



## Installation Instructions

# Tracer® Symbio 210 Bypass Damper Controller

### Packaged Contents

- One (1) Symbio 210 Bypass damper controller
- One (1) 6-inch Thermistor duct/immersion temperature sensor

**Important:** Visually inspect contents for obvious defects or damage. All components have been thoroughly inspected before leaving the factory. Any claims for damage incurred during shipment should be filed immediately with the carrier.

### 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.

March 2022

BAS-SVN230A-EN

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## Warnings, Cautions, and Notices

Read this manual thoroughly before operating or servicing this unit. 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

### 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 such as HCFCs and HFCs.

### 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.

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### 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 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 Labeling 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.

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### 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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### Ordering Numbers

Order Number	Description
BMSY210AAA0T00111	Symbio 210 MS/TP Programmable Bypass Controller w/ Trane actuator and duct temperature sensor
501897940100	VAV controls metal enclosure

### Agency Compliance

- UL916 PAZX- Open Energy Management Equipment
- UL94-5V Flammability
- CE Marked
- FCC Part 15, Subpart B, Class B Limit
- AS/NZS CISPR 32:2015
- VCCI-CSPR 32:2016

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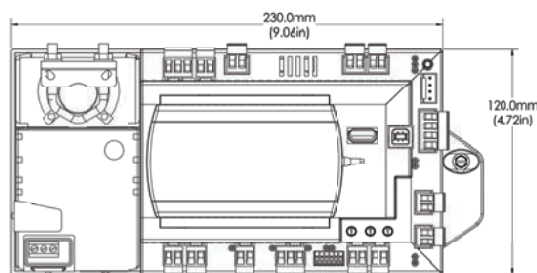
- CAN ICES-003(B)/NMB-003(B)
- Communications BACnet MS/TP, BACnet IP, or BACnet Zigbee (Air-Fi). The Symbio 210 is BACnet Testing Laboratory (BTL) certified to revision 15 of the ASHRAE
- BACnet-135 standard as an Building Controller (BC) profile device

### Storage and Operating Specifications

Storage	
Temperature:	67°F to 203°F (-55°C to 95°C)
Humidity:	5% to 95% (non-condensing)
Operating	
Temperature:	40°F to 122°F (-40°C to 50°C)
Humidity:	5% to 95% (non-condensing)
Mounting weight:	(without actuator) 0.88 lbs. (0.40kg.) (with actuator) 1.60 lbs (0.73 kg.)
Power:	20-4-27.6 Vac, (24 Vac ±15% nominal, 50-60 Hz, 10.5 VA plus 1 VA per 20 mA of 24 VDC load plus 12 VA maximum per binary load
Environmental Rating (Enclosure):	NEMA 1
Pollution:	U.L. 840: Degree 2

### Dimensions

Figure 1. Symbio 210 controller with actuator



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## Install Bypass Dampers

Bypass damper(s) should be located before the first zone runs out from the supply air duct. VAV boxes or supply duct branches should be installed downstream of bypass dampers. The distance between bypass dampers and the **communicating sensor/bypass control** should be two to three equivalent duct diameters.

In a ducted return system, bypass dampers will be ducted directly to the return air duct. In systems with plenum return, bypass damper(s) should be ducted into the return air riser. Confirm that sufficient relief or exhaust exists to prevent return plenum pressurization.

**Important:** The use of a relief fan or backdraft damper is strongly recommended in the return air system. This will prevent bypassed air from pressurizing the return air duct system and spilling out of return grills into conditioned space, especially when the unit is in economizer mode.

### Mounting the Controller

Mounting inside an enclosure is optional, but recommended. Sheet metal screws for mounting are not supplied.

1. If using a metal enclosure, mount the enclosure to the VAV box using self-tapping sheet metal screws. Be careful not to place screws in a location that may interfere with the damper actuation.
2. Insert the actuator shaft through the hole in the base and through the actuator shaft coupling. If the kit does not include a damper control actuator, secure a locally-supplied actuator to the damper shaft and the VAV box.
3. Secure the controller to the enclosure or VAV box with the provided mounting screw.
4. With the damper fully closed, press the manual override button and rotate the clamp to about 5 degrees from the closed position (1/16" to 1/8" between Stop and the clamp). Tighten the 2 nuts on the universal clamp. The end stops can now be adjusted.

**Note:** The damper is now fully closed. However, the actuator is at about 5 degrees from fully closed. This is the proper "pre-load" for the actuator and damper.

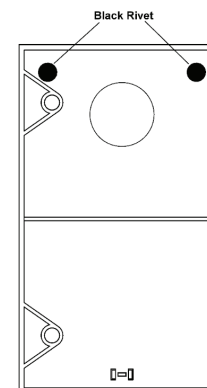
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## Removing the Actuator from the Controller

Refer to Figure 2.

1. Using needle-nose pliers, remove the black rivets located on the back side of the controller by squeezing and pulling with the pliers.
2. Remove the actuator by pulling the top away from the plastic enclosure and sliding the bottom off of the mounting clip.

Figure 2. Back side of Symbio 210 controller



**Note:** The actuator can be removed but not flipped and re-attached.

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## Input/Output Terminal Wiring

Input/output terminal wiring must meet the following requirements:

- All wiring must be in accordance with NEC™ and local codes.
- Use only 18-22 AWG, stranded, tinned-copper, twisted-pair wire.
- Binary input and output wiring should be a maximum length of 300 ft (100 m).
- Analog input wiring should be a maximum length of 300 ft (100 m).
- Do not run input/output wires in the same wire bundle with AC power wires.
- A pressure sensor can be connected to up to 300 feet of tubing.
- A pressure sensor can be connected to up to 60 feet of wire.

Table 1. I/O points

Location	Function
Pressure Input	Duct Static Pressure Local
A13/DAT	Discharge Air Temperature
Actuator	Damper Actuator

### Communication Link Wiring

The Tracer Symbio 210 controller communicates with the building automation system (BAS) and with other controllers over a BACnet™ MS/TP communication link.

For instructions on BACnet MS/TP communication wiring, refer to the *BACnet Best Practices and Troubleshooting Guide* (BAS-SVX51\*-EN).

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## A/C Power Wiring

Prior to connecting AC power to the controller:

- All wiring must comply with National Electrical Code™ (NEC) and local codes.
- The recommended wire for AC power is 16 AWG copper wire, minimum.
- Refer to the below section for Transformer Recommendations.

### ⚠ WARNING

#### Hazardous voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

### ⚠ CAUTION

#### Injury and equipment damage!

Make sure that the 24 Vac transformer is properly grounded. Failure to do so may result in personal injury and/or damage to equipment.

### ⚠ CAUTION

#### Equipment damage!

Failure to follow instructions below could result in damage to the controller, power transformer, or input/ output devices due to inadvertent connections to power circuits.

Remove power to the controller before making input/output connections..

### NOTICE

#### Equipment Damage!

Sharing 24 Vac power between controllers could result in equipment damage.

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## Transformer Recommendations

The Symbio 210 can be powered with 24 Vac.

- *AC transformer requirements*; U.L. listed, Class 2 power transformer, 24 Vac  $\pm$ 15%, device max load 24 VA. The transformer must be sized to provide adequate power to the Symbio 210 controller (12 VA) and outputs (maximum 12 VA per binary output).
- *CE-compliant installations*; the transformer must be CE marked and SELV compliant per IEC Standards

### NOTICE

#### Equipment Damage!

Sharing 24 Vac power between controllers could result in equipment damage.

A separate transformer is recommended for each Symbio 210. The line input to the transformer must be equipped with a circuit breaker sized to handle the maximum transformer line current. If a single transformer is shared by multiple Symbio 210 units, then:

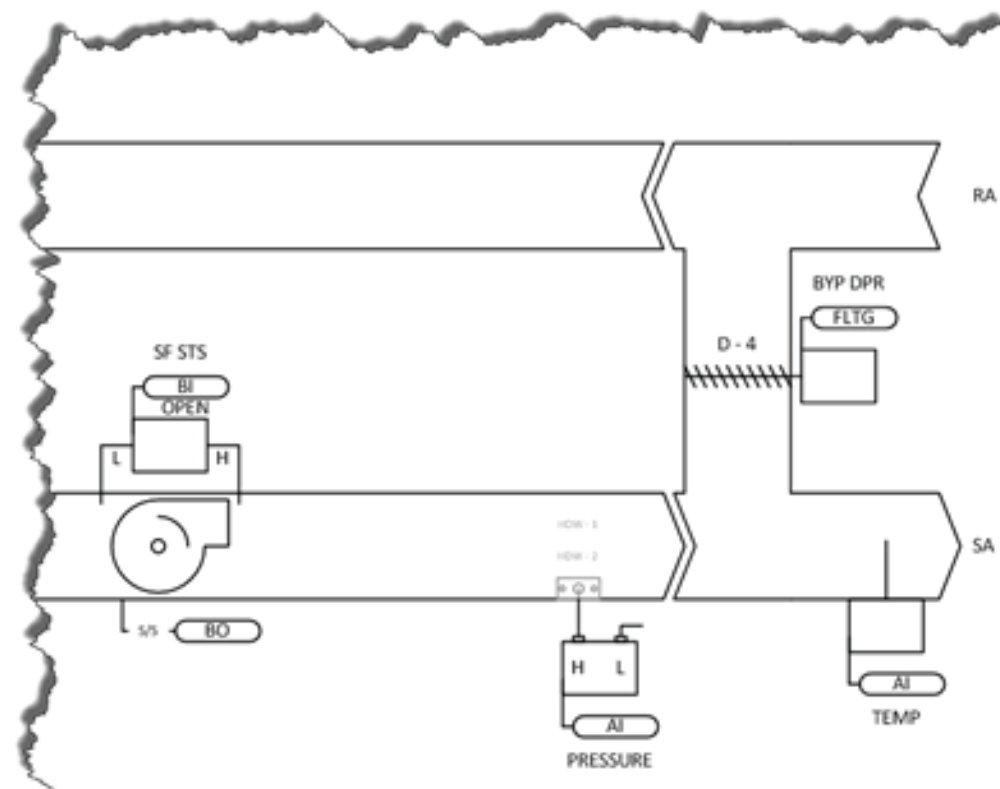
- The transformer must have sufficient capacity.
- Polarity must be maintained for every Symbio 210 powered by the transformer.

**Important:** If a technician inadvertently reverses polarity between controllers powered by the same transformer, a difference of 24 Vac will occur between the grounds of each controller. The following symptoms could result:

- Partial or full loss of communication on the entire BACnet MS/TP link.
- Improper function of Symbio 210 outputs.
- Damage to the transformer or a blown transformer fuse.

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Figure 3. Sensor locations



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## Sequence of Operation

### Building Automation System Interface

The Building Automation System (BAS) shall send the controller Occupied Bypass, Morning Warm-up/Pre-Cool, Occupied/Unoccupied and Heat/Cool modes. If a BAS is not present shall operate in the occupied mode using default setpoints. If a BAS is present and communication is lost with the BAS the controller shall be commanded to a fail-safe position.

### Occupied Mode

During occupied periods, the bypass damper will modulate to maintain the duct static pressure to a duct static pressure setpoint of 1" W.C. (adj.).

### Unoccupied Mode

During occupied periods, the bypass damper will be commanded to a default position of 50% (adj.). The BAS shall monitor night heating and cooling requests. Upon entering a night heat/cool mode, the bypass damper will modulate to maintain the duct static pressure to a duct static pressure setpoint of 1" W.C. (adj.).

### Optimal Start

The BAS shall monitor the scheduled occupied time, average occupied space setpoints and space temperatures to calculate when the optimal start occurs. Upon entering optimal start, the bypass damper will modulate to maintain the duct static pressure to a duct static pressure setpoint of 1" W.C. (adj.).

### Morning Warm-Up Mode

During optimal start, if the average space temperature is below the system setpoint a morning warm-up mode shall be activated. When morning warm-up is initiated, the bypass damper will modulate to maintain the duct static pressure to a duct static pressure setpoint of 1" W.C. (adj.). When the average space temperature reaches the system setpoint (adj.), the system shall transition to the occupied mode.

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### Pre-Cool Mode

During optimal start, if the average space temperature is above the system setpoint, pre-cool mode shall be activated. When pre-cool is initiated, the bypass damper will modulate to maintain the duct static pressure to a duct static pressure setpoint of 1" W.C. (adj.). When the average space temperature reaches the system setpoint (adj.), the system shall transition to the occupied mode.

### Optimal Stop

The BAS shall monitor the scheduled unoccupied time, average occupied space setpoints and space temperatures to calculate when the optimal stop occurs. When the optimal stop mode is active, the bypass damper will modulate to maintain the duct static pressure to a duct static pressure setpoint of 1" W.C. (adj.).

### Occupied Bypass

The BAS shall monitor the status of the "on" and "cancel" buttons of the systems space temperature sensors. When an occupied bypass request is received from a space sensor, the unit shall transition from its current occupancy mode to occupied bypass mode and the bypass damper will modulate to maintain the duct static pressure to a duct static pressure setpoint of 1" W.C. (adj.).

### Duct Static Pressure Failures

The bypass damper controller will monitor a valid duct static pressure source. If the source is considered invalid, the bypass damper will be commanded to a fail-safe position.

**Note:** The round Varitrac bypass damper operates in duct static pressures up to 1.75 inches wg. The rectangular Varitrac bypass damper operates in duct static pressures up to 2.00 inches wg. Varitrane boxes and Round in Round out boxes can operate in duct static pressures up to 5 inches wg.

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## Agency Listings and Compliance

The European Union (EU) Declaration of Conformity is available from your local Trane® office.

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