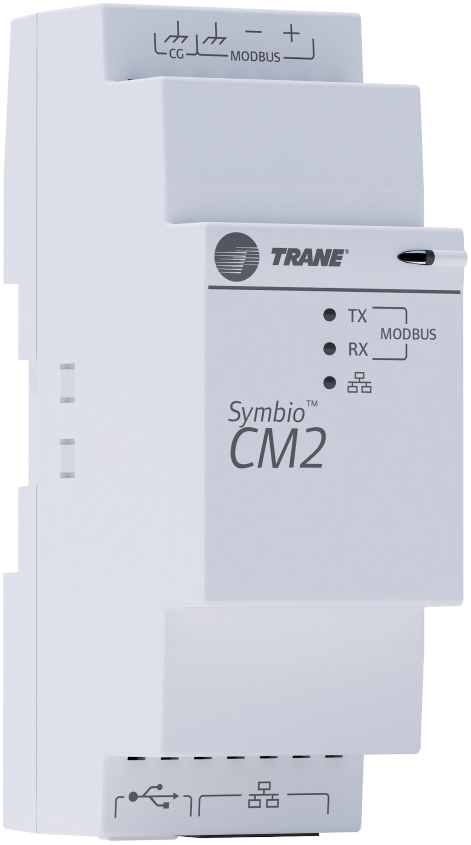
Installation, Operation, and Maintenance

Symbio™ Communication Module (CM2)



⚠ 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.

July 2024

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Trademarks

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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.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ 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.**

Table of Contents

Overview

When used with a Symbio™ controller, the Symbio Communication Module (CM2):

- Provides additional IP connection, which can be configured for use with either BACnet IP or TD7 display.
- Enables Modbus client capability (communication with third-party downstream Modbus devices).
- The CM2 communication module is connected to a Symbio controller via USB port.

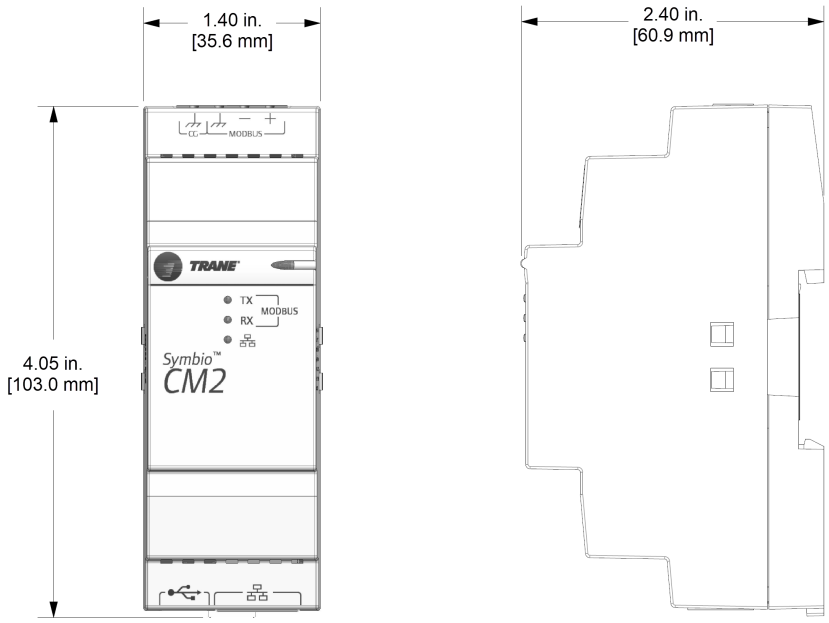
Specifications

Table 1. Storage and operating environment specifications

Storage	
Temperature:	-67°F to 203°F (-55°C to 95°C)
Relative humidity:	5% to 95% (non-condensing)
Operating	
Temperature:	-40°F to 158°F (-40°C to 70°C)
Humidity:	5% to 95% (non-condensing)
Power:	24 Vdc ±10%, 120 mA
Mounting weight of controller:	Mounting surface must support 0.17 lb. (0.077 kg)
Environmental rating (enclosure):	NEMA 1
Installation:	UL 840: Category 3
Pollution:	UL 840: Degree 2
Agency Compliance	
• UL60730-1 PAZX – (Open Energy Management Equipment) • UL94-5VA Flammability • CE Marked • FCC Part 15, Subpart B, Class B Limit • UKCA Marked • AS/NZS CISPR 32:2015 Class B Limit • VCCI-CISPR 32:2016: Class B Limit • CAN ICES-003(B)/NMB-003(B)	

Dimensions

Figure 1. CM2 dimensions



*One DIN unit = 18 mm

*DIN Standard 43 880, Built-in Equipment for Electrical Installations, Overall Dimensions and Related Mounting Dimensions

Important: *Slotted release clip shown– if removing or repositioning the controller, the user must remove connectors before proceeding.*

Installation Instructions

Location Guidelines

Before installing the CM2, choose a location that is:

- In an environment protected from weather elements.
- Restricted from public access to minimize tampering and vandalism.
- Near the controlled equipment to reduce wire usage.
- In an area easily accessible by service technicians.

Required Tools for Mounting and Wiring

A 1/8 inch, flat-bladed screwdriver is required to remove or reposition the module on the DIN rail.

Mounting and Removing the CM2 Module

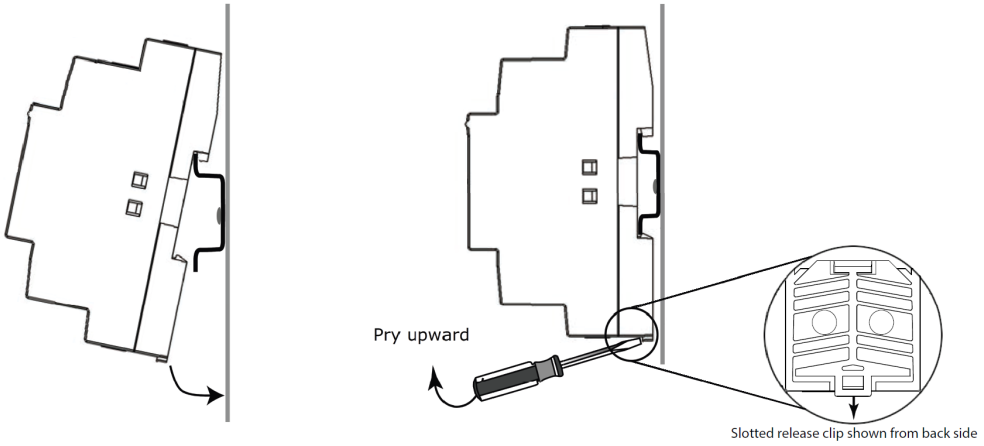
To mount the CM2 on the DIN rail:

1. Hook device over top of DIN rail.
2. Gently push on lower half of device in the direction of arrow until the release clip clicks into place.

To remove or reposition the device:

1. Disconnect all connectors before removing or repositioning.
2. Insert screwdriver into slotted release clip and gently pry upward on the clip with the screwdriver.
3. While holding tension on the clip, lift device upward to remove or reposition.
4. If repositioned, push on the device until the release clip clicks back into place to secure the device to DIN rail.

Figure 2. CM2 mounting or removal

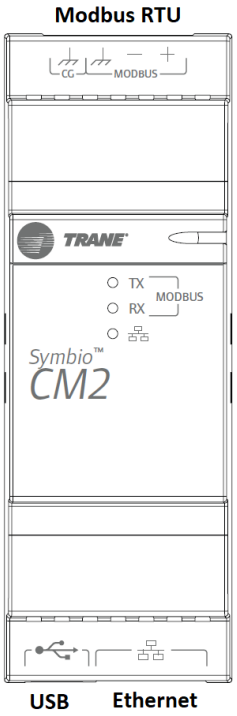


Connection Details

The CM2 module includes field connections for Modbus RTU (RS-485), Ethernet (RJ-45), and the USB cable for connection to the Symbio™ 500 controller.

- Use Modbus +, Modbus -, and Modbus GND for connection to the Modbus server(s).
- Use the Common GND connection to ground the CM2 module to the chassis of the panel or unit.

Figure 3. CM2 connection details



Modbus RTU	+	Modbus +
	-	Modbus -
		Modbus GND
		Common GND
USB-C		USB Connection to Symbio 500
Ethernet		BACnet/IP or TD7 Connection

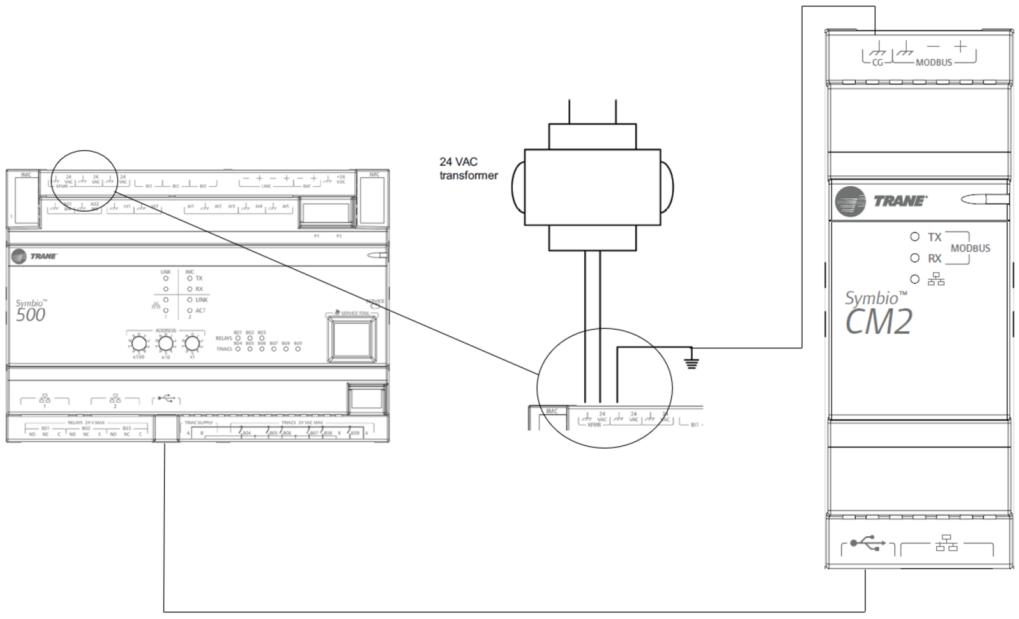
Connecting Common GND and Chassis GND to the Symbio Controller

1. Connect the USB-C end of the cable to the CM2 module.
2. Connect the USB-A end of the cable to a USB port on the Symbio controller.
3. Mount on DIN rail horizontally or vertically (allow for proper ventilation clearance).

Important:

- *Route the USB cable so that it will not be damaged by panel doors or similar obstructions. Severely kinked, cut, or otherwise damaged cables should be replaced even if they appear to be in working order.*
- *Do not route the USB cable in proximity with electrically noisy cables such as AC power (24, 120, 240 VAC), or wires that are switched by relays or contactors. Maintain a minimum distance of 5.9 inches (150 mm) between the USB cable and these types of cables and wires.*

Figure 4. CM2 connecting to Symbio controller



Important: *The Symbio controller must be properly connected to chassis ground.*

LED Functions

After powering up the Symbio controller, the transmitting (TX) and receiving (RX) LEDs blink when communication occurs between the devices. Note the following LED activity on the front of the CM2 module:

Marquee LED:

- Solid green — power is present.
- Off — no power is present.

Modbus:

- TX — blinks with CM2 Modbus transmit activity. Even if the CM2 is not physically wired into a Modbusy network, this LED constantly blinks as the controller continually scans for additional devices.
- RX — blinks with CM2 Modbus receive activity.

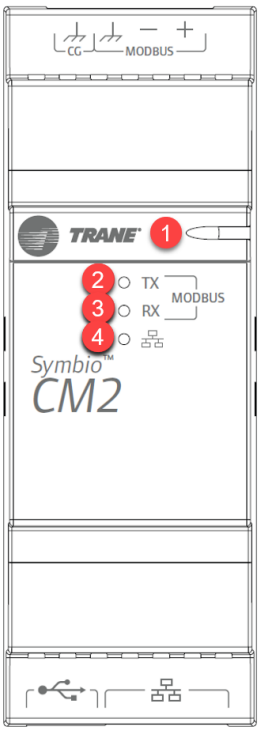
Ethernet:

- Solid green — indicates an active Ethernet link, without activity.
- Blinking green — indicates an active Ethernet link with network activity.
- Off — indicates there is no active Ethernet link connected to the CM2 Ethernet port.

If the LEDs are not lit:

- Determine if a CM2 device is trying to talk to a controller or if it is capable of talking to the controller.
- Determine if the communication status shows down all the time.
- Check wiring polarity and baud rate.

Figure 5. CM2 LED functions

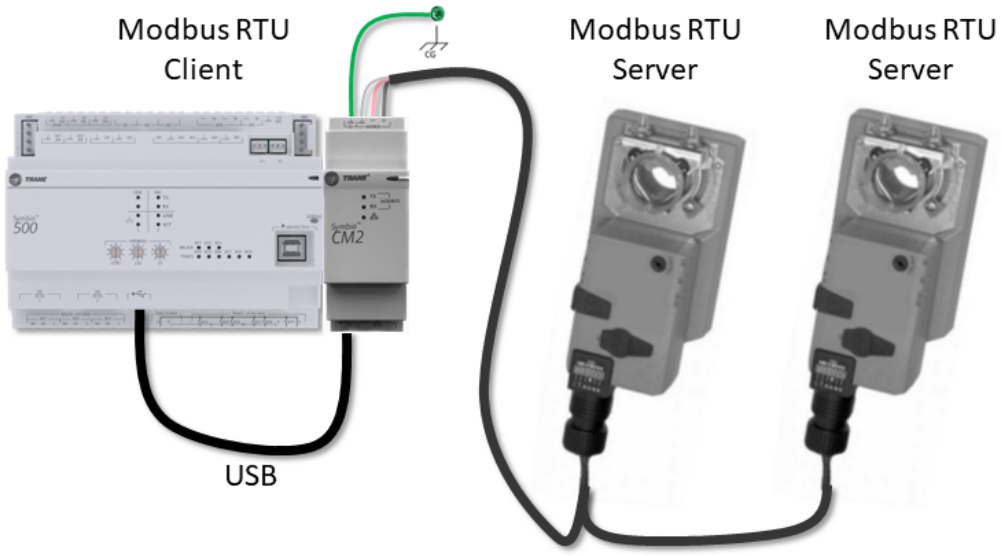


LEDs	1	Power	Green
	2	TX	Green
	3	RX	Amber
	4	IP Network	Green

Modbus RTU Connection

The CM2 module includes Modbus Client functionality for a local Modbus RTU network. Consider the addition of the CM2 module to enable communication with a variety of Modbus server devices.

Figure 6. Modbus RTU client and server devices



Modbus RTU is a client/server protocol, where the client requests information from one or more servers. With Modbus RTU, there can be only one client for each network. The server devices reply only when communication is initiated by the client and otherwise remain passive/silent.

The Modbus Client settings of the CM2 module must match the settings of all connected Modbus RTU server devices. These settings include the baud rate, parity bit setting, and stop bits. For all connected devices to communicate, these settings must be identical for all devices.

Because the CM2 module is a Modbus Client, it does NOT need a Modbus address. However, each Modbus RTU server must have a unique Modbus address. It is recommended to start addressing with address 1 and increment by 1 for each additional Modbus server device.

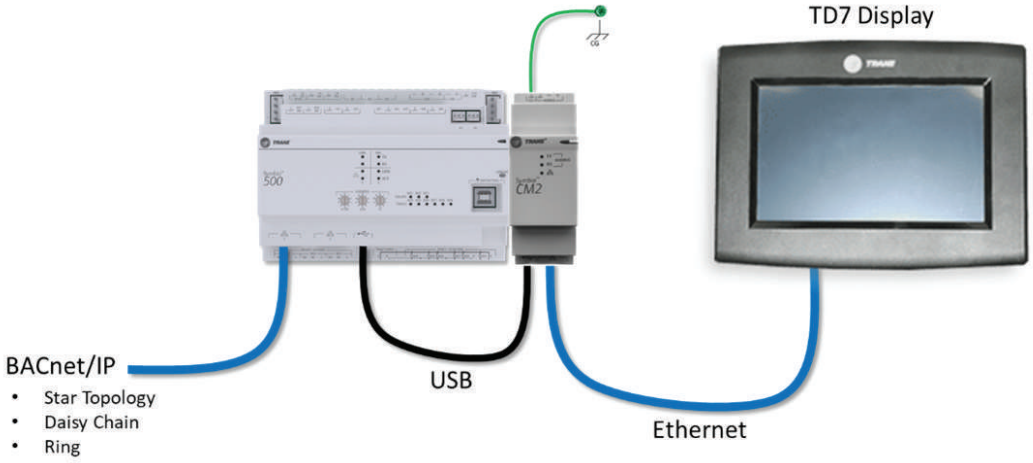
Refer to the Modbus server device manufacturer's literature for specific setup and configuration information. Because the default Modbus settings vary by manufacturer, confirm all addressing and communication settings as part of the installation and commissioning process.

Ethernet Connection

The Symbio™ 500 controller has two Ethernet ports, labeled 1 and 2, that are internally connected as one port. The ports share one IP address and associated setup parameters. These ports enable wired BACnet/IP or support for the TD7 display. Because the ports are internally connected as one, simultaneous use of BACnet/IP and the TD7 display requires the CM2 communication module.

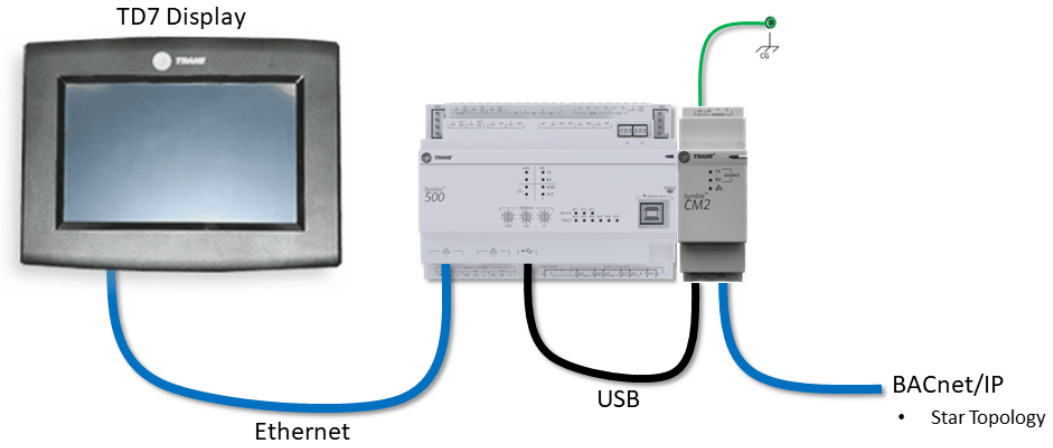
As shown in Figure 7, p. 12, use the CM2 for the TD7 display connection while connecting the BACnet/IP network to the Symbio controller (star, daisy chain, or ring topology).

Figure 7. CM2 module with TD7



Alternately, Figure 8, p. 12 demonstrates another connection option, with the TD7 display connected directly to the Symbio 500 controller and network communication to the CM2 module. Because the CM2 includes functionality associated with only a single Ethernet port, only BACnet/IP star topology is supported in this configuration.

Figure 8. CM2 module with BACnet/IP

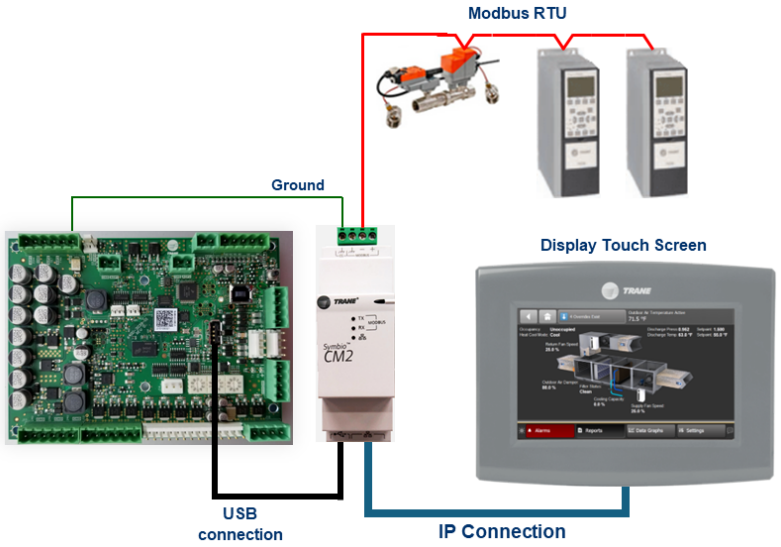
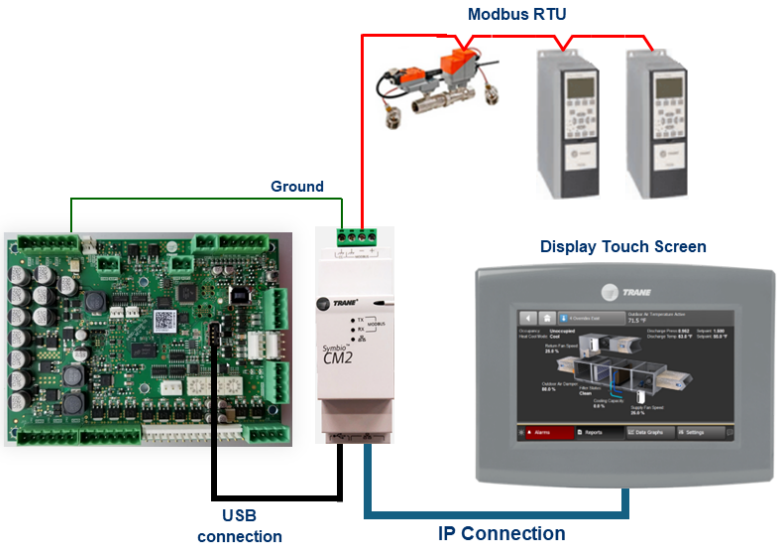


Note: *Two TD7 displays cannot be connected simultaneously. A warning message displays if two TD7 displays are connected.*

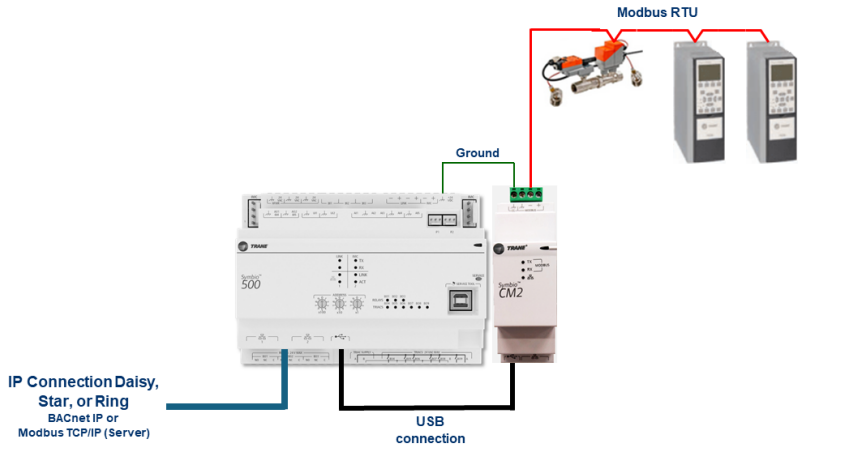
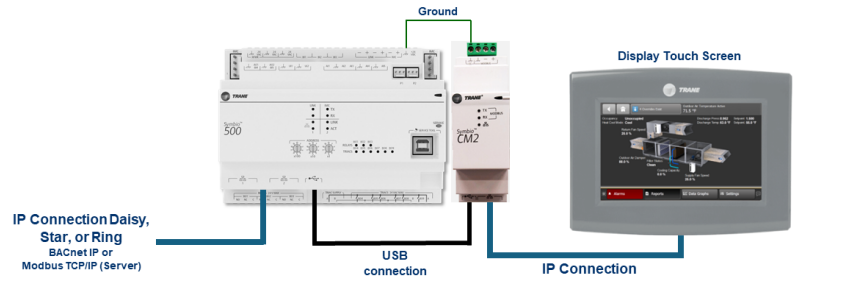
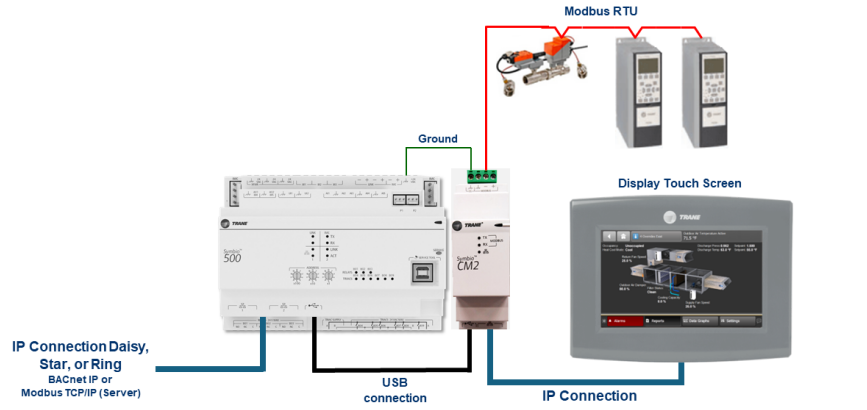
For more information on BACnet/IP wiring refer to BACnet®/IP Wiring and Best Practices Application Guide, BAS-APG046*–EN.

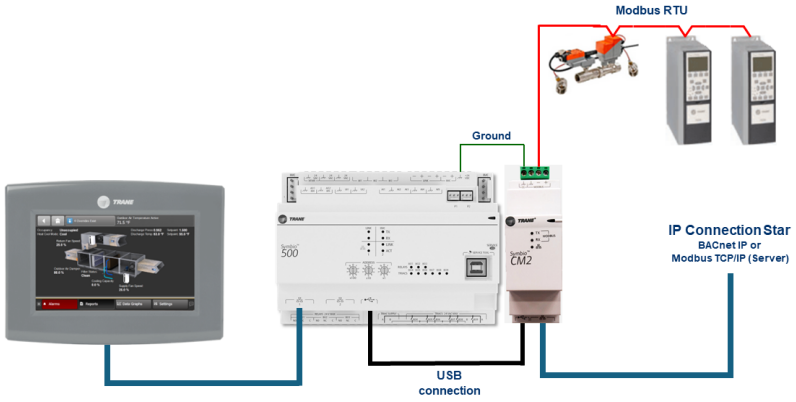
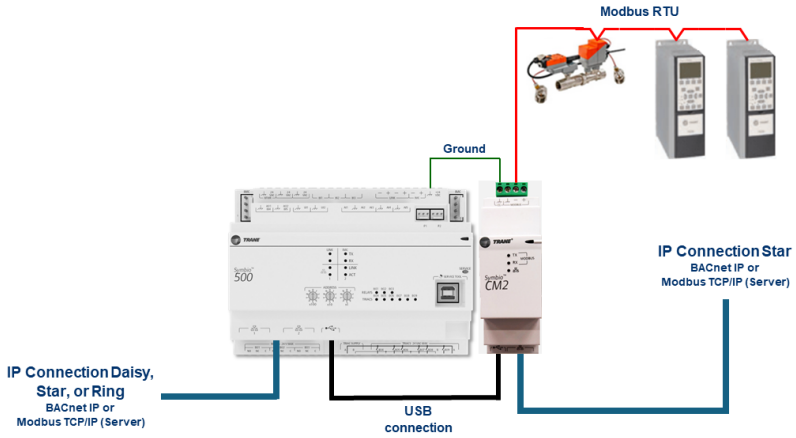
Symbio Communication Module (CM2) Connection Combinations

The following are examples of combinations for connecting CM2 module with Symbio™ 400/500 controllers.

Symbio 400–B use case 1: • Modbus RTU Client capability • Communication to 3rd party Modbus devices • IP connection to communicate BACnet/IP or Modbus TCP/IP	
Symbio 400–B use case 2: • Modbus RTU Client capability • Communication to 3rd party Modbus devices • TD7 display supported	

Symbio Communication Module (CM2) Connection Combinations

Symbio 500 use case 1: • Modbus RTU Client capability • Communication to 3rd party Modbus devices	
Symbio 500 use case 2: • IP connection and the TD7 display simultaneously supported	
Symbio 500 use case 3: • Modbus RTU Client capability • Communication to 3rd party Modbus devices • IP connection and the TD7 display simultaneously supported	

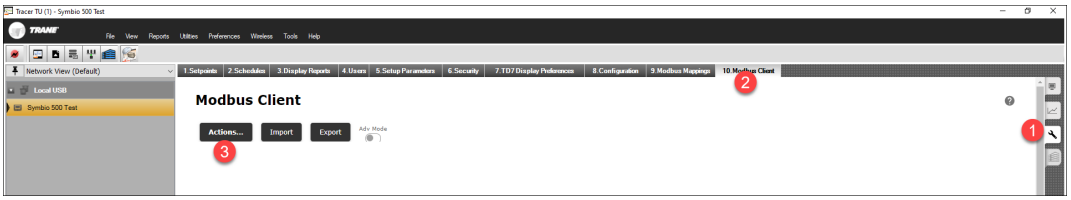
Symbio 500 use case 3a: • Modbus RTU Client capability • Communication to 3rd party Modbus devices • IP connection and the TD7 display are simultaneously supported • The IP Port in the CM2 can be configured for an IP connection	
Symbio 500 use case 3b: • Modbus RTU Client capability • Communication to 3rd party Modbus devices • Two IP connections are simultaneously supported	

Configuration of CM2 Module — Modbus and Ethernet Settings

Configure Modbus Client Settings

1. Use Tracer TU to connect to the Symbio™ controller.
2. With the controller connected, select the **Equipment Utility** wrench on the right side of the page.
3. Select the **Modbus Client** tab at the top of the page.

Figure 9. Modbus client actions



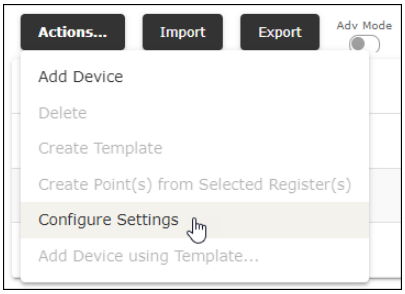
Important: *If the Modbus Client tab does not display in Tracer TU, confirm that:*

- *The CM2 module is communicating with the Symbio controller.*
- *The firmware version of the Symbio controller supports the CM2 module. Firmware version 2.10.0017 and later are compatible with this module.*

4. Select **Actions** > **Configure Settings** to view/edit the Modbus communication settings of the CM2 module.

   Note: *Confirm the settings prior to defining the first Modbus server, as the definition process is streamlined when the device is connected and communicating.*

Figure 10. Configure settings



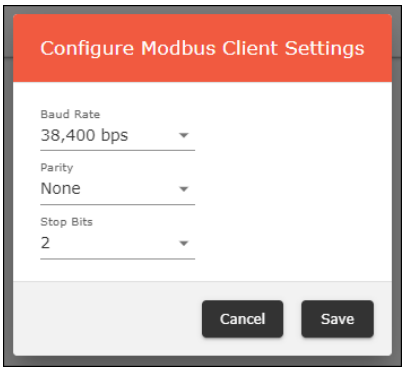
Important: *The Modbus settings for all connected servers must be identical.*

Table 2. Modbus client settings

Baud Rate	2400, 4800, 9600, 19200, 38400, 57600, or 115200 bps
Data Bits (not shown)	8
Parity Bit	Even, Odd, or None
Stop Bits	1 or 2

Note: *If the manufacturer does not provide the default address information, the common default for many devices is 9600-8-N-1.*

Figure 11. Modbus client settings



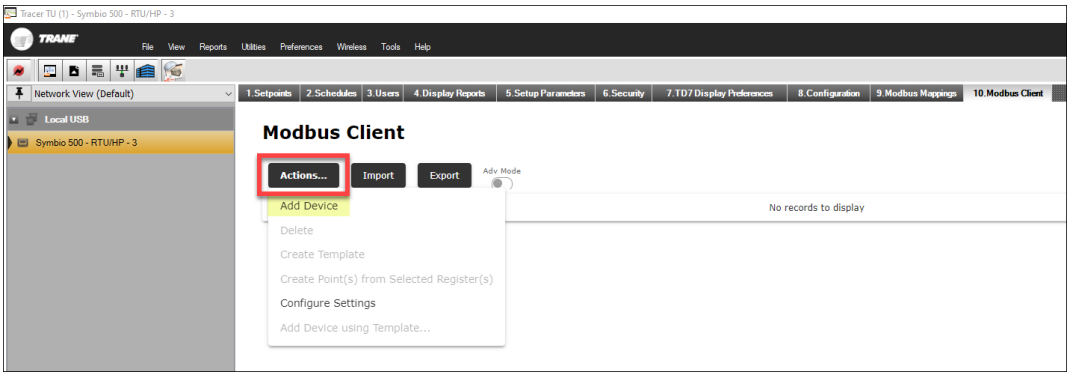
Modbus Register Definition

The manufacturer of each connected Modbus RTU server provides a list of the available Modbus points (registers). The interpretation of the device data will likely vary from manufacturer to manufacturer. Carefully read the documentation provided by the manufacturer for integration instructions pertaining to each register and register type. The register types are described further in the setup section below.

Because manufacturers normally provide comprehensive data lists with more registers than may be needed for a specific application or project, consider defining only those registers that are essential. This will reduce integration time, effort, and the network traffic once the integration of all devices is complete.

1. To begin the definition for the first device, select **Actions** > **Add Device** from the Modbus Client page.

Figure 12. Add device

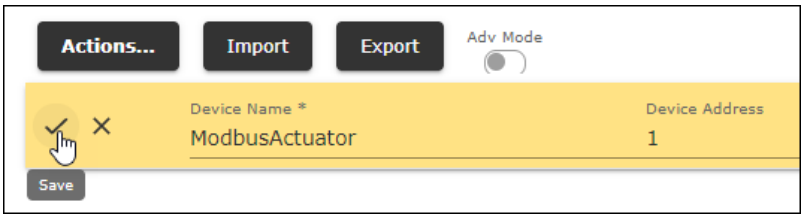


2. Enter a unique name for the Modbus server device.

Important: *Do not include spaces or special characters in the name.*

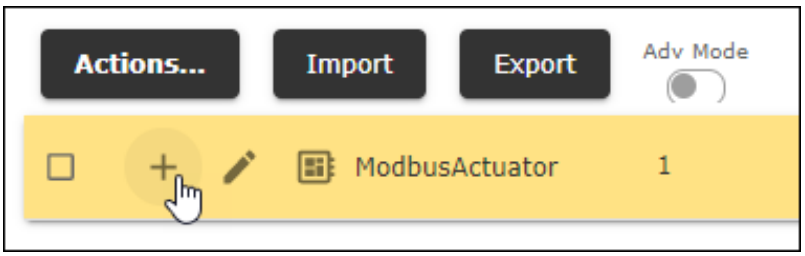
3. Provide the unique address for the Modbus server device.
   - The valid range is 1 to 247.
   - Refer to the manufacturer's documentation to confirm the default address.
   - Use the manufacturer's instructions to edit the Modbus address at the device as appropriate.
4. Click the check mark to save.

Figure 13. Save Device Name and Address

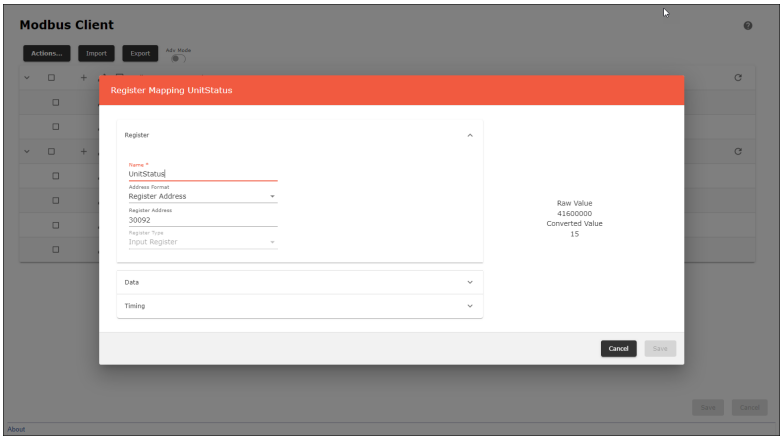


5. Select the **+** icon to add the definition for the first Modbus register.

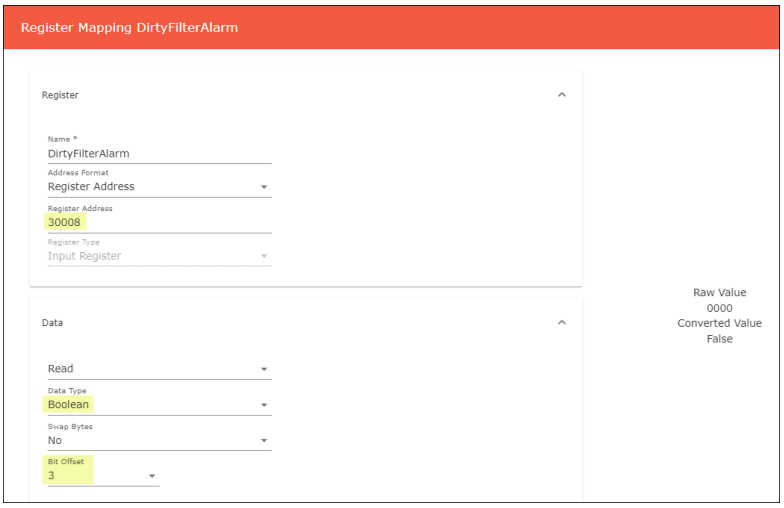
Figure 14. Define register(s)



6. Define the Modbus register:

Field	Definition
Name	Provide a unique name for the Modbus register. ***Important:*** *Do not include spaces or special characters in the name.*
Address Format	Select from the available address formats. Refer to the device manufacturer's documentation to confirm the preferred format. Register Address Decimal Offset Hex Offset
Register Address/Offset	Provide the register address/offset. Refer to the manufacturer's documentation to identify the appropriate value. **Example:** Address formats that represent the same data. Register Address: 30092 Decimal Offset: 91 (30001 + 91) Hex Offset: 5b (0x5b = 91 decimal, 30001 + 91) ***Best Practice:*** *During the register mapping process for each register, the* ***raw value*** *and* ***converted value*** *appear on the right-hand side of the pop-up window when the Modbus server is connected and communicating.* **Figure 15. Register definition** 

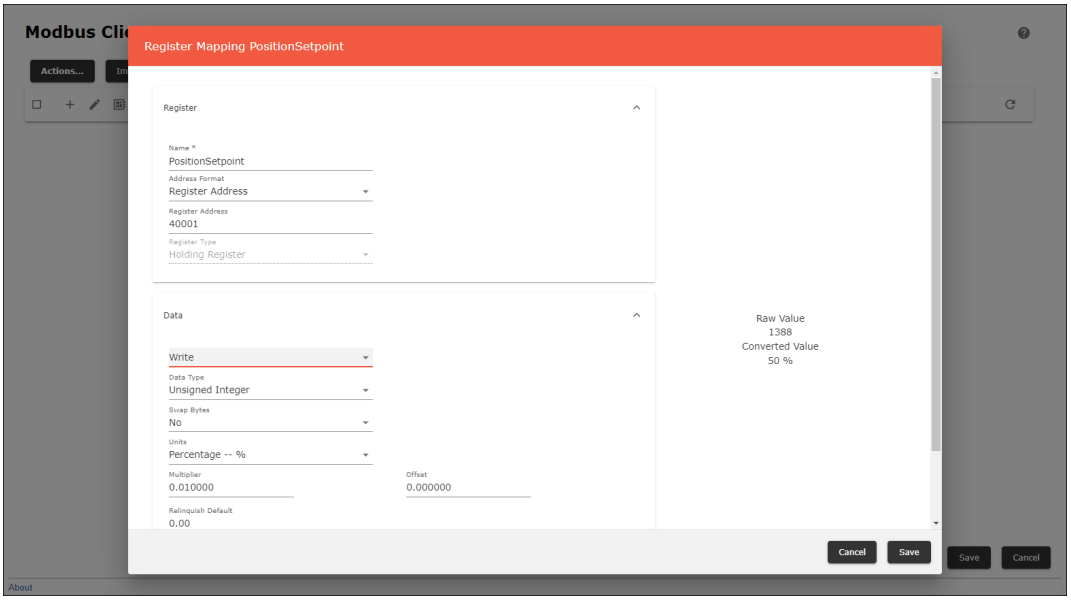
Field	Definition
Register Type	When the register address is provided (see above), the register type is automatically selected from the available list of options. For decimal or hex offset scenarios, select the appropriate type from the list below. Coil (1–9999) Read/write (binary outputs) Discrete Input (10001-19999) Read discrete input contacts (binary inputs) Input Register (30001-39999) Read analog input registers (analog inputs) Holding Register (40001-49999) Read/write analog output holding registers (analog outputs)
Data Section	
Read or Write	Select if this register is defined by the device manufacturer as a read or write register. ***Important:*** • *Depending on the manufacturer's implementation, some registers are written to permanent/retained memory, which is limited by a finite number of writes before the memory may become compromised. Use caution when writing to such registers.* • *In some instances, it may be necessary to create two points for the same register – one to write the value to the register and a second to read the status of that same register. The write register reflects the last written value and does not represent the corresponding status.*
Data Type	Refer to the manufacturer's documentation to determine the data type. Select the from the available options based on the documentation. Unsigned Integer (16-bit unsigned integer; range: 0 to 65535) Signed Integer (16-bit signed integer; range: -32768 to 32767) Unsigned Long (32-bit unsigned integer; range: 0 to 4,294,967,295) Signed Long (32-bit signed integer; range: -2,147,483,648 to 2,147,483,647) Float (32-bit floating point number) Boolean (on/off value)
Swap Bytes	Depending on the data type and definition, byte order swapping may be necessary to properly interpret the register data. Refer to the manufacturer's documentation as to whether byte swapping is necessary. No Yes
Units	To properly setup the BACnet object when integrating to Tracer SC+ or a non-Trane BACnet controller, select from the available units of measure to associate with the register data or leave the unit selection as none. None Select from list
Multiplier	Depending on the implementation by the device manufacturer, it may be necessary to apply a multiplier to the data to properly display the intended value. Refer to the device manufacturer's documentation for details on the application of a multiplier. For example, the manufacturer may provide data for the actuator position as an unsigned integer with range = 0 to 10,000. To properly interpret the data as 0 to 100%, apply a multiplier of 0.01.

Field	Definition
Offset / Bit Offset	Depending on the implementation by the device manufacturer, it may be necessary to apply an 'offset' to the data to properly display the intended value. For example, to convert Modbus data to a BACnet multistate object, it may be necessary to add an offset of 1 to simplify the integration of the Modbus and BACnet data. Use 'bit offset' to identify a packed bit. Bit offset 0 refers to the least significant bit in the 16-bit data. **Figure 16. 16–bit offset** 16-bit Data (2 bytes) Byte: 0 0 0 0 0 0 0 0 | Byte: 0 0 0 0 0 0 0 0 Data: 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 *Offset*: *15 14 13 12 11 10 9 8* | *7 6 5 4 3 2 1 0* For example, if the dirty filter alarm is a packed bit (bit offset = 3) in the 16-bit register shown above, configure the register definition as follows: **Figure 17. Bit offset example** 
Relinquish Default Section	
Fault Value	With 'use fault' checked and the value in fault, the controller will use the 'fault value'.
Use Fault	With 'use fault' checked and the value in fault, the controller will use the 'fault value'.
Register Order	3210 (Big Endian) 1032 (Little Endian) 2301 (Big Endian, Byte Swapped) 0123 (Little Endian, Byte Swapped)
Timing Section	
Interval (milliseconds)	If the controller has identified a Modbus device to Communication Down, this is the amount of time in seconds (s) the controller will not make requests to the non-communicating device. The default interval is 100 ms. ***Note:*** *The Modbus device cannot have its communication state restored to Communications Up until this timer expires.*
Retries	If the Modbus device fails to respond to a request, the retry count is the number of additional times the message is resent before the controller will go to the next request. If the Modbus device does not respond to any of the messages, the controller will set the Modbus device to Communication Down. The default retry count is 2.

Field	Definition
Timeout (milliseconds)	The amount of time in milliseconds (ms) the controller will wait for a response before assuming there will not be a response. This will trigger a retry unless the retry count has been reached. The default response timeout is 100 ms.
Inter-Message Delay (microseconds)	The amount of time in microseconds (µs) the controller will wait to send another request after receiving a response. The default Inter-message delay is 0 µs. **Figure 18. Timing parameters** 

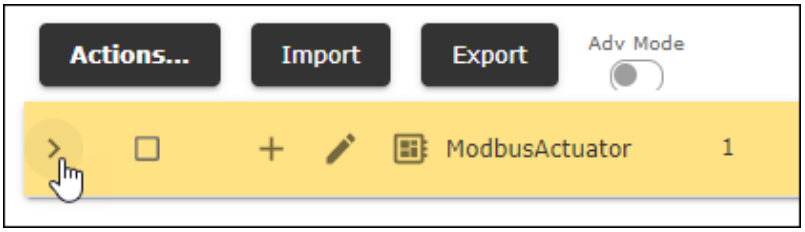
7. To save the setup for this register and close the pop-up and select **Save**.

Figure 19. Save the setup



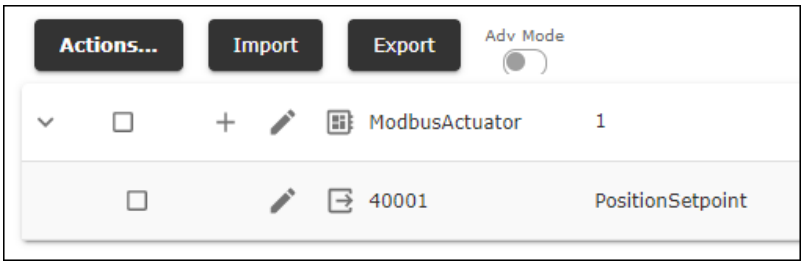
8. To view the summary for the newly created Modbus register, expand the tree by selecting the **>** icon.

Figure 20. Expand the tree



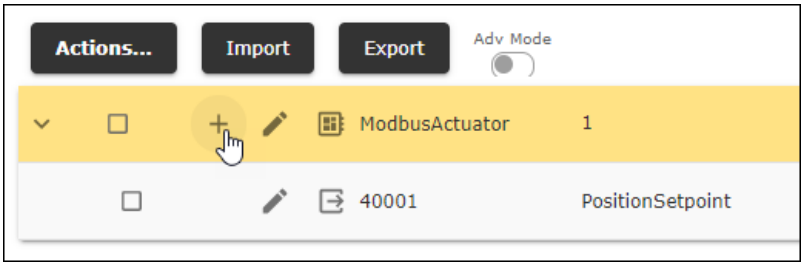
The expanded view displays all registers defined for this Modbus server device.

Figure 21. Register summary



9. With the first register visible, select the **+** icon to begin the definition of the next register.

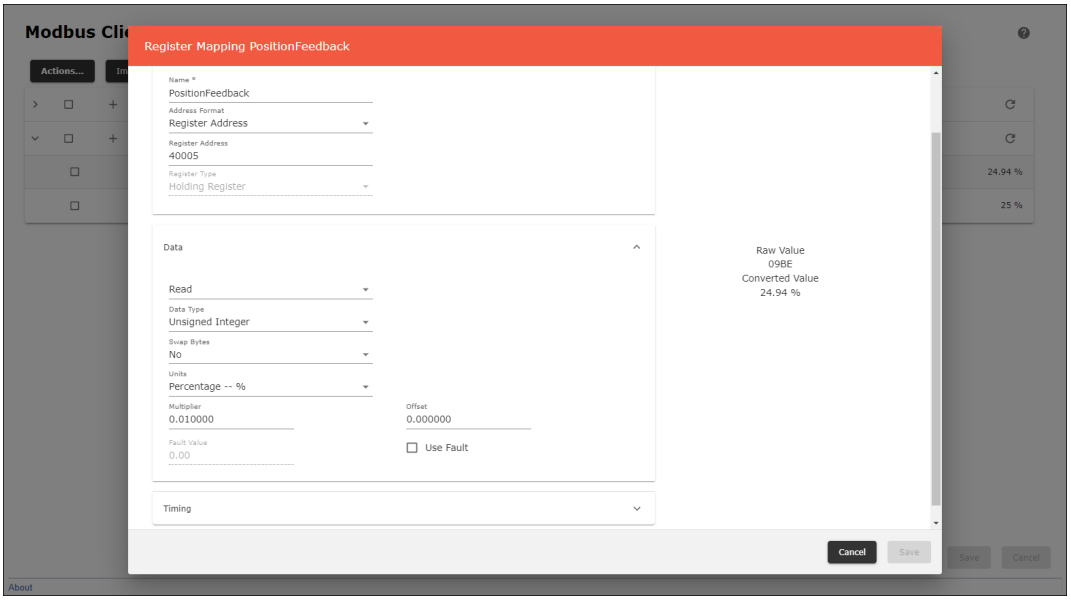
Figure 22. Defining additional registers



Repeat the process for any additional registers.

In this example, the first register is associated with the position setpoint for a Modbus actuator. The second register, definition shown below, represents the position feedback for that same actuator.

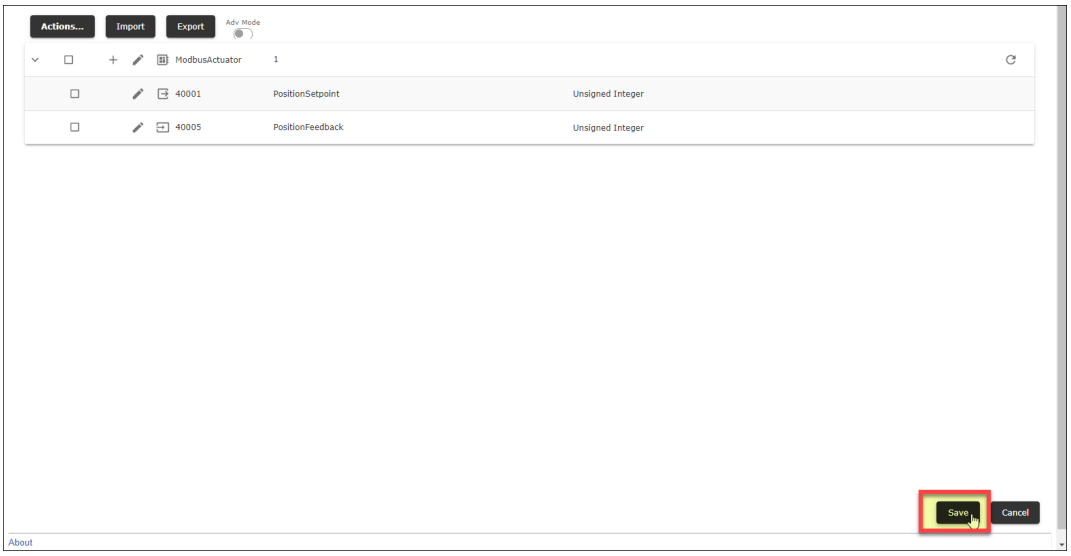
Figure 23. Read register example



Once the mapping setup is complete for the register, click **Save**.

With all Modbus register definition complete, select **Save** from the Modbus Client page. This sends the Modbus definition to the controller.

Figure 24. Save Modbus setup

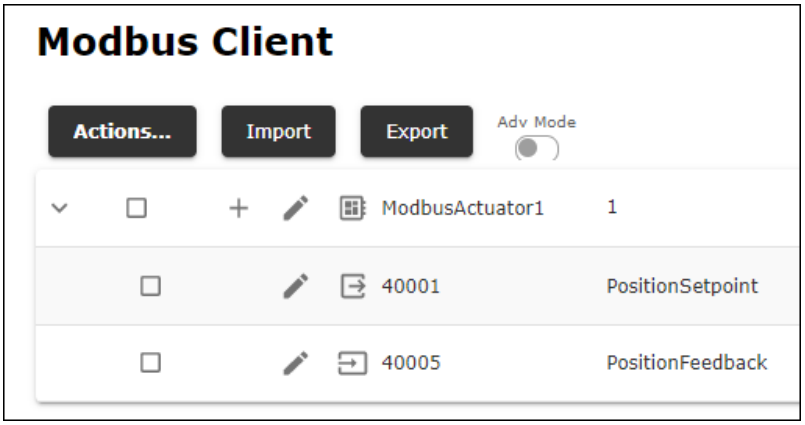


Export and Import

Use the Export and Import capability to use the configuration of one device to simplify the definition of a similar device on a different controller. With the definition of the Modbus device complete, select the Export button to create a representation of the device.

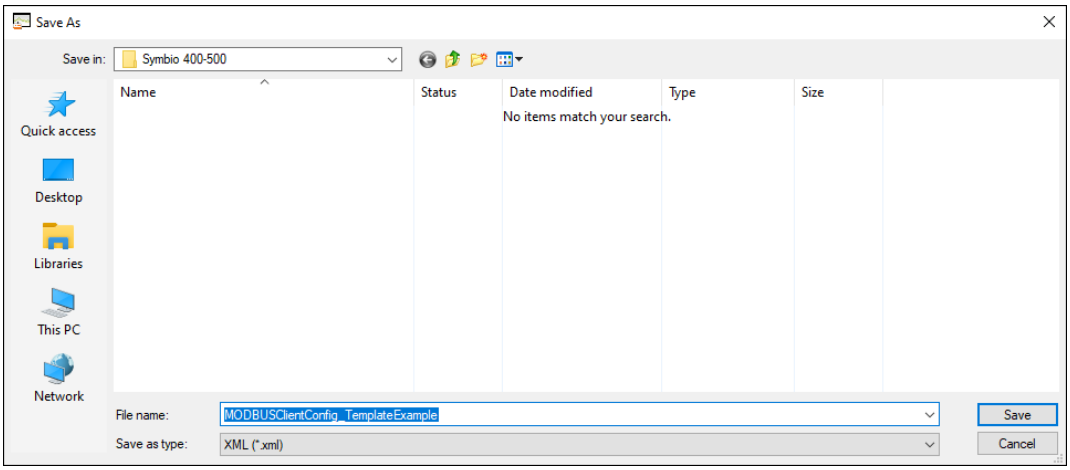
1. With the definition of the Modbus device complete, select the **Export** button to create a representation of the device.

Figure 25. Export



2. Name and save the file to the appropriate directory.

Figure 26. Save and export image

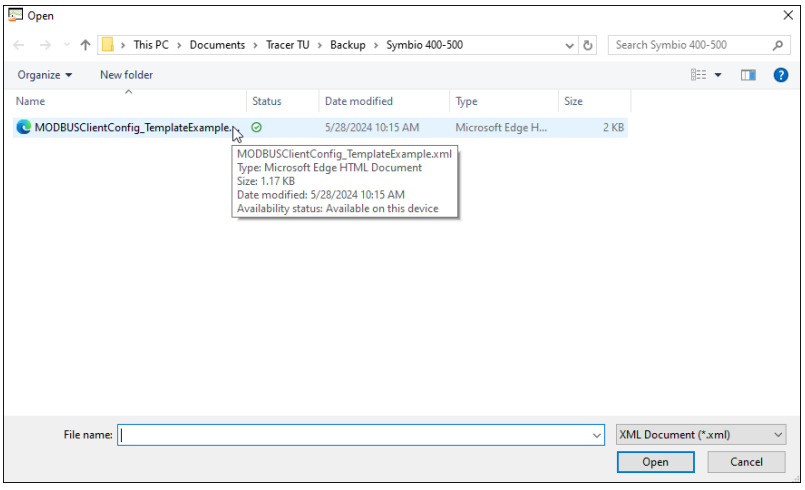


3. Connect to the next device and import the saved device image.

Figure 27. Import

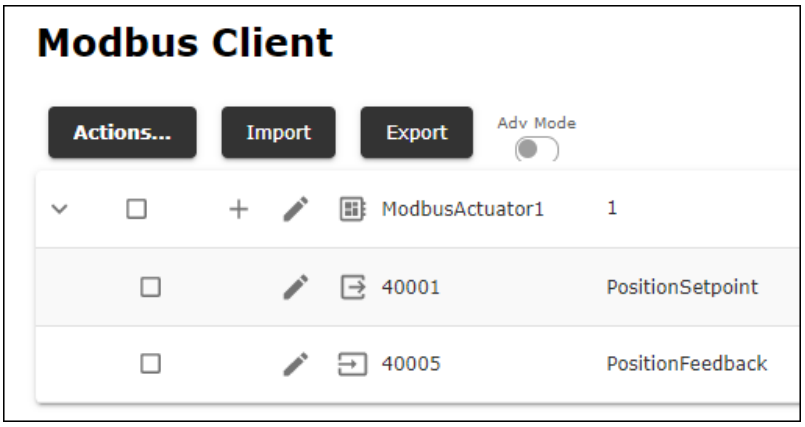
4. Select the exported file from the appropriate directory.

Figure 28. Import — select file



5. After the file is selected, the imported image appears in the Modbus Client summary of the second controller.

Figure 29. Modbus Client summary

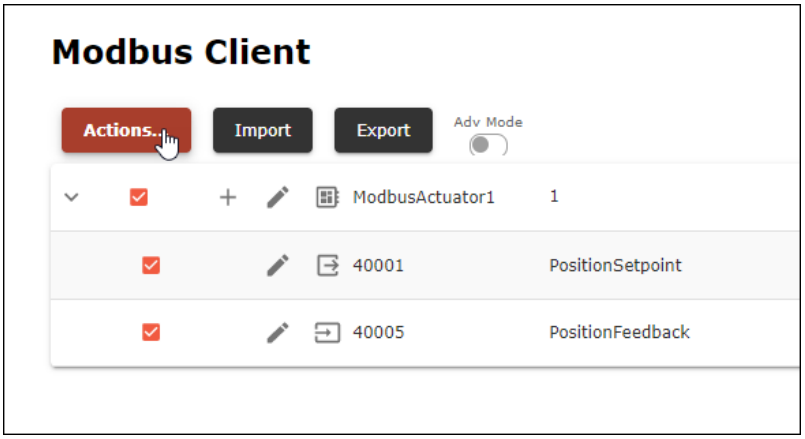


Create Template

Use the template capability to use the configuration of one device to simplify the definition of one or more similar devices on the same controller.

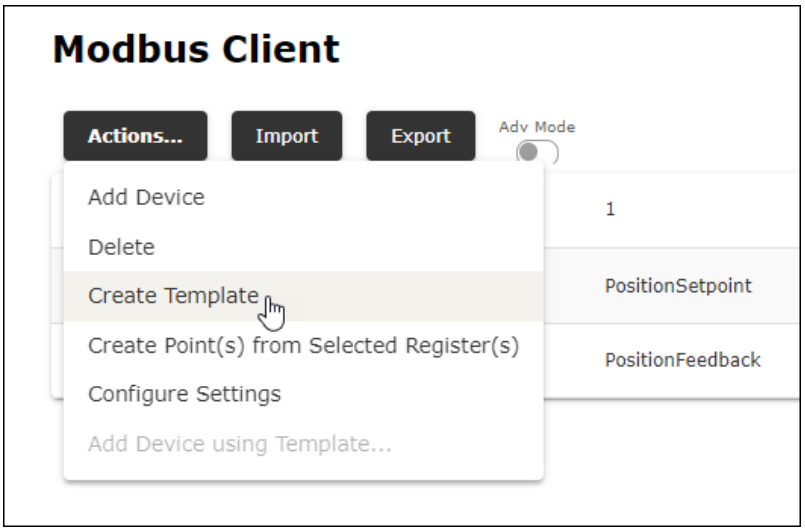
1. With the definition of the first Modbus device complete, check the box in front of the device, then select the **Actions...** button.

Figure 30. Create template



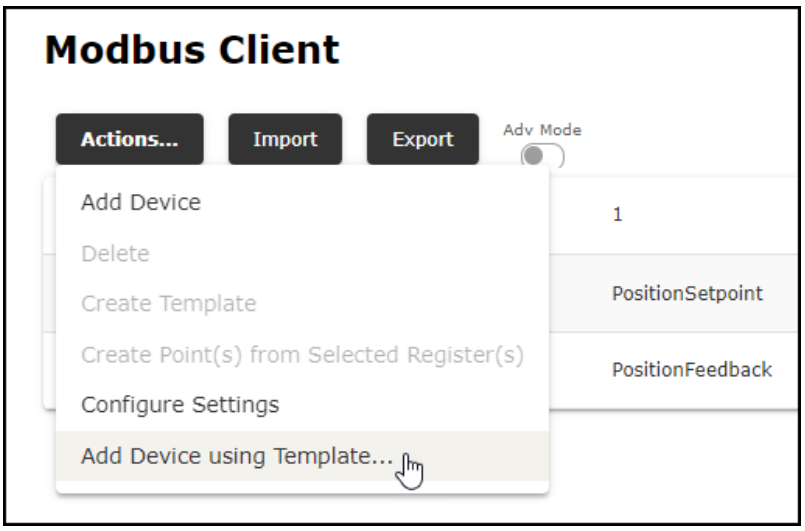
2. From the actions list, select **Create Template**. The template file is automatically created and saved.

Figure 31. Create template selection



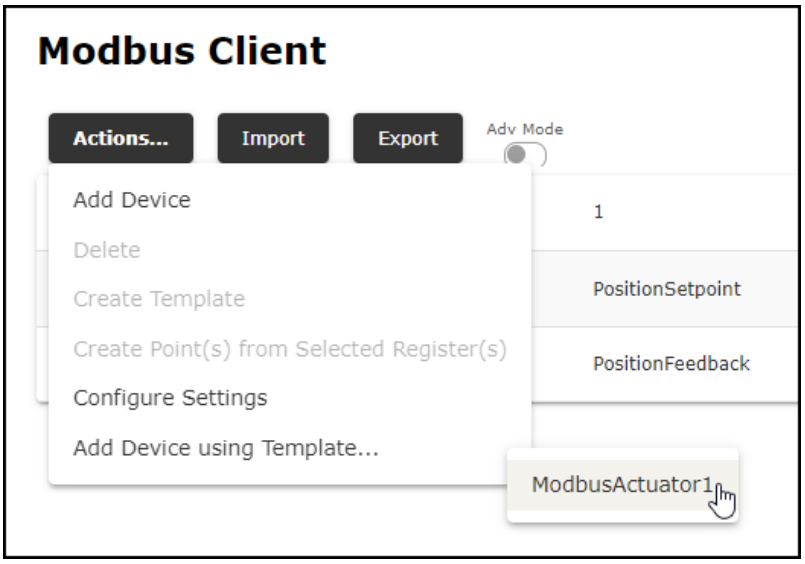
3. To configure another device using the saved template, select **Add Device Using Template** under the Actions button.

Figure 32. Create device using template



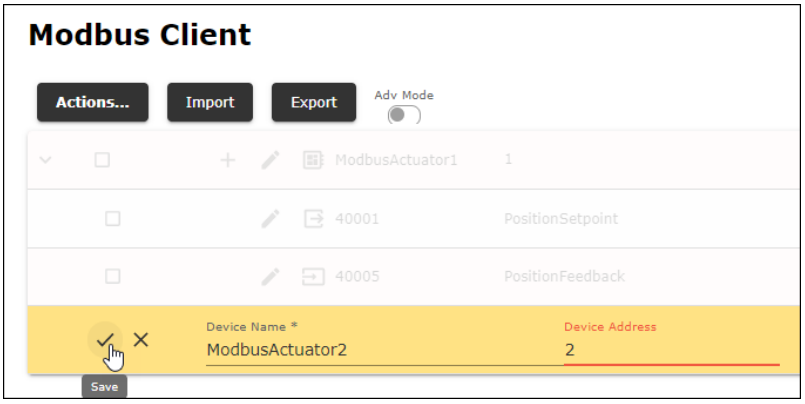
4. Select the specific saved template for the creation of another device.

Figure 33. Select the template



5. Rename the template information, including a unique device name (do not use spaces or special characters) and unique Modbus address that corresponds to the device address.

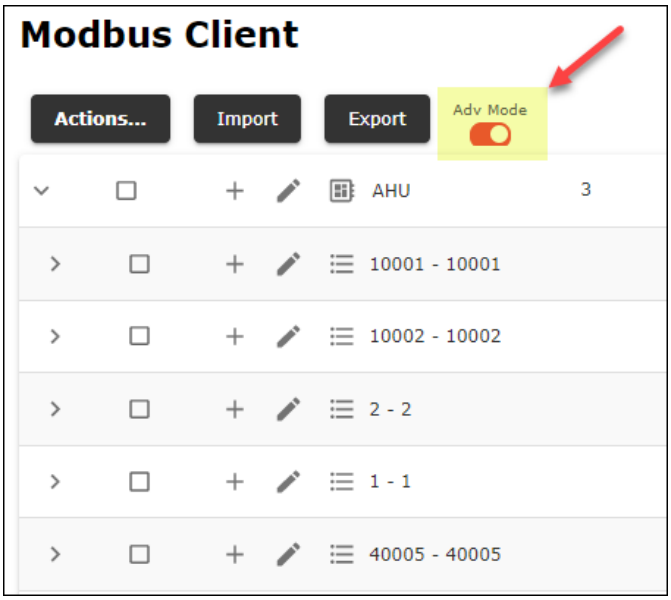
Figure 34. Rename the template/device



Advanced Mode

Enable advanced mode to read/write multiple registers for more complex data structures.

Figure 35. Enable Advanced Mode



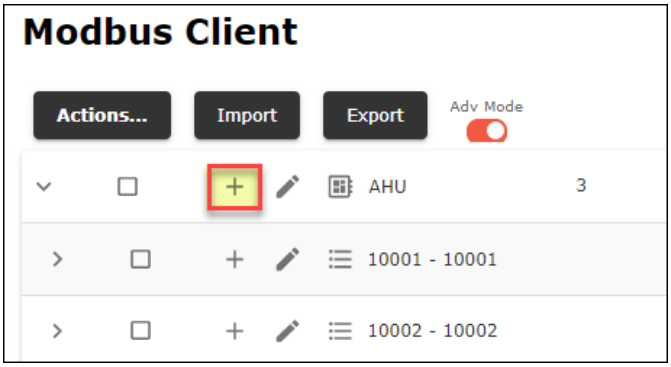
For both coil status and discrete input status, advanced mode allows the user to select 1-32 contiguous addresses. For both input registers and holding registers, advanced mode allows the user to select up to 16 consecutive bits.

Create Custom Block

To create a custom block for both read and write registers:

1. Add a new register to the Modbus Server device definition by selecting the **+** sign in front of the server name.

Figure 36. Create new custom block register

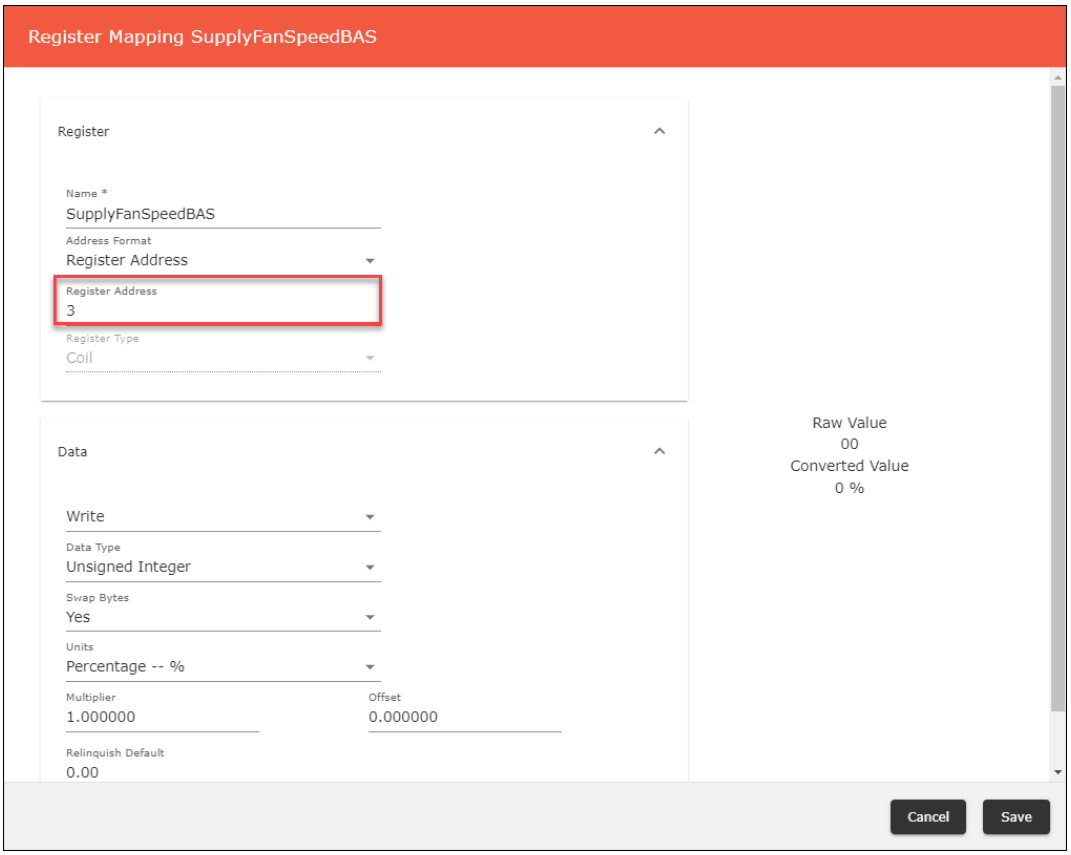


2. For the Register Mapping, define the address of the first register of the custom block. The definition of the specific data will depend on the Modbus Server data. Refer to the manufacturer's information for more details.

   For the example shown in the following figure, the custom block begins at coil/register 00003.

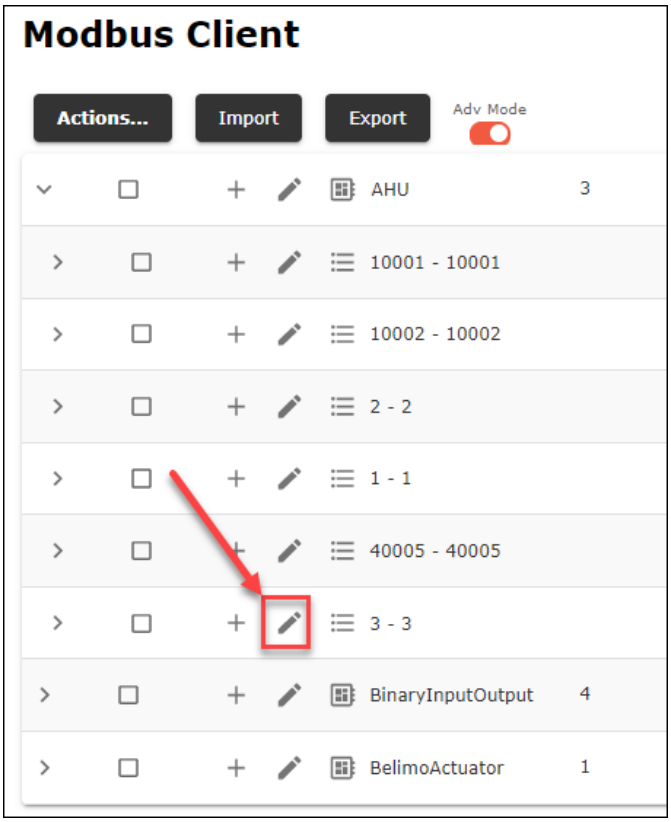
3. **Save** the information in this window, then **Save** the client setup.

Figure 37. Define the beginning block address



4. In front of the newly created register, select the pencil icon to edit the size of the desired custom block.

Figure 38. Edit block size



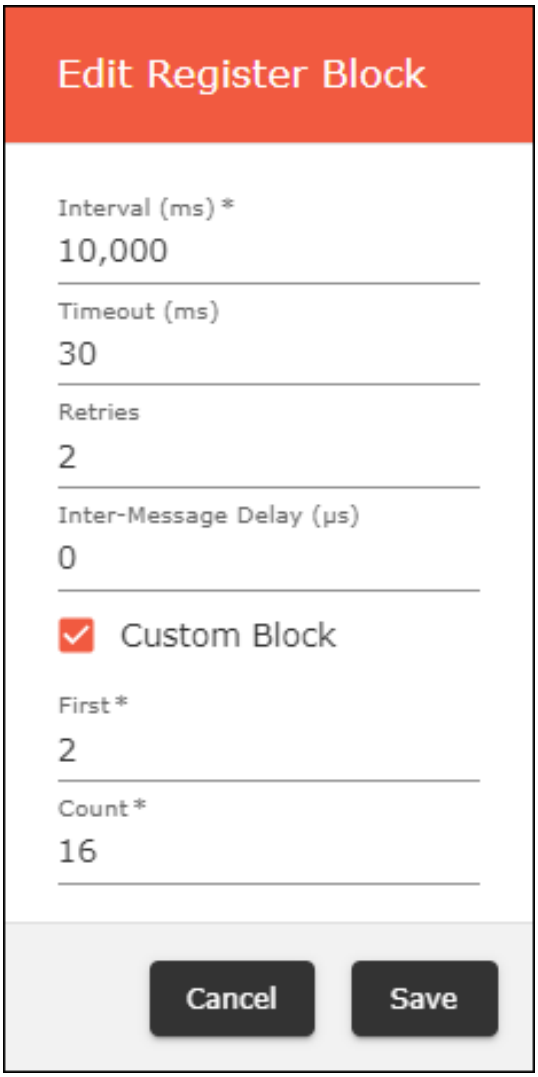
5. As shown in Figure 39, p. 31 and Figure 40, p. 32 the **custom block** checkbox, then **first** (offset of the first coil/register) and **count** (total number of coils). For registers defined as write registers, and when applicable, select the checkbox to force the Modbus Client to write multiple coils/registers as a bundle.
6. **Save** the information in this window, then **Save** the client setup.

Important: *The value for 'first' is defined as an OFFSET, not address, so in this example the value of 2 is equivalent to a beginning address of 3.*

Figure 39. Custom register definition — write

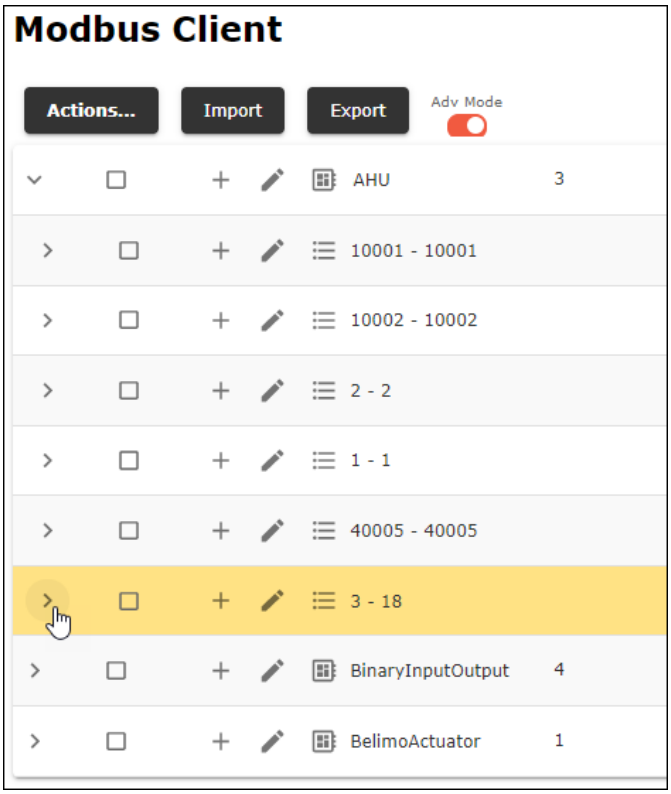
7. For blocks defined with read capability, not write, the option to **Force Write Multiple** appears. In those cases, the **first** and **count** parameters represent the same definition as above.

Figure 40. Custom register definition — read



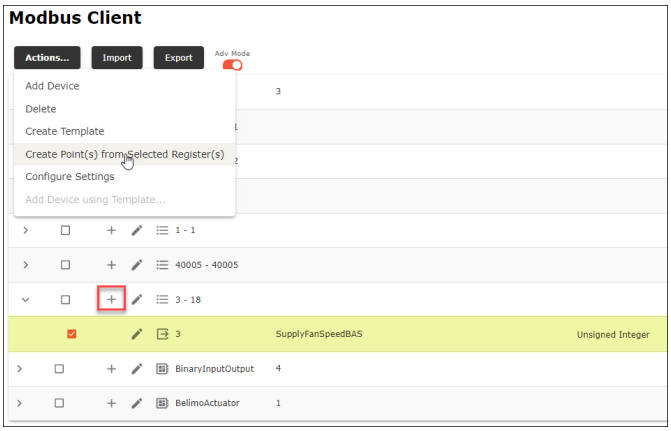
8. To view/edit the contents of the custom block, expand the arrow at the left of the tree, as shown below.

Figure 41. Expand the custom block definition



9. When appropriate, use the **+** icon for the custom block to add additional register definition inside the block.
10. With the definition complete, **check the box** for the register(s), select **Actions**, then **Create Point (s) from Selected Devices**.

Figure 42. Add register detail to custom block

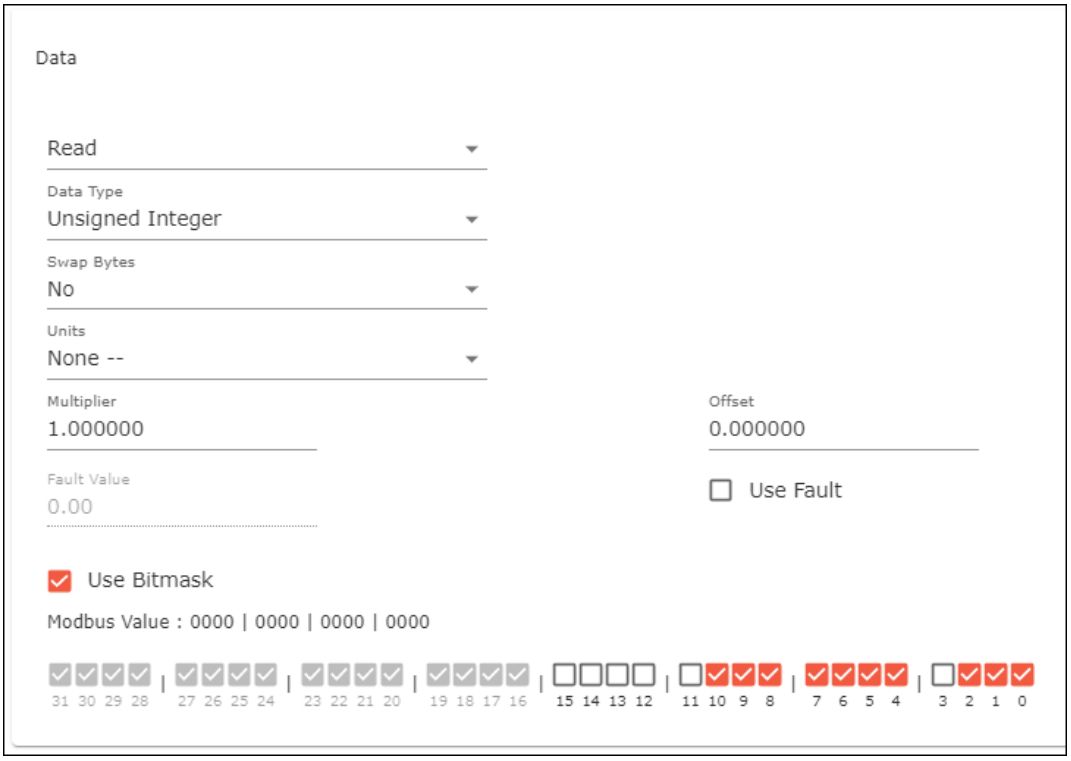


Use Bitmap Mask

Enable Advanced Mode to enable and edit the bitmask for a given register. When only a certain bit of the register is applicable, the bitmask feature allow the user to enable/disable individual bits. As shown in the figure below, select the **Use Bitmask** checkbox, then check the box for each bit to be used. Unchecked bit will be masked (unused).

- Use Bitmask option is only available in Advanced Mode and when the Data Type is set to Unsigned Integer, Signed Integer, Unsigned Long, Signed Long, or Float.
- When Use Bitmask is selected, 32 selection boxes numbered from 0 to 31 are displayed. Each box represents a bit in the register. Bits 16 to 31 may not be available depending on the Data Type chosen and will be marked with a gray check indicating it is not used.
- By default, all available bits are checked, which means that all bits will be readable or writable.
- If a box is unchecked, the register bit will be masked, which means that it will not be read from or written to.
- The **Modbus Value** field will display the current value of the register in binary which allows you to see the value of each bit.

Figure 43. Bitmap mask



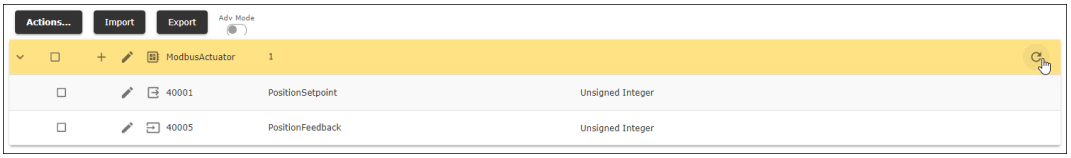
	Bits are not available. Register bits 16 – 31 will show this icon when Data Type is set to Unsigned and Signed Integer. Unsigned and Signed Integer only use bits 0 to 15.
	This register bit is masked. It will not be read from or written to.
	This register bit is unmasked. In other words, it will be read from or written to.

Modbus Register Status

With the definition and setup complete for all device registers, use Tracer TU to confirm the values associated with each register.

The status of each Modbus register is shown in the right column. However, immediately after register creation, the status of each may not yet be visible until the information is refreshed.

Figure 44. Status and refresh



Press the refresh button to retrieve and display the most recent values for each register.

Figure 45. Status and refresh

If the information shown for the status is different than expected, consult the manufacturer's documentation, and use Tracer TU to confirm the setup of each register.

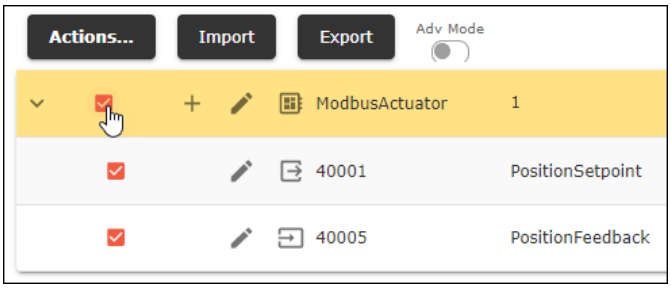
BACnet Point Creation

Once the setup of each Modbus register is complete and operation confirmed, use the Modbus Client application to automatically create BACnet points associated with each Modbus register. The BACnet points can be used on the controller for custom programming and as part of the integration with the building management system.

1. Select the checkboxes for the server device and associated registers for each BACnet point to be created.

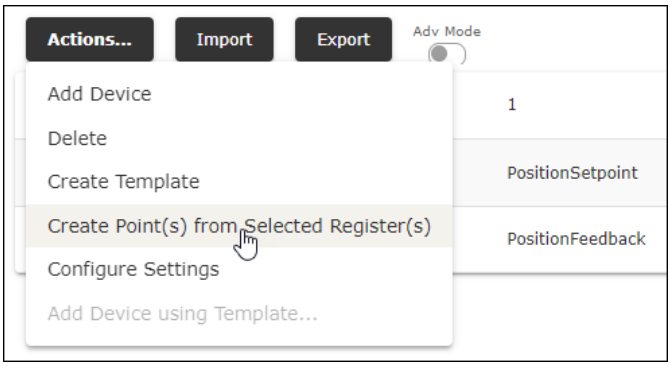
Important: *When BACnet points are not created, all Modbus registers created in the Modbus Client editor* ***will be polled****.*

Figure 46. Select registers



2. From the drop-down, menu Select **Actions** > **Create Point(s) from Selected Register(s)**. The instance numbers of each type of BACnet point will be automatically determined by Tracer TU based on the next available instance.

Figure 47. Create BACnet points



BACnet objects are automatically created for each selected register without requiring additional information. For each BACnet object created, the point type is automatically defined as follows:

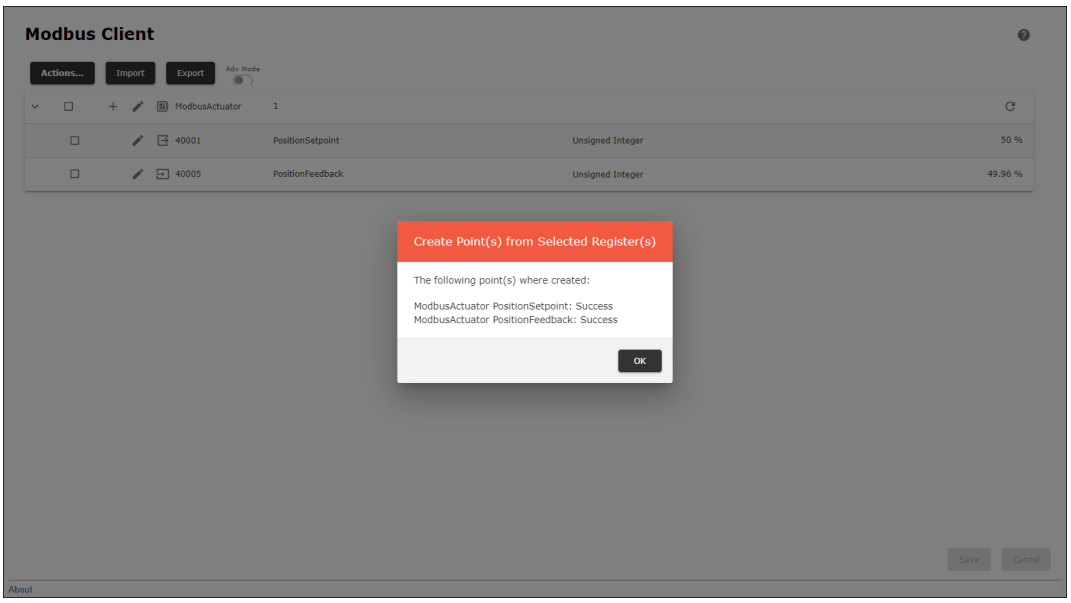
Table 3. Modbus register and BACnet points types

Modbus Register/Type	BACnet Object Type
Coil (1-9999)	Binary Output
Discrete Input (10001-19999)	Binary Input
Input Register (30001-39999)	Analog Input
Holding Register (40001-49999)	Analog Output

Important: *The Modbus Client application will not create a BACnet Multistate point for Modbus Multistate registers. It will create a BACnet Analog Input for the Modbus Multistate register. For applications that require the use of multistate BACnet objects, first define the applicable multistate object/type, then reference the Analog Input object that Modbus Client application created automatically.*

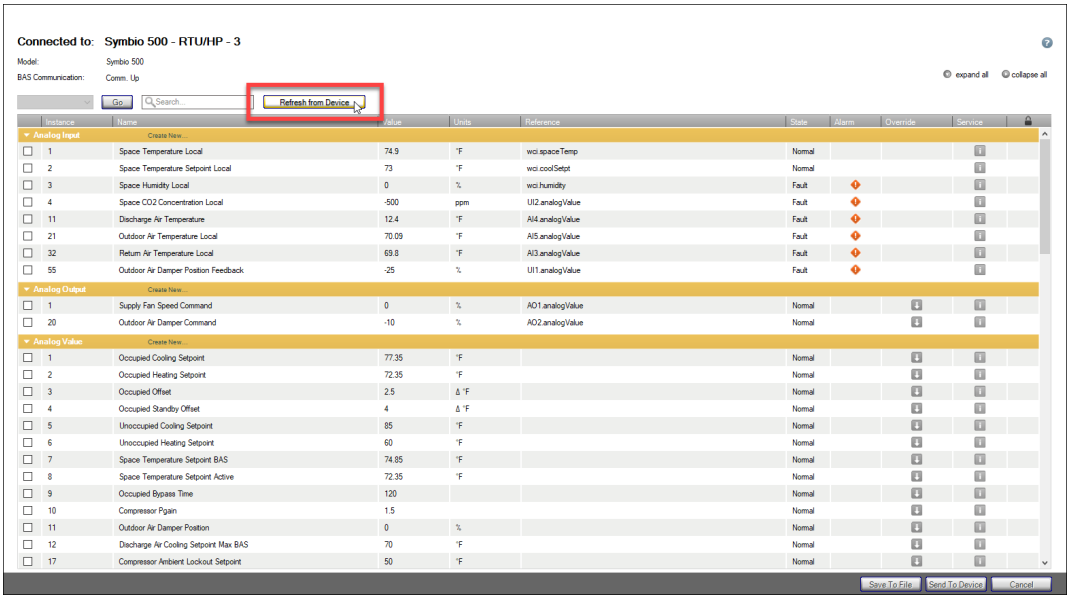
Best Practice: *When adding, deleting, or editing points/registers, update the interface to the building management system when applicable.*

Figure 48. BACnet point creation confirmation



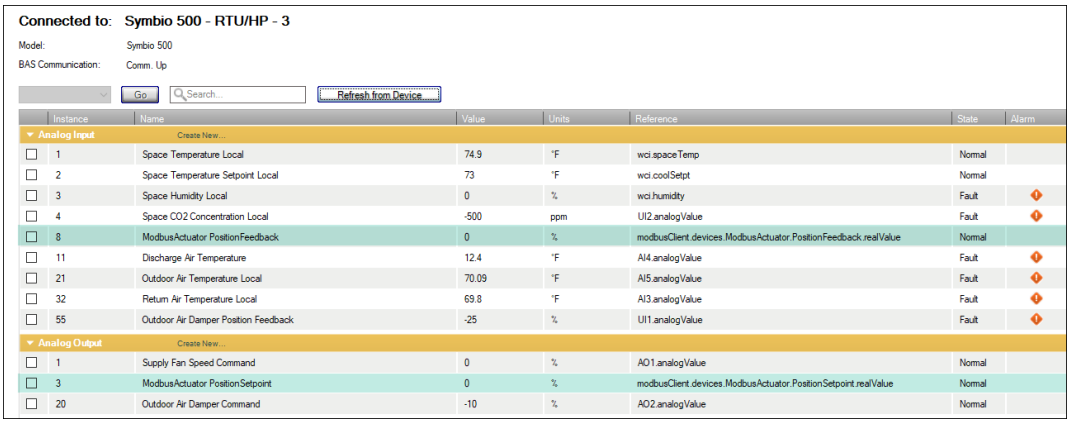
3. Points may not initially display in Tracer TU, although they are created in the client device. Return to the **Status Utility** page in Tracer TU and select the applicable point type.
4. Select **Refresh from Device** to repopulate the lists with the newly created BACnet points.

Figure 49. Refresh from device



Following the refresh, the newly created BACnet points appear on the appropriate page. Note the reference to the Modbus client, server, and register name associated with each new BACnet point, shown in the table below in the ‘Reference’ column.

Figure 50. Refreshed points list

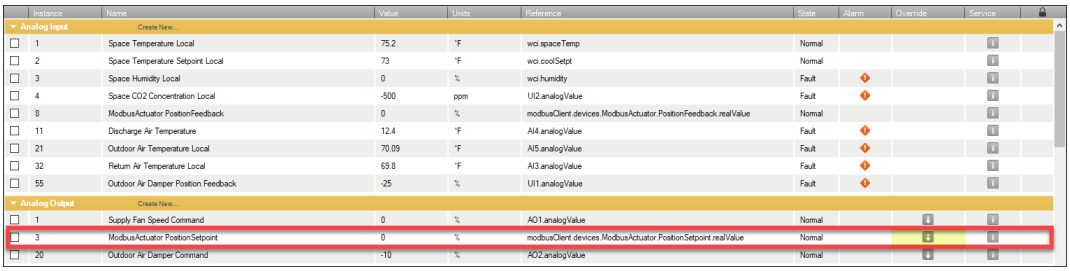


Test the BACnet/Modbus Functionality

After the creation of the BACnet points for each Modbus register, confirm the functionality of each using Tracer TU. In addition to Tracer TU, consider the use of Trane’s SerialSpy to confirm the Modbus data passed between client and server.

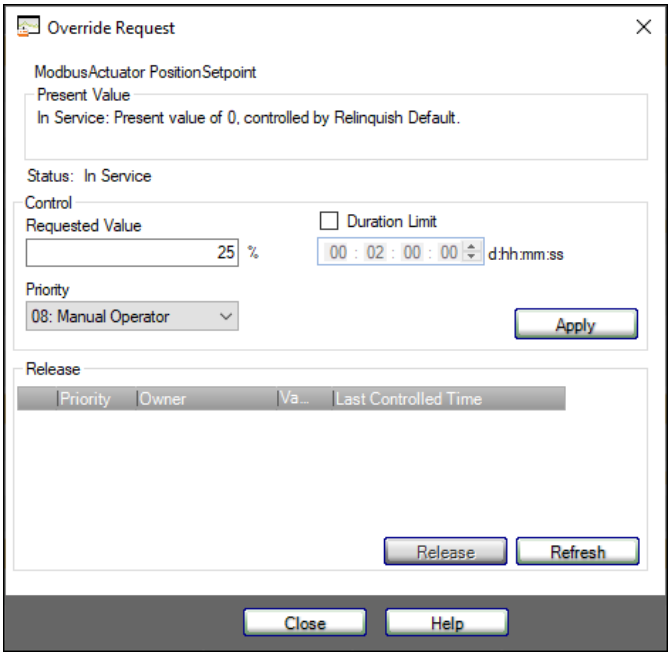
1. For all status points, refer to the **Value** column on the appropriate Status Utility page: analog, binary, or multistate.
2. For any output points, temporarily override the point to confirm the BACnet-to-Modbus functionality.
3. Select the **Override** arrow for an output point.

Figure 51. Overriding BACnet points



4. In the override request pop-up, edit the requested value, duration limit, and priority level for the point.

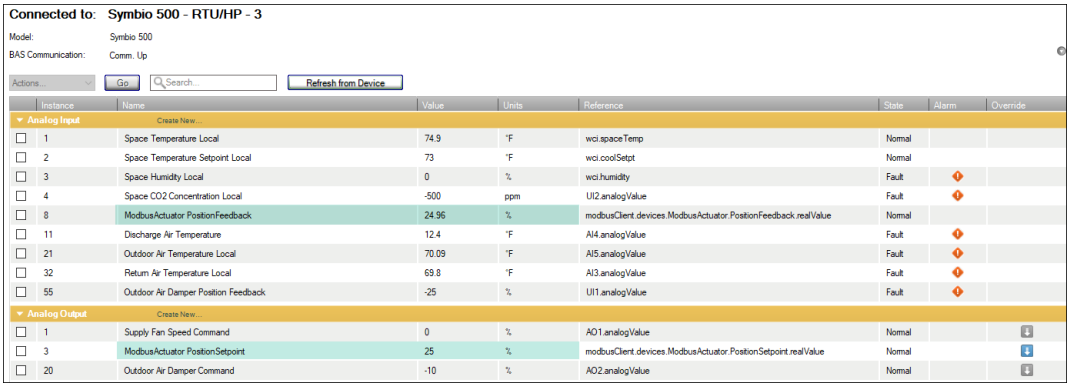
Figure 52. Override request pop-up



5. Press **Apply**.
6. **Close** the pop-up.
7. Refer to the **Value** column in the appropriate page to confirm the override and associated status data.

   In this example, the position setpoint of the actuator was temporarily overridden to 25%, as shown in Analog Output 2. The corresponding Position Feedback is 24.96, roughly the equivalent value, with some rounding error.

Figure 53. BACnet Value/Status



8. With the functionality confirmed and testing completed, **release all overridden points** as appropriate.

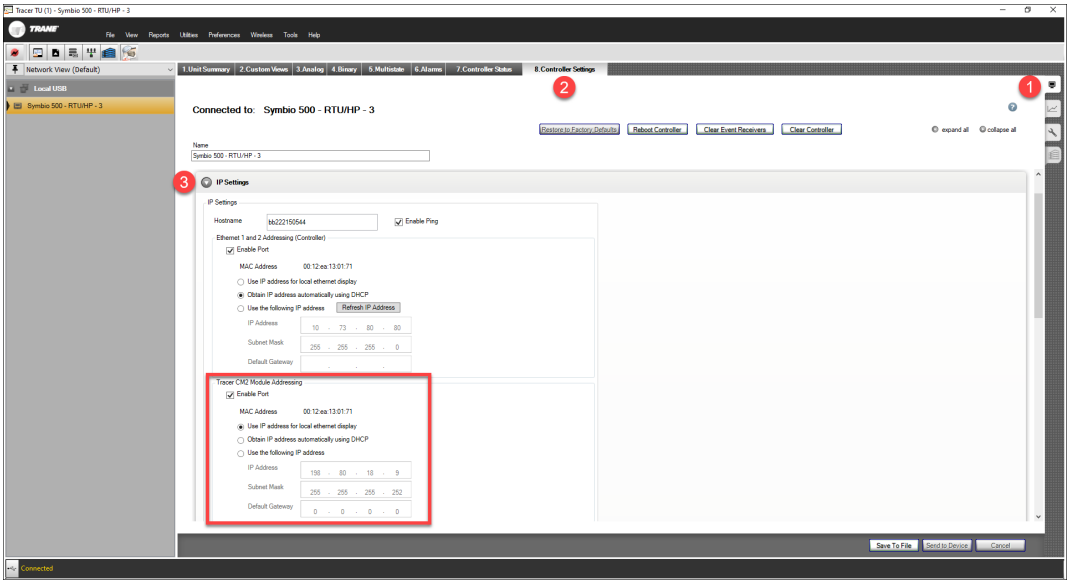
Ethernet Settings

Use Tracer TU to connect to the Symbio controller:

1. With the controller connected, from the Status Utility page, select **Controller Settings**.
2. Expand the section for **IP Settings**.

Note: *User cannot connect two TD7 displays simultaneously. In case if two TD7 displays were connected, then there will be a pop-up with warning message.*

Figure 54. IP Settings



3. Configure the IP settings:

Field	Definition
Hostname	If supported on the network, a host name can be assigned to the device for remote connectivity with Tracer TU.
Enable Ping	Checked by default. Uncheck if requested by the customer's IT professionals.
Ethernet 1 and 2 Addressing (Symbio 500 Controller) Section	
Enable Port	Check this box if the Ethernet port is to be used. Uncheck this box if the customer's IT professionals prefer it be disabled.
MAC Address	Available if the customer's IT professionals require the MAC address for firewall rules, opening ports, or identifying the controller on the network.
Use IP address for local Ethernet display	Check this box if a TD7 display is to be plugged into this port.
Obtain IP address automatically using DHCP	Select this option to allow for a network DHCP server to dynamically assign an IP address to the device.
Use the following IP address	Select this option to manually enter a static IP address specific to the application and network.
Refresh IP Address	When pressed, the DHCP server refreshes the controller IP address.
Symbio Communication Module (CM2) AddressingSection	
Enable Port	Check this box if the Ethernet port is to be used. Uncheck this box if the customer's IT professionals prefer it be disabled. ***Note:*** *The configuration of the onboard Ethernet port and CM2 Ethernet port may not be identical.*

Field	Definition
MAC Address	Available if the customer's IT professionals require the MAC address for firewall rules, opening ports, or identifying the controller on the network.
Use IP address for local Ethernet display	Check this box if a TD7 display is to be plugged into this port.
Obtain IP address automatically using DHCP	Select this option to allow for a network DHCP server to dynamically assign an IP address to the device.
Use the following IP address	Select this option to manually enter a static IP address specific to the application and network.
Wi—Fi Addressing Section	
Enable Wi-Fi	Check this box if the Wi-Fi dongle is to be used. Uncheck this box if the Trane Wi-Fi Module is not used or if the customer's IT professionals prefer it be disabled.
MAC Address	Available if the customer's IT professionals require the MAC address for firewall rules, opening ports, or identifying the controller on the network.
IP Address	Enter static IP address of the Wi-Fi Module/connection.
DNS Setup Section	
Obtain DNS server address automatically	Select this option to obtain the DNS server address automatically.
DNS Disabled	Select this option to disable the DNS server.
Use the following DNS server addresses	Select this option to manually define the DNS server settings. Primary DNS Server Secondary DNS Server Tertiary DNS Server

Troubleshooting

Problem	Possible Cause	Possible Solution
No LEDs are ON / Power LED is not ON	No power	• Check USB cable connection / Cable condition. • Check Symbio controller's Power.
Modbus LEDs are not Blinking	Modbus RS485 cable not connected / field device not turned on.	• Check the Modbus RS485 cable termination at both ends (CM2 Modbus Terminal and Field device Modbus terminal). • Check Cable termination polarity at both ends (+, -). • Check cable working condition. • Check power status of the field device.
Ethernet LED is not Blinking	Cable / port issue	• Check LAN cable working condition. • Check cable properly latched into the Ethernet port. • Check power of both devices.
Modbus Devices not communicating	Configuration error	Check Modbus parameters configuration at both the devices are matching (Symbio controller and Field device) See "Configure Modbus Client Settings," p. 16 for more details.
TD7 not connecting	Power / Configuration error	See "Ethernet Connection," p. 12 for connection details. If the problem is not resolved, see the TD7 Troubleshooting section in BAS-SVX50*-EN.
BACnet-IP not connecting	Configuration error	Check BACnet parameters configuration at both the devices are matching (Symbio controller and Field device)

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.

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