User Guide

Symbio 700 Controller

⚠ 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.

June 2020

BAS-SVU054A-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.

⚠ 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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Introduction

The Symbio™ 700 controller is a factory installed, programmed control system providing digital control and protection of the equipment. It offers equipment and control configurations that can be used with Odyssey™ cooling and heat pump systems. This control system consists of the Symbio™ 700 main controller and up to four option modules used to provide optional functional operation. A system may or may not include option modules, depending on the configuration of the equipment.

Applications

Odyssey cooling and heat pump split systems

Features and Benefits

- Open and Flexible
  - Readily available software for configuration and troubleshooting
  - Field upgradable software
  - Built on mobile service technology, Symbio 700 empowers customers to select servicer that meets their needs
  - Full suite of communication options for BAS integration today and into the future
  - Optional TGP2 and XM support (Tracer TU required) to provide custom sequences and/or side control functionality
- Connected
  - Optional remote access and monitoring, providing troubleshooting support without a site visit.

Controller Overview

The Symbio 700 has two model options:

- **Standard Configuration** — provides standard troubleshooting via on-board user interface (UI) and access to the Symbio Service and Installation mobile app.
- **Advanced Configuration** — introduces additional troubleshooting tools and Building Automation System interface via BACnet® (ANSI/ASHRAE Standard 135-2016) or LonTalk™.

To upgrade from Standard Functionality to Advance Functionality a new Symbio 700 controller must be purchased with the Advance Functionality and installed on the equipment.

Functionality

Feature	Standard Functionality	Advanced Functionality
Event Log	Only show last 5 through Mobile Service Tool Unavailable on Onboard UI	Unrestricted on Mobile Service Tool Unavailable on Onboard UI
Active Alarms	Most Current with Highest Priority through Mobile Service Tool Unrestricted with Onboard UI	Unrestricted
Export Trends	Not Allowed on Mobile Service Tool Not Allowed on Onboard UI	Unrestricted on Mobile Service Tool
Communication Protocol	None	BACnet MS/TP BACnet Air-Fi BACnet IP LonTalk
TGP2	None	Unrestricted

User Interface

The Symbio 700 controller provides a 2 X 16 backlit LCD display on the middle of the controller. The onboard user interface includes a Bluetooth pair button to pair with the Symbio 700 controller for use with the mobile service tool.

Figure 1. User interface keypad

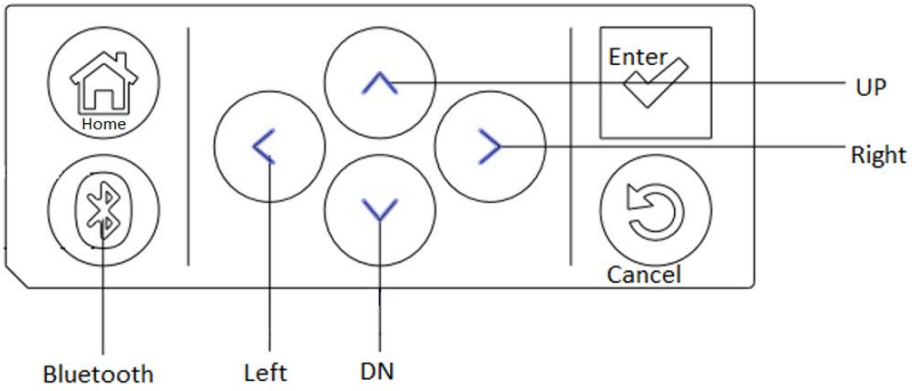


Table 1. User interface buttons

Button	Description
Up/down	Allow the user to scroll the menus and submenus.
Left/right	Allow the user to scroll between values for editable items.
✔	• Allows user to drill down into a component of the menu tree. • Confirm data changes on writable data. When data is editable, the data point's least significant digit flashes with a cursor. If the data has multiple editable digits, the user scrolls the curser left and right to choose the editable digit. Once the editing is complete, the data is not changed and propagated through the controller until the **Enter** button is tapped.
	Tap to exit all submenus and return to the Home screen.
	Tap to go to the Bluetooth menu and initiate the Bluetooth device pairing sequence.
	Tap to return to the previous menu level.

Menu

Figure 2. Symbio 700 menu

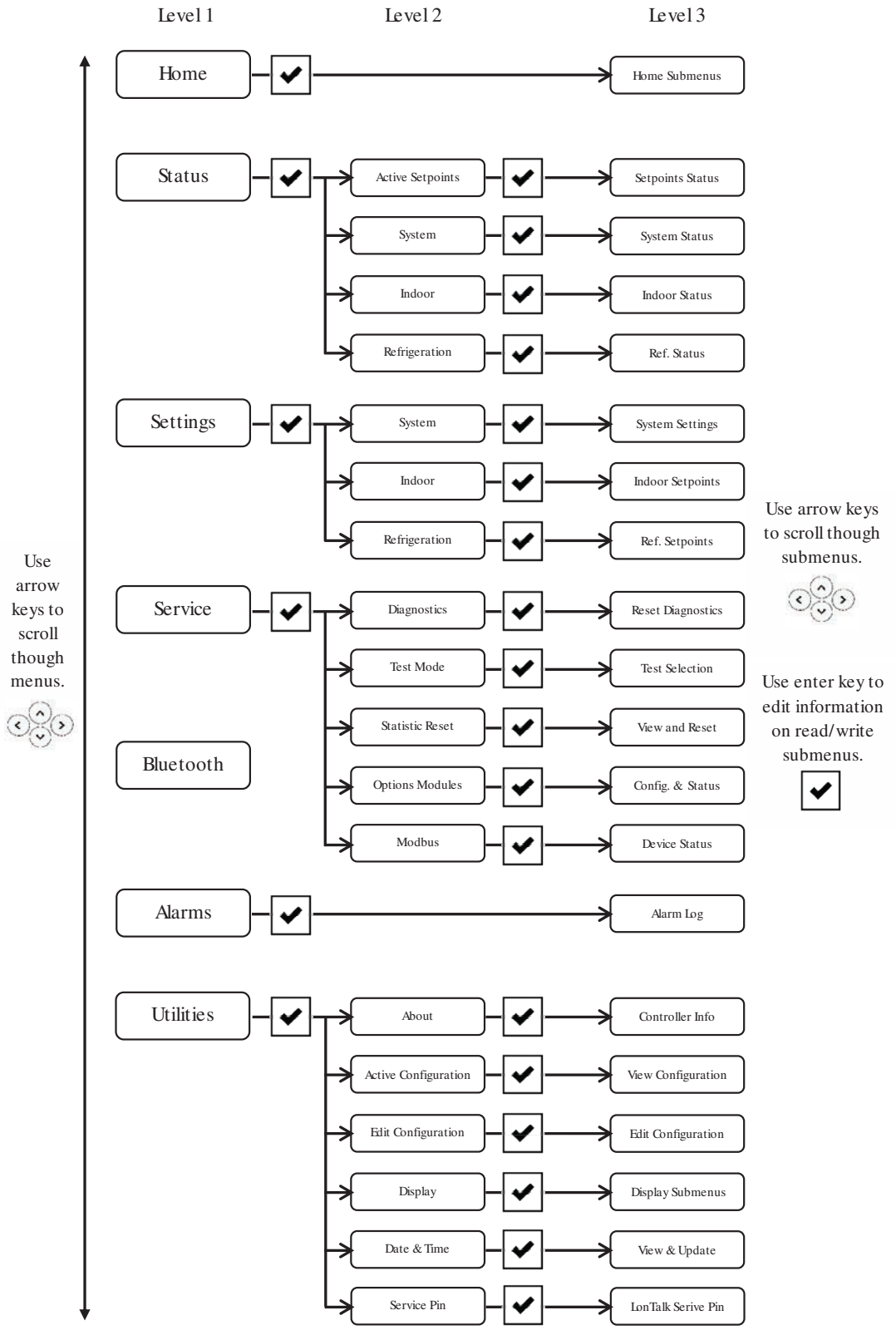


Table 2. Symbio 700 menu item descriptions

Menu		Description
Home		Allows the user to view the status of:
		Unit Operation
Status	Active Setpoints	Allows the user to view all active setpoint values
	System	Allows the user to view the status of:
		Alarm indicator
		Equipment shutdown input
		Phase Monitor
		Supply Air Tempering (if configured)
		T-Stat Inputs
	Indoor	Allows the user to view the status of (if configured):
		Supply fan information
		Indoor Symbio Options Module
		Discharge Air Temperature
		Filter Runtime Hours
	Refrigeration	Allows the user to view the status of:
		Compressor Information and Setpoints
		Refrigeration Circuit Information
Settings	System	Allows the user to change the:
		Arbitration Method Request
		Emergency Override BAS
		Unit Stop Command
	Indoor	Allows the user to change the (if configured):
		Supply Fan Information
		Filter Runtime Hours
	Refrigeration	Allows the user to change the:
		Compressor Information
		Refrigeration Circuit Information
Service	Diagnostics	Allows the user to reset active diagnostics.
	Test	Allows the user to set the unit into service test using the Service Test Request.
	Statistic Reset	Allows the user to reset all the component statistic data.
	Options Modules	Displays configuration, communication status, and firmware versions of option modules.
	Modbus	Displays communication status of modbus devices.
Bluetooth		Identifies if a bluetooth device is connected.
Alarms		Provides list of active alarms, newest alarm is listed first
		Alarms presented:
		Line 1: Point Name
		Line 2: Assigned Severity (if applicable)

Table 2. Symbio 700 menu item descriptions (continued)

Menu		Description
Utilities	About	Lists the Symbio module(s) software versions
	Active Configuration	Read only list of current unit configuration
	Edit Configuration	Allows user to reconfigure the unit or modify individual configuration settings.
	Display	Allows the user to change display units and display scroll speed
	Date and Time	Display and edit the current date and time
		(hh:mm AM/PM), Date (MM/DD/YYY), and Time Zone
	Service Pin	Service Pin request

LED Functions

Table 3. Symbio 700 LED functions

LED	Function
LED 1 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 2 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 3 – Bluetooth	OFF = Bluetooth radio is not available ON = Active Bluetooth connection in process BLINKING = Controller is waiting for a Bluetooth connection
LED 4 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 5 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 6 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 7	SOLID ON = When link is connected OFF = When link is disconnected
LED 8	BLINKING = Activity on link OFF = No activity on link
LED 9	SOLID GREEN = All objects in a normal state OFF = Controller not powered or is in an alarm condition
LED 10 – Status	BLINKING RED = At least one object is in a not normal state OFF = Controller not powered or is in a normal state
LED 11 – Modbus RTU Link TX	BLINKING GREEN = when Modbus data is sent
LED 12 – Modbus RTU Link RX	BLINKING YELLOW = when Modbus data is received
LED 13 – IMC Link TX	BLINKING GREEN = when IMC data is sent
LED 14 – IMC Link RX	BLINKING YELLOW = when IMC data is received
LED 15 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 16 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 17 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 18 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 19 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 20 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 21 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 22 – Binary Output	SOLID ON=When output is on OFF=When output is off
LED 23 – BACnet MS/TP Link RX	BLINKING YELLOW = when BACnet data is received
LED 24 – BACnet MS/TP Link TX	BLINKING GREEN = when BACnet data is received

Mobile Application

The Symbio™ Service and Installation mobile app provides advanced configuration, setup, status updates, alarms, and service capabilities for the Symbio 700 controller via Bluetooth connection.

The Symbio 700 can connect to mobile devices that support BLE version 4.2 and higher. Only one connection is allowed at a time to prevent another user from connecting to the system while it is already in use. If a connection is lost, whether accidental or purposeful, a timer is used to prevent the controller from being locked by a user that does not disconnect the controller in a preferred manner.

The Symbio Service and Installation app is required to configure the following:

- BACnet® over ZigBee® (Air-Fi® Wireless)
- BACnet IP
- BACnet MS/TP
- LonTalk

Technical Specifications

Input/Output Connection Assignments

Figure 3. Symbio 700 module factory connections

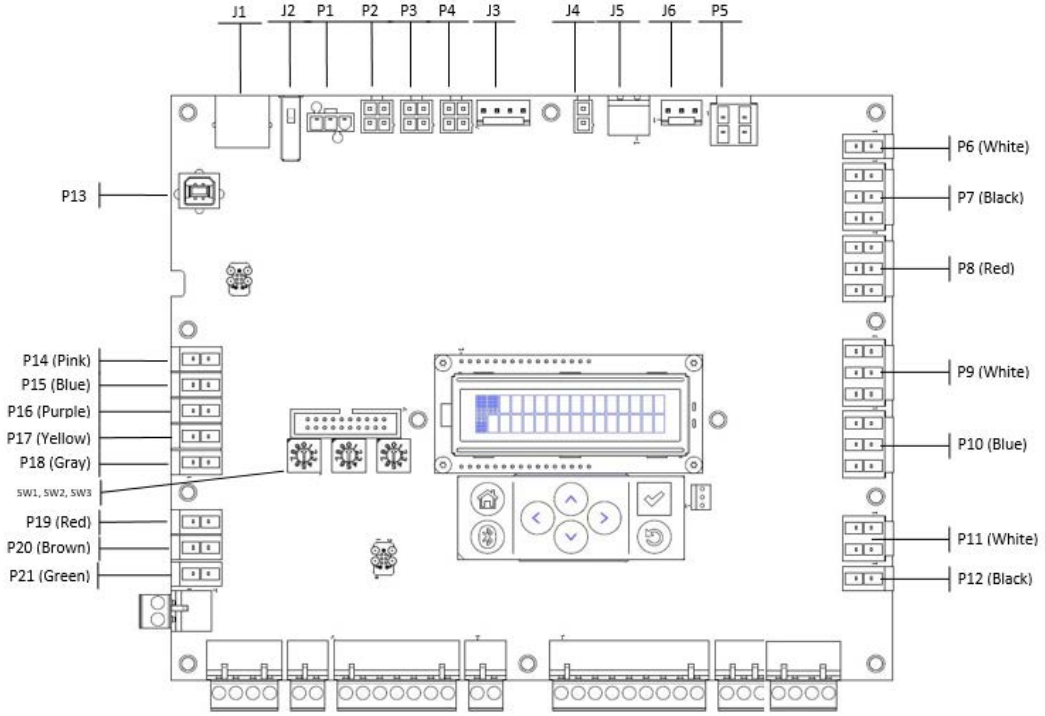


Table 4. Symbio 700 factory connections

Factory Connection	Function	Pin #	Signal
P1	Modbus Communication	1	GND
		2	Modbus -
		3	Modbus +
P2	IMC Communication	1	24VAC Out
		2	GND
		3	IMC +
		4	IMC -
P3	IMC Communication	1	24VAC Out
		2	GND
		3	IMC +
		4	IMC -
P4	IMC Communication	1	24VAC Out
		2	GND
		3	IMC +
		4	IMC -

Table 4. Symbio 700 factory connections (continued)

Factory Connection	Function	Pin #	Signal
P5	Indoor Fan	1	Common
		2	Indoor Fan Run Command
		3	Common
		4	Indoor Fan High Speed
P6	Power for Outdoor Fan and SOV Outputs	1	24VAC In
		2	GND
P7	Outdoor Fan Outputs	1	Outdoor Fan 1
		2	GND
		3	Outdoor Fan 2
		4	GND
		5	Outdoor Fan 3
		6	GND
P8	Compressor 1 Circuit	1	24VAC Pass-through
		2	24VAC Pass-through
		3	Compressor 1 Proving
		4	Common
		5	Compressor 1 Run
		6	Compressor 1 Unloader
P9	Compressor 2 Circuit	1	24VAC Pass-through
		2	24VAC Pass-through
		3	Compressor 2 Proving
		4	Common
		5	Compressor 2 Run
		6	Compressor 2 Unloader
P11	Switchover Valves	1	Switchover Valve 1
		2	GND
		3	Switchover Valve 2
		4	GND
P12	ECM Fan Control	1	ECM Fan Control Output
		2	GND
P13	USB Service Tool		
P14	Spare Input	1	Spare
		2	GND
P15	Outdoor Air Temperature	1	Outdoor Air Temperature
		2	GND
P16	Coil Temperature 1	1	Coil Temperature 1 Input
		2	GND
P17	Coil Temperature 2	1	Coil Temperature 2 Input
		2	GND
P19	Circuit 1 LPC	1	24Vac Out
		2	Circuit 1 LPC Input

Table 4. Symbio 700 factory connections (continued)

Factory Connection	Function	Pin #	Signal
P20	Circuit 2 LPC	1	24Vac Out
		2	Circuit 2 LPC Input
P21	Spare	1	24Vac Out
		2	Spare
J1	Ethernet		
J2	USB Host [a]		
J3	IMC Communication	1	24V DC Power out
		2	GND
		3	IMC +
		4	IMC -
J4	Input Power	1	24VAC In/Out
		2	GND
J5	Input Power	1	24VAC In/Out
		2	GND
J6	Phase Monitor Input	1	24VAC Out
		2	Phase Monitor Input
		3	GND
SW1	BACnet Address	NA	
SW2	BACnet Address	NA	
SW3	BACnet Address	NA	

(a) USB HOST not intended to charge mobile phones

Figure 4. Symbio 700 field connections

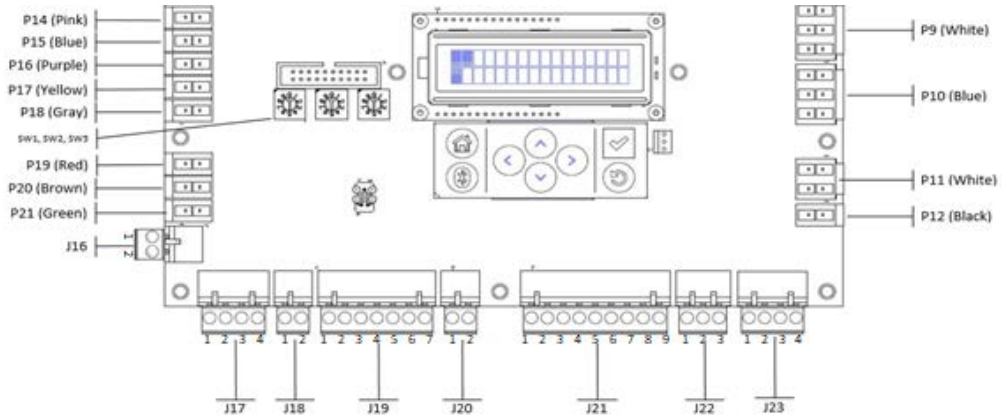


Table 5. Symbio 700 field connections

Customer Connections	Function	Pin #	Signal
J16	Demand Shed/Demand Limit Connection	1	24VAC Out
		2	Demand Shed/Demand Limit Input
J17	BACnet Communication Connections	1	BACnet +
		2	BACnet -
		3	BACnet +
		4	BACnet -
J18	Equipment Shutdown Input Connections	1	24VAC Out
		2	Equipment Shutdown Input
J19	Zone Sensor Connections	1	Space/Zone Temperature
		2	GND
		3	Cool Setpoint
		4	Mode
		5	Heat Setpoint
		6	GND
		7	24VAC Out
J20	Occupancy Connections	1	24VAC Out
		2	Occupancy Switch
J21	Thermostat Connections	1	24VAC Out
		2	Y1
		3	W1/O
		4	G
		5	W2
		6	Y2
		7	X2
		8	1.5K Ohms Pull-down
		9	GND
J22	Space CO2	1	24VDC Out
		2	Input (0-10Vdc)
		3	GND
J23	Space Humidity	1	24VDC Out
		2	Input (4-20mA)
		3	GND
		4	NA

Figure 5. Symbio 700 indoor option module factory connections

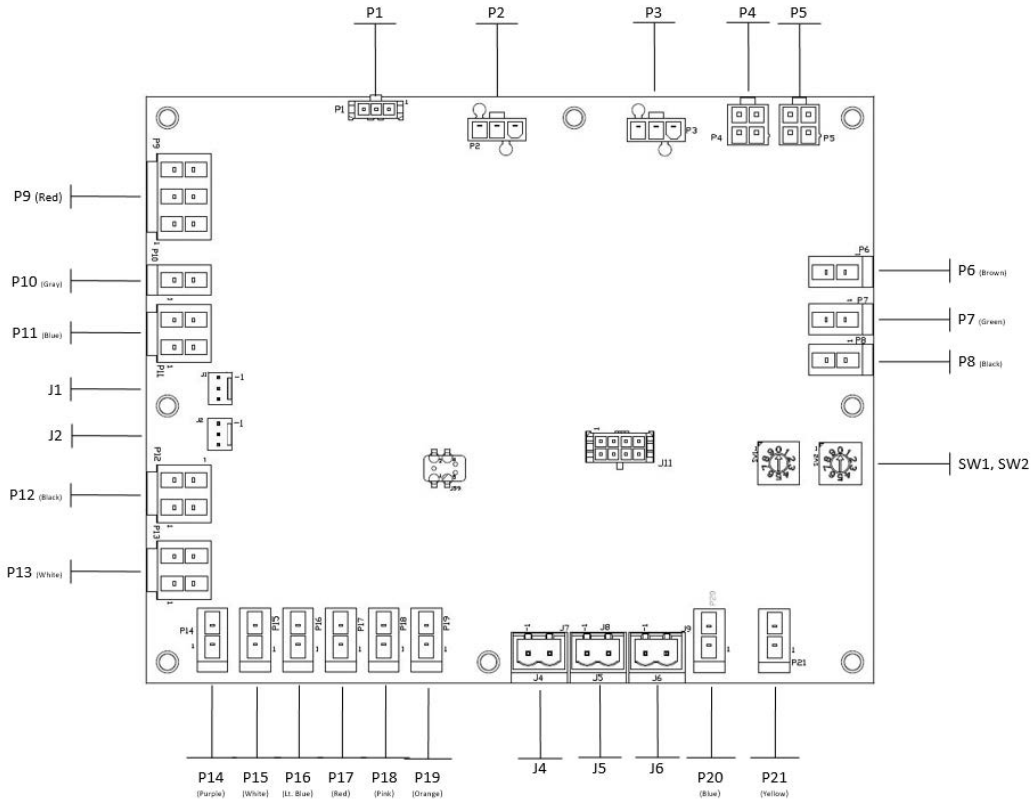


Table 6. Symbio 700 indoor option module factory connections

Factory Connections	Function	Pin #	Signal
P4	IMC Communication	1	24VAC In/Out
		2	GND
		3	IMC +
		4	IMC -
P5	IMC Communication	1	24VAC In/Out
		2	GND
		3	IMC +
		4	IMC -
P6	Electric Heat Stage 1	1	Electric Heat Stage 1 Output
		2	GND
P7	Electric Heat Stage 2	1	Electric Heat Stage 2 Output
		2	GND
P14	Discharge Air Temp	1	Discharge Air Temperature Input
		2	GND
P16	FroStat	1	24Vac Out
		2	FroStat Input
SW1	Module Address	NA	NA
SW2	Module Address	NA	NA

Thermostats and Zone Sensors

Thermostats

Customers occasionally require operation with a conventional thermostat rather than a zone sensor. Non-Trane building controllers typically provide an interface to HVAC equipment based on a conventional thermostat interface. Units applied with this type of controller need to accept conventional thermostat inputs. Conventional thermostat signals represent direct requests for unit functions. This function provides inputs for the thermostat signals and processing to enhance reliability and performance. Compressor protection and reliability enhancement functions (HPC, LPC, minimum On/Off timers, etc.) all operate the same whether applied with zone sensors or a conventional thermostat. Logic is also provided to cause appropriate unit functions when inappropriate thermostat signals are provided. Simultaneous calls for heating and cooling will be ignored, and the fan will be turned on with a call for heating or cooling even if the fan request is not detected. If the thermostat is immediately changed from a heating to a cooling call, or vice versa, there will be a delay before the new mode will initiate.

Table 7. Thermostat signals

Thermostat Operation	Signal
J21 terminal	(1) R 24VAC power to thermostat (2) Y1 Call for stage 1 of cooling (6) Y2 Call for stage 2 of cooling (4) G Call for supply fan (3) W1 Call for stage 1 of heating (5) W2 Call for stage 2 of heating
Heat pump only	(7) X2 Call for emergency heat (3) O Switchover valve On = cooling, Off = heating
Conventional thermostat – gas/ electric, electric heat	G (fan) Fan runs continuously Y1 (first stage of cooling) Compressor 1 runs Y2 + Y2 (second stage of cooling) Compressor 1 and Compressor 2 runs W1 (first stage of heating) Electric first stage operates W2 (second stage of heating) Electric second stage operates
Conventional thermostat – heat pump	G (fan) Fan runs continuously O (reversing valve during cooling) Reversing valve in cool mode Y1 + O (first stage cooling) Compressor 1 runs Y1 + Y2 + O (second stage of cooling) Compressor 1 and Compressor 2 will run

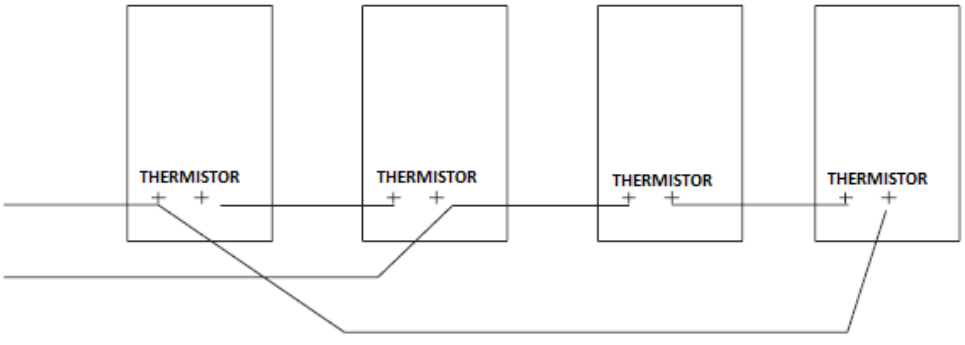
Zone Sensors

A 10k ohm resistance type 2 thermistor can be wired to terminals J19-1 and J19-2 as an input for space temperature.

Averaging

In some applications, 1 zone sensor does not give a good representation of zone temperature. The internal thermistors, 10K ohm resistance @ 25C/77F, can be wired as shown below in order to provide an average input to the J19-1 and J19-2 terminals

Figure 6. Zone sensors



Communication Protocols

BACnet (ANSI/ASHRAE Standard 135-2016)

The Symbio 700 controller supports communication using BACnet MS/TP, BACnet IP, or BACnet/Zigbee (Air-Fi™ Wireless). This allows the controller to communicate with most building automation systems. For more information on this protocol, see BACnet Integration to Odyssey Units with Symbio 700 Controls (ACC-SVP001).

LonTalk

The Symbio 700 Controller supports communication using LonTalk when the Tracer USB LonTalk Module is installed. This allows the controller to communicate with most building automation systems. For more information on this protocol, see LonTalk Integration to Odyssey Units with Symbio 700 Controls (ACC-SVP002).

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