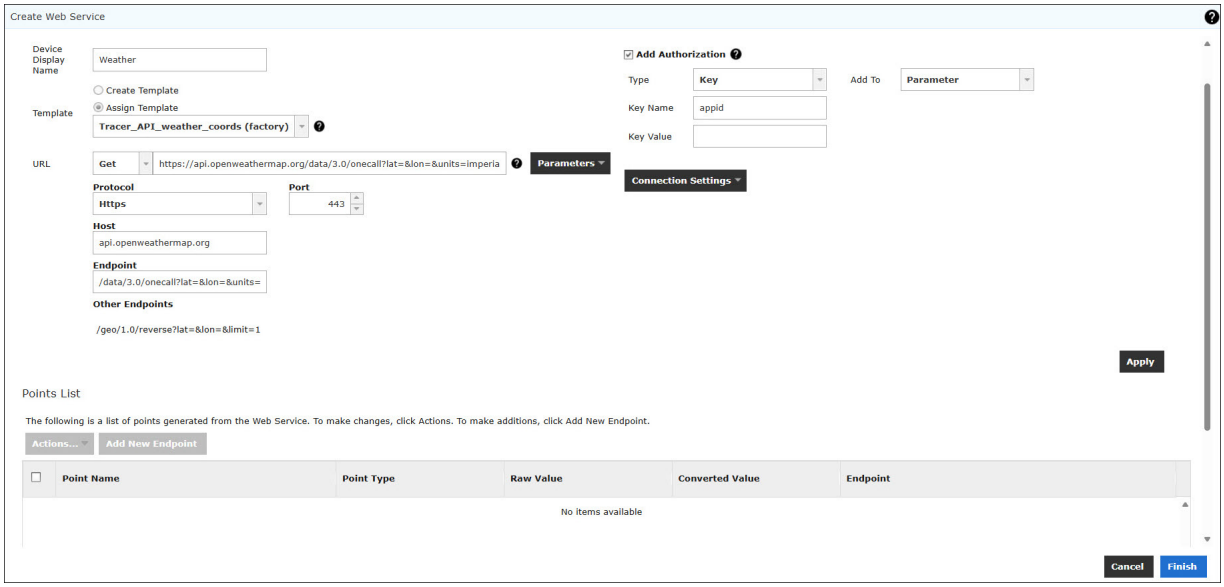
The Web Service page user interface in Tracer synchrony allows users to set up, manage, and troubleshoot API connections. When users access the Web Services tab, they will see the Web Service main page. Under this main page, there is a section dedicated to APIs.

API Functionality Overview

Tracer SC+ acts as a client, fetching data from servers or devices that support APIs. This allows the Tracer SC+ controller to interact with web services (e.g., weather, air quality index) or devices like people-counting cameras. The APIs use protocols and data formats such as URLs (API server addresses), endpoints (paths to access data), REST APIs (HTTP methods like GET, POST, PUT), and JSON (a lightweight data format for exchanging information).

An API Builder license is required to create new API connections or make any sort of modifications to existing API. For more information, refer to *Tracer® SC+ API Builder User Guide* (BAS-SVU057A-EN).

Figure 48. Web services



Applications

Tracer SC+ includes a powerful system control engine. Every Tracer SC+ ships with several factory engineered HVAC applications, support for Trane Earthwise™ Systems, and a powerful custom graphical programming language.

Tracer SC+ supports the following system applications:

- Area
- Variable Air Systems (VAS)
- Chiller Plant Control (CPC)
- Trim/Respond
- Linear Reset
- Demand Management

The Synchrony user-interface for each system component allows you to view status, configure the system and its functions, and to view and add members.

Area Application

Area is an application that resides on the Tracer SC+. The primary function of Area is to coordinate the start and stop of equipment based on a schedule stored in the Tracer SC+. An Area may consist of a single room, a group of rooms, a large open warehouse, a manufacturing space, or any grouping defined by a system user. Area allows such functions as synchronizing member setpoints and controlling a large number of devices to be performed as one efficient operation.

Area can be configured to use multiple algorithms, along with area temperatures and humidity inputs, to make an economizing decision.

Area also supports:

- Optimal start/stop
- Humidity pulldown
- Unoccupied Economizer (formally Night Purge)
- Unoccupied heating/cooling setpoints
- Unoccupied humidify/dehumidify
- Timed override functions
- Setpoint synchronization

Additionally, the Area application allows users to efficiently perform a single operation, such as changing a setpoint, creating a schedule, performing an override, and apply it to all members of the area. For more information, see the *Air Systems for Tracer SC+ Application Guide,* (BAS-APG036*-EN).

Variable Air Systems (VAS) Application

The variable air system (VAS) coordinates the control of air handlers, rooftop units, and variable air volume terminal units. The Tracer SC+ VAS includes valuable tools to help manage tasks that might otherwise be problematic and time consuming, such as:

- Determining Heat/Cool mode for changeover systems
- Coordinating AHU and VAV box operation
- Commissioning VAV boxes
- Scheduling common spaces
- Optimizing ventilation
- Optimizing duct static pressure
- Coordinating system operation for A2L sequences and mitigation.

For more information, see the *Air Systems for Tracer SC+ Application Guide,* (BAS-APG036*-EN).

Chiller Plant Control (CPC) Application

The Chiller Plant Control (CPC) application coordinates chillers and provides system chilled water control.

The CPC application allows you to configure a chiller plant for optimal efficiency and reliability, and provides a means for you to monitor and control the daily operation. Depending upon the many possible chiller plant configurations and design differences, the CPC application can:

- Provide overall chiller plant status information and alarms to local and remote Tracer SC+ users.
- Enable or disable chiller plants.
- Start, stop, and monitor the status of system chilled water pumps.
- Calculate individual chilled water setpoints for individual chillers in series chiller plants
- Request when chillers are added or subtracted according to building load requirements and user-specified add and subtract logic
- Rotate chillers according to user-defined intervals
- Remove chillers from the rotation in the event

For more information, see the *Chiller Plant Control, Application Guide* (BAS-APG037*-EN).

Trim/Respond Setpoint Reset Logic

Trim/Respond (T/R) logic is an application that resets a setpoint for pressure, temperature, or any other variable in a system. It changes the setpoint at a fixed rate (Trim) until a downstream device is no longer satisfied and generates a request. When a sufficient number of requests are present in a specific time frame, the setpoint is adjusted in response (Respond). The importance of each zone's requests can be adjusted to ensure that critical zones are always satisfied (Importance multiplier). When a sufficient number of requests no longer exist, the setpoint resumes changing (Trim) at its fixed rate. The deadband enable option allows the Trim and Respond feature to hold current value between the need to not trim or respond. A running total of the requests generated by each zone is kept to identify zones that are driving the reset logic.

Trim/Respond logic is optimal for controlling a single variable that is subject to the requirements of multiple downstream zones and is prescribed by ASHRAE Guideline 36 as the method for resetting Discharge Air Temperature, Static Pressure, Hot Water Temperature, Chilled Water Temperature, and others values in a system.

Several instances of T/R logic can be created on the same Tracer SC+ to control different setpoints. Users can select from the predefined resets described on ASHRAE Guideline 36 or create their own custom reset strategy. The following is the list of available options:

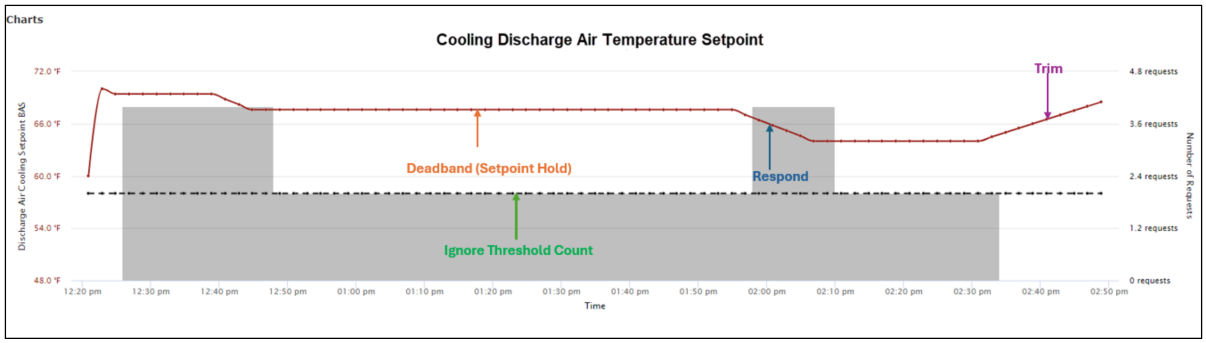
- Cooling Discharge Air Temperature Setpoint Reset
- Heating Discharge Air Temperature Setpoint Reset
- Duct Static Pressure Setpoint Reset
- Chilled Water Temperature Reset
- Chilled Water Plant Enable
- Chilled Water Pump Pressure Reset
- Hot Water Temperature Reset
- Hot Water Plant Enable
- Hot Water Pump Pressure Reset
- Custom Reset

Beginning with SC+ version 6.3, Trim and Respond essential points have a reference selector for an external reference (except for start-up time delay and run frequency).

A custom reset strategy can enable a multistate value point to be managed under Trim and Respond control.

For more information, see the *Air Systems for Tracer SC+ Application Guide* (BAS-APG036*-EN).

Figure 49. Trim and respond graph

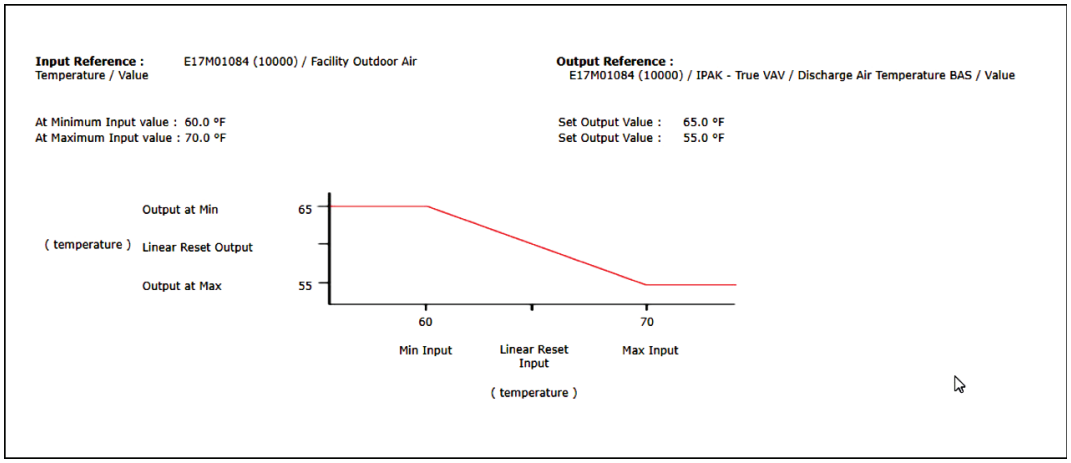


Linear Reset

Linear reset is a reset application that follows a linear function. An input is selected as the condition to reset one or several output setpoints. The slope of the linear function can be positive or negative depending on the values defined by the user (see the Figure 50, p. 68).

Note: *Linear Reset operates at priority 13. If used in conjunction with Trim/Respond, Linear Reset should be set to priority 9. This will allow the Linear Reset to modify the configuration parameters of the Trim/Respond application.*

Figure 50. Linear reset example



Dampening option is available if needed to slow down the rise and/or fall of the Output.

Demand Management Application

The Demand Management application provides users several options to automatically reduce the demand on their buildings. Demand Management allows users to configure their buildings for the following types or curtailment programs:

- Demand Limiting
- Demand Response – Day Ahead
- Demand Response – Day Of

Demand Limiting monitors the building demand and automatically applies ***resources*** – curtailment loads/strategies – to maintain the building demand at or below the user-defined demand limit. For more integrated applications, Trane offers two different types of demand response programs – both applied with Trane GridFlex, a cloud-based application designed to help users manage their demand.

Demand Response – Day Ahead programs notify users one day prior to a curtailment event, while **Demand Response – Day Of** events normally provide users notification in the range of 30 minutes up to a few hours.

For all program types, the demand management application controls the Curtailment Request point for each of the defined resources (loads). The user has the flexibility to define how the curtailment request controls an actual load or strategy. Users

normally leverage existing standard tools and/or custom programs to accomplish the control of the equipment, device, or control strategy to reduce the demand on their facility. For more information, see the *Demand Management Application Guide*, (BAS-APG044*-EN).

Points

In an automated building control system, points are the building blocks used to create a control system. They are used in setpoints, controlling outputs on a device, reading the values of hardware inputs and holding calculated data. In addition, points provide the only means to generate and route alarms to the event log.

Tracer SC+ defines points in two ways:

User-defined: You can create points to use, for example, with a TGP program or to monitor a temperature for a building.

System-defined: These points are created when you create an Area, a VAS, and when you install equipment or spaces.

Point Types

Tracer® SC+ classifies points according to one of three types (analog, binary, multistate) and one of three functions (input, output, value). In total, there are nine point types:

- Analog inputs—These are typically values such as room temperature or air flow pressure generated by a sensor or device. Inputs points obtain their value from a selected referencer. Input points are typically used to read values from other controllers such as LonTalk® devices or unit controller input points.
- Analog outputs—These are used to control devices such as damper actuators or water valves, or to provide setpoints to control other devices. Analog outputs can be controlled and overridden by using priority control.
- Analog values—These are points that have real number values. Analog values do not contain referencers but can be controlled and overridden by using priority control. Value points are typically used for calculated values or setpoints.
- Binary inputs—These are typically two-state inputs, such as on/off or alarm/normal. Binary inputs are generated by switching devices. Inputs points obtain their value from a selected referencer. Input points are typically used to read values from other controllers such as LonTalk® devices or unit controller input points.
- Binary outputs—These points are typically used to turn devices on or off. Binary outputs can be controlled and overridden by using priority control.
- Binary values—These points can only be true or false. Binary values do not contain referencers but can be controlled and overridden by using priority control. Value points are typically used for calculated values or setpoints.
- Multistate inputs— Multistate points have between 1 and 200 states. Text is displayed for each state rather than a numerical value. Inputs points obtain their value from a selected referencer. Input points are typically used to read values from other controllers such as LonTalk® devices or unit controller input points.
- Multistate outputs— Multistate points have between 1 and 200 states. Text is displayed for each state rather than a numerical value. Multistate outputs can send their values to a defined referencer and can be controlled and overridden by using priority control. Multistate outputs are typically setpoints that are sent to controllers such as occupancy or heat cool mode request on LonTalk® controllers.
- Multistate values—Multistate points have between 1 and 200 states. Text is displayed for each state rather than a numerical value. Multistate values do not contain referencers but can be controlled and overridden by using priority control. Multistate values are typically calculated values in controllers or applications such as such as occupancy status or heat cool mode status.

Analog, Binary and Multistate Values can be selected as Normal Value or Read/Write. A Normal Value point operates as a read-only point with no reference and it has a priority array defined. Read/Write points will continuously read from a referenced value (such as an input point). When written to, the point will write to the reference (such as an output point). This point does not have a priority array. This type of point is useful for the following scenarios:

- Behavior of last command wins is desired such as for lighting control.
- Point is writable from the system, but can also change in the unit controller.
- When the same setpoint in some non-Trane devices can be changed from the BAS or from the controller itself.

Certain power meters accumulate data in a point, and require that the point be written to **0** in order to reset the accumulation. Configuration parameters in a LonTalk® device can be changed from the BAS or from the Rover service tool. This type of point will be available in the following areas:

- Points that were previously writable elements (LonTalk®, Modbus, and Comm3/4 only) in Synchrony will now be Read/Write values. Most notably this includes Air Flow Setpoints on VAV boxes.
- Points in which a user can create an equipment key defined as a Read/Write key. When applied to a LonTalk®, Modbus, or Comm3/4 device it will create a point with the Read/Write behavior.

When applied to a BACnet device it will have no effect. The native BACnet point will still apply. A user can create a value point manually and select the Read/Write configuration.

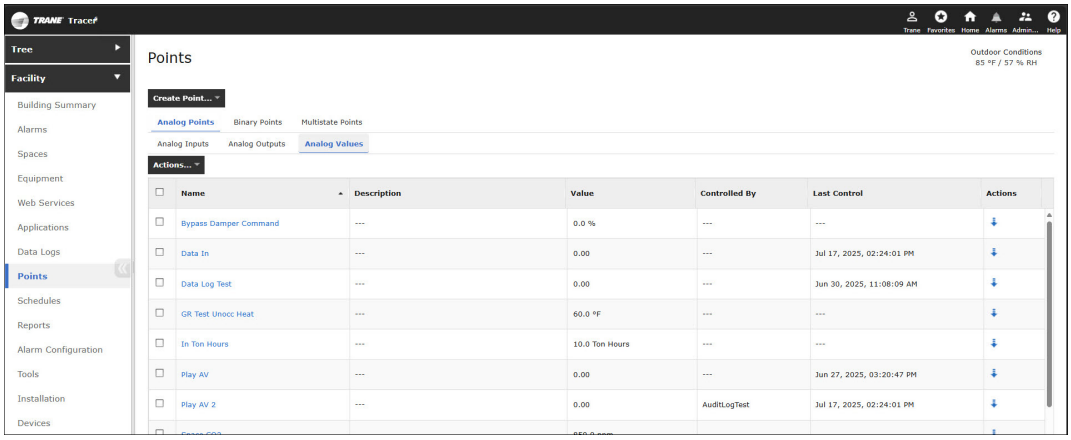
User-defined Points

You can access user-defined points by selecting **points** in the left navigation menu. The **Points** page shows a table of all user-created points currently in the system, will appear.

The page is arranged with tabs: **Analog Points**, **Binary Points**, and **Multistate Points**. Each tab of the table contains a sub-tab of the point type (input, output, or value). The table consists of the following columns:

- Name —The identifiable name of the point
- Value —The current value of the point.
- Controlled by — The user of application currently controlling the point.
- Last control — The date and time that the point was last controlled.
- Actions — This column allows users to take action on a point by initiating an override, stopping an override, or making changes to an existing override.

Figure 51. Points page



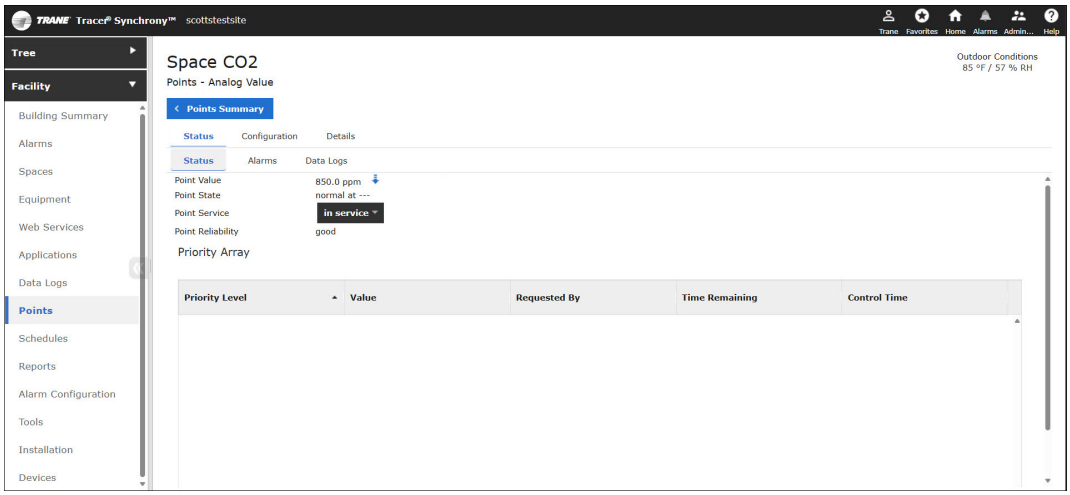
Viewing a User-defined Point Status Page

To view a point status page:

1. Select points in the left navigation menu to view the **Points** page, then select the point tab (Analog, Binary, or Multi-state).
2. Select the point type sub-tab (Inputs, Outputs, or Values), and then select a point from the table to view. The selected point status page opens.

   The point status page shows the current status of the selected point.

   There are two additional sub-tabs: Alarms and Data Logs. Click on the **Alarms** tab to view a list of alarms for the point. Click on the **Data Logs** tab to see a graphical view of data logs that have been set up for the point.



Creating a User-defined Point

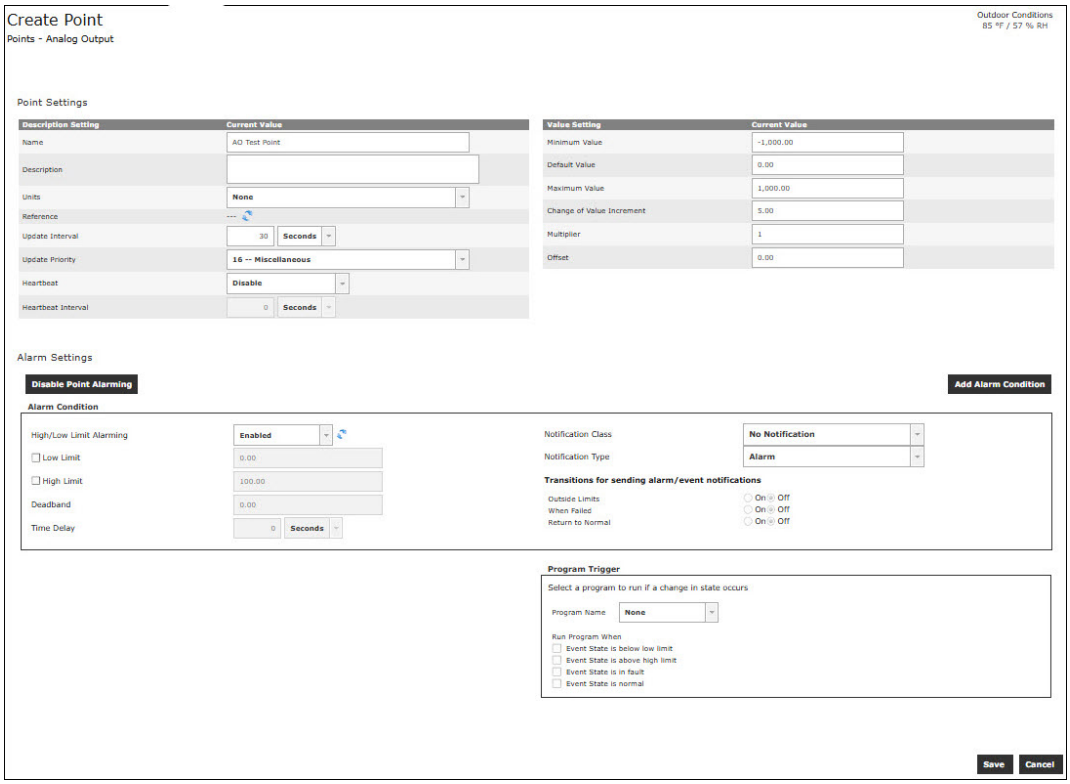
Tracer SC+ has the ability to add an additional alarm condition when creating or editing analog points as shown in the following figure.

This creates a secondary alarm condition that occurs in situations outside the primary alarm conditions. It works in conjunction with the High/Low Limits Alarming feature. Access the Tracer Synchrony Help at the user interface for more information.

Note: *The Add Alarm Condition option is only available for Analog points.*

1. From the **Points** page, click the **Create Point** button and then select a point type. The Create Point page for the selected point type will appear.
2. Configure the new point and click **Save.**

Figure 52. Create point page (analog point shown)

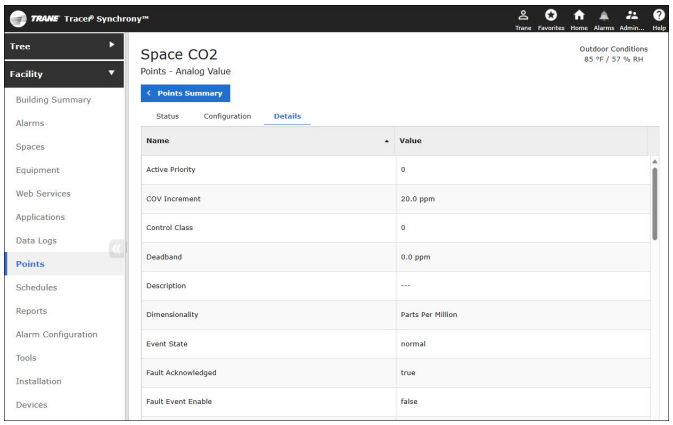


System-defined Points

You can access system-defined points as follows:

Click the **Details** tab on a **spaces**, **equipment**, or **systems** page. A table contains system-defined points appears (see the following figure).

Figure 53. Point details page



Point Overrides

An override refers to the action of a user taking control of a point rather than allowing the system to control it. Point values can be overridden for output and value points by users who have been assigned a priority level that gives them override capability. Priority levels of 1–16 exist, with 1 being the highest. The following four priority levels have been pre-assigned for user overrides:

- 1: Life Safety - Manual
- 8: Manual Override High
- 11: Manual Override Medium
- 13: Manual Override Low (the default for user overrides)

A user with a priority level higher than 13 has advanced override capability.

Overrides take place based on a user's priority level. If a user with a higher priority level has performed an override, an override entered by a user with a lower priority level will not take effect until the entry by the higher priority user clears.

Points appearing with the following icon on their right can be overridden: .

A point that has been overridden appears with the following icon:

- A user override exists:
- A temporary user override exists:

Performing Simple Overrides

The simple override feature uses a priority level of 13 —*Manual Override Low*.

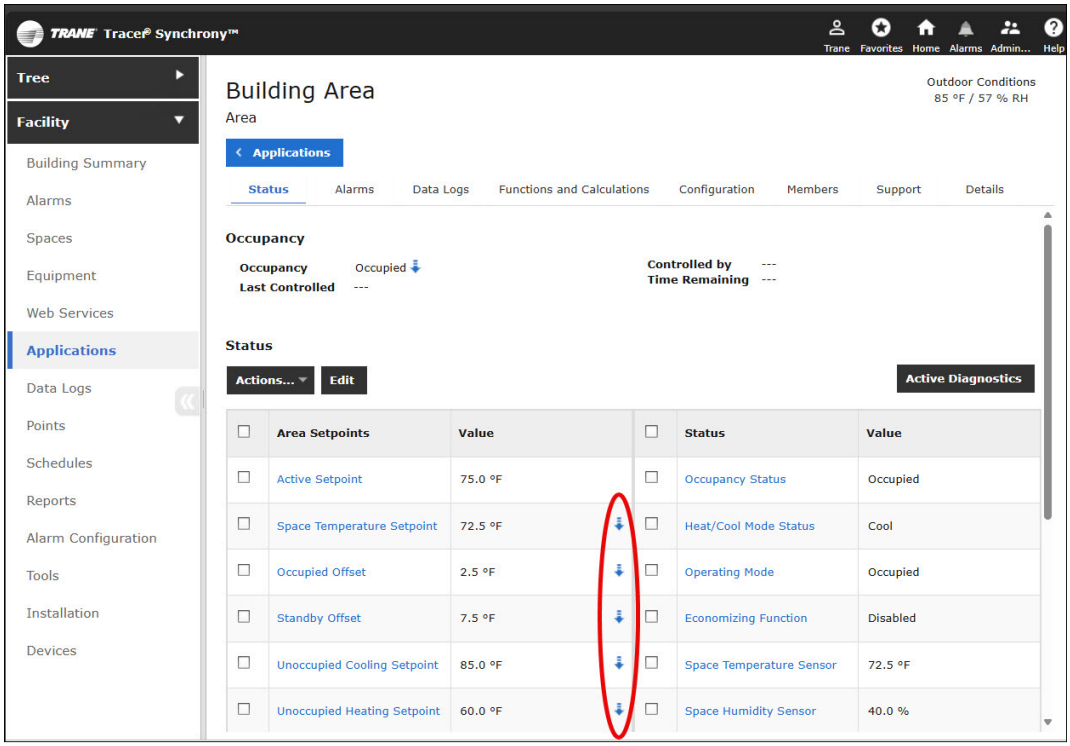
To perform a simple override of an output or value point:

1. Begin at one of the following pages:
   - For a point, begin at the page containing the list of points of that type.
   - For the occupancy mode of a point, begin at the status page for the specific equipment.
   - For a space or equipment setpoint, begin at the status page for the specific equipment, then click the **configure** button to open the **Configuration** page.
2. Select the override icon ( ) to the right of the point. The simple override page appears.

   Select or enter a point value, with or without an expiration time.

3. Click **Save**.

Figure 54. Status page with simple override points



On the Tracer Synchrony user interface, points that can be overridden, or have existing user overrides show one of the icons displayed in the following table.

Override Icon	Override Icon Description
	Indicates that the point can be overridden
	Indicates that a user override is in effect
	Indicates that a temporary user override is in effect and will expire at a designated time.

Performing Advanced Overrides

The advanced override feature allows the user to:

- See the current override priority
- See all priority levels controlling the point
  - Priority levels of 1 through 16 are available, with 1 being the highest.
  - The maximum priority level is specified by the role that is assigned to a user.
  - The simple override feature uses a priority level of 13 —*Manual Override Low*.
- Release an existing override at a selected priority level
- Set a priority level and a point value, with or without an expiration time

To perform an advanced override of an output or value point:

1. Begin at one of the following pages:

- The page containing the list of points of the type you want to override; for example, the **Analog Input Points** list page.
- For the occupancy mode of a point, begin at the status page for the specific space or equipment.

  For a space or equipment setpoint, begin at the status page for the specific space or equipment and then click the **configure** button to open the **Configuration** page.

2. Select the override icon ( ) to the right of the point. The simple override page appears.
3. Select **more options**. The advanced override page appears in which the following options appear:
   - Select the override priority level, and then select or enter a point value.
   - Release control of an existing override by selecting its priority level from the drop-down list and then selecting **release control**. (There must be an override at the selected priority level for the release control option to appear.)
4. Click **Apply**.

Point Service

Points can be put in or out of service. Points are put out of service typically for testing purposes.

- **Input points**: When input points are out of service, they no longer update their value based on the referenced property. Instead, the user must enter the point value.
- **Output points**: When output points are out of service, they no longer control the value (reference).
- **Value points**: When value points are out of service, they no longer respond to automated control (TGP programming or application control).

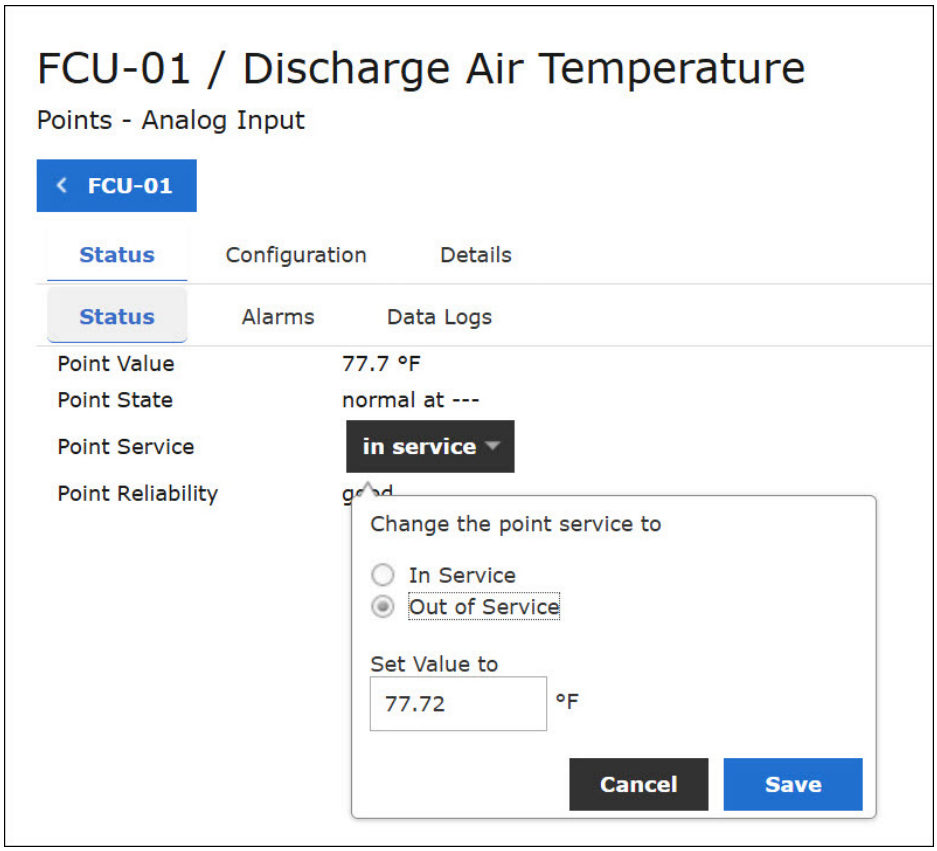
  Note: *For equipment using a Tracer UC400, set the point service from the equipment configuration page.*

Placing Points In or Out of Service

To place a point in or out of service:

1. Click on the name of the point. A status page for that point will appear. (For system-defined points, click on the Details tab for a points list.)
2. On the point status page, select the **Point Service** drop-down list.
3. Make your selection and then click **Save**.

Figure 55. Placing a point in or out of service



Space Temperature Setpoints

A temperature setpoint can be communicated to a unit controller in three ways:

- From the Tracer system
- From the sensor thumbwheel
- From the values stored in the unit controller

This section describes how to determine the source of the space temperature setpoint and how to change the setpoint source for VAV boxes.

Determining the Space Temperature Setpoint Source

The space temperature setpoint source for a unit is determined by the following two points:

- Space Temperature Setpoint BAS
- Space Temperature Setpoint Local

If Space Temperature Setpoint BAS is in service, the unit uses the setpoint sent from the Tracer SC+. If the Space Temperature Setpoint BAS is out of service, the unit uses either the thumbwheel or its locally stored setpoint; the decision is based on the following conditions:

- If the Space Temperature Setpoint BAS is out of service and Space Temperature Setpoint local is enabled, the unit uses the thumbwheel.
- If the Space Temperature Setpoint BAS is out of service and Space Temperature Setpoint local is disabled, the unit uses the locally stored setpoints for control.

Source of control	Space Temperature Setpoint BAS	Space Temperature Setpoint Use Local
Tracer SC+	In service	N/A
Thumbwheel	Out of service	Enabled
Stored setpoints	Out of service	Disabled

Changing the Temperature Setpoint Control for VAV Boxes

The method of changing the setpoint control depends on how the VAV box is receiving the temperature setpoint.

Tracer System Control

If the Space Temperature BAS is out of service (the temperature setpoint value is controlled by a thumbwheel or a locally stored setpoint), you can change the control to the Tracer system as follows:

1. From the **Spaces** page, click on the appropriate VAV box. The VAV box status page opens.
2. Click on **Space Temperature Setpoint BAS**, which opens the associated point status page.
3. From the **Point Service** drop-down list, select **in service** and then click **Save.**
4. The VAV box will now use the value communicated by the Tracer system to calculate its active setpoint:
   - If the VAV box is in heating and occupied mode, the active setpoint is the Space Temperature Setpoint BAS – Occupied Offset.
   - If the VAV box is in cooling and occupied mode, the active setpoint is the Space Temperature Setpoint BAS + Occupied Offset.

Thumbwheel Control

If the Space Temperature Setpoint BAS is in service (that is, if the temperature setpoint value is controlled by the Tracer system), you can change the control to the thumbwheel as follows:

1. From the **Spaces** page, click on the appropriate VAV box, which open the associated status page.
2. Click on the **Space Temperature Setpoint BAS** point, which opens the associated status page.
3. From the **Point Service** drop-down list, select **Out of Service** and then click **Save**. This action removes the control of the setpoint from the Tracer system.
4. Return to the **Spaces** page and click to highlight the equipment for which you just changed the point service.
5. From the **Actions** button**,** select **Enable Local Setpoint** and then click **save.**

   The VAV box will now use the value communicated by the thumbwheel to calculate its active setpoint.

   Note: *If thumbwheel control fails, the controller will revert to the locally stored setpoint.*

Locally Stored Setpoint Control

If If Space Temperature BAS is enabled (that is, if the temperature setpoint is controlled by the Tracer system or the thumbwheel), you can change control of the setpoint to its locally stored value as follows:

1. From the **Spaces** page, click on the appropriate VAV box, which open the associated status page.
2. Click on the **Space Temperature Setpoint BAS** point, which opens the associated status page.
3. From the **Point Service** drop-down list, select **Out of Service** and then click **Save**. This action removes the control of the setpoint from the Tracer system.
4. Return to the **Spaces** page and click to highlight the equipment for which you just changed the point service.
5. From the **Actions** button, select **Disable Local Setpoint** and then click **Save**.

   The VAV box will now use its locally stored temperature setpoint to calculate its active setpoint.

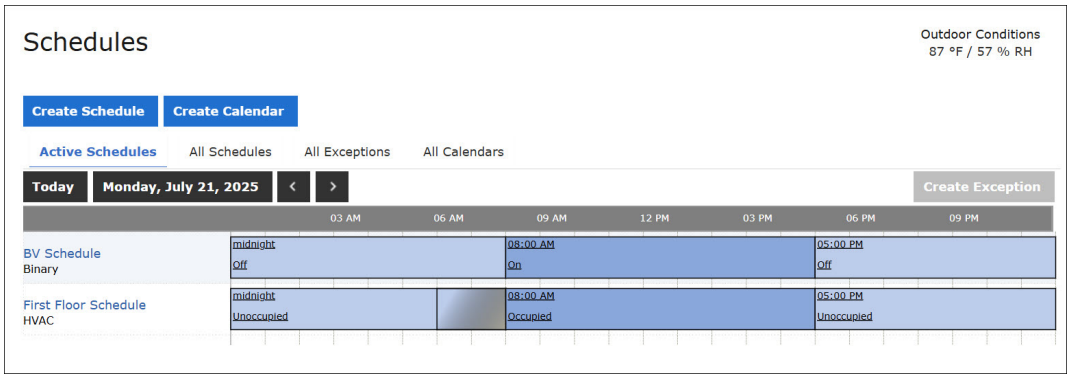
Schedules

Scheduling for Tracer SC+ is based on the BACnet schedule object implementation. Scheduling is one of a facility's most important energy-saving strategies. It ensures that equipment runs only when needed. Scheduling facilitates the following tasks:

- Creating, editing, and deleting schedules
- Creating, editing, and deleting calendars and exception schedules
- Viewing all effective schedules in a facility

The Schedules page contains four tabs: Active Schedules, All Schedules, All Exceptions, and All Calendars.

Figure 56. All schedules (Active shown)



Note: *Active Schedules tab shows both normal events and resultant events as different color format.*

Optimal Start/Stop

Optimal start and stop times can be defined for HVAC schedules. HVAC refers to both Area and equipment.

The schedule coordinates with the Area application or equipment to calculate when the optimal start and stop occurs. Optimal start/stop times are based on outside air conditions, space temperature, and occupied setpoints.

Exceptions and Calendars

Exceptions are temporary modifications to a schedule. Exceptions contain one set of dates or one repeating pattern of dates. If a schedule has an exception applied, a red box outline will appear.

Calendars

For multiple dates and repeating patterns a calendar can be created, which is then applied to the exception.

Calendars are used to group dates, which can then have exceptions applied to these dates on a schedule. For example, a school might create a calendar to group the days that require extended operating hours for after-school meetings.

Release Function

The release function is a predetermined time in which the present schedule or the event releases control over to the next event based on priority. Conceptually, a scheduled release is very similar to a timed override. For example, after the daily schedule ends at 12:00 am (midnight), the schedule releases control over to the next event.

Creating a Schedule

The system controller leads you through the process of creating a schedule for your facility by navigating through a series of steps and pages, often referred to as a **wizard**. If you need help completing the steps, click the help icon located on each page. You can create a schedule to control the following points and applications based on time and date:

- Binary outputs and values
- Analog outputs and values
- Multistate outputs and values

- Equipment, spaces, and system applications (typically referred to as HVAC schedules)

Points and applications are referred to as *members* when they are assigned to a schedule. Members can be assigned to only one schedule during the same effective period. Members must be the correct type; that is, a binary point cannot be included in an analog schedule.

To create a schedule:

1. Click the **create schedule** button.

   The **Create Schedule – Schedule Information** page appears.
2. Enter a name for the schedule, and select the schedule type and effective dates.
3. Click **Next** to continue. The **Create Schedule – Select Members** page appears.
4. From the **selection tree** select members (spaces and areas) for the schedule, then click **Add** to move to **selected items**.
5. Click **Next** to continue. The **Create Schedule – Schedule Times page appears.**
6. Select a schedule default. Each day is independent of the others and always begins with the **schedule default** value. The schedule default value is applied to each day of the week and is the value that the schedule defaults to at 12:00 a.m. for any given day. Select **Release** (see below), Occupied, or Unoccupied.

   Note: *A **Release** is a predetermined time in which the present schedule or the event releases control over to the next event based on priority. A scheduled Release is very similar to a timed point override.*
7. Add events to the schedule: click **Add Event**, which opens the event dialog box.
8. Enter a time for when the event will start and select a value.
9. Enter a time for when the event will stop (this is optional).
10. Select the days of the week to which the event will be applied.
11. Click Add. The event appears in the schedule viewer. (To edit or delete an event, click on the event in the schedule viewer.)
12. Click **Next** to continue. The **Create Schedule – Summary** page appears.
13. Review the schedule. Click **Finish** to save the new scheduled as summarized.

Reports

You can generate the following types of reports for Trane equipment:

Site Reports

1. All Items in Override
2. All Items Out of Service
3. All Items in Alarm
4. Schedule Report
5. Site Commissioning
6. System Points
7. Network Report

VAV Commissioning Reports
VAS VAV Auto Commissioning

Point Reports

1. Analog Input
2. Analog Output
3. Analog Value
4. Binary Input
5. Binary Output
6. Binary Value
7. Multistate Input
8. Multistate Output
9. Multistate Value

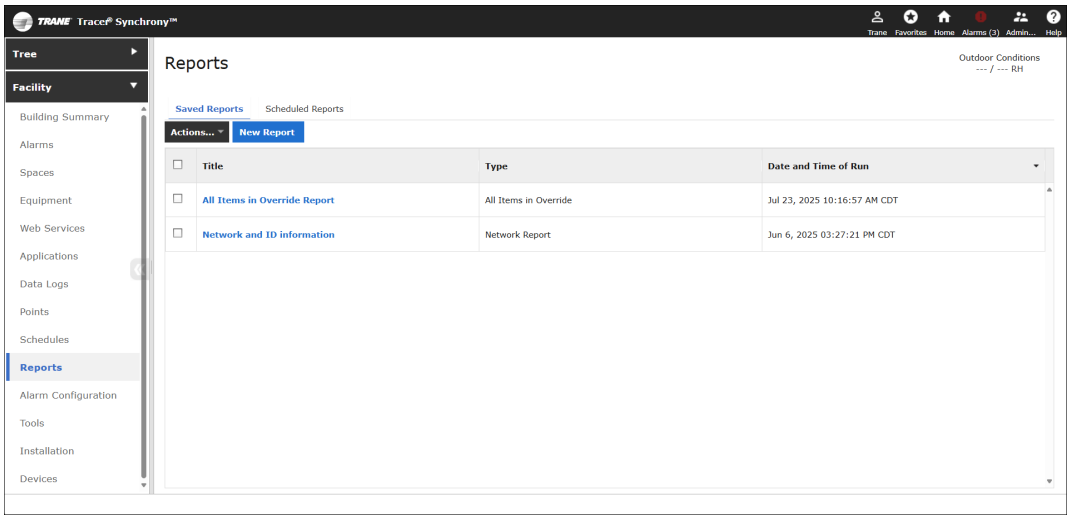
Chiller Reports

1. ASHRAE Std 147 Reports
2. Chiller Standard
3. Chiller Plant Control

Report features include:

- Scheduling reports to run during specific date periods and run frequencies
- Specifying file storage options for scheduled reports
- Exporting reports to save to your PC as CSV, HTML, or PDF files
- Editing scheduled reports

Figure 57. Reports page



Creating a New Report

Reports can be created to run manually, or you can create a scheduled report. Either way, the new report is stored as a saved report after it is run. The following instructions describe how to create a new scheduled report.

1. From the **Reports** page, click on the **new report** button. The **New Report – Select Report Type** dialog opens.
2. Select a report from the **Report Definition Category** drop-down list. The type of reports, based on your selection, will appear in the table directly below.
3. Select a report type from the table, and then select **schedule** from the **Actions** button. The **Schedule Report – Select Items** dialog opens.
4. Select items listed in the table that you want included in the new report.
5. Click **Next**. The **Schedule Report – Options** page opens.
6. Select a **File Storage Option:**
   a. **Overwrite previous file of same scheduled report —** select this option to overwrite the previously saved file with the new one. Data in the previously run report cannot be recovered from the system. The file name is based on the report title.
   b. **Create unique file name by adding a sequence number each time the report is run** — select this option to save the report after each run by adding a sequence number to the file name. This results in multiple saved reports. For example, East Wing Chiller 2, East Wing Chiller 3, and East Wing Chiller 4.
7. Select **Report Date(s)** options:
   a. Select a recurrence pattern: single date, daily, weekly, monthly, or yearly.
   b. Select one or more days of the week that it will recur.
   c. Select a start date (End date is optional).
   d. Select the time of day that the report will run.
8. Click **Next**. The **Schedule Summary** page opens. To confirm your selections, click **Finish**.

Exporting a Report

When you export a saved report, it is saved locally to your computer (PC) or an external device into a format of your choice.

1. From the Reports page select a saved report to view (Saved Reports tab). The selected report page opens.
2. Select **Export As** from the **Actions** button. Format choices are HTML, PDF, and CSV. If CSV format is selected, the **Export Report** dialog box appears: Click export to save the report. Select a location to save the report, then click save.
3. If PDF or HTML formats were selected, export (save) the report to your PC other external storage device.

Data Logs

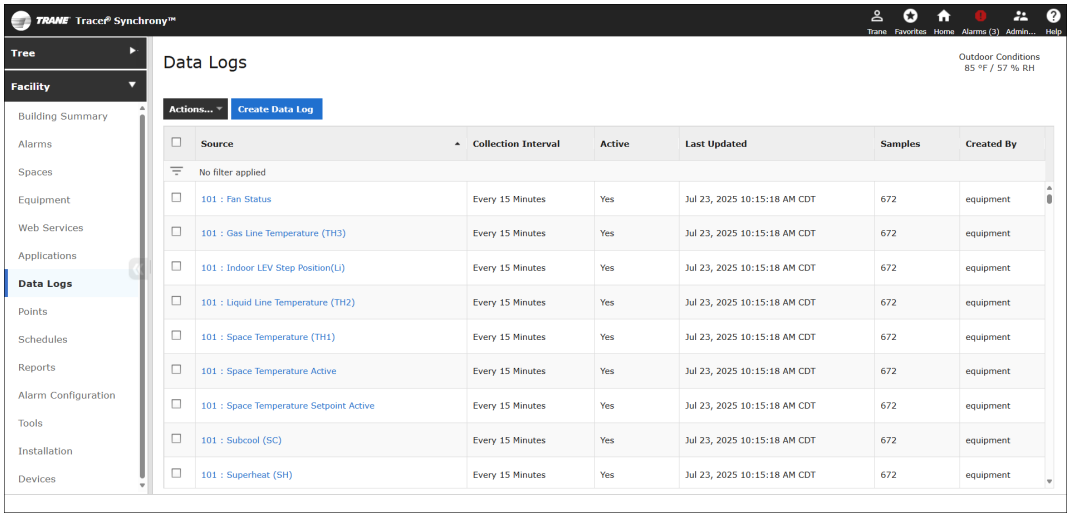
Data Logging, also referred to as trending, records in real-time the value of a data point in the system and the time at which the value was recorded.

By default, Tracer® SC+ automatically generates system-created data logs (for equipment and standard applications) on a 15-minute interval and then stores that data for seven days. Data storage is a continuous window where only the most recent seven days of data are stored. Data older than seven days is discarded in order to make room for the newest data.

Users can also create interval (either scheduled or triggered) or change of value data logs by clicking the log data button on equipment and applications pages or by using the create data log wizard from the Data Logs section.

A list of data logs can be accessed by clicking **Data Logs** from the left navigation menu. From this page you can take action on a data log, such as comparing or exporting, by selecting one or more data logs and then clicking the **Actions** button.

Figure 58. Data logs page



Using the Trend Viewer

The trend viewer displays trend data in a chart. The trend viewer supports a time comparison mode that allows you to compare trend data at different points in time (day-to-day, month-to-month, year-to-year). A maximum of six data logs are supported (up to two data logs when time comparison mode is enabled). A maximum of two types of dimensionality are supported on the left and right y axis. Samples are plotted on a date/time scale on the x axis. Samples in fault (due to communication loss) are not plotted and will result in an interpolation gap within the plotted line. If all samples are in fault, no line will be displayed.

The trend viewer is available on the data logs tab of status pages for equipment and systems. To view trends graphically, select up to six data logs from the Data logs page and then select **View data** from the **Actions** button.

Figure 59. Tracer® SC+ Trend Viewer

1	**Duration preset buttons and Export/Options buttons** The duration preset buttons change the range of data displayed in the trend as described below:
	1d — displays one day of data
	1w — displays 1 week of data
	1m — displays one month of data
	1y — displays one year of data
	Max — displays all available data
	Export — displays options for printing or exporting the chart data in various formats (SVG, PNG, JPEG, PDF, CSV, XLS).
	Options — displays options to hide or display the legend, or hide or display tooltips.
2	**Indicators** display the nearest sampled point on the chart. The indicators show up as a circle with a light gray outline. Each indicator will be filled with the color of the associated trend line.
3	The **Range Slider** represents the range of data displayed in the trend. Click and drag the range slider to shift the date and time of the data displayed in the plot.
4	**Bumper buttons** shift the date and time in small increments. Bumper buttons are available to shift the data to the left and the right.

Zooming: You can zoom in and out of the range of all trends by clicking and dragging your mouse in the preferred area on the chart. Click the Reset Zoom button to return to normal view.

Creating a Data Log for Multiple Points

1. Click the **Create Data Log** button located on the Data Logs page. The **Create Data Log – Data Log Type** page appears.
2. Select the Data Log type (defaults are interval-start now and change of value). Click **Show Advanced Options** to see other types including schedule or trigger. Make your selection and click **Next**.
3. Select data points from the **Member Selection Tree** and click **Add** to move to the **selected items** frame. Use the Search tab to find a point name and select multiple devices that use it. Click **Next**.
4. Set the Interval to collect data and the storage time (if applicable). **Advanced Options** allows you to choose data collection on a schedule or on a trigger.

Creating a Change of Value Data Log

Change of Value data logs collect data only when the value changes.

To create a change of value data log:

1. Click **Create Data Log** located on the Data Logs page.

   The **Create Data Log – Data Log Type** page appears.
2. Select the radio button for **Data collection happens with change of value**. Set desired storage range.
3. Select the check box to Include re-subscription interval samples in the data collection. Set the desired interval.
4. Click **Next**.
5. Select data points from the **Member Selection Tree** and click **Add** to move to the **selected items** frame.
6. Click **Next**.

   Note: *Better verification was added to determine if a BACnet® devices supports COV. Not all BACnet® devices support COV which can result in wasted time or invalid COV data logs. Synchrony now learns a device's COV capabilities so that the user can be notified early in the process that COV Data Logs cannot be setup on an unsupported device.*
7. For change of value data logs, a threshold must be set for Analog points (if selected in step 3).

   Enter the threshold amount in the provided fields. Data will be collected when the value changes by at least the threshold amount.

   Important: *Changing the default threshold will affect any non-Trane system that relies on Change of Value in this point. Verify that this change will not cause problems with critical functions.*
8. Click **Finish**.

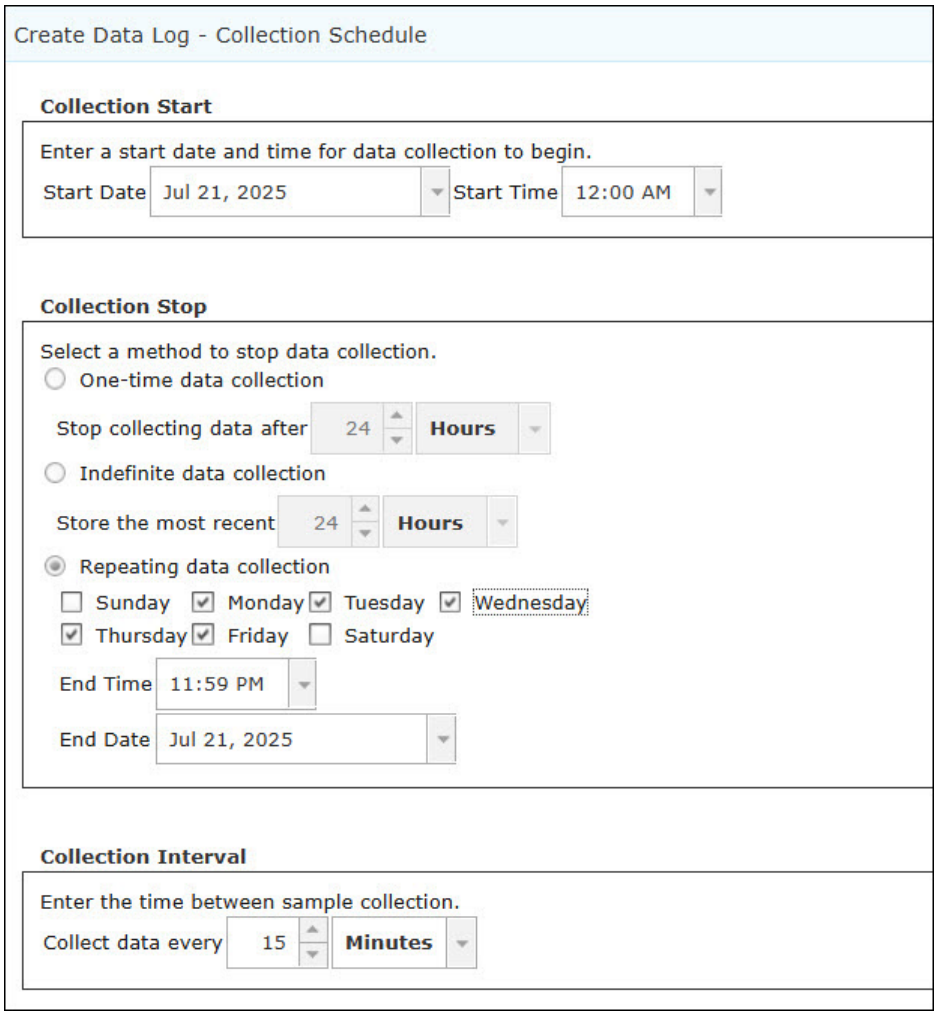
Creating a Scheduled Data Log

Scheduled data logs collect data based on a scheduled start and stop time.

To create a scheduled data log:

1. Click the **Create Data Log** button located on the Data Logs page.

   The **Create Data Log – Data Log Type** page appears.
2. Click **Show Advanced Options**.
3. Select **Data Collection Starts on a Schedule**, and then click **Next**.
4. Select data points from the **Member Selection Tree** and click **Add** to move to the **selected items** frame. Click **Next**.
5. On the **Create Data Log** – **Collection Schedule** page, enter a a start date and time for collection to begin.
6. In the **Collection Stop** frame, select a method that will stop data collection.
   - **One-time data collection** – this option collects data for a short period of time (for example, a 24-hour period).
   - **Indefinite data collection** – this option allows for a continuous window of a defined period of time. For example, seven days of data at 15-minute intervals. The seven day window will always maintain data for the last seven days. The maximum window is three years.
   - **Repeating data collection** – this option allows for a defined period of collection that can contain significantly more data (for example, 12 months at 15 minute intervals).
7. In the **Collection Interval** frame, enter the amount of time that passes between sample collections.
8. Click **Next**. The **Create Data Log — Summary** page appears.
9. Review the data log summary page and then click **Finish**.



Creating a Triggered Data Log

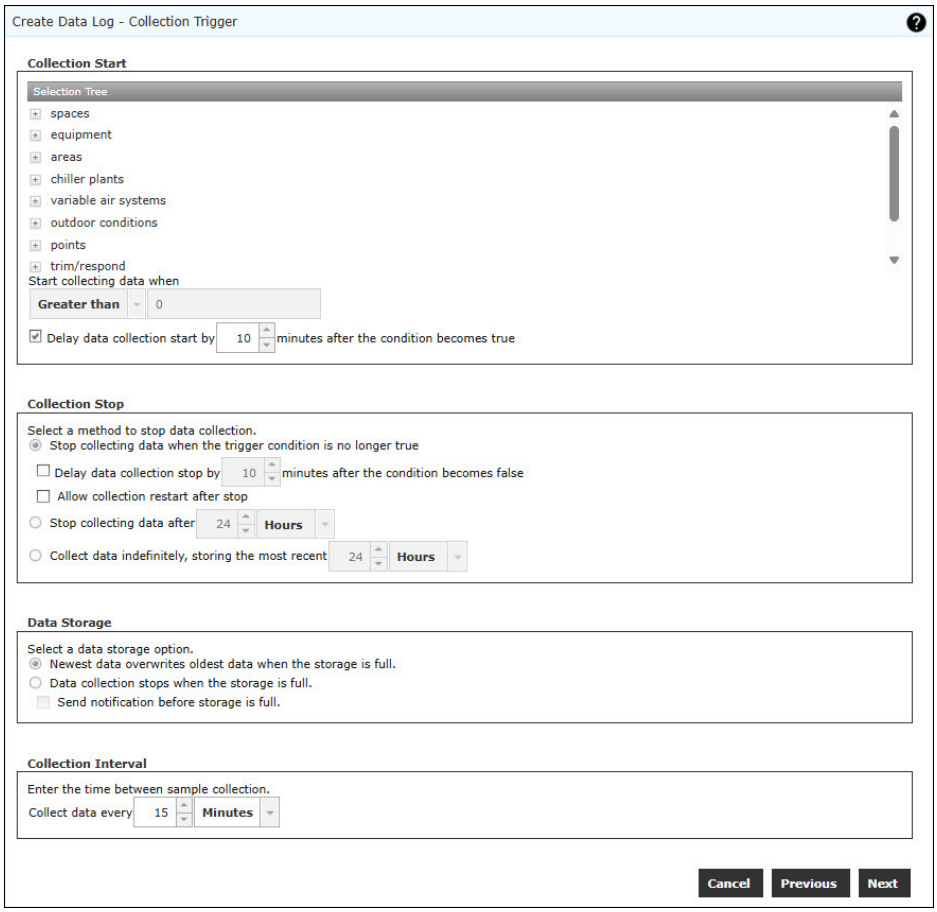
This type of data log collects data when triggered by a condition. For example, a triggered data log could be set up to log the temperature of a space only when the fan is running.

1. Click the **Create Data Log** button located on the Data Logs page.
2. The **Create Data Log** – **Data Log Type** page appears.
3. Click **Show Advanced Options**.
4. Select **Data Collection Starts on a Trigger** and then click **Next**.
5. Select data points from the **Member Selection Tree** and click **Add** to move to the **selected items** frame.
6. On the **Create Data Log** – **Collection Trigger** page, determine the conditions that will trigger data collection by selecting a value from the **selection tree.**
7. From the **Start collecting data when** drop-down list, select either Greater than or Less than and then manually enter a value. Optionally, you can select the **Delay data collection start by** box to determine an amount of time to delay collection start after the trigger condition occurs.
8. In the **Collection Stop** frame, select a method to stop data collection.
   - **Stop collecting data when the trigger condition is no longer true** – this option stops collecting data when the defined start trigger condition is no longer true. Additional options to delay collection start/stop and resume data collection after a stop are available.
   - **Stop collecting data after X time** – this option collects a sample for a defined period of time after the trigger condition is met, and when collection begins (for example, a 24-hour period).

- **Indefinite data collection** – this option allows for a continuous window of a defined amount of time after the trigger condition is met and when collection begins. For example, seven days of data at a 15-minute intervals. The seven day window will always maintain the last seven days. The maximum window is seven days.

9. In the **Collection Interval** frame, enter the amount of time that passes between sample collection.
10. Click **Next**. The **Create Data Log** – **Summary** page appears.
11. Review the data log summary page and then click **finish** (or previous to make changes).

Figure 60. Creating a triggered data log

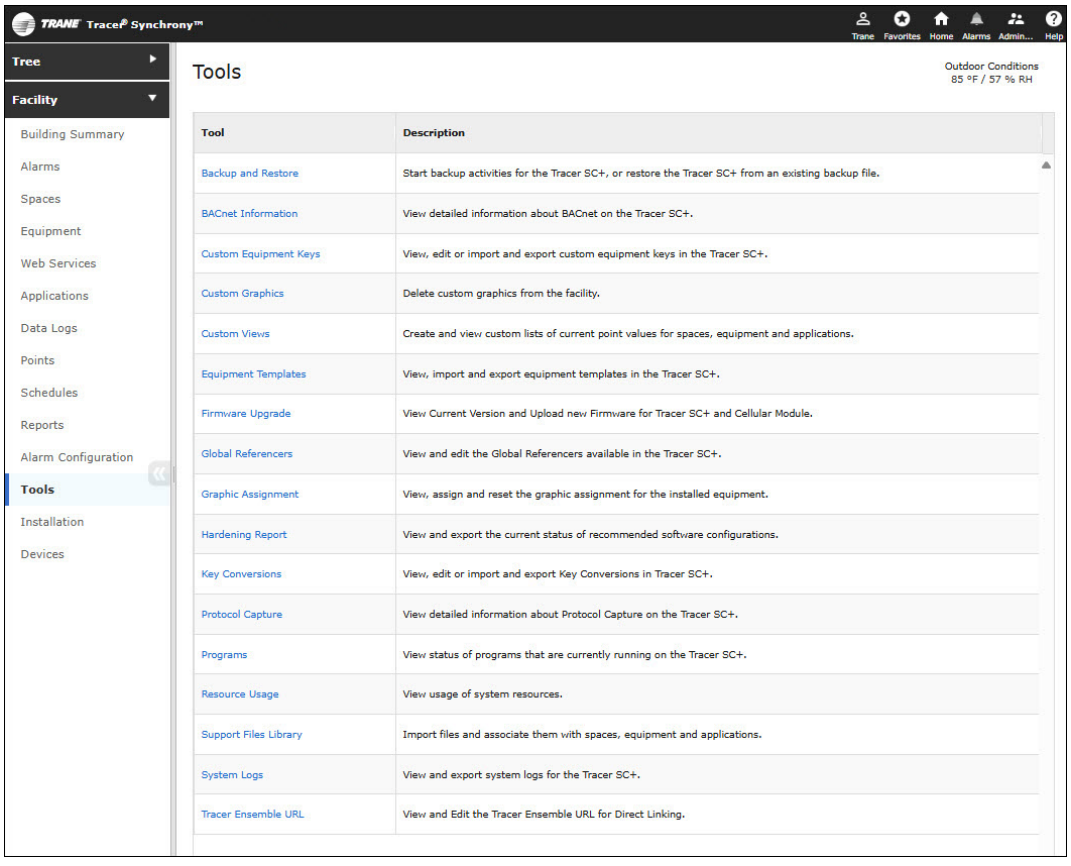


The Tools Menu

To effectively manage Tracer® SC+, a selection of task-based tools are available. The following tools described in this section are accessible from the Tools page:

- Backup and Restore
- BACnet® Information
- Custom Equipment Keys
- Custom Graphics
- Custom Views
- Equipment Templates
- Firmware Upgrade
- Global Referencers
- Graphic Assignment
- Hardening Report
- Key Conversions
- Protocol Capture
- Programs
- Resource Usage
- Support Files Library
- System Logs
- Tracer Ensemble IP Address

Figure 61. Tools menu



Backup and Restore

From the left navigation menu click **Tools > Backup and Restore**. Backup and Restore is a process that involves creating an exact duplication of a Tracer SC+, exporting (saving) the duplicated copy, and then restoring that copy at a later time. Use the Restore tool to restore the Tracer SC+ system configuration file that was produced by the backup tool.

It is important to back up Tracer SC+ system controllers in the event that a system failure occurs. Backups should also be performed prior to upgrading software, adding devices, or adding new applications.

Follow best practices when implementing a backup and restore procedure plan for your system. Backups do not include license files.

Important: *If a microSD card has been installed in the Tracer SC+, it will store up to ten backups (FIFO).*

To back up a Tracer SC+:

1. In the Backup section, click **Create new**. This will generate a new backup, replace the existing backup on the Tracer SC+, or append to the backups on the microSD (if present). Observe the Status dialog, which monitors the backup progress. When the backup is complete, the Opening backup dialog box appears where you can choose the location to export the backup to your PC.
2. Click **Export Backup** to export an existing backup on the SC+. In the Export dialog box, browse to a location on your PC to save the backup copy. Exporting a backup copy is highly recommended.
3. To set up scheduled backups, click **Edit** in the **Backup schedule** field. A dialog box appears, which allows you to enable scheduled backups on a daily, weekly, or monthly basis.

To restore a backup copy:

1. In the Restore section, select a backup copy to restore (either from the Tracer SC+ or from your local PC).
2. Click **Restore**. The Confirm Restore dialog box appears informing you that you will be logged off of the Tracer SC+. Click restore to continue.

After the restore process is complete, Tracer SC+ will restart.

Notes:

- *If you are replacing a Tracer SC+, you can remove the microSD card from the old Tracer SC+, insert it in the new Tracer SC+, and then restore from the microSD card.*
- *BACnet/SC certificates will not be restored into SC+ controllers for security reasons. Therefore, most BACnet/SC networks must be reconfigured following a restore operations.*

BACnet Information

Information about BACnet configurations is shown on this page. This information is typically used by Trane Technical Support. For capturing data see “Appendix L: Network Troubleshooting Tools,” p. 225.

Custom Equipment Keys

You can create equipment keys during the device discovery process if a predefined equipment key is not available.

Mapping points to Tracer® SC+ keys makes communication between controllers and Tracer® SC+ possible. Each key is a predefined data object recognized by Tracer® SC+. For example, the key Space Temperature Setpoint Active can be used by both the BACnet UC400 (with the BACnet object of the same name) and the LonTalk® VV550 (nvoSpace Temp).

From the left navigation menu click **Tools > Custom Equipment Keys**. Click on a key name to view details.

To edit an equipment key, select a key to view from the Custom Equipment Keys page and then click edit.

Custom Graphics

You can use custom graphics in Tracer SC+ to view and navigate through the building automation system. Custom graphics can be used as your home page, as status pages, and can be associated with the customized navigation tree.

Custom graphics can display data related to building environments, such as climate, lighting, and other controllable operations, and can be used to change setpoints and override equipment operation.

Note: *Custom graphics must be configured by a qualified Trane technician. Contact your Trane representative for more information.*

Creating Custom Graphics

Creating Custom Graphics

Use the Tracer Graphic Editor (TGE) to create custom graphics. For instructions on creating custom graphics, see the *Tracer® Graphics Editor (TGE) Utility and Custom Graphics Studio, Applications Guide* (BAS-APG020*-EN).

Note: *TGE is a component of the Tracer TU service tool and is launched from a Tracer TU menu item. To obtain the Tracer TU installation file, go to the Service Technicians page on the Trane portal. See the Tracer® TU Service Tool, User Guide (BAS-SVU046*-EN) for reference.*

Deleting Custom Graphics from Tracer SC+

On the **Custom Graphics** page, select the graphic(s) you want to delete. From the **Actions** button, select **Delete**.

Setting Up User Access for Custom Graphics

An administrator must set up access privileges individually for each user, to enable users to have access to graphics.

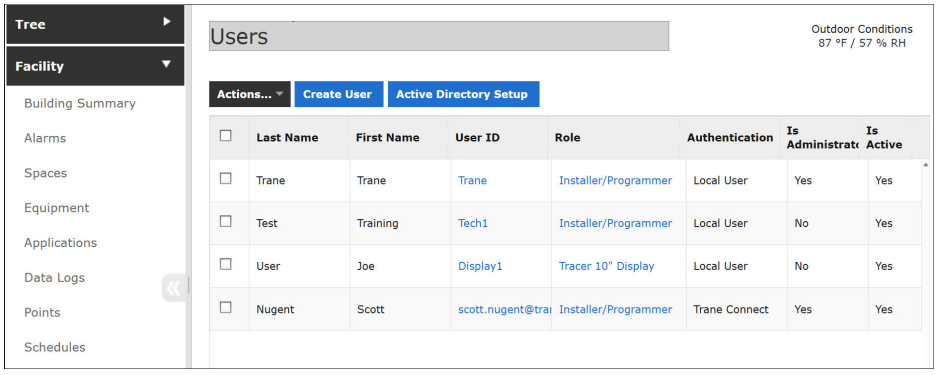
After an administrator has assigned graphics access privileges to a user the user can:

- Choose a graphic as a home page
- View status pages graphically
- Choose to have the navigation tree open automatically upon log in or to remain closed until the user opens it

To set up graphics access privileges:

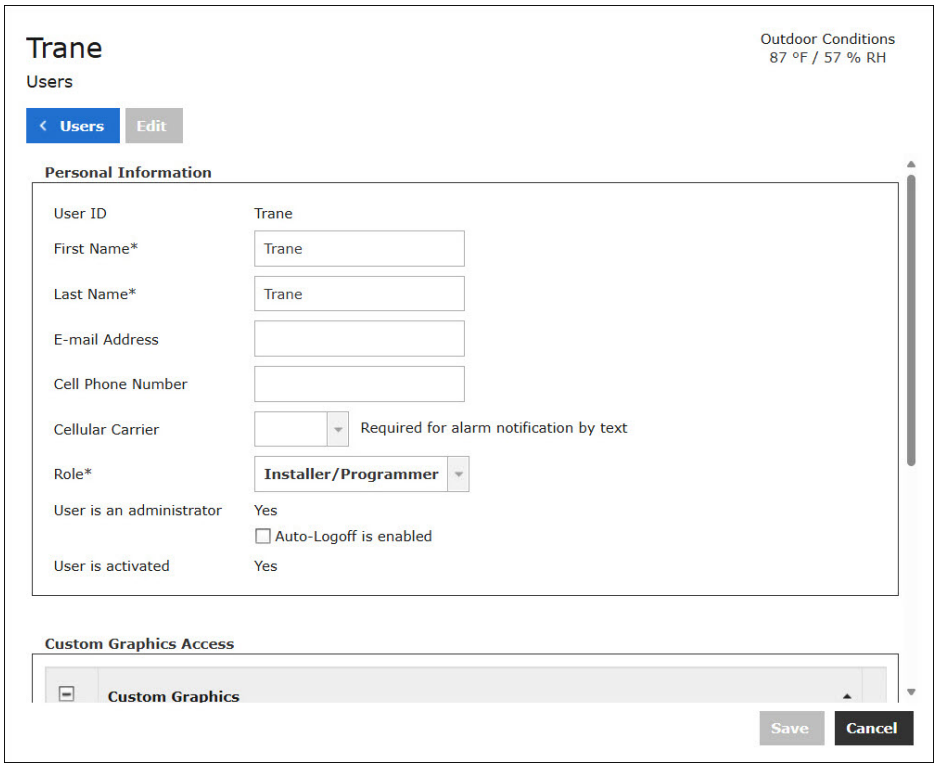
1. Select **Admin...** in the global navigation bar of any Tracer Synchrony page.
2. Select **Users** from the drop-down list. The **Users** list page appears.

Figure 62. User page



3. Select the check box to the left of the name of the user you are setting up. Then, from the **Actions** button, select **View**. Information for the selected user is displayed, as shown in the following figure.

Figure 63. User page (personal information)



4. Click the **Edit** button. In the **Custom Graphics Access** section of the page, select the check boxes to the left of the graphics that you want the user to be able to access.
5. Click **Save**.

Editing User Preferences

Users can choose the where and how graphics are displayed on Tracer Synchrony. These are initially set up by the administrator.

1. Select **User...** in the global navigation bar of any Tracer Synchrony page.
2. Select **preferences** from the drop-down list. The **Users Preferences** page appears.
3. Graphics-related preferences are in the General Preferences section.
4. To edit preferences, click the **Edit** button and make selections.
5. Click **Save**.

Custom Views

Custom Views allow users to create customized views of points for spaces, equipment and systems. A Custom View creates tables for each selected family type, and allows table editing, overriding individual values, and mass point overrides. Additionally, some columns can be hidden temporarily for a closer look at the points. A Custom View can be set as a home page or a favorite page.

Create a Custom View

To create a custom view:

1. From the left navigation menu, click **Tools > Custom Views**. The **Custom Views** page opens.
2. Click the **Create Custom View** button.
3. Enter a name and description.
4. Select all family types that you want to display in the custom views. Click **Next**. For every Family type there will be a selection page to choose the points you wish to display.

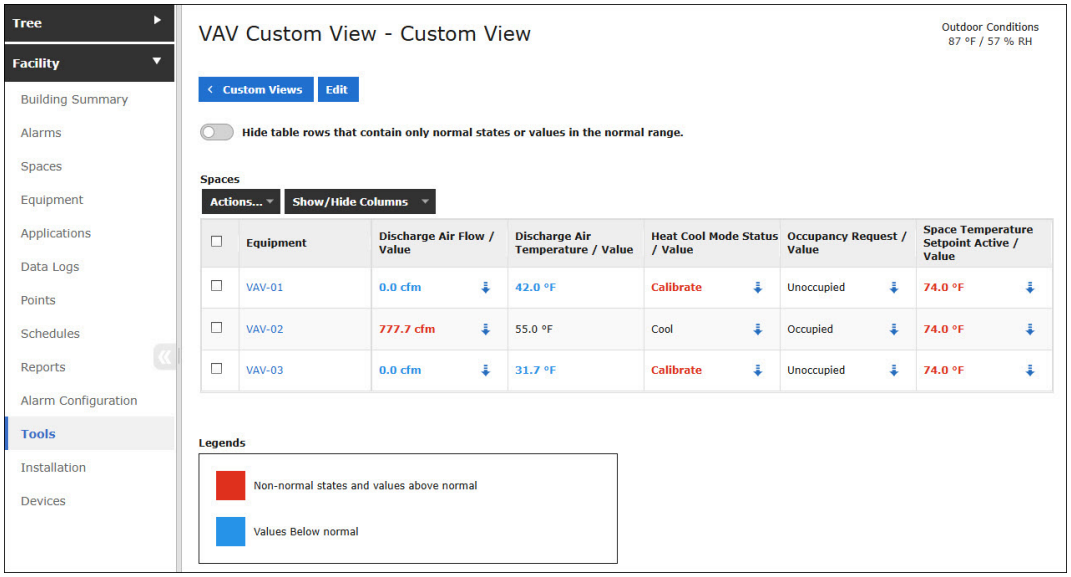
5. Select the equipment from the left column. A search functionality is available .The second column will be populated depending on the equipment selected.
6. Select the points for each piece of selected equipment that will be displayed on the custom view. There is a search functionality, as well as a point type filter that can help to locate the points faster.
7. Select the properties for each point from the drop-down menu.

   Notes:

   - *By default the property Value is selected when a point is checked, but other points can be added.*
   - *Beginning with Synchrony version 6.1, users can add system applications (such as Trim/Respond, CPC, VAS, Area, and Demand Management) member points to a custom. Detailedness of member points will be displayed separately in a custom view table.*

   Click once to select the properties; click again to deselect them.
8. Click **Next**.
9. Conditional Display — Out-of-range values and normal states for points can be set up in Custom Views. Based on the setting value, above-range or non-normal states are shown in red and values below range are shown in blue. This is an optional setting for Custom Views.
10. Click **Finish**.

Figure 64. Custom views



Edit a Custom View

To edit a custom view:

1. From the left navigation menu, click **Tools > Custom Views**. The **Custom Views** page opens.
2. Select the Custom View you wish to edit.
3. Click the **Edit** button. The **Edit Custom View — Select Family Type** dialog box opens.
4. Select the Family Types you wish to edit. Click **Next**.
5. Make changes to equipment, points or properties as needed. Click **Next**.
6. Edit the conditional display set up as needed.
7. Click **Finish**.

Import/Export Custom View

To import a custom view:

1. From the left navigation menu, click **Tools > Custom Views**. The **Custom Views** page opens.
2. Click the **Import** button.

3. Click **Browse** button to select the Custom view files (. sccvt) stored in the local PC/laptop.
4. Click **Next**.
5. Click **Finish**.

To export a custom view:

1. From the left navigation menu, click **Tools > Custom Views**. The **Custom Views** page opens.
2. Select the Custom View to export.
3. 3. Click the **Action** button, and then select **Export** button.

Table Functionality on Custom Views

Each Family type table allows for some override actions.

- Use the blue downwards arrow to override a single point.
- Click the Show/Hide Columns button to select the columns of the table that will be hidden temporarily. Select again to unhide.
- Use toggle button to hide rows from all tables that contain normal states or values in the normal range.
- Use the check box to select several devices to use the options from the Actions menu:
  - Override: select one point from the selected equipment to override
  - Set In Service: select all points that will be set to In Service
  - Set out of Service: select all points that will be set to Out of Service

Equipment Templates

Equipment templates are used when installing devices onto Tracer SC+. Some equipment templates are pre-defined, others are created based on the device that is being installed.

From the left navigation menu click **Tools > Equipment Templates.** Click on an equipment template name to view details.

To edit an equipment template, select a template from the Equipment Templates page and then click edit.

To delete equipment templates, select templates on either the **User Defined Template** or **Factory Template** tabs and Select **Delete**. To view more info of a template, including which equipment is using it, select the template name.

Firmware Upgrade

Firmware upgrades for Tracer SC+, Symbio™ products, and the Trane USB Cellular Module can be done from this tool.

Global Referencers

A global reference is a connection that is made between a data point in Tracer SC+ and one or more systems that are configured to respond to the value of the data point. A global reference is made up of one trigger source and one or more destinations. It allows you to read a piece of data from one place and then send to one or more places. Global references can be made to a point in Tracer Synchrony or to external points of BACnet MS/TP equipment.The information from the source can be sent on a continuous frequency, triggered by an event, at the start-up, or by a manual update.

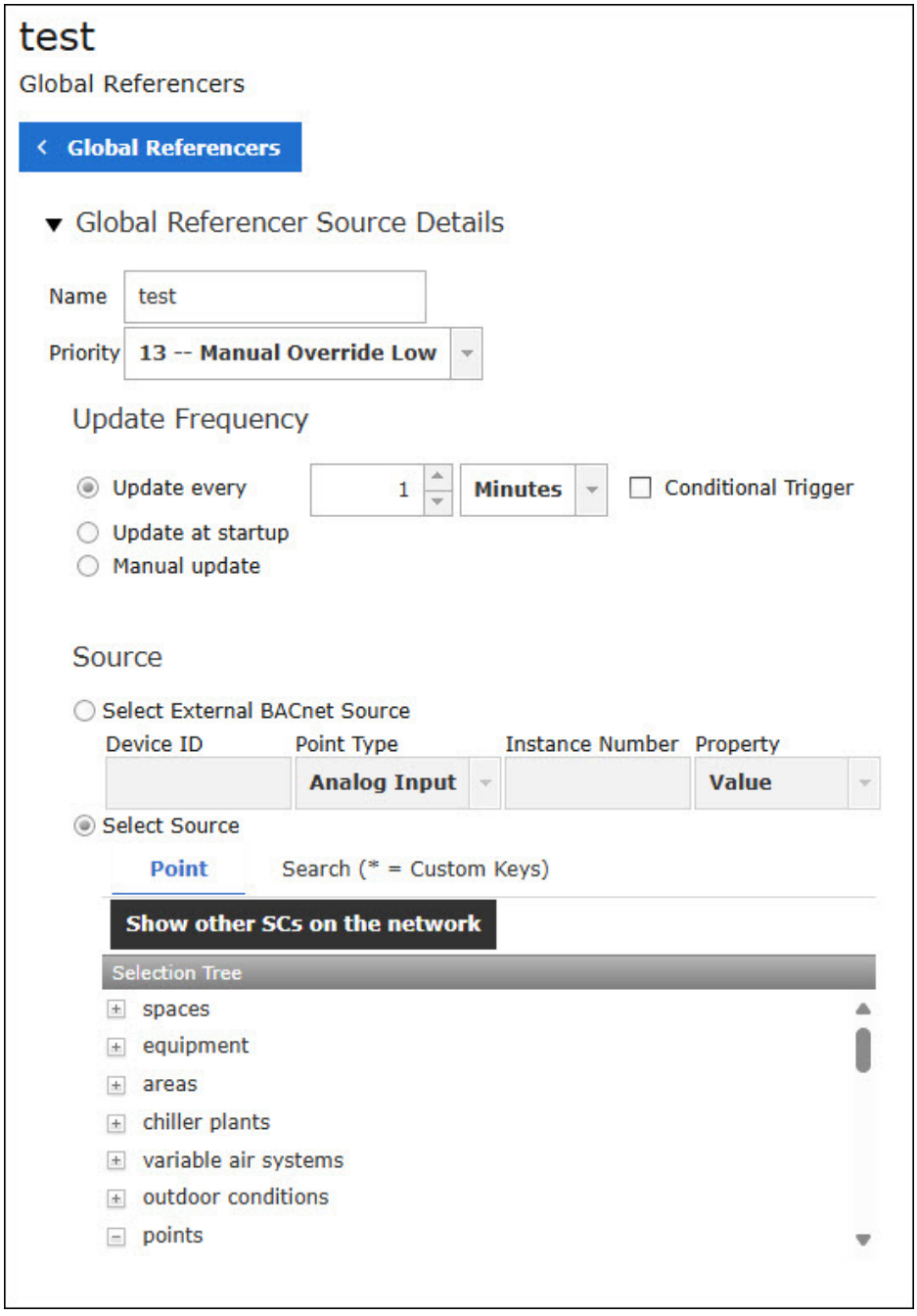
From the left navigation menu click **Tools** > **Global Referencers.** The Global Referencers list page serves as a starting point for additional options.

Create a Global Referencer

To create a global referencer:

1. Click **Create Global Referencer**. The **Create Global Referencer — Select Source** dialog opens.
2. Click **Show other SCs on the network**, which populates the **Select Source** window with the other Tracer SC+s.
3. From there, select the equipment or point for reference.
4. Click **Next** to continue.
5. On the **Select Destinations** page, use the selection tree to select points (destinations) where the source will be sent to. Click the add icon to move the selected points, then click **Next**.
6. Confirm your selections and then click **Finish**.

Figure 65. Create global referencer



Hardening Report

The SC+ Hardening Report is the output document of a security scan done by the Tracer SC+. The Hardening Report shows the current SC+ settings related to network and user security. IT security scans will identify many of the same items on this report. Use this report to document the configuration and check for any issues. This self-assessment by the Tracer SC+ does not cover all IT security concerns. The vulnerabilities highlighted in this report should be assessed by an IT security person. Additional cyber security testing is always recommended.

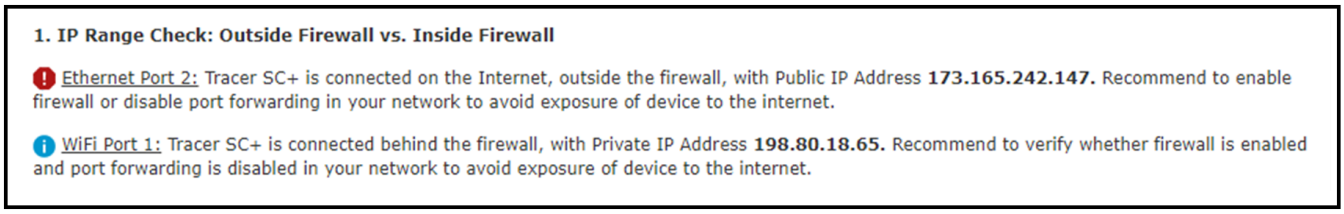
Note: *The Hardening Report should only be run when the Tracer SC+ is in its final configuration. Do not perform any special setup prior to running the report.*

Hardening Report Details and Examples

There are four categories in a Tracer SC+ Hardening Report. Each is described below.

IP Range Check: Outside Firewall vs. Inside Firewall

The first and most important part of the hardening report is the IP Range check. Most exposed Tracer SC+(s) will fail this first check. The SC+ will look at the IP Address digits to determine if it is using a private or public IP address. IP Address numbers within the ranges below are considered private and will PASS. The result below shows a public IP, which requires immediate action to remedy. This can be fixed by setting the IP Address within the range of numbers below.



The Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of the IP address space for private internets:

- 10.0.0.0 – 10.255.255.255 (10/8 prefix)
- 172.16.0.0 – 172.31.255.255 (172.16/12 prefix)
- 192.168.0.0 – 192.168.255.255 (192.168/16 prefix)

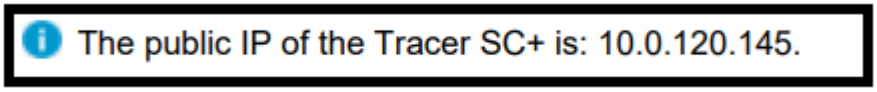
Port Scanning

The Port Scanning section has several components including an external TIS Port Scan, Used/Unused port check, BBMD/MDT Network Setup check, and SSL Certificate Verification.

TIS Port Scan: If you are connected to the internet while running the hardening report, the Tracer SC+ will attempt to perform this external port scan. It is not necessary to configure the Tracer SC+ in Trane Connect, or anything else to run this test. If the Tracer SC+ can access the Trane Cloud, the TIS Port Scan will initiate in order to verify exposure to the internet. The first result in the port scanning section will be the execution status (if unsuccessful) or the result of the port scan. The following figures are possible outcomes of this scan with more information.

Success

Figure 66. Success



A successful result will only show the public IP of the Tracer SC+. This IP may or may not match your configured IP depending on the network being used (USB Cellular Module, WiFi, IPv4/6).

Ports Found Open (Fail - Port Forwarding)

Figure 67. Ports found open (Fail - Port Forwarding)

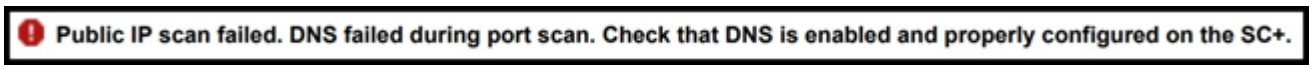
A failure will provide the public IP, as well as a complete list of exposed HTTP and HTTPS Ports. This device is either exposed to the internet with a public IP and no firewall (most common) or the firewall has been configured with Port Forwarding on the ports listed. Either way, this device is susceptible to an attack and immediate action must be taken.

TIS Scan Incomplete (Unable to Execute Scan)

Figure 68. TIS Scan incomplete (unable to execute scan)

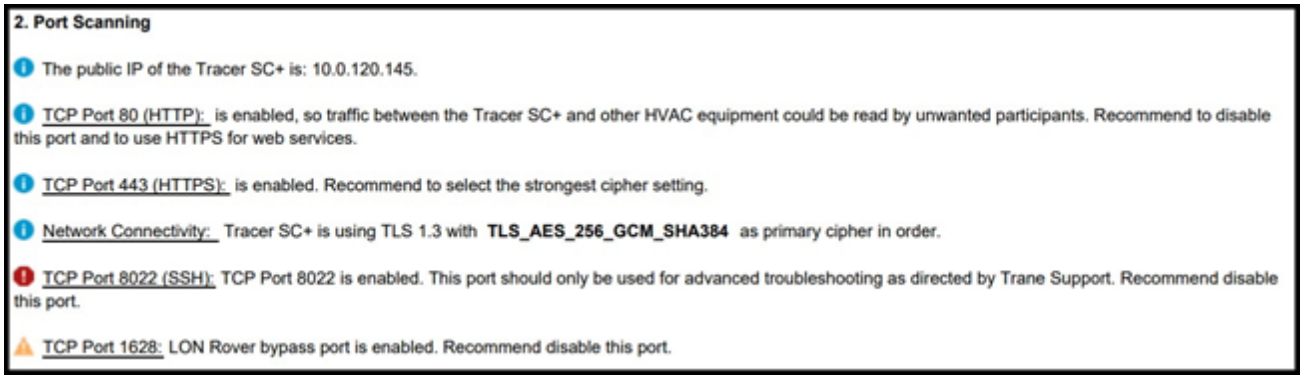
TIS only executes a port scan once per 5 minutes on a given device. If you are re-running the hardening report, please wait 5 minutes between executions.

Older Tracer SC+ devices do not have the necessary hardware to complete the TIS Port Scan.



If the Tracer SC+ is isolated from the internet or unable to reach the TIS cloud, this error will appear. If possible, troubleshoot your Trane Connect Connection.

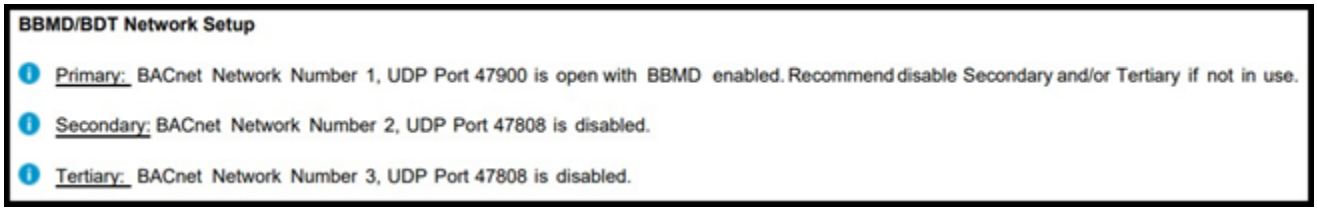
Tracer SC+ displays open ports are open and those that have been disabled. This is helpful information for an IT security person to assess.



***Note:** : If a port is recommended to be disabled (TCP Port 1628: LON for example), but is still in use, make a note on the Hardening Report before forwarding it to an IT security person. LON can be disabled if no LON devices are being used. This must be ON if you will be using Rover Bypass.*

BBMD/BDT Network Setup

When multiple UDP Ports are open with BBMD enabled, it is recommended to disable those that will not be used. If a second BACnet network is not required, turn off secondary/ tertiary BBMD/BDT.



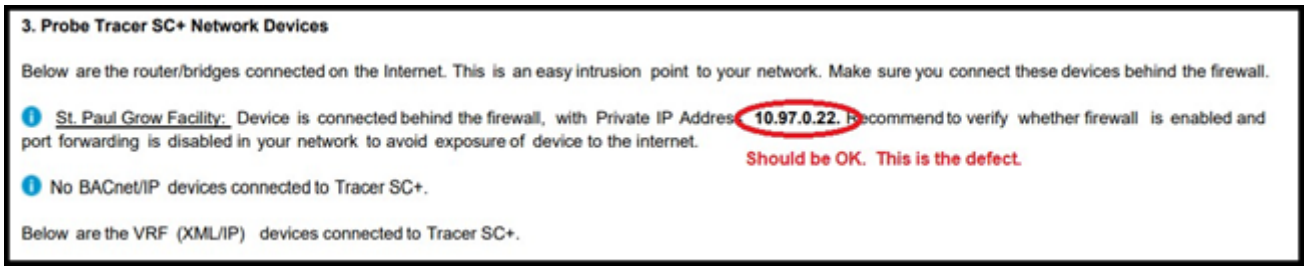
SSL Certificate Verification

Most controllers will receive the following message in this category:

An IT Person can upload an SSL Certificate to replace the self-signed one used by the Tracer SC+. For HTTPS, your certificate is unsigned. IT security persons can assess this risk to their own satisfaction.

Probe Tracer SC+ Network Devices

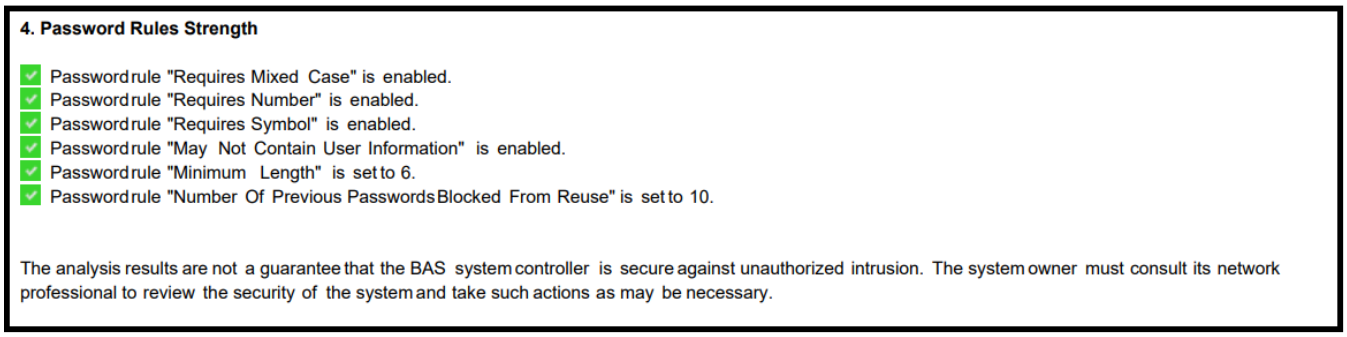
This feature finds other network devices communicating over IP. This also checks whether the IP Address is private or public by checking the digits themselves. This is the same check as the IP Range Check, just for the devices that the Tracer SC+ can find.



Note: *As of Tracer SC+ V5.4, a defect exists where 10.x.x.x IP addresses are incorrectly being called* ***Public*** *when in fact it is a* ***Private*** *IP address.*

Password Rules Strength

Password rules strength looks at the settings around password rules. Within the Tracer SC+, administrators are allowed to set up password rules. If any of the password rules have been modified from default in a way that decreases password security, it will be pointed out here on the Hardening Report.



Key Conversion

The Key Conversion page displays both custom and factory key conversions. Select a tab to view either Custom of Factory.

Custom key conversions:

- Custom key conversions are displayed with the type, the key, and whether the key conversion is in use.
- To view details of a custom key conversion, click on the name; the **Key Conversion Details** page opens.
- Delete or export custom key conversions, by selecting one or more and then making a selection from the Actions button.
- To import a new custom key conversion, click the Import button.

Factory key conversions:

- Factory key conversions are displayed with the type, the key, and whether the key conversion is in use.
- To view details of a factory key conversion, click on the name; the **Key Conversion Details** page opens.

Protocol Capture

Allows the user to capture data on active links of the SC+. For more information, see Tracer SC+, Network Troubleshooting Appendix in *Tracer® SC+ System Controller with the Tracer® Synchrony User Interface Installation, Operation, and Maintenance manual* (BAS-SVX077*-EN).

Programs

Tracer Graphical Programming (TGP2) programs are created and downloaded to Tracer SC+ by using the Tracer TU service tool. To view the status of programs after they have been downloaded to Tracer SC+, select **Tools** > **Programs** from the left navigation menu. The **Programs** list page shows the how often programs in Tracer SC+ run and the most recent run time.

Custom TGP2 routines for installed equipment can now be viewed in real-time. Data points in the routine will reflect present value and gets updated for every 15 seconds.

Note: *See the Tracer® TU Service Tool, User Guide (BAS-SVU046*-EN).*

Resource Usage

Resource Usage displays system usage among applications, memory, and points. This is primarily used by Trane Technical support.

Support Files Library

Support Files Library allows you to upload useful files to Tracer Synchrony such as manuals, sequence of operations, and wiring diagrams. The files can then be associated with a specific piece of equipment, space, or system. This functionality is also available from the Support tab on any equipment, space, or system page.

System Logs

System logs that are currently on the system are available for viewing or exporting. System logs can be the standard **hydra** log files (hydra.log, hydra.log.0, hydra.log.1, hydra.log.2, hydra.log.3, hydra.log.4), any stack dump log files (stackdump.log.x), or any additional log files that may be generated by a Tracer SC+ application and/or process.

From the left navigation menu click **Tools > System Logs**.

Tracer Ensemble IP Address

This tool only applies to facilities with Tracer Ensemble installed. You can view and edit the Tracer Ensemble IP address for Direct Linking. To access, select **Tools > Tracer Ensemble IP Address** from the left navigation menu.

Connecting a Tracer SC+ to a Building Network

Today, most business systems use Internet Protocol (IP) networks. A Tracer Synchrony building automation system can exist on an IP network along with the other business systems. An IP network allows all applications on the network to be accessed from a single PC. All networks referred to in this guide are IP networks. A single IP network can exist in a single building or can connect a group of buildings separated by several feet or hundreds of miles. An IP network that is confined to a single building or group of buildings is referred to as a local area networks (LAN). LANs can be connected together over any distance by using telephone lines and radio waves. A system of LANs connected in this way is called a wide area network (WAN).

A network can have multiple virtual local area networks (VLANS). If Tracer controls are on the customer network it is best practice to request a separate VLAN for HVAC equipment from the IT Staff.

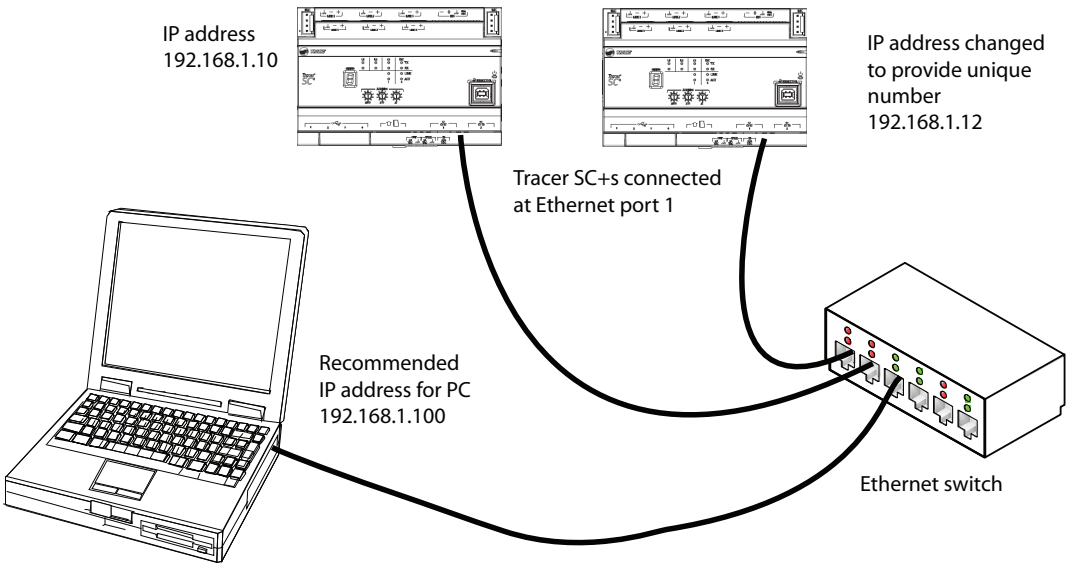
Network Pre-installation

Before installing a Tracer SC+ on a network, determine if the network will be used on one or more Tracer SC+s and if the network will be divided into subnets. Meet with the customer's IT staff to discuss where the Tracer SC+s are to be located and to obtain required information and equipment.

Single and Multiple Tracer SC+ Facilities

The following figure shows a multi-Tracer SC+ facility. Two Tracer SC+s are connected to a PC by an Ethernet switch. The Tracer SC+ on the left still has its IP address. The Tracer SC+ on the right has had its IP address changed so that it is unique. The PC has the recommended IP address.

Figure 69. Multiple Tracer SC+s connected through an Ethernet switch



Networks with Multiple Subnets

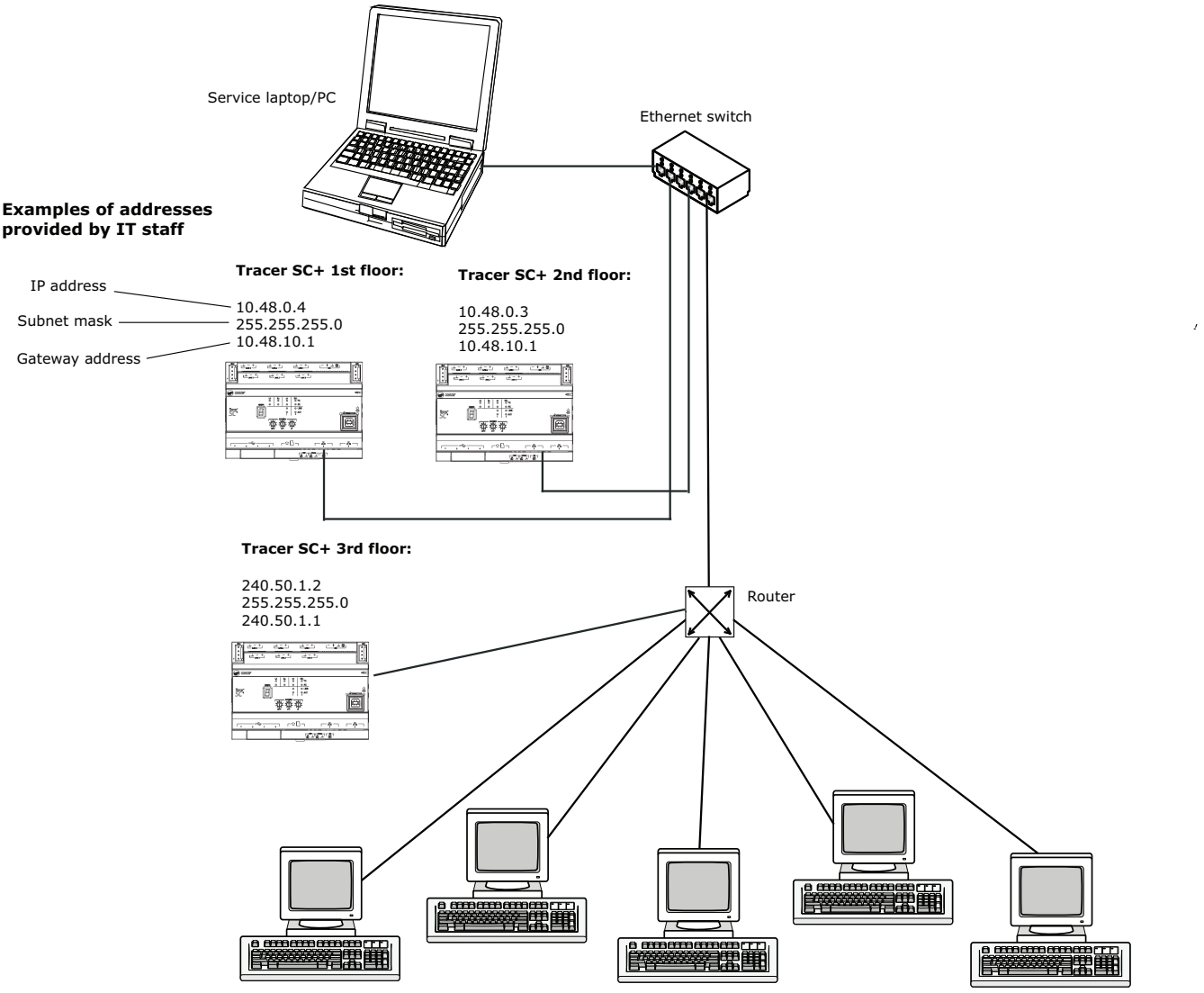
Large complex networks are often divided into segments called subnets.

It is crucial to involve the customer's IT staff in setting up such networks.

Subnets make network communication more efficient. A typical subnet might consist of, for example, all the equipment at one geographic location, in one building, or on a single LAN (if the network is a WAN).

A router separates a network into subnets and controls excessive network traffic which can slow network performance. Some broadcast messages (messages that are sent to all devices on an entire network) are not needed by all devices. Devices on the same subnet have IP and gateway addresses with a common IP routing prefix. The router manages communication between the subnets by using the gateway addresses to determine which messages pass from one subnet to another.

Figure 70. Networks with multiple subnets



Network Installation

The following information and equipment is required or optional, as stated, for installing Tracer SC+ on a building network.

Note: *A memo is available for communicating with the customer's IT staff about the information that must be obtained from them for network installation.*

Obtaining the IP Address

A unique IP address is required for each Tracer SC+ for all networks. A Tracer SC+ can use either:

- A permanently assigned (static) IP address, or
- An address that is sent from a Dynamic Host Configuration Protocol (DHCP) server. The DHCP server must be set up to send the Tracer SC+ the same reserved IP address each time the Tracer SC+ connects to the DHCP server.

You can obtain IP addresses from the customer's IT staff.

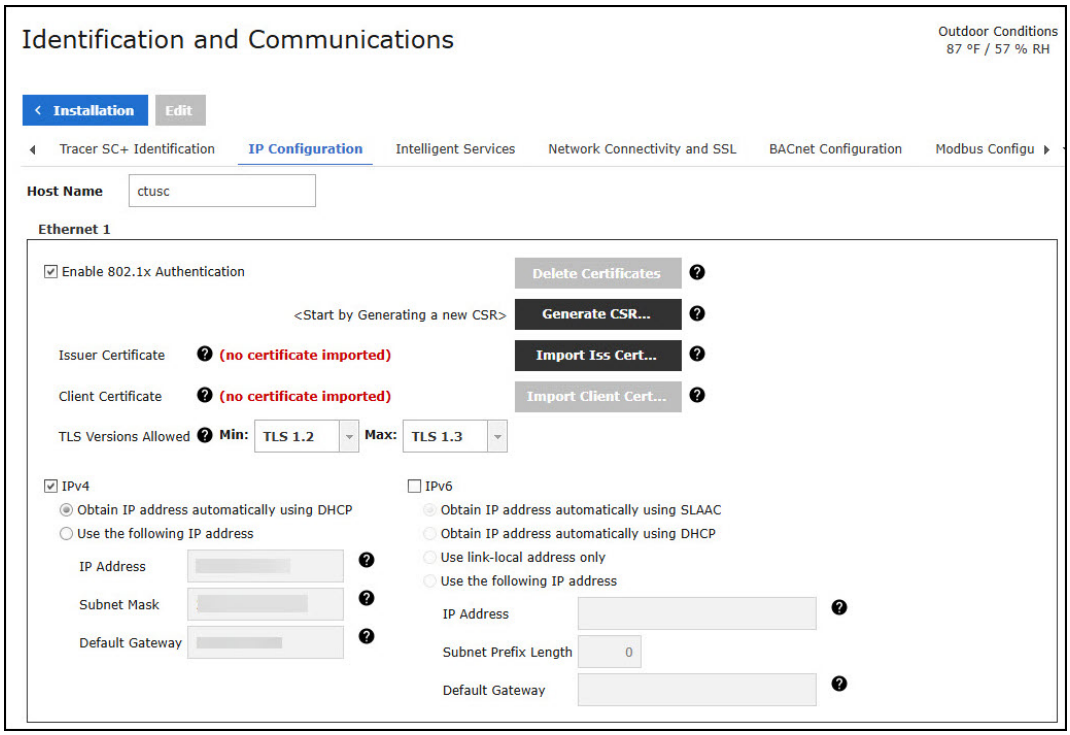
To edit the IP address of a Tracer SC+:

1. A the Tracer Synchrony user interface select Identification and Communications from the Installation page, then select the IP Configuration tab. See Figure 71, p. 100
2. Click **Edit.** To edit the network address for one or both Ethernet Network ports, select one of the following options:

- **Obtain IP address automatically using DHCP**. A Dynamic Host Configuration Protocol (DHCP) requests an IP address from a server.
- **Use the following IP address**. Enter an IP address in the provided fields.

3. Click **Save**.

Figure 71. Edit IP address



Routing

Routing is the process of selecting paths in a network to send network traffic. Use network routing for Trane Intelligent Services (IS) applications or in any case where the BAS network must be separated from the Internet.

To select network routing:

1. Use the check boxes to select one or more network addresses See Figure 72, p. 100.
2. Click the actions button to edit or delete the address.
3. Click **Save**. OR add a network route by clicking the add route button. The **add route** dialog box appears Figure 73, p. 101.
4. Enter the required information in the fields, then click **Save**.

Figure 72. Selecting a routing network

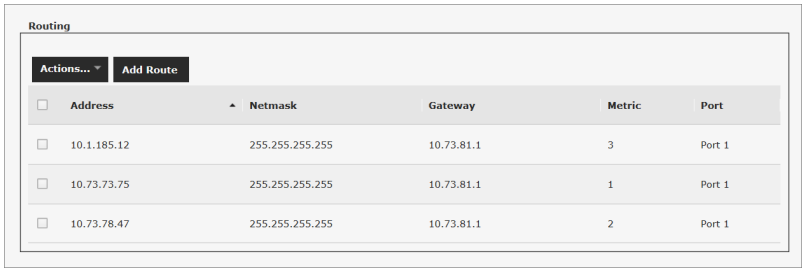
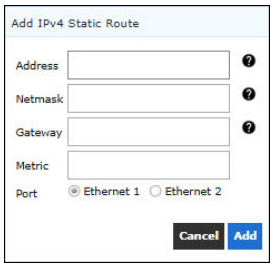


Figure 73. Add a network route



DHCP

If the network uses the Dynamic Host Configuration Protocol (DHCP), DHCP server must be set up to send the Tracer SC+ (unless it is a BBMD) the same reserved IP address each time the Tracer SC+ connects to the DHCP server. If the Tracer SC+ is a BBMD, the IP address must be fixed.

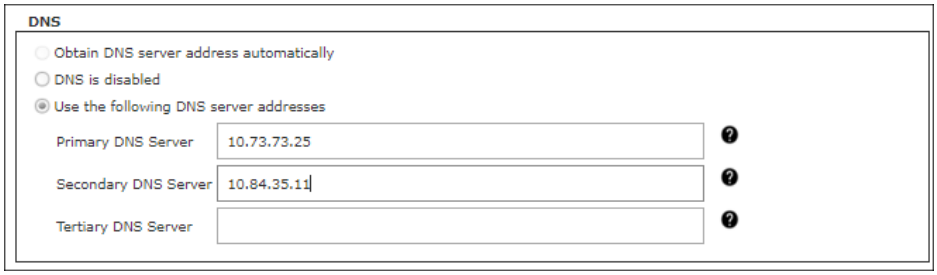
DNS Server

Domain Name System (DNS) is an Internet service that translates domain names into IP addresses. It may be necessary to configure the DNS server for network routing. Use network routing for Trane Intelligent Services (IS) applications or in any case where the BAS network must be separated from the Internet.

To manually configure the DNS server:

1. From the left navigation menu, click **Installation > Identification and Communications > IP Configuration**.
2. Click **Edit**.
3. In the **DNS Setup** section, select the **Use the following DNS server addresses** radio button See Figure 74, p. 101.
4. Enter the DNS server addresses for Primary, Secondary, and Tertiary (where applicable).
5. Click **Save**.

Figure 74. Configure the DNS server



Jacks and Cabling

Required for connecting the network. (Obtain from IT staff).

Gateway Address

Required for all networks. The gateway address allows traffic to be routed between the Internet and an internal network. (Obtain from IT staff.)

MAC Address

Required for all networks. A media access control (MAC) address — also called a physical address — is a unique number assigned by the manufacturer for identification. The IT staff at the customer site will request that you provide the MAC address of any Tracer SC that is to be installed on the building network. The MAC address can be found in the IP configuration section of the Tracer SC user interface.

You can also obtain the MAC address by doing the following:

1. Select **Start > Run.**
2. In Run, type **command**. A DOS screen opens and presents a prompt.

3. At the prompt, type **ping** followed by a space and then the IP address. Click Enter.
4. At the next prompt, type **arp -a**. Click Enter.

   The response contains the MAC address below the heading, Physical Address.

Ethernet Switch

An Ethernet switch is an optional device used to connect multiple Tracer SC+s on the same facility for convenience and as a way of optimizing network traffic. Use Ethernet port 1 to connect multiple Tracer SC+s individually to the Ethernet switch.

Router

Required to separate a network into subnets to manage network traffic.

Subnet Mask

Required for subnets. A subnet mask is a number used for routing traffic to a particular subnet. The subnet mask is stored in the PC, server, or router and is matched up with the incoming IP address to determine whether to accept or reject a packet. (Obtain from IT staff.)

Securing Your Network with VPN

Trane recommends the use of a Virtual Private Network (VPN) to provide extra security to your BAS. VPN is a mechanism that safely extends a private network across a public network such as the Internet.

VPN provides an additional layer of security to your BAS without comprising your ability to access Tracer Synchrony remotely. A VPN can help to prevent Internet based attacks on your BAS by requiring an additional layer of authentication. This method requires a VPN server and VPN client software to be set up by the customer’s IT staff.

Trane's recommended method of VPN is Trane Connect. However, customer-provided VPNs can be used if the customer's IT staff will not allow Trane Connect.

Frequently Asked Questions about VPN

My facility already uses SSL. Do I still need to use a VPN?

The use of a VPN is still recommended as an additional layer of security. Attacks can come from both inside and outside of your network.

After I set up a VPN, do I still need to use SSL?

Yes. A VPN only provides encryption between the VPN endpoints (the VPN client and server). Traffic from the VPN endpoint to and from the server is not encrypted unless SSL is used.

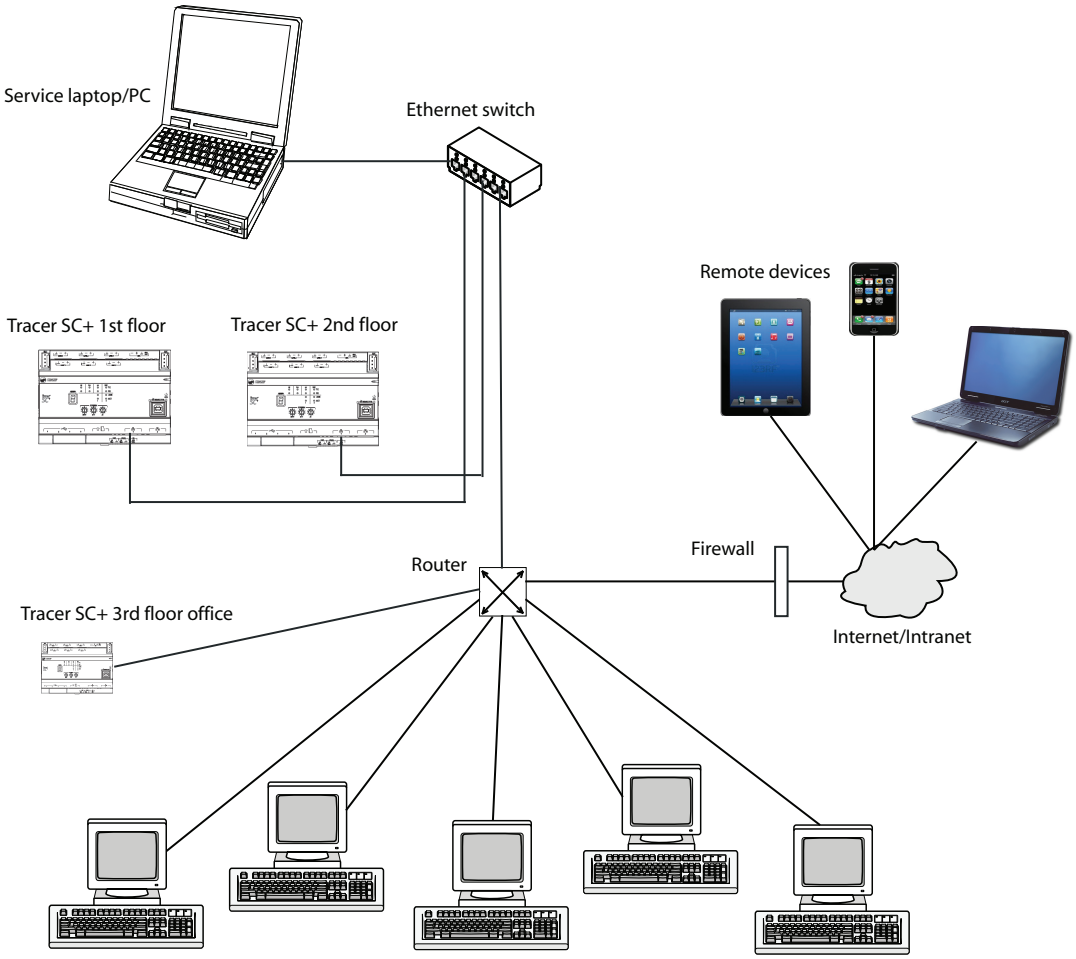
Do I still need a firewall?

Yes. Firewall rules should be set up to restrict Internet access to the VPN port only. Consider setting up rules with the VPN server to restrict VPN access to only the required IP addresses and port.

What is the impact of VPN on my system performance?

Impact to performance should be minimal.

Figure 75. Remote access to a Tracer SC+ by port forwarding



IPv6 Protocol

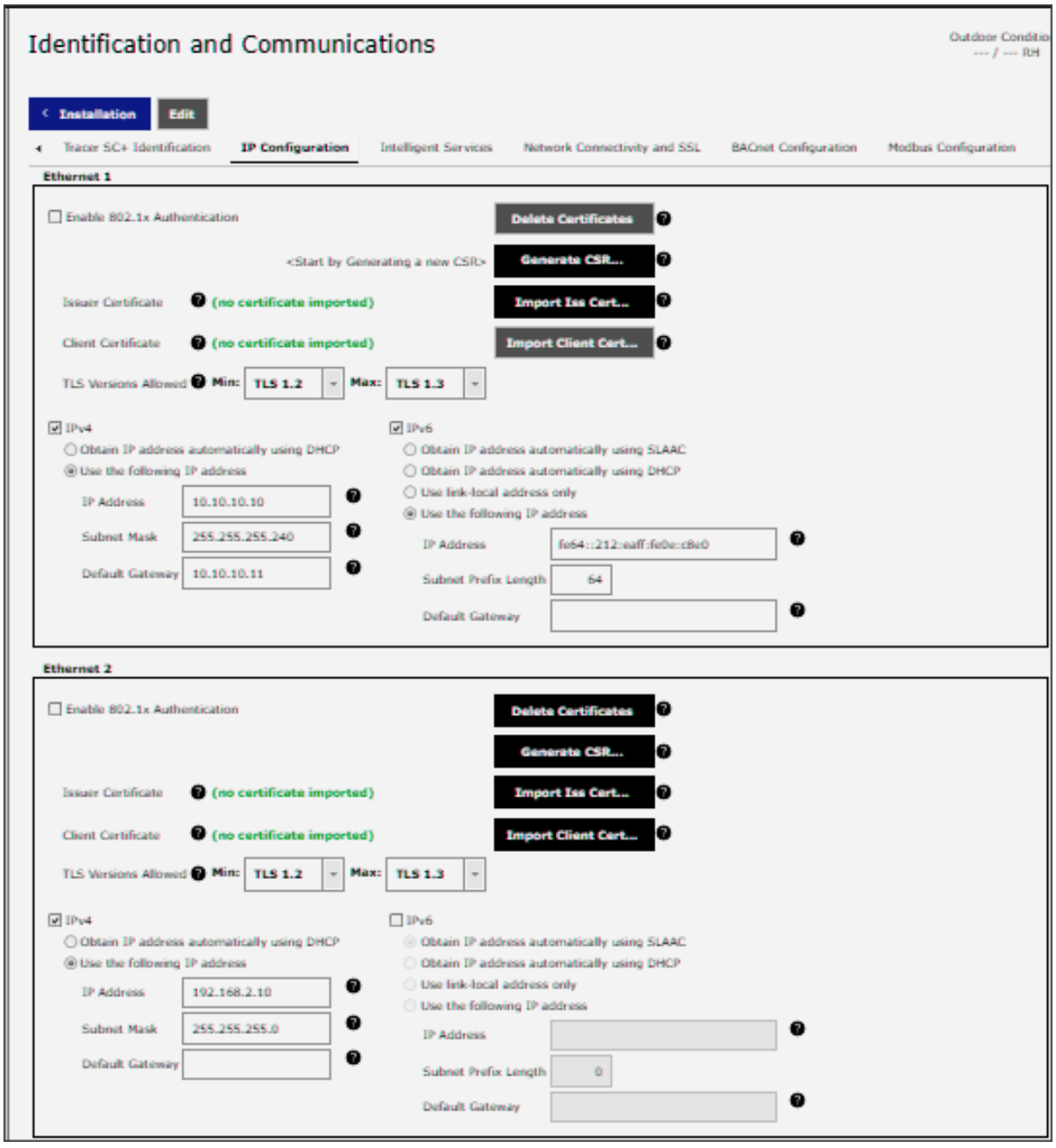
IPv6 is the next generation internet protocol that addresses the shortage of IP addresses in IPv4. Tracer SC+ supports IPv6 for Ethernet Communications on Ethernet Port 1 and Port 2. The DNS must be set up for IPv6. BACnet IPv6 is also supported.

To configure IPv6 on an SC+:

1. Navigate to Installation > Identification and Communications, and then select the IP Configuration tab (see Figure 76, p. 104).
2. Click **Edit**.
3. Select the IPv6 protocol from Ethernet 1 or Ethernet 2.

   Note: *Both IPv4 and IPv6 can be configured to operate simultaneously.*
4. Select one of the following methods to obtain the IP address:
   - SLAAC — a method in which the host or router interface is assigned a 64-bit prefix, and then the last 64 bits of its address are delivered by the host or router with help of EUI-64.
   - DHCP — a dynamic host configuration protocol (DHCP) requests an IP address from a server.
   - Link-local address — generates a link-local type IPv6 address that can be used within the context of the system.
   - Static address — enter the IP address in the provided field; enter the subnet prefixed length.

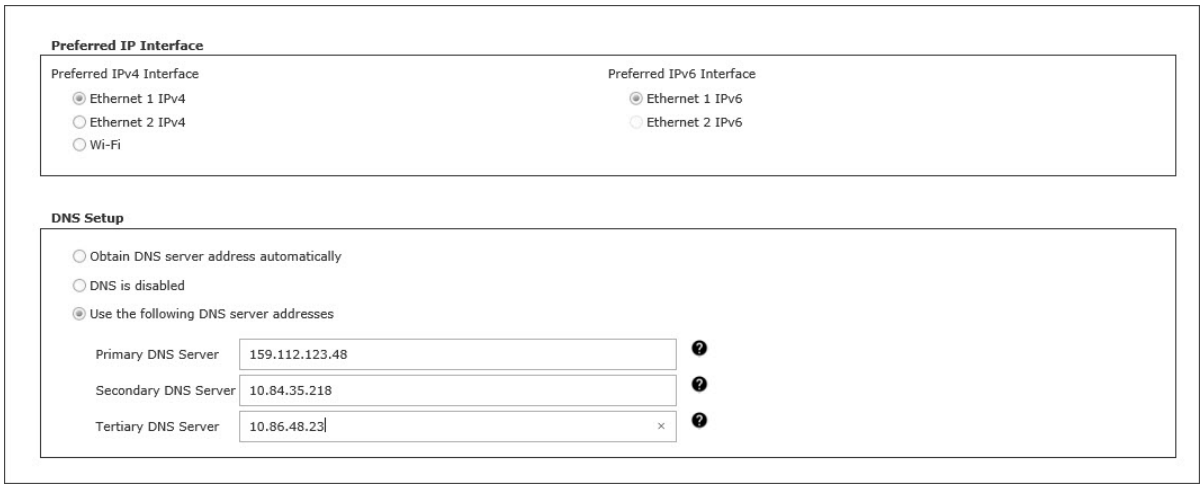
Figure 76. Configuring IPv6 on Tracer SC+/Synchrony



The IPv6 address consists of eight groups of four hexadecimal digits, with each group representing 16 bits. The groups are separated by colons. Leading zeros may be omitted. Groups of consecutive zeros can be abbreviated as two colons (::).

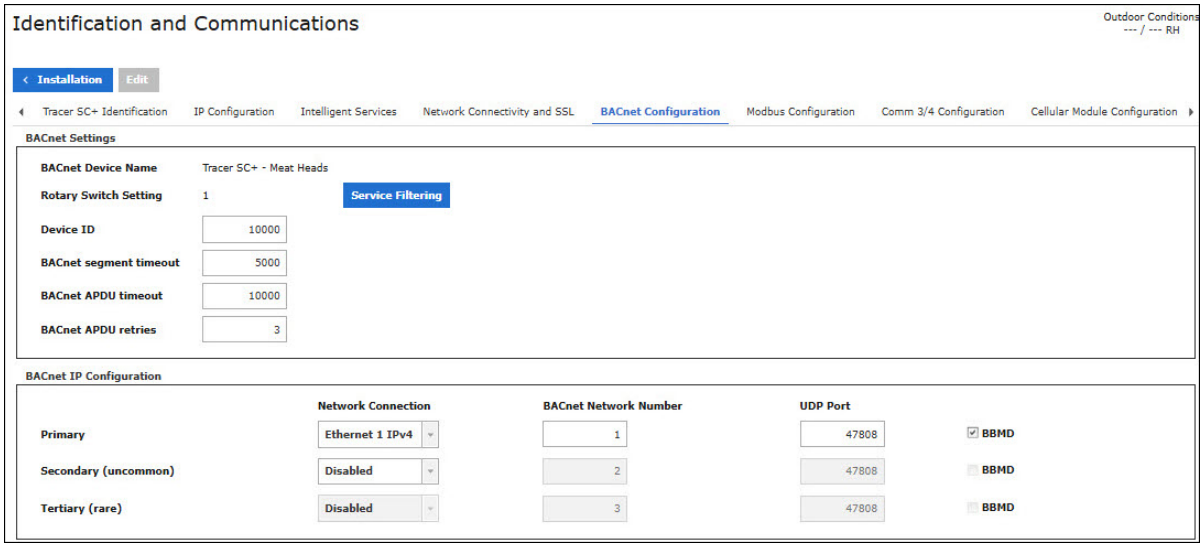
5. Select the preferred IPv6 Interface.
6. Select the option to set up the DNS server address. If the static option is selected, specify the IPv6 address. Click **Save**.

Figure 77. Selecting the network connection for IPv6



7. Navigate to the BACnet Configuration tab and click **Edit**.
8. Choose the network connection for primary, secondary, or tertiary with the Ethernet port you enabled for IPv6. Click **Save**.

Figure 78. Selecting the network connection



802.1x Authentication

Overview

802.1x authentication is a network access control protocol that authenticates devices attempting to connect to a network. It is used to enhance security by ensuring that only authorized devices can access network resources. This is particularly useful in environments where sensitive data and systems need protection from unauthorized access. While 802.1x authentication is standard for securing access on networks that require strict control and authentication (main building network), there may be components of the overall network infrastructure where 802.1x is not implemented, often to maintain simplicity or for other operational reasons.

Configuring 802.1x

Configuring 802.1x authentication is crucial for securing the BAS controller access to the network. It ensures that:

- The identity of the device is verified through trusted certificates.
- Network communications are encrypted and secure.
- Only authorized devices can connect to the network, protecting against unauthorized access and potential cyber threats.

Note: *Collaborate with the customer IT department or a trusted Certificate Authority (CA) to configure the authentication.*

To enable 802.1x authentication:

1. Navigate to the IP Configurations page: **Installation > Identification and Communications > IP Configuration.**. Click **Edit**.
2. Navigate to the Ethernet port you wish to secure and check the option to **Enable 802.1x Authentication**. This activates the protocol, requiring authentication for network access for the desired Ethernet port.
3. Select **Generate CSR...** to create a Certificate Signing Request. This action prompts the system to generate a key pair (public and private keys) and compile information that will be included in the certificate. The CSR file is automatically downloaded and must be sent to the IT department or a Certificate Authority (CA) for signing.
4. Obtain and Upload Certificates:
   a. The IT department or CA will review the CSR and, if everything is in order, issue two certificates: an issuer (or CA) certificate and a client certificate.
   b. Use the **Import Iss Cert...** button to upload the issuer certificate, sometimes referred to as the CA certificate. This certificate establishes trust for the client certificate by linking it to a known and trusted CA.
   c. Use the **Import Client Cert...** button to upload the client certificate, which is essentially the signed CSR. This certificate identifies the BAS controller and proves its identity to the network.
5. If applicable, specify the TLS (Transport Layer Security) version range that the 802.1x network supports. This ensures that the encryption standards used for securing the connection are compatible with the network requirements.
6. Click **Save** to apply the changes. The ethernet port is now configured to use 802.1x authentication.

Ethernet Network Wiring

Ethernet network requirements are described in this section.

Network Wiring Specifications

Trane requires Cat5, 5e, or 6 cable for Ethernet network wiring.

The Ethernet port on Tracer SC+ supports only twisted-pair wire (100BaseT) with RJ45 connectors. With twisted-pair wiring, one pair is used to receive data signals and the other pair is used to transmit data signals.

If a direct connection between two devices is required, use a straight-through or crossover cable. If multiple devices are required to communicate, use an Ethernet switch.

The EIA/TIA cabling standard recommends a maximum segment length of 295 ft (90 m) between the wire termination equipment in the wiring closet and the wall plate in the office. This recommendation provides 33 ft (10 m) of cable allowance to accommodate patch cables at each end of the link and signal losses in intermediate wire terminations on the link.

Note: *Cable installations must comply with both federal and local codes. Plenum-rated cable is available to meet NEC Article 725, which addresses flame resistance and smoke emission for signal cables*

Due to the high precision required when performing twisted-pair wire terminations, Trane recommends that only qualified technicians with the proper equipment handle all terminations and splicing.

Wire type	Maximum total wire length [a]	Minimum distance between two devices
100BaseT	328 ft (100 m)	1.64 ft (0.5 m)

[a] You can increase distances and the number of devices by using an Ethernet switch.

BACnet Network Communication

BACnet communication must be configured for Tracer SC+ system controllers. For communication between Tracer SC+s, BACnet IP addressing is used. For communication with unit controllers on a twisted-pair communication link, the BACnet (MS/TP) protocol is used. Review your network configurations to determine whether or not Tracer SC+s are able to communicate with each other. Depending on how your network is configured, BBMDs may not be required.

BBMDs

BBMDs are required for subnets. To ensure that messages are routed properly through the network, one controller on each subnet must be assigned as the BBMD for that subnet. BBMDs are assigned during configuration of the Tracer SC+.

A subnet's local BBMD enables the passing of a BACnet message from one subnet to the next by repackaging it as a *directed message* (a message that is intended for specific devices), and then sending it to each remote BBMD on its broadcast distribution table (BDT). The subnet's local BBMD then rebroadcasts the message to the devices on its subnet. A Tracer SC+ that is a BBMD must have a fixed IP address.

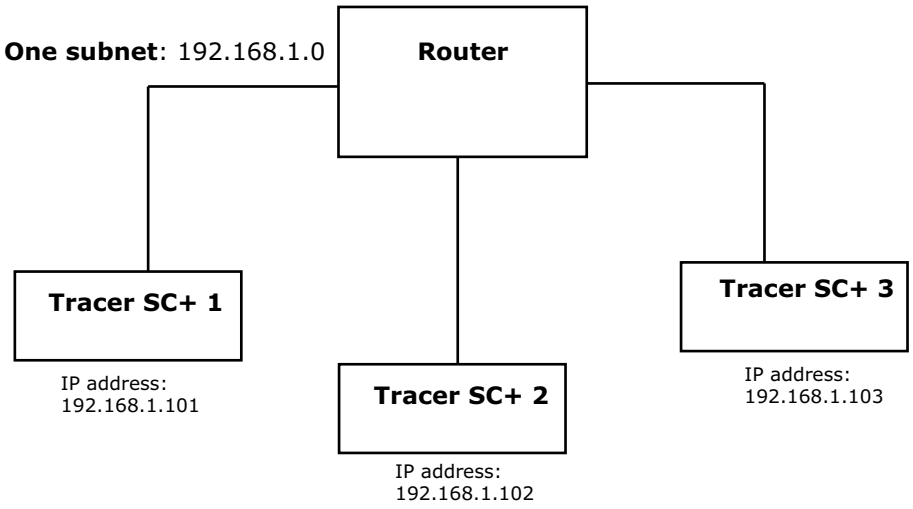
BDTs

BDTs are required for subnets. A broadcast distribution table (BDT) is essential for routing broadcast messages. It is created during Tracer SC+ configuration. A BDT contains the IP address for each BBMD on the network. An identical BDT must be downloaded to each BBMD on a site, which is facilitated by the BDT editor in the Tracer Synchrony user interface.

UDP Port

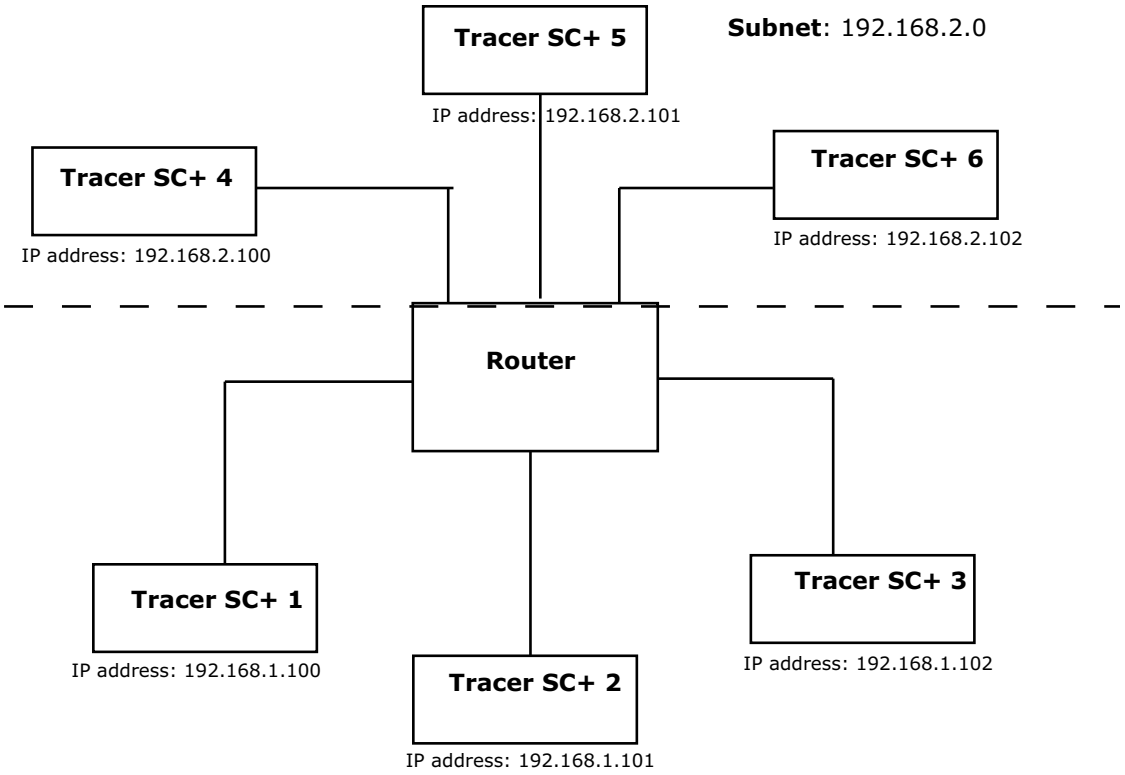
UDP ports are always required for BACnet IP, even if there is only one subnet. The User Datagram Protocol (UDP) is an internet protocol used for BACnet device communication. The default UDP port number is 47808, and can be changed at the Tracer Synchrony user interface by navigating to **Installation>Identification and Communications>BACnet Configuration**. Refer to the following two figures for examples.

Figure 79. Example of a facility that does not require BBMDs (single subnet)



Some facilities do require a BBMD if they are configured with more than one subnet as shown in the following figure.

Figure 80. Example of a facility that requires BBMDs (multiple subnets)



Multi-Tracer® SC+ Facilities

Multi-SC+ facilities provide improved performance and job layout options, particularly in large facilities such as college campuses. A multi-SC facility consists of one Tracer® SC+ with a Core license (App SC+) and controls all applications (schedules, systems, reports and so forth), and one or more Tracer® SC+s with a Base license (Base SC+) that serve as BACnet routers. With this layout, a Tracer® SC+ installation can utilize:

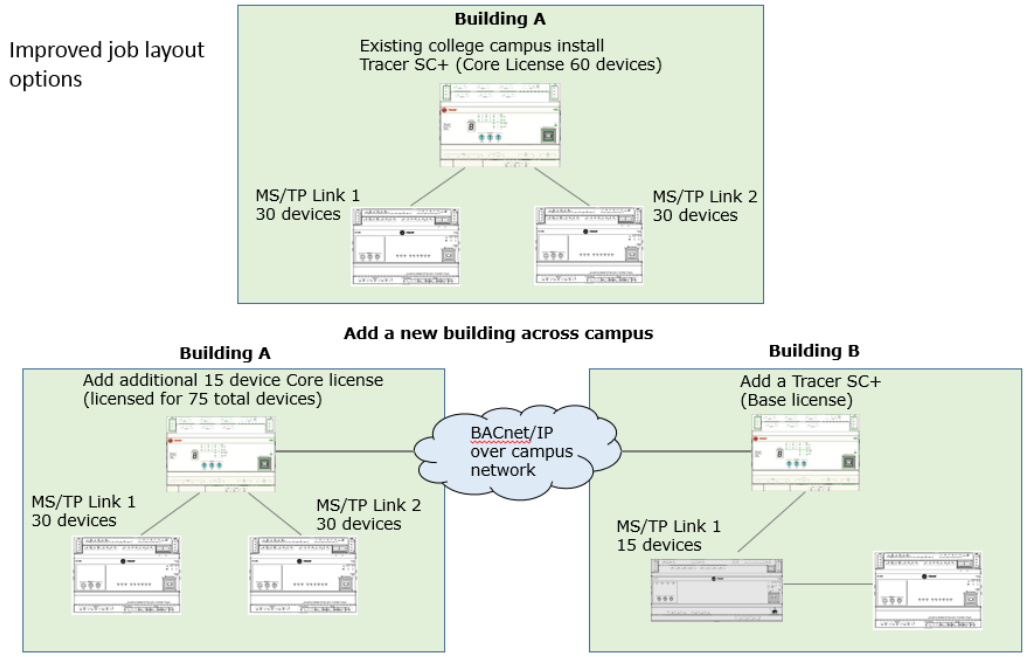
- One or more MS/TP links with 60 devices on each link
- A variety of customized configurations

The following table shows both single SC+ and multi-SC+ support for various protocols

Communication Type	Single SC+	Multi SC+
Air-Fi® Wireless	Up to 120 devices	Up to 240 devices
BACnet MS/TP	Up to 180 devices	Up to 240 devices
BACnet IP	Up to 240 devices	Up to 240 devices
COMM 3/4	Up to 240 devices	Up to 240 devices
LonTalk®	Up to 240 devices (when using two Tracer® USB LonTalk® modules)	Up to 240 devices (when using two Tracer® USB LonTalk® modules)*
Modbus®TCP	Up to 240 devices	Up to 240 devices*
Modbus® RTU	Up to 90 devices	Up to 90 devices*
* Must be installed on the Application SC+		

Note: *Trane Air-Fi sensors do not count against the device limits listed above. For more information, see the Air-Fi Wireless System, Installation, Operation, and Maintenance Manual, (BAS-SVX40*-EN).*

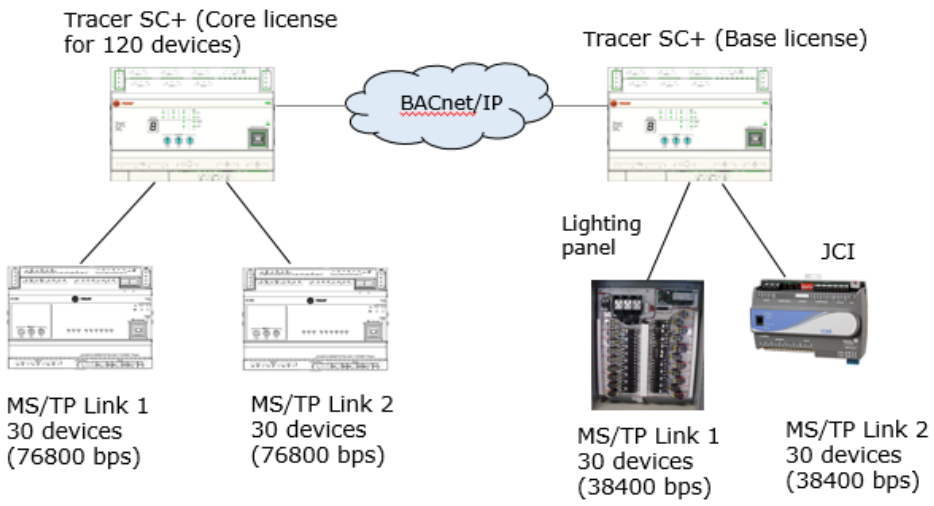
Figure 81. Example of a multi-SC+ facility (college campus)



Multi-SC+ communication also allows for increased integration options with non-Trane BACnet systems. The following figure illustrates a sample facility layout with an additional Tracer® SC+ that serves as a base module and non-Trane devices with slower baud rates.

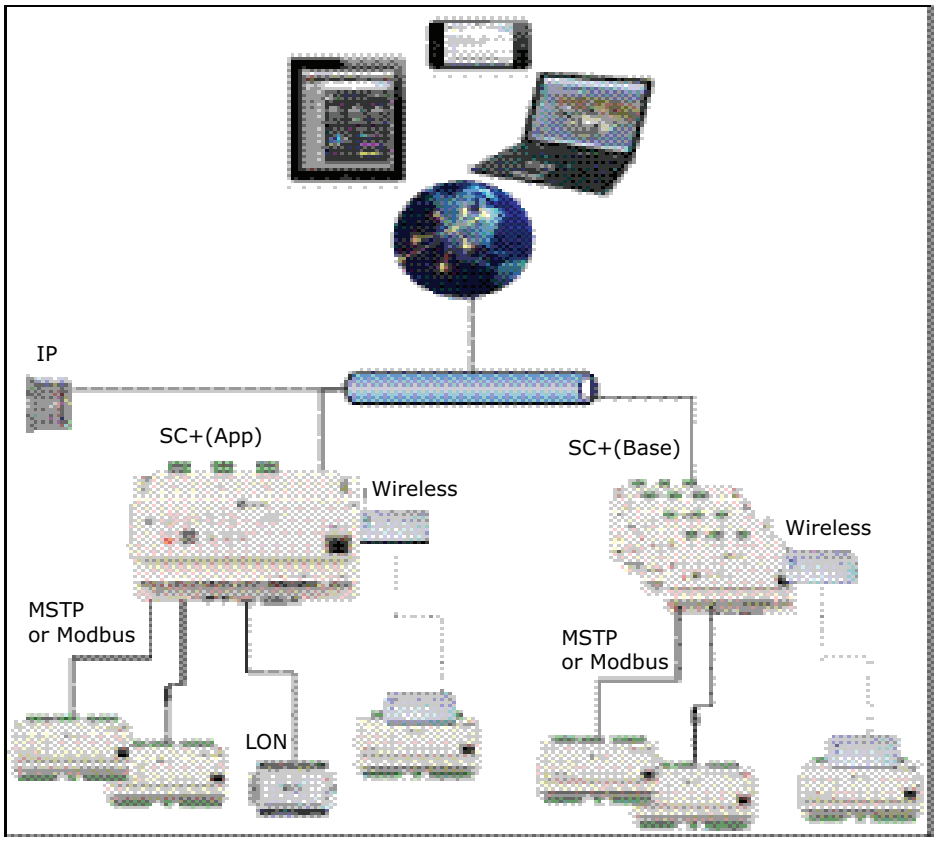
Note: *Please contact Trane Product Support in St. Paul to assist with implementation and provide up-to-date support.*

Figure 82. Example of a facility with non-Trane devices and slower baud rates



The following figure illustrates how LonTalk® devices must be physically connected to the App SC+. BACnet unit controllers can be physically connected to any
Tracer® SC+ controller.

Figure 83. Facility layout with LonTalk® and wireless devices

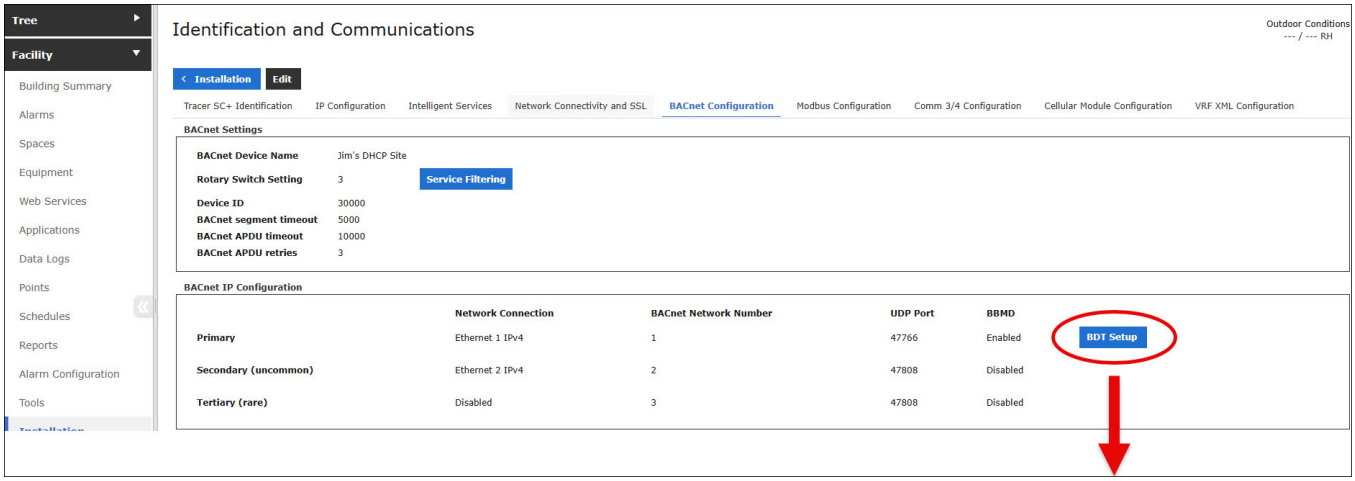


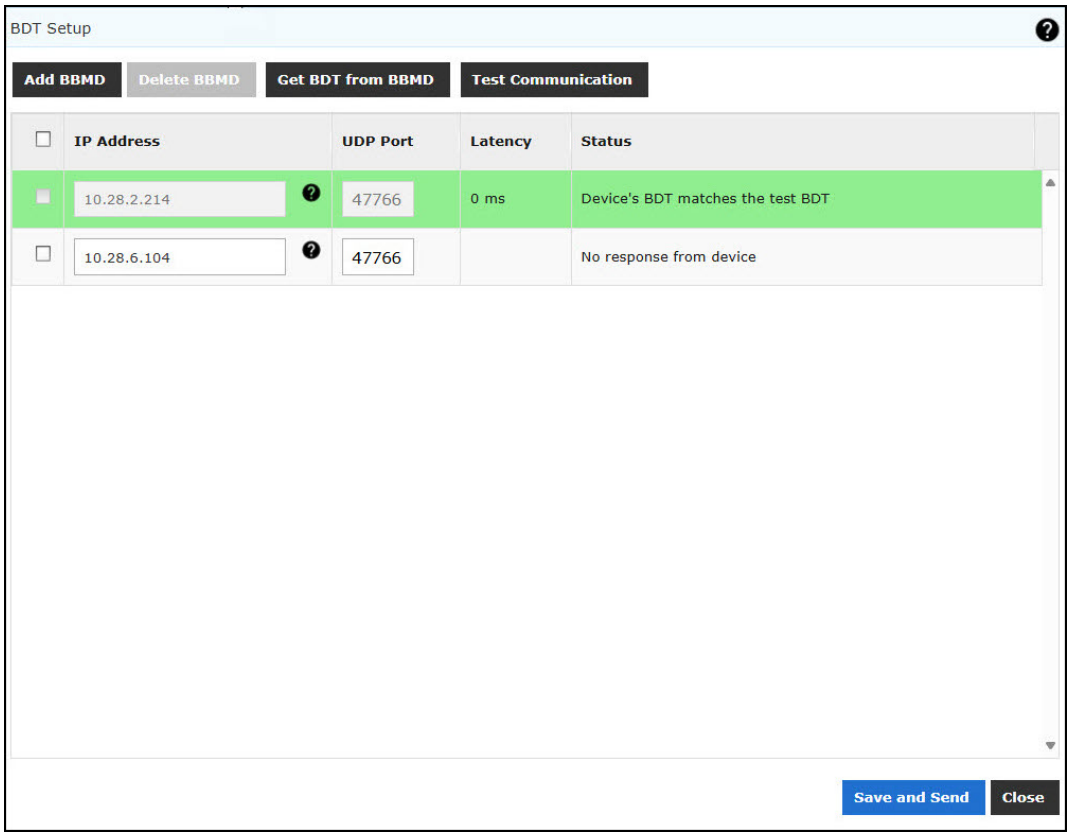
Setting Up BACnet Communication for Multiple Tracer SC+s

To set up BACnet communication:

1. Determine how your Tracer SC+ controllers are configured on the BACnet network. If there is more than one subnet, a BBMD is required on each subnet.
2. Record the IP addresses for all Tracer SCs and subnet masks; save for a later step.
3. Navigate to the Identification and Communications section of the Tracer Synchrony Installation page, then click the BACnet Configuration tab.
4. Click **Edit**.
5. In the BACnet IP configuration, click **BDT Setup**. The **BDT Setup** dialog opens.

Figure 84. Setting up a BDT





6. Enter the IP address (s) that you saved from an earlier step. Enter the addresses in the IP address fields. The entries in the BDT table are BBMDs. If your network requires additional BBMDs, click add BBMD.

   Important: *Only one Tracer SC+ can be set up as a BBMD on a subnet even if multiple Tracer SC+ controllers reside on the same subnet.*

7. Click **Save and Send**.

Sharing Data Between Two Tracer® SC+s

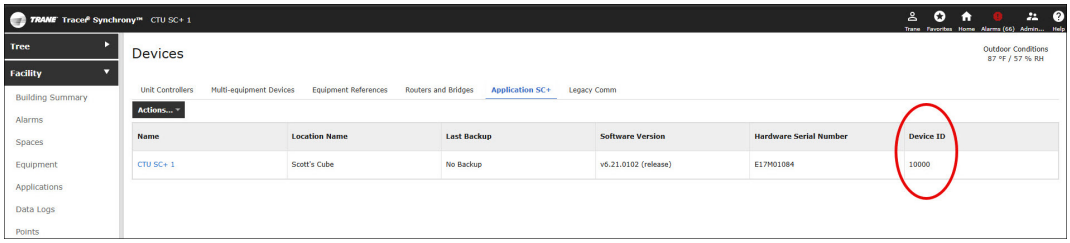
To set up communication between Tracer® SC+ controllers, it is necessary to create points in each controller. The following procedures describe both the **Pull** and **Push** methods, using a chiller plant scenario.

Sharing Data Using the Pull Method

Use the following procedure to set up a reference for a chilled water request from SC+ 1, which does not have the chiller plant in it, to SC+ 2, which does have the chiller plant. The assumption is that SC+ 1 and SC+ 2 are already properly configured to communicate with each other.

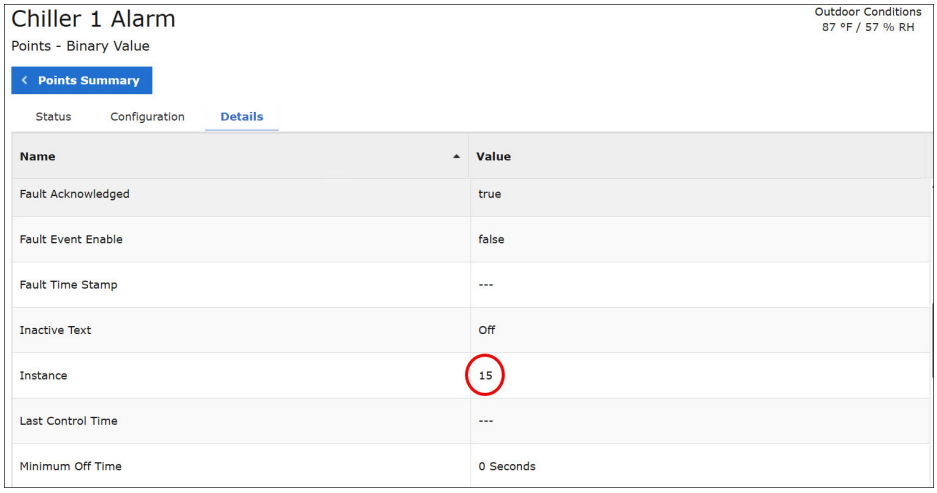
1. Create a binary value point in SC+ 1 that indicates the chilled water request. The value would typically be controlled by a TGP2 program.
2. At the Tracer® Synchrony user interface, click **Devices** from the left navigation menu. The **Devices** page opens.
3. Click on the **Application SC** tab. Locate and record the device ID; save for a later step. (See the following figure.)

Figure 85. Locate the device ID



4. Navigate to the **Details** tab of the point that you created in step 1, and locate the instance number (see the following figure). Record the instance number for a later step.

Figure 86. Point details page (locating the instance number)



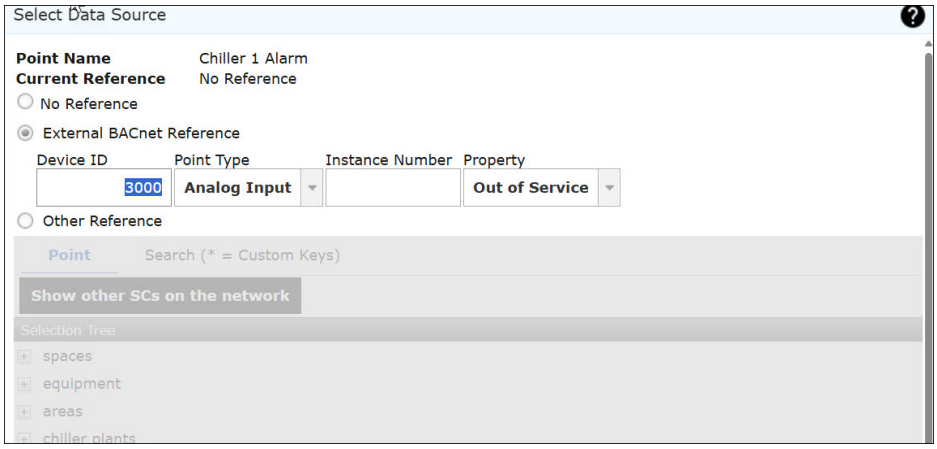
5. End you session with Tracer® SC+ 1.
6. Log in to Tracer® SC+ 2.
7. Click **Points** from the left-navigation menu.
8. On the **Points** page, click Create Point. Create a binary input point in SC+ 2 and name it **SC+1 Chilled Water Request** or a similar meaningful name.
9. Click **Select external BACnet® reference.**
10. Enter the device ID, point type, and instance number that you recorded in an earlier step (see the following figure). Select **Value** from the property drop-down list.
11. Click **Apply** to return to the **Create Point** page.
12. Set the update interval for the binary input point. The interval should be how often you want SC+2 to request the chilled water request status.

- An interval of 1 to 5 minutes is recommended for BACnet® IP data sharing.
- An interval of 5 to 15 minutes is recommended for BACnet® MS/TP data sharing.

13. Enter any other preferred point data, then click **Save**.

The chilled water request from SC+ 1 is now available to be used in SC+ 2 as needed.

Figure 87. Setting up an external reference



Sharing Data Using the Push Method

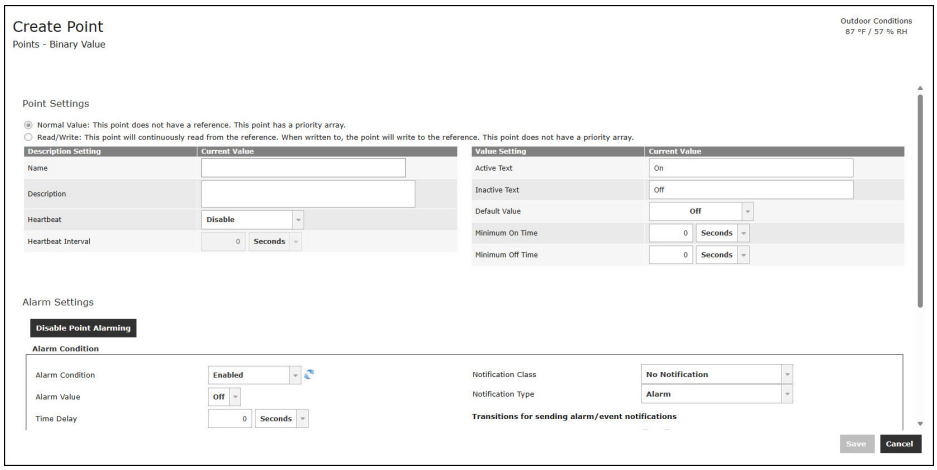
The following example of a **push** method is a chilled water request. SC+ 1 is the controller that receives the request from some device connected to it. SC+ 2 is the controller that must receive the request to start its chiller plant.

By using this method, the output point can be configured to send the data at a rate that is faster than the heartbeat interval on the receiving value object. This allows for multiple attempts to be made at sending the data before the value point enters a fault state.

1. At the Tracer® Synchrony user interface, click **Points** from the left navigation menu. The **Points** page opens.
2. Click the **Create Point** button, then select **Binary Value**.
3. Enter the following information in the fields as shown in the following figure.
   - Name – Chilled water request (user specified)
     - Heartbeat – enable (to detect communication failures)
     - Heartbeat Interval – 15 minutes (recommended range is 30 seconds to 12 hours)

     Note: *The point will enter a fault state if not written to within the heartbeat interval. This value should be a multiple of the update interval of the point in the source device.*
4. Enter preferred data in the remaining fields.
5. Click **Save**.

Figure 88. Configuring a Binary Value point



6. Obtain the SC+ 2 Device ID and point instance number of the binary value you create above as described in “Sharing Data Between Two Tracer® SC+s,” p. 112. Save for a later step.
7. End your session with SC+ 2, and log in to Tracer® SC+ 1.
8. Create a binary output point.
   a. From the **Points** page, click **Create Point**, and select **Binary Output**.
   b. Click the reference icon. The **Select Data Source** dialog box opens.
   c. Select **External BACnet® Reference**.
   d. Enter the SC+ 2 Device ID and point instance number that you recorded in an earlier step. Select Value from the property drop-down list.
   e. Click **Apply** to return to the **Create Point** page.
   f. Enter any other preferred data, then click **Save**.

Multiple BACnet IP Networks

Tracer SC+ can support multiple BACnet IP networks simultaneously on Ethernet port 1, Ethernet port 2 and Wi-Fi. When using multiple BACnet IP connections, Tracer SC+ will route BACnet traffic between the two networks just as it does with the BACnet MS/TP links. The following BACnet rules must be observed when configuring multiple BACnet IP networks:

- All device IDs on all BACnet networks must be unique. A device connected to Ethernet port 2 on Tracer SC+ must have a unique device ID among all other BACnet devices – even if the BACnet devices are connected to other networks such as a base SC+ or non-Trane BACnet router.
- All BACnet network numbers must be unique. Common practice is to set the primary BACNet IP network number to 1 and the secondary BACnet IP network number to 2. However, network 2 must not be in use anywhere else on the BACnet network.

The UDP port in use on the secondary BACnet IP network must be the same among all devices on that network. It does not matter if it is the same as the UDP port for the primary BACnet network.

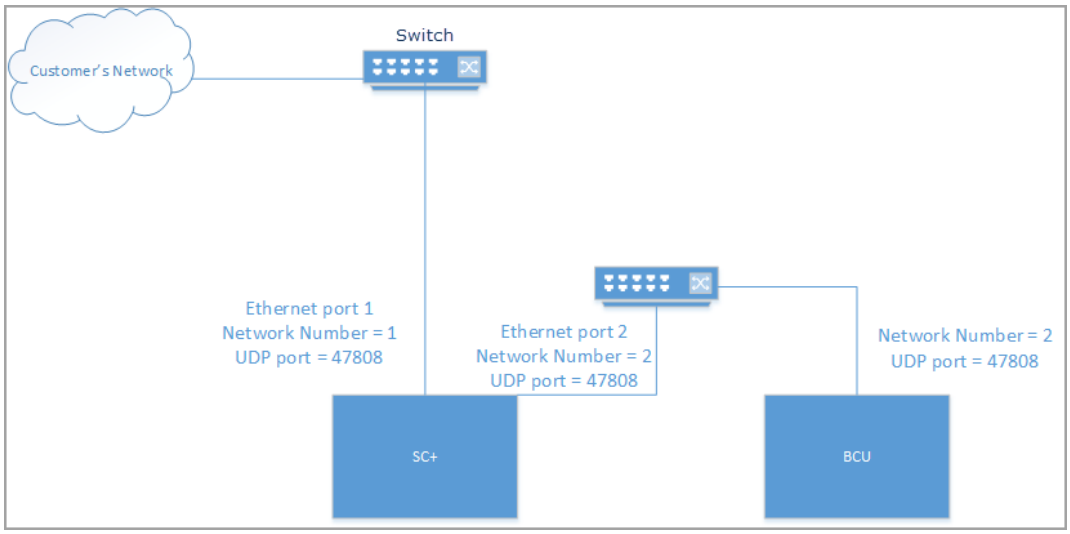
Example Scenario 1

A customer has an existing BCU/Summit system and has added Tracer SC+. The customer wants to put Tracer SC+ on the company network but the IT department will not allow the BCU on the network due to security concerns.

Solution:

Tracer SC+ can be set up as a BACnet IP to BACnet IP router to connect the two BACnet IP networks. The customer’s network is set up on port 1 of Tracer SC+ to use network number 1. The BCU is on a separate private IP network. The solution in this scenario is to change the default BACnet IP network number of the BCU from 1 to 2 (to match the network number of Tracer SC + port 2).

Figure 89. BACnet IP to BACnet IP router



Note: *The UDP port that is used has no effect between the two BACnet IP networks, but it is recommended that the same UDP port be used in this scenario.*

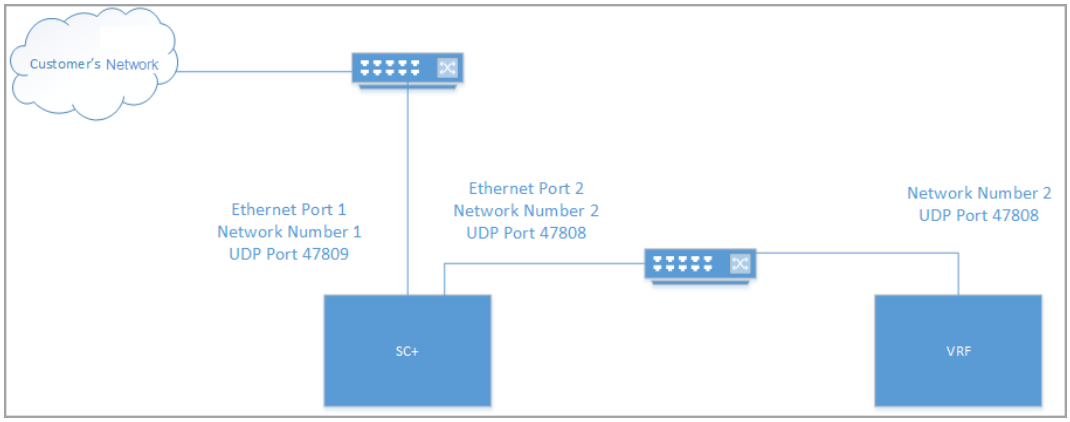
Example Scenario 2

A VRF system controller is only capable of using UDP port 47808, but the customer's existing BACnet network is using UDP port 47809.

Solution:

Tracer SC+ can be set up as a BACnet IP to BACnet IP router to connect the two BACnet IP networks. The customer's network is set up on port 1 of Tracer SC+ to use network number 1 and UDP port 47809. Tracer SC+ port 2 is set up to route to the VRF system controller using network number 2 and UDP port 47808. The VRF system controller is on a separate private IP network. The VRF system controller is using UDP port 47808 and network number 2 for BACnet IP.

Figure 90. BACnet IP to BACnet IP router (VRF)



BACnet® Secure Connect

BACnet® Secure Connect on Tracer SC+

This section includes the step-by-step processes and information to manage BACnet/SC on a Tracer SC+ controller.

Important: *Disable BBMDs. BACnet/SC automatically forwards BACnet messages through the Tracer SC+. Whether each Tracer SC+ is a node or Hub, the BBMDs on all BACnet/SC-enabled Tracer SC+(s) should be disabled.*

Selecting the Right Mode

Choosing the right mode depends on the application. Each mode serves a different function for the device and the *BACnet/SC network as whole. Refer to the BACnet Secure Connect for Tracer SC+ and Ensemble Application Guide*, (BAS-APG049*-EN) for required network layout information.

The following three BACnet/SC mode types are available: Node, Node + Hub, and Node + Hub + CA.

- **Node mode**: Used to connect to a BACnet/SC Hub. All nodes connected to a BACnet/SC Hub can communicate with each other.
- **Node + Hub mode**: The Tracer SC+ controller becomes a Hub for the BACnet/SC network, and a third party acts as the Certificate Authority. This allows the Tracer SC+ to connect and integrate BACnet/SC node devices, while the local IT manages the certificates.
- **Node + Hub + CA mode**: The Tracer SC+ controller becomes a Hub for the BACnet/SC network and manages the certificates for itself and all other nodes that will be brought into the network. This makes it possible to connect to other Tracer SC+(s) and third party node devices. The Tracer SC+ acts as the Certificate Authority. In this mode, the Tracer SC+ provides Issuer Certificates and signs CSR Certificates.

Setting up the BACnet®/SC Link

To complete BACnet/SC, the following information is required. This information is gathered from two setup wizard screens. The look and inputs will vary depending on the mode selected.

Add Link: This creates a new link for BACnet Secure Connect. The controller acts as a node and the link must connect to a BACnet Secure Connect Hub.

Delete Link: This permanently deletes the BACnet Secure Connect link.

Enabled: Check this box to enable the link (default is Enabled/checked). Uncheck this box to disable the link information (certificates will be saved).

Generate New CSR: This generates and downloads a Certificate Signing Request file. This must be signed by the Certificate Authority and then uploaded as an Operational Certificate.

BACnet Network Number: This number should be consistent with other devices on the BACnet/SC network. It must be unique from other BACnet network numbers. Tracer SC+ defaults to 5001 and increments up with each new link.

Port: This is the local NTP port used for endpoint communication. For Cloud customers, leave this as the default port, as other ports will not work.

Primary Hub URL: This is the URL of the Hub device for a specific network. When entering a Hub URL into a node (SC+, third party device), always use the full URL for that network on the BACnet/SC Manage Networks page.

Failover Hub URL: This optional field is a BACnet/SC function that reroutes traffic from the local node to a separate Hub device. This should only be used if entire network and device failover scenarios have been planned.

VMAC: This local Virtual MAC address is displayed to help identify the local node. In the Manage Network Settings page, this appears as the local node on each BACnet/SC Network.

CA Certificate / Issuer Certificate: This is the CA Certificate (also called the Issuer Certificate). It is populated automatically in Node + Hub + CA mode, but must be imported from the Certificate Authority in any other mode.

Operational Certificate: An Operational Certificate is a signed CSR. It is specific to each node on the network. In Node + Hub + CA mode, it appears automatically.

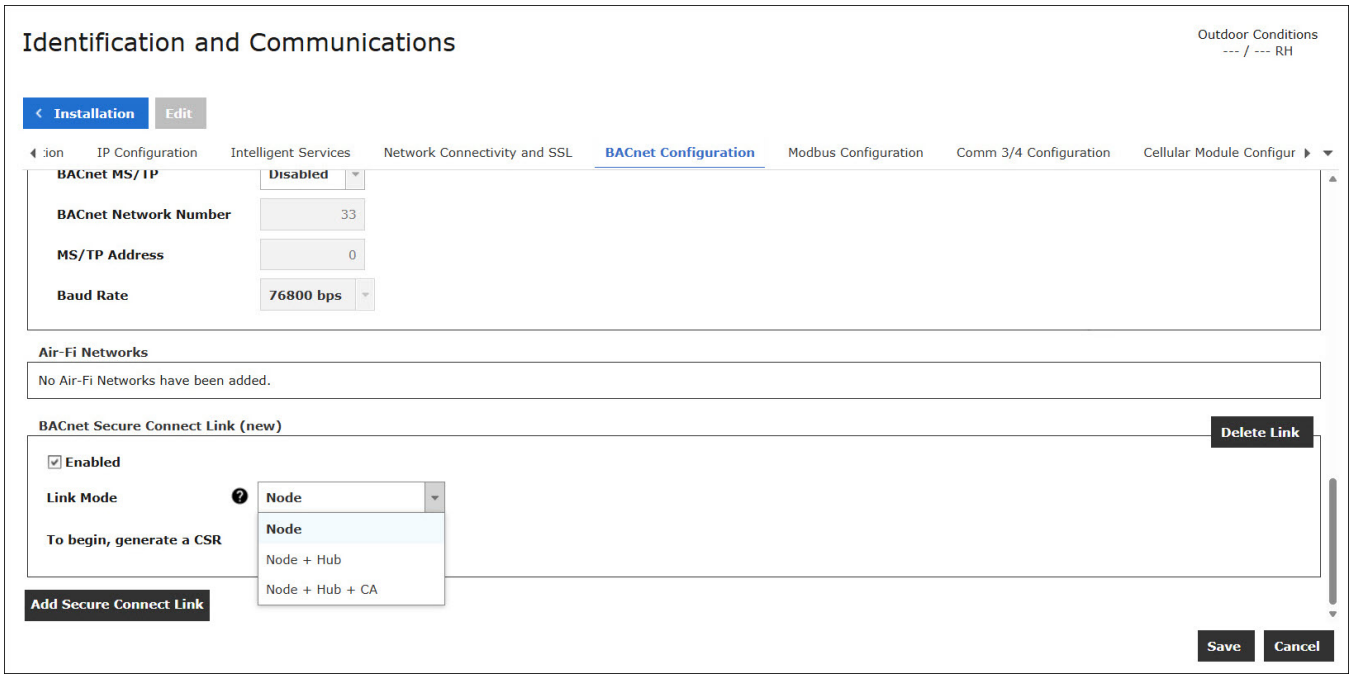
TLS Versions Allowed: This is the lowest level of encryption allowed on the BACnet/SC Network. TLS 1.2 is the default used by Trane in 2022, and currently the only level of encryption available with Ensemble Cloud. If running an on-premises server with Windows 2022 or later, TLS 1.3 can be used. Trane will update this when the AWS cloud platform supports TLS 1.3.

Connection Timeout: When the primary Hub is unreachable, the node device waits this many seconds before attempting to connect to the failover Hub. If no failover Hub URL is entered, this value is not used.

Setting up Node Mode

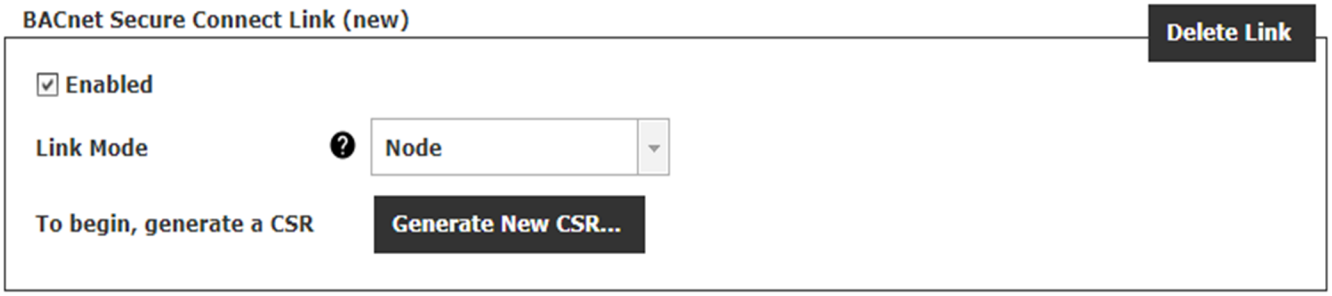
1. At the Tracer Synchrony user interface, navigate to **Identification and Communications** > **BACnet Configuration**. Click **Edit** and **Add Secure Connect Link**.

Figure 91. Add BACnet Secure Connect link



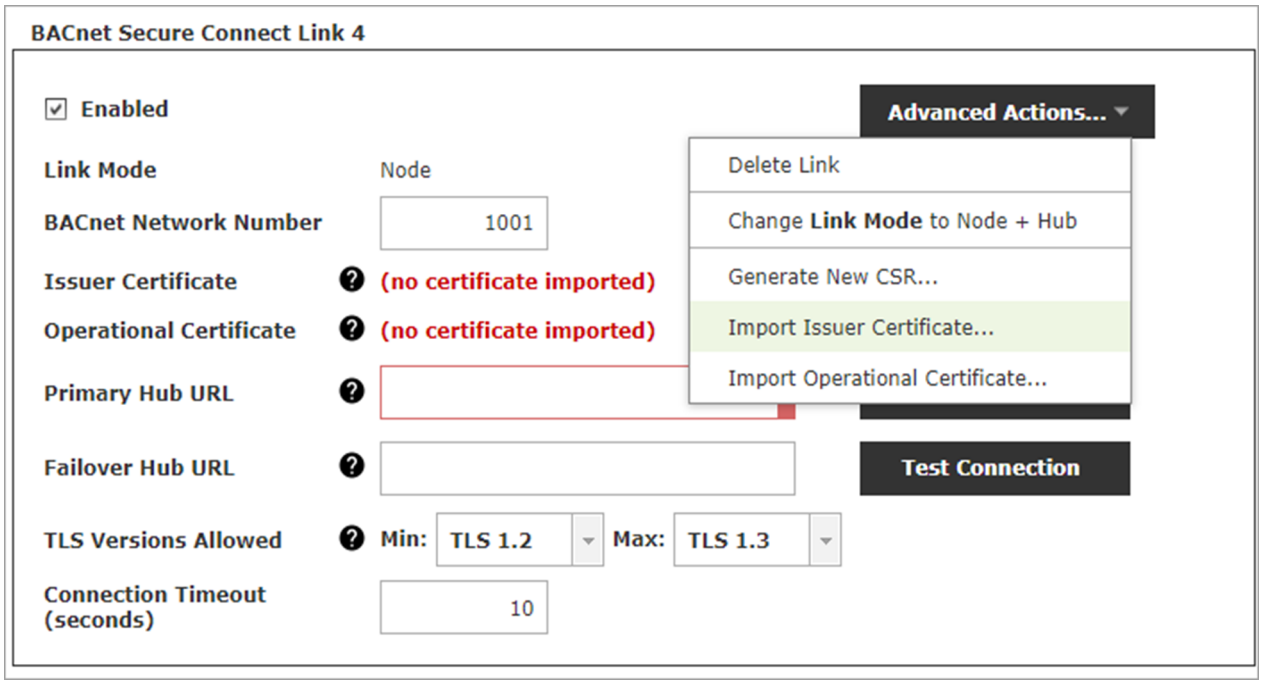
2. Select **Node**, and then click **Generate new CSR**. This will generate and automatically download a .csr type file, which will be signed by the Certificate Authority.

Figure 92. Select link mode (Node)



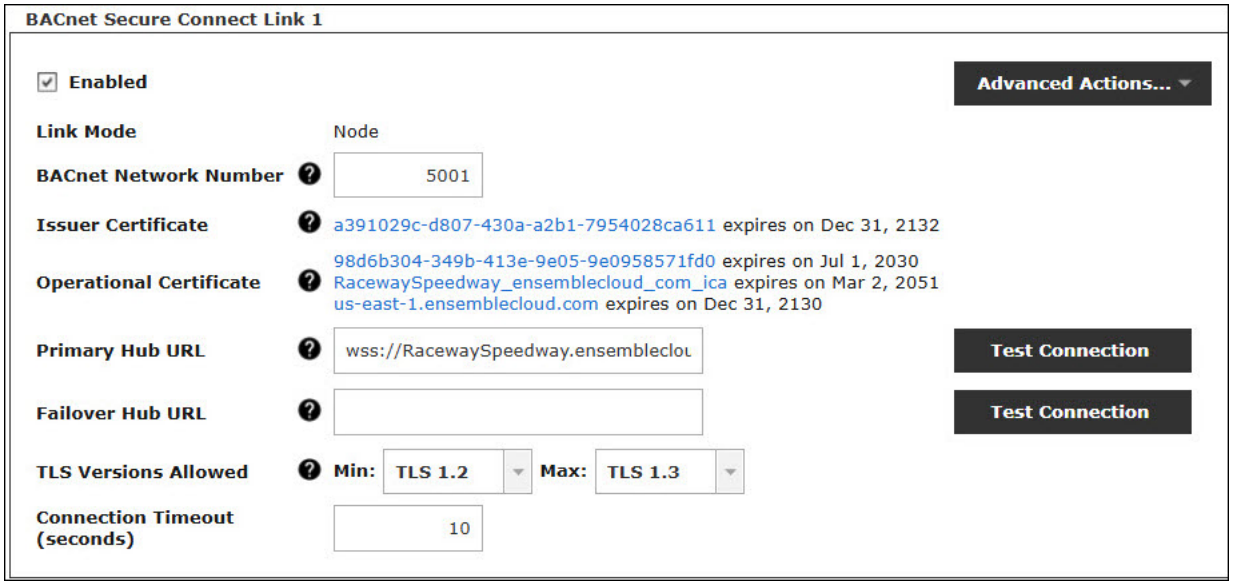
3. Assign the link a network number. This number should be consistent with other devices on the BACnet/SC network. It should be unique from other BACnet network numbers. Tracer SC+ defaults to 5001 and increments up with each new link.

Figure 93. Assign a network number



4. Import the CA Certificate (Issuer Certificate) and the signed .csr file (now called the Operational Certificate). Both certificates will come from the Certificate Authority. Import these with buttons or by using the Advanced Actions menu.

Figure 94. Import the CA certificate (Node)



5. Enter the Primary Hub URL.
6. If required, add a Failover Hub URL. Select TLS versions and specify the connection timeout.
7. Use **Test Connection** to verify that you can reach the BACnet/SC Hub device.

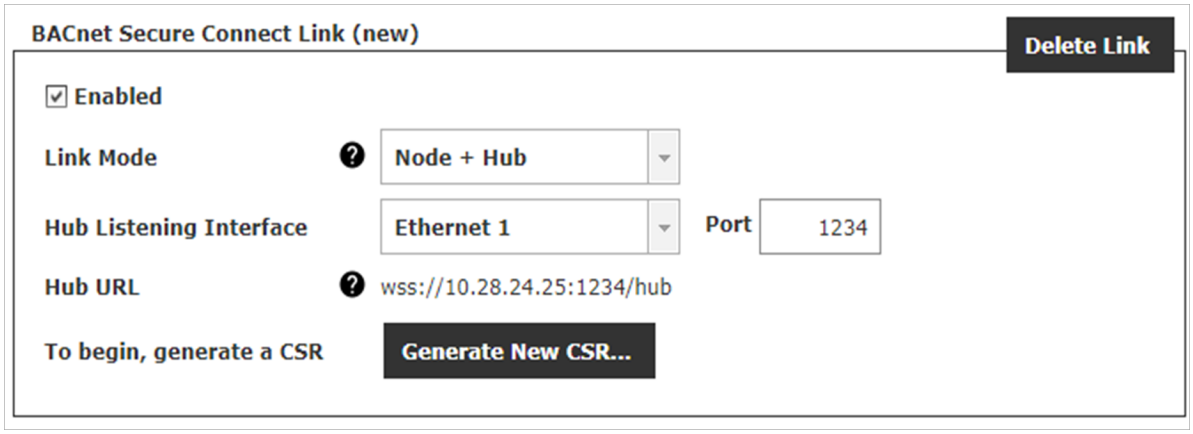
Figure 95. Test connection

8. Click **Save**. The Tracer SC+ is now a Node on the BACnet/SC network.
9. Discover devices (see, "BACnet/SC Device Discovery," p. 123).

Setting Up Node + Hub Mode

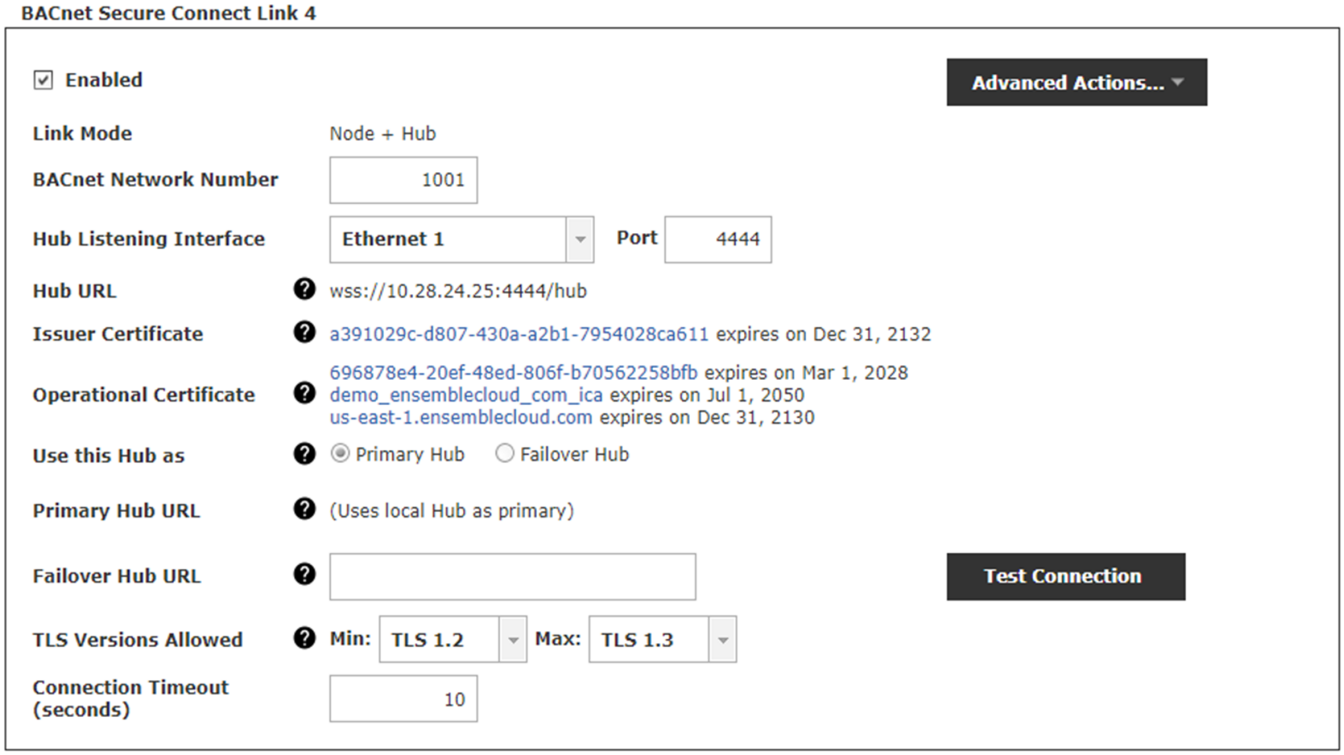
1. At the Tracer Synchrony user interface, navigate to **Identification and Communications > BACnet Configuration**. Click **Edit** and **Add Secure Connect Link**.
2. Select **Node + Hub**, then add the Ethernet Port and Port number (only used internally in the Tracer SC+). Click **Generate new CSR**. This will generate and automatically download a .csr type file, which will be signed by the Certificate Authority.

Figure 96. Select link mode (Node + Hub)



3. Assign the link a network number. This number should be consistent with other devices on the BACnet/SC network. It must be unique from other BACnet network numbers. Tracer SC+ defaults to 5001 and increments up with each new link.
4. Import the CA Certificate (Issuer Certificate) and the signed .csr file (now called the Operational Certificate). Both certificates will come from the Certificate Authority. Import these with buttons or by using the Advanced Actions menu.
5. Select how this Hub will be used (Primary or Failover). This is used for the local node to determine whether to connect to the local Hub first, or another primary Hub (This is typically set to Primary Hub).
6. If required, add a Failover Hub URL. Select TLS versions and specify the connection timeout.

Figure 97. Configure settings (Node + Hub)

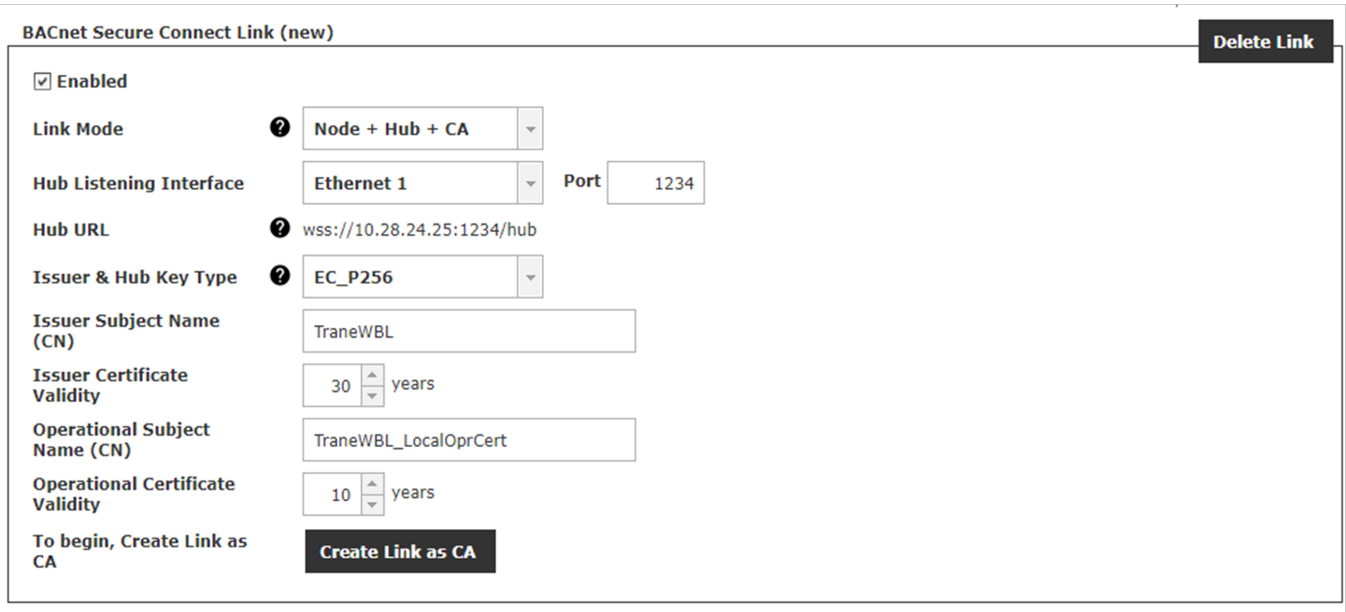


7. Use **Test Connection** to verify that you can reach the BACnet/SC Hub device.
8. Click **Save**. The Tracer SC+ is now a Node + Hub on a BACnet/SC network. Other nodes can use this Hub URL to make a connection.
9. Discover devices (see, "BACnet/SC Device Discovery," p. 123).

Node + Hub + CA Mode

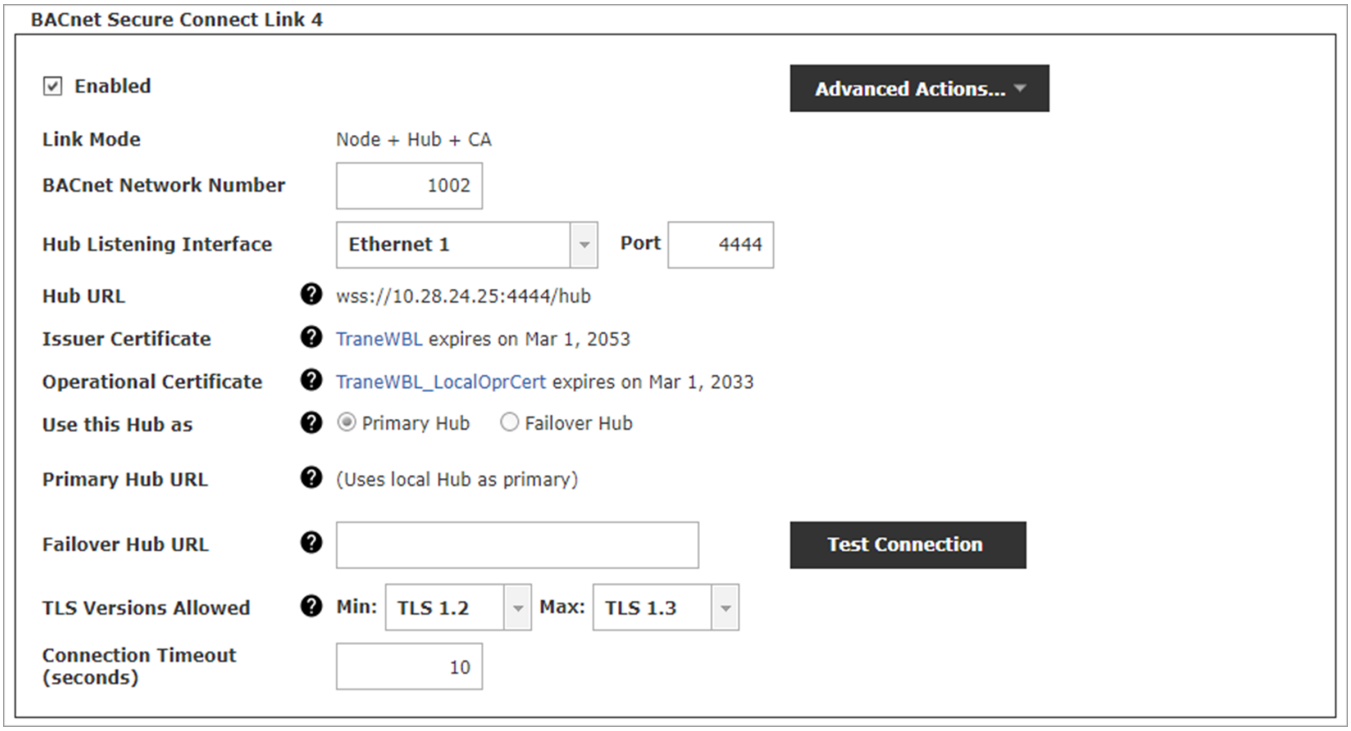
1. At the Tracer Synchrony user interface, navigate to **Identification and Communications > BACnet Configuration**. Click **Edit** and **Add Secure Connect Link**.
2. Select Node + Hub + CA. Add the Ethernet Port and Port number, which is only used internally for the Tracer SC+.
3. Because this device is a Certificate Authority, additional configuration is required to manage the certificates.
   - **Issuer and Hub Key Type**: This is the encryption key type used in all the certificates. If unsure what to select, use the default.
   - **Issuer Subject Name (CN)**: Provide a name for the Issuer Certificate. This will be added to all the node devices on the network as the CA Certificate/Issuer Certificate.
   - **Issuer Certificate Validity**: This is the number of years that the Issuer Certificate will be valid.
   - **Operational Subject Name**: Provide a subject name for the Operational Certificate. This is only used locally and stored in the Tracer SC+.
   - **Operational Certificate Validity**: This is the number of years that the local Operational Certificate will be valid. This applies to the local node only.
4. Click Create Link as CA to save these settings.

Figure 98. Select link mode (Node + Hub + CA)



5. Assign the link a network number. This number should be consistent with other devices on the BACnet/SC network. It must be unique from other BACnet/SC networks configured in the Tracer SC+.
6. Select how this Hub will be used (Primary or Failover). This is used for the local node to determine whether to connect to the local Hub first, or another primary Hub. (This is typically set to Primary Hub).
7. If required, add a Failover Hub URL or Primary Hub URL, select TLS versions, and specify the Connection Timeout.

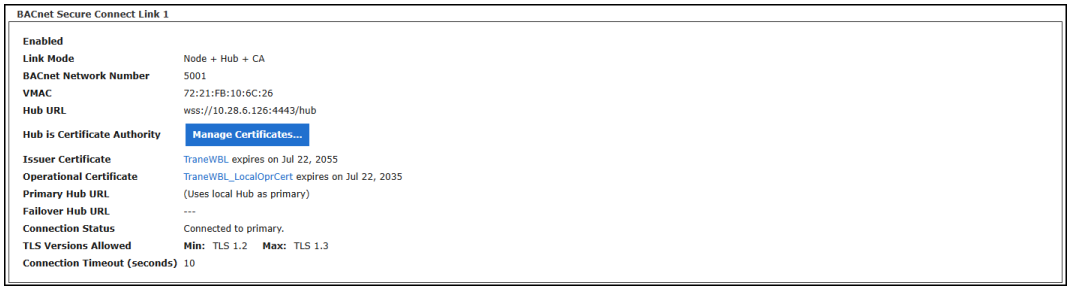
Figure 99. Configure settings (Node + Hub + CA)



8. Use **Test Connection** to verify you can reach the BACnet/SC Hub device.

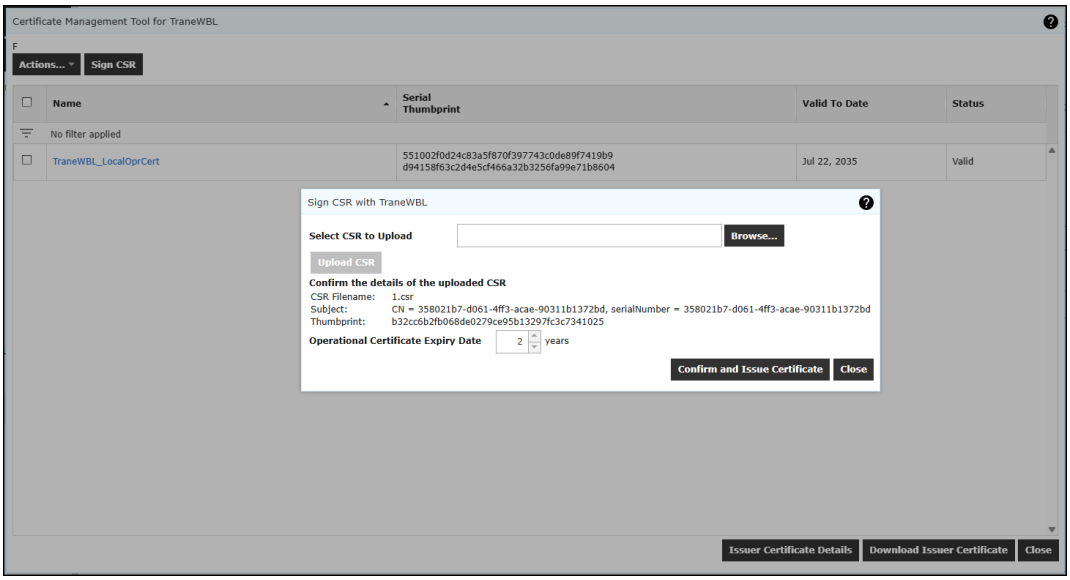
9. Once configured, select **Save**. You will see a **Manage Certificates** button. This allows you to sign CSR Certificates to produce Operational Certificates. Click the Issuer Certificate hyperlink to download a copy of the Issuer Certificate, which will be uploaded to each node device. Select **Manage Certificates**.

Figure 100. Manage certificates



10. Sign a CSR. A Node + Hub + CA device will be signing CSR Certificates.
    - Find a CSR Certificate file from a node device using the **Browse** button.
    - Select **Upload CSR** to import and validate the certificate.
    - If the CSR file is validated, you can select a number of years the Operational Certificate will be valid.
    - Select **Confirm and Issue Certificate** to download the Operational Certificate specific to the Nodes CSR.

Figure 101. Sign CSR

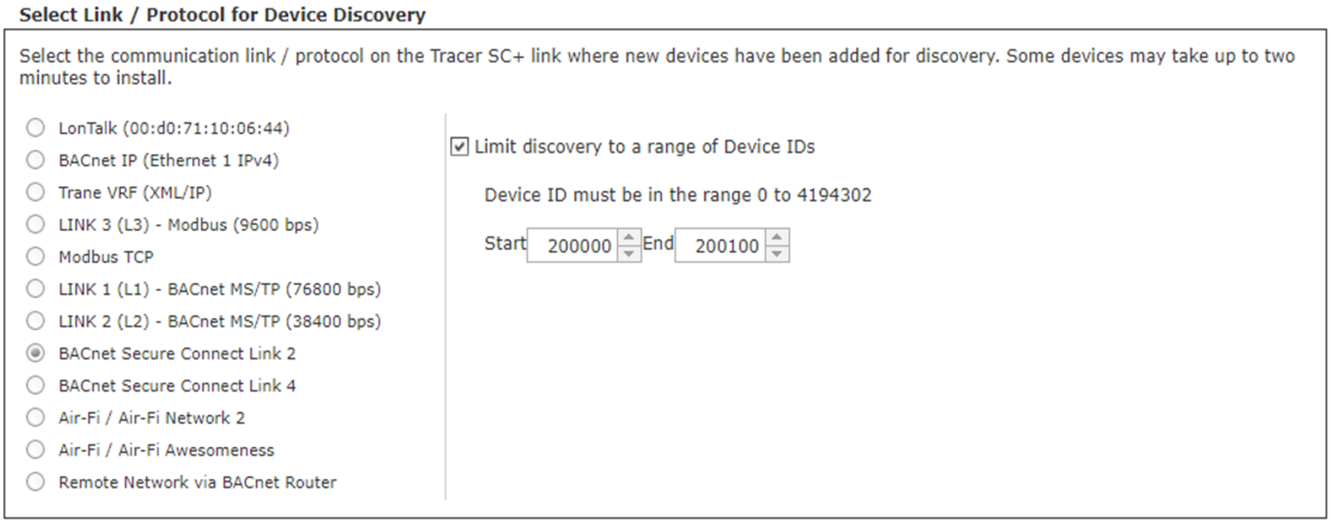


11. Discover devices (see, “BACnet/SC Device Discovery,” p. 123).

BACnet/SC Device Discovery

Once a BACnet/SC network is enabled, the devices are ready to be discovered in the Tracer SC+. At the Tracer Synchrony user interface, navigate to the Devices page. The process is the same as discovering BACnet MS/TP and BACnet/IP. Just like BACnet MS/TP, you must choose the correct link or network. If you do not see the BACnet/SC Links in the drop-down option, verify that the BACnet/SC network is configured and enabled.

Figure 102. Device discovery



Unit Control

Unit controllers provide all necessary unit control functions. They operate associated unitary equipment, while ensuring that all built-in safety features are enabled and that diagnostics are issued. Each controller is designed to operate in stand-alone mode. Therefore, if system control fails, unit operation can continue. Unit controllers installed on a Tracer® SC+ can be a combination of the following BACnet®, LonTalk®, Air-Fi® wireless, and legacy unit controllers:

BACnet® (MS/TP) Unit Controllers Supported by Tracer SC+

Tracer UC factory and field programmable controllers, including UC210, UC400, UC600, UC800, Symbio™ 210, Symbio™ 400-B, Symbio™ 500, Symbio™ 700, and Symbio™ 800.

BACnet IP Unit Controllers Supported by Tracer SC+

Tracer UC600, Symbio™ 210e, Symbio™ 500, Symbio™ 700, Symbio™ 800, and Symbio™ factory and field programmable controllers.

Modbus Controllers Support by Tracer SC+

- Trane Enercept Flex Power and Energy Meters
- Trane E50 Series Power and Energy Meters

Air-Fi® Wireless Unit Controllers Supported by Tracer SC+

All Tracer Symbio™ factory and field programmable controllers, including Symbio™ 800, Symbio™ 700.

LonTalk® Unit Controllers Supported by Tracer® SC+

- Tracer® AH540/541 air-handler controllers
- Tracer® MP501 multi-purpose controller
- Tracer® MP503 input/output module
- Tracer® MP580/581 programmable controller
- Tracer® VV550/551 VAV controller
- Tracer® ZN510/511 zone controller
- Tracer® ZN517 unit controller
- Tracer® ZN520/521 zone controller
- Tracer® ZN523 zone controller
- Tracer® ZN524 water-source heat pump unit controller
- Tracer® ZN525 zone controller
- Tracer® CH530 chiller controller
- Tracer® CH532 chiller controller
- LCI-C: LonTalk® communications interface for chillers
- LCI-I: LonTalk® communications interface for IntelliPak systems
- LCI-R: LonTalk® communications interface for ReliaTel systems
- LCI-V: LonTalk® communications interface for Voyager systems
- Trane TR200 Variable Frequency Drive (VFD)
- WAGO High Density I/O module (third-party)
- Trane® Enercept Flex Power and Energy Meters
- Trane E50 Series Power and Energy Meters
- Non-Trane LonTalk® devices using SCC, DAC, and chiller profiles, devices that support LonTalk® standard network generic variables, and devices with Standard Network Variable Types (SNVTs)

Trane®/Mitsubishi VRF Unit Controllers Supported by Tracer SC+

Trane®/Mitsubishi Electric VRF Unit Controllers supported by Tracer SC+ are listed below.

Note: *The following devices are supported through the use of Trane®/Mitsubishi Electric T/AE-200, T/AE-50, T/EW-50 and 400 and EW-C50 with software version 7.7+.*

- Indoor units (IC/AIC)
- Outdoor units (OC/OS)
- Branch controllers (BC/BS)
- Lossnay ERV units (LC)
- Heat exchangers (WH/BU)
- Remote controllers – Smart ME (URC)

The following unit controllers require a template:

- LEV Kit – Installs as an IC by default without a template
- All HVAC controller (AHC)
- PI controller (MCp)
- AI controller (MCt)
- DIDO (DC)

Trane Legacy Unit Controllers (Comm3/4) Supported by Tracer SC+

Notes:

- *The following devices are supported through the use of Legacy Comm Bridge.*
- *Starting with Tracer SC+ v6.0, the SC+ will support direct wired Comm 3/4 devices, and thus the BMTB is not needed.*

- Variable Air Volume (VAV I, II, III, IV)
- IntelliPak
- Voyager
- Commercial Self-Contained (CSC)
- Thermostat Control Module (TCM)
- Programmable Control Module (PCM)
- Universal Programmable Control Module (UPCM)
- Terminal Unit Controller (TUC)
- Centrifugal Chillers (UCP2)
- Helical Rotary Chillers (UCP2)
- CGX Chillers
- Series-R Chillers (RTA/RTW)

The BACnet Unit Controller Network

Every BACnet device on a Tracer building automation system, including unit controllers, must have a BACnet device ID. Trane BACnet unit controllers use MS/TP communication.

Observe the following best practices when installing, replacing, or adding BACnet devices:

- Equally distribute the number devices between Tracer SC+ BACnet MS/TP links 1, 2 and 3.
- Sequentially address each BACnet MS/TP link (using the rotary switches), between links 1, 2 and 3 and so forth. Each BACnet MS/TP should start at address 1.
- Do not leave any gaps when setting addresses.
- Minimize unnecessary communication on the links by setting up event-triggered TGP and slow sample rates.

Important: *Never duplicate BACnet network numbers or Device IDs — always assign unique numbers.*

Note: *After you have established communication-link and power wiring for the unit controllers, you can connect the Tracer TU service tool to a BACnet unit controller and access any other BACnet unit controller on the link.*

Installing Factory-Programmed BACnet Unit Controllers

Trane recommends installing factory-programmed controllers before field-programmable controllers. Factory-programmed BACnet unit controllers currently include the Tracer UC400, Symbio™ 500, Symbio™ 800 Field controller configured for VAV.

Note: *Follow the wiring procedures given in the BACnet MS/TP Wiring Best Practices (BAS-SVX51*-EN).*

To install field-programmable BACnet unit controllers on Tracer SC+, follow these steps.

1. Mount the unit controller.
2. Using a small screwdriver, set the rotary switches on the unit controllers. The valid range is 001–127 (000 will prevent BACnet link communication). This setting is initially used as the BACnet device ID until installation into the SC+ controller.
3. Connect the controller power supply.
4. Using a USB cable, connect the Tracer TU service tool to the controller.
5. In Tracer TU, on the **Controller Settings** tab:
   - Enter the name (the default is UC400).
   - In the Protocol section:
     - Verify that the device baud rate is set to 76800 bps.
     - Verify the BACnet device ID, which was set in step 2.
6. Connect the communication link to the unit controller.
7. Repeat through steps 1 through 6 for each unit controller.
8. Connect the communication link wiring to the Tracer SC+.

   Note: *BACnet devices automatically perform a time synchronization daily at 3:00 a.m. If manually changing the time on the Tracer SC+, it may take up to 5 minutes for synchronization.*

Installing Field-Programmable BACnet Unit Controllers

Field-programmable BACnet unit controllers currently include the Tracer UC400, Symbio™ 500, Symbio™ 800 field programmable controller.

Note: *Follow the wiring procedures given in the BACnet MS/TP Wiring Best Practices (BAS-SVX051*-EN).*

To install field-programmed BACnet unit controllers on Tracer SC+, follow these steps in order:

1. Mount the unit controller.
2. Using a small screwdriver, set the rotary switches on the unit controllers. The valid range is 001–127 (000 will prevent BACnet link communication). This setting is initially used as the BACnet device ID until installation into the SC+ controller.
3. Connect the controller power supply.
4. Using a USB cable, connect the Tracer TU service tool to the controller.
5. In Tracer TU, on the **Controller Settings** tab:

- Enter the name (the default is UC400).
- In the Protocol section:
  - Verify that the device baud rate iis set to 76800 bps.
  - Verify the BACnet device ID, which was set in step 2.

6. Connect the communication link wiring to the controller.
7. Repeat steps 1 through 6 for each unit controller.
8. Connect the communication link wiring to the Tracer SC+.

   Note: *BACnet devices automatically perform a time synchronization daily at 3:00 a.m. If manually changing the time on the Tracer SC+, it may take up to 5 minutes for synchronization.*

Adding BACnet Unit Controllers

Note: *Follow the wiring procedures provided in the BACnet MS/TP Wiring Best Practices (BAS-SVX051).*

If you need to add a BACnet unit controller to an existing communication link on Tracer SC+, follow these steps to ensure that currently installed controllers do not lose communication.

To add BACnet unit controllers:

1. Follow steps 1 through 4 of "Installing Factory-Programmed BACnet Unit Controllers," p. 127 or steps 1 through 4 of "Installing Field-Programmable BACnet Unit Controllers," p. 127."
2. In Tracer TU, set up application specific settings for a factory-configured controller or TGP2 and point configuration for a field programmable applications.
3. Connect the communication link wiring to the unit controller.
4. To complete the installation on Tracer SC+, select **installation** > **devices**. The **Devices** page opens.
5. Click the **Discover Devices** button, which initiates the device discovery process.

Replacing BACnet Unit Controllers

Note: *Follow the wiring procedures given in the BACnet MS/TP Wiring Best Practices (BAS-SVX051*-EN).*

To replace BACnet unit controllers on Tracer SC+, follow these steps in order:

1. Mount the new unit controller.
2. Using a small screwdriver, set the rotary switches to match the settings on the unit controller that is being replaced.
3. Connect the input/output wiring and power supply.
4. Using a USB cable, connect the Tracer TU service tool to the controller.
5. In Tracer TU, configure the controller to be the same as the one you are replacing.
6. Connect the communication link wiring to the unit controller.
7. Connect the communication link wiring to Tracer SC+.
8. To complete the installation on Tracer SC+, navigate to the **Devices** page (**Installation** > **Devices**).
9. Select the check box to the left of the device to be replaced. From the actions menu, select **replace device**. A pop-up window appears. Click **OK**.

The LonTalk® Unit Controller Network

Every LonTalk® device on a Tracer® building automation system, including unit controllers, must have a valid network address (domain, subnet, node [DSN]). The Tracer® SC+ controller does not provide any type of LonTalk® network management function. The Rover service tool (version 7.3+) in Active mode provides this function for the LonTalk® communication link.

Note: *After you have established communication link and power wiring for the LonTalk® unit controllers, you can connect the Rover service tool to a LonTalk® unit controller and access any other LonTalk® unit controllers on the link. For information about using Rover, see the Rover Service Tool, Installation, Operation, and Programming Guide, (EMTX-SVX01*-EN).*

LonTalk Network Configuration

The Tracer USB LonTalk module (U60) connects to any one of the four USB ports on Tracer SC+ controller. The U60 adapter may require configuration of the DSNs using the Rover service tool. The DSNs for the U60 adapter need to be set to: DSN A (ZL-255-004) and DSN B (11-255-004). For more information, refer to HUB solution: (https://hub.tranetechnologies.com/docs/DOC-152535).

There are four scenarios in which a LonTalk network would require configuration:

- Adding or a new link.
- Adding or replacing a LonTalk member on an existing link.
- Moving a LonTalk link from a BCU to a Tracer SC+
- Moving a LonTalk link from an existing Tracer SC to a Tracer SC+.

Best practices for each scenario are described in the following procedures.

Creating a New LonTalk® Link on a Tracer® SC+

1. Connect all members to the link (including the Tracer® SC+ system controller and the Tracer® USB LonTalk® module).
2. Place the Rover Service Tool in Active mode. This will reassign all DSNs to the complete link.

Adding or Replacing a LonTalk® Device on a Tracer® SC+ Link

1. Connect the Rover Service Tool to the existing link.
2. View the DSN numbers that are in use in the Active View Group table. For this procedure, you will need to add a new DSN.
3. Remove the old device and mount the new one. DO NOT connect the new device to the communication link wiring yet.
4. On the new device, press and hold the service pin for 20–30 seconds; this sets it to uncofingured.
5. With the new device isolated from the link, make a direct connection with the Rover Service Tool.
6. Place the Rover Service Tool in Active mode to discover the new device.
7. In the Rover Service Tool, right-click on Device ID and use the Domain entry table to manually enter a new unique DSN. If this is a replacement device, DO NOT set it to the old DSN.
8. Connect the new device to the LonTalk® communication link.
9. To complete installation at the Tracer® Synchrony user interface, click Installation > Devices. The Devices page opens.
10. From the Actions menu, select Discover Devices (new device) or Replace Device (replacing a device).

For more information refer to the following HUB solution (https://hub.tranetechnologies.com/docs/DOC-101790).

Retrofitting a LonTalk® Link from a BCU to Tracer® SC+

1. Place the Rover Service Tool on the link in Active mode while the link is connected to the BCU.
2. Select any device on the link, then select bindings (check for custom bindings), and save the Bindings Report for custom bindings.
3. Remove the communication link from the BCU.
4. Connect the USB LonTalk® module (U60) to one of the USB ports on the Tracer® SC+ controller.
5. Connect the communication link to the Tracer® SC+ controller.
6. Connect and launch the Rover Service Tool.

7. Using the Rover Service Tool, re-discover the link in Active mode. This will clean up the existing bindings (BCU auto bindings and custom bindings). If there were custom bindings, recreate using the saved Bindings Report text file (step 2).
8. Use the Tracer® Synchrony user interface to install the devices.

The Modbus Unit Controller Network

Modbus unit controllers are placed into one of two types — RTU or TCP.

Although many of the discovery and installation steps are similar across communication links, there are some notable differences depending on the link type.

- All three RS-485 links of the Tracer SC+ now support Modbus RTU devices in addition to BACnet MS/TP. The link must be dedicated to either Modbus RTU or BACnet MS/TP.
- BACnet MS/TP must first be disabled for a link in order to enable Modbus RTU.
- Both Ethernet ports of the Tracer SC now support Modbus TCP devices.
- Modbus TCP and BACnet IP devices can coexist on the LAN.

Modbus RTU:

- Link 1 and Link 2 of the Tracer SC+ are enabled by default for BACnet MS/TP.
- If there are no BACnet controllers already installed on a given link, the Link can be enabled for Modbus RTU. This action automatically disables BACnet MS/TP functionality for the Link.

Modbus TCP:

- Ethernet Network Port 1 and Port 2 on Tracer SC+ supports Modbus TCP communication.
- Although the links for Modbus RTU can be individually enabled and disabled, Port 1 and Port 2 for Modbus TCP (and BACnet IP) are always enabled.

Wire and Network Characteristics

Modbus TCP

- Uses standard Ethernet wire. Most Modbus TCP devices use the familiar RJ-45 connector for Ethernet communications.

Modbus RTU

- Wiring tends to be more complicated. Tracer SC+ supports Modbus RTU using 2-wire EIA/TIA-485.
- EIA/TIA-485 can be 2-wire or 4-wire. A 4-wire (full duplex) device can be converted to a 2-wire (half-duplex) device.
  - Refer to the manufacturer documentation. Typically, jumpering both transmit (+) terminals and jumpering both receive (-) terminals will convert the device to be a 2-wire device.

Important:

- *Modbus RTU wiring must be assembled in a daisy-chain configuration.*
- *Some Modbus devices use Modbus RTU with EIA/TIA-232 wiring; these are **NOT** supported by Tracer SC+. A third party, addressable EIA/TIA 232 to 485 converter can be used to convert the device to EIA/TIA-485. Companies such as Advantech B+B SmartWorx (formerly B&B Electronics) stock EIA/TIA-232 to EIA/TIA-485 converters.*

Refer to manufacturer documentation for specific wiring requirements, termination resistors, and the maximum number of devices supported per link. If third-party product literature is not available, general low-data rate guidelines are as follows:

- Wire Style - braid or foil shield, twisted pair wire
- Wire Impedance – 120 ohms (recommended)
- Wire Capacitance – 16pF per foot
- Wire gauge – 18–24 AWG
- Maximum wire length – 4000 feet
- Termination resistors – 120 ohm (should match the wire impedance)
- Number of devices per link – 30

Modbus Addressing

Modbus RTU is a Client/Server protocol where only one device is the client on a link. All communication requests are initiated by the client. For this reason, there can only be a single client controller on the Modbus network at a time. Tracer SC+ and most Modbus tools are client devices; therefore, Tracer SC+ must be removed from the Modbus link before using most Modbus tools.

The Modbus Unit Controller Network

Modbus RTU has a simple addressing scheme that uses only a server address. Each Modbus server device must have a unique address.

- Modbus server addresses range from 0 through 247.
- Modbus client devices do not have an address.
- Address 0 is reserved for sending a broadcast message to all server devices. Tracer SC+ does not use Modbus broadcasts.

Modbus TCP devices have a unit identifier and port number. The unit identifier is often referred to as a server address, similar to Modbus RTU. Modbus TCP is not restricted to a single client. All Modbus TCP devices must have a unique identifier.

Some Modbus TCP devices can represent multiple Modbus devices. In this case, they would use the same IP address with a unique unit identifier. The port number may or may not be unique for each Modbus device.

- Unit identifier or server address range 1 through 247, 255.

  Note: *0 and 255 addresses are reserved for Modbus TCP devices that represent a single Modbus TCP device.*
- IP address of the Modbus TCP device.
- Port number (default is 502).

Refer to the manufacturer literature to properly configure the network parameters of a specific Modbus TCP device.

Devices

Devices are the unit controllers, sensors, and communications wiring that provide the physical control of the facility. After the unit controllers have been mounted and wired in the facility, you are now ready to discover and install the devices.

This section contains the following topics:

- Discovering and installing BACnet, LonTalk®, Legacy Comm 3/4 devices, and Modbus devices
- Creating and editing an equipment template
- Applying an existing template to a device
- Changing the display name of a device
- Replacing devices
- Deleting a device
- Updating the IP address of the centralized controller

Discovering and Installing SC+ (app) and SC+ (base) Devices

After configuring the network settings for the Tracer SC+ (app) and the Tracer SC+ (base), you must now discover and install devices that will be communicating through the Tracer SC+ (base). The discovery and installation process must be facilitated by using the Tracer SC+ (app), except for TIS ready sites with a single SC+.

- For Single SC+ and Multiple SC+ facilities, devices must always be installed into the SC+ (app). **DO NOT** install devices using the Tracer SC+ (base).
- For TIS Ready sites where no SC+ (app) exists, devices must be installed into the SC+ (base).

To discover and install devices:

1. Connect to the Tracer SC+ (app) using a USB connection or TCP/IP address.
2. Navigate to **Configure Basic Settings For This Tracer SC+** located on the Tracer Synchrony Installation page, then click **Device Discovery.**
3. Select the **Remote Network via BACnet Router** radio button.
4. The Tracer SC+ (app) automatically searches for all Tracer SC+ (base) controllers in the facility. For each BACnet MS/TP port that is enabled in a Tracer SC+ (base), an additional network number will appear in the list.

   Note: *If there are multiple Tracer SC+ (apps) on the same network and UDP port, they will also be listed. Installation of devices already installed in another Tracer SC+ (app) is not supported.*
5. Select a remote network, then click **Start Discovery.**
6. When discovery is complete, click **Install Devices.**
7. The **Define Equipment for Devices** page will list all the devices discovered on the selected network.
8. Select the devices to be installed and then click **Install Selected Devices**.
9. The Tracer SC+ (app) will now install the devices wired to the Tracer SC+(base).

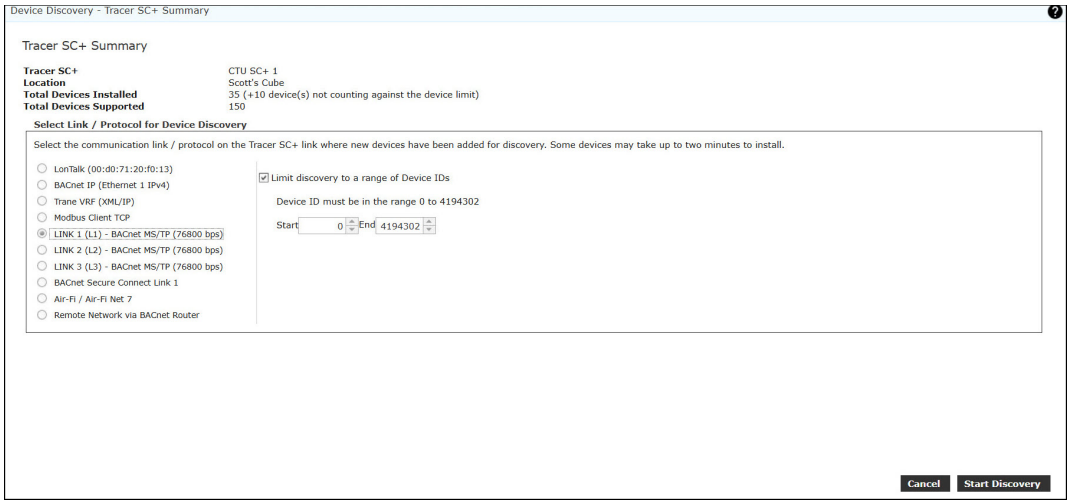
   Equipment wired to the Tracer SC+ (base) is now available for use in the applications of the Tracer SC+ (app).

Discovering BACnet Devices

After physically installing the unit controllers (devices) on the Tracer SC+ system controller, BACnet devices must be discovered and installed at the Tracer Synchrony user interface. BACnet/SC devices must be on an enabled network to be available for device discovery.

1. From the left navigation menu, click **Devices**.
2. Click the **Discover Devices** button. The **Device Discovery** page opens.
3. Select one Link/Protocol type from the menu. If known, specify Device IDs ranges and then click **Start Discovery**. After discovery is complete, the Discovery in Progress subheading will change to Discovery Completed, and the button will change from **Cancel discovery** to **Install Devices.**
4. Click **install devices**. The **Define Equipment for Devices** page opens Step 5.
5. Install the devices (this will vary depending on whether the device is factory- or field-programmed.)

Figure 103. Device discovery (BACnet)

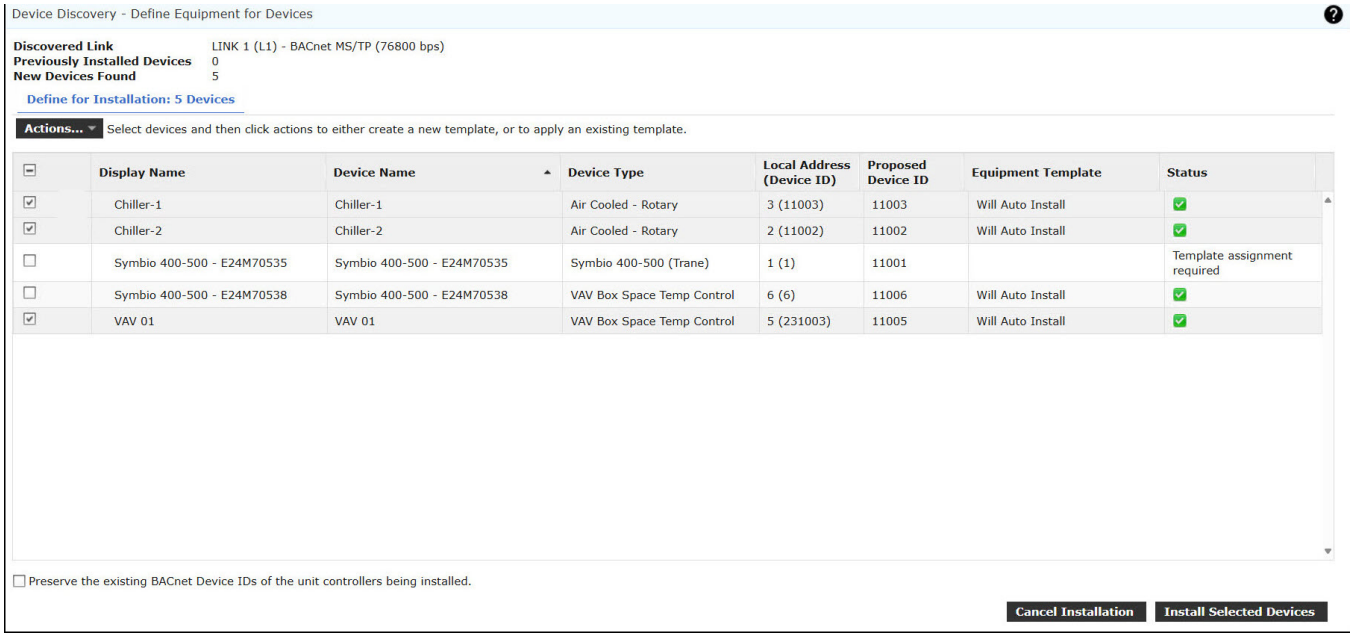


Installing Factory-Programmed BACnet Devices

Factory-programmed controllers can be identified by **Will Auto Install** in the **equipment template** column in the Ready to Install section.

1. Select the devices that you want to install. Then click the **install selected devices** button. A confirmation pop-up window appears.
2. Click the **Install Selected Devices** button. The **Installation Complete** page appears, which include a summary of the installed devices.

Figure 104. BACnet devices: will auto install



Installing Field-Programmable BACnet Devices

1. Review the **Define for Installation** section. Field-programmable controllers can be identified by **Template assignment required** in the **status** column.
2. Select the device that you want to install. Depending on the device, you may be able to apply an existing equipment

template, or create a new equipment template:

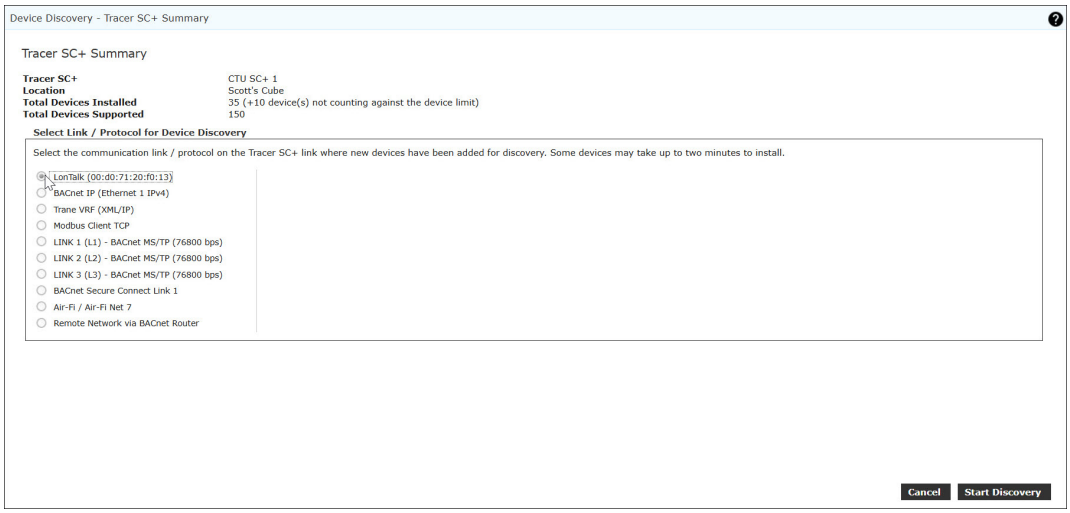
- If an existing template can be applied to a device you are installing, proceed to “Applying an Existing Template to a Device,” p. 143.
- To create an equipment template, see “Creating an Equipment Template,” p. 139.

Discovering LonTalk® Devices

After physically installing the unit controllers (devices) on the Tracer® SC+, LonTalk® devices must be discovered and installed at the Tracer® Synchrony user interface.

1. From the left navigation menu click **Devices**.
2. Click the **Discover Devices** button. The **Device Discovery** page opens.
3. Select the LonTalk® communication link, and click **Start Discovery**. After discovery is complete, the Discovery in Progress subheading will change to Discovery Completed, and the button will change from **cancel discovery** to **install devices.**
4. Click **install devices**. The **Install Devices: Define Equipment for Devices** page opens.
5. Proceed to the following sections to install the devices (depending on whether the device is factory- or field-programmed).

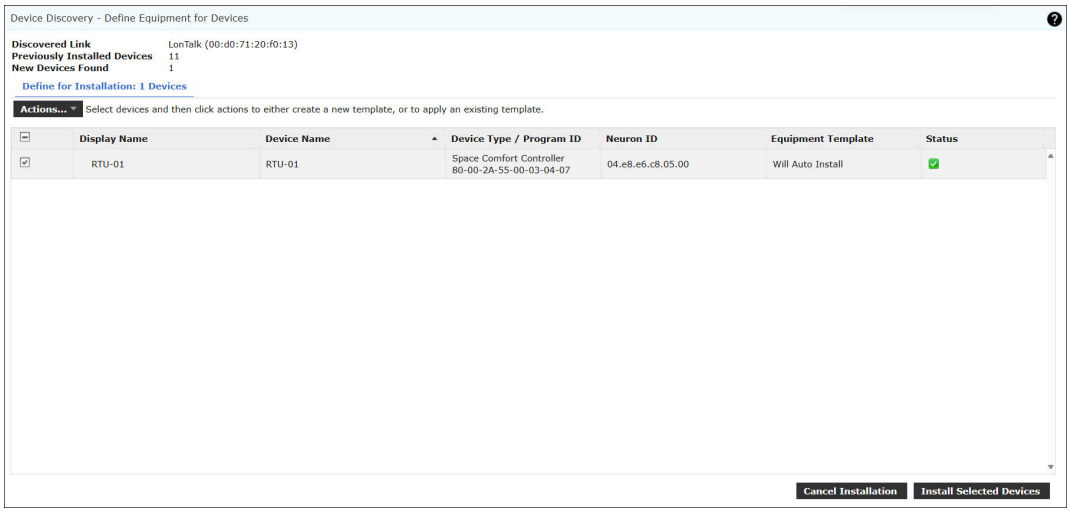
Figure 105. Device discovery (LonTalk®)



Installing Factory-Programmed LonTalk® Devices

1. Review the Define for Installation section. Factory-programmed controllers can be identified by **Will Auto Install** in the **equipment template** column as shown in the following figure.
2. Select the devices that you want to install.
3. Click **Install Selected Devices**. The **Installation Complete** page appears, which includes a summary of the installed devices.

Figure 106. LonTalk® devices: will auto install



Installing Field-Programmable LonTalk® Devices

1. Review the **Define for Installation** section. Field-programmable devices are identified by **Template assignment required** in the **Status** column.
2. Select the device that you want to install. Depending on the device, you may be able to apply an existing equipment template, or create a new equipment template.

Discovering Legacy Comm3/4 Devices

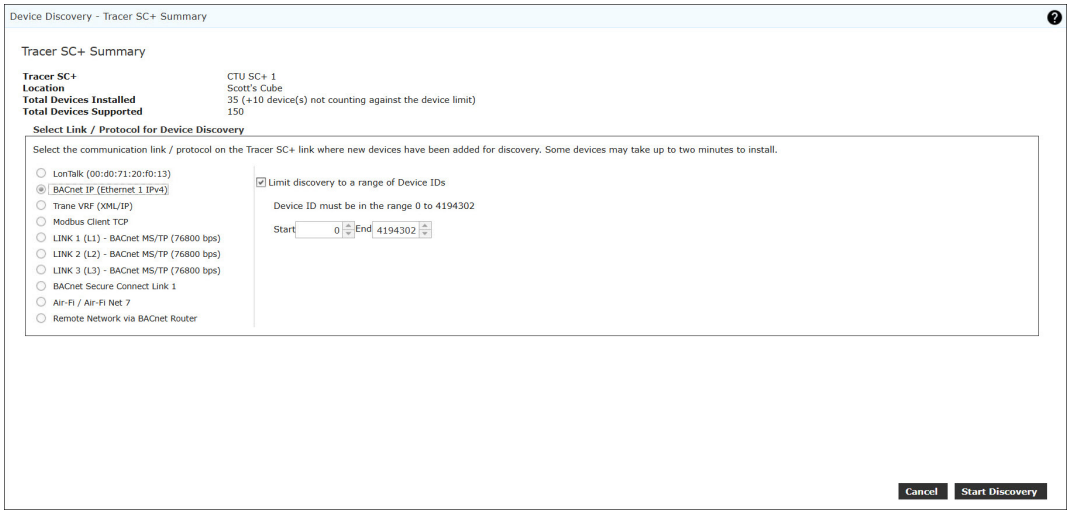
After physically installing the unit controllers (devices) on the Tracer SC+, Legacy Comm3/4 devices must be discovered and installed at the Tracer Synchrony user interface

Prior to Tracer SC+ v6.0, Legacy devices require the use of a Tracer Communication bridge in order to communicate with Tracer SC+. For more information, refer to the *Tracer Communications Bridge Comm3/4 to Tracer SC, Installation, Operation, and Maintenance*, (BAS-SVX064*-EN).

For Tracer SC+ v6.0 or greater, Legacy devices can be directly wire to the Tracer SC+. However, they need to be Created and Scanned, prior to Discovery. Refer to the *Tracer SC+ Direct-Wired Legacy Comm 3/4 Support, User Guide*, (BAS-SVU056*-EN).

1. From the left navigation menu click **Devices**, then click **Discover Devices**. The **Device Discovery** page opens.
2. Select appropriate direct wired Comm 3/4 link the BACnet IP (Ethernet 1) communication link for a remote SC+, and then click **Start Discovery** .
3. After discovery is complete, the Discovery in Progress subheading will change to Discovery Completed and the button will change from **Cancel discovery** to **Install Devices**.
4. Click **Install Devices**. The **Define Equipment for Devices** page opens.
5. Proceed to the following sections to install the devices (depending on whether the device is factory- or field-programmed.

Figure 107. Device Discovery (Legacy Comm3/4)



Installing Factory-Programmed Legacy Comm3/4 Devices

1. Review the **Define for Installation** section. Factory-programmed controllers can be identified by **Will Auto Install** in the **equipment template** column. shows an example for BACnet devices. The actual screen for Legacy Comm3/4 will closely resemble this.
2. The Comm3/4 devices will appear under the Define for Installation tab. The Comm3/4 bridge will appear under the Cannot Install table, because the bridge is not considered a device that can be installed.
3. Use the check boxes to select the devices, and then click **Install Selected Devices**. The Installation Complete page appears, which provides a summary of the installed devices.

Installing Field-Programmable Legacy Comm3/4 Devices

1. Review the **Define for Installation** section. Field-programmable controllers can be identified by **Template assignment required** in the **status**column. shows an example for BACnet controllers. The actual screen for Legacy Comm3/4 will closely resemble this.
2. Select the device that you want to install. Depending on the device, you may be able to apply an existing equipment template, or create a new equipment template.

Discovering Modbus RTU Devices

After physically installing the controllers (devices) on the Tracer SC+, Modbus devices must be discovered and installed at the Tracer Synchrony user interface. Before discovering and installing devices, make any necessary configurations to the specific communication link as described below. The settings for each link define the communication protocol in use. Modbus RTU and BACnet MS/TP devices CANNOT co-exist on the same link.

To enable Modbus RTU on links 1, 2 or 3:

1. Navigate to **Installation>Identification and Communications**.
2. Select the **Modbus Configuration** tab, and then click **Edit**.
3. For link 1, 2 or 3, edit the **Modbus** field to **Modbus Client**.
4. Select the baud rate for the Modbus link(s).
5. Edit the **Discovery Register Address** if device does not use standard address of 40001.
6. Click **Save**.

   Note: *When Modbus is enabled for a link, BACnet for that link is automatically disabled.*

With the Modbus link(s) properly configured, discovery can be initiated:

7. From the left navigation menu, click **Devices**.
8. From the **Devices** page, click **Device Discovery.** The **Device Discovery** page opens.

9. Select the communication link (Link 2 in this example).
10. Optionally, select the **Limit Discovery to a Range of Modbus Addresses** check box to limit the address range for discovery, then edit the Start and End addresses for the limited range.

    Note: *Limiting the address range of discovery will reduce the overall time of device discovery.*
11. Click **Start Discovery**.

Figure 108. Device Discovery (Modbus RTU)

Discovering Modbus TCP Devices

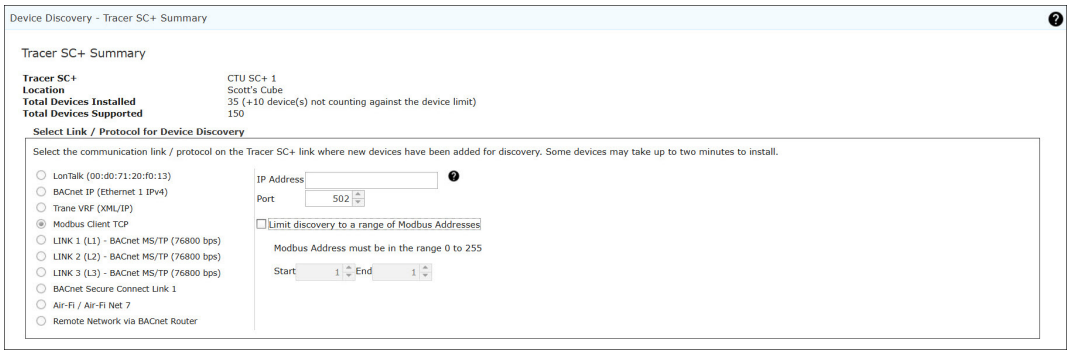
After physically installing the controllers (devices) on the Tracer SC+, Modbus devices must be discovered and installed using the Tracer Synchrony user interface.

Unlike Modbus RTU, Modbus Client TCP is always enabled and does not require link configuration. Additionally, Modbus Client TCP devices can co-exist in the IP network with other TCP/IP devices, including BACnet IP devices. Edit the **Discovery Register Address** if device does not use standard address of 40001.

Initiate discovery for a single Modbus Client TCP device:

1. From the left navigation menu, click **Devices**.
2. From the **Devices** page, click **Device Discovery.** The **Device Discovery** page opens.
3. Select the **Modbus Client TCP** communication link.
4. Enter the IP Address of the connected device, including the Port (default port is 502).
5. Optionally, select the **Limit Discovery to a Range of Modbus Addresses** check box to limit the address range for discovery, then edit the Start and End addresses for the limited range.

   Note: *Limiting the address range of discovery will reduce the overall time of device discovery.*
6. Click **Start Discovery**.
7. Repeat discovery for each Modbus Client TCP device, changing the IP Address for each device prior to discovery.



Discovering Trane®/Mitsubishi Electric VRF Devices

A Mitsubishi Electric VRF System must be installed and in operation with a Centralized Controller (T/AE-200, T/AE-50, or T/EW-50). The indoor units must be a member of a group before integrating with Tracer SC+. Each Centralized Controller must be running firmware version 7.8 or later. Optionally, Smart ME remote controllers can be members of a group (Tracer SC+ cannot

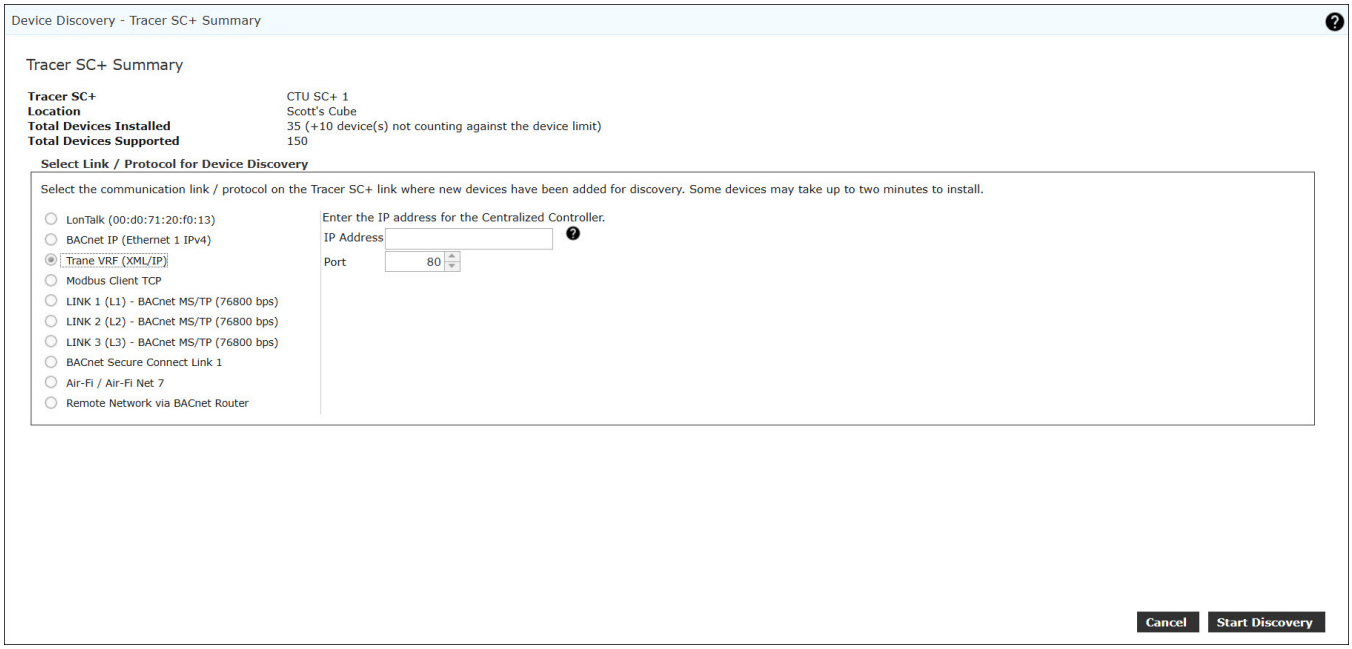
discover the Smart ME controllers if they are not members).

Ensure that the Trane/Mitusbishi Electric VRF license has been uploaded to the Tracer SC+ (version 5.4 and later), and covers device licenses for every VRF device except the smart ME Remote controllers when auto-installed.

1. Download and run **MaintenanceDataTool.exe**while connected to each Centralized Controller. This enables you to acquire the data from the VRF devices.
2. From the **Devices** page, click **Device Discovery**. The **Device Discovery** dialog box opens.

   Note: *you will need to repeat the discovery process for each Centralized Controller.*
3. Select the **Trane VRF (XML/IP)** link.
4. Enter the IP address of the Centralized Controller. Note that newer Centralized Controllers (AE-C400 and EW-C50) also require a Username and Password.
5. Click **Start Discovery**.
6. Upon completion of discovery, click **Install Devices**.
7. Optionally, change the display name of the discovered devices. Display names can also be changed after installation is complete.
8. Ensure that all devices to be installed have been selected (checked on the left), and then click **Install Selected Devices**. It may take several minutes for all devices to install.

Figure 109. Device discovery (Trane VRF XML/IP)



Equipment Templates

Creating an Equipment Template

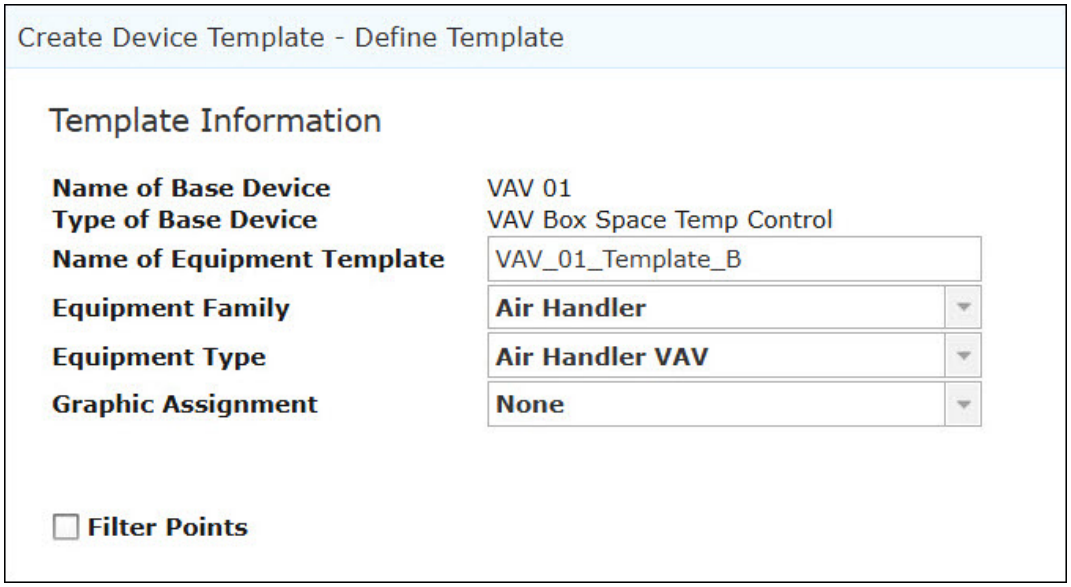
1. From the Define Equipment for Devices page, select a device and then select **Create Template from Device** from the Actions button. The **Create Device Template - Define Template** dialog box appears.
2. In the **Template Information** section, complete all the fields:
   a. Enter a name for the template that does not include spaces. Trane recommends using the equipment type followed by template and a letter; for example, CV_template_A.
   b. Select the equipment family and type, which will determine where the equipment appears in the Tracer Synchrony user interface.

      Or, choose **Select Existing Template** if most information you need for a template is very similar to an existing one, or if you are installing a Tracer UC800.

Note: *For items that exist in the template, but not in the device, the key mapping is omitted and will not display.*

3. As an option, you can select the **Filter Points** check box to filter points that will appear on successive Create Device Template pages. When selected, a filtering drop-down list appears from which you can choose the type of filter: **Point name contains** or **Point instance is in range**.

Figure 110. Create equipment template (define)

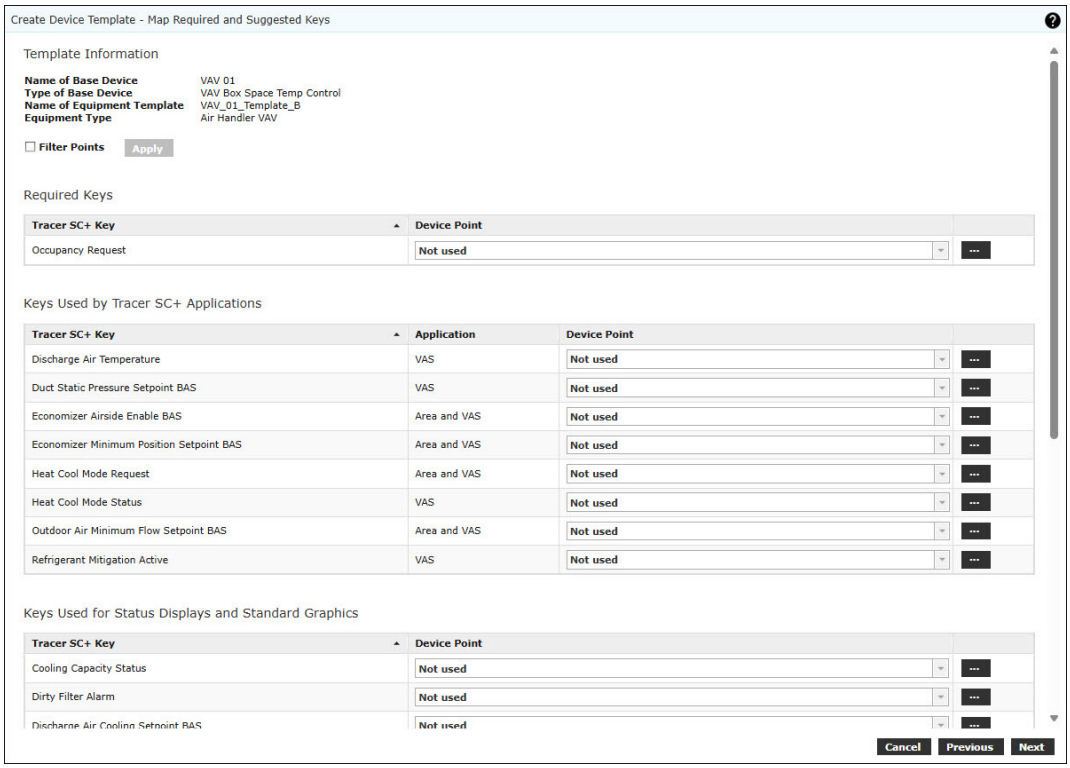


4. Click **Next**. The **Map Required and Suggested Keys** dialog box appears as shown in Figure 111, p. 141.
5. In the Required Keys section, select a device point for Occupancy Request (AHUs and spaces) from the drop-down list. For chillers, select a point for Chiller Auto Stop Command.
6. In the Keys Used By Tracer SC+ Applications section, select device points for the associated keys to be used in Tracer SC+ applications such as Area and VAS. Or, select Not used to exclude from the template.

   Notes:

   - *Click the more options button (···) to display additional points.*
   - *By default, the system will attempt to auto-map a suggested status key to a device point. If there is no match, then the* ***Not used*** *option appears by default.*
7. In the Keys Used for Status Displays and Standard Graphics section, select device points for common keys that will populate equipment status displays or on standard graphic pages.

Figure 111. Map required and suggested keys



8. For BACnet devices, Tracer SC+ Equipment Points can be created in the template. A Tracer SC+ Equipment Point is a point created in the SC+ but is displayed in and associated with the device. If a device point does not exist to map to a key, a Tracer SC+ Equipment Point can be created and mapped to the key for the device. To create and map an Equipment Point, select the (···) **More Options** button on the same line as the key, and the **More Options** dialog box will appear. In the **More Options** dialog box, make a selection in the **Create a Tracer SC+ Equipment Point** box, and click the **Apply** button.

   Note: *Two options exist for Tracer SC+ Equipment Points: Local Point, which creates a place holder Equipment Point, and Local Point with Reference, which is automatically referenced to the selected point in the controller.*

9. Click **Next**. The **Map the Remaining Points in the Device** dialog box appears. These point mappings are not required to install the device, but if they remain unmapped the points will not be available in the Tracer Synchrony. In order for a point to be used by a built-in application or a TGP2 custom program, a point must be mapped to an equipment key. For Generic templates, this page will be titled **Points in the Device**.

10. To create a Tracer SC+ Equipment point, click **Add Tracer SC+ Equipment Point**. This will open the ‘More Options’ dialog box to edit the key properties. The **Create a Tracer SC+ Equipment Point** checkbox will automatically be selected. Selected either an existing key or create a new key to be applied. The Key Conversion checkbox will be disabled, as key conversions cannot be applied to Tracer SC+ Equipment Points.

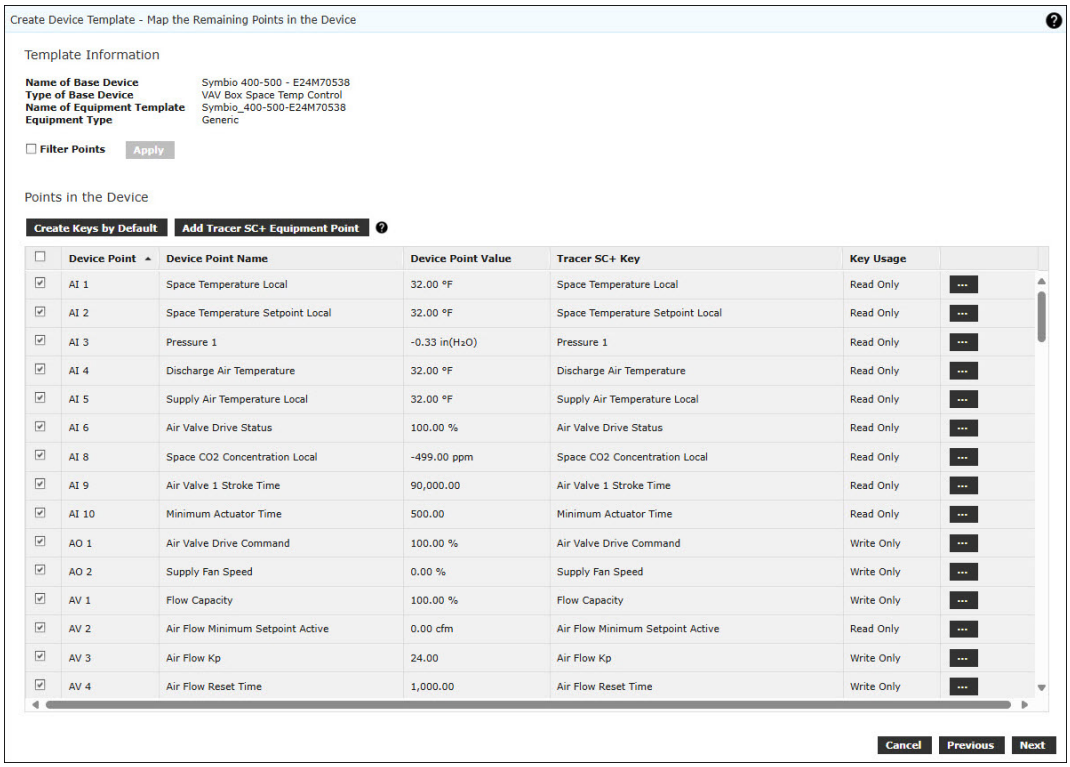
    Note: *Tracer SC+ Equipment point is a point created in the SC+ but is displayed in and associated with the device.*

11. Confirm that the points in the list that are selected to be mapped should be. Deselect points that should be excluded from the template. To edit key mapping or create user keys, click the more options button (···), which opens the More Options dialog box.

    Select Keys by Default— This is the default setting in which keys appear on this page. Click this button to clear the defaults, which changes the button to **Create keys by Default**.

    Note: *Generic templates: By default, every point in the list will be selected. Uncheck any points that should be excluded from the template.*

Figure 112. Map remaining points



12. Click **Next**. The Template Summary popup appears. Click **Create Template.** You will be returned to the Define Equipment for Devices page.
13. Click the **Install Selected Devices** button. The **Install Devices** page shows the installation progress. When installation is complete, the new devices will appear on the **Devices** page and the **Equipment** or **Spaces** list pages, depending on the type of equipment.

Editing an Equipment Template

To edit an equipment template:

1. From the left navigation menu, click **Installation > Devices**. The **Devices** list page opens.
2. Select the preferred device from the list and then select **Edit Template** from the **Actions** menu. The **Edit Equipment Template** page opens.
3. Provide a new name for the template and make your preferred changes in the **Map Equipment Keys to Device Properties** section. The equipment family or type cannot be changed.

   As an option, you can select the **Filter Points** check box to filter points that will appear on successive Create Device Template pages. When selected, a filtering drop-down list appears from which you can choose the type of filter: **Point name contains** or **Point instance is in range**.
4. Click **Next**. The **Map Required and Suggested Keys** page opens.
5. Make your preferred changes in any of the three Keys sections, then click **Next**. The **Map the Remaining Points** page opens.
6. Map any remaining points in the device, or create new keys if necessary. **Select Keys by Default**— This is the default setting in which keys appear on this page. Click this button to clear the defaults, which changes the button to **Create keys by Default**.

   Note: *Generic templates: By default, every point in the list will be selected. Uncheck any points that should be excluded from the template.*

7. Click **Next**. The **Template Summary** page opens. Review your changes, and then click **Update Template and Devices.**

Editing an Equipment Template When adding Additional Points

You can add additional input and output points to factory-programmed BACnet controllers in the field after they have been discovered.

To add additional points:

1. From the left navigation menu, click **Devices**. The **Devices** list page opens.
2. Select the preferred device from the list and then select **edit template** from the **actions** menu. The **Edit Device Template** dialog box opens.
3. Make your preferred changes. The equipment family or type cannot be changed.
4. In the **Map Equipment Keys to Device Properties** section, select the equipment keys to map to the device properties (points). If necessary, you can create additional equipment keys for points that cannot be mapped to a key.
5. Click **Next**. Select a different device points for the following (if preferred): Occupancy Request and Keys Used by Tracer SC + Applications section.
6. Click **Next**.
7. Map any remaining points in the device, or create new keys if necessary.
8. Click **Next**. The Template Summary dialog opens.

Deleting an Equipment Template

Note: *Templates that are currently in use cannot be deleted.*

To delete an equipment template:

1. From the left navigation menu click **Tools > Equipment templates.** The **Equipment Templates** list page opens.
2. Select the template that you want to delete and then click **Delete** from the **Actions** menu.

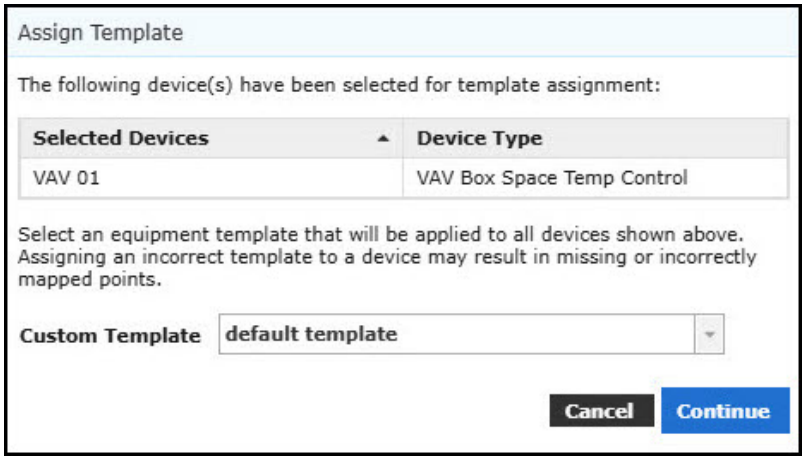
Applying an Existing Template to a Device

To apply an existing template to a device/multiple devices:

1. On the Define for Installation page for any type of device, select a device and then select one of the following from the **Actions** button:
   - **Edit Display Name/Template –** if you are applying a template to a single device**.**
   - **Assign Template –** If you are applying a template to multiple devices, select the option.

   Figure 113, p. 143 shows the dialog box for a single device; the assign template for multiple devices is very similar.
2. Select the appropriate template from the Custom EquipmentTemplate list, and then click **Continue**.
3. Repeat the above steps for each device that needs an existing template assigned to it.
4. When you are ready to install, click **install selected devices.**

Figure 113. Assign an existing template



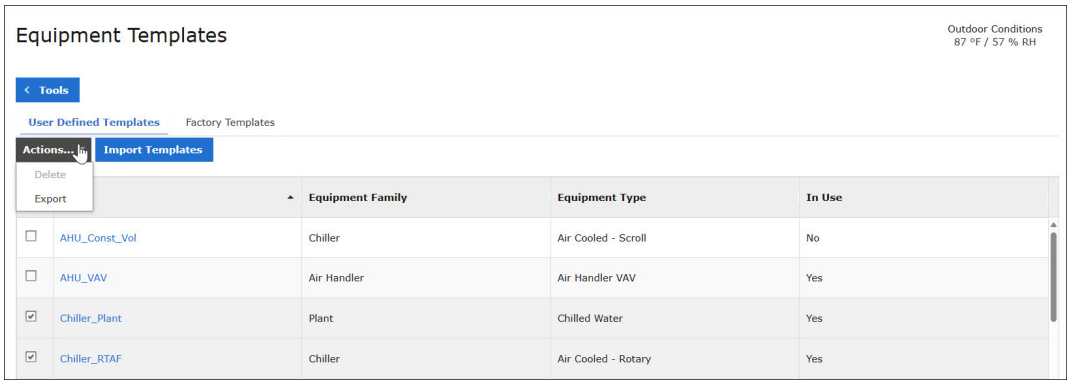
Exporting and Importing Templates

You can copy equipment templates and equipment keys from one Tracer SC+ to another Tracer SC+ by using the export and import functions. Copying equipment templates is useful when working on multiple job sites. For example, if the unit controls are identical, or even similar to those in building A, then the equipment templates and keys can be imported to the Tracer SC+ in building B.

Export Equipment Templates

1. From the left navigation menu click **Tools > Equipment Templates.** The **Equipment Templates** page opens.
2. Select one or more equipment templates from the list and then select **export** from the **Actions** button as shown in the following figure. The **File Download** dialog box appears.
3. Click **Save File** to copy to your local PC hard drive or another external storage device.

Figure 114. Exporting equipment templates



Import Equipment Templates

1. From the left navigation menu click **Tools > Equipment Templates.** The **Equipment Templates** page opens.
2. Click the **Import Templates** button**.** The **Import Equipment Templates and Keys** page opens.
3. In the **Template Filename** field, browse for the template file to be imported.
4. Click **Import**. Tracer Synchrony begins the file loading process and then the **Import Equipment Templates and Keys** page opens.
5. Use the check boxes to select the equipment templates and keys to be saved in the Tracer SC.
6. Click **Finish**.

   Note: *All equipment templates and keys must have unique names. If duplicate names are discovered, the rename template or rename key dialog box appears. Enter a new name in the field, then click rename. Keys — display names cannot exceed 64 characters. Equipment templates — display names cannot exceed 64 characters or contain spaces.*

Multi-equipment Devices and Templates

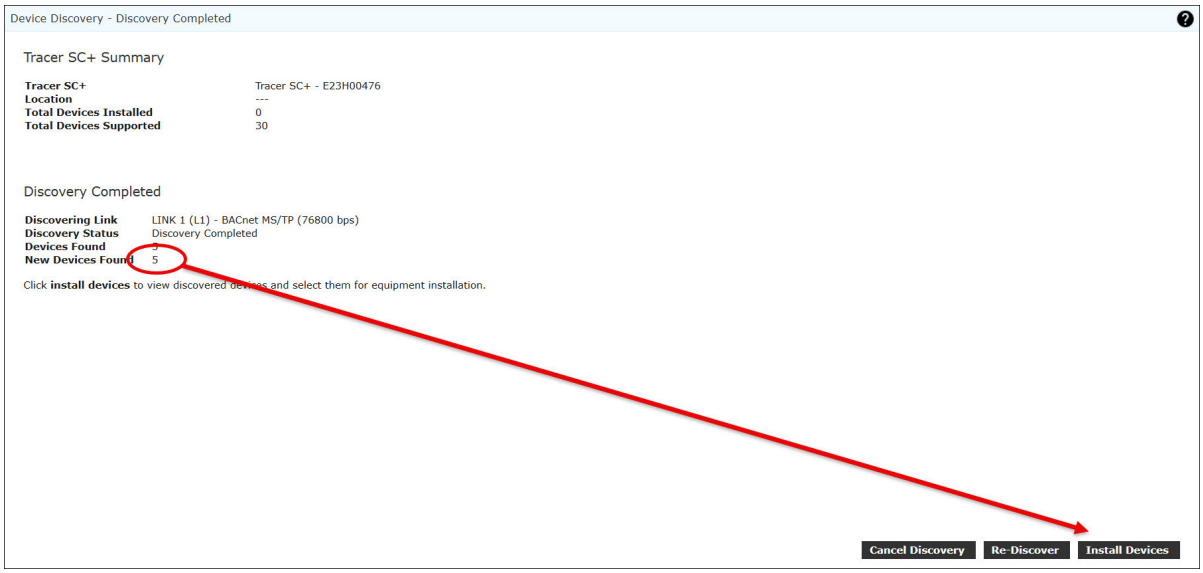
A facility may have multiple pieces of equipment connected to one unit controller. When discovered on the Tracer SC+, the equipment is installed as a single generic device with a **bag of points** that cannot be used with Tracer SC+ applications. Trane does not recommend connecting multiple pieces of equipment to a single unit controller. However, if the equipment must be integrated into Tracer SC+, virtual equipment for multi-equipment devices can be created.

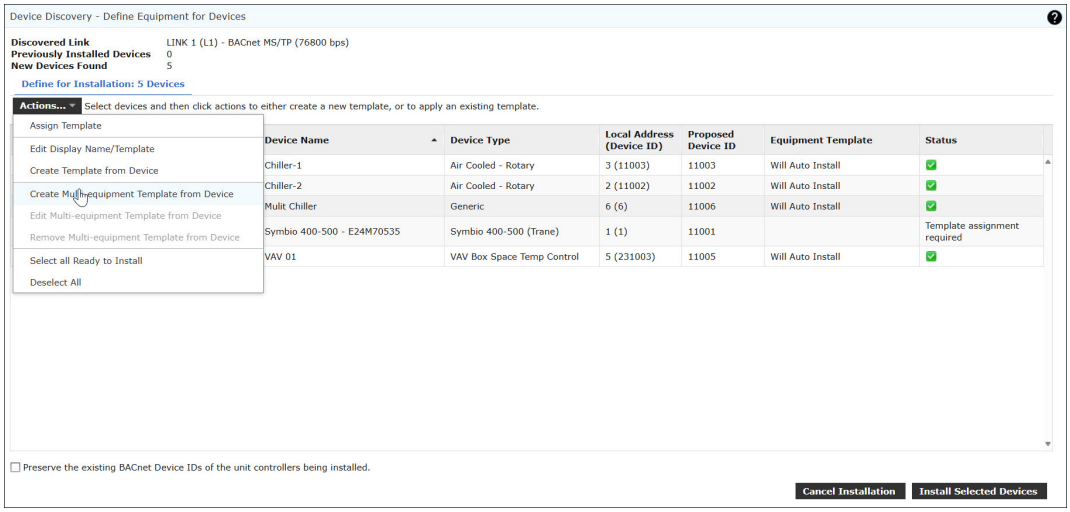
Creating a Virtual Equipment Template

In the following example, three identical chillers are connected to one device that must be integrated into Tracer SC+. The chillers will be installed as virtual equipment devices.

1. Following device discovery in Tracer Synchrony, click **Install Devices**. The **Define Equipment for Devices** page opens.
2. Select the discovered device from the list and then select **Create Multi-equipment Template from Device** from the **Actions** button. The **Define Multi-equipment Device Template** page opens.

Figure 115. Creating a virtual equipment template (steps 1 and 2)

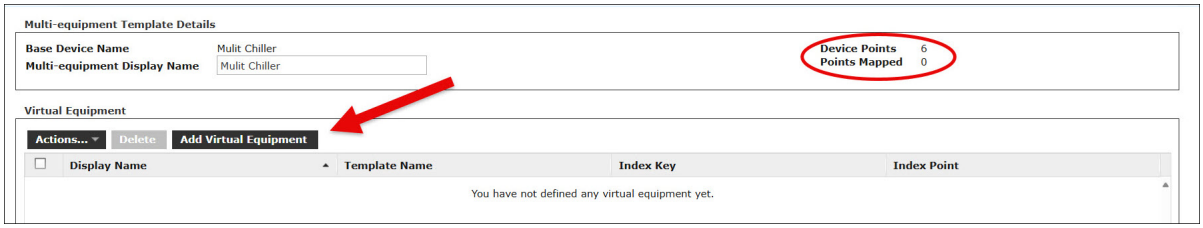




3. Click **Add Virtual Equipment**. The **Virtual Equipment Information** dialog opens.

   Note: *The total number of discovered device points is displayed in the upper right portion of the page.*

Figure 116. Add virtual equipment

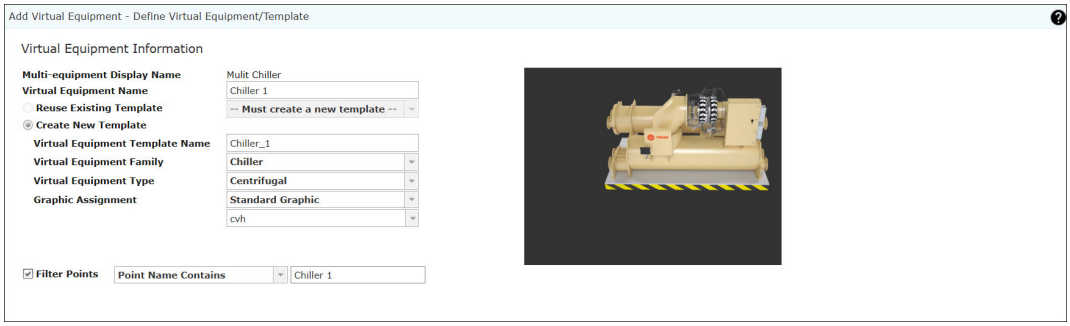


The equipment template for the first chiller must be defined. Because the template has not yet been defined, a new template must be created.

4. Click **Create New Template.** Assign an appropriate name (Chiller 1), and select drop-down options based on the installed

equipment type.

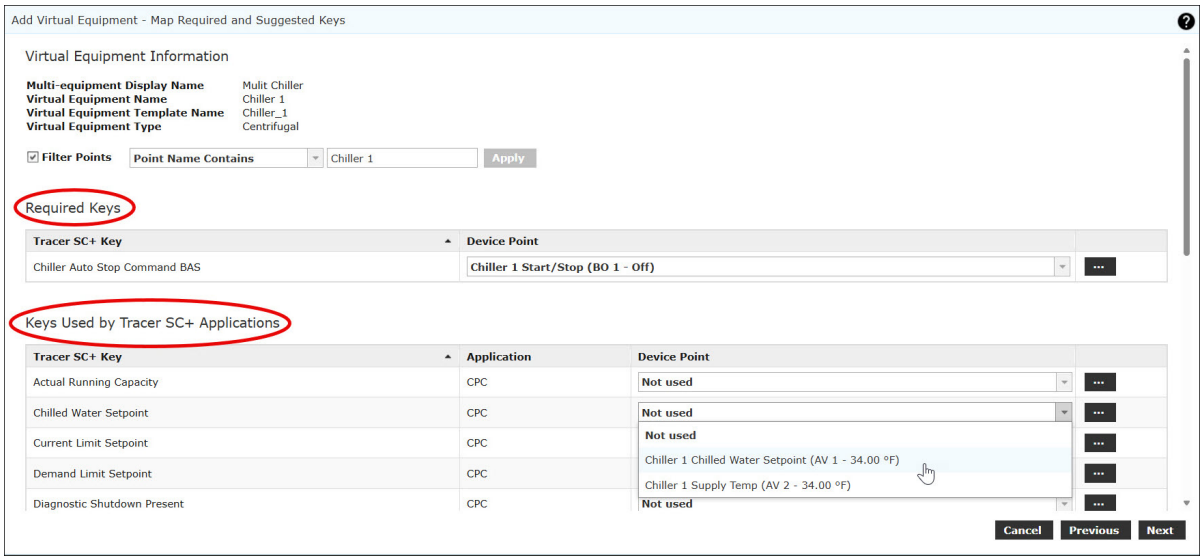
Figure 117. Create new template for virtual equipment



5. Click **Next**. The **Map Required Keys** page opens.
6. Continue to define the virtual equipment template by mapping the required and suggested standard keys.

   Note: *It may be necessary to use key conversion as part of this process if the standard key and device point are not inherently compatible.*

Figure 118. Map required keys (examples)



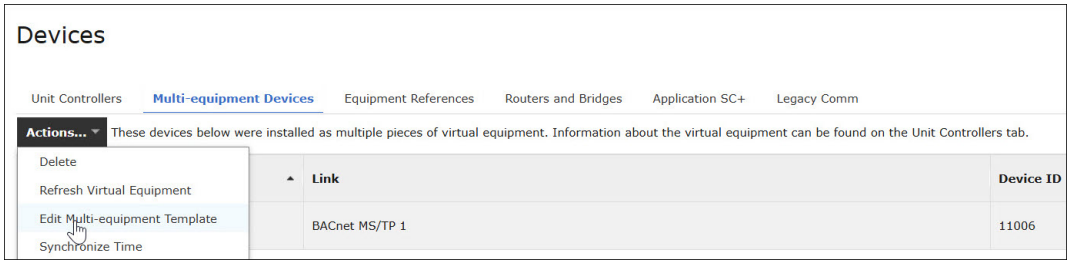
7. After all of the device points have been mapped to keys in the template, click **Add Virtual Equipment**. This completes the definition of the virtual equipment template. It can be reused on the remaining two chillers.

Editing Multi-equipment Templates

Multi-equipment templates contain one or more virtual equipment templates as part of their definition. To add or remove one or more virtual devices to the template, edit the multi-equipment device template as follows.

1. On the **Devices** page, click the **Multi-equipment Devices** tab. See Figure 119, p. 147
2. Select the appropriate device and then select **Edit Multi-equipment Template** from the **Actions** button. The **Define Multi-equipment Device Template dialog box** opens.

Figure 119. Edit multi-equipment templates



3. Select to add or delete virtual equipment as needed.

   Note: *From the Actions menu, select View Device Points to display all the points in the installed device. This can be useful when determining which points to install.*

   To modify an existing virtual equipment template, select the check box next to the virtual equipment and then click **Edit** from the **Actions** menu. The **Edit Virtual Equipment** dialog box opens.
4. Click **Edit Current Template**. As an option, select the **Filter Points** check box. When the check box is selected, the filter mode drop-list and filter text box are displayed, in which filtering parameters can be applied. Click **Next** to continue. The **Edit Virtual Equipment — Select Equipment** dialog box opens.
5. Use the check boxes to select the virtual equipment. Click **Next**. The **Edit Virtual Equipment — Map Keys** dialog box opens.
6. Map the desired points to the Tracer SC+ keys. Click **Next**. The **Virtual Equipment — Map Remaining Points** dialog box opens. The remaining unmapped points are shown on this page.

   Note: *These point mappings are not required to install the device, but if they remain unmapped the points will not be available in Tracer SC+. In order for a point to be used by a built-in application or a TGP2 custom program, a point must be mapped to an equipment key.*
7. Click **Next**. The **Edit Virtual Equipment Summary** page appears. Review the edits, and then click **Update Virtual Equipment**.

Add Equipment References

This action allows for the addition of point(s) from installed devices to a selected device.

1. From the **Devices** list page, select a device and then select **Add Equipment Reference** from the **Actions** button. The **Add Equipment Reference** dialog appears.
2. To **Add** or **Modify** references, select **Next**. If adding references same or similar to previous work, the **Import Reference** selection can be used.

Note: *Device has to be of the same Equipment Family.*

3. Select points from left hand navigation to add to the right pane, select **Next**.
4. Modify Key mappings
   a. **Source** – This is the Key Name of point(s) selected on previous page.
   b. **Host** – This is the Key Name that will be used in the Host device. Use (**More Options**) to edit key naming.

      Note: *Recommended to better identify origin of the Source point, thus adding equipment name should be considered.*
5. Select **Update Reference** to finish add the equipment references.

Replacing a Device

Before replacing a device, ensure that the new device has been properly configured. Devices are typically replaced when an installed device has failed.

Note: *The selected device must match the functionality and configuration of the device it is replacing.*

Replacing BACnet Devices

- BACnet MS/TP devices: The MAC address must match the failed device. For Trane devices, this is done by setting the rotary address to match the failed device.
- BACnet IP devices: The replacement device must have the same network number, IP address, and UDP port as the failed device.

To replace a BACnet device:

1. From the **Devices** list page, select a device and then select **Replace Device** from the **Actions** button. The **Replace Device** dialog box appears.
2. Select a communication link to discover the replacement device, and then click **Discover**.
3. If **Remote Network via BACnet Router** was selected, the Select Remote Network section will appear. Select a network and then click Discover.
4. When discovery is complete, select a new device from the Replacement Device section, and then click **Replace**.
5. Click **replace device**. The replace device loading popup appears, which refreshes the page.

Replacing LonTalk® Devices

Tracer® SC will initiate a discovery of the LonTalk® link. Replacement devices must have the same program ID and profile.

To replace a LonTalk® device:

1. From the **Devices** list page, select **replace device** from the actions button. The **Replace Device** page appears, which contains LonTalk® devices with the same program ID.
2. From the Select Replacement Device section, select one newly discovered device and then click **replace device.**

Replacing Modbus® Devices

1. From the **Devices** list page, select a device and then select **Replace Device** from the **Actions** button. The **Replace Device** dialog box appears.
2. Select a communication link to discover the replacement device, and then click **Discover**.

   If the communication link is Modbus® TCP enter the IP address, Port number, and address range.
3. When discovery is complete, select a new device from the Replacement Device section, and then click **Replace**.
4. Click **replace device**. The replace device loading popup appears, which refreshes the page.

Refreshing Equipment (Devices)

This action updates configuration changes made to the equipment without the need to rediscover and reinstall the equipment. This action can be used on multiple pieces of equipment simultaneously.

Following are examples when refreshing equipment might be used:

- A user has edited an equipment key assigned to a device and wants to update the device with new data.
- A user has imported a new template from another device and wants to update the equipment to the new template definitions.
- A technician has upgraded the firmware in a device that adds new properties or communication performance enhancements between the device and Tracer SC+.

To refresh equipment:

1. From the **Devices** list page, select a device and then select **refresh equipment** from the actions button.
2. The **refreshing device** loading pop-up appears, which refreshes the page.
3. When the **Device Refresh Status** dialog box appears, click **OK**.

Changing the Display Name of an Installed Device (Equipment)

To change the name of an installed device (equipment):

1. Select **Devices** from the Tracer Synchrony left navigation menu. The **Devices** page opens.
2. Select the check box to the left of the device that is to have its display name changed. From actions menu, select **change display name**. A popup window appears. Enter the new display name.
3. Click **Save.** The new display name will appear in the **display name** column.

Deleting a Device

To delete a device:

1. Select **Devices** from the Tracer Synchrony left navigation menu. The **Devices** page opens.
2. Select the check box to the left of the device (or devices) that is to be deleted. From the actions, menu, select **delete**. A confirmation window appears.
3. Click **Yes – Delete**. The devices will be removed from the list of devices.

   Note: *Before deleting a device, remove the device from TGP programs and applications such as Area, VAS, and Scheduling. The Tracer SC+ does not automatically remove a device from application memberships. Any graphics that reference information on the device that is to be deleted will need to be corrected.*

Add Equipment References

This action allows for the addition of point(s) from installed devices to a selected device.

1. From the **Devices** list page, select a device and then select **Add Equipment Reference** from the **Actions** button. The **Add Equipment Reference** dialog appears.
2. To **Add** or **Modify** references, select **Next**. If adding references same or similar to previous work, the **Import Reference** selection can be used.

Note: *Device has to be of the same Equipment Family.*

3. Select points from left hand navigation to add to the right pane, select **Next**.
4. Modify Key mappings
   a. **Source** – This is the Key Name of point(s) selected on previous page.
   b. **Host** – This is the Key Name that will be used in the Host device. Use  (**More Options**) to edit key naming.

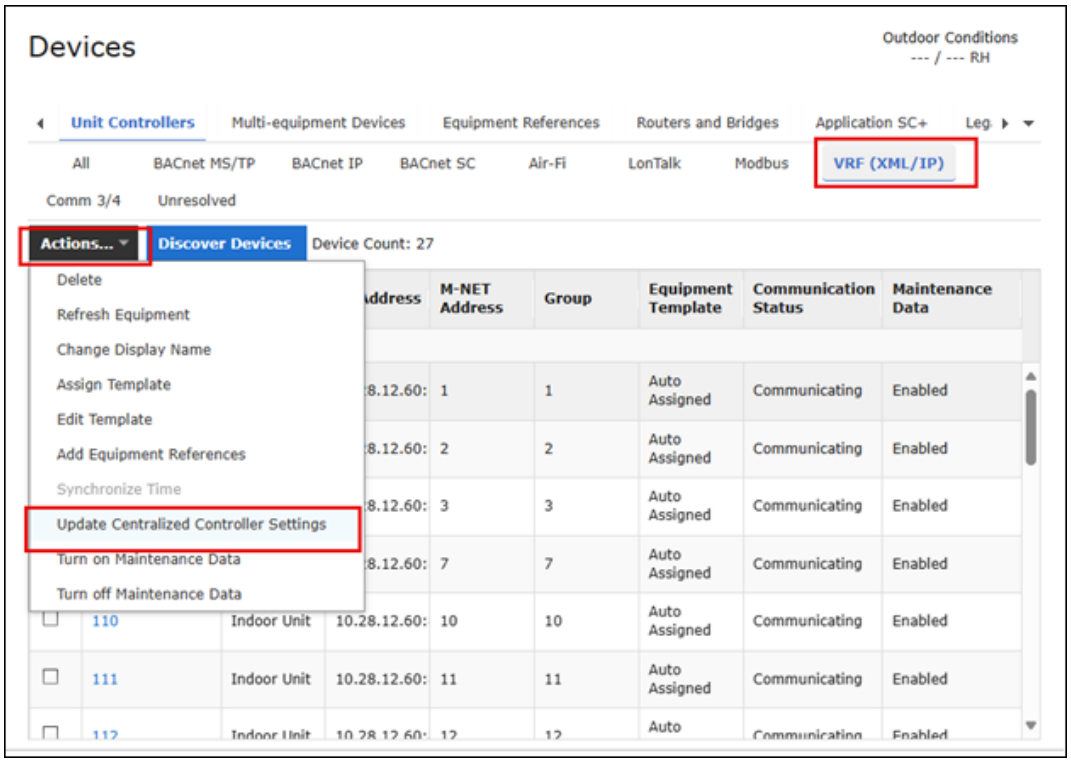
      Note: *Recommended to better identify origin of the Source point, thus adding equipment name should be considered.*
5. Select **Update Reference** to finish add the equipment references.

Updating Centralized Controller Settings

A Trane/Mitsubishi Electric VRF System integrates to the Tracer SC+ by connecting to the Mitsubishi Centralized controller. If the Centralized controller changes IP address or the username and password change, the Tracer SC+ must be updated to continue communication to the devices.

If the login credentials or IP address of a Centralized Controller need to be updated, follow these steps for proper communication with the Tracer SC+ system.

Figure 120. Devices



Updating Login Credentials

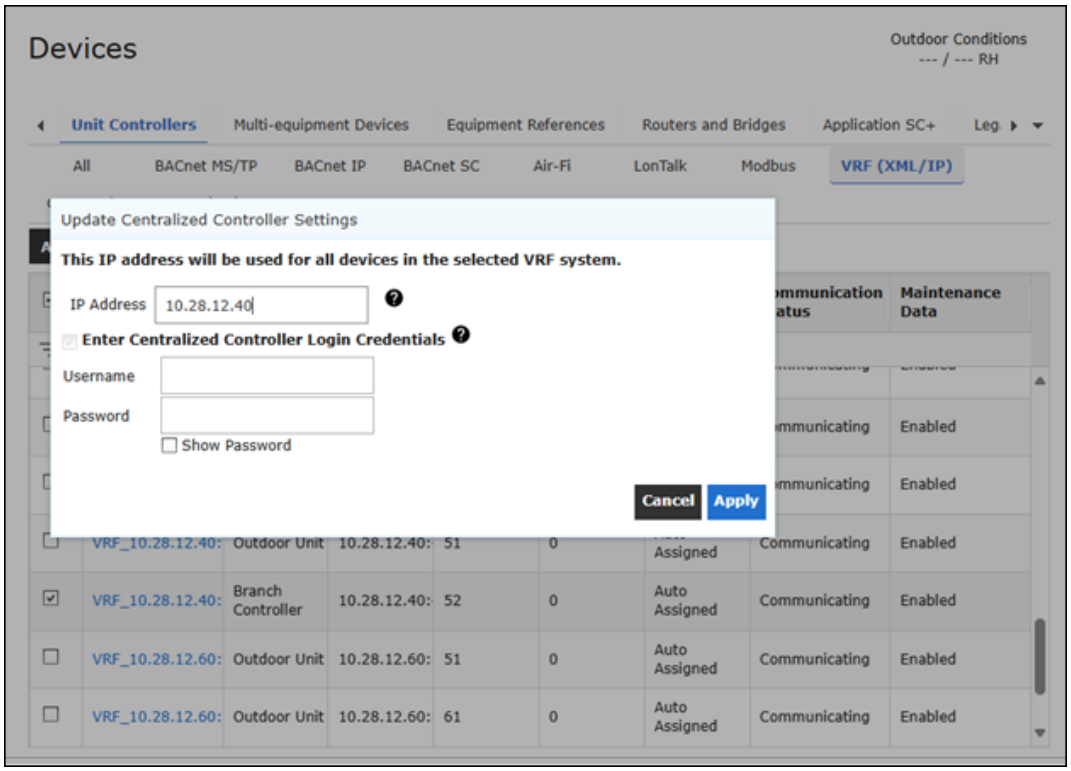
1. Navigate to the Devices section and click on the VRF (XML/IP) tab.
2. Select the check box to the left of the device associated with the Centralized controller for which the IP address and/or credentials will be updated.
3. Click on the "Update Centralized Controller Settings" action.
4. If you are updating the username and password for a port 443 Centralized Controller:
    a. The credential checkbox will be pre-checked and disabled, requiring you to enter the new credentials before clicking the Apply button.
    b. Enter the updated username and password.
    c. Click Apply.
    d. If the credentials are incorrect, an error message will appear with instructions on how to correct the issue.

Updating IP Address

1. Navigate to the Devices section and click on the VRF (XML/IP) tab.
2. Select the check box to the left of the device associated with the Centralized controller for which the IP address and/or credentials will be updated.
3. Click on the "Update Centralized Controller Settings" action.
4. If you are updating the username and password for a port 443 Centralized Controller:
    a. The credential checkbox will be pre-checked and disabled, requiring you to enter the new credentials before clicking the Apply button.
    b. Enter the updated username and password.
    c. Click Apply.
    d. If the credentials are incorrect, an error message will appear with instructions on how to correct the issue.
    e. If the IP address is invalid, an error message will appear with instructions on how to correct the issue.

5. If you are updating the IP address for a port 80 Centralized Controller:
    a. Credentials are not required, so the username and password fields will be hidden or disabled.
    b. Enter the updated IP address.
    c. Click Apply.
    d. If the IP address is invalid, an error message will appear with instructions on how to correct the issue.

Figure 121. Updating IP address



Note: *Update IP Address of Centralized Controller does not change the actual IP address of the Centralized Controller; to do that you need to use the Centralized Controller display or other Mitsubishi Electric software tool. Ensure that you have selected the correct Centralized Controller before making any updates. If no VRF devices are selected or if multiple VRF devices from different Centralized Controllers are selected, the "Update Centralized Controller Settings" action will not be available.*

LEDs and the 7–Segment Display

This section describes how to interpret the activity of the Tracer SC+ LEDs and the 7–segment display.

Powering Up/Powering Down the Tracer SC+ System Controller

To power up the Tracer SC+, press the power button.

All LEDs illuminate and the following sequence flashes on the 7-segment display: 8, 7, 9*, 5, 4, L, dancing dash pattern. The dancing dashes persist while the Tracer SC is operating normally.

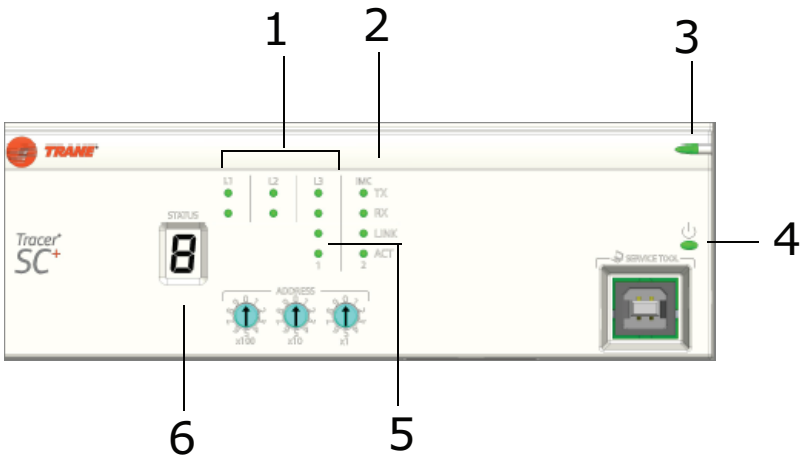
Note: *7-segment 6 was changed to 9 to indicate the new boot file had been successfully applied.*

To power down the Tracer SC+, press the power button. The 7-segment display performs a shutdown sequence (3, -, 2, -, 1, -) before the Tracer SC+ powers down.

The LEDs and the 7–Segment Display

The LEDs and the 7-segment display on the Tracer SC+ indicate the operation and communication status of the Tracer building automation system. The following figure and the corresponding table show their locations on the front of the controller.

Figure 122. Location of LEDs and the 7–segment display on the Tracer SC+



Callout Number in Figure	Description
1	RS-485 communication link LEDs
2	IMC LEDs
3	Status LED
4	Power button
5	Ethernet LEDs
6	7-segment display

Interpreting the LEDs

The following table identifies the LEDs and interprets their activity.

Table 16. LED identification and interpretation

LED type	LED activity	Indicates...
Status	On steady (green)	Power reception
	Flashing (red), and an **F** appears on the 7-segment display followed by a code	Fatal error. Service required.
	Flashing (red), and an **H** appears on the 7-segment display followed by a code	Hardware failure. SC+ will probably need to be replaced.
Link 1 communication	L1 TX flickers (green)	Data transmission
	L1 RX flickers (yellow)	Data reception
Link 2 communication	L2 TX flickers (green)	Data transmission
	L2 RX flickers (yellow)	Data reception
Link 3 communication	L3 TX flickers (green)	Data transmission
	L3 RX flickers (yellow)	Data reception
IMC	IMC TX (green)	Data transmission
	IMC RX (yellow)	Data reception
Ethernet 1, Ethernet 2	LINK on steady (green)	Valid Ethernet connection
	ACT flickers (yellow)	Data transmission and reception

Interpreting the 7–Segment Display

The 7–segment display shows the operating status of the Tracer SC+ as described in the following table.

Table 17. 7-segment display: Codes and interpretation

Red/Green LED	7-segment display	Indicates...
Green	8	Processor in reset, or no functioning software. A persistent **8** means that service is required.
Green	7	Starting level 1 boot loader
Green	9	Starting level 2 boot loader
Green	5	Entering operating system. A persistent **5** means the operating system is malfunctioning.
Green	4 (this number remains for a few seconds)	Booting operating system.
Green	–L	Loading and initializing main program.
Green	**Dancing dash** dashes flash one at a time: top, middle, bottom	Normal operation
Green	3, -, 2, -, 1, - (sequence repeats)	Power button was pressed and Tracer SC+ is shutting down. May take 10 or more seconds.
Green	3, 2, 1 (sequence repeats)	Main program shutting down due to reboot command. In most cases, the main program will be restarted.
Flashing Red	7 F	Mismatch between level 1 boot loader and hardware. Service is required.
Flashing Red	7 H	Hardware failure. The SC+ will probably need to be replaced.
Flashing Red	7 A	Missing level 2 boot loader.
Flashing Red	7 U	Mismatch between level 2 boot loader and hardware.

Table 17. 7-segment display: Codes and interpretation (continued)

Red/Green LED	7-segment display	Indicates...
Green	Single digit during operation	Rotary switch was changed. The new setting of the changed switch is displayed on the 7-segment LED for several seconds.
	U, P, d	Firmware update is in progress.
	d, o, n, E	Updating of the operating system is finished. The Tracer SC+ can be powered off, the SD card removed, and the Tracer SC+ restarted.
	F, o, r, C, E	Rotary switches set to 999; forced return to factory defaults in progress.
	C, L, E, A, r	Tracer SC is restoring factory defaults (whether by force return, UI command, or at the beginning of a database restore operation).
	r	Database restore in progress.
Flashing Red	H, O, L, d	Main program is delayed due to multiple crashes (may take up to 4 hours).
Red	F	Cannot load operating system. May be remedied by SD-card update with appropriate software version.
Flashing Green	U	Power button was pressed when main program was not running/not responsive. The SC+ is shutting down; wait for LEDs to turn off.

Normal start-up sequence: 8, 7, 9, 5, 4, -L, dancing dashes

Shutdown sequence: Press power button. LED displays 3, -, 2, - 1 - until the application shuts down. Press the power button to turn power off.

Troubleshooting

The following troubleshooting suggestions are meant to help resolve most common problems associated with the Tracer SC+. If you are unable to resolve a problem, contact a qualified Trane service technician or the Trane Product Support team.

Troubleshooting with LEDs and the 7-Segment Display

The LEDs and the 7-segment display can be used for troubleshooting. Refer to the following table for causes and resolutions to specific LED displays.

Event	Probable cause	Resolution
7-segment display sequence does not follow the start-up sequence	May indicate a failure of the Trace®r SC+.	To reset the Tracer SC+, press the power button to shutdown, and then press again to restart. Contact the Trane Product Support team if this does not solve the problem
F code displays on the 7-segment display	Indicates a fatal error.	Contact the Trane Product Support team for assistance.
H, o, L, D displays on the 7-segment display	This code indicates that a recoverable error is present, and is waiting to restart. The restart process may take up to four hours.	Contact the Trane Product Support team if your Tracer SC+ does not restart after the maximum four hour period.
Ethernet LINK LED is not illuminated	This indicates that the Tracer SC+ is not connected to Ethernet.	Check all cables and connections. It may be possible that the Ethernet cable is not working. Attempt to resolve by replacing the Ethernet cable.
Ethernet ACT LED is not illuminated	This indicates that communication does not exist between the Tracer SC+ and Ethernet.	Verify that the IP address you have entered is correct.
Red status LED along with an F code or H code on the 7-segment display		Contact the Trane Product Support team
Status LED is unlit.	The Tracer SC+ is not receiving power.	Verify that the power supply is functioning properly.
7-segment display shows 3, 2, 1 and then lower-left, upper-right in sequence	Indicates that the application is shutting down and not restarting.	Attempt to resolve the problem by cycling power to the SC+. If it recurs, contact the Trane Product Support team.

Force Return to Factory Defaults

In some cases, a corrupt database or similar problem may prevent you from accessing the Tracer Synchrony user interface in order to return to factory defaults. For information about SC+ recovery methods, see “Recovery (USB Memory Stick),” p. 155.

If this occurs, do the following to return to factory defaults:

1. Power down the Tracer SC+.
2. Reset the rotary switches to **999**.
3. Power up the Tracer SC.
   The 7-segment display shows F, o, r, C, E.
4. Within 30 seconds, set the rotary switches to the intended normal value.
   The 7-segment display shows C, L, E, A, r, indicating that the database is being cleared. It will then resume normal operation showing –L on the 7-segment display during start-up and then **dancing dashes**.

   Note: *If rotary switches are not reset within 30 seconds, the Tracer SC+ will power down leaving the database intact.*

Recovery (USB Memory Stick)

In the event the Tracer SC+/Synchrony becomes unresponsive, you can attempt to recover it by following the instructions below.

1. Insert the USB memory stick with the Tracer SC+ firmware (.scfw) file into any one of the USB ports on the Tracer SC+ system controller.
2. Set the rotary switches on the Tracer SC+ to **998** and cycle power (or power up if already off). Or, set the rotary switches for **997** to return to factory defaults.

   Upon power-up, the Tracer SC+ will complete the recovery process. When complete, the 7–Segment display will return to **dashing dances**.

Troubleshooting Network Connections

Troubleshoot network connections to a Tracer SC+ by using the following tools and procedures.

PING

PING is a PC utility that is provided with every Microsoft operating system. You can use it to verify the connectivity between two devices on an IP network.

To perform the test:

1. Select **Start > Run.**
2. In Run, type **ping** followed by the IP address of the device you want to verify connection with. Click Enter.

   You will receive a message with either a positive or negative response. A positive response to PING, but a negative response to the web browser may indicate a problem with proxy settings, IP addressing, or network communication.

IPCONFIG

IPCONFIG is a software program that is provided with every Microsoft operating system. It identifies all of the configured connections for your PC. Use this tool to verify your connection settings.

To perform the test:

1. Select **Start > Run.**
2. In Run, type **cmd**. Click **Enter**.
3. In the cmd/exe window, type **ipconfig/**. Click **Enter**.

   You will receive a detailed list of all hardware and software connections and the associated settings.

Specifications

This section contains specifications for Tracer® SC+ system controllers and for Tracer building automation systems.

Table 18. Controller specifications

Tracer SC+ Controller	
Web Browsers	The most recent version of web browsers are tested with each new firmware release and will provide the best user experience. Utilization of other operating systems and browsers may work given our adherence to web standards, but this is not recommended/supported. **Microsoft® Windows** • Google Chrome • Mozilla Firefox • Microsoft Edge (chromium) **Apple® Mac OS** • Google Chrome • Mozilla Firefox
Mobile Devices	**Apple® iOS/iPadOS** • Google Chrome • Mozilla Firefox • Safari **Android** • Google Chrome • Mozilla Firefox
Concurrent Users	• Five
Supported Languages	Up to four languages are supported per Tracer SC+. • English • Chinese (Simplified/Traditional) • French • French Canadian • Portuguese (Brazil) • German • Indonesian • Japanese • Korean • Spanish (Latin America) • Thai • Polish • Arabic

Table 18. Controller specifications (continued)

Power requirements	24 Vac @ 30 VA Class 2 transformer- Output:600mA at 24 Vdc@ 50C, Tracer® Plugin power supply w/single barrel connector - Output: 0.75A maximum at 24 Vdc @50C. Polarity: outer ground, inner 24 Vdc, PM014power supply module through inter-module-communication bus (IMC) - Output: 1.4A maximum @ 24 Vdc @ 70C
Operating environment	• Temperature: From –40°F to 158°F (–40°C to 70°C) when 24 Vdc and 500 mA max. USB current. -40°C to 50°C (-40°F to 122°F) for all other configurations. • Relative humidity: From 10% to 90%, non-condensing
Storage environment	• Temperature: From –40°F to 158°F (–40°C to 70°C) • Relative humidity: From 5% to 95%, non-condensing
Agency Listings	CE: • The European Union (EU) Declaration of Conformity is available from your local Trane® office.
Processor	Arm A9 Cortex Dual Core
Memory	• FLASH 4 GB eMMC • SDRAM 1 GB DDR3
Battery	• Coin cell battery (2032 type) that preserves regional settings (including date/time) for up to 30 days. Battery must be obtained from an outside vendor.
Protocol Communications	
BACnet	Tracer building automation systems communicates with BACnet devices that support: • Communications based on the BACnet ASHRAE/ANSI standard • ENV-1805-1/ENV-13321-1 • User Datagram Protocol/Internet (UDP/IP) compatible network Tracer SC+ is listed by BACnet Test Labs (BTL) as a BACnet Building Controller (B-BC). Listing information can be found at: http://www.bacnetinternational.net
LonTalk®	Tracer building automation systems communicates with LonTalk devices that support: • Communications based on the EIA-709.1 (LonTalk) standard • LonTalk standard network variable types (SNVTs) • FTT-10A or FT-X1 transceivers • Twisted-pair physical media (Level 4 wiring) • Non-Trane LonTalk – 120/240 ***Note:*** *Requires an external Tracer USB LonTalk module (part# X13651698001)*
Modbus	• Communications based on Modbus RTU defacto standard over EIA/TIA 485 (2–wire) • Communications based on Modbus TCP defacto standard over 100BASE-TX Transmission Control Protocol/ Internet Protocol (TCP/IP) compatible network
Trane VRF	Tracer building automation systems communicates with XML devices that support: • Communication based on Trane®/Mitsubishi Electric VRF Centralized Controllers (T/AE-200, T/AE-50, T/EW-50, AE-C400 and EW-C50) • User Datagram Protocol/Internet (UDP/IP) Compatible network

Table 18. Controller specifications (continued)

Device Limits	240 per facility - per device limits below (per link/per facility) BACnet Tracer UC210/400/600/800/BCI, Symbio™ 210/210e/400-B/500/700/800, BCI2- 60/240 Non-Trane BACnet - 32/240 Trane Communicating Thermostats - 60/240 Air-Fi® (BACnet Zigbee) - 30/240 Symbio 800 - 60/240 LonTalk® AH/CH/VV/ZN Series - 120/240 MP503 - 120/240 MP580 - 20/40 Trane Communicating Thermostats - 120/240 Symbio 800 - 120/240 Non-Trane LonTalk – 120/240 Modbus® TCP - 240/240 RTU - 30/90 Trane VRF XML/IP – 240/240 Legacy Trane Comm 2 - 240 through Comm 2 bridge Comm 3 - 240 through BMTB or direct wired with Tracer SC+ v6.0 or greater Comm 4 - 240 through BMTB or direct wired with Tracer SC+ v6.0 or greater
Medium Enclosure (optional)	
NEMA Type	NEMA-1
Weight	14 lb. (6.5 kg)
Mounting	Wall-mounted with #10 (5 mm) screws and #10 wall anchors. Mounting surface must be able to support 60 lb. (28 kg)
Large Enclosure (optional)	
NEMA Type	NEMA-1
Weight	50 lb (23.0 kg)
Mounting	Wall-mounted with #10 (5 mm) screws and #10 wall anchors. Mounting surface must be able to support 120 lb. (56 kg)

Resources

The following is a list of related Tracer® SC+ documentation and training resources.

- **Tracer SC+ System Controller Installation Sheet (BAS-SVN037*-EN)**

  For installing the controller and providing AC power.

- **Tracer Synchrony Help**

  An online help system is included with the Tracer Synchrony user interface. Global help has a table of contents and is searchable. Contextual help is specific to the information on each page.

- **Tracer BAS Operator Suite (Mobile App) Getting Started Guide (BAS-SVU23*-EN)**

  Describes how to obtain, download, install, and set up the mobile app.

- **BACnet® MS/TP Wiring Best Practices and Troubleshooting (BAS-SVX51*-EN)**

  Provides best practices, procedures, and troubleshooting for wiring BACnet unit controllers to a Tracer SC+ system controller.

- **Tracer Synchrony Air Systems Application Guide (BAS-APG036*-EN)**

  Describes variable-air-volume strategies for variable air systems. It also includes constant-volume applications and area application strategies for Tracer SC+.

- **Tracer Graphical Programming (TGP2) Applications Guide (BAS-APG008*-EN)**

  Describes how to use the TGP2 editor and typical implementation strategies and best practices for using TGP2.

- **Tracer® TU Service Tool User Guide (BAS-SVU046*-EN)**

  This document describes how to use the Tracer TU service tool to

  – Transfer programs to the Tracer SC+

  – Start the Tracer Graphical Programming (TGP2) Editor and the Tracer Graphics Editor from within Tracer TU

  – Backing up and restoring firmware and TGP2 programs

- **Rover™ Service Tool Installation, Operation, and Programming Guide (EMTX-SVX01*-EN)**

  Describes how to use the Rover service tool for configuring, monitoring, and testing Tracer controllers that use Comm4 and LonTalk® communications.

- **Trane University™**

  Trane University offers a comprehensive portfolio of technical courses to help you effectively monitor and coordinate your HVAC equipment and systems.

  For more information, visit the portal page: https://tranetechnologies.sharepoint.com/sites/trane-u/SitePages/Building%20System%20and%20Controls.aspx

- **BACnet® Secure Connect Application Guide (BAS-APG049*-EN)**
- **BAS Cyber Security Application Guide (BAS-APG047*-EN)**

Software Upgrades

Tracer Synchrony software upgrades can be performed at the user interface or with a USB memory stick or with Tracer TU.

Tracer Synchrony User Interface

A service tool is no longer required to upgrade/downgrade Tracer SC+ and can be performed from the Tracer Synchrony user interface. Navigate to the **Devices** page and select the **Application SC+** or **Base SC+** (depending on licensing) tab. Select **Upgrade Firmware** from the **Actions** button, select the firmware file and then click **Upload**. The Tracer SC+ will process the upgrade and you will be returned to the log in screen. The same functionality can be found under **Tools > Firmware Upgrade**.

USB Mass Storage

Note: *The file format of the USB memory stick must be FAT32 or NTFS.*

USB memory sticks is primarily used as a recovery method in the event of Tracer SC+ becomes unresponsive. And, if necessary can also be used to perform software upgrades and downgrades.

1. From the https://tranetechnologies.sharepoint.com/sites/softwaredownloads/SitePages/SC+.aspx page, copy a Tracer Synchrony firmware file (.scfw) to the USB memory stick. Make sure there is only one firmware file on the stick.
2. Insert the USB memory stick into any one of the USB ports on the Tracer SC+ system controller.
3. Set the rotary switches on the Tracer SC+ to **998** and cycle power (or power up if already off). This preserves controller configuration and programming.

   To upgrade and return to factory defaults, set the rotary switches on the Tracer SC+ to **997**.

   Important: *Setting the rotary switches to **997** will clear the database; all existing programming will be lost.*

Upon power-up, the Tracer SC+ will process the upgrade. When complete, the 7–Segment display will return to **dashing dances**.

Appendix A: Building Network Installation Memo

You can use this memo for communicating your networking needs to the IT staff.

To: IT Staff

From: Local Trane office

Date: _____

Subject: Tracer® building automation system installation

As part of the upcoming building renovation project, Trane has been selected to provide the new facility-wide Tracer building automation system. This system will control heating, air conditioning, and ventilation in the building, which will provide increased comfort and decreased utility costs.

Tracer SC+ controllers will be used for configuration and operation and to control the equipment in the building. As part of the construction specifications, Trane will be using the IP network for communication.

The Tracer building automation system uses the BACnet protocol, ASHRAE/ANSI 135-95 and IP communication adheres to annex J-1999 of the same standard.

Any point of access to the corporate Intranet can be used to connect the Tracer building automation system.

Critical networking requirements are as follows:

- The items requested in the table below for each Tracer SC:

Location	Provided by IT				Provided by Trane
	Network jacks (100BaseT)	IP address[a]	Subnet mask	Gateway address	MAC address

[a] If using a DHCP server, please provide static IP addresses.

- For BACnet device communications, the UDP port address is 47808. If IT wants to use a different address, please enter it here:

  UDP port: _____
- A firewall that allows UDP at the designated port and exposes the IP addresses of the Tracer SC+.
- NTP server address: _____ (for acquiring network time for use by Tracer SC+)
- SMTP server address: _____(for sending e-mail notifications of alarms)

Please e-mail the information requested to my e-mail address _____, or fax this page to me _____.

If you have any questions or concerns, please call me at _____.

Thank you,

Project Manager

Appendix C: Configuring Tracer SC+ as a Gateway for Tracer Summit to TIS

A Base Tracer SC+ controller without a license can function as a gateway for the Tracer Summit Workstation and Trane Intelligent Services. The connection, made through Trane Connect, allows the collection of BCU data to generate analytics and alarming.

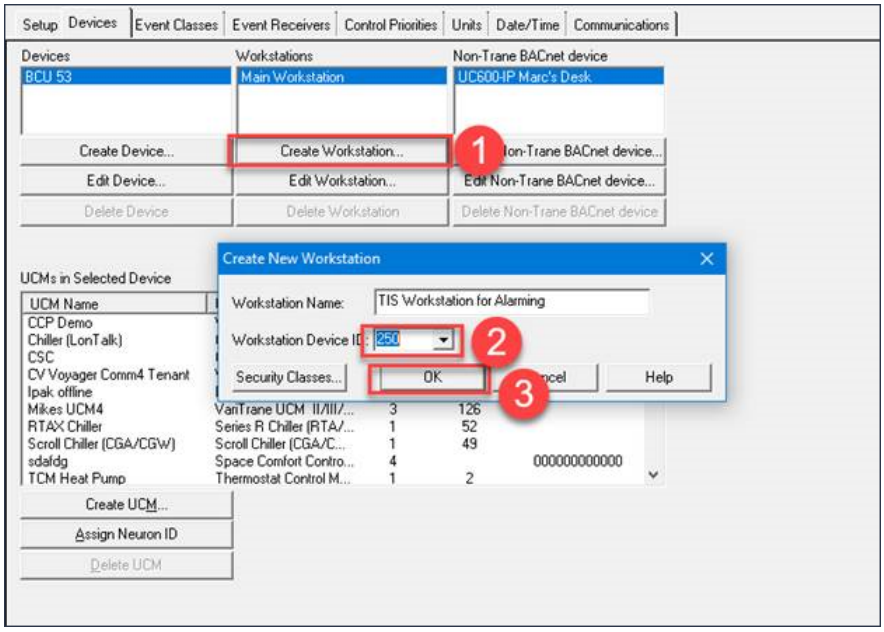
Note: *Only a Tracer SC+ controller without a license (BASE SC+) will work for this functionality.*

Before configuring Tracer SC+ as a gateway for Tracer Summit to TIS, a Tracer Summit Workstation must be set up:

1. On Tracer Summit, open the **Devices** tab.
2. Click **Create Workstation**.
3. In the **Workstation Device ID** drop-down, select 250, which is a unique number.

   Note: *The BCU cannot have a device ID greater than 255 due to the DIP switches.*
4. Click **OK**.

Figure 123. Create a workstation in Tracer Summit

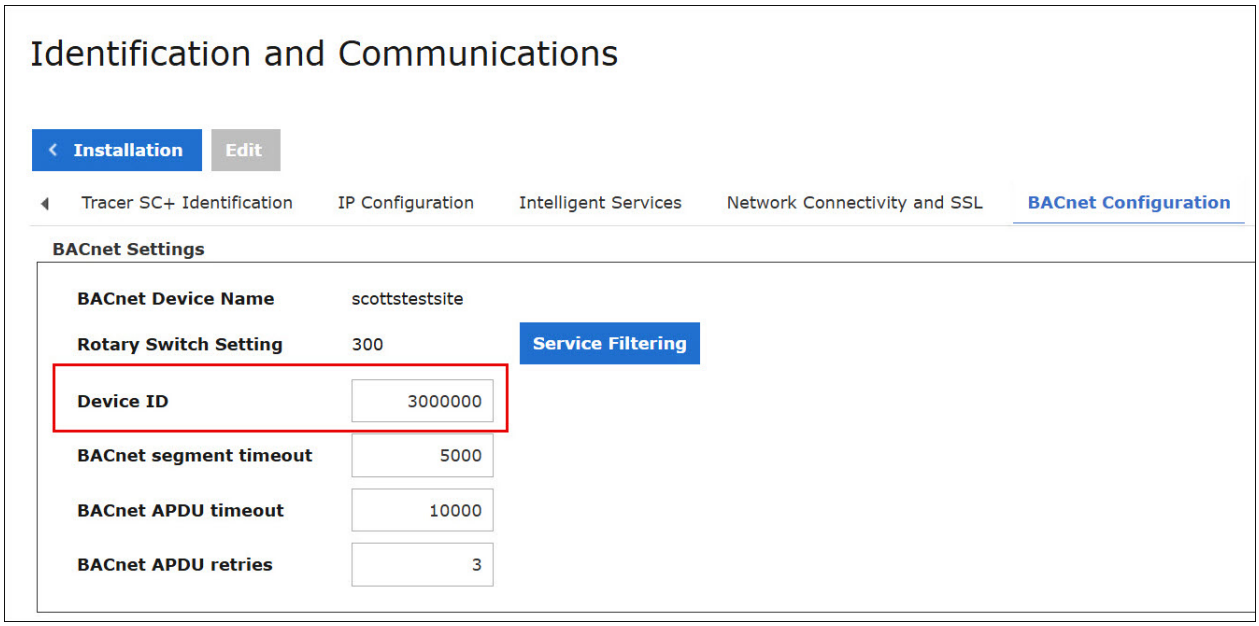


When the Workstation appears listed, configure the Tracer SC+ as follows:

5. Install Tracer SC+ on the customer's site.

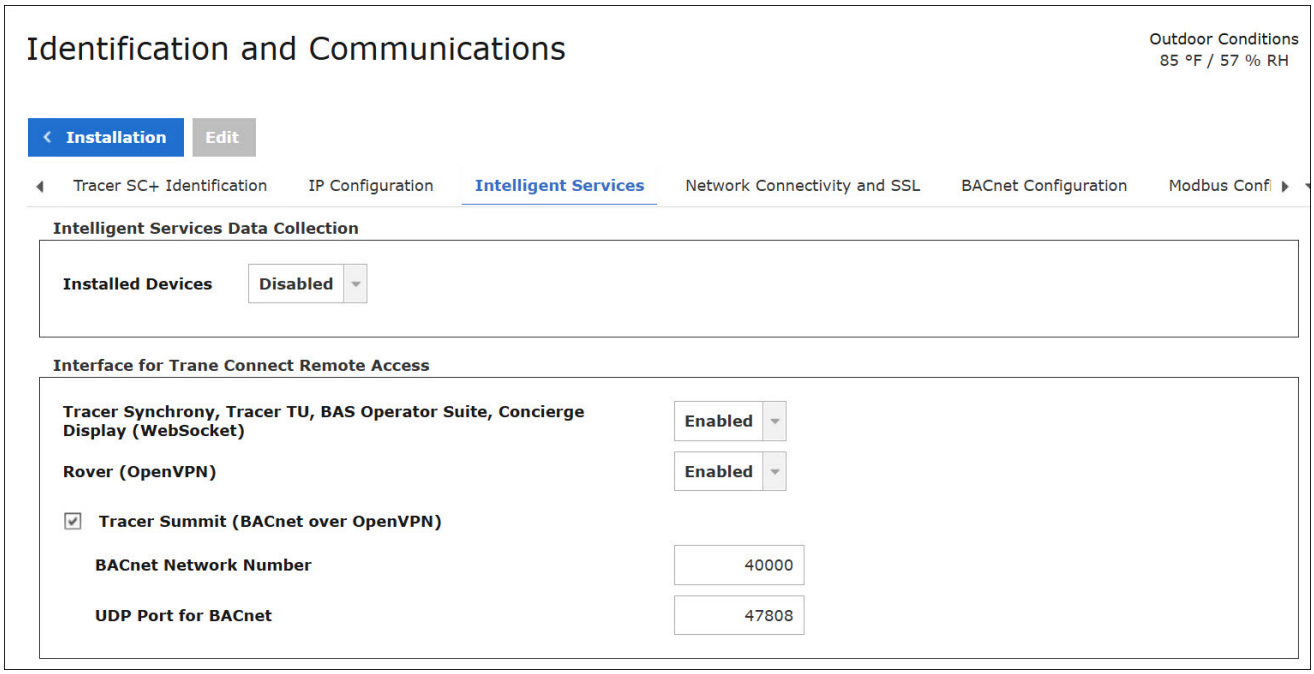
   Note: *This BCU feature is only supported on a Base SC+ (an SC+ without an application license), and on Tracer SC+ version 5.2 or higher.*
6. Set up BACnet configuration settings.
   a. At the Tracer Synchrony user interface from the left hand menu, navigate to Installation>Identification and Communications>BACnet Configuration tab.
   b. In the **Device ID** field, enter 250. The Device ID must match the BCU in order to receive alarms.

Figure 124. BACnet configuration (Device ID)



7. Enable BCU support on the Tracer SC+:
   a. At the Tracer Synchrony user interface from the left hand menu, navigate to Installation>Identification and Communications>Intelligence Services tab.
   b. Click **Edit**.
   c. From the **BCU (BMTW/ X) Data** drop-down, select **Enabled**.
8. Enable Trane Connect Remote Access:
   a. In the **Interface for Trane Connect Remote Access** frame, select Enabled in the **Tracer TU, Rover (VPN)** field.
   b. Check the **Tracer Summit (BACnet over OpenVPN)** box to enable Trane Connect. This sets up an additional BACnet IP datalink bound to the Trane Connect connection.
   c. Enter a **BACnet network number**. This is the network number assigned to the Trane Connect datalink connection. As with all other links, this MUST be unique across the entire BACnet internetwork (particularly be aware of remote networks accessed via routers that may cause a conflict). If in doubt, choose a large number less than 65535. The default is 40,000.
   d. Enter a **UDP Port for BACnet** number. This is the port for the BACnet IP over Trane Connect datalink. This port will be used when configuring the connection in Tracer Summit. Because Trane Connect is on a private IP subnet, it is not necessary to change this from the default of 47808 and it does not need to match your BCD UDP Port.
   e. Click **Save**. You will be prompted to restart Tracer SC+. Click **OK**.

Figure 125. Enabling BCU support



9. Generate alarm test on the Tracer Summit Workstation (created earlier).
   a. Create a binary output.
   b. Name the binary output **test1**.
   c. Configure the binary output to critical alarm.
   d. Test the alarm.
10. Set up the tile for the SC+ in TIS Command Center.
   a. Log in to the TIS Command Center.
   b. Register the SC+ by using Site Administration.

      Important: *Be sure to select SC/BCU in the Connectivity Type drop-down.*
   c. Remove the old Connectivity Module (CM) out of network to ensure that no data is sent from the old CM/tile.
   d. Create a Feedback ticket with the following details as soon as the new tile is created to prevent loss of data.
      - Feedback Ticket Summary: Data migration from the old CM to the new SC+ gateway.
      - Description: Old CM site name and new SC+/BCU site name with the SC+ serial number.

      Note: *Data contained in all objects in the old tile (all existing mapping) will be migrated to the new SC+ gateway tile in the Command Center 3. New mapping is not required on the new tile.*
   e. Do not make any updates in either tile (mappings, objects, etc.) until the Feedback ticket is closed.

Appendix D: Tracer SC+ LonTalk® UNVT and SVNT Support

LonTalk® UNVT Support

The Tracer® SC+ system controller integrates previously non-supported standard network variable types (SNVTs) and user-defined network variable types (UNVTs). Some LonTalk® devices use proprietary (user-defined) network variables that previously were not possible to integrate into Tracer SC+.

The **UNVT More Options** dialog in the Tracer Synchrony user interface is used to define a single UNVT into one or many points as defined by the manufacturer of the LonTalk® device. Specific manufacturer product documentation that describes how the UNVT is defined is required. Product documentation for a specific vendor's UNVTs can typically be found in the following places:

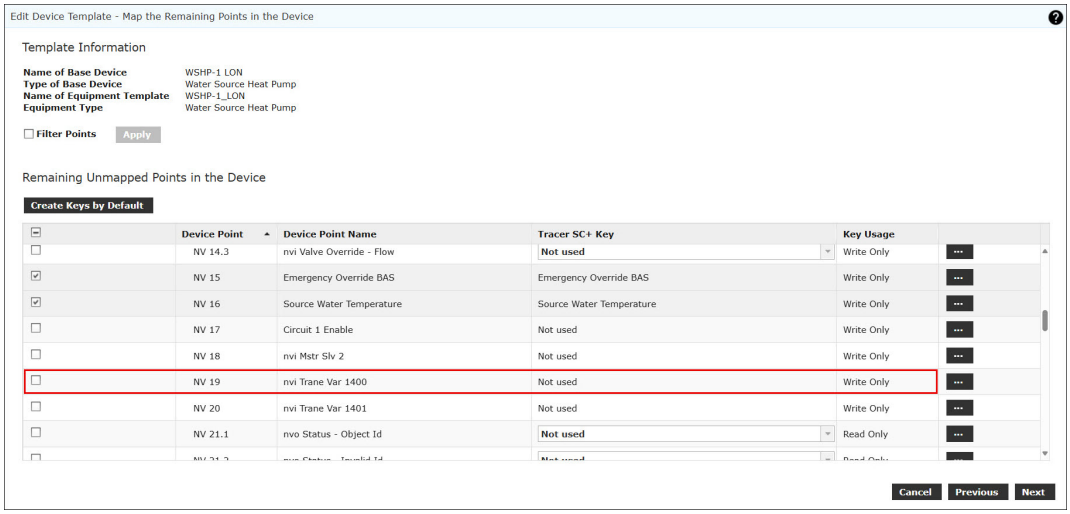
- The integration guide from the manufacturer
- Device Resource Files (DRF) on LonMark
- Industry or community discussion boards

UNVT Mapping Procedure

The **UNVT More Options** dialog is available when creating or modifying a LonTalk® device template. The following procedure describes how to use the **UNVT More Options** dialog.

1. On the **Edit Device Template - Map the Remaining Points in the Device** screen, search for UNVTs (and previously unsupported SNVTs). These can be identified by the absence of a drop-down box in the **Tracer SC+ Key** column. In the figure below, nviManValue, nviFlowOffset, nviShare, nvoShare, nvoCtlDataG, nvoData, and nvoError are all UNVTs.

Figure 126. Edit device template (LonTalk® — search for UNVTs)

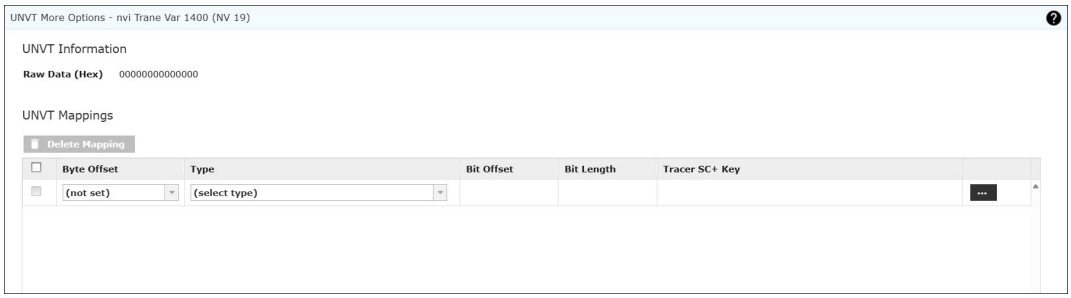


2. Click the more options icon (···) in the far-right column, which opens the **UNVT More Options** dialog.

The **UNVT More Options** dialog shows the raw value in hex in the **UNVT Information** section. The raw value displays the data length of the point, and it allows you to verify that the correct pieces of data are being used to create a point in Tracer SC+. The raw value is read-only when starting the UNVT editor – it does not automatically refresh.

3. Using the vendor documentation that defines the UNVT, identify the point or points that must be extracted from the UNVT. Some UNVTs will be short and may represent a single point; other UNVTs may be very large and provide multiple points.
4. In the **Byte Offset** column select **not set** and then select the starting location of the first point to be created in Tracer SC+. A byte offset of 0 starts with the left-most byte of data with sequential bytes moving left to right.

Figure 127. UNVT more options dialog box



5. select the appropriate (data) type in the Type field. The Type field includes SNVTs and proprietary data types. Based on the Byte Offset and Type that are defined, the raw bytes to be used will be highlighted in yellow in the Raw Data (Hex) field. Proprietary data type have a prefix of UNVT_. Some examples of UNVT_ data types are:
   - UNVT_U08 Unsigned 8 bits
   - UNVT_S08 Signed 8 bits
   - UNVT_U16 Unsigned 16 bits
   - UNVT_S16 Signed 16 bits
   - UNVT_STATE_08 1 to 8 bits of data. Use the Bit Offset and Bit Length fields.
   - UNVT_STATE_16 1 to 16 bits of data. Use the Bit Offset and Bit Length fields.
6. Select an existing Tracer SC+ key or click the more options icon (…) to create a new key. A key conversion may also be applied or created as needed.
7. Click **Save Mappings**, and continue the device template create/edit procedure.

The following figure shows an example of more complicated UNVT. This UNVT has many points, which use a variety of types with standard and custom keys.

SNVT Types Supported by Tracer SC+

Standard Network Variable Types (SNVTs) facilitate interoperability by providing a well-defined interface for communication between devices made by different manufacturers. Devices can be installed in a network and connected to other devices by using network variables, providing the data types match.

The following table contains SNVT types supported by Tracer SC+

Table 19. Supported SVNT types (alphabetical)

SNVT Type	SNVT Index
SNVT_ABS_HUMID	160
SNVT_AMP	1
SNVT_AMP_AC	139
SNVT_AMP_F	48
SNVT_AMP_MIL	2
SNVT_ANGLE_DEG	104
SNVT_BTU_F	67
SNVT_BTU_KILO	5
SNVT_BTU_MEGA	6
SNVT_CHLR_STATUS	127
SNVT_COUNT	8
SNVT_COUNT_F	51

Table 19. Supported SVNT types (alphabetical) (continued)

SNVT Type	SNVT Index
SNVT_COUNT_INC	9
SNVT_COUNT_INC_F	52
SNVT_DEFR_MODE	120
SNVT_DEFR_STATE	122
SNVT_DEFR_TERM	121
SNVT_DENSITY_F	101
SNVT_ELEC_KWH	13
SNVT_ELEC_KWH_1	146
SNVT_ELEC_WHR	14
SNVT_ELEC_WHR_F	68
SNVT_ENTHALPY	153
SNVT_EVAP_STATE	118
SNVT_FLOW	15
SNVT_FLOW_F	53
SNVT_FLOW_P	161
SNVT_FREQ_F	75
SNVT_FREQ_HZ	76
SNVT_FREQ_KILOHZ	77
SNVT_HVAC_EMERG	103
SNVT_HVAC_MODE	108
SNVT_HVAC_OVERIDE	111
SNVT_HVAC_STATUS	112
SNVT_LENGTH	17
SNVT_LENGTH_F	54
SNVT_LENGTH_MIL	20
SNVT_LEV_CONT	21
SNVT_LEV_CONT_F	55
SNVT_LEV_DISC	22
SNVT_LEV_PERCENT	81
SNVT_LUX	79
SNVT_MASS_KILO	24
SNVT_MASS_MEGA	25
SNVT_MULTIPLIER	82
SVNT_OCCUPANCY	109
SNVT_PH_F	126
SNVT_POWER	27
SNVT_POWER_F	57

Table 19. Supported SVNT types (alphabetical) (continued)

SNVT Type	SNVT Index
SNVT_POWER_KILO	28
SNVT_PPM	29
SNVT_PPM_F	58
SNVT_PRESS	30
SNVT_PRESS_F	59
SNVT_PRESS_P	113
SNVT_PWR_FACT	98
SNVT_PWR_FACT_F	99
SNVT_RES	31
SNVT_RES_F	60
SNVT_RES_KILO	32
SNVT_RPM	102
SNVT_SETTING	117
SNVT_SOUND_DB	33
SNVT_SOUND_DB_F	61
SNVT_SPEED	34
SNVT_SPEED_F	62
SNVT_SPEED_MIL	35
SNVT_STATE	83
SNVT_STATE_64	165
SNVT_STR_ASC	36
SNVT_SWITCH	95
SNVT_TEMP_DIFF_P	147
SNVT_TEMP_F	63
SNVT_TEMP_P	105
SNVT_TEMP_SETPT	106
SNVT_THERM_MODE	119
SNVT_TIME_HOUR	124
SNVT_TIME_F	64
SNVT_TIME_MIN	123
SNVT_TIME_SEC	107
SNVT_TIME_STAMP	84
SNVT_TOD_EVENT	128
SNVT_TURBIDITY_F	144
SNVT_VOL	41
SNVT_VOL_F	65
SNVT_VOL_KILO	42

Table 19. Supported SVNT types (alphabetical) (continued)

SNVT Type	SNVT Index
SNVT_VOLT	44
SNVT_VOLT_AC	138
SNVT_VOLT_F	66
SNVT_VOLT_KILO	46
SNVT_VOLT_MIL	47
SNVT_STATE_64	165

Table 20. Supported SNVT types (arranged by index)

SNVT Type	SNVT Index
SNVT_AMP	1
SNVT_AMP_MIL	2
SNVT_BTU_KILO	5
SNVT_BTU_MEGA	6
SNVT_COUNT	8
SNVT_COUNT_INC	9
SNVT_HVAC_OVERIDE	11
SNVT_ELEC_KWH	13
SNVT_ELEC_WHR	14
SNVT_FLOW	15
SNVT_LENGTH	17
SNVT_LENGTH_MIL	20
SNVT_LEV_CONT	21
SNVT_LEV_DISC	22
SNVT_MASS_KILO	24
SNVT_MASS_MEGA	25
SNVT_POWER	27
SNVT_POWER_KILO	28
SNVT_PPM	29
SNVT_PRESS	30
SNVT_RES	31
SNVT_RES_KILO	32
SNVT_SOUND_DB	33
SNVT_SPEED	34
SNVT_SPEED_MIL	35
SNVT_STR_ASC	36
SNVT_VOL	41

Table 20. Supported SNVT types (arranged by index) (continued)

SNVT Type	SNVT Index
SNVT_VOL_KILO	42
SNVT_VOLT	44
SNVT_VOLT_KILO	46
SNVT_VOLT_MIL	47
SNVT_AMP_F	48
SNVT_COUNT_F	51
SNVT_COUNT_INC_F	52
SNVT_FLOW_F	53
SNVT_LENGTH_F	54
SNVT_LEV_CONT_F	55
SNVT_POWER_F	57
SNVT_PPM_F	58
SNVT_PRESS_F	59
SNVT_RES_F	60
SNVT_SOUND_DB_F	61
SNVT_SPEED_F	62
SNVT_TEMP_F	63
SNVT_TIME_F	64
SNVT_VOL_F	65
SNVT_VOLT_F	66
SNVT_BTU_F	67
SNVT_ELEC_WHR_F	68
SNVT_FREQ_F	75
SNVT_FREQ_HZ	76
SNVT_FREQ_KILOHZ	77
SNVT_LUX	79
SNVT_LEV_PERCENT	81
SNVT_MULTIPLIER	82
SNVT_STATE	83
SNVT_TIME_STAMP	84
SNVT_SWITCH	95
SNVT_PWR_FACT	98
SNVT_PWR_FACT_F	99
SNVT_DENSITY_F	101
SNVT_RPM	102
SNVT_HVAC_EMERG	103
SNVT_ANGLE_DEG	104

Table 20. Supported SNVT types (arranged by index) (continued)

SNVT Type	SNVT Index
SNVT_TEMP_P	105
SNVT_TEMP_SETPT	106
SNVT_TIME_SEC	107
SNVT_HVAC_MODE	108
SVNT_OCCUPANCY	109
SNVT_HVAC_STATUS	112
SNVT_PRESS_P	113
SNVT_SETTING	117
SNVT_EVAP_STATE	118
SNVT_THERM_MODE	119
SNVT_DEFR_MODE	120
SNVT_DEFR_TERM	121
SNVT_DEFR_STATE	122
SNVT_TIME_MIN	123
SNVT_TIME_HOUR	124
SNVT_PH_F	126
SNVT_CHLR_STATUS	127
SNVT_TOD_EVENT	128
SNVT_VOLT_AC	138
SNVT_AMP_AC	139
SNVT_TURBIDITY_F	144
SNVT_ELEC_KWH_1	146
SNVT_TEMP_DIFF_P	147
SNVT_ENTHALPY	153
SNVT_ABS_HUMID	160
SNVT_FLOW_P	161
SNVT_STATE_64	165

Appendix E: Key Mapping and Enumerations for Unit Controllers

This section contains information necessary for installing unit controllers on a Tracer® SC+. For Object Data Points and Diagnostic Data Points on Symbio controllers, refer to the Integration guides for specific type of equipment. For example, *BACnet® Integration to IntelliPak® Rooftop Units with Symbio™ 800 Controls, Integration Guide* (ACC-SVP02*-EN)

Tracer UC400/Symbio™ 500 Controller Points

The following tables map Tracer SC+ user-display names to the most commonly used Tracer UC400/Symbio™ 500 points for the following applications:

- Constant-volume air-handling unit (CV AHU)
- Air-handling unit variable-air-volume (VAV AHU)
- 2-heat/2-cool (2H/2C)
- Fan-coil unit
- VAV box

Table 21. Tracer UC400/Symbio™ 500 unit controller points: CV AHU applications

UC400/Symbio™ 500 point name	UC400/Symbio ™ 500 point type	Description
Space Temperature Local	AI1	
Space Temperature Setpoint Local	AI2	Hardwired space temperature setpoint value
Discharge Air Temperature Local	AI	Hardwired discharge temperature sensor value
Mixed Air Temperature	AI	Hardwired mixed air temperature sensor value
Outdoor Air Temperature Local	AI	
Space Humidity Local	AI	
Cooling Valve	AO	Position of the cooling valve
Heating Valve	AO	Position of the heating valve
Outdoor Air Damper	AO	Position of the outdoor air damper
Discharge Air Temperature Setpoint Active	AV	Temperature value the control system will maintain for the air leaving the discharge of the equipment
Economizer Enable Temperature Setpoint BAS	AV	A BAS supplied temperature value that is compared with the outdoor air temperature to determine when the economizer system should be enabled
Economizer Minimum Position Setpoint BAS	AV	BAS supplied position value of the outdoor air damper when the minimum amount of outdoor air is required
Economizer Minimum Position Setpoint Active	AV	
Economizer Minimum Position Setpoint Default	AV	Unit controller supplied position value of the outdoor air damper when the minimum amount of outdoor air is required and no other control source is available
Occupied Bypass Time	AV	Amount of time a unit will remain in occupied mode after a tenant override event has occurred
Occupied Cooling Setpoint	AV	
Occupied Heating Setpoint	AV	
Occupied Offset	AV	Delta value applied to the space temperature setpoint to calculate the occupied cooling and heating setpoints
Outdoor Air Temperature Active	AV	Outdoor air temperature being used by the control system to make control decisions
Outdoor Air Temperature BAS	AV	BAS supplied outdoor air temperature

Table 21. Tracer UC400/Symbio™ 500 unit controller points: CV AHU applications (continued)

UC400/Symbio™ 500 point name	UC400/Symbio ™ 500 point type	Description
Space Humidity Setpoint Active	AV	
Space Humidity Setpoint BAS	AV	BAS supplied space air humidity value
Space Humidity Setpoint Default	AV	
Space Temp Setpoint Default	AV	
Space Temperature Active	AV	Space temperature value being used by the unit controller to make control decisions
Space Temperature BAS	AV	BAS supplied space temperature value
Space Temperature Setpoint Active	AV	Space temperature value being used by the unit controller to make control decisions
Space Temperature Setpoint BAS	AV	BAS supplied space temperature setpoint value
Standby Offset	AV	Delta value applied to the space temperature setpoint to calculate the standby cooling and heating setpoints
Unoccupied Cooling Setpoint	AV	The space temperature that a unit will maintain when in unoccupied cooling mode
Unoccupied Heating Setpoint	AV	The space temperature that a unit will maintain when in unoccupied heating mode
Mixed Air Low Limit Cutout	BI	Indicates if the mixed air temperature is below the low limit setpoint
Supply Fan Status	BI	The measured state of the supply fan
Supply Fan Start Stop	BO	Commanded state of the supply fan hardware output
Dehumidification Mode	BV	
Fan Failure Reset	BV	Reset for supply fan failure diagnostics
Heat Cool Mode Active	BV	
Night Heat Cool	BV	
Outdoor Air Temperature Failure	BV	
Space Temperature Failure	BV	
Start-up Delay Completed	BV	
Supply Fan Failure	BV	
Communication Status	MI	Indicates if the unit is communicating with a parent device on the BAS network
Enthalpy Mode	MV	
Heat Cool Mode Request	MV	The mode of operation the BAS is requesting for unit control
Heat Cool Mode Status	MV	The mode of operation the unit is currently in
Occupancy Request	MV	The mode of occupancy the BAS is requesting for unit control
Occupancy Status	MV	The mode of occupancy the unit is currently in

Table 22. Tracer UC400/Symbio™ 500 unit controller points: VAV AHU applications

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Space Temperature Local	AI1	
Space Temperature Setpoint Local	AI2	

Table 22. Tracer UC400/Symbio™ 500 unit controller points: VAV AHU applications (continued)

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Discharge Air Temperature Local	AI	Hardwired discharge temperature sensor value
Duct Static Pressure Local	AI	
Mixed Air Temperature	AI	Hardwired mixed air temperature sensor value
Outdoor Air Temperature Local	AI	
Cooling Valve	AO	Position of the cooling valve
Heating Valve	AO	Position of the heating valve
Outdoor Air Damper	AO	Position of the outdoor air damper
Supply Fan Speed	AO	The supply fan speed value sent by unit to the fan controller
Discharge Air Cooling Setpoint Active	AV	
Discharge Air Cooling Setpoint BAS	AV	BAS supplied discharge air temperature setpoint when the unit is in cooling mode
Discharge Air Cooling Setpoint Default	AV	
Discharge Air Heating Setpoint Active	AV	
Discharge Air Heating Setpoint BAS	AV	BAS supplied discharge air temperature setpoint when the unit is in heating mode
Discharge Air Heating Setpoint Default	AV	
Discharge Air Temperature Setpoint Active	AV	Temperature value the control system will maintain for the air leaving the discharge of the equipment
Duct Static Pressure Active	AV	Static air pressure value in the supply duct being used by the control system to make control decisions
Duct Static Pressure BAS	AV	BAS supplied static air pressure value in the supply duct
Duct Static Pressure Setpoint Active	AV	Static pressure value the control system will maintain for the air in the supply duct
Duct Static Pressure Setpoint BAS	AV	BAS supplied static pressure value the control system will maintain for the air in the supply duct
Duct Static Pressure Setpoint Default	AV	
Economizer Enable Temperature Setpoint BAS	AV	A BAS supplied temperature value that is compared with the outdoor air temperature to determine when the economizer system should be enabled
Economizer Minimum Position Setpoint Active	AV	
Economizer Minimum Position Setpoint BAS	AV	BAS supplied position value of the outdoor air damper when the minimum amount of outdoor air is required
Economizer Minimum Position Setpoint Default	AV	
Occupied Bypass Time	AV	Amount of time a unit will remain in occupied mode after a tenant override event has occurred
Occupied Cooling Setpoint	AV	
Occupied Heating Setpoint	AV	
Occupied Offset	AV	Delta value applied to the space temperature setpoint to calculate the occupied cooling and heating setpoints
Outdoor Air Temperature Active	AV	Outdoor air temperature being used by the control system to make control decisions
Outdoor Air Temperature BAS	AV	BAS supplied outdoor air temperature
Mixed Air Low Limit Setpoint Default	AV	

Table 22. Tracer UC400/Symbio™ 500 unit controller points: VAV AHU applications (continued)

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Space Temp Setpoint Default	AV	
Space Temperature Active	AV	Space temperature value being used by the unit controller to make control decisions
Space Temperature BAS	AV	BAS supplied space temperature value
Space Temperature Setpoint Active	AV	Space temperature value being used by the unit controller to make control decisions
Space Temperature Setpoint BAS	AV	BAS supplied space temperature setpoint value
Standby Offset	AV	Delta value applied to the space temperature setpoint to calculate the standby cooling and heating setpoints
Unoccupied Cooling Setpoint	AV	The space temperature that a unit will maintain when in unoccupied cooling mode
Unoccupied Heating Setpoint	AV	The space temperature that a unit will maintain when in unoccupied heating mode
Mixed Air Low Limit Cutout	BI	Indicates if the mixed air temperature is below the low limit setpoint
Supply Fan Status	BI	The measured state of the supply fan
Supply Fan Start Stop	BO	Commanded state of the supply fan hardware output
Heat Cool Mode Active	BV	
Night Heat Cool	BV	
Outdoor Air Temperature Failure	BV	
Space Temperature Failure	BV	
Start-up Delay Completed	BV	
Supply Fan Failure	BV	
Supply Fan Failure Reset BAS	BV	
Communication Status	MI	Indicates if the unit is communicating with a parent device on the BAS network
Heat Cool Mode Request	MV	The mode of operation the BAS is requesting for unit control
Heat Cool Mode Status	MV	The mode of operation the unit is currently in
Occupancy Request	MV	The mode of occupancy the BAS is requesting for unit control
Occupancy Status	MV	The mode of occupancy the unit is currently in

Table 23. Tracer UC400/Symbio™ 500 unit controller points: 2H/2C applications

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Space Temperature Local	AI1	
Space Temperature Setpoint Local	AI2	Hardwired space temperature setpoint value
Discharge Air Temperature Active	AI	The temperature of the air at the discharge opening of the equipment
Space CO2 Concentration Local	AI	
Supply Fan Speed	AO	The supply fan speed value sent by unit to the fan controller
Auxiliary Heat Control Request	AV	Maximum amount of reheat available to control space temperature
Cabinet Style	AV	Describes the cabinet style of the unit

Table 23. Tracer UC400/Symbio™ 500 unit controller points: 2H/2C applications (continued)

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Cool Type	AV	Describes the cooling type installed in the unit
Cooling Capacity Status	AV	Indicates the unit cooling capacity being utilized
Cooling Enable BAS	AV	Allows a BAS to control the unit cooling system
Cooling Setpoint High Limit	AV	Maximum value allowed for the Cooling Temperature Setpoint
Cooling Setpoint Low Limit	AV	Minimum value allowed for the Cooling Temperature Setpoint
Economizer Minimum Position Setpoint BAS	AV	BAS supplied economizer position minimum setpoint value
Economizer Minimum Position Setpoint Local	AV	Indicates the local economizer minimum position setpoint
Economizer System Status	AV	Indicates the operating state of the waterside economizer system
Economizer Temperature Enable Setpoint	AV	Temperature setpoint below which economizer mode can be used
Filter Runtime Hours	AV	Indicates the number of hours air has flowed through the filter
Filter Runtime Hours Setpoint	AV	The setpoint value used by the filter run hours calculation
Heat Primary Capacity Status	AV	Indicates the unit primary heating capacity being utilized
Heating Setpoint High Limit	AV	Maximum value allowed for the Heating Temperature Setpoint
Heating Setpoint Low Limit	AV	Minimum value allowed for the Heating Temperature Setpoint
Occupied Bypass Time	AV	Time an override of the occupancy mode will stay in effect
Occupied Offset	AV	Offset value used to calculate setpoints in occupied mode
Outdoor Air Damper Position Status	AV	Indicates the unit outside air damper position
Outdoor Air Temperature BAS	AV	BAS supplied outdoor air temperature sensor value
Preheat Type	AV	Describes the heating type installed in the unit
Reheat Type	AV	Describes the reheat type installed in the unit
Space CO2 Concentration Active	AV	Space CO2 concentration value being used for unit control
Space CO2 Concentration BAS	AV	BAS supplied space CO2 sensor value
Space Humidity Active	AV	The space humidity currently used for unit control
Space Humidity BAS	AV	BAS supplied space humidity sensor value
Space Temp Setpoint Default	AV	
Space Temperature Active	AV	The space temperature currently used for unit control
Space Temperature BAS	AV	BAS supplied space air temperature sensor value
Space Temperature Setpoint Active	AV	Space air temperature setpoint value being used for unit control
Space Temperature Setpoint BAS	AV	Base value to calculate setpoints in occupied and standby modes
Standby Offset	AV	Offset value used to calculate setpoints in standby mode
Supply Fan Type	AV	Describes the supply fan type installed in the unit
Unit Energy Demand	AV	Indicates the current heat/cool energy demand of the unit
Unoccupied Cooling Setpoint	AV	Cooling temperature setpoint used for control in unoccupied mode
Unoccupied Heating Setpoint	AV	Heating temperature setpoint used for control in unoccupied mode
Occupancy Input	BI	
Cool Output 1	BO	Indicates the commanded state of cooling output 1

Table 23. Tracer UC400/Symbio™ 500 unit controller points: 2H/2C applications (continued)

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Cool Output 2	BO	Indicates the commanded state of cooling output 2
Heat Output 1	BO	Indicates the commanded state of heating output 1
Heat Output 2	BO	Indicates the commanded state of heating output 2
Cooling Fan Control Method	BV	Fan control method when the unit is in cooling mode
Cooling Fan Default Status	BV	The fan speed when the unit is in cooling mode
Diagnostic Reset Command BAS	BV	Command used to reset latching diagnostics
Filter Timer Reset	BV	Command the unit to reset the accumulated filter run hours
Heating Fan Control Method	BV	Fan control method when the unit is in heating mode
Heating Fan Default Status	BV	The fan speed when the unit is in heating mode
Communication Status	MI	Indicates if the unit is communicating with a parent device
Timed Override Status	MI	Timed override request or cancel from zone sensor
Economizer Airside Enable BAS	MV	Command the state of the airside economizer system
Economizer Type	MV	General description of the equipment economizer system
Emergency Override BAS	MV	Command the unit into an emergency mode of operation
Exhaust Return Fan Type	MV	Describes the exhaust or return fan type installed in the unit
Heat Cool Mode Request	MV	Command the unit to a specific application mode
Heat Cool Mode Status	MV	Indicates the current application mode of the equipment
Occupancy Request	MV	Command the unit to a specific occupancy mode
Occupancy Status	MV	Indicates the current occupancy mode of the unit
Outdoor Damper Status	MV	Indicates the state of the outdoor air damper
Unit Type	MV	General description of the equipment type classification

Table 24. Tracer UC400/Symbio™ 500 unit controller points: Fan-coil unit applications

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Space Temperature Local	AI1	
Space Temperature Setpoint Local	AI2	Setpoint value from space mounted sensor device
Discharge Air Temperature	AI	Hardwired discharge temperature sensor value
Entering Water Temperature	AI	The temperature of water entering the unit
Space CO2 Concentration Local	AI	
Supply Fan Speed	AO	The supply fan speed value sent by unit to the fan controller
Water Valve Position	AO	
Auxiliary Heat Control Request	AV	Maximum amount of reheat available to control space temperature
Cabinet Style	AV	Describes the cabinet style of the unit
Cool Type	AV	Describes the cooling type installed in the unit
Cooling Capacity Status	AV	Indicates the unit cooling capacity being utilized
Cooling Enable BAS	AV	Allows a BAS to control the unit cooling system

Table 24. Tracer UC400/Symbio™ 500 unit controller points: Fan-coil unit applications (continued)

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Cooling Setpoint High Limit	AV	Maximum value allowed for the Cooling Temperature Setpoint
Cooling Setpoint Low Limit	AV	Minimum value allowed for the Cooling Temperature Setpoint
Economizer Airside Enable BAS	AV	Command the state of the airside economizer system
Economizer Minimum Position Setpoint BAS	AV	BAS supplied economizer position minimum setpoint value
Economizer Minimum Position Setpoint Local	AV	Indicates the local economizer minimum position setpoint
Economizer Temperature Enable Setpoint	AV	Temperature setpoint below which economizer mode can be used
Exhaust Enable Position	AV	The minimum position of outdoor air damper to start exhaust fan
Exhaust Return Fan Type	AV	Describes the exhaust or return fan type installed in the unit
Fan Speed Command	AV	Allows a BAS to override the local unit fan speed
Filter Runtime Hours	AV	Indicates the number of hours air has flowed through the filter
Filter Runtime Hours Setpoint	AV	The setpoint value used by the filter run hours calculation
Heat Output Secondary Status	AV	Indicates the amount of reheat provided by the unit
Heating Setpoint High Limit	AV	Maximum value allowed for the Heating Temperature Setpoint
Heating Setpoint Low Limit	AV	Minimum value allowed for the Heating Temperature Setpoint
Occupied Bypass Time	AV	Time an override of the occupancy mode will stay in effect
Occupied Offset	AV	Offset value used to calculate setpoints in occupied mode
Outdoor Air Damper Position	AV	Indicates the unit outside air damper position
Outdoor Air Temperature Active	AV	The outdoor air temperature currently used for unit control
Outdoor Air Temperature BAS	AV	BAS supplied outdoor air temperature sensor value
Outdoor Damper Status	AV	Indicates the state of the outdoor air damper
Preheat Type	AV	Describes the heating type installed in the unit
Primary Heat Output	AV	Indicates the unit primary heating capacity being utilized
Reheat Capacity	AV	Indicates the unit reheat capacity being utilized
Reheat Type	AV	Describes the reheat type installed in the unit
Source Temperature BAS	AV	Temperature of the air or water entering the unit
Space CO2 Concentration Active	AV	Space CO2 concentration value being used for unit control
Space Humidity Active	AV	The space humidity currently used for unit control
Space Humidity BAS	AV	BAS supplied space humidity sensor value
Space Temp Setpoint Default	AV	
Space Temperature Active	AV	The space temperature currently used for unit control
Space Temperature BAS	AV	BAS supplied space air temperature sensor value
Space Temperature Setpoint Active	AV	Space air temperature setpoint value being used for unit control
Space Temperature Setpoint BAS	AV	Base value to calculate setpoints in occupied and standby modes
Standby Offset	AV	Offset value used to calculate setpoints in standby mode
Supply Fan Type	AV	Describes the supply fan type installed in the unit
Unit Energy Demand	AV	Indicates the current heat/cool energy demand of the unit

Table 24. Tracer UC400/Symbio™ 500 unit controller points: Fan-coil unit applications (continued)

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Unoccupied Cooling Setpoint	AV	Cooling temperature setpoint used for control in unoccupied mode
Unoccupied Heating Setpoint	AV	Heating temperature setpoint used for control in unoccupied mode
Occupancy Input	BI	
ECM Fan Output	BO	
Fan Output	BO	
Heat Output 1	BO	
Heat Output 2	BO	
Heat Output 3	BO	
Cooling Fan Default Status	BV	The fan speed when the unit is in cooling mode
Filter Timer Reset	BV	Command the unit to reset the accumulated filter run hours
Heating Fan Default Status	BV	The fan speed when the unit is in heating mode
Reset Diagnostic	BV	Command used to reset latching diagnostics
Supply Fan Switch Local Control	BV	Controls when the unit fan speed switch is used for control
Communication Status	MI	Indicates if the unit is communicating with a parent device
Timed Override Status	MI	Timed override request or cancel from zone sensor
Baseboard Heat Status	MV	Indicates the state of base board heating in the space
Defrost System Status	MV	Indicates the state of the unit defrost function
Dehumidification System Status	MV	Indicates the state of the unit dehumidification function
Economizer Type	MV	General description of the equipment economizer system
Emergency Override BAS	MV	Command the unit into an emergency mode of operation
Heat Cool Mode Request	MV	Command the unit to a specific application mode
Heat Cool Mode Status	MV	Indicates the current application mode of the equipment
Occupancy Request	MV	Command the unit to a specific occupancy mode
Occupancy Status	MV	Indicates the current occupancy mode of the unit
Unit Type	MV	General description of the equipment type classification
Water Valve Override	MV	Allows a user to command the position of the water valve

Table 25. Tracer UC400/Symbio™ 500 unit controller points: VAV box applications

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Space Temperature Local	AI1	
Space Temperature Setpoint Local	AI2	Setpoint value from space mounted sensor device
Space CO2 Concentration Local	AI	
Discharge Air Temperature	AI	Temperature of the air leaving the unit
Pressure 1	AI	
Supply Air Temperature Local	AI	
Air Valve Position Status	AO	The current position of the air valve

Table 25. Tracer UC400/Symbio™ 500 unit controller points: VAV box applications (continued)

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Supply Fan Speed	AO	The supply fan speed value sent by unit to the fan controller
Water Valve Position	AO	
Air Flow Gain	AV	
Air Flow Measurement Offset	AV	
Air Flow Minimum Setpoint Active	AV	The minimum air flow that will be provided to the space
Air Flow Nominal Status	AV	Factory assigned air flow value based on unit size
Air Flow Override Percent	AV	Percent of air flow based on Air Flow Maximum Setpoint
Air Flow Setpoint Active	AV	Amount of air that the unit will to deliver to the space
Air Flow Setpoint Maximum	AV	Maximum air that may be provided when the supply air is cold
Air Flow Setpoint Maximum Heat	AV	Maximum air that may be provided when the supply air is hot
Air Flow Setpoint Minimum	AV	Minimum air that must be provided when the supply air is cold
Air Flow Setpoint Minimum Heat	AV	Minimum air that must be provided when the supply air is hot
Air Flow Setpoint Minimum Local Heat	AV	Minimum air flow setpoint when reheat is active
Air Flow Setpoint Minimum Standby	AV	Minimum air supplied when supply air is cold and unit in standby
Air Flow Setpoint Minimum Standby Heat	AV	Minimum air supplied when supply air is hot and unit in standby
Auxiliary Heat Control Request	AV	Maximum amount of reheat available to control space temperature
Cabinet Style	AV	Describes the cabinet style of the unit
Cool Type	AV	Describes the cooling type installed in the unit
Cooling Setpoint High Limit	AV	Maximum value allowed for the Cooling Temperature Setpoint
Cooling Setpoint Low Limit	AV	Minimum value allowed for the Cooling Temperature Setpoint
Discharge Air Flow	AV	The volume of air provided to the space
Heat Output Secondary Status	AV	Indicates the amount of reheat provided by the unit
Heating Setpoint High Limit	AV	Maximum value allowed for the Heating Temperature Setpoint
Heating Setpoint Low Limit	AV	Minimum value allowed for the Heating Temperature Setpoint
Occupied Bypass Time	AV	Time an override of the occupancy mode will stay in effect
Occupied Offset	AV	Offset value used to calculate setpoints in occupied mode
Preheat Type	AV	Describes the heating type installed in the unit.
Reheat Type	AV	Describes the reheat type installed in the unit
Space CO2 Concentration Active	AV	Space CO2 concentration value being used for unit control
Space CO2 Concentration BAS	AV	BAS supplied space CO2 sensor value
Space CO2 Limit	AV	CO2 concentration limit where CO2 demand ventilation ends
Space CO2 Low Limit	AV	CO2 concentration limit where CO2 demand ventilation begins
Space Temp Setpoint Default	AV	
Space Temperature Active	AV	The space temperature currently used for unit control
Space Temperature BAS	AV	BAS supplied space air temperature sensor value
Space Temperature Setpoint Active	AV	Space air temperature setpoint value being used for unit control

Table 25. Tracer UC400/Symbio™ 500 unit controller points: VAV box applications (continued)

UC400/Symbio™ 500 point name	UC400/Symbio™ 500 point type	Description
Space Temperature Setpoint BAS	AV	Base value to calculate setpoints in occupied and standby modes
Standby Offset	AV	Offset value used to calculate setpoints in standby mode
Supply Air Temperature Active	AV	
Supply Air Temperature BAS	AV	Temperature of the air or water entering the unit
Supply Fan Type	AV	Describes the supply fan type installed in the unit
Unoccupied Cooling Setpoint	AV	Cooling temperature setpoint used for control in unoccupied mode
Unoccupied Heating Setpoint	AV	Heating temperature setpoint used for control in unoccupied mode
Ventilation Ratio	AV	The ratio of the ventilation setpoint to actual air flow
Ventilation Ratio Limit BAS	AV	The maximum ventilation ratio used for air flow control
Ventilation Setpoint Active	AV	The ventilation setpoint calculated by the unit
Ventilation Setpoint BAS	AV	The ventilation or air flow setpoint provided by the BAS
Ventilation Setpoint Local	AV	The ventilation or air flow setpoint for stand alone operation
Ventilation Standby Setpoint	AV	The ventilation or air flow setpoint for stand by operation
Occupancy Input	BI	
ECM Fan Output	BO	
Fan Output	BO	
Heat Output 1	BO	
Heat Output 2	BO	
Heat Output 3	BO	
Diagnostic: Air Flow Override Local	BV	Binary point for alarming
Diagnostic: Flow Sensor Calibration Failure	BV	Binary point for alarming
Diagnostic: Flow Sensor Failure	BV	Binary point for alarming
Diagnostic: Low Primary Air Flow	BV	Binary point for alarming
Diagnostic: High Air Flow	BV	Binary point for alarming.
Communication Status	MI	Indicates if the unit is communicating with a parent device
Timed Override Status	MI	Timed override request or cancel from zone sensor
Air Flow Minimum Setpoint Source	MV	The application providing the air flow minimum setpoint value
Air Flow Override	MV	Allows a user to override the air valve to a desired flow
Emergency Override BAS	MV	Command the unit into an emergency mode of operation
Heat Cool Mode Request	MV	Command the unit to a specific application mode
Heat Cool Mode Status	MV	Indicates the current application mode of the equipment
Occupancy Request	MV	Command the unit to a specific occupancy mode
Occupancy Status	MV	Indicates the current occupancy mode of the unit
Unit Type	MV	General description of the equipment type classification
Water Valve Override	MV	Allows a user to command the position of the water valve

Tracer MP501 Unit Controller Points

The following table provides network variable information for an MP501 and serves as a guide for Tracer SC+ key mapping. Determine the configuration used in the MP501 and map the appropriate network variables.

Table 26. Network variable information and key mapping guide for the Tracer MP501 multi-purpose controller

MP501 configured for:					NV Name	SNVT Type	NV Index	Tracer SC Key	Point Type Created in Tracer SC
Tempera-ture	Pressure	Flow	Percent	PPM					
*	*	*	*	*	nvoStage1	SNVT_switch	27	Generic Stage 1 Status	BI
*	*	*	*	*	nvoStage2	SNVT_switch	28	Generic Stage 1 Status	BI
*	*	*	*	*	nvoOutputPer-cent	SNVT_lev_ percent	29	Generic Output Percent Status	AI
X	X	X	X	X	nvoRelayState	SNVT_switch	30	Generic Relay Status	BI
X	X	X	X	X	nvoBI1State	SNVT_switch	31	Generic Binary Input Status	BI
X	X	X	X	X	nviLoopEnable	SNVT_switch	32	Generic Loop Enable BAS	BO
X	X	X	X	X	nviCmdOverr-ide	SNVT_lev_ percent	33	Generic Output Override BAS	AO
X	X	X	X	X	nviRelayOverr-ide	SNVT_switch	34	Generic Relay Override BAS	BO
			X		nviSetptPer-cent	SNVT_lev_ percent	35	Generic Percent Setpoint BAS	AO
		X			nviSetptFlow	SNVT_flow	36	Generic Flow Setpoint BAS	AO
	X				nviSetpoint-Pressure	SNVT_press_p	37	Generic Pressure Setpoint BAS	AO
X					nviSetptTemp	SNVT_temp_p	38	Generic Temperature Setpoint BAS	AO
				X	nviSetptPPM	SNVT_ppm	39	Generic PPM Setpoint BAS	AO
			X		nvoInputPer-cent	SNVT_lev_ percent	40	Generic Input Percent Status	AI
		X			nvoInputFlow	SNVT_flow	41	Generic Input Flow Status	AI
	X				nvoInputPres-sure	SNVT_press_p	42	Generic Input Pressure Status	AI
X					nvoInputTemp	SNVT_temp_p	43	Generic Input Temperature Status	AI
				X	nvoInputPPM	SNVT_ppm	44	Generic Input PPM Status	AI
			X		nviInputPercent	SNVT_lev_ percent	45	Generic Percent BAS	AO
		X			nviInputFlow	SNVT_flow	46	Generic Flow BAS	AO
	X				nviInputPres-sure	SNVT_press_p	47	Generic Pressure BAS	AO
X					nviInputTemp	SNVT_temp_p	48	Generic Temperature BAS	AO
				X	nviInputPPM	SNVT_ppm	49	Generic PPM BAS	AO

Note: *Available based on MP501 output configuration.*

Tracer MP503 Unit Controller Points

The following table provides network variable information for an MP503 and serves as a guide for Tracer SC+ key mapping.

Table 27. Network variable information and key mapping guide for the Tracer MP503 input/output module

NV Name	SNVT Type	NV Index	Tracer SC Key	Point Type Created in Tracer SC
nviBOP1Request	UNVT_switch_binary	1	Binary Output Request 1	BO
nviBOP2Request	UNVT_switch_binary	2	Binary Output Request 2	BO
nviBOP3Request	UNVT_switch_binary	3	Binary Output Request 3	BO
nviBOP4Request	UNVT_switch_binary	4	Binary Output Request 4	BO
nviBOP1Override	UNVT_switch_binary	5	Binary Output Override 1	BO
nviBOP2Override	UNVT_switch_binary	6	Binary Output Override 2	BO
nviBOP3Override	UNVT_switch_binary	7	Binary Output Override 3	BO
nviBOP4Override	UNVT_switch_binary	8	Binary Output Override 4	BO
nvoTemperature1	SNVT_temp_p	14	Temperature 1	AI
nvoTemperature2	SNVT_temp_p	15	Temperature 2	AI
nvoTemperature3	SNVT_temp_p	16	Temperature 3	AI
nvoTemperature4	SNVT_temp_p	17	Temperature 4	AI
nvoBIP1Status	UNVT_switch_binary	18	Binary Input Status 1	BI
nvoBIP2Status	UNVT_switch_binary	19	Binary Input Status 2	BI
nvoBIP3Status	UNVT_switch_binary	20	Binary Input Status 3	BI
nvoBIP4Status	UNVT_switch_binary	21	Binary Input Status 4	BI
nvoCurrent1	SNVT_amp_mil	22	Current 1	AI
nvoCurrent2	SNVT_amp_mil	23	Current 2	AI
nvoCurrent3	SNVT_amp_mil	24	Current 3	AI
nvoCurrent4	SNVT_amp_mil	25	Current 4	AI
nvoVolts1	SNVT_volt	26	Voltage 1	AI
nvoVolts2	SNVT_volt	27	Voltage 2	AI
nvoVolts3	SNVT_volt	28	Voltage 3	AI
nvoVolts4	SNVT_volt	29	Voltage 4	AI
nvoBOP1Status	UNVT_switch_binary	30	Binary Output Status 1	BI
nvoBOP2Status	UNVT_switch_binary	31	Binary Output Status 2	BI
nvoBOP3Status	UNVT_switch_binary	32	Binary Output Status 3	BI
nvoBOP4Status	UNVT_switch_binary	33	Binary Output Status 4	BI

Tracer SC+ Enumerations

Table 28. Tracer SC+ enumerations

Tracer SC Point Name	Enumerations and State Text
Active Base Loading Setpoint Source	1 = Front Panel 2 = External 3 = Ice 4 = BAS
Active Chilled Water Setpoint Source	1 = Front Panel 2 = External 3 = Ice 4 = BAS
Active Current Limit Setpoint Source	1 = Front Panel 2 = External 3 = Ice 4 = BAS
Active Hot Water Setpoint Source	1 = Front Panel 2 = External 3 = Ice 4 = BAS
Add Input	false = Inactive true = Active
Add Request Exist	false = Inactive true = Active
AHU Mode Request	1 = Occupied 2 = Unoccupied 3 = Optimal Start 4 = Humidity Pulldown 5 = Optimal Stop 6 = Unoccupied Heating/Cooling 7 = Night Purge 8 = Unoccupied Humidify 9 = Unoccupied Dehumidify 10 = Unknown Operating Mod
Air Flow Minimum Setpoint Source	1 = None (no min enforced) 2 = Cooling Minimum 3 = Heating Minimum 4 = Local Heating Minimum 5 = Standby Cooling Minimum 6 = Standby Heating Minimum 7 = Derived from Ventilation Requirements 8 = Pressure Dependent Mode Min
Air Flow Override	1 = Air Valves Auto Control 2 = Not Used 3 = Not Used 4 = Not Used 5 = Air Valves Full Open 6 = Air Valves Full Closed 7 = Air Valves Minimum Setpoint 8 = Air Valves Maximum Setpoint
Air Valve Position Control	false = pressure independent control true = position control/pressure dependent
Alarm Relay Output Status	false = De-energized true = Energized
All Chillers Are Unavailable	false = None true = Failure
All Chillers Have Failed	false = None true = Failure
Ambient Temperature Lockout Active	false = Disabled true = Enabled
Ambient Temperature Lockout Function	false = Disabled true = Enabled

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Auto Calibration Enabled	false = Disabled true = Enabled
Auto Commissioning Active	false = Disabled true = Enabled
Auto Commissioning Command	false = Cancel true = Start
Auto Commissioning State	1 = Waiting 2 = Calibrating 3 = Flow Test 4 = Fan Test 5 = Reheat Test 6 = Finished 7 = Canceled
Available	false = Unavailable true = Available
Base Loading Active	false = Inactive true = Active
Base Loading Auto/On Request BAS	false = Auto true = On
Baseboard Heat Status	1 = Off 2 = On 3 = Not Present
Binary Member Control Function	false = Disabled true = Enabled
Boiler Pump 1 Fault Status	false = Normal true = In Alarm
Boiler Pump 1 Flow Status	false = No Flow true = Flow
Boiler Pump 1 Reset BAS	false = Normal true = Reset
Boiler Pump 1 Start Stop Output	false = Off true = On
Boiler Pump 1 VFD Fault Status	false = Normal true = In Alarm
Boiler Pump 2 Fault Status	false = Normal true = In Alarm
Boiler Pump 2 Flow Status	false = No Flow true = Flow
Boiler Pump 2 Reset BAS	false = Normal true = Reset
Boiler Pump 2 Start Stop Output	false = Off true = On
Boiler Pump 2 VFD Fault Status	false = Normal true = In Alarm
Boiler Pump 3 Fault Status	false = Normal true = In Alarm
Boiler Pump 3 Flow Status	false = No Flow true = Flow
Boiler Pump 3 Reset BAS	false = Normal true = Reset
Boiler Pump 3 Start Stop Output	false = Off true = On
Boiler Pump 3 VFD Fault Status	false = Normal true = In Alarm

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Bypass Chilled Water System Flow Status	false = No Flow true = Flow
Calibration Active	false = Inactive true = Active
Capacity Limited	false = Not Limited true = Limited
Chilled Water Flow	false = No Flow true = Flow
Chilled Water Pump 1 Fault Status	false = Normal true = In Alarm
Chilled Water Pump 1 Flow Status	false = No Flow true = Flow
Chilled Water Pump 1 Reset BAS	false = Normal true = Reset
Chilled Water Pump 1 Start Stop Output	false = Off true = On
Chilled Water Pump 1 VFD Fault Status	false = Normal true = In Alarm
Chilled Water Pump 2 Fault Status	false = Normal true = In Alarm
Chilled Water Pump 2 Flow Status	false = No Flow true = Flow
Chilled Water Pump 2 Reset BAS	false = Normal true = Reset
Chilled Water Pump 2 Start Stop Output	false = Off true = On
Chilled Water Pump 2 VFD Fault Status	false = Normal true = In Alarm
Chilled Water Pump 3 Fault Status	false = Normal true = In Alarm
Chilled Water Pump 3 Flow Status	false = No Flow true = Flow
Chilled Water Pump 3 Reset BAS	false = Normal true = Reset
Chilled Water Pump 3 Start Stop Output	false = Off true = On
Chilled Water Pump 3 VFD Fault Status	false = Normal true = In Alarm
Chilled Water Pump 4 Fault Status	false = Normal true = In Alarm
Chilled Water Pump 4 Flow Status	false = No Flow true = Flow
Chilled Water Pump 4 Reset BAS	false = Normal true = Reset
Chilled Water Pump 4 Start Stop Output	false = Off true = On
Chilled Water Pump 4 VFD Fault Status	false = Normal true = In Alarm
Chilled Water Valve Status	false = Closed true = Open
Chiller 1 Chilled Water Flow Status	false = No Flow true = Flow

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Chiller 1 Pump Request BAS	false = Off true = On
Chiller 1 Pump Request Local	false = Off true = On
Chiller 2 Chilled Water Flow Status	false = No Flow true = Flow
Chiller 2 Pump Request BAS	false = Off true = On
Chiller 2 Pump Request Local	false = Off true = On
Chiller 3 Chilled Water Flow Status	false = No Flow true = Flow
Chiller 3 Pump Request BAS	false = Off true = On
Chiller 3 Pump Request Local	false = Off true = On
Chiller 4 Chilled Water Flow Status	false = No Flow true = Flow
Chiller 4 Pump Request BAS	false = Off true = On
Chiller 4 Pump Request Local	false = Off true = On
Chiller Auto Stop Command	false = Stop true = Auto
Chiller Auto Stop Command BAS	false = Stop true = Auto
Chiller Auto Stop Command Multistate BAS	1 = Stop 2 = Auto
Chiller Available	false = Unavailable true = Available
Chiller Failure	1 = No Failures 2 = Failed To Command Chiller Pump On 3 = Failed To Confirm Chilled Water Flow 4 = Failed To Command Chiller On 5 = Failed To Confirm Chiller Running. Chiller Plant Reset Required 6 = Failed To Command Chiller Off 7 = Failed To Confirm Chiller Off 8 = Failed To Command Chiller Pump Off 9 = Failed To Confirm Chiller Chilled Water Flow Off 10 = Chiller Manual Reset Active 11 = Optional Chiller Failure Input Active 12 = Communication Lost
Chiller Failure Exists	false = None true = Failure
Chiller Failure Reset	false = None true = Failure
Chiller Lockout	false = Normal true = Lockout
Chiller Manual Reset Active	false = None true = Failure
Chiller Mode Command BAS	1 = Cooling 2 = Heating 3 = Ice Building 4 = Free Cool
Chiller Plant Enable	false = Disabled true = Enabled

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Chiller Plant Pump Request	false = Disabled true = Enabled
Chiller Pump 1 Status	false = Off true = Running
Chiller Pump 2 Status	false = Off true = Running
Chiller Running State	false = Off true = On
Chiller Setpoint Source	1 = BAS 2 = External 3 = Front Panel
Chillers Running Out of Sequence	false = Inactive true = Active
Circuit 1 Enable	false = Disabled true = Enabled
Circuit 2 Enable	false = Disabled true = Enabled
Communication Lost	false = None true = Failure
Communication Status	1 = Not Communicating 2 = No Logical Device Connected 3 = Communicating 4 = Start-up
Compressor 1A Status	false = Off true = Running
Compressor 1A Status	1 = Off 2 = Running 3 = Alarm ***Note:*** *This enumeration is only valid for UC800 controllers.*
Compressor 1B Status	false = Off true = Running
Compressor 1B Status	1 = Off 2 = Running 3 = Alarm ***Note:*** *This enumeration is only valid for UC800 controllers.*
Compressor 1C Status	false = Off true = Running
Compressor 1C Status	1 = Off 2 = Running 3 = Alarm ***Note:*** *This enumeration is only valid for UC800 controllers.*
Compressor 2A Status	false = Off true = Running
Compressor 2A Status	1 = Off 2 = Running 3 = Alarm ***Note:*** *This enumeration is only valid for UC800 controllers.*
Compressor 2B Status	false = Off true = Running
Compressor 2B Status	1 = Off 2 = Running 3 = Alarm ***Note:*** *This enumeration is only valid for UC800 controllers.*

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Compressor 2C Status	false = Off true = Running
Compressor 2C Status	1 = Off 2 = Running 3 = Alarm ***Note:*** *This enumeration is only valid for UC800 controllers.*
Compressor Lead Lag Enable Command	false = Disable true = Enable
Compressor Lockout Status	false = Normal true = Locked out
Condenser Fan 1 Circuit 1 Status	false = Off true = Running
Condenser Fan 1 Circuit 2 Status	false = Off true = Running
Condenser Fan 2 Circuit 1 Status	false = Off true = Running
Condenser Fan 2 Circuit 2 Status	false = Off true = Running
Condenser Fan 3 Circuit 1 Status	false = Off true = Running
Condenser Fan 3 Circuit 2 Status	false = Off true = Running
Condenser Fan A Status	false = Off true = Running
Condenser Fan B Status	false = Off true = Running
Condenser Fan C Status	false = Off true = Running
Condenser Fan Circuit 1 Status	false = Off true = Running
Condenser Fan Circuit 2 Status	false = Off true = Running
Condenser Fan D Status	false = Off true = Running
Condenser Fan E Status	false = Off true = Running
Condenser Fan F Status	false = Off true = Running
Condenser Fan G Status	false = Off true = Running
Condenser Fan H Status	false = Off true = Running
Condenser Pump 1 Fault Status	false = Normal true = In Alarm
Condenser Pump 1 Flow Status	false = No Flow true = Flow
Condenser Pump 1 Reset BAS	false = Normal true = Reset
Condenser Pump 1 Start Stop Output	false = Off true = On

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Condenser Pump 1 VFD Fault Status	false = Normal true = In Alarm
Condenser Pump 2 Fault Status	false = Normal true = In Alarm
Condenser Pump 2 Flow Status	false = Normal true = In Alarm
Condenser Pump 2 Reset BAS	false = Normal true = Reset
Condenser Pump 2 Start Stop Output	false = Off true = On
Condenser Pump 2 VFD Fault Status	false = Normal true = In Alarm
Condenser Pump 3 Fault Status	false = Normal true = In Alarm
Condenser Pump 3 Flow Status	false = No Flow true = Flow
Condenser Pump 3 Reset BAS	false = Normal true = Reset
Condenser Pump 3 Start Stop Output	false = Off true = On
Condenser Pump 3 VFD Fault Status	false = Normal true = In Alarm
Condenser Pump 4 Fault Status	false = Normal true = In Alarm
Condenser Pump 4 Flow Status	false = No Flow true = Flow
Condenser Pump 4 Reset BAS	false = Normal true = Reset
Condenser Pump 4 Start Stop Output	false = Off true = On
Condenser Pump 4 VFD Fault Status	false = Normal true = In Alarm
Condenser Type	1 = None 2 = Air Cooled Condenser 3 = Water Cooled Condenser 4 = Evaporative Condenser
Condenser Water Flow BAS	1 = Flow 2 = No Flow 3 = Auto
Condenser Water Flow Status	false = No Flow true = Flow
Condenser Water Pump Request	false = Off true = On
Condenser Water Pump Status	false = Off true = On
Cool Output 1	1 = Off 2 = On 3 = Not Present
Cool Output 1 Status	
Cool Output 2	1 = Off 2 = On 3 = Not Present

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Cool Output 2 Status	false = Off true = On
Cool Output 3	1 = Off 2 = On 3 = Not Present
Cool Output 4	1 = Off 2 = On 3 = Not Present
Cool Output 5	1 = Off 2 = On 3 = Not Present
Cool Output 6	1 = Off 2 = On 3 = Not Present
Cool Output 7	1 = Off 2 = On 3 = Not Present
Cool Output 8	1 = Off 2 = On 3 = Not Present
Cooling Fan Default Status	1 = No Default 2 = Off 3 = Low 4 = Undefined 5 = Medium 6 = Not Used 7 = Not Used 8 = Not Used 9 = High 10 = Not Used 11 = Not Used 12 = Not Used 13 = Not Used 14 = Not Used 15 = Not Used 16 = Not Used 17 = Auto
Cooling Fan Operation Default	false = Cycling true = Continuous
Cooling Reset Type Status	1 = None 2 = Outdoor Air 3 = Zone 4 = Return Air
Cooling Type	1 = Water Cooled 2 = Air Cooled
Current Operation	1 = Disabled 2 = Waiting To Add 3 = Waiting To Subtract 4 = Starting Chiller 5 = Shutting Off Chiller 6 = Start Interval Active 7 = No Changes Needed 8 = System Chilled Water Request Active 9 = In Second Step 10 = Second Step Shutting Off Chiller
Daytime Warmup Enable Command	false = Disable true = Enable
Dehumidification Command	false = Disable true = Enable
Dehumidification Reheat Control	false = Disable true = Enable

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Dehumidification Status	false = Off true = On
Dehumidification System Status	1 = Off 2 = On 3 = Not Present
Detailed Chiller Status	1 = Unit Is Running 2 = Stopped By Alarm 3 = Stopped By BMS 4 = Stopped By Clock 5 = Stopped By External Signal 6 = Stopped By Operator 7 = Oil Cycle Running
Diagnostic Alarm Present	false = Inactive true = Active
Diagnostic Condensate Overflow	false = Normal true = In Alarm
Diagnostic Present	false = Normal true = In Alarm
Diagnostic Present	false = Inactive true = Active ***Note:*** *This enumeration is only valid for the Area system point.*
Diagnostic Shutdown Present	false = Normal true = In Alarm
Dirty Filter Alarm	false = Normal true = In Alarm
Display Temperature Scale	false = °C true = °F
Drive Fault Status	false = Normal true = In Alarm
Drive Motor Status	false = Off true = On
Duct Static Optimization	1 = Active 2 = Disabled 3 = No VAV Data 4 = In Test 5 = Maximum Heat 6 = Air Handler Off 7 = Air Valve Closed 8 = Unknown Status
Duct Static Optimization Function	false = Inactive true = Active
ECM Fan Output Status	false = Off true = On
Economizer Airside Enable Command	1 = Disabled 2 = Enabled 3 = Auto
Economizer Decision Method	1 = Absolute Temperature 2 = Relative Temperature 3 = Absolute Enthalpy 4 = Comparative Enthalpy
Economizer Minimum Position Enable Command	false = Enable true = Disable
Economizer Status	false = Disabled true = Enabled
Economizer System Status	1 = Disabled 2 = Enabled 3 = Not Present

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Economizer Type	1 = None 2 = 2 Position Ventilation 3 = Modulation Economizer 4 = 2 Position Ventilation/Waterside Economizer 5 = Waterside Economizer 6 = Airside/Waterside Economizer 7 = TRAQ Damper 8 = Airside Economizer and TRAQ Damper/Sensor 9 = Waterside Economizer and TRAQ Damper/Sensor 10 = Airside/Waterside Economizer and TRAQ Damper/Sensor
Economizer Waterside Enable Command	1 = Disabled 2 = Enabled 3 = Auto
Electric Heat Timer Reset	false = Normal true = Reset
Emergency Heat Status	false = Off true = On
Emergency Override Command	1 = Normal 2 = Pressurize 3 = Depressurize 4 = Purge 5 = Shutdown 6 = Fire
Emergency Stop	false = Off true = On
Energy Recovery Frost Avoidance Status	false = Inactive true = Active
Energy Recovery Preheat Status	false = Inactive true = Active
Energy Recovery Status	false = Inactive true = Active
Enforce Minimum Setpoint Differential	false = Disabled true = Enabled
Evaporator Water Flow Status	false = No Flow true = Flow
Evaporator Water Pump Request	false = Off true = On
Exhaust Fan Failure	false = Normal true = In Alarm
Exhaust Fan Failure Reset	false = Normal true = Reset
Exhaust Fan Output	1 = Off 2 = On 3 = Not Present
Exhaust Fan Proving Status	1 = Off 2 = On 3 = Not Present
Exhaust Fan Status	false = Off true = On
Fail Chiller On Alarm	false = None true = Failure
Failed To Command Chiller Off	false = None true = Failure
Failed To Command Chiller On	false = None true = Failure

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Failed To Command Chiller Pump Off	false = None true = Failure
Failed To Command Chiller Pump On	false = None true = Failure
Failed To Command System Pump Off	false = None true = Failure
Failed To Command System Pump On	false = None true = Failure
Failed To Confirm Chilled Water Flow Off	false = None true = Failure
Failed To Confirm Chilled Water Flow On	false = None true = Failure
Failed To Confirm Chiller Off	false = None true = Failure
Failed To Confirm Chiller Running	false = None true = Failure
Failed To Confirm System Chilled Water Flow Off	false = None true = Failure
Failed To Confirm System Chilled Water Flow On	false = None true = Failure
Failed To Read Bypass Flow	false = None true = Failure
Fan Mode BAS	1 = On 2 = Auto 3 = Smart
Fan Output Status	false = Off true = On
Fan Speeds Configured	1 = Zero 2 = One 3 = Two 4 = Three 5 = Variable Speed
Filter Timer Reset	false = Normal true = Reset
Final Filter Status	1 = Clean 2 = Dirty 3 = Not Present
Forced Rotation Enabled	false = Disabled true = Enabled
Front Panel Auto Stop Status	1 = Stop 2 = Auto
Front Panel Base Loading Command	false = Auto true = On
Front Panel Chiller Mode	1 = Cooling 2 = Heating 3 = Ice Building 4 = Free Cool
Frost Detection Input	1 = Off 2 = On 3 = Not Present
Generic Binary Input Status	false = Off true = On
Generic Binary Input Status 1	false = Off true = On

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Generic Binary Input Status 2	false = Off true = On
Generic Binary Input Status 3	false = Off true = On
Generic Binary Input Status 4	false = Off true = On
Generic Binary Output Override 1	false = Off true = On
Generic Binary Output Override 2	false = Off true = On
Generic Binary Output Override 3	false = Off true = On
Generic Binary Output Override 4	false = Off true = On
Generic Binary Output Request	false = Off true = On
Generic Binary Output Request 1	false = Off true = On
Generic Binary Output Request 2	false = Off true = On
Generic Binary Output Request 3	false = Off true = On
Generic Binary Output Request 4	false = Off true = On
Generic Binary Output Status	false = Off true = On
Generic Binary Output Status 1	false = Off true = On
Generic Binary Output Status 2	false = Off true = On
Generic Binary Output Status 3	false = Off true = On
Generic Binary Output Status 4	false = Off true = On
Generic Heat Cool Mode Request	1 = Auto 2 = Heat 3 = Morning Warm-up 4 = Cool 5 = Night Purge 6 = Pre Cool 7 = Off 8 = Test 9 = Emergency Heat 10 = Fan Only 11 = Free Cool 12 = Ice-Making 13 = Max Heat 14 = Economizer 15 = Dehumidify 16 = Calibrate

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Generic Heat Cool Mode Status	1 = Auto 2 = Heat 3 = Morning Warm-up 4 = Cool 5 = Night Purge 6 = Pre Cool 7 = Off 8 = Test 9 = Emergency Heat 10 = Fan Only 11 = Free Cool 12 = Ice-Making 13 = Max Heat 14 = Economizer 15 = Dehumidify 16 = Calibrate
Generic Loop Enable BAS	false = Off true = On
Generic Relay Override BAS	false = Off true = On
Generic Relay Status	false = Off true = On
Generic Stage 1 Status	false = Off true = On
Generic Stage 2 Status	false = Off true = On
Generic State Input 1	1 = Off 2 = On 3 = Not Present
Generic State Input 2	1 = Off 2 = On 3 = Not Present
Generic State Input 3	1 = Off 2 = On 3 = Not Present
Generic State Input 4	1 = Off 2 = On 3 = Not Present
Generic State Input 5	1 = Off 2 = On 3 = Not Present
Generic State Input 6	1 = Off 2 = On 3 = Not Present
Generic State Input 7	1 = Off 2 = On 3 = Not Present
Generic State Input 8	1 = Off 2 = On 3 = Not Present
Generic State Output 1	1 = Off 2 = On 3 = Not Present
Generic State Output 2	1 = Off 2 = On 3 = Not Present
Generic State Output 3	1 = Off 2 = On 3 = Not Present

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Generic State Output 4	1 = Off 2 = On 3 = Not Present
Generic State Output 5	1 = Off 2 = On 3 = Not Present
Generic State Output 6	1 = Off 2 = On 3 = Not Present
Generic State Output 7	1 = Off 2 = On 3 = Not Present
Generic State Output 8	1 = Off 2 = On 3 = Not Present
Head Relief Request	false = Off true = On
Heat Cool Mode Request	1 = Auto 2 = Heat 3 = Morning Warm-up 4 = Cool 5 = Night Purge 6 = Pre Cool 7 = Off 8 = Test 9 = Emergency Heat 10 = Fan Only 11 = Free Cool 12 = Ice-Making 13 = Max Heat 14 = Economizer 15 = Dehumidify 16 = Calibrate
Heat Cool Mode Status	1 = Auto 2 = Heat 3 = Morning Warm-up 4 = Cool 5 = Night Purge 6 = Pre Cool 7 = Off 8 = Test 9 = Emergency Heat 10 = Fan Only 11 = Free Cool 12 = Ice-Making 13 = Max Heat 14 = Economizer 15 = Dehumidify 16 = Calibrate
Heat Output 1	1 = Off 2 = On 3 = Not Present
Heat Output 1 Status	false = Off true = On
Heat Output 2	1 = Off 2 = On 3 = Not Present
Heat Output 2 Status	false = Off true = On
Heat Output 3	1 = Off 2 = On 3 = Not Present

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Heat Output 3 Status	false = Off true = On
Heat Output 4	1 = Off 2 = On 3 = Not Present
Heat Output 5	1 = Off 2 = On 3 = Not Present
Heat Output 6	1 = Off 2 = On 3 = Not Present
Heat Output 7	1 = Off 2 = On 3 = Not Present
Heat Output 8	1 = Off 2 = On 3 = Not Present
Heat/Cool Mode Request	1 = Auto 2 = Heat 3 = Morning Warm-up 4 = Cool 5 = Night Purge 6 = Pre Cool 7 = Off 8 = Test 9 = Emergency Heating 10 = Fan Only 11 = Economizing 12 = Ice Making 13 = Maximum Heat 14 = Economy 15 = Dehumidify 16 = Calibrate 17 = Emergency Cool 18 = Emergency Heat 19 = Humidify
Heat/Cool Mode Status	1 = Auto 2 = Heat 3 = Morning warm-up 4 = Cool 5 = Night Purge 6 = Pre Cool 7 = Off 8 = Test 9 = Emergency Heating 10 = Fan Only 11 = Free Cool 12 = Ice-Making 13 = Max Heat 14 = Economizer 15 = Dehumidify 16 = Calibrate
Heating Fan Default Status	false = Cycling true = Continuous
Heating Fan Operation Default	false = Normal true = In Alarm
High Static Alarm	false = Normal true = In Alarm
Hot Gas Bypass Active	false = Inactive true = Active
Hot Water Pump 1 Fault Status	false = Normal true = In Alarm

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Hot Water Pump 1 Flow Status	false = No Flow true = Flow
Hot Water Pump 1 Reset BAS	false = Normal true = Reset
Hot Water Pump 1 Start Stop Output	false = Off true = On
Hot Water Pump 1 VFD Fault Status	false = Normal true = In Alarm
Hot Water Pump 2 Fault Status	false = Normal true = In Alarm
Hot Water Pump 2 Flow Status	false = No Flow true = Flow
Hot Water Pump 2 Reset BAS	false = Normal true = Reset
Hot Water Pump 2 Start Stop Output	false = Off true = On
Hot Water Pump 2 VFD Fault Status	false = Normal true = In Alarm
Hot Water Pump 3 Fault Status	false = Normal true = In Alarm
Hot Water Pump 3 Flow Status	false = No Flow true = Flow
Hot Water Pump 3 Reset BAS	false = Normal true = Reset
Hot Water Pump 3 Start Stop Output	false = Off true = On
Hot Water Pump 3 VFD Fault Status	false = Normal true = In Alarm
Hot Water Valve Status	false = Closed true = Open
Humidification Command	false = Disable true = Auto
Humidity Pulldown Can Occur	false = Disabled true = Enabled
Humidity Pulldown Function	false = Disabled true = Enabled
In Defrost	false = Not in Defrost true = Defrost
Include In Calculation Function	false = Disabled true = Enabled
Include In Dehumidify Function	false = Disabled true = Enabled
Include In Economize Function	false = Disabled true = Enabled
Include In Humidify Function	false = Disabled true = Enabled
Is Equipment	false = No true = Yes

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Keypad Lockout	1 = Setpoint, Mode, Fan, TOV 2 = Setpoint, Mode, Fan 3 = Setpoint, TOV 4 = Setpoint Only 5 = TOV Only 6 = No Access
Light 1 Request BAS	false = Off true = On
Light 1 Request Local	false = Off true = On
Light 1 Status	false = Off true = On
Light 2 Request BAS	false = Off true = On
Light 2 Request Local	false = Off true = On
Light 2 Status	false = Off true = On
Local Setpoint Control	false = Remote control true = Local control
Low Temperature Alarm	false = Normal true = In Alarm
Maintenance Ping	false = Off true = On
Manual Override Exists	false = Off true = On
Manual Reset Present	false = Inactive true = Active
Manufacturing Location	1 = Field Applied 2 = La Crosse 3 = Pueblo 4 = Charmes 5 = Rushville 6 = Macon 7 = Waco 8 = Lexington 9 = Forsyth 10 = Clarksville 11 = Ft. Smith 12 = Penang 13 = Colchester 14 = Curitiba 15 = Taicang 16 = Taiwan 17 = Epinal 18 = Golbey
Maximum Capacity	false = Off true = On

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Model Information	1 = RTA 2 = CVH 3 = CVG 4 = CVR 5 = CDH 6 = RTH 7 = CGW 8 = CGA 9 = CCA 10 = RTW 11 = RTX 12 = RTU 13 = CCU 14 = CXA 15 = CGC 16 = RAU
Morning Warmup Enable Command	false = Disable true = Enable
MP Communication Status	1 = Communications 2 = Communication Loss 3 = Failed to Establish 4 = Waiting To Establish
Night Purge Economizing Referencer Input	false = Disabled true = Enabled
Night Purge Enable	false = Disabled true = Enabled
Night Purge Function	false = Disabled true = Enabled
Noise Reduction Active	false = Off true = On
Noise Reduction Request BAS	false = Normal true = Reduce Noise
Occupancy Input	false = Occupied true = Unoccupied
Occupancy Request	1 = Occupied 2 = Unoccupied 3 = Occupied Bypass 4 = Occupied Standby 5 = Auto
Occupancy Request	1 = Occupied 2 = Unoccupied 3 = Bypass 4 = Standby 5 = Unknown ***Note:*** *This enumeration is only valid for the Area system point.*
Occupancy Status	1 = Occupied 2 = Unoccupied 3 = Occupied Bypass 4 = Occupied Standby 5 = Auto
Occupancy Status	1 = Occupied 2 = Unoccupied 3 = Bypass 4 = Standby 5 = Unknown ***Note:*** *This enumeration is only valid for the Area and VAS system point.*
Occupant Call	false = Off true = On

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Operating Mode	1 = Cooling 2 = Heating 3 = Ice Building 4 = Free Cool ***Note:*** *This enumeration os only valid for chillers.*
Operating Mode	1 = Occupied 2 = Unoccupied 3 = Optimal Start 4 = Humidity Pulldown 5 = Optimal Stop 6 = Unoccupied Heating/Cooling 7 = Night Purge 8 = Unoccupied Humidify 9 = Unoccupied Dehumidify 10 = Unknown Operating Mode ***Note:*** *This enumeration is only valid for the Area and VAS system point.*
Operating Status	1 = Disabled 2 = Disabling 3 = Dispatch 4 = Turning System Water Request On 5 = Waiting for System Chilled Water Flow 6 = Unload 7 = Turning Chiller Pump On 8 = Waiting for Chiller Chilled Water Flow On 9 = Turning Chiller On 10 = Verifying Chiller On 11 = Turning Chiller Off 12 = Verifying Chiller Off 13 = Turning Chiller Pump Off 14 = Turning System Water Request Off 15 = Verifying System Chilled Water Flow Off
Optimal Start Can Occur	false = Disabled true = Enabled
Optimal Stop Can Occur	false = Disabled true = Enabled
Optional Chiller Failure Input Active	false = None true = Failure
Outdoor Air Damper Status	1 = At or Below Minimum Position 2 = Above Minimum Position 3 = Not Present
Outdoor Air Temperature Compensation	false = Disabled true = Enabled
Plant Type	1 = Constant Flow - Water always flows through all chillers (Subtract on Temperature) 2 = Constant Flow - Water always flows through all chillers (Subtract on Capacity) 3 = Variable Flow - Water flows though running chillers only (Subtract on Temperature) 4 = Variable Flow - Water flows though running chillers only (Subtract on Capacity) 5 = Decoupled System (Primary-Secondary) - Water flows through running chillers only (Subtract on Temperature) 6 = Decoupled System (Primary-Secondary) - Water flows through running chillers only (Subtract on Flow) 7 = Decoupled System (Primary-Secondary) - Water flows through running chillers only (Subtract on Capacity) 8 = Variable Primary Flow - Variable water flows through chillers
Power Failure Recovery Function	false = Normal true = Rapid
Prefilter Status	1 = Clean 2 = Dirty 3 = Not Present

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
PreHeat Valve Status	false = Closed true = Open
Primary Chilled Water Pump 1 Fault Status	false = Normal true = In Alarm
Primary Chilled Water Pump 1 Flow Status	false = No Flow true = Flow
Primary Chilled Water Pump 1 Reset BAS	false = Normal true = Reset
Primary Chilled Water Pump 1 Start Stop Output	false = Off true = On
Primary Chilled Water Pump 1 VFD Fault Status	false = Normal true = In Alarm
Primary Chilled Water Pump 2 Fault Status	false = Normal true = In Alarm
Primary Chilled Water Pump 2 Flow Status	false = No Flow true = Flow
Primary Chilled Water Pump 2 Reset BAS	false = Normal true = Reset
Primary Chilled Water Pump 2 Start Stop Output	false = Off true = On
Primary Chilled Water Pump 2 VFD Fault Status	false = Normal true = In Alarm
Primary Chilled Water Pump 3 Fault Status	false = Normal true = In Alarm
Primary Chilled Water Pump 3 Flow Status	false = No Flow true = Flow
Primary Chilled Water Pump 3 Reset BAS	false = Normal true = Reset
Primary Chilled Water Pump 3 Start Stop Output	false = Off true = On
Primary Chilled Water Pump 3 VFD Fault Status	false = Normal true = In Alarm
Primary Chilled Water Pump 4 Fault Status	false = Normal true = In Alarm
Primary Chilled Water Pump 4 Flow Status	false = No Flow true = Flow
Primary Chilled Water Pump 4 Reset BAS	false = Normal true = Reset
Primary Chilled Water Pump 4 Start Stop Output	false = Off true = On
Primary Chilled Water Pump 4 VFD Fault Status	false = Normal true = In Alarm
Primary Filter Status	1 = Clean 2 = Dirty 3 = Not Present
Pump Out Relay Circuit 1	false = Off true = On
Pump Out Relay Circuit 2	false = Off true = On
Purge Compressor Relay Circuit 1	false = Off true = On

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Purge Compressor Relay Circuit 2	false = Off true = On
Purge Regenerating Valve Solenoid Circuit 1	false = Off true = On
Purge Regenerating Valve Solenoid Circuit 2	false = Off true = On
Refrigerant Type	1 = R-11 2 = R-12 3 = R-22 4 = R-123 5 = R-134A 6 = R-407C 7 = R-410A 8 = R-113 9 = R-114 10 = R-500 11 = R-502 12 = R-404A
ReHeat Valve Status	false = Closed true = Open
Release Overrides	1 = No Release 2 = Temperature setpoint release 3 = Fan speed command release 4 = Occupant call release 5 = Release all overrides
Request Pending	0 = None 1 = Add 2 = Subtract
Requested Operating Mode	1 = Occupied 2 = Unoccupied 3 = Optimal Start 4 = Humidity Pulldown 5 = Optimal Stop 6 = Unoccupied Heating/Cooling 7 = Night Purge 8 = Unoccupied Humidify 9 = Unoccupied Dehumidify 10 = Unknown Mode
Reset Diagnostic	false = Normal true = Reset
Return Fan Failure	false = Normal true = In Alarm
Return Fan Failure Reset	false = Normal true = In Alarm
Return Fan Output	1 = Off 2 = On 3 = Not Present
Return Fan Proving Status	1 = Off 2 = On 3 = Not Present
Return Fan Status	false = Off true = On
Reversing Valve	false = Denergized true = Energized
Reversing Valve Status	1 = Heating 2 = Cooling 3 = Not Present
Rotation Input	false = Inactive true = Active

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Run Enabled	false = Run Not Enabled true = Run Enabled
Running Mode	1 = Chiller Off 2 = Chiller In Start Mode 3 = Chiller In Run Mode 4 = Chiller In Pre-Shutdown Mode 5 = Chiller In Service Mode
Secondary Chilled Water Pump 1 Fault Status	false = Normal true = In Alarm
Secondary Chilled Water Pump 1 Flow Status	false = No Flow true = Flow
Secondary Chilled Water Pump 1 Reset BAS	false = Normal true = Reset
Secondary Chilled Water Pump 1 Start Stop Output	false = Off true = On
Secondary Chilled Water Pump 1 VFD Fault Status	false = Normal true = In Alarm
Secondary Chilled Water Pump 2 Fault Status	false = Normal true = In Alarm
Secondary Chilled Water Pump 2 Flow Status	false = No Flow true = Flow
Secondary Chilled Water Pump 2 Reset BAS	false = Normal true = Reset
Secondary Chilled Water Pump 2 Start Stop Output	false = Off true = On
Secondary Chilled Water Pump 2 VFD Fault Status	false = Normal true = In Alarm
Secondary Chilled Water Pump 3 Fault Status	false = Normal true = In Alarm
Secondary Chilled Water Pump 3 Flow Status	false = No Flow true = Flow
Secondary Chilled Water Pump 3 Reset BAS	false = Normal true = Reset
Secondary Chilled Water Pump 3 Start Stop Output	false = Off true = On
Secondary Chilled Water Pump 3 VFD Fault Status	false = Normal true = In Alarm
Secondary Chilled Water Pump 4 Fault Status	false = Normal true = In Alarm
Secondary Chilled Water Pump 4 Flow Status	false = No Flow true = Flow
Secondary Chilled Water Pump 4 Reset BAS	false = Normal true = Reset
Secondary Chilled Water Pump 4 Start Stop Output	false = Off true = On
Secondary Chilled Water Pump 4 VFD Fault Status	false = Normal true = In Alarm
Send Allow VAV Auxillary Heat at Night	false = Disabled true = Enabled
Send VAV Drive Max to VAV Boxes	false = Disabled true = Enabled
Send VAV Source Temperature To VAV Boxes	false = Disabled true = Enabled

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Series Chiller Plant	false = No true = Yes
Service Test Status	1 = Inactive 2 = Fan On 3 = IGV Open 4 = IGV Closed 5 = Min Vent 6 = Econ Open 7 = Cool 1 8 = Cool 2 9 = Cool 3 10 = Dehumidification/Reheat 11 = Heat 1 12 = Heat 2 13 = Heat 3 14 = Heat 4 15 = Defrost 16 = Emergency Heat
Service Test Mode Status	false = Inactive true = Active
Soft Start Function	false = Disabled true = Enabled
Space Temperature Setpoint Use Local	false = Disabled true = Enabled
Subtract Input	false = Inactive true = Active
Subtract Request Exist	false = Inactive true = Active
Sunblind 1 Request BAS	false = Close true = Open
Sunblind 1 Request Local	false = Close true = Open
Sunblind 1 Status	false = Close true = Open
Sunblind 2 Request BAS	false = Close true = Open
Sunblind 2 Request Local	false = Close true = Open
Sunblind 2 Status	false = Close true = Open
Supply Air Tempering Enable Command	false = Disable true = Enable
Supply Air Tempering Status	false = Disable true = Enable
Supply Fan Configuration Status	false = Cycling true = Continuous
Supply Fan Failure	false = Normal true = In Alarm
Supply Fan Failure Reset	false = Normal true = Reset
Supply Fan Mode Command	false = Cycling true = Continuous
Supply Fan Output	1 = Off 2 = On 3 = Not Present

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Supply Fan Proving Status	1 = Off 2 = On 3 = Not Present
Supply Fan Speed Setpoint BAS	1 = Auto 2 = Off 3 = Low 4 = Medium 5 = High
Supply Fan Speed Setpoint Local	1 = Auto 2 = Off 3 = Low 4 = Medium 5 = High
Supply Fan Staged Speed Status	1 = Auto 2 = Off 3 = Low 4 = Medium 5 = High
Supply Fan Status	false = Off true = On
Supply Fan Switch Local Control	false = Disable true = Enable
System Chilled Water Flow	false = No Flow true = Flow
System Chilled Water Flow Lost	false = None true = Failure
System Chilled Water Flow Sensor Exists	false = No true = Yes
System Chilled Water Pump Request	false = Disabled true = Enabled
System Chilled Water Request Failures Enabled	false = Disabled true = Enabled
System Chilled Water Return Sensor Failure	false = None true = Failure
System Chilled Water Supply Sensor Failure	false = None true = Failure
System Control Command	false = Stand Alone Control true = BAS Control
System Control Status	false = Stand Alone Control true = BAS Control
System Failure Exists	false = None true = Failure
System Mode	1 = Off 2 = Ambient Lockout 3 = Shutdown in Progress 4 = Softstart 5 = Normal 6 = Rapid Power Failure Recovery ***Note:*** *This enumeration is only valid for the Chiller Plant Control system point.*
System Mode	1 = Off 2 = Air Handler Start-up Delay 3 = On 4 = Common Space VAV Shutdown Delay 5 = Unknown ***Note:*** *This enumeration is only valid for the VAS system point.*

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Tenant Override Function	false = Disabled true = Enabled
Timed Override Active	false = Inactive true = Active
Timed Override Duration Setpoint	1 = 0 Hour 2 = 1 Hour 3 = 2 Hours 4 = 3 Hours 5 = 4 Hours 6 = 5 Hours 7 = 6 Hours 8 = 7 Hours 9 = 8 Hours 10 = 9 Hours 11 = 10 Hours 12 = 11 Hours 13 = 12 Hours
Timed Override Function	false = Disabled true = Enabled
Timed Override in Control	false = Inactive true = Active
Timed Override Option Input	1 = Auto 2 = Timed Override Request 3 = Timed Override Cancel
Timed Override Status	1 = Idle 2 = On 3 = Cancel
Tower 1 Fan 1 Fault Status	false = Normal true = In Alarm
Tower 1 Fan 1 Flow Status	false = No Flow true = Flow
Tower 1 Fan 1 Low Speed Start Stop Output	false = Off true = On
Tower 1 Fan 1 Reset BAS	false = Normal true = Reset
Tower 1 Fan 1 Start Stop Output	false = Off true = On
Tower 1 Fan 1 VFD Fault Status	false = Normal true = In Alarm
Tower 1 Fan 2 Fault Status	false = Normal true = In Alarm
Tower 1 Fan 2 Flow Status	false = No Flow true = Flow
Tower 1 Fan 2 Low Speed Start Stop Output	false = Off true = On
Tower 1 Fan 2 Reset BAS	false = Normal true = Reset
Tower 1 Fan 2 Start Stop Output	false = Off true = On
Tower 1 Fan 2 VFD Fault Status	false = Normal true = In Alarm
Tower 1 Isolation Valve Output	false = Close true = Open
Tower 1 Isolation Valve Status	false = Close true = Open

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Tower 1 Request BAS	false = Off true = On
Tower 1 Request Local	false = Off true = On
Tower 2 Fan 1 Fault Status	false = Normal true = In Alarm
Tower 2 Fan 1 Flow Status	false = No Flow true = Flow
Tower 2 Fan 1 Low Speed Start Stop Output	false = Off true = On
Tower 2 Fan 1 Reset BAS	false = Normal true = Reset
Tower 2 Fan 1 Start Stop Output	false = Off true = On
Tower 2 Fan 1 VFD Fault Status	false = Normal true = In Alarm
Tower 2 Fan 2 Fault Status	false = Normal true = In Alarm
Tower 2 Fan 2 Flow Status	false = No Flow true = Flow
Tower 2 Fan 2 Low Speed Start Stop Output	false = Off true = On
Tower 2 Fan 2 Reset BAS	false = Normal true = Reset
Tower 2 Fan 2 Start Stop Output	false = Off true = On
Tower 2 Fan 2 VFD Fault Status	false = Normal true = In Alarm
Tower 2 Isolation Valve Output	false = Close true = Open
Tower 2 Isolation Valve Status	false = Closed true = Open
Tower 2 Request BAS	false = Off true = On
Tower 2 Request Local	false = Off true = On
Tower 3 Fan 1 Fault Status	false = Normal true = In Alarm
Tower 3 Fan 1 Flow Status	false = No Flow true = Flow
Tower 3 Fan 1 Low Speed Start Stop Output	false = Off true = On
Tower 3 Fan 1 Reset BAS	false = Normal true = Reset
Tower 3 Fan 1 Start Stop Output	false = Off true = On
Tower 3 Fan 1 VFD Fault Status	false = Normal true = In Alarm
Tower 3 Fan 2 Fault Status	false = Normal true = In Alarm
Tower 3 Fan 2 Flow Status	false = No Flow true = Flow

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Tower 3 Fan 2 Low Speed Start Stop Output	false = Off true = On
Tower 3 Fan 2 Reset BAS	false = Normal true = Reset
Tower 3 Fan 2 Start Stop Output	false = Off true = On
Tower 3 Fan 2 VFD Fault Status	false = Normal true = In Alarm
Tower 3 Isolation Valve Output	false = Close true = Open
Tower 3 Isolation Valve Status	false = Closed true = Open
Tower 3 Request BAS	false = Off true = On
Tower 3 Request Local	false = Off true = On
Tower Low Water Level Status	false = Off true = On
Tower Makeup Water System Status	false = Off true = On
Tower Sump Water Heater Status	false = Off true = On
Trane Unit Type	1 = 1 Heat/1 Cool 2 = Heat Pump 3 = Blower Coil 4 = Unit Ventilator 5 = Fan Coil 6 = Rooftop 7 = Air Handler 8 = Vertical Self Contained 9 = Unitary 10 = VAV Box 11 = Fan Coil
Unload at Start	false = Disabled true = Enabled
Unload Request	false = Inactive true = Active
Unoccupied Dehumidify Function	false = Disabled true = Enabled
Unoccupied Heating/Cooling Function	false = Disabled true = Enabled
Unoccupied Humidify Function	false = Disabled true = Enabled
VAV Drive Maximum Status	false = Auto true = Open
Ventilation Optimization Function	false = Inactive true = Active
Ventilation Optimization Status	1 = Active 2 = Disabled 3 = No VAV Data 4 = Air Handler Not Occupied 5 = No Qualified VAVs 6 = Unknown
Water Pump Request	false = Off true = On

Table 28. Tracer SC+ enumerations (continued)

Tracer SC Point Name	Enumerations and State Text
Water Valve Override	1 = Off 2 = Not Valid 3 = Not Valid 4 = Not Valid 5 = Open 6 = Close
When Will A Chiller Be Added?	1 = Suspended 2 = No Chillers Available 3 = Normal Add Input In Fault Add Delay Timer Active 4 = Normal Add Input In Fault Add Delay Timer Not Active 5 = Normal Add Delay Timer Active 6 = Normal Add Delay Timer Not Active 7 = Soft Start Add Input In Fault Add Delay Timer Active 8 = Soft Start Add Input In Fault Add Delay Timer Not Active 9 = Soft Start Add Delay Timer Active 10 = Soft Start Add Delay Timer Not Active 11 = Rapid Power Fail Recovery
When Will A Chiller Be Subtracted?	1 = Suspended 2 = No Chillers Available 3 = On Temp Subtract Input In Fault Subtract Delay Timer Active 4 = On Temp Subtract Input In Fault Subtract Delay Timer Not Active 5 = On Temp Subtract Delay Timer Active 6 = On Temp Subtract Delay Timer Not Active 7 = On Flow Subtract Input In Fault Subtract Delay Timer Active 8 = On Flow Subtract Input In Fault Subtract Delay Timer Not Active 9 = On Flow Subtract Delay Timer Active 10 = On Flow Subtract Delay Timer Not Active 11 = On RLA Subtract Input In Fault Subtract Delay Timer Active 12 = On RLA Subtract Input In Fault Subtract Delay Timer Not Active 13 = On RLA Subtract Delay Timer Active 14 = On RLA Subtract Delay Timer Not Active

Appendix F: Configuring TCP/IP and BACnet Settings

Configuration for TCP/IP and BACnet settings is located in the Identification and Communications section on the Tracer Synchrony Installation page.

The following instructions provide example configuration settings when both the Tracer SC+ with an application license and the Tracer SC+ with a base license both reside on the same subnet and a BBMD is not required.

Tracer SC+(app) and Tracer SC+(base) Reside on the Same Subnet

Configure the Tracer SC+(app)

1. Log on to the Tracer SC+(app) controller.
2. Navigate to the Identification and Communications section on the Tracer Synchrony Installation page.
3. Click the **IP Configuration** tab and then click **Edit**.
4. Click **Use the Following Address** radio button and enter the following:
   - IP address — 192.168.1.10
   - Subnet Mask — 255.255.255.0
   - Default Gateway — 192.168.1.254
5. Click **Save**. An error message appears stating that your PC will restart. Click **OK.**
6. Return to the Identification and Communications page. Click the **BACnet Configuration** tab, and then click **Edit**.
7. Enter the following:
   - Rotary Switch Setting — 1
   - Device ID — 10000
   - BACnet Network Number for Ethernet Port 1 — 1
   - UDP Port for BACnet over IP using Ethernet Network Port 1— 55110
   - This Tracer SC+ is a BACnet Broadcast Management Device (BBMD) — No
   - BACnet Network Number for MS/TP Port 1 — 11
   - Baud Rate for MS/TP Port 1 - 76800 bps
   - BACnet Network Number for MS/TP Port 2 — 12
   - Baud Rate for MS/TP Port 2 — 76800 bps
8. Click **Save**

Configure the Tracer SC+(base)

1. Log on to the Tracer SC+(base) controller.
2. Navigate to the Identification and Communications section on the Tracer Synchrony Installation page.
3. Click the IP Configuration tab and then click **Edit**.
4. Click **Use the Following Address** radio button and enter the following:
   - IP address — 192.168.1.20
   - Subnet Mask — 255.255.255.0
5. Click **Save**. An error message appears stating that your PC will restart. Click OK.
6. Return to the **Identification and Communication**s page. Click the **BACnet Configuration** tab and then click **Edit**.
7. Enter the following:
   - Rotary Switch Setting — 2
   - Device ID — 20000
   - BACnet Network Number for Ethernet Port 1 — 1
   - UDP Port for BACnet over IP using Ethernet Network Port 1— 55110
   - This Tracer SC+ is a BACnet Broadcast Management Device (BBMD) — No

- BACnet Network Number for MS/TP Port 1 — 21
- Baud Rate for MS/TP Port 1 —76800 bps
- BACnet Network Number for MS/TP Port 2 — 22
- Baud Rate for MS/TP Port 2 — 76800 bps

8. Click **Save**.

Tracer SC+(app) and Tracer SC+(base) Reside on Separate Subnets

The following instructions provide example configuration settings when both the Tracer SC+(app) and the Tracer SC+(base) both reside on separate subnets and a BBMD is required for both.

Configure the Tracer SC+(app)

1. Log on to the Tracer SC+(app) controller.
2. Navigate to the **Identification and Communications** section on the Tracer Synchrony Installation page.
3. Click the **IP Configuration** tab and then click **Edit**.
4. Click **Use the Following Address** radio button and enter the following:
   - Click **Use the Following Address** radio button and enter the following:
   - IP address — 192.168.1.10
   - Subnet Mask — 255.255.255.0
   - Default Gateway — 192.168.1.254
5. Click **Save**. An error message appears stating that your PC will restart. Click OK.
6. Return to the Identification and Communications page. Click the **BACnet Configuration** tab, then click **Edit**.
7. Enter the following:
   - Rotary Switch Setting —1
   - Device ID — 10000
   - BACnet Network Number for Ethernet Port 1—1
   - UDP Port for BACnet over IP using Ethernet Network Port 1— 46410
   - This Tracer SC+ is a BACnet Broadcast Management Device (BBMD) — Yes
   - BACnet Network Number for MS/TP Port 1—11
   - Baud Rate for MS/TP Port 1— 76800 bps
   - BACnet Network Number for MS/TP Port 2 —12
   - Baud Rate for MS/TP Port 2 —76800 bps

Configure the Tracer SC+(base)

1. Log on to the Tracer SC+(base) controller.
2. Navigate to the Identification and Communications section on the Tracer Synchrony Installation page.
3. Click the **IP Configuration** tab and then click **Edit**.
4. Click **Use the Following Address** radio button and enter the following:
   - IP address — 192.168.1.20
   - Subnet Mask — 255.255.255.0
5. Click **Save**. An error message appears stating that your PC will restart. Click **OK**.
6. Return to the Identification and Communications page. Click the **BACnet Configuration** tab and then click **Edit**.
7. Enter the following:
   - Rotary Switch Setting — 2
   - Device ID — 20000
   - BACnet Network Number for Ethernet Port 1 — 1

- UDP Port for BACnet over IP using Ethernet Network Port 1 — 46410
- This Tracer SC+ is a BACnet Broadcast Management Device (BBMD) — Yes
- BACnet Network Number for MS/TP Port 1 — 21
- Baud Rate for MS/TP Port 1 - 76800 bps
- BACnet Network Number for MS/TP Port 2 — 22
- Baud Rate for MS/TP Port 2 — 76800 bps

8. Click **Save**.
9. Set up a BDT table.

Setting Up the BDT Table

A broadcast distribution table (BDT) contains BACnet IP broadcast management devices (BBMDs). BDTs are required for a Tracer SC+(app) and Tracer SC+(base) controllers when both reside on separate subnets.

1. Log on to the Tracer SC+(app) controller.
2. From the left navigation menu click **Installation>Identification and Communications>BACnet Configuration**. The BACnet IP Configuration frame contains the BBMD information.
3. Click **BDT Setup**. The BDT Setup dialog opens.
4. In the provided fields, enter the IP address of the Tracer SC+(base).
5. Click **Test Communication**to verify communication.
6. Click **Save and Send.**

   Repeat the above steps if using more than one Tracer SC+(base).

Appendix G: Networking and IT Security

This section provides details on how Tracer products interact with an IT network. For more detailed information, refer to the *IT Security Best Practices Guide, (BAS-SVU035*-EN)*.

Network

HTTP and HTTPS Ports

Tracer SC+ and Tracer Ensemble use HTTP and HTTPS to exchange data between a web client and server. The facility network administrator must open these ports to enable access to the BAS from an external network location.

Simple Network Management Protocol (SNMP)

SNMP is not supported by Tracer SC+ or Tracer Ensemble. Internet protocol (IP) network configuration of either system is performed with the user interface. Application administration privileges are required to modify device network configuration.

Active Directory Services

Microsoft active directory services are supported by Tracer SC+ and Tracer Ensemble. User credentials are managed with the software application. For more information see “Active Directory Setup,” p. 44.

Domain Name Services (DNS)

Tracer SC+ and Tracer Ensemble support outbound DNS functionality. With this capability it is easy to configure the system to send alarm and event messages by e-mail to multiple users of the system.

Network Bandwith Usage

A Trane BAS system requires very little network bandwidth because of the network architecture design. For small to medium size facilities, only the Tracer SC+ resides on the building LAN. The Tracer SC+ uses BACnet MS/TP or LonWorks FTT-10 protocols to communicate with equipment-level controllers. Neither protocol is IP based.

- **Communication among Tracer SC+s in a multi-Tracer SC+ facility.** This communication is BACnet IP (UDP) based and the amount of traffic will vary depending on how the system is configured. Generally, this communication will be infrequent and will utilize very small IP packets.
- **Communication between an active web client and the Tracer SC+ web server**. The server application Web pages and images are optimized for a Web environment and the transfer of a Web page uses very little bandwidth.
- **Communication between multiple BAS sites and Tracer Ensemble**. Tracer Ensemble provides a web based user interface to manage multiple BAS sites. The bandwidth required for communication is typical of other client/server applications.

IP Addressing and Network Address Translation (NAT) Routing

The BACnet protocol requires that all BACnet IP devices be assigned a static IP address. Because of this requirement, BACnet systems do not support Network Address Translation. To enable external communication with the system, the network firewall must be configured to accept packets directed at the Tracer SC+ IP address.

Virtual Local Area Network (VLAN)

Trane BAS systems may reside on VLAN networks. The same rules apply as stated in the IP Addressing and NAT Routing section above.

Security

Software

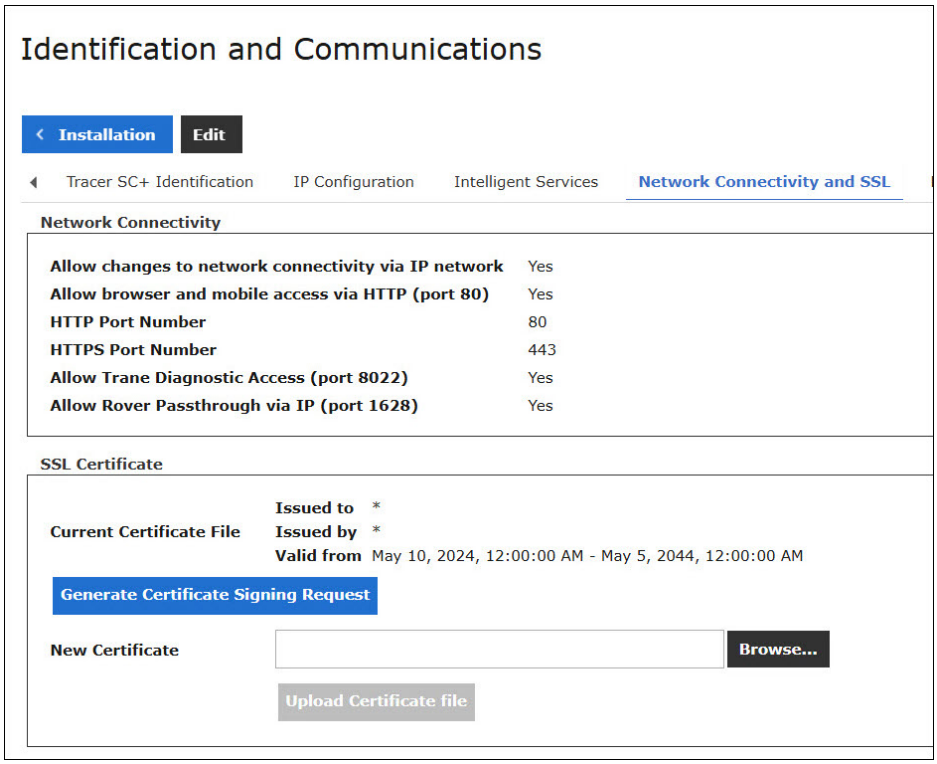
Tracer Synchrony is a Web application that requires a modern browser including the most recent versions of each supported browser. For more information, see “Software and Service Tools,” p. 22.

Network Connectivity and SSL

This section covers important network security and configurations that will make your customer's Tracer SC+ more secure. Although enhancing network security is favorable, in some cases it restricts user access or increases the number of steps to gain access.

The following configurations are done in the Network Connectivity frame, which is accessible from the Identification and Communication page.

Figure 128. Network connectivity and SSL tab



Allow changes to network connectivity via IP network — If selected, you can access the Network Connectivity and SSL tab over the Internet. If not selected, you must connect locally to Tracer SC+ by using a USB cable to view and make changes to the Network Connectivity and SSL section.

Note: *When this option is left unchecked (not selected), the Network Connectivity and SSL tab will not appear on the Tracer Synchrony user interface when connected over TCP/IP. Any changes, including those made to this option, must be done locally at the Tracer Synchrony user interface while connected via a USB cable. Selections made for this option affects all users of Tracer Synchrony.*

Allow browser and mobile access via HTTP (port 80) — If selected, you can access Tracer SC+ through the HTTP port, versus HTTPS (secured). If unchecked (not selected), you will encounter a dialog box stating that the connection is untrusted. This is to be expected and users have the option to add the URL as an exception.

HTTP Port Number — The default value is 80. It is recommend that you retain the default.

HTTPS Port Number — The default value is 443 . It is recommend that you retain the default.

Allow Trane Diagnostic Access (port 8022) — This is a low level services port, which provides access to Trane Technical Support when Yes is selected. If not selected, access to this port is denied to all users including Trane Technical Support.

Allow Rover Passthrough via IP (port 1628) — This field displays enable/disable status.

SSL Certificate

An SSL certificate establishes a secure encrypted connection between a browser and a server (website). This section describes the process required to obtain an SSL certificate for a customer's Tracer SC+.

To request an SSL certificate:

1. From the Tracer Synchrony user interface, navigate to the network Connectivity and SSL tab. Click the **Generate Certificate Signing Request** button, which opens the accompanying dialog box.
2. Enter the requested information in the fields and then click **Generate**. Print or save the document.
3. Forward the document to an Internet Services organization for approval.

To upload a new SSL certificate:

1. In the **New Certificate** field, click **Browse**.
2. Select the appropriate file and then click **Upload Certificate File**.

Web Server Security Settings

This section allows you to see and edit which Web Server Ciphers are being used.

Minimum Web Server TLS Version — To change the TLS version, click **Edit** at the top of the page. A drop-down box appears from which you can select a TLS Version. Setting a Minimum Web Server TLS Version will remove lower TLS Ciphers from the table. Click Save.

Note: *Selecting the highest TLS Version as the minimum may break your connection to the Web Server.*
Web Server Cipher RFC Name — This is the name of each specific cipher that is supported. Only ciphers at or above the Minimum TLS Version are displayed.

Allow Cipher— To change the settings, click **Edit** at the top of the page. Ciphers can be individually Enabled/Disabled by checking the box in the **Allow Cipher** Column.

Note: *TLS Minimum Versions can also be managed for Email, LDAP, and more if necessary. These settings are only available through evox. Contact Technical Support for more information on modifying these settings.*

Client Access and Password

Tracer SC+ and Tracer Ensemble support individual user accounts and a role-based security access system. Tracer SC+ emphasizes ease of use while protecting the BAS from inadvertent access by unauthorized users. Trane strongly recommends the enforcement of optional complex password requirements. Tracer SC+ administrators have the authority to require users to adhere to the following when setting up a password:

- Password minimum length (must be at least 6 characters)
- Password requires mixed case
- Password requires a symbol
- Password cannot contain user information (cannot contain the user ID)
- Previous passwords blocked from reuse (valid range is 1 to 175)
- Password expiration

Network Ports

The Tracer SC+ has two Ethernet Ports on the device. They are used for IP communications using BACnet, BACnet/SC, TCP, HTTP, HTTP(S), etc. The ports can be enabled, disabled, and customized in the Installation and Communication section at the Tracer Synchrony user interface. Following are standard default port numbers and configurations.

Incoming

- Port 80/443: TCP/HTTP(S) – Used for initial device setup and configuration and to provide runtime status of the device.
- Port 47808: UDP – Used for BACnet IP communications. This port can be changed if dictated by job requirements, or personal preference.

Outgoing

- Port 443: TCP /HTTPS – Used for sending data to Trane and to communicate control messages to the Tracer SC+.
- Port 1194: UDP/TLS – Used to provide high speed, secure access for the Trane Intelligent Services Center (ISC) to service a building system.

- Port 47808: UDP – Used for BACnet IP communications. This port can be changed if dictated by job requirements, or personal preference.

Firewalls

Trane systems do not have built in firewalls and rely on the network security infrastructure for protection. Trane recommends that Tracer products be installed behind a firewall. For correct operation behind a firewall, the following ports should be opened:

Incoming

If remote access to the web browser interface is required, Tracer SC+ supports the following options:

- Internet routable (external) IP address of Tracer SC+.
- VPN as defined in VPN Client access.

Outgoing

If the existing network configuration allows outbound communications to the Internet, then no additional work is required (standard configuration). If outbound ports are restricted, then ports 443 (HTTPS) and 1194 (UDP) must be opened for the assigned IP address of the Tracer SC+.

VPN Client Access

A Virtual Private Network (VPN) can be used to allow a user to access the BAS from outside a firewall. This is a typical configuration for remote access of a Tracer BAS system. You may need to contact your administrator to request VPN access.

VPN LAN to LAN Access

Trane supports some LAN to LAN trusted network connections, but recommends the secure tunneling methods built into Tracer SC+. Contact Trane Product Support for inquiries regarding LAN to LAN connections.

Cellular Routers

Cellular Routers can be connected directly to the Tracer SC+ as a convenient way to allow external access to the BAS system prior to its connection to the building network. Permanent use of a router may be an efficient way to isolate the BAS from the IT network. Monthly cost and BAS performance should be considered prior to selecting this option. Trane has created a standard solution, process, and support system for Trane offices to use when the preferred remote access method cannot be achieved or the customers's network is not available. For more information, refer to the *Trane® Cellular Router Solution Installation, Operation, and Maintenance Guide, (BAS-SVX067*-EN)*.

Air-Fi® Wireless

Trane BAS systems can be ordered with an Air-Fi® Wireless System instead of a wired fieldbus. Air-Fi® is communicated over the Zigbee (IEEE 802.15.4) wireless protocol and can coexist with other wireless protocols, including Wi-Fi. Trane Air-Fi® networks are secured so that only Trane devices can operate with them. Although wireless access might extend beyond the site perimeter, the Air-Fi® network uses authentication encryption to provide confidentiality and integrity of the data.

Physical Security

The BACnet protocol is an open standard protocol. There are many vendor and publicly offered software tools that, when connected to a network, can read and write data to any vendor's BACnet system. This is a core benefit of the BACnet protocol. Physical access to devices and networks should be controlled to a level appropriate for your facility. Physically mounting devices in restricted access areas is a good best practice.

Special Considerations: Anti-virus Software

Trane does not support the installation of anti-virus software on Tracer SC+, as it may interrupt its intended operation. Services not in use have been turned off to mitigate susceptibility to viruses and malicious software (malware).

Hardening Report

The Hardening Report is the output document of a security scan done by the Tracer SC+. The Hardening Report shows the current Tracer SC+ settings related to network and user security. It is intended to ensure that Trane's IT Security Best Practices are followed when installing a Tracer SC+.

Appendix H: Setting Up the Tracer 10-inch Display

The Tracer 10-inch Display can be used on Tracer SC+ sites to help non-technical users in the following scenarios:

- To access a subset of zones. For example, a nurses station in a hospital that has access to a small number of surgical suites.
- To only display custom graphics. For example, a chiller plant custom graphic.

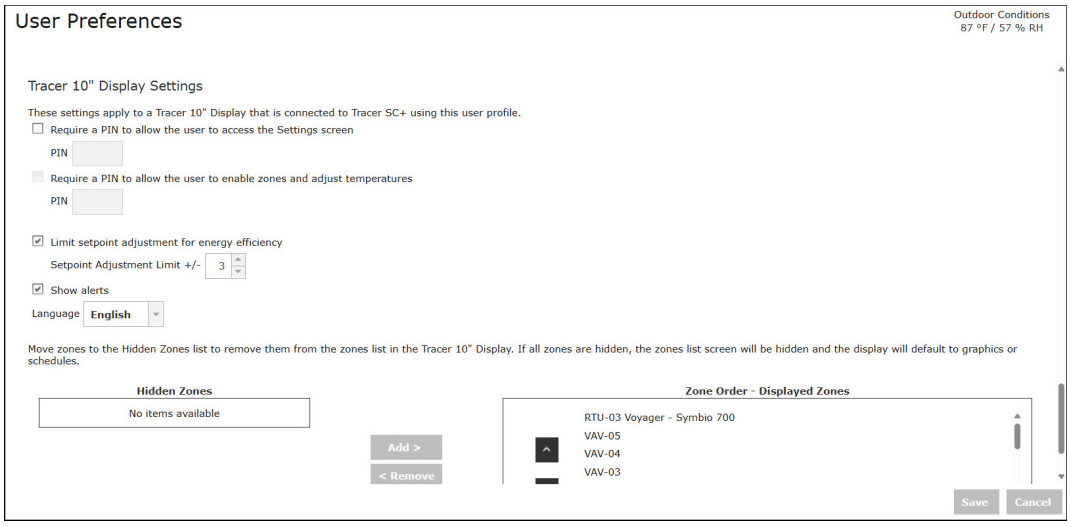
A Tracer SC+ can accommodate a maximum of three Tracer 10-inch Displays.

To install a Tracer 10-inch Display:

1. At the Tracer Synchrony user interface, create a new user assigned to the role of either Tracer 10-inch Display *or* Tracer 10-inch Display without schedules.
2. During the creation process, configure the display settings in the **Tracer 10-inch Display Settings** section (see the following figure).
3. Click **Save**.
4. Connect the display to the Tracer SC+ controller via Ethernet or WiFi. The display must be on the same network as the Tracer SC+.
5. On the Tracer 10-inch Display, enter the newly created user name and password to connect it to the Tracer SC+.

Note: *To show the same view on multiple displays, use the same user credentials. To display different views on the displays, create multiple users.*

Figure 129. Configuring display settings



Appendix J: Connecting Air-Fi® Wireless Sensors to Tracer® SC+

Beginning with version 5.1, Tracer SC+ supports direct connection of Air-Fi wireless sensors. Tracer SC+ supports a maximum of eight networks, with six sensors maximum per network, allowing a total number of 48 sensors.

Applications include (but not limited to):

- Refrigerator/Freezer monitoring sensor
- Monitoring sensor for remote areas
- Direct connection to devices that cannot be connected to unit controllers (for example, VRF)

Note: *This application only configures sensors directly connected to the Tracer SC+. An Air-Fi sensor connected to a unit controller must be configured using the Tracer TU service Tool.*

Note: *Sensor 1 for each network is enabled by default.*

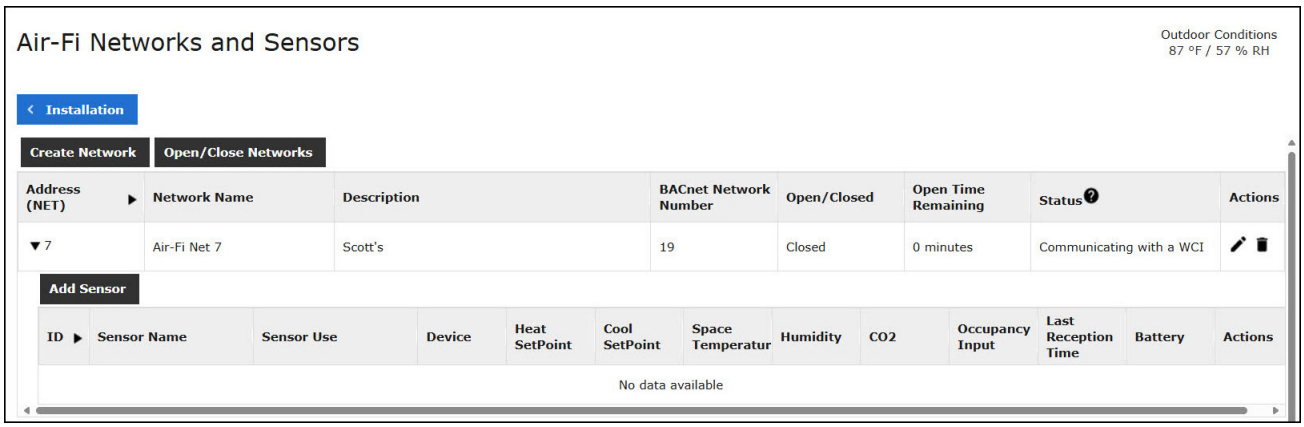
Note: *More than one sensor per network requires SC+ Configuration.*

Setting Up an Air-Fi® Network on Tracer Synchrony

1. Set the Addresses, mount, and wire the Air-Fi® Wireless Communications Interface (WCI) and the Air-Fi® Wireless Communications Sensors (WCSs) according to instructions in the *Air-Fi® Wireless System Installation, Operation, and Maintenance* (BAS-SVX40*-EN).
2. At the Tracer Synchrony user-interface, click **Installation** from the left navigation menu, then click **Air-Fi Networks and Sensors**.
3. Click the **Create Network** button. A new network displays.
4. Edit the BACnet Network Number if needed. The BACnet network numbers are provided by default but can be edited by clicking the edit (pencil) icon. BACnet network numbers should not be duplicated.
5. Click the check icon when finished.
6. To delete networks: Select a network and then click the delete (trash can) icon. All sensors in the network will be deleted when the network is deleted.

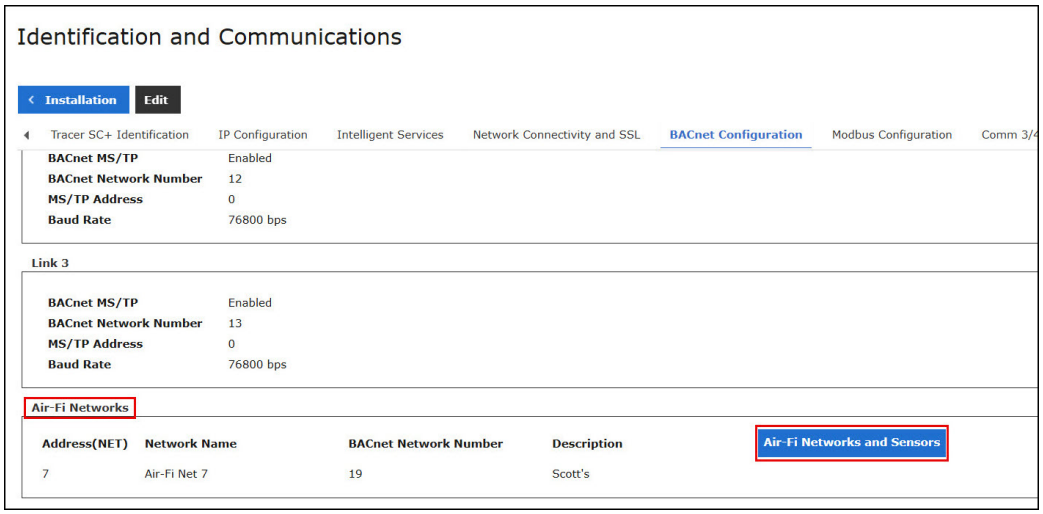
   Note: *Networks reflected here are all of the Air-Fi networks on the SC+ including the WCIs connected to unit controllers.*

Figure 130. Air-Fi Networks and Sensors



Air-Fi BACnet vitals were added back to the **BACnet Configuration** tab under **Identification and Communications**. This makes troubleshooting BACnet Network numbers easier by having them all on one page. Air-Fi Setup is still done under **Installations/Air-Fi Networks and Sensors**, so a quick link button was added in the Air-Fi Network area of **BACnet Configuration**.

Figure 131. Air-Fi Identification and Communications

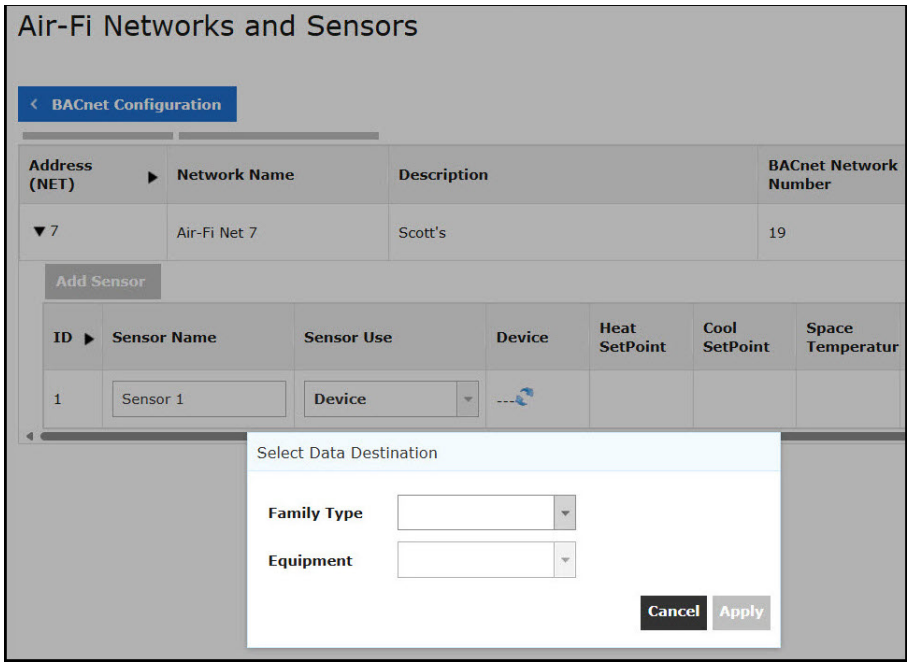


Configuring Air-Fi® Sensors Connected Directly to Tracer SC+ Without a Unit Controller

1. At the Tracer Synchrony user-interface, click **Installation** from the left navigation menu, then click **Air-Fi Networks and Sensors**.
2. Select the network to which you want to add sensors. Use the arrow to the left of the network name to expand the frame and to display network details.
3. Click the **Add Sensor** button.

   Note: *A maximum of six sensors can be added to each network. If the maximum has already been reached, the Add Sensor button will be disabled.*
4. Select the sensor use:
   a. Monitoring — refers to sensors that will be used to monitor such as a freezer sensor. If Monitoring is selected, the table will auto populate with the values from the sensor.
   b. Device — refers to sensors that are directly connected to Tracer SC+ but that will be matched with a piece of equipment. For example, a VRF Indoor Unit. The installed device does not use a unit controller to communicate to the Air-Fi® sensor.
      1. If Device is selected for sensor use, click on the referencer icon on the Device column to choose an installed device.
      2. Select the family type and equipment.

Figure 132. Adding Sensors (select family type and equipment)

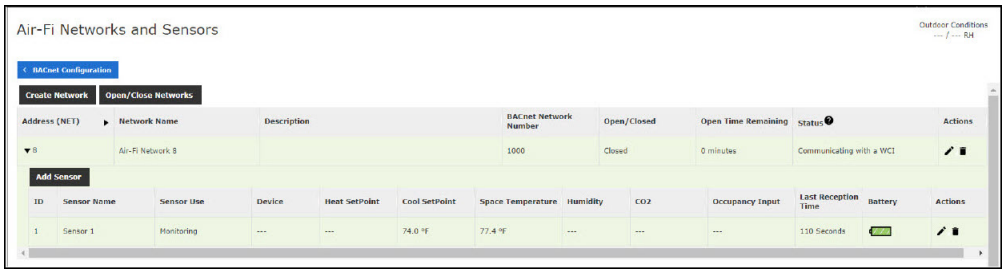


Tracer SC+ automatically proposes points on that device to send the sensor data. Notice that the rest of the table is populated with point names from the selected device. If a default point does not exist on the device, dashes and the referencer icon will be shown to allow the user to select the point where the sensor value will be sent to. To change the selection of points, click on the referencer icons.

5. Click the check mark when finished with the configuration.
   - On view mode, hover over the point name to see the values from the sensor.
6. To delete a sensor, click the trash can icon.
7. To edit a sensor configuration, click the pencil icon.

Note: *A maximum of six sensors can be directly connected to the Tracer SC+ for each network.*

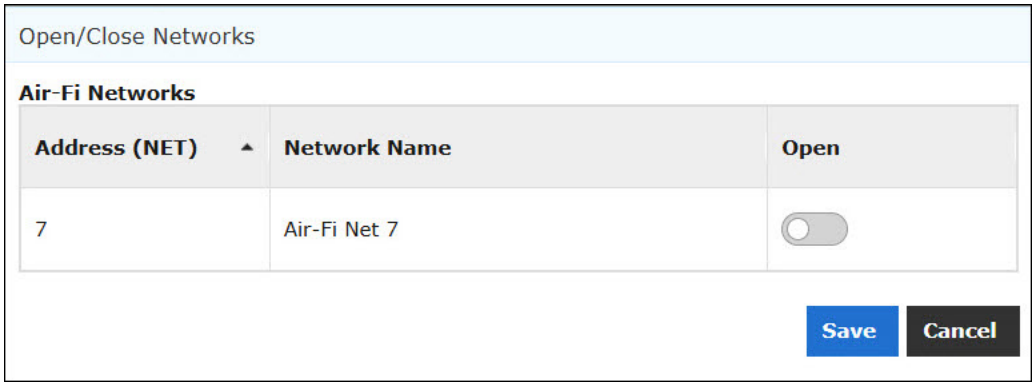
Figure 133. Air-Fi edit sensors



Appendix K: Opening an Air–Fi® Network with Synchrony

1. Navigate to Air-Fi Networks and Sensor page.
2. Click **Open/Close Networks** tab.
3. Toggle the network to Open or Closed. The network will stay open for up to 90 minutes.

Figure 134. Air–Fi open/close networks

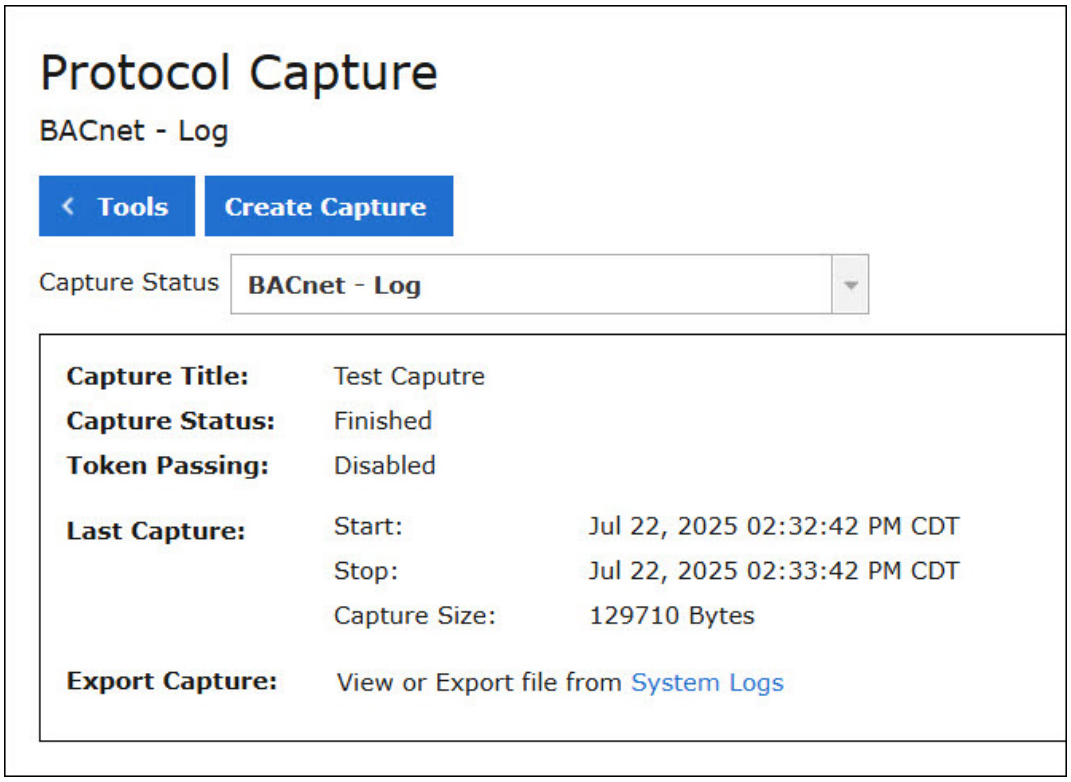


Appendix L: Network Troubleshooting Tools

Protocol Capture Tool (Formerly BACnet Capture Tool)

Protocol Capture tool can be found under **Tools > Protocol Capture**.

Figure 135. Protocol capture



The page shows the status of the last capture.

Capture Status selection – Multiple Capture Status windows. Use the selection window to select the appropriate one. Settings of the Capture Status window will automatically filter to appropriate protocol when Create Capture is used.

Capture Title – Name of the last capture to be run or name of the one currently running or scheduled.

Capture Status

- Idle – The capture has not yet begun running.
- Running – The capture is currently running.
- Finished – The capture is completed; a download file is available.
- Scheduled – The capture has been scheduled to run at a specific time.

Token Passing – When applicable it will show if it was enabled for capture.

Last Capture

- If the status is Scheduled or Running, it will show the start time and planned capture duration.
- If the status is Idle or Finished, it will show the previous capture start/stop time and the size of the capture.

Export Capture – Two options will be displayed based off Protocol link. Log files will have a link to navigate to System Logs. Pcap files will have a link to download the file.

In System Logs, two file structures are used to store captures and are named according to their Protocol (bacnetCapture, modbusCapture). Logs file can be viewed or exported to view with Serial Spy.

How to Create New Protocol Capture

To create a new capture, click **Create Capture**. The Create Capture dialog box opens.

Capture Title – Text box in which the user needs to give title of the capture.

Link Selection – All active BACnet/Modbus/VRF/API links on the Tracer SC+ are shown here. Select one Protocol and one or more of its links.

File Selection – Applicable for BACnet only. Use Log File to capture Link data and Pcap for IP traffic.

Enable Token Passing – Applicable for BACnet only. Enabling this option will limit link selection only to MS/TP and only one link at a time. Capture will include Token passing data for that particular link.

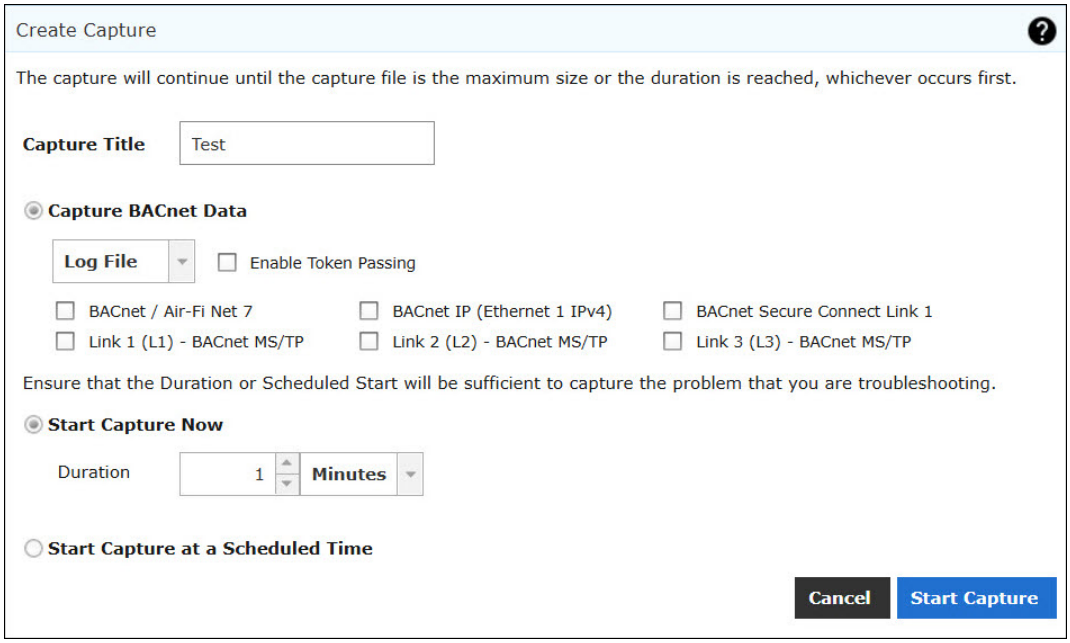
Users can either start the capture now or schedule the capture, by selecting the preferred radio button.

Start capture now – Allows the user to capture the network now. Users are required to provide the duration of the capture (default it is 1 hour or 60 minutes) and the maximum limit is 12 hours or 720 minutes.

Schedule the Capture – Users can schedule the capture by providing the start date and time duration of the capture (default it is 1 hour or 60 minutes) and the maximum limit is 12 hours or 720 Minutes.

Once the required fields are filled, users must click **Start Capture** to begin the capture or click **Schedule Capture** in the event of scheduling a capture.

Figure 136. Create capture

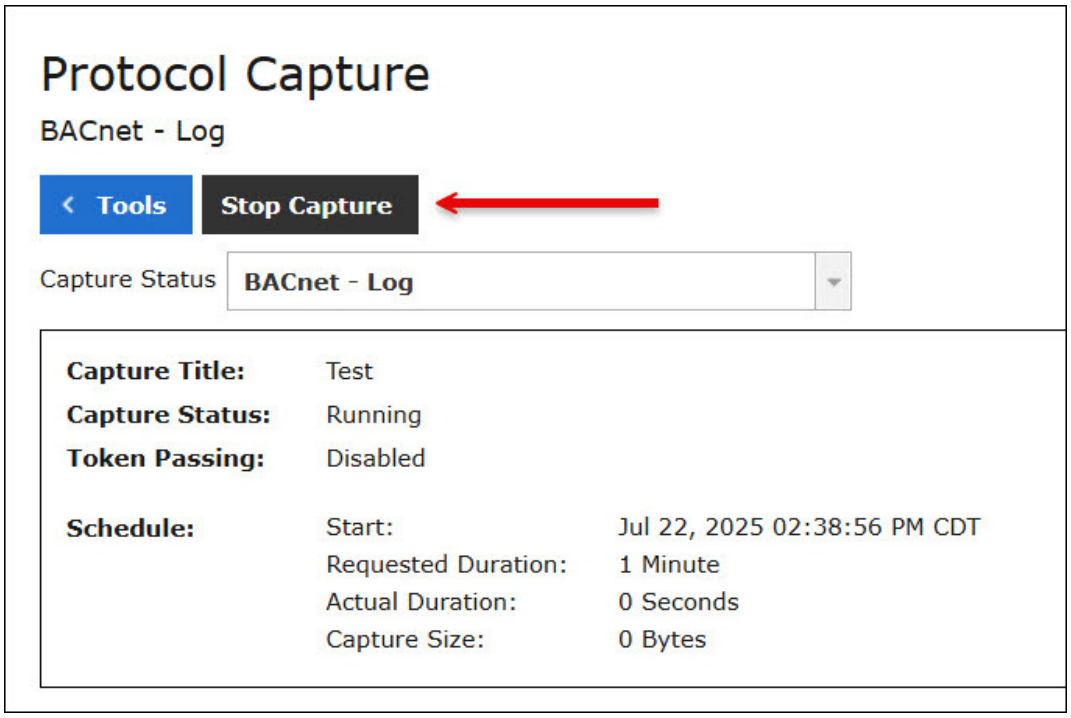


Note: *Once the capture has been created, users will not be allowed to create another capture until the current capture completes the activity.*

Stop Capture

Click **Stop Capture** to stop the capture while it is in running status. Once stopped, the capture status shows **Finished** and displays the **Create Capture** button.

Figure 137. Stop capture

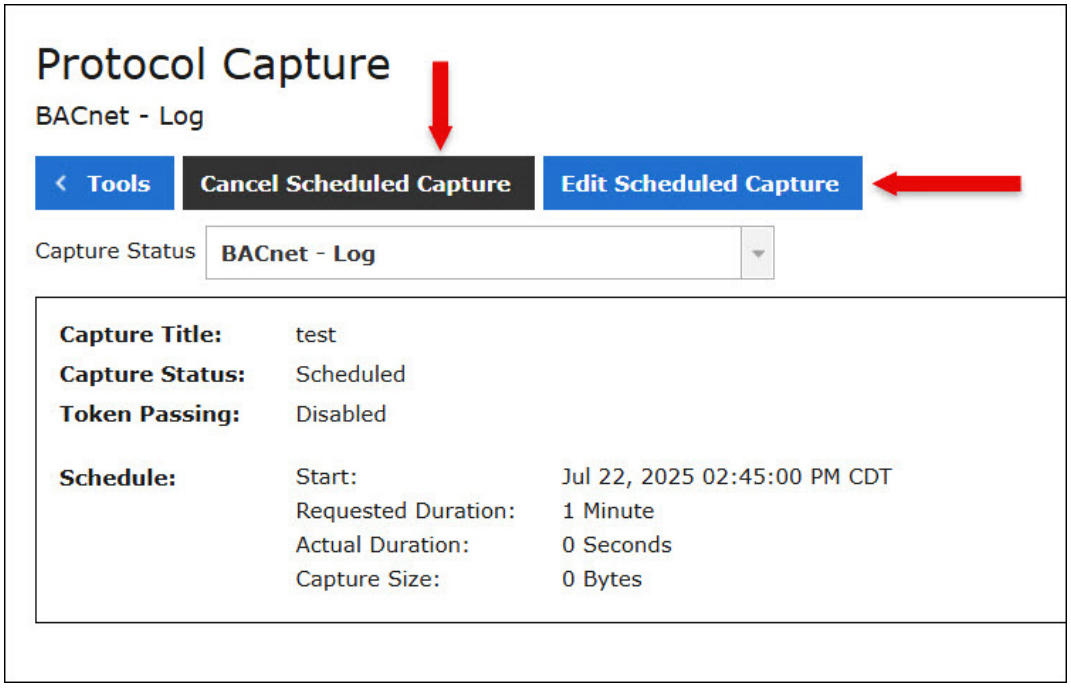


Cancel/Edit Scheduled Capture

To cancel a scheduled capture, click **Cancel Scheduled Capture**. Once cancelled, the capture status shows **Idle** and displays the **Create Capture** button.

To edit a scheduled capture, click **Edit Schedule Capture** which opens the edit dialog box (same as create).

Figure 138. Cancel/Edit scheduled capture



Export Capture

View or export the capture through **System Logs** in tools or download file from appropriate link.

Figure 139. System logs

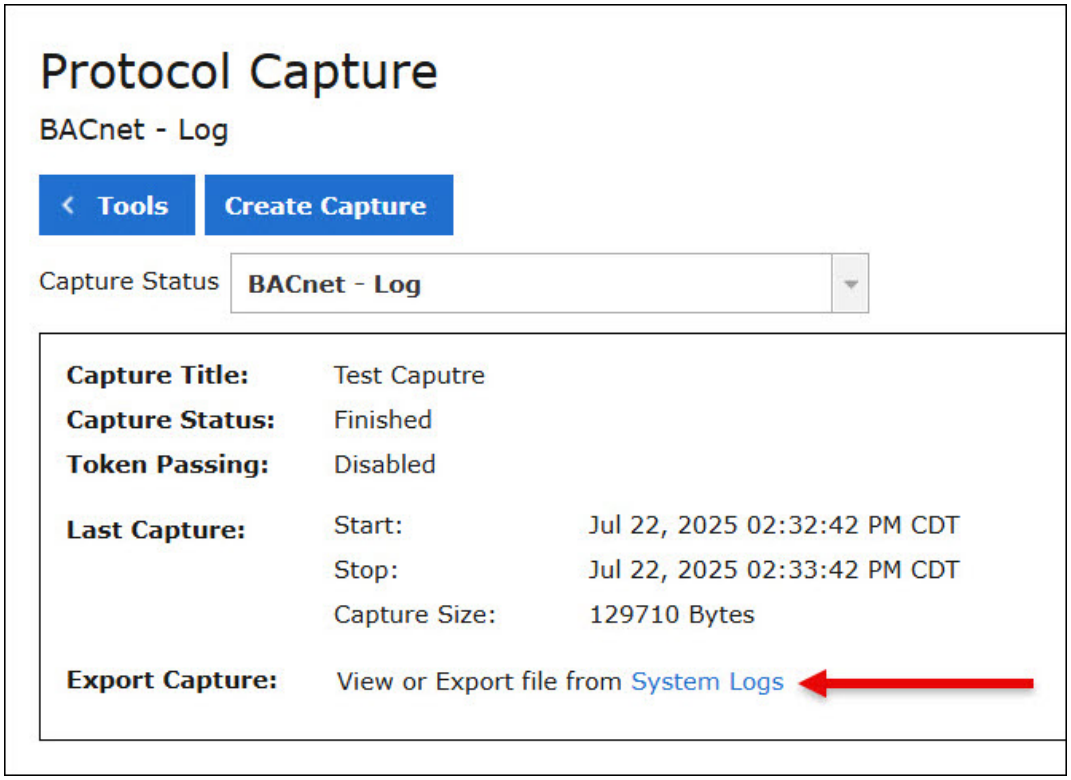
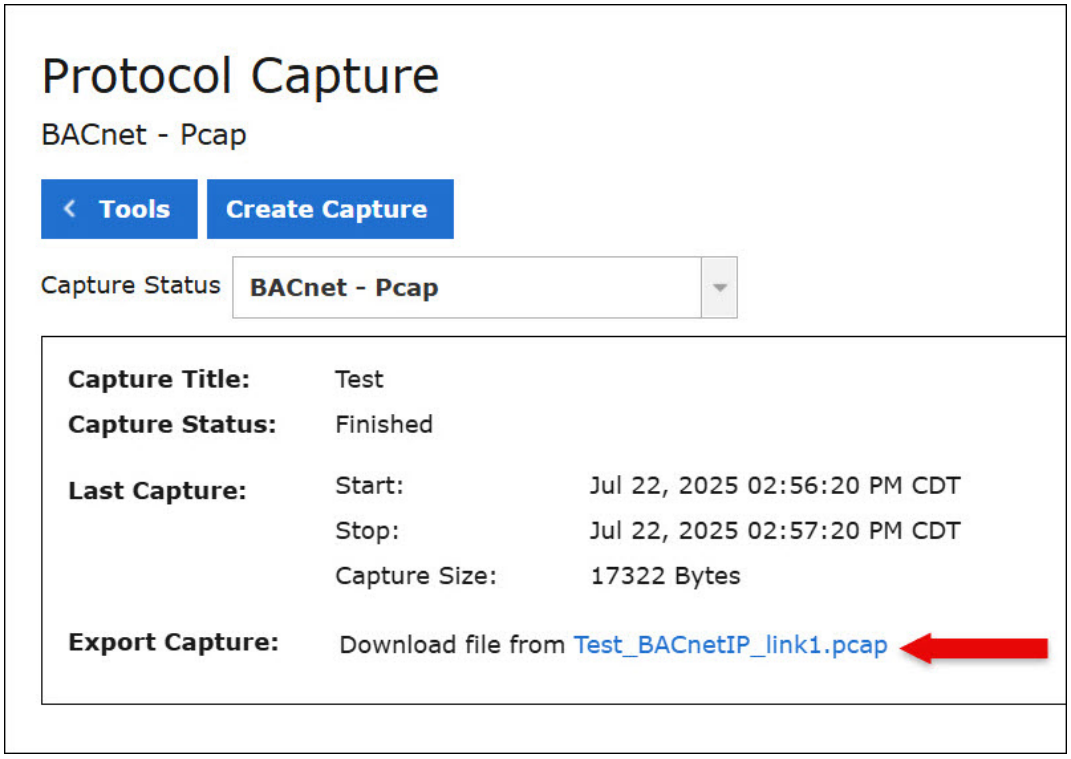


Figure 140. Download file



Log Files

When a capture finished, follow link on the status page to **System Logs** or navigate to **Tools > System Logs**.

- Protocol Capture tool uses the same file format add hydra, comm, and other log files. As the main .log file fills, the data is then pushed to .log.1, which pushes to .log.2 and so forth.
- Protocol Capture tool BACnet log files are saved as bacnetCapture.log, bacnetCapture.log.1 through 4. Modbus log files are saved as modbusCapture.log, modbustCapture.log.1 through 4.

  Note: *New data will be stored in the bacnetCapture.log file.*
- Each capture log file holds 2 MB data, with a total maximum of 10 MB spread across all five log files.

  Note: *Capture larger than 10 MB will be missing the data from the beginning of the Capture.*

Viewing a Log File

The best practice is to export the log file and view it with Serial Spy.

Service Filtering

Service Filtering can be found under **Installation>Identification and Communications>BACnet Configuration**.

Figure 141. Service filtering

Filtered Services

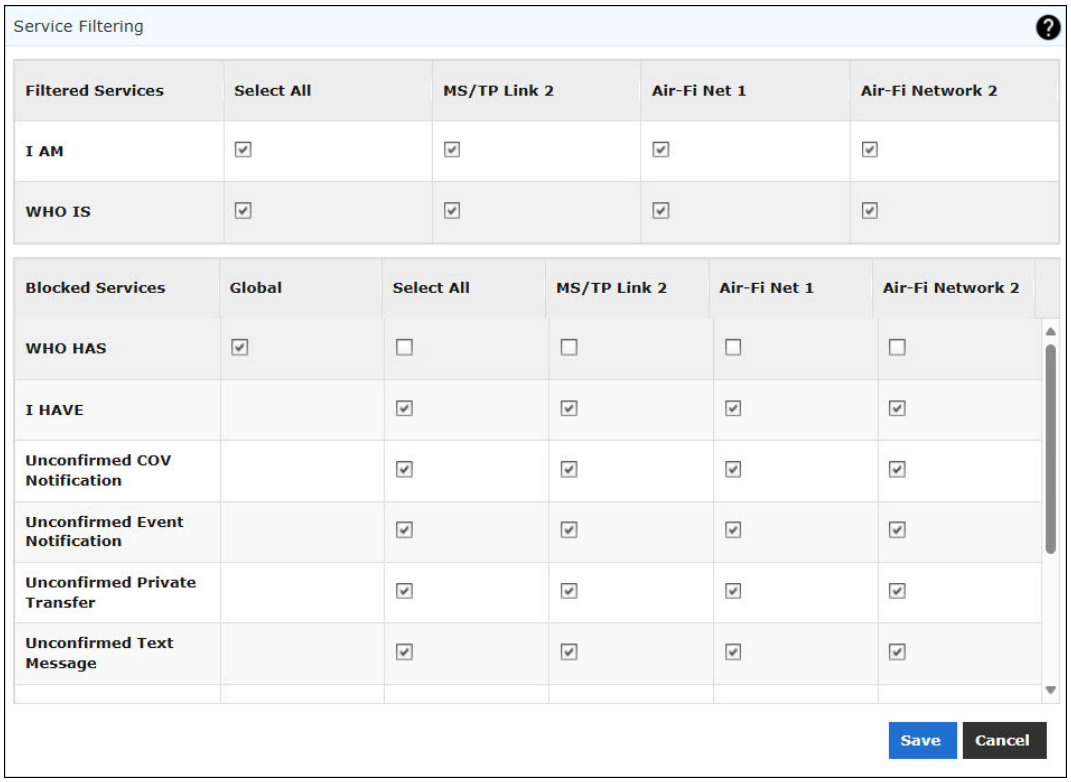
Select associated checkbox to filter unwanted request traffic on one or multiple links. SC+ keeps track of downstream device IDs and thus will allow them to pass through while blocking the rest.

Blocked Services

Select associated checkbox to block unwanted request traffic on one or multiple links. SC+ will block all selected services.

Note: *Global WHO HAS checkbox blocks all WHO HAS requests at the SC+ level, versus one or more of its links.*

Figure 142. Service filtering checkboxes



Appendix M: Setting Up A2L System Mitigation

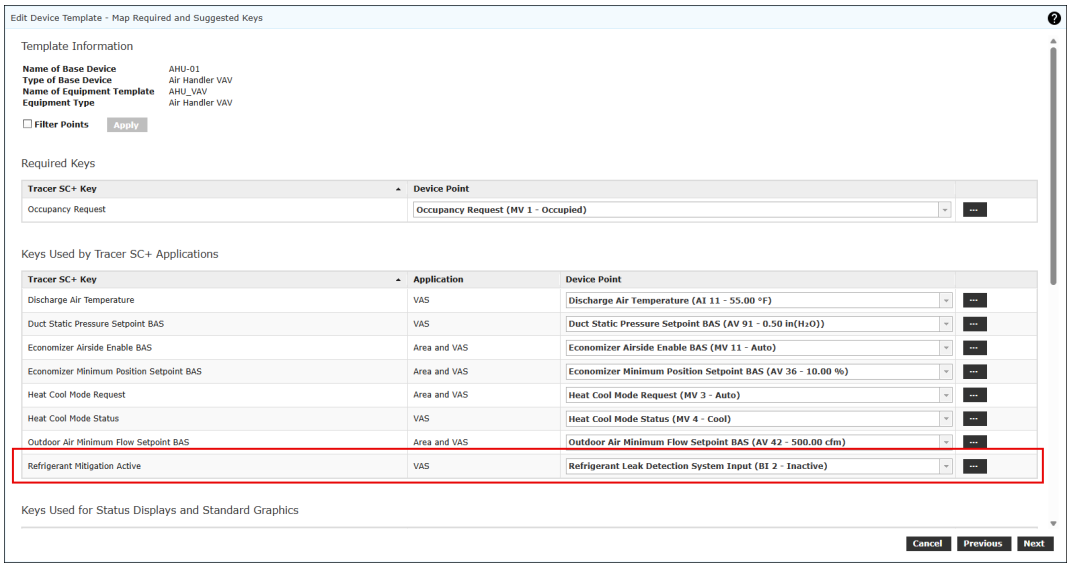
Equipment mitigation for A2L refrigerant leak detection events is to be provided by the equipment controller based on the status and validity of the leak detection system. For single zone applications, no additional system control is necessary. However, multiple zone applications require mitigation coordination between the air handling unit and associated VAV terminals.

Beginning at version 6.1, VAS now includes a check box to indicate whether this instance of VAS includes A2L equipment, in which case additional mitigation and coordination is required.

Beginning at version 6.3, the check box was removed and Enable/Disable is done via Mitigation Sequence point on the Details page.

As shown in Figure 143, p. 231, Trane equipment with A2L refrigerant includes the BACnet point ***Refrigerant Mitigation Active***, that automatically maps to the equipment template in Tracer SC+/Synchrony during installation. The new key has been added to both the Equipment and Spaces templates.

Figure 143. Equipment template – Refrigerant mitigation active

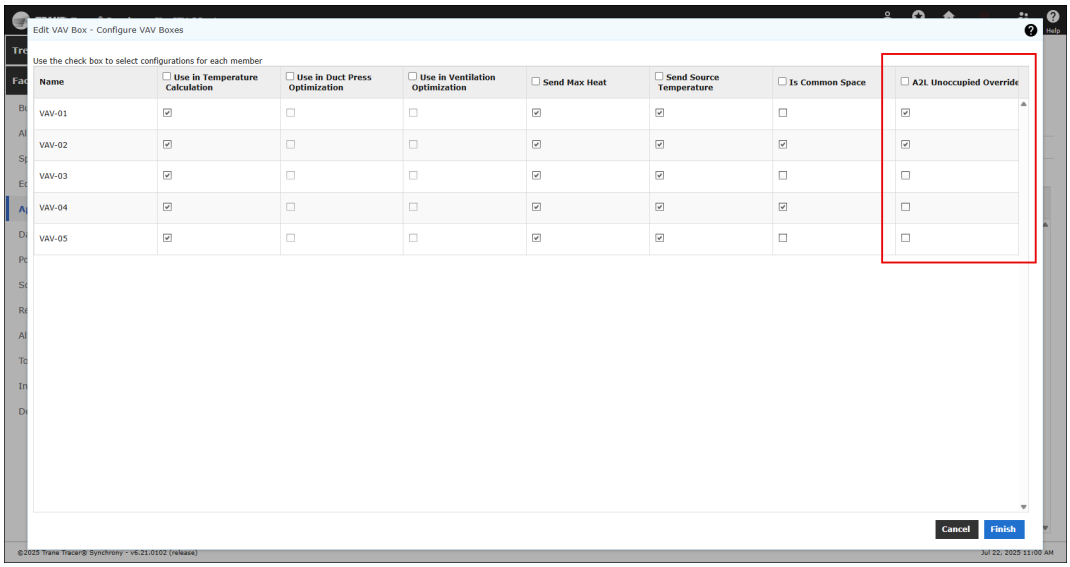


The ***Refrigerant Mitigation Active*** key is not normally mapped with R-410A equipment. In cases where ***Refrigerant Mitigation Active*** is not automatically mapped for R-454B equipment, it may be necessary to manually map the applicable point in the unit controller. Since third party controllers will likely use a BACnet point with a different name, carefully select the applicable point in the third-party controller.

ASHRAE Standard 15 requires mitigation actions within 15 seconds of leak detection. In cases where leak detection occurs during the unoccupied mode, it is important to provide an adequate path for air flow prior to starting the air handling unit supply fan. To avoid a race condition between the VAV box position override and the supply fan operation, the user may select VAV boxes to override open during unoccupied, pre-positioning those boxes in case leak detection occurs. Refer to below figure.

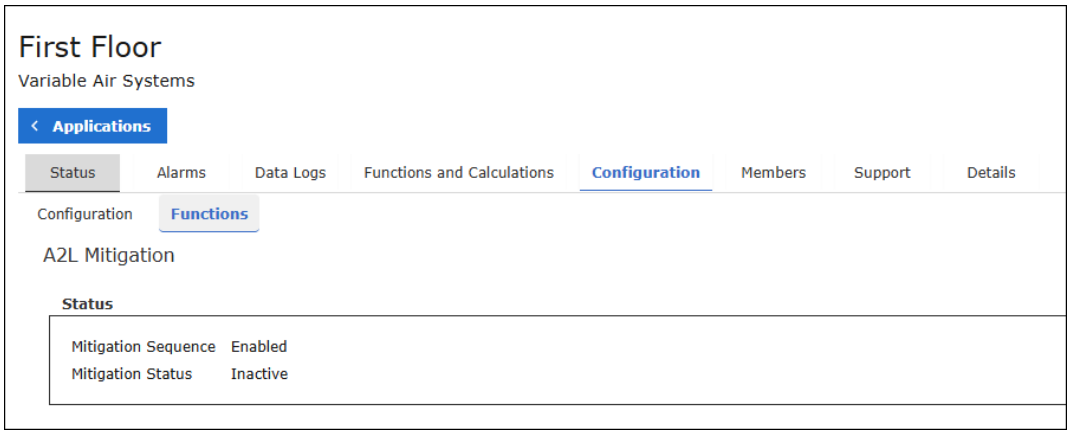
From the **VAS > Members > VAV Box** page, select one or more VAV members, then **Actions > Edit Configuration**. Select which members to override fully open during unoccupied, the **Finish**.

Figure 144. Edit Configuration – Unoccupied Override



The A2L system configuration and status are summarized on the **Configuration > Functions** page in a dedicated section titled A2L Mitigation. As shown in Figure 145, p. 232, the **Mitigation Sequence** reflects whether the VAS is configured for A2L mitigation sequences. The **Mitigation Status** reflects the state of the Refrigerant Mitigation Active point in the connected equipment controller.

Figure 145. A2L mitigation status



To ensure proper operation during mitigation, the ***Air Flow Override*** key in the VAV Box Spaces template must be properly referenced to the applicable point in the associated VAV Box controllers. For Trane controls, this mapping is normally accomplished automatically. For non-Trane controllers, mapping and/or key conversion will likely be necessary.

During the unoccupied mode and just after auto calibration, VAS sends an enumeration of FULLY OPEN to the VAV boxes designated for unoccupied override. Similarly, VAS sends FULLY OPEN to the remaining VAV boxes during mitigation. Once the mitigation has ended, VAS releases the override to the undesignated boxes but leaves the override in place to the designated boxes until the transition to occupied mode. When auto calibration is disabled, VAS overrides the boxes to FULLY OPEN in the unoccupied mode while monitoring the ***Heat Cool Mode Status***. When the ***Heat Cool Mode Status*** is CALIBRATE, VAS will temporarily release the air flow override, allowing the VAV box to calibrate. Once calibration has ended, VAS will reinitiate the flow override.

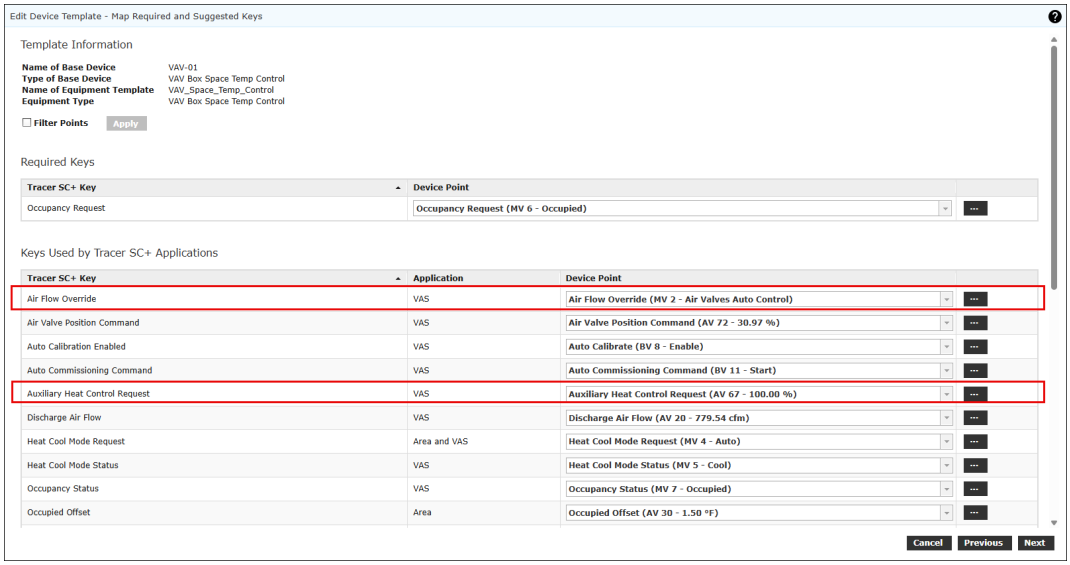
In addition to the flow override, Figure 5 shows how the ***Auxiliary Heat Control Request*** must also be mapped correctly in the VAV members to properly disable electric heat during mitigation. This point is normally mapped automatically for Trane VAV Boxes. Like the override above, mapping and/or key conversion will likely be necessary for non-Trane VAV Boxes.

During mitigation, VAS sends a value of ZERO to the Auxiliary Heat Control Request point to disable electric heat. Once mitigation has ended, VAS releases the override, allowing electric heat to operate as needed. VAS will forego sending the

override during mitigation when the ***Reheat Type*** is either hot water or steam, enforcing the overridden value only for electric reheat.

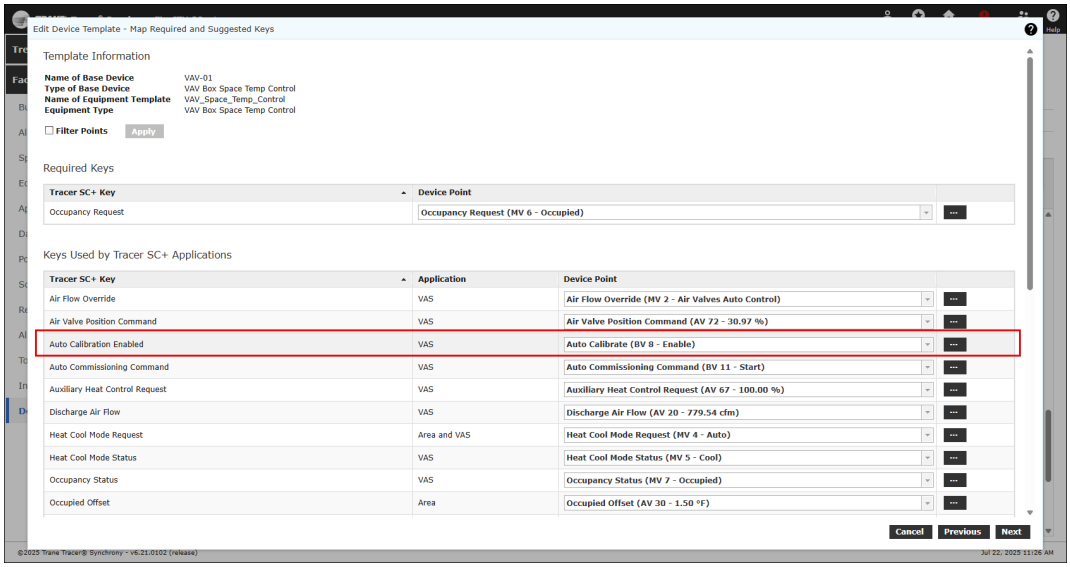
Note: *For Trane VAV Boxes, commanding the Air Flow Override point to Air Valves Full Open will put the VAV in Test Mode(Heat Cool Mode Status) and thus locking out Electric Heat. This is true for all VAV boxes(Shutoff VAV, VAV with Reheat, and Parallel Fan-powered VAV) except Series Fan-powered VAV.*

Figure 146. VAV override template mapping



Trane VAV boxes include an option for auto calibration. When enabled, auto calibration initiates the calibration sequence in the VAV box just after the transition from occupied to unoccupied mode. Though template/point mapping for Trane controllers is normally automatic, mapping for non-Trane controller may not be applicable, depending on the BACnet points and associated functionality in those non-Trane controllers. As shown in Figure 147, p. 233, the ***Auto Calibration*** point in the controller is automatically mapped for Trane VAV boxes to the Auto Calibration Enabled template key.

Figure 147. Auto calibration template mapping



Notes

Trane - by Trane Technologies (NYSE: TT), a global innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

BAS-SVX077T-EN 12 Oct 2025
Supersedes BAS-SVX077R-EN (July 2025)