Integration Guide

# LonTalk® Integration to Ascend™ Air-Cooled Chiller Model ACR

with Symbio™ 800 Controls


**⚠ 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.


February 2021

**BAS-SVP046A-EN**

# 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. |

## 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-including industry replacements for CFCs and HCFCs such as saturated or unsaturated HFCs and HCFCs.

## 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.**

## Copyright



## Trademarks

# Table of Contents

# Overview

## Purpose

The purpose of this document is to provide instructions for integrating the Symbio™ 800700 controller into Non-Trane building automation systems. This document is targeted to system integrators and controls contractors.

## Symbio 800 Controller Overview

The Trane Chiller includes the Symbio 800 controller. The controller has been installed, programmed, wired, commissioned, and tested in the factory prior to shipment. While some sensors and end devices are normally wired in the field, nearly all other wiring is factory-provided. Power for the controller is provided and connected from within the chiller control panel.

The chiller and associated controller can be applied as standalone or as part of a building automation system.

***Note:*** *For communicating applications to third-party control systems, network communication wiring must be provided by others.*

## Communication Options

The Symbio™ 700800 controller supports the following communication protocol options for integration to either Trane or Non-Trane control systems:

- BACnet MS/TP
- BACnet IP
- BACnet Zigbee (Air-Fi)™
- BACnet/IP
  - Ethernet
  - Wi-Fi
- Modbus RTU
- Modbus TCP
- LonTalk

For information pertaining to the integration of the Symbio™ 700800 controller using either Modbus or LonTalk communication, refer to the integration guides specific to those applications.

## Units of Measure

The communicated data of the Symbio™ 800 controller will be passed in the factory-configured units of measure, either inch-pound (I-P) or the International System of Units (SI). The units of measure are selected as part of the unit order (the default selection is normally I-P). Should the units of measure need to be changed in the field, contact your local Trane representative.

The Symbio 800 controller provides a browser-based user interface for USB connection to the controller. One of the tools provided with that interface allows the user to change and customize the Data Display Units Preferences.

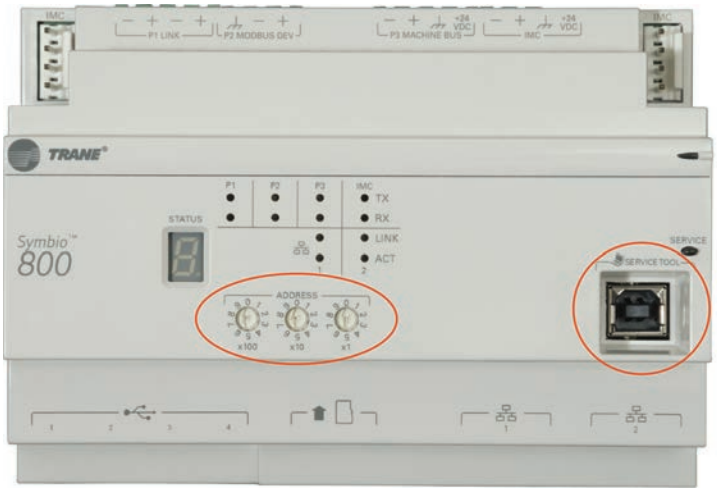
***Important:*** *These adjustable settings are applied only to the units of measured displayed in the web interface, not the communicated interface.*

Regardless of the communicated (system) units of measure, the user may change the displayed units of measure on their smart device. These user preference units of measure are independent of the communicated units.

# Communication Setup and Configuration

The Symbio™ 800 controller can be factory ordered with a specific protocol configuration and rotary address setting. If communication options were not specified, the Symbio™ 800 controller will be setup for BACnet MS/TP communications at 76,800 bps with a rotary address setting of 000.

**Figure 1. Symbio™ 800 rotary address and service tool port**



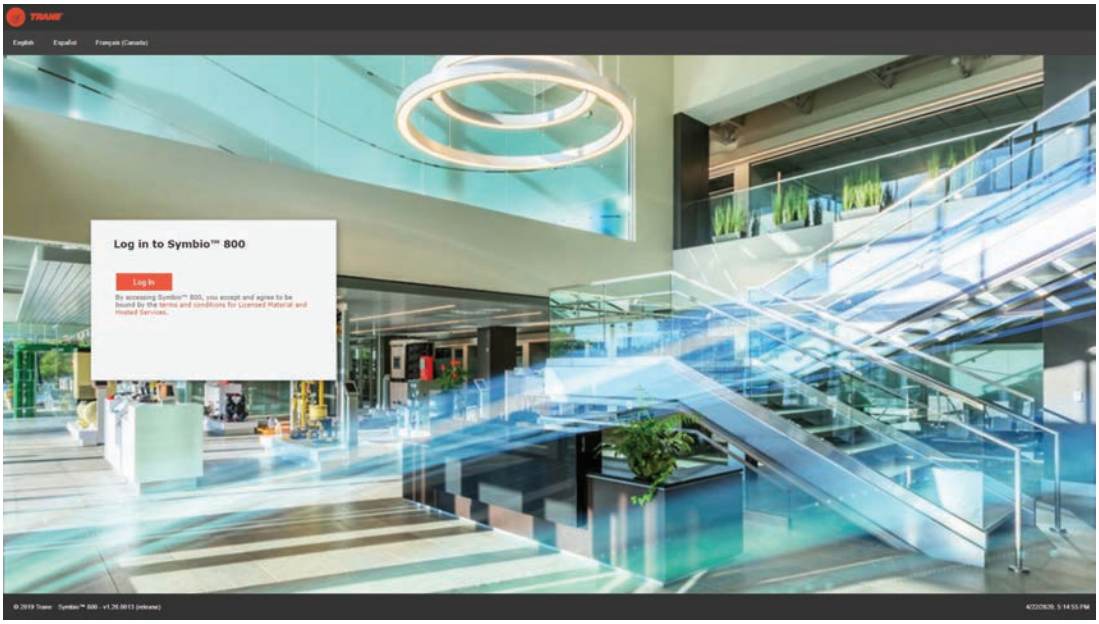

## Service Tool for Symbio™ 800 Configuration

The service tool used to modify the Symbio™ 800 controller is a standard web browser. The Symbio™ 800 webpage is accessed by using a standard USB type A/B cable. Connect the USB cable between a laptop and the service tool port on the Symbio™ 800 controller (shown in Figure 1, p. 6).

# Connecting to the Symbio™ 800 Web Interface

1. Connect a laptop to the Symbio™ 800 controller using a USB cable.
2. On the laptop, open a web browser to http://198.80.18.1/
3. When the Symbio™ 800 page displays, click **Log In**.

**Figure 2. Symbio™ 800 log in screen**



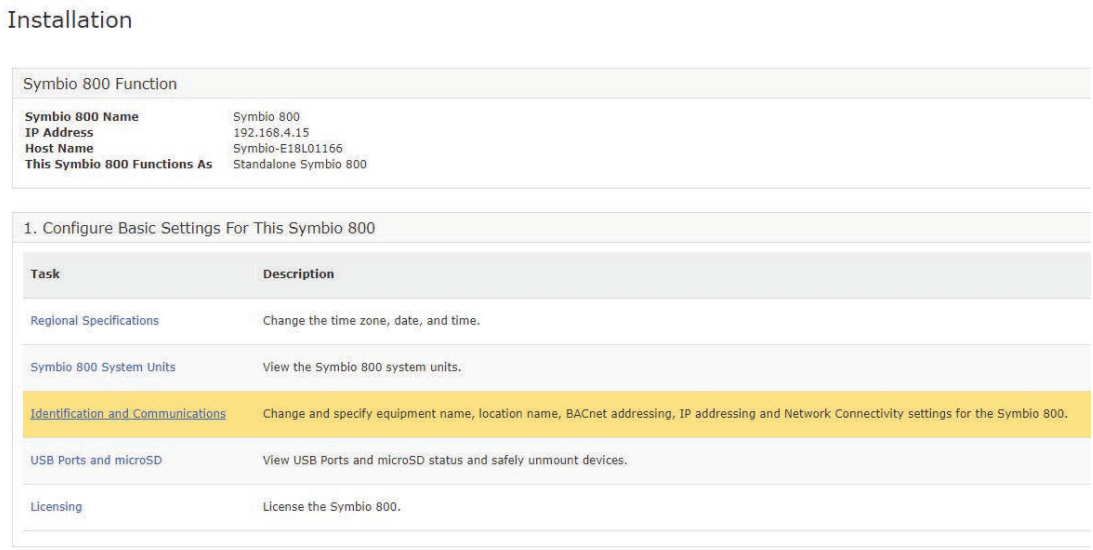

***Note:*** *The Symbio™ 800 web interface can only be viewed using the USB connection. Ethernet port 1 and Ethernet port 2 will not allow access to the Symbio™ web server to meet IT security requirements.*

# Protocol Configuration

To access the Symbio 800 Protocol Configuration page:

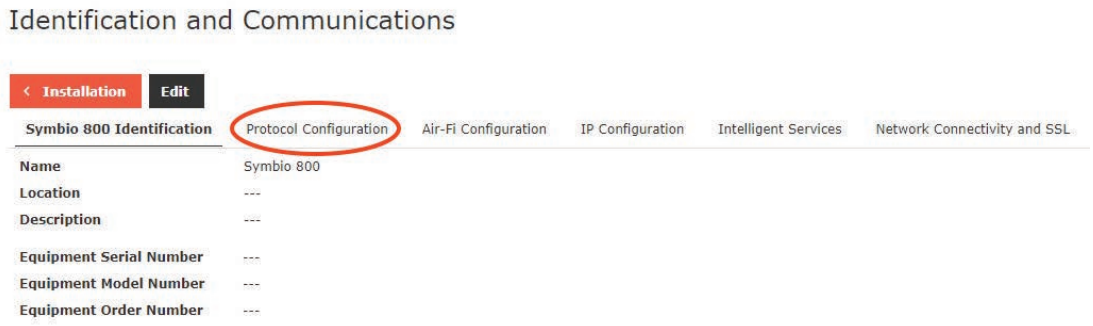
1. Connect to the Symbio 800 web interface.
2. On the left-hand navigation, click **Installation**.
3. Click **Identification and Communications**.

**Figure 3. Identification and Communications**




4. Click the **Protocol Configuration** tab.

**Figure 4. Protocol Configuration**




5. View the existing Protocol Configuration settings.

   ***Note:*** *There are no LonTalk communication parameters to edit.*

# LonTalk Protocol Settings

The Symbio 800 controller supports LonTalk communications with the optional LonTalk module. The LonTalk module is din rail mounted and is connected to the Symbio 800 controller using USB.

***Note:*** *The Symbio 800 rotary addresses are not used with LonTalk communications.*

**Figure 5. LonTalk protocol configuration**


1. Verify the LonTalk adapter connection status is **Connected**. If the adapter connection status is another state, verify the LonTalk adapter is connected to a Symbio 800 USB port.
2. Verify the Link Status is **Online**. If the Link Status is set to a different state, LonTalk network management software such as Trane's Rover software is needed to set the Link status to Online.
3. The Service Pin button will send a service pin message to the LonTalk network. A service pin will broadcast the Neuron ID to the LonTalk network so a LonTalk network management tool can find a device and set its Domain, Subnet, Node address.

LonTalk communication wire is connected to the LonTalk adapter. LonTalk does not require wire polarity but it is recommended that wire polarity be observed. Refer to the LonTalk standard for detailed information on LonTalk wiring.

All LonTalk devices must have a unique DSN address and must have the same Domain value. The Symbio 800 LonTalk adapter ships on the zero-length domain so it can be easily discovered by LonTalk network managers and tools.

# Profile Definition and Network Variables

The following tables are sorted as follows:

- Tables are listed by unit/profile type and sorted by network variable number.
- Tables are sorted by name and provide a complete list of names, types, values/ranges, and descriptions.

***Note:*** *Not all points are available to the user. The available data points are defined during self-configuration and are dependent on the type of equipment.*

## ACRB 150–300 Tons Data Points

**Table 1. ACRB 150–300 tons configuration parameters**

| nv Index | Configuration Variable Name | Variable Type | Variable description | Point Name |
|---|---|---|---|---|
| 2 | nciChillerType | UCPT_chiller_type | Chiller Information | |
| | | Model Information | Enum list - See table in UNVT-UCPT.doc | Model Information |
| | | Unit Capacity | Capacity of Unit (in watts) | Chiller Design Capacity |
| | | Cooling Type | 0 = Water Cooled<br>1 = Air Cooled<br>2 to 254 = Unused | Cooling Type |
| | | Number of Circuits | Number of Circuits on Unit | Number Of Circuits |
| | | Number of Compressors – Crt 1 | Number of Compressors on Circuit 1 | Number Of Compressors, Circuit 1 |
| | | Number of Compressors – Crt 2 | Number of Compressors on Circuit 2 | Number Of Compressors, Circuit 2 |
| 5 | nciMfgLocation | UCPT_manufacturing_location | Chiller Manufacturing Location | Manufacture Location |
| 6 | nciNoiseRdcnReq | SNVT_switch | Default for Noise Reduction Auto/On Request | Noise Reduction request |
| 7 | nciRefrigerant | UCPT_refrig_type | Chiller Refrigerant Type | Refrigerant Type |
| 8 | nciCapacityLim | SCPTCapacityLimit | Capacity Limit | Demand Limit Setpoint |
| 9 | nciChillerEnable | SCPTChillerEnable | Default Value for nviChillerEnable | Chiller Enable |
| 10 | nciCoolsetpt | SCPTCoolSetpoint | Default Value for nviCoolSetpt | Chiller water Setpoint |
| 11 | nciDefaults | SCPTDefaultBehavior | Determines which set of values will be used on power up and communications failure, stated default values or a list of manufacturer specified values | Default Values |
| 12 | nciDevMajVer | SCPTdevMajVer | The major version number for the device | Software Major Version |
| 13 | nciDevMinVer | SCPTdevMinVer | The minor version number for the device | Software Minor Version |
| 15 | nciLocation | SCPTlocation | Location Label | Location Label |
| 16 | nciMinOutTm | SCPTminSendTime | Minimum Send Time | Minimum Send Time |
| 17 | nciMode | SCPTHVACmode | Default Value for nviMode | Chiller Mode |
| 18 | nciPwrup | SCPTpwrUpDelay | Power Up Delay | Power Up Delay |
| 19 | nciRcvHrtBt | SCPTmaxRcvTime | Receive Heartbeat Time | Receive Heartbeat |
| 20 | nciSndHrtBt | SCPTmaxSendTime | Send Heartbeat Time (nciMAXSendTime) | Send Heartbeat |
| 21 | nciBuildNum | U16 | Device Build Number | Manufacturer-defined |
| 22 | nciCRC | UCPT_crc | CRC calculation result | Manufacturer-defined |
| 23 | nciDeviceConfig | U16 | Device Configuration Choices | Manufacturer-defined |

**Table 2. ACRB 150–300 tons network variable inputs**

| Profile Index | Network Variable Name | Variable Type | Variable description | Recv HrtBt | Point Name |
|---|---|---|---|---|---|
| 24 | nviChillerEnable | SNVT_switch | Request Start/Stop Chiller | ♥ | BAS Chiller Auto Stop Command |
| 25 | nviCoolSetpt | SNVT_temp_p | Desired Temp of Lvg Chilled Wtr | ♥ | BAS Chilled Water Setpoint |
| 26 | nviCapacityLim | SNVT_lev_percent | Capacity Limit of Chiller | ♥ | BAS Demand Limit Setpoint |
| 28 | nviMode | SNVT_Hvac_mode | Chiller Modes | ♥ | BAS Chiller Mode Command |
| 32 | nviNoiseRdcnReq | SNVT_switch (2-state) | Noise Reduction Auto/ On Request | ♥ | Noise Reduction Request BAS |
| 35 | nviRequest | SNVT_obj_request | Status Request | | Status Request Input |
| 36 | nviTraneVar2 | UNVT_c5c | Trane Comm 5 Command Input | | Manufacturer-defined |

**Table 3. ACRB 150–300 tons network variable outputs**

| nv Index | Configuration Variable Name | Variable Type | Variable description | Delta to Send (Notes) | SendHrdBt | Point Name |
|---|---|---|---|---|---|---|
| 37 | nvoOnOff | SNVT_switch | Chiller On / Off run state | any | ♥ | Chiller Running State |
| 38 | nvoActiveSetpt | SNVT_temp_p | Active Cool or Heat Setpt | 0.10 °C | ♥ | Active Chilled Water Setpoint |
| 39 | nvoActualCapacity | SNVT_lev_percent | Actual Running Capacity of Unit | 0.03 | ♥ | Chiller Power |
| 40 | nvoCapacityLim | SNVT_lev_percent | Current Capacity Limit Setting of Chiller | 0.01 | ♥ | Active Demand Limit Setpoint |
| 41 | nvoLvgCHWTemp | SNVT_temp_p | Leaving Chilled Water Temp | 0.10 °C | ♥ | Evaporator Leaving Water Temperature |
| 42 | nvoEntCHWTemp | SNVT_temp_p | Entering Chilled Water Temp | 0.10 °C | ♥ | Evaporator Entering Water Temperature |
| 44 | nvoAlarmDescr | SNVT_str_asc | Alarm annunciation text | N/A | | Diagnostic Last Message |
| 45 | nvoChillerstat | SNVT_chlr_stat | Chiller States , modes | any | ♥ | |
| | | chiller_t (enum) | | | | Chiller Running Status |
| | | CHLR_OFF | 00 = Chiller off | | | |
| | | CHLR_START | 01 = Chiller in start mode | | | |
| | | CHLR_RUN | 02 = Chiller in run mode | | | |
| | | CHLR_PRESHUTDN | 03 = Chiller in pre-shutdown mode | | | |
| | | CHLR_SERVICE | 04 = Chiller in service mode | | | |
| | | hvac_t (enum) | | | | Operating Mode |
| | | HVAC_COOL | 03 = Cooling only | | | |
| | | HVAC_ICE | 0B = Ice-making mode | | | |
| | | u8 (01234567) | | | | |
| | | in_alarm | bit 0 (MSB) = in alarm mode | | | Diagnostic Present |
| | | run_enabled | bit 1 = run enabled | | | Run Enable |
| | | local | bit 2 = local | | | Local Setpoint Control |
| | | limited | bit 3 = limited | | | Capacity Limited |
| | | chw_flow | bit 4 = evaporator water flow | | | Evaporator Water Flow Status |
| | | Not Defined | bit 6 Not Defined | | | Not defined |
| | | Not Defined | bit 7 Not Defined | | | Not defined |

**Table 3. ACRB 150–300 tons network variable outputs (continued)**

| nv Index | Configuration Variable Name | Variable Type | Variable description | Delta to Send (Notes) | SendHrdBt | Point Name |
|---|---|---|---|---|---|---|
| 46 | nvoStatusOutputs | SNVT_state | Status Outputs | defined at element | ♥ | |
| | | bits 0 – 7 | Validity of bits 8 – 15 | any | | Reserved |
| | | bit 8 | Max Capacity | any | | Maximum Capacity Relay |
| | | bit 12 | Noise Reduction Active | any | | Noise Reduction active |
| | | bit 15 (LSB) | Not Defined | Undefined | | Not defined |
| 48 | nvoCprsrsRunning | SNVT_state | Compressor Running Outputs | defined at element | ♥ | |
| | | bits 0 – 7 | Validity of bits 8 – 15 | any | | Reserved |
| | | bit 8 | Compressor A Running | any | | Running Status Compressor 1A |
| | | bit 11 | Compressor D Running | any | | Running Status Compressor 2A |
| 49 | nvoEvapWtrPump | SNVT_switch | Evaporator Water Pump Request | any | ♥ | Evaporator Water Pump Command |
| 50 | nvoEvapWtrFlow | SNVT_switch | Evaporator Water Flow Status5 | any | ♥ | Evaporator Water Flow Status |
| 53 | nvoOutdoorTemp | SNVT_temp_p | Outdoor Air Temperature | 1.00°C | ♥ | Outdoor Air Temperature |
| 54 | nvoEvapWFlowRate | SNVT_flow | Evaporator Water Flow Rate | defined at element | ♥ | Evaporator Water Flow Rate |
| 64 | nvoEvapRfgtPrsC1 | SNVT_press_f | Evaporator Refrigerant Pressure - Circuit 1 | 5.0 kPa | ♥ | Evaporator Refrigerant Pressure Ckt1 |
| 65 | nvoEvapRfgtPrsC2 | SNVT_press_f | Evaporator Refrigerant Pressure - Circuit 2 | 5.0 kPa | ♥ | Evaporator Refrigerant Pressure Ckt2 |
| 66 | nvoEvapRfgtTmpC1 | SNVT_temp_p | Evaporator Refrigerant Temperature - Circuit 1 | 0.50°C | ♥ | Evaporator Saturated Rfgt Temp Ckt1 |
| 67 | nvoEvapRfgtTmpC2 | SNVT_temp_p | Evaporator Refrigerant Temperature - Circuit 2 | 0.50°C | ♥ | Evaporator Saturated Rfgt Temp Ckt2 |
| 68 | nvoCondRfgtPrsC1 | SNVT_press_f | Condenser Refrigerant Pressure - Circuit 1 | 30.0 kPa | ♥ | Condenser Refrigerant Pressure Ckt1 |
| 69 | nvoCondRfgtPrsC2 | SNVT_press_f | Condenser Refrigerant Pressure - Circuit 2 | 30.0 kPa | ♥ | Condenser Refrigerant Pressure Ckt2 |
| 70 | nvo-CondRfgtTmpC1 | SNVT_temp_p | Condenser Refrigerant Temperature - Circuit 1 | 1.00°C or 3.00°C | ♥ | Condenser Saturated Rfgt Temp Ckt1 |
| 71 | nvo-CondRfgtTmpC2 | SNVT_temp_p | Condenser Refrigerant Temperature - Circuit 2 | 1.00°C or 3.00°C | ♥ | Condenser Saturated Rfgt Temp Ckt2 |
| 72 | nvoAirFlowPctC1 | SNVT_lev_percent | Air Flow Percent – Circuit 1 | 0.05 | ♥ | Air Flow Ckt1 |
| 73 | nvoAirFlowPctC2 | SNVT_lev_percent | Air Flow Percent – Circuit 2 | 0.05 | ♥ | Air Flow Ckt2 |
| 76 | nvoHiSideOilPrsA | SNVT_press_f | High Side Oil Pressure - Compressor A | 20.0 kPa | ♥ | Oil Pressure - Compressor 1A |
| 79 | nvoHiSideOilPrsD | SNVT_press_f | High Side Oil Pressure - Compressor D | 20.0 kPa | ♥ | Oil Pressure - Compressor 2A |
| 94 | nvoRfgtDischTmpA | SNVT_temp_p | Refrigerant Discharge Temperature - Compressor A | 0.50°C | ♥ | Discharge Temperature Compressor 1A |
| 97 | nvoRfgtDischTmpD | SNVT_temp_p | Refrigerant Discharge Temperature - Compressor D | 0.50°C | ♥ | Discharge Temperature Compressor 2A |
| 112 | nvoStartsRunTmA | UNVT_starts_runtime | Starts and Run Time – Compressor A | defined at element | ♥ | |
| | | SNVT_count_f | Starts | 1 | | Starts Compressor 1A |
| | | SNVT_time_f | Run Time | 360 sec | | Running Time Compressor 1A |
| 115 | nvoStartsRunTmD | UNVT_starts_runtime | Starts and Run Time – Compressor D | defined at element | ♥ | |
| | | SNVT_count_f | Starts | 1 | | Starts Compressor 2A |
| | | SNVT_time_f | Run Time | 360 sec | | Running Time Compressor 2A |
| 118 | nvoUnitPower | SNVT_power_f | Unit Power Consumption | Note 1 | ♥ | Unit Power Consumption |
| 133 | nvoStatus | SNVT_obj_status | Status Response | NA | ♥ | Status Response |
| 134 | nvoTraneVar9 | UNVT_c5s | Trane Comm 5 Status Output | | | Manufacturer-defined |
| | nvoFileDirectory | SNVT_address | File Directory | NA | | File Directory |

# ACRB 350–500 Tons Data Points

**Table 4. ACRB 350–500 tons configuration parameters**

| nv Index | Configuration Variable Name | Variable Type | Variable description | Point Name |
|---|---|---|---|---|
| 2 | nciChillerType | UCPT_chiller_type | Chiller Information | |
| | | Model Information | Enum list - See table in UNVT-UCPT.doc | Model Information |
| | | Unit Capacity | Capacity of Unit (in watts) | Chiller Design Capacity |
| | | Cooling Type | 0 = Water Cooled<br>1 = Air Cooled<br>2 to 254 = Unused | Cooling Type |
| | | Number of Circuits | Number of Circuits on Unit | Number Of Circuits |
| | | Number of Compressors – Crt 1 | Number of Compressors on Circuit 1 | Number Of Compressors, Circuit 1 |
| | | Number of Compressors – Crt 2 | Number of Compressors on Circuit 2 | Number Of Compressors, Circuit 2 |
| 5 | nciMfgLocation | UCPT_manufacturing_location | Chiller Manufacturing Location | Manufacture Location |
| 6 | nciNoiseRdcnReq | SNVT_switch | Default for Noise Reduction Auto/On Request | Noise Reduction request |
| 7 | nciRefrigerant | UCPT_refrig_type | Chiller Refrigerant Type | Refrigerant Type |
| 8 | nciCapacityLim | SCPTCapacityLimit | Capacity Limit | Demand Limit Setpoint |
| 9 | nciChillerEnable | SCPTChillerEnable | Default Value for nviChillerEnable | Chiller Enable |
| 10 | nciCoolsetpt | SCPTCoolSetpoint | Default Value for nviCoolSetpt | Chiller water Setpoint |
| 11 | nciDefaults | SCPTDefaultBehavior | Determines which set of values will be used on power up and communications failure, stated default values or a list of manufacturer specified values | Default Values |
| 12 | nciDevMajVer | SCPTdevMajVer | The major version number for the device | Software Major Version |
| 13 | nciDevMinVer | SCPTdevMinVer | The minor version number for the device | Software Minor Version |
| 15 | nciLocation | SCPTlocation | Location Label | Location Label |
| 16 | nciMinOutTm | SCPTminSendTime | Minimum Send Time | Minimum Send Time |
| 17 | nciMode | SCPTHVACmode | Default Value for nviMode | Chiller Mode |
| 18 | nciPwrup | SCPTpwrUpDelay | Power Up Delay | Power Up Delay |
| 19 | nciRcvHrtBt | SCPTmaxRcvTime | Receive Heartbeat Time | Receive Heartbeat |
| 20 | nciSndHrtBt | SCPTmaxSendTime | Send Heartbeat Time (nciMAXSendTime) | Send Heartbeat |
| 21 | nciBuildNum | U16 | Device Build Number | Manufacturer-defined |
| 22 | nciCRC | UCPT_crc | CRC calculation result | Manufacturer-defined |
| 23 | nciDeviceConfig | U16 | Device Configuration Choices | Manufacturer-defined |

**Table 5. ACRB 350–500 tons network variable inputs**

| Profile Index | Network Variable Name | Variable Type | Variable description | Recv HrtBt | Point Name |
|---|---|---|---|---|---|
| 24 | nviChillerEnable | SNVT_switch | Request Start/Stop Chiller | ♥ | BAS Chiller Auto Stop Command |
| 25 | nviCoolSetpt | SNVT_temp_p | Desired Temp of Lvg Chilled Wtr | ♥ | BAS Chilled Water Setpoint |
| 26 | nviCapacityLim | SNVT_lev_percent | Capacity Limit of Chiller | ♥ | BAS Demand Limit Setpoint |
| 28 | nviMode | SNVT_Hvac_mode | Chiller Modes | ♥ | BAS Chiller Mode Command |
| 32 | nviNoiseRdcnReq | SNVT_switch (2-state) | Noise Reduction Auto/ On Request | ♥ | Noise Reduction Request BAS |
| 35 | nviRequest | SNVT_obj_request | Status Request | | Status Request Input |
| 36 | nviTraneVar2 | UNVT_c5c | Comm5 Status | | Manufacturer-defined |

**Table 6. ACRB 350–500 tons network variable outputs**

| nv Index | Configuration Variable Name | Variable Type | Variable description | Delta to Send (Notes) | SendHrdBt | Point Name |
|---|---|---|---|---|---|---|
| 37 | nvoOnOff | SNVT_switch | Chiller On / Off run state | any | ♥ | Chiller Running State |
| 38 | nvoActiveSetpt | SNVT_temp_p | Active Cool or Heat Setpt | 0.10 °C | ♥ | Active Chilled Water Setpoint |
| 39 | nvoActualCap | SNVT_lev_percent | Actual Running Capacity of Unit | 0.03 | ♥ | Chiller Power |
| 40 | nvoCapacityLim | SNVT_lev_percent | Current Capacity Limit Setting of Chiller | 0.01 | ♥ | Active Demand Limit Setpoint |
| 41 | nvoLvgCHWTemp | SNVT_temp_p | Leaving Chilled Water Temp | 0.10 °C | ♥ | Evaporator Leaving Water Temperature |
| 42 | nvoEntCHWTemp | SNVT_temp_p | Entering Chilled Water Temp | 0.10 °C | ♥ | Evaporator Entering Water Temperature |
| 44 | nvoAlarmDescr | SNVT_str_asc | Alarm annunciation text | N/A | | Diagnostic Last Message |
| 45 | nvoChillerstat | SNVT_chlr_stat | Chiller States , modes | any | ♥ | |
| | | chiller_t (enum) | | | | Chiller Running Status |
| | | CHLR_OFF | 00 = Chiller off | | | |
| | | CHLR_START | 01 = Chiller in start mode | | | |
| | | CHLR_RUN | 02 = Chiller in run mode | | | |
| | | CHLR_PRESHUTDN | 03 = Chiller in pre-shutdown mode | | | |
| | | CHLR_SERVICE | 04 = Chiller in service mode | | | |
| | | hvac_t (enum) | | | | Operating Mode |
| | | HVAC_COOL | 03 = Cooling only | | | |
| | | HVAC_FREE_COOL | 0A = Cooling with compressor not running | | | |
| | | HVAC_ICE | 0B = Ice-making mode | | | |
| | | u8 (01234567) | | | | |
| | | in_alarm | bit 0 (MSB) = in alarm mode | | | Diagnostic Present |
| | | run_enabled | bit 1 = run enabled | | | Run Enable |
| | | local | bit 2 = local | | | Local Setpoint Control |
| | | limited | bit 3 = limited | | | Capacity Limited |
| | | chw_flow | bit 4 = evaporator water flow | | | Evaporator Water Flow Status |
| | | Not Defined | bit 6 Not Defined | | | Not Defined |
| | | Not Defined | bit 7 Not Defined | | | Not Defined |
| 46 | nvoStatusOutputs | SNVT_state | Status Outputs | defined at element | ♥ | |
| | | bits 0 – 7 | Validity of bits 8 – 15 | any | | Reserved |
| | | bit 8 | Max Capacity | any | | Maximum Capacity Relay |
| | | bit 9 | Head Relief Request | any | | Head Relief Request |
| | | bit 12 | Noise Reduction Active | any | | Noise Reduction active |
| | | bit 15 (LSB) | Not Defined | Undefined | | Not Defined |
| 48 | nvoCprsrsRunning | SNVT_state | Compressor Running Outputs | defined at element | ♥ | |
| | | bits 0 – 7 | Validity of bits 8 – 15 | any | | Reserved |
| | | bit 8 | Compressor A Running | any | | Running Status Compressor 1A |
| | | bit 9 | Compressor B Running | any | | Running Status Compressor 1B |
| | | bit 11 | Compressor D Running | any | | Running Status Compressor 2A |
| 49 | nvoEvapWtrPump | SNVT_switch | Evaporator Water Pump Request | any | ♥ | Evaporator Water Pump Command |
| 50 | nvoEvapWtrFlow | SNVT_switch | Evaporator Water Flow Status5 | any | ♥ | Evaporator Water Flow Status |

**Table 6. ACRB 350–500 tons network variable outputs (continued)**

| nv Index | Configuration Variable Name | Variable Type | Variable description | Delta to Send (Notes) | SendHrdBt | Point Name |
|---|---|---|---|---|---|---|
| 53 | nvoOutdoorTemp | SNVT_temp_p | Outdoor Air Temperature | 1.00°C | ♥ | Outdoor Air Temperature |
| 58 | nvoEvapAprchTmp | SNVT_temp_diff_p | Evaporator Approach Temperature | 0.50°C | ♥ | Evaporator Approach Temperature |
| 62 | nvoUnitVoltage | UNVT_3phase_volt | Unit Voltage Per Phase | defined at element | ♥ | |
| | | SNVT_volt_ac | BC voltage | Note 1 | | Starter Voltage Phase BC |
| | | SNVT_volt_ac | CA voltage | Note 1 | | Starter Voltage Phase CA |
| | | SNVT_volt_ac | AB voltage | Note 1 | | Starter Voltage Phase AB |
| 64 | nvoEvapRfgtPrsC1 | SNVT_press_f | Evaporator Refrigerant Pressure - Circuit 1 | 5.0 kPa | ♥ | Evaporator Refrigerant Pressure Ckt1 |
| 65 | nvoEvapRfgtPrsC2 | SNVT_press_f | Evaporator Refrigerant Pressure - Circuit 2 | 5.0 kPa | ♥ | Evaporator Refrigerant Pressure Ckt2 |
| 66 | nvoEvapRfgtTmpC1 | SNVT_temp_p | Evaporator Refrigerant Temperature - Circuit 1 | 0.50°C | ♥ | Evaporator Saturated Rfgt Temp Ckt1 |
| 67 | nvoEvapRfgtTmpC2 | SNVT_temp_p | Evaporator Refrigerant Temperature - Circuit 2 | 0.50°C | ♥ | Evaporator Saturated Rfgt Temp Ckt2 |
| 68 | nvoCondRfgtPrsC1 | SNVT_press_f | Condenser Refrigerant Pressure - Circuit 1 | 30 KPA | ♥ | Condenser Refrigerant Pressure Ckt1 |
| 69 | nvoCondRfgtPrsC2 | SNVT_press_f | Condenser Refrigerant Pressure - Circuit 2 | 30 KPA | ♥ | Condenser Refrigerant Pressure Ckt2 |
| 70 | nvo-CondRfgtTmpC1 | SNVT_temp_p | Condenser Refrigerant Temperature - Circuit 1 | 1.00°C or 3.00°C 6 | ♥ | Condenser Saturated Rfgt Temp Ckt1 |
| 71 | nvo-CondRfgtTmpC2 | SNVT_temp_p | Condenser Refrigerant Temperature - Circuit 2 | 1.00°C or 3.00°C 6 | ♥ | Condenser Saturated Rfgt Temp Ckt2 |
| 72 | nvoAirFlowPctC1 | SNVT_lev_percent | Air Flow Percent – Circuit 1 | 5.00% | ♥ | Air Flow Ckt1 |
| 73 | nvoAirFlowPctC2 | SNVT_lev_percent | Air Flow Percent – Circuit 2 | 5.00% | ♥ | Air Flow Ckt2 |
| 76 | nvoHiSideOilPrsA | SNVT_press_f | High Side Oil Pressure - Compressor A | 20.0 kPa | ♥ | Oil Pressure - Compressor 1A |
| 77 | nvoHiSideOilPrsB | SNVT_press_f | High Side Oil Pressure - Compressor B | 20.0 kPa | ♥ | Oil Pressure - Compressor 1B |
| 79 | nvoHiSideOilPrsD | SNVT_press_f | High Side Oil Pressure - Compressor D | 20.0 kPa | ♥ | Oil Pressure - Compressor 2A |
| 94 | nvoRfgtDischTmpA | SNVT_temp_p | Refrigerant Discharge Temperature - Compressor A | 0.50°C | ♥ | Discharge Temperature Compressor 1A |
| 95 | nvoRfgtDischTmpB | SNVT_temp_p | Refrigerant Discharge Temperature - Compressor B | 0.50°C | ♥ | Discharge Temperature Compressor 1B |
| 97 | nvoRfgtDischTmpD | SNVT_temp_p | Refrigerant Discharge Temperature - Compressor D | 0.50°C | ♥ | Discharge Temperature Compressor 2A |
| 100 | nvoVoltageB | UNVT_3phase_volt | Voltage Per Phase – Compressor B | defined at element | ♥ | |
| | | SNVT_volt_ac | BC phase voltage | Note 1 | | Phase BC Voltage - Compressor 1B |
| | | SNVT_volt_ac | CA phase voltage | Note 1 | | Phase CA Voltage - Compressor 1B |
| | | SNVT_volt_ac | AB phase voltage | Note 1 | | Phase AB Voltage - Compressor 1B |
| 107 | nvoCurrentB | UNVT_3phase_ current | Current Per Line – Compressor B | defined at element | ♥ | |
| | | SNVT_amp_ac | L1 current in Amps | Note 2 | | Line 1 Current - Compressor 1B |
| | | SNVT_amp_ac | L2 current in Amps | Note 2 | | Line 2 Current - Compressor 1B |
| | | SNVT_amp_ac | L3 current in Amps | Note 2 | | Line 2 Current - Compressor 1B |
| | | SNVT_lev_percent | L1 current in %RLA | 100% | | Line 1 Current RLA - Compressor 1B |
| | | SNVT_lev_percent | L2 current in %RLA | 100% | | Line 2 Current RLA - Compressor 1B |
| | | SNVT_lev_percent | L3 current in %RLA | 100% | | Line 3 Current RLA - Compressor 1B |
| 112 | nvoStartsRunTmA | UNVT_starts_runtime | Starts and Run Time – Compressor A | defined at element | ♥ | |
| | | SNVT_count_f | Starts | 1 | | Starts Compressor 1A |
| | | SNVT_time_f | Run Time | 360 sec | | Running Time Compressor 1A |

**Table 6. ACRB 350–500 tons network variable outputs (continued)**

| nv Index | Configuration Variable Name | Variable Type | Variable description | Delta to Send (Notes) | SendHrdBt | Point Name |
|---|---|---|---|---|---|---|
| 113 | nvoStartsRunTmB | UNVT_starts_runtime | Starts and Run Time – Compressor B | defined at element | ♥ | |
| | | SNVT_count_f | Starts | 1 | | Starts Compressor 1B |
| | | SNVT_time_f | Run Time | 360 sec | | Running Time Compressor 1B |
| 115 | nvoStartsRunTmD | UNVT_starts_runtime | Starts and Run Time – Compressor D | defined at element | ♥ | |
| | | SNVT_count_f | Starts | 1 | | Starts Compressor 2A |
| | | SNVT_time_f | Run Time | 360 sec | | Running Time Compressor 2A |
| 118 | nvoUnitPower | SNVT_power_f | Unit Power Consumption | Note 3 | ♥ | Unit Power Consumption |
| 133 | nvoStatus | SNVT_obj_status | Status Response | NA | ♥ | Status Response |
| 134 | nvoTraneVar9 | UNVT_c5s | Trane Comm 5 Status Output | | | Manufacturer-defined |
| | nvoFileDirectory | SNVT_address | File Directory | NA | | File Directory |

# Appendix A. Arbitration

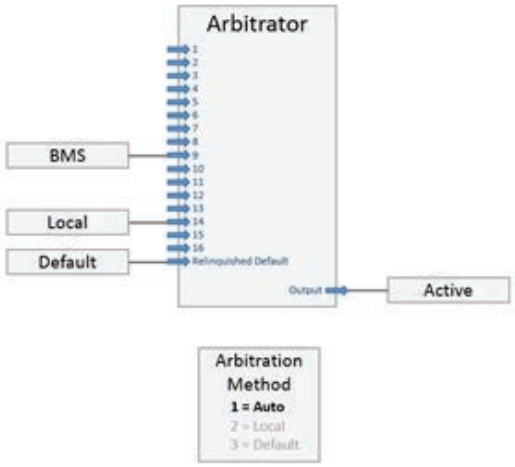
The Symbio™ 800 controller includes arbitration logic for several points. For each read/write point designated as “BAS”, an associated “Arbitration” point determines the behavior of that communicated data compared to the local hardwired (or wireless) sensor and a default value.

As shown in Figure 6, p. A–1, the arbitrator considers all possible sources of the provided data, including Building Management Systems (BMS), local, and default. Each potential source is defined at a pre-determined, fixed priority. When the arbitration method is selected as full/auto, the BMS value is used instead of the local or default values.

The point designator with the arbitrator suffix includes the full priority array, allowing the user to see the value associated with all potential sources considered in the logic. The active point reflects the result of the arbitration logic.

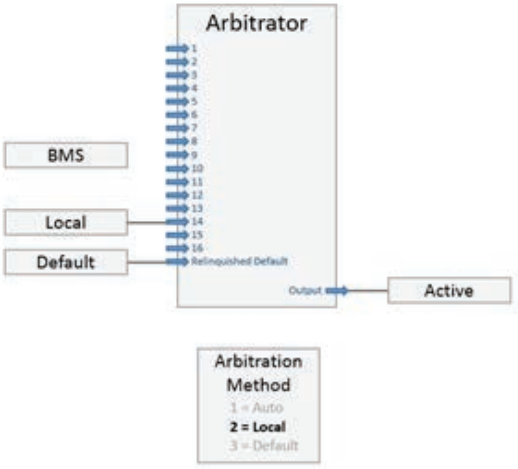
Because the arbitrated points are normally associated with sensors, the default value is invalid, meaning the value must be provided either by the BMS or the local sensor.

**Figure 6. Arbitration method - full/auto**



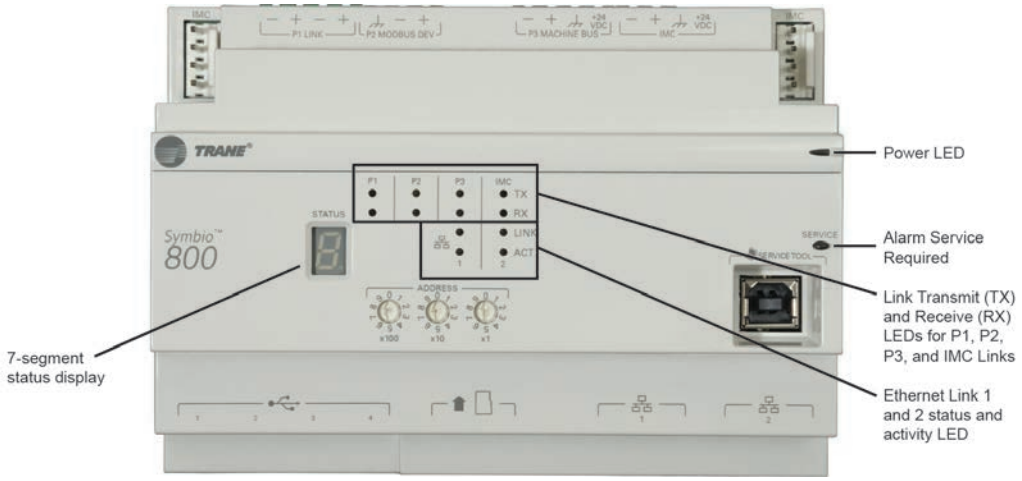

When the Arbitration Method is selected as local, the BMS value is ignored and local value is used instead. Though the arbitration logic still considers all inputs, any values sent by the BMS are effectively ignored.

**Figure 7. Arbitration method - local**



# Appendix B. Symbio™ 800 Controller Display

**Figure 8. Symbio™ 800 controller display and LEDs**




### 7–Segment status display

**Table 7. Codes for 7–segment display segment**

| Code | Description |
|---|---|
| U0. | Waiting for USB drives to mount |
| U2. | Checking signature on the .scfw file |
| U3. | Checking software maintenance plan |
| U4. | Reformatting main filesystem (clearing database) |
| U5. | Beginning update |
| U12. | Searching for .scfw files on USB drive(s) |
| U51. | Updating main firmware |
| U54. | Updating FPGA image |
| U55. | Updating U-boot image |
| U57. | Updating recovery partition |

***Note:*** *A code starting with an "F" indicates a failure, and requires Trane Service to resolve the issue.*

### P1 Link — BACnet MS/TP or Modbus RTU

- RS-485 daisy chain
- Used for connection to a Master Controller

**Figure 9. P2 Modbus device (factory installed Modbus slave devices)**

***Note:*** *The P2 link is intended for factory devices only and should not have any other devices added this link.*

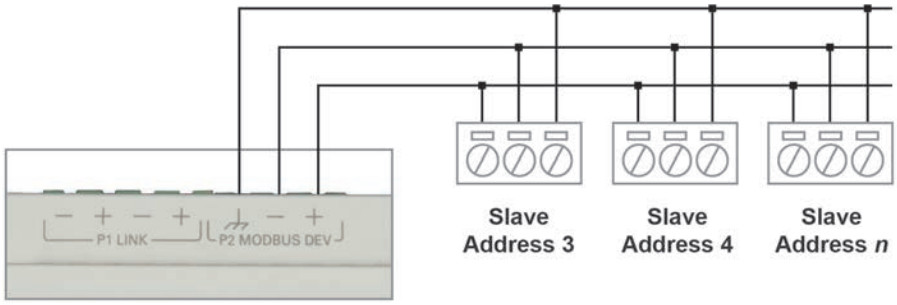



**Figure 10. P3 machine bus (global bus — internal communication bus)**

***Note:*** *The P3 link is intended for factory devices only and should not have any other devices added this link.*

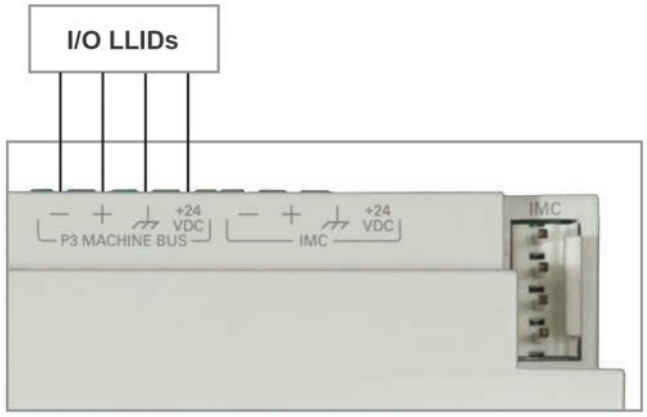


**Figure 11. IMC link terminations for optional Air-Fi and expansion module (XM70)**

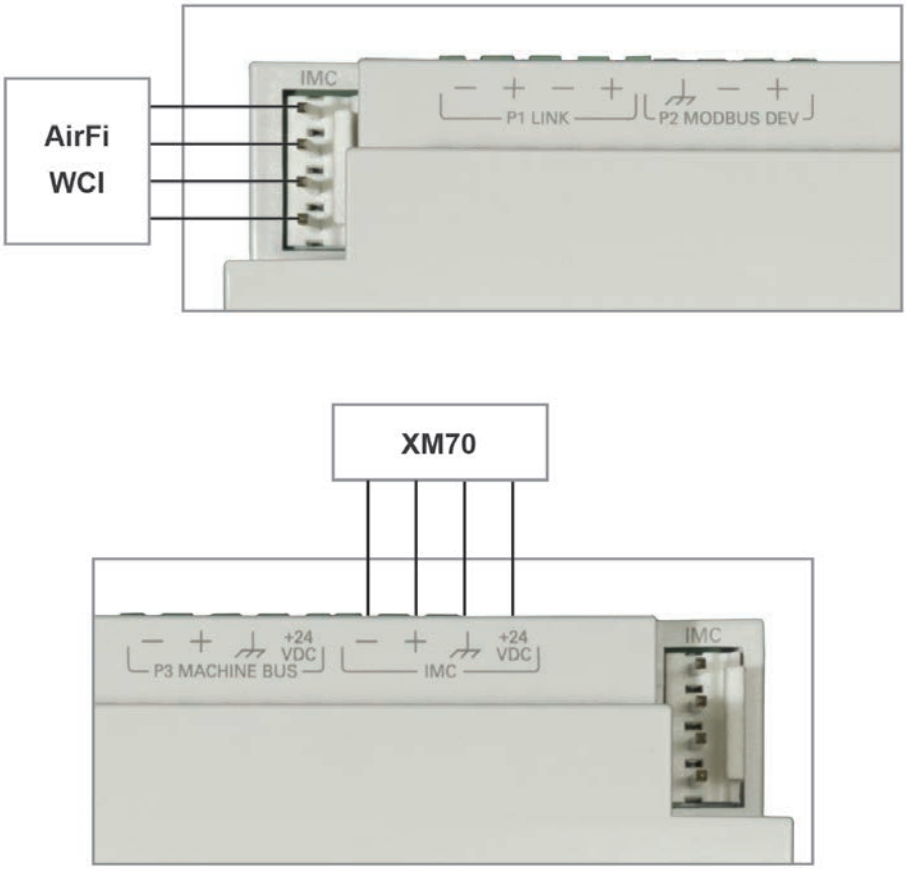
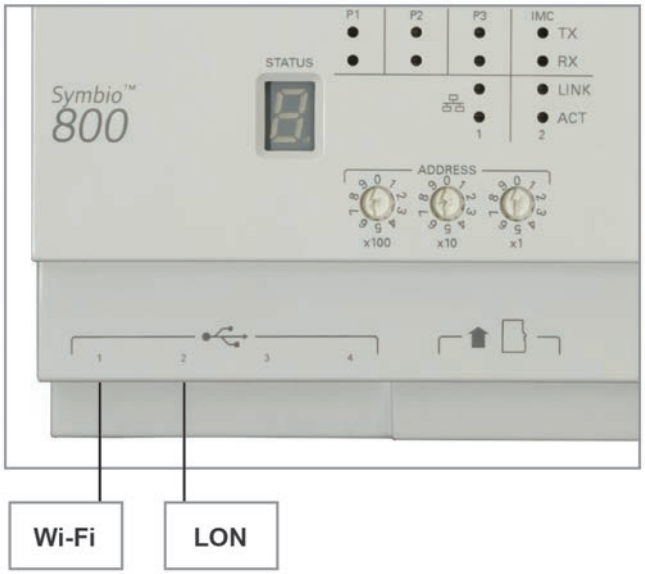


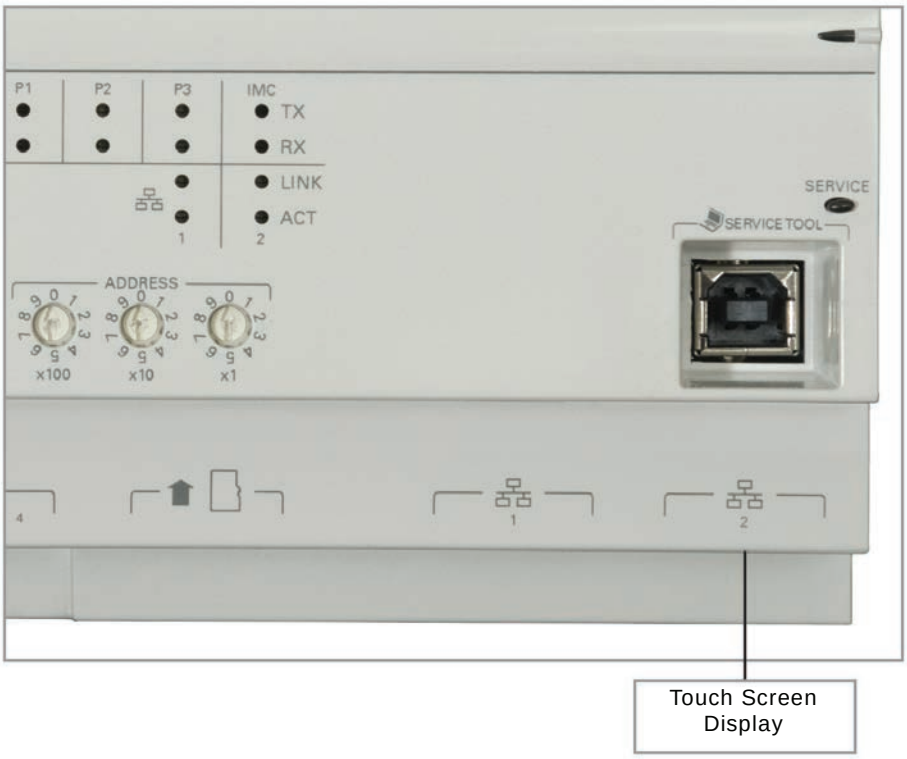

**Figure 12. (4) USB connectors**




The controller automatically detects devices on any of the ports (not port specific). The controller ships with all ports enabled, but they can be disabled via the Web interface.

***Note:*** *The USB ports are not to be used for any devices that are not Trane approved, such as cellular phones.*

**Figure 13. Ethernet port 2**




***Note:*** *Ethernet Port 2 is for use with the Touch Screen display only. Communication to other devices is not supported.*

## 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-SVP046A-EN 06 Feb 2021
Supersedes (New)