



## Installation Instructions

# CVRF - Symbio™ Chiller Controller Retrofit Replacement Panel Double Door Pneumatic



Model Number: CVRF

This document applies to service offering applications only.

Distribution/use of this document is limited to the Trane sales and service organization in support of the Symbio™ control panel upgrade and is not intended for independent third party use or for use apart from the Symbio™ control panel.

### **⚠ 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.



# 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.

## 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 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.**

**⚠ 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.

**⚠ WARNING****Refrigerant under High Pressure!**

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage.

System contains refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

## Copyright

This document and the information in it are the property of Trane, and may not be used or reproduced in whole or in part without written permission. Trane reserves the right to revise this publication at any time, and to make changes to its content without obligation to notify any person of such revision or change.

## Trademarks

All trademarks referenced in this document are the trademarks of their respective owners.

## Revision History

Document updated to reflect Service Offering number.



# Table of Contents

General Information	5	Air-Fi® Installation	23
About This Manual	5	LTE Modem Installation	24
Application Guidelines	5	Communication Device Mounting	24
Other Required Manuals	5	Water Flow Measurement	25
Getting Started	5	Standard Accuracy Option	25
Nameplates	6	Mounting	26
Symbio™ Panel Conversion Kit Contents	6	Mounting of flow measurement assembly	26
Notes for Remote Starter Installations	8	Water box types	26
Note for Open Transition Starters	8	Preparation of Wells	26
Tools Required	8	Water box valve mounting	27
Field-Provided Material	8	High Accuracy, Customer Provided Meter Option	27
Model Number Descriptions	9	Heat Recovery/Aux COND Option	27
Installation	11	Energy Meter Option Installation	28
Control Panel Conversion	11	480 Volts and Lower Installations	29
Before You Begin	11	Oil Pump Control	29
Removal of Existing Panel	13	Line Voltage Pump Installation	29
Installation of New Control Panel	13	Starter Work	30
Wiring Installation	14	Starter Control Planning	30
Motor Temperature Devices	14	Starter Sub-Box Installation	31
Mount Display Arm and Display	15	Starter Sub-Panel	32
Adjusting the Tracer®		Starter Sub-Panel Installation	35
AdaptiView™ Display Arm	16	Control Power Transformer	35
Oil Pressure Transducer		Current Transformers, CTs	36
Installation	17	CT Work	37
Sensor Installation and Wiring	17	Potential Transformers, Optional PTs	40
Mounting Sensors Externally	18	Starter Wiring	41
Temperature Sensor Cable		Wiring Diagram Matrix	42
Mounting for Wells	18		
Option I/O Installation	19		
Inlet Guide Vane Actuator			
Installation	19		
Running the IPC Bus	19		
Purge Control Installation	21		
PRGA and PRGB Purifier Purge	21		
PRGC Purifier Purge	22		
PRGD, PRGG and PRGF EarthWise™			
Purge	22		
LonTalk® Option Installation	22		
Communication Option Installation	23		
Wi-Fi Installation	23		





# General Information

## About This Manual

This manual is provided to support the factory-assembled CVRF complete control panel for former double door pneumatic control panels. This work replaces the older pneumatic control panel with the current Symbio™ Chiller Control system. The factory-assembled portion is the control panel only. Some of the control items will be field-installed.

The step-by-step instructions outlined in this manual describe the procedures required to successfully install Symbio controls on CVHAs and CVHBs with a double door pneumatic-based control system.

Notice that the installation instructions in this manual are divided into the following general topic areas:

1. Control panel installation includes removal of existing control panel. It is followed by installation of new panel and mounting brackets, and wiring in the new control panel.
2. Sensor installation includes the mounting of temperature and pressure sensors and wiring instructions.
3. Starter Panel planning for wye-delta starter applications, as well as additional information for converting non-wye-delta starters.

4. Actuator mounting includes removal of the old pneumatic actuator and installation instructions for the stepper IGV actuator.
5. Accessories and options installation includes information on how to install and wire any optional LLIDs or components. LLIDs are individual control components that communicate with the main processor.

**Note:** *New Symbio™ and older Trane® wiring diagrams are often referenced throughout this manual. Locate any drawings reflecting changes, upgrades, or BAS tie-ins that have been performed on the unit since original installation. A complete set of Symbio™ wiring diagrams are referenced in "Wiring Diagram Matrix," p. 42 in this manual. Also referenced in this manual are wiring diagrams that are representative of the machine you will be retrofitting. You may find it helpful to obtain a copy of the machine or job specific drawings before you attempt to perform the control system conversion.*

## Application Guidelines

This Symbio™ control package is specifically designed to upgrade the controls of CVHA and CVHB water cooled chillers having pneumatic controls that are housed in a double door style enclosure.

**Table 1. Retrofit panel types**

Description	Application <sup>(a)</sup>
Single door pneumatic	1966 to 1976 Trane CenTraVac™ liquid chillers with pneumatic controls and a single horizontal door control panel
Double door pneumatic	1976 to 1980 Trane CenTraVac™ liquid chillers with pneumatic controls and a double horizontal door control panel
Classic	1980 to 1985 CVHE/CVHB CenTraVac™ chillers with Trane electronic "Classic" type controls
UCP1 <sup>(b)</sup>	1985 to 1993 CVHE/CVHB/CVHF CenTraVac™ chillers having factory installed Trane UCP1 digital controls
UCP2 <sup>(b)</sup>	1993 to 2001 CVHE/CVHF/CVHG CenTraVac™ chillers having factory installed Trane UCP2 digital controls

(a) These are general guidelines. The dates are not exact. It is necessary to confirm exactly which control system your chiller has.

(b) The UCP1 and UCP2 application is specific to those units originally shipped with those controls. It does NOT include retrofit UCP1, UCP2, and UCP2 FastPak™ controllers; to upgrade chillers with retrofit UCP1, UCP2, and UCP2 FastPak controllers, please refer to the appropriate manual for the original unit controls.

## Other Required Manuals

This manual must be used with the following publications (or their most recent versions):

- *CenTraVac™ Water-cooled Chillers Models CVHE, CVHF, and CVHG With Symbio™ Controls - Installation, Operation, and Maintenance* (CVHE-SVX005\*-EN).
- *CenTraVac™ Water-Cooled Chillers AdaptiView™ Display with Symbio™ Controls - User Guide* (CTV-SVU004\*-EN).
- *Tracer® TU Service Tool For Water-Cooled CenTraVac™ Chillers with Symbio™ Controls - Programming Guide* (CTV-SVP004\*-EN).
- *CenTraVac™ Water-cooled Chillers with Symbio™ Controls Diagnostic Descriptions, Troubleshooting Tables, and Control Component Overview - Diagnostics Manual* (CTV-SVD005\*-EN).

- *Tracer® TU Service Tool - User Guide* (BAS-SVU047\*-EN).
- *Symbio™ Panel Upgrade - Programming Guide* (SO-SVP002\*-EN).

## Getting Started

To properly install a Symbio™ retrofit, the technician must have a good knowledge of Symbio™ control systems. Training in Symbio controls is highly recommended before beginning this retrofit.

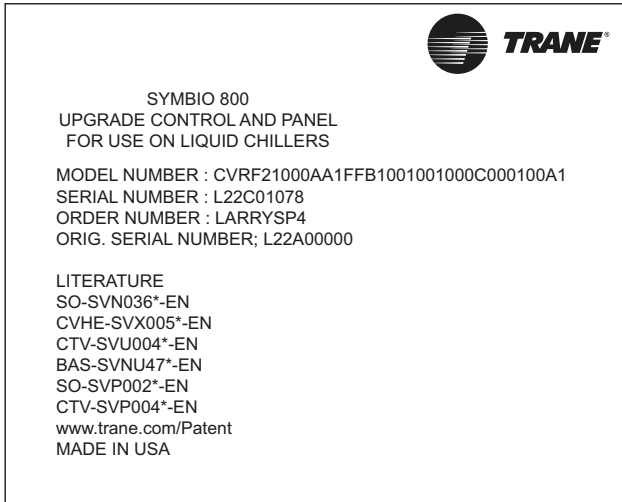


## General Information

### Nameplates

A Symbio™ nameplate is provided with the kit; the nameplate should be placed onto the panel after installation. Always provide the model number and serial number information from the nameplate when making inquiries, or ordering parts or literature for the Symbio retrofit system.

Figure 1. Symbio™ nameplate example



Remove the existing chiller metal nameplate on the unit and relocate to the outside of the new control panel. Important information is contained on this existing nameplate that must be retained for future unit servicing.

### Symbio™ Panel Conversion Kit Contents

Each Symbio™ panel conversion kit includes a pre-assembled control panel with a number of standard features and options installed, wired, bound, and tested, along with some device LLIDs shipped loose that require field installation and binding.

Before commencing the Symbio control retrofit, be sure to compare the data on the panel nameplate and ordering and shipping information to the data in the following tables to verify that the proper Symbio components were shipped. The tables are split into those components that are factory installed and those that are shipped loose and need to be field installed.

If an inspection of the conversion package reveals damage or material shortages, be sure to file these claims with the carrier immediately. Specify the extent of the damage or material shortages and be sure to notify the appropriate Trane representative. Do not install a damaged component or panel.

Table 2. LLID legend and identification<sup>(a)</sup>

LLID Name	Description	Part Number
Tracer® AdaptiView™ color display		MOD03183
LON	Kit; Echelon module field install kit	KIT18458
DAIO	Dual analog input and output	BRD04875
DBI	Dual low voltage binary input	BRD04873
DHVBI	Dual high voltage binary input	BRD04874
DRO	Dual relay output	BRD04878
HPRO	High power relay output	MOD01401
IGV	Inlet guide vane stepper actuator	ACT00680
Power supply	27 Vac to 24 Vdc for bus power supply	BRD02102
Pressure sensor	Low pressure range, 0 to 50 psia	TDR00733
Pressure sensor	High pressure range, 0 to 475 psia	TDR00734
Pressure transducer	Danfoss pressure transducer, 475 PSI 7/16-20 NUF	TDR00735
QRO	Quad relay output	BRD04879
Starter module	Trane control board, starter module	BRD04877
Starter module power supply	110 Vac/24 Vdc power supply	PWR00147
Starter module on sub plate w/o power supply or LV PTs	Starter sub-panel for unit mount medium voltage starters	018504210100
Starter module on sub plate w/o power supply with LV PTs	Starter sub-panel for remote mount medium voltage starters	018504330100
Starter module on sub plate with power supply w/o LV PTs	Starter sub-panel for unit mount low voltage starters	018504220100
Starter module on sub plate with power supply and LV PTs	Starter sub-panel for remote mount low voltage starters	018504350100
AFD starter nodule on sub plate w/o power supply or LV PTs	Assembly for unit mount UCP2 non-communicating AFDH	018504340100
AFD starter nodule on sub plate with power supply w/o LV PTs	Assembly for remote mount UCP2 non-communicating AFDH	018504370100

**Table 2. LLID legend and identification<sup>(a)</sup> (continued)**

LLID Name	Description	Part Number
Temp sensor	Low range temperature sensor	SEN02133
Triac	Dual triac output	BRD04876
TWTI	Triple winding temperature input	MOD02462
Symbio™ controller		MOD02979
WiFi	WiFi Mobile App	MOD03122
Air-Fi®	Air-Fi® BACnet® via Zigbee®	018504240100 MOD02971
LTE	LTE 4G modem	MOD03184

(a) All part number information in this table is subject to change at any time. Contact the Trane Parts Center for assistance with identification of all parts involved with the Symbio™ system.

**Table 3. Factory installed LLIDs**

	DBI	DHVBI	HPRO	QRO	TWTI	Power Supply	Symbio™ 800	Color Display
Panel type—factory Double Door	1	2	1	3	1	2	1	1

**Table 4. Field installed LLIDs for various options**

	DBI	DHVBI	DRO	HPRO	QRO	DAIO	LON	IGV	PS 475 PSI	Temp Sensor	PS 0-50 or 475 PSI	Starter Module	Color Display	WiFi	Air-Fi®	LTE
Panel type—factory Double Door										7			1			
Starter module—3-phase												1				
Actuator-stepper								1 or 2								
Oil protection—full, low pressure, or high pressure											2					
Heat recovery / aux condenser		1								2						
Hot gas bypass			1							1						
Cold water reset										1						
Enhanced protection										3	1					
Chilled/tower water flow display, standard accuracy									4							
Chilled/tower water flow display, high accuracy						1										
Heat recovery / aux condenser water flow display, standard accuracy									2							
Heat recovery / aux condenser water flow display, high accuracy						1										
Extended operation	2		1			1										
Free cooling	1				1											
LonTalk®							1									
Generic BAS						2										
WiFi Mobile App														1		
Air-Fi® BACnet® via Zigbee®															1	
LTE 4G modem																1



## Notes for Remote Starter Installations

For applications having remote starters, the remote starter will be provided with 24 Vdc power supply. When this power supply is used, connect the existing starter module communications twisted pair to the communications terminals of one of the panel power supplies. Do not connect 24-Vdc power between the panel power supply and the starter supply.

You can use CAB01163 to connect the starter module to the control panel if new communications cable is needed. This cable is not included in the standard package and can be ordered through Trane Parts Centers. It is a four conductor 150 foot cable that can be used for communication.

## Note for Open Transition Starters

For applications with open transition starters, the starter will have to be replaced with a closed transition style. Symbio™ controls will not function with an open transition starter.

## Tools Required

Common hand tools and hand-held power tools are required to perform the work. A trained service technician with a well-stocked tool chest should have all of the necessary tools to perform the job. The following list is a sampling of the tools that one could expect to find inside the technician’s tool chest:

- Box-end wrenches in sizes from 5/16 to 1.5-inch.
- 3/8 and 1/2-inch. drive socket sets.
- Electric drill with 1/2-inch. chuck.
- Drill index with bit sizes ranging from 3/32 to 1/2-inch.
- Wire strippers and cutters.
- A standard selection of Phillips-head and flat-bladed screwdrivers in various sizes and lengths.

The following special tools are also required to perform the controls retrofit:

**Note:** *Some field provided material will be required to perform the replacement. This is a partial list in addition to normal service tools and hardware.*

- Type A to Type B USB cable.
- Computer having Tracer® TU version 13.0 or newer.
- Digital multi-meter, with phase detection capability.
- 13-mm and 14-mm wrenches.
- 6-mm Allen wrench.

## Field-Provided Material

Some field provided material will be required to perform the Symbio™ controls retrofit. A list of material is provided here to help the technician plan ahead and to avoid material shortages at the job site.

- Wire, Red #16 AWG - Control wire will be required to make the connections between LLIDs and existing components.
- Wire connectors (fork, ring, 1/4 and 3/16-inch receptacle quick connect), and crimping tool for these connectors. Wire markers will be required to identify field wiring. Wire nuts and splicers may be required if splicing wires in the control panel. Cable ties help to “clean up” wiring runs.
- A heat conductive adhesive will be required when mounting the bearing temperature sensors to the bearing oil return lines. Use Loctite® 383 Output High Strength Adhesive or equal.
- An epoxy will be required when mounting plastic sensor sleeves on the machine for externally mounted sensors. Trane recommends Loctite® Quickset Epoxy.
- A can of Executive Beige spray paint (Trane part # PAI00061) or may be required for touch-up work.
- Field provided fuses will be required when installing the optional potential transformers. Refer to [Table 5](#) for proper fuse sizing.
- Field provided relays may be required in the starter (refer to “[Wiring Diagram Matrix](#),” p. 42).
- A control power transformer may be required if the existing transformer in the starter panel does not have a minimum capacity of 3 kVA.
- Loctite® 565 Liquid Thread Sealant (Trane part number SLT00042) for installing pressure transducers. This sealant type does not require the use of heat to break the seal if a transducer needs to be replaced in the future.
- Loctite® 277 Thread Lock (Trane part number SLT00037 for a 10-ml tube, or Trane part number SLT00038 for a 50-ml tube) for the adapter fittings used to convert the flare connections previously required by the oil differential pressure switch (1S2) from the existing control system to allow installation of Symbio™ pressure transducers on the copper oil lines.

**Table 5. Fusing added for 2F1, 2F2 and 2F3 (as needed) for optional PT transformers**

Voltage (Vac)	Fuse (A)	Voltage (Vac)	Fuse (A)
200	1	600	1
230	1	2400	1
380	1	4200	1
460	1	3300	1
575	1	6600	1

Replacing an existing control system with one based on the Symbio™ control scheme requires a number of wiring and hardware changes. To ensure that the chiller control system retrofit procedure is performed properly, carefully review the instructions in this section, and, if necessary, contact a qualified service organization before beginning the work.

**Important:** *Record a detailed description of all electrical changes made during the Symbio upgrade process. Be sure to add a copy of this report to the chiller record file for future reference.*



# Model Number Descriptions

For service purposes, Symbio 800 Panel Upgrade Kits are assigned a multiple character alphanumeric model number that precisely identifies each unit. An explanation of the identification code that appears on the unit nameplate is shown below. Use of the servicer will enable the owner/operator, installing contractors and service technicians to define the operation, components and options for any specific unit. Refer to the control panel model number printed on the nameplate when ordering replacement parts or requesting service.

## Digit — 1, 2, 3

CVR= CenTraVac® liquid chiller retrofit

## Digit 4 — Development Sequence

F = Tracer® Symbio™ 800 chiller controller

## Digit 5 — Panel Type

- A = Single door pneumatic controls
- B = Double door pneumatic controls
- C = Classic black controls
- G = Generic
- 1 = UCP-1
- 2 = UCP-2

## Digit 6 — Solid State Oil Relay Control

- 1 = No solid state relay
- A = Solid state relay only
- B = Solid state relay W/ELM01116
- C = Solid state relay W/ELM08119

## Digit 7, 8 — Chiller RLA (CTs)

- 00 = None, uses existing signal
- 0J = <600 V, 33–50 A, 2 inch hole, CTs (3)
- 0K = <600 V, 18–27 A, 2 inch hole, CTs (3)
- 0A = <600 V, 67–100 A, 2 inch hole, CTs (3)
- 0B = <600 V, 100–150 A, 2 inch hole, CTs (3)
- 0C = <600 V, 134–200 A, 2 inch hole, CTs (3)
- 0D = <600 V, 184–275 A, 2 inch hole, CTs (3)
- 0E = <600 V, 267–400 A, 2.5 inch hole, CTs (3)
- 0F = <600 V, 334–500 A, 2.5 inch hole, CTs (3)
- 0G = <600 V, 467–700 A, 2.5 inch hole, CTs (3)
- 0H = <600 V, 667–1000 A, 2.5 inch hole, CTs (3)
- 0L = <600 V, 936–1400 A, 3.5 inch hole, CTs (3)
- 0M = <600 V, 1260–1800 A, 4 inch hole, CTs (3)
- 0N = Turn down transformer 5 A to 100 mA (3)
- 0P = >600 V, 8–18 A, 1.25 inch hole, CTs (3)

- 0R = >600 V, 18–27 A, 1.25 inch hole, CTs (3)
- 0T = >600 V, 24–144 A, 4 inch hole, CTs (3)
- 0U = >600 V, 120–252 A, 4 inch hole, CTs (3)
- 0V = >600 V, 480–1080 A, 4 inch hole, CTs (3)
- 0W = >600 V, 864–1800 A, 4 inch hole, CTs (3)

## Digit 9 — Chiller voltage monitoring (Potential Transformers)

- 0 = None
- A = 480 Vac or less
- B = Greater than 600 Vac
- C = 2300/2400 Vac
- D = 3300 Vac
- E = 4200 Vac
- F = 6600 Vac/50Hz

## Digit 10, 11 — Design Sequence

A0 = 1st Design sequence

## Digit 12 — Actuator

- 1 = Stepper actuator
- 2 = Pulse actuator (generic only)

## Digit 13 — Oil Protection

- F = Full protection for low pressure units
- H = Full protection for high pressure units (generic only)
- P = Oil pressure status for low pressure units (generic only)

## Digit 14 — Motor Protection and HPC

- F = Full motor protection w/ 15 psig HPC switch
- H = High pressure option w/ 195 psig HPC switch (generic only)

## Digit 15 — Symbio™ 800 Monitor

- A = Without Symbio™ 800 monitor
- B = With Symbio™ 800 monitor

## Digit 16 — Starter Box

- 0 = None
- 1 = Starter enclosure

## Digit 17 — Free Cooling

- 0 = No
- 1 = Yes

## Digit 18 — Heat Recovery/Auxiliary Condenser

- 0 = No
- 1 = Yes

## Digit 19 — Hot Gas Bypass

- 1 = No
- 2 = Compressor discharge temp sensor w/LLID, bulb well
- 3 = 3 inch HGBP valve w/sensor, LLID, bulbwell, conduit
- 4 = 4 inch HGBP valve w/sensor, LLID, bulbwell, conduit
- 05 = 5 inch HGBP valve w/sensor, LLID, bulbwell, conduit

## Digit 20 — Tracer® Interface Control

- 0 = None
- 2 = With generic BAS
- 5 = LonTalk®

## Digit 21 — Cold Water Reset (CWR)

- 0 = No
- 1 = Yes

## Digit 22 — Enhanced Protection

- 0 = No
- 1 = -15 to 35 psig (0 to 50 psia) low pressure transducer
- 2 = -15 to 335 psig (0 to 350 psia) high pressure transducer (Generic only)

## Digit 23 — Extended Operation

- 0 = No
- 1 = Yes

## Digit 24 — Chilled/Tower Water Flow Display

- 0 = No
- 1 = Water Flow Display Standard Accuracy, Dual Pressure Sensor
- 2 = Water Flow Display High Accuracy, Customer Flow Meter

## Digit 25 — Design Special

- 0 = Standard unit offering

## Digit 26 — Purge Upgrade

- A = No purge option
- C = Interface for UCP2 purge
- E = ECOWISE purge

## Digit 27 — Air-Fi® Operation

- 0 = No
- 1 = Yes

## Digit 28 — WiFi Operation

- 0 = No
- 1 = Yes

## Digit 29 — LTE Operation

- 0 = No
- 1 = Yes

## Digit 30 — Panel Enclosure

- 1 = Standard enclosure, NEMA 1 type
- 2 = NEMA 4 enclosure

## Digit 31 — NEMA 4 Communication Box

- 0 = Without box
- 1 = Small box
- 2 = Large box

## Digit 32 — Energy Meter Operation

- 0 = No
- A = Energy meter, 480V and low



## Model Number Descriptions

---

### Digit 33 — Starter Type

- 0 = No starter module
- 3 = Starter module current limit 3 phase
- A = Starter module with plate for low voltage unit starter
- B = Starter module with plate for low voltage remote starter
- C = Starter module with plate for unit AFD
- D = Starter module with plate for remote AFD
- E = Starter module with plate for medium voltage unit starter
- F = Starter module with plate for medium voltage remote starter

### Digit 34 — Oil pump type

- 1 = 120 Vac standard type oil pump
- 2 = 120 Vac refrigerant type oil pump
- 3 = Line voltage oil pump





# Installation

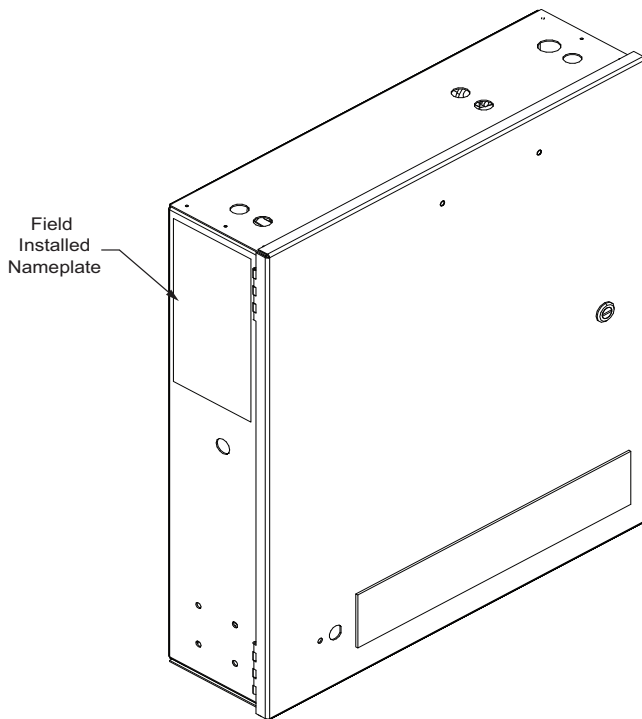
## Control Panel Conversion

The control panel conversion will consist of removing, marking, and retaining selected wires in the existing control panel. The existing control panel will be removed. The new control panel will be installed. The existing wires will be terminated on the terminal block or LLIDs in the control panel along with any new wires required.

Make a note of run hours and starts on the hour meter and start counter. Symbio™ 800 will allow you to enter this information into its program.

Remove the nameplate from the existing panel by cutting the rivets holding it on. If the chiller original nameplate is a stick-on label, it may be necessary to cut out the metal section. This nameplate needs to be moved and attached to the new control panel near the new control panel nameplate. The old nameplate contains original unit information that will be useful in service and parts issues in the future.

Figure 2. Recommended nameplate location on new panel



## Before You Begin

1. Identify all field modifications made to the existing chiller control scheme; then label all field-installed wiring entering the control panel accordingly, if required. This may include things like the power supply for the purge and any BAS interface wiring.

2. Determine how each of the field-adapted control functions just identified in [Step 1](#) will be assumed by the new Symbio chiller control panel.
3. Capture all existing chiller control settings before powering down chiller controls.
4. Open all starter and control panel disconnect switches and secure them in the open position.

### **⚠ WARNING**

#### **Hazardous Voltage w/Capacitors!**

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

**Disconnect all electric power, including remote disconnects and wait for DC capacitors to discharge before servicing. Refer to the manufacturer's recommendations for proper discharge time as DC bus capacitors retain hazardous voltages after input power has been disconnected. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged before touching any internal components.**

### **⚠ WARNING**

#### **PPE for Arc/Flash Required!**

**Failure to wear appropriate PPE could result in death or serious injury.**

**On this unit, if the handle shield is cracked the circuit breaker could arc/flash when reset. To avoid being injured, technicians MUST put on all necessary Personal Protective Equipment (PPE), in accordance with NFPA70E for arc/flash protection, PRIOR to entering the starter panel cabinet.**

5. Disconnect the leads at the control panel terminal block from the oil heater (wire numbers 201 and 202), oil pump (wire numbers 214 and 212) and purge (wire numbers 207, 208, and 209). Insure that these wires are properly identified and marked before disconnecting them. To assist in the identification of wires, refer to the job specific wiring diagrams (see "[Wiring Diagram Matrix](#)," p. 42 for a list of typical original wiring diagrams). Note that these are only a typical wiring diagram and is not meant to be an accurate representation of the machine being retrofit. These labels should be used where appropriate.

#### **Notes:**

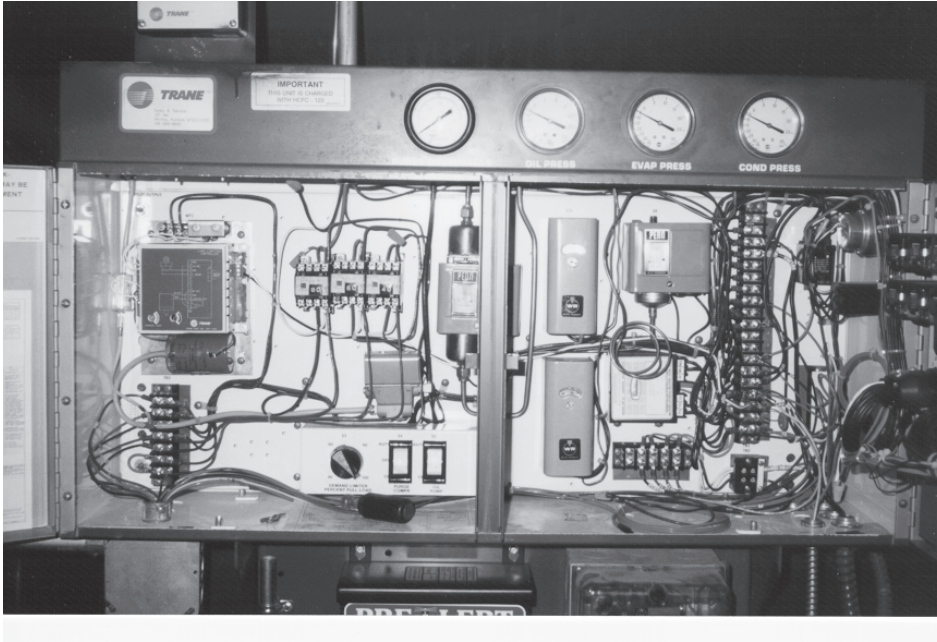
- *Some CVHA control panels are equipped with a Robertshaw motor protection module (U4) in 8 lieu of a motor temperature cut-out switch (S12). RTDs embedded in the motor windings are wired to this device. If the machine you are retrofitting has this module, remove the RTD leads (wire numbers 401, 402, 403, and 404) from the terminal block at this time. Insure that these wires are properly identified and marked before disconnecting them.*



## Installation

- To eliminate migration of refrigerant into the oil sump, temporarily connect a field supplied thermostat and an auxiliary 115 volt power source to the oil heater.
- If motor is cooled with water, disconnect leads at the terminal block from the water solenoid valve, wires 218 and 219.

Figure 3. Double door pneumatic panel before Tracer® AdaptiView™ retrofit (door open)



6. Disconnect the leads at the control panel terminal block for the evaporator flow switch (wire numbers H and 1) and the condenser flow switch (wire numbers 1A and 5). In addition, disconnect all field-installed wiring entering the control panel (i.e., identified in [Step 1](#)) from the control panel terminal strips. Insure that all wires are properly identified and marked before disconnecting them.
7. Remove from the control panel terminal block all wiring that has been routed through conduit from the starter panel to the control panel (wire numbers 2, 7, 12, H1, H2, N). This should include wires from the variable ratio current transformer (terminated at TB3-1A, 1B, 1C, 1D and 2). Insure that these wires are properly identified before disconnecting them.

See [Figure 4](#) and [Figure 5, p. 13](#) for typical double door pneumatic panel layouts. Use the drawings in these figures to help with identification of components in the panel in the steps that follow.

Figure 4. Typical existing CVHA control panel

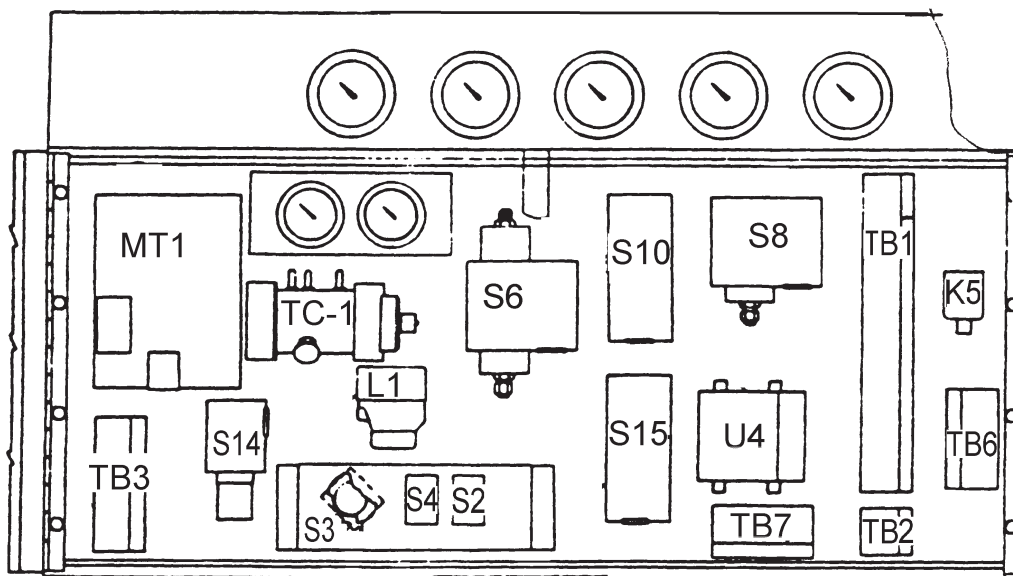
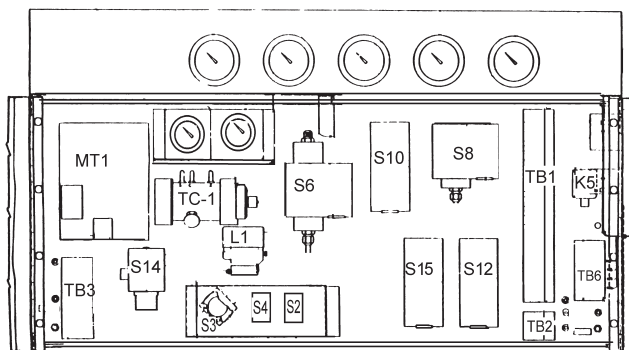


Figure 5. Typical existing CVHB control panel



8. Remove the sensor bulbs (to be discarded) of the:
  - a. High oil temperature switch (S15), if applicable (see Note, Step 9), and
  - b. Low refrigerant temperature switch (S10).
9. Valve off, disconnect, and remove any pneumatic lines at the control panel.

**Note:** On some machines the oil temperature controller (5S1A) is located at the oil tank. In these instances, the control panel will not have a high oil temperature switch (S15). Valve, disconnect and remove any pneumatic lines at the control panel.

10. Oil differential pressure switch (S6):
 

The OPC will be replaced by individual oil pressure transducers outside the new control panel. Before the existing control panel can be removed, the OPC must be removed and the new oil pressure transducers installed. Care must be taken to prevent infiltration of air into the machine during the installation.

## Removal of Existing Panel

Remove the existing double door panel. The existing brackets on the chiller will be reused to mount the new control panel. New isolators are provided with the new panel so discard the old isolators.

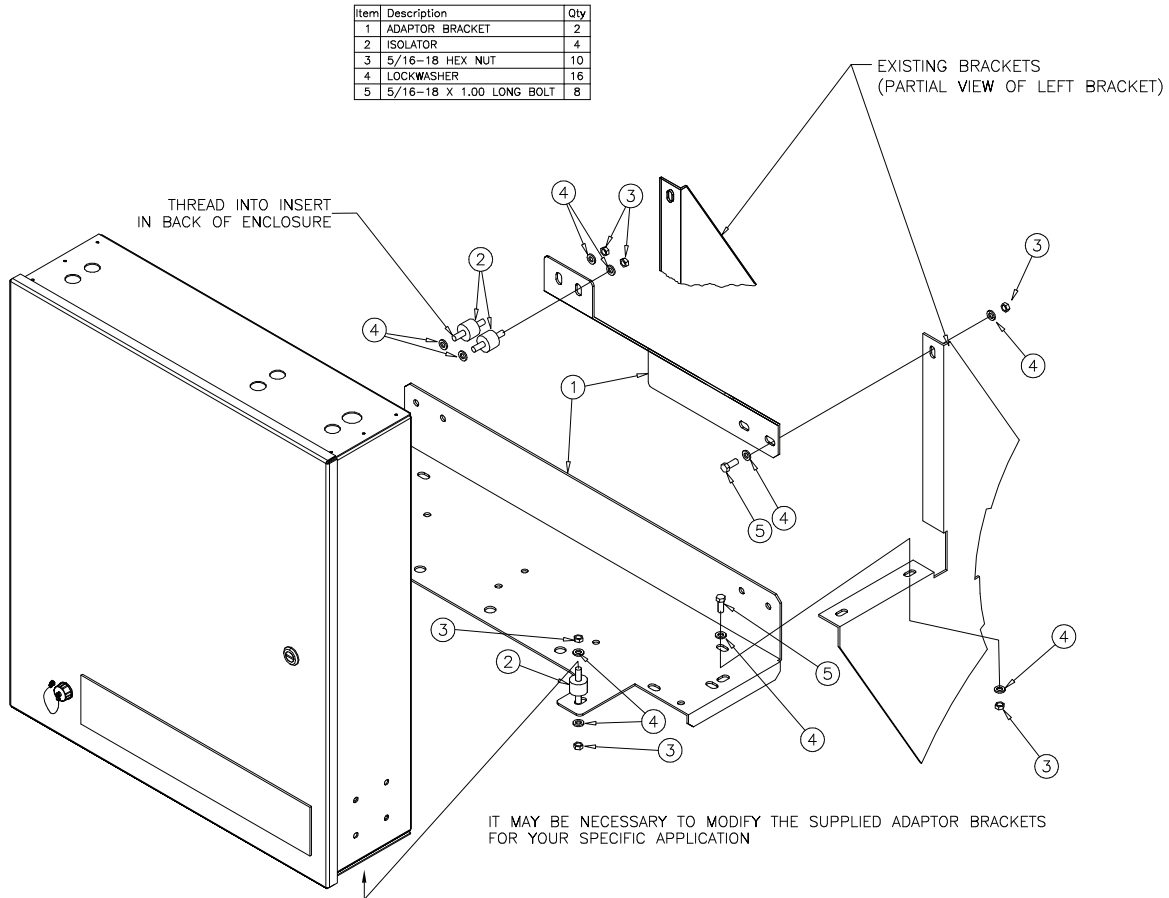
## Installation of New Control Panel

Install the new control panel. The isometric view at the top of the figure shows the space required for the control panel.

Adapter brackets and hardware are provided. New holes may need to be drilled in existing brackets. Mark and drill holes as required.

There are two sets of brackets included which will accommodate how the original panel was attached to the chiller. The original panel could be shell mounted or compressor mounted. See drawing in Figure 6, p. 14 for details. The two brackets are identical for shell mounted panels. They are oriented differently. New isolators are included for both mounting types.

It may be necessary to modify the supplied adapter brackets for your specific application.

**Figure 6. Mounting brackets, Symbio™ panel upgrade, ref. 50710531 rev. A**


## Wiring Installation

### **⚠ 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.

Unless otherwise indicated, all 115 volt control circuits use, as a minimum, #16 AWG, 600 volt wire. Be sure to use existing conduit wherever possible and separate all 115 Vac wiring from any low voltage circuits.

Most wiring will use the existing wires removed and marked from the original panel and moved to the terminal block in the new panel. Some wires may need to be connected directly on a LLID terminal. For all control panel wiring, refer to wiring diagrams shipped with the kit and to the connection and

schematic diagrams listed in [“Wiring Diagram Matrix,” p. 42](#) for additional detail.

For 50 Hz applications, the control power transformer (1T1) is supplied as a 60 Hz application. To convert from 60 Hz to 50 Hz, the following step must be performed: move wire 2H from H3 on 1T1 to H2.

If you have wired a temporary thermostat and 115 volt power source to the oil heater leads, wait to connect these wires until the Symbio™ retrofit is complete to avoid too much cooling of the oil.

## Motor Temperature Devices

The new Symbio panel comes with the motor winding temperature input LLID (IA26). This is used for motors that have RTD-type sensors embedded in the motor windings. If the motor does not have RTD-type sensors, motor temperature protection can be accomplished a temperature sensor which installed in the bulb well of the motor, and connect to the IPC bus.



## Mount Display Arm and Display

1. Secure the arm to the control panel using the 5/16 - 18 x 1-inch hex bolts, 5/16 - inch lock washers, and 5/16 - 18 hex nuts provided. There are pre-drilled holes on the left and right sides of the control panel; select the side that's most suitable for your specific application.

**Note:** There is a production display arm bracket BRK04345 provided that where applicable can be mounted to the existing control panel mounting arms. When used, the holes on the unused side(s) should be plugged.

**Figure 7. Production display arm bracket**



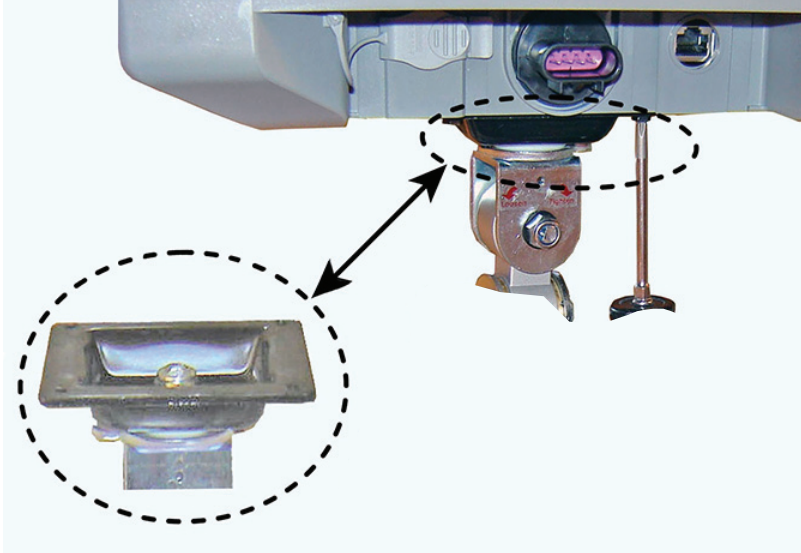
**Figure 8. Bolting display arm to the panel**



## Installation

- Securely fasten the Tracer® AdaptiView™ display to the mounting plate on the end of the display arm with the hardware provided.

**Figure 9. Attaching the Tracer® AdaptiView™ display to arm**



- After the display is attached, recheck the arm tension. The arm tension should be set so that the display does not spring up or sag down out of the position it is moved to by the operator.

### ⚠ CAUTION

#### Tension in Display Support Arm!

Failure to follow instructions below could result in unexpected movement of the spring-loaded support arm which could result in minor to moderate injury. Ensure that the support arm is in the full upright position when removing the Tracer® AdaptiView™ display from the support arm.

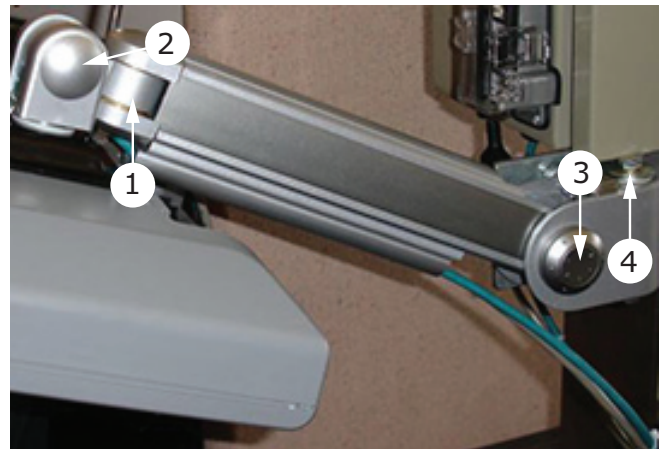
## Adjusting the Tracer® AdaptiView™ Display Arm

The Tracer AdaptiView display arm may be too loose or too tight and in need of adjustment. To adjust the tension on the display arm:

- There are three joints on the display arm that allow the Tracer AdaptiView display to be positioned at a variety of heights and angles (refer to items labeled 1, 2, and 3 in [Figure 10, p. 16](#)). At each joint in the display arm there is either a hex bolt (1 and 2) or hex screw (3). Turn the hex bolt or screw in the proper direction to increase or decrease tension.

**Note:** Each hex bolt or screw is labeled with 'loosen'/'tighten', or '+/'-' indicators.

**Figure 10. Joint locations on the display arm**



- Joint 3 has a 6 mm hex screw controlling the tension on a gas spring, which allows the Tracer AdaptiView display to tilt up and down.
- Joints 1 and 2 are covered by a plastic cap. Remove the plastic cap to access the hex bolt. Adjust using a 13 mm wrench as necessary.
- To adjust the swivel of the Tracer AdaptiView display (the spin right and left similar to the steering wheel on a car), you need to adjust the hex bolt located inside the display arm back plate. This adjustment needs to be done BEFORE attaching the display. Use a 9/16 inch or 14 mm wrench.
- Use a 13 mm wrench to adjust the bolt (item labeled 4 in [Figure 10, p. 16](#)) that allows the entire display arm to swivel to the left and right.



## Oil Pressure Transducer Installation

### **⚠ WARNING**

#### **Hazardous Voltage w/Capacitors!**

Failure to follow instructions below could result in death or serious injury. Disconnect all electric power, including remote disconnects and wait for DC capacitors to discharge before servicing. Refer to the manufacturer's recommendations for proper discharge time as DC bus capacitors retain hazardous voltages after input power has been disconnected. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged before touching any internal components.

### **⚠ WARNING**

#### **PPE for Arc/Flash Required!**

Failure to wear appropriate PPE could result in death or serious injury. On this unit, if the handle shield is cracked the circuit breaker could arc/flash when reset. To avoid being injured, technicians **MUST** put on all necessary Personal Protective Equipment (PPE), in accordance with NFPA70E for arc/flash protection, PRIOR to entering the starter panel cabinet.

The oil differential pressure switch (S6) will be replaced with two Symbio™ pressure transducers.

1. The copper lines leading to the existing DP switch will be modified for reuse with the new sensors. The Symbio pressure sensors are 1/4 inch MPT. Fittings are supplied to convert from the existing flair connection to 1/4 inch FPT. Use Loctite® 277 on threads of conversion piece to prevent leaks. Use Loctite 565 on pressure transducer so connection can be broken without heat if future replacement of pressure transducer is required. Note which line is oil pump discharge pressure and which is sump pressure. Quickly attach sensors to lines to avoid large quantities of air entering machine.

The transducers can be mounted in any direction. Lines should be routed and transducers mounted to minimize any potential stacking of liquid on top of the transducers.

If desired, Symbio pressure transducers can be mounted externally from the control cabinet (see [Figure 11, p. 17](#)). This can be done to avoid spraying control panel components with oil if the fittings should leak. Use caution with copper lines to avoid crimping if moving outside control cabinet.

Figure 11. Pressure transducers mounted outside of control cabinet



2. Remove oil differential pressure switch and wires from enclosure. Symbio 800 does not require the switch function so the switch and associated wiring can be discarded.
3. Once the new panel is installed attach pressure transducers to the cabinet using adhesive pads and wire ties or similar method.
4. Label pressure transducers using labels provided.

## Sensor Installation and Wiring

Existing double door sensors cannot be used with a Symbio upgrade. It is recommended that existing bulb wells be used. Installing new wells would necessitate opening the chiller to atmosphere.

### **⚠ WARNING**

#### **Refrigerant under High Pressure!**

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage.

**System contains refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.**

If installing new bulb wells (optional), use safe refrigerant practices to evacuate the chiller.

## Installation

Install and wire each of the temperature sensors listed below.

When the sensor is installed in a bulb well, be sure to:

- Add thermastic paste to each bulb well before inserting the sensor, and
- Ensure that the sensor bottoms out at the base of the bulb well.

It is recommended that sensors 1 through 3 be mounted in wells. The rest may be installed externally. Connect all Symbio™ temperature sensors to the main IPC bus using the provided pluggable cables.

### NOTICE:

#### Equipment Damage!

Failure to follow instruction below could result in equipment damage. Never route low-voltage leads with other conductors carrying 30 or more volts.

The Symbio component identification is in parenthesis following each sensor name:

1. Oil tank temperature sensor (4R5).
2. Evaporator leaving water temperature sensor (4R7).
3. Evaporator saturated refrigerant temperature sensor (4R10).
4. Condenser entering and leaving water temperature sensors (4R8 and 4R9).
5. Evaporator entering water temperature sensor (4R6).
6. Condenser saturated refrigerant temperature sensor (4R11).

Locate sensor at the bottom of the condenser or on the condenser liquid line upstream of any orifices or float valves.

**Note:** If unit has an EarthWise™ purge, PRGD (CH530 controls), the sensor bound as Condenser Saturated Refrigerant Temperature Sensor (used as Purge Liquid Temperature) cannot be used and will need to be unbound. Install the temperature sensor sent with the Symbio™ components as described above.

7. Condenser discharge refrigerant temperature sensor 4R16 (optional). This sensor is only shipped if Hot gas bypass or Enhanced Protection packages were ordered and are to be installed.
8. Bearing temperature sensors: inboard-4R1, outboard-4R2 (optional). These sensors are only shipped if Enhanced Protection package was ordered and is to be installed.

## Mounting Sensors Externally

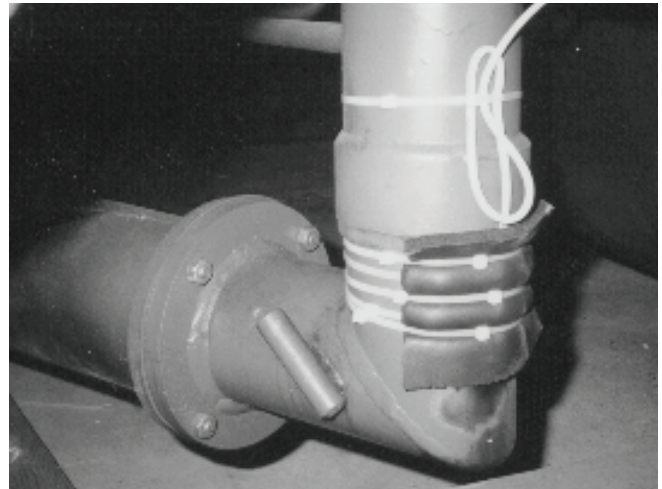
1. Remove the paint and rust from the pipe or chiller surface; then use a wire wheel to expose bare metal.
2. Epoxy the supplied plastic sleeve to the pipe surface. Use Loctite® Epoxy Quick Set or equivalent, [Figure 12, p. 18](#).

3. Install the sensor probe, with thermastic paste, into the sleeve. Wire tie the sensor leads to the plastic sleeve tab.
4. Wrap the sensor with Armaflex® insulation, [Figure 13, p. 18](#).

**Figure 12. Epoxy application**



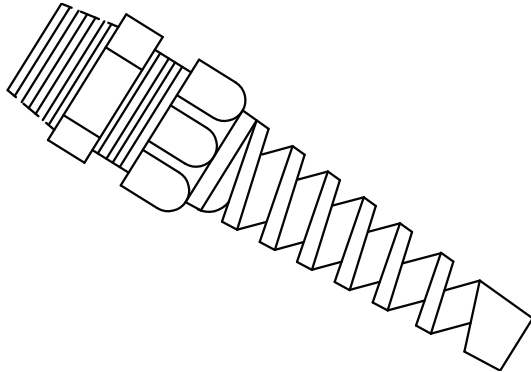
**Figure 13. Sensor mounting with Armaflex insulation**



## Temperature Sensor Cable Mounting for Wells

For a convenient way to mount Symbio temperature sensors into existing wells, order strain relief CON00849 (10 per package).

To install insert the threaded end and screw this into the temperature well, [Figure 14, p. 19](#). The temperature probe can be inserted through the hole in the strain relief.

**Figure 14. Strain relief**


## Option I/O Installation

Wire additional LLIDs as shown on schematics. Pay careful attention to which LLIDs require low voltage inputs and which are 115 Vac inputs.

## Inlet Guide Vane Actuator Installation

### **⚠ WARNING**

#### **Hazardous Voltage w/Capacitors!**

Failure to follow instructions below could result in death or serious injury. Disconnect all electric power, including remote disconnects and wait for DC capacitors to discharge before servicing. Refer to the manufacturer's recommendations for proper discharge time as DC bus capacitors retain hazardous voltages after input power has been disconnected. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged before touching any internal components.

### **⚠ WARNING**

#### **PPE for Arc/Flash Required!**

Failure to wear appropriate PPE could result in death or serious injury. On this unit, if the handle shield is cracked the circuit breaker could arc/flash when reset. To avoid being injured, technicians **MUST** put on all necessary Personal Protective Equipment (PPE), in accordance with NFPA70E for arc/flash protection, **PRIOR** to entering the starter panel cabinet.

Inlet guide vane (IGV) stepper actuator mounting and wiring follows.

1. Installing Symbio™ stepper actuator.

- a. Determine the inlet guide vane stroke by manually closing and opening the vanes and accurately measuring the length of travel.
  - b. Record this value as it will be used when performing the post conversion checkout.
2. Remove the existing pulse IGV actuator and existing conduit and wire.
  3. Install the new IGV actuator on the chiller.
    - a. Use the connecting hardware retained when the old pulse actuator was removed.
    - b. Use the existing actuator mounting plate, piston yoke and mounting hardware to install the new electric actuator.

The motor can be rotated 180 degrees to accommodate existing hardware. The actuator rod may be connected to the mounting plate at the compressor housing or to the vane linkage.

### **NOTICE**

#### **Equipment Damage!**

Failure to ensure that the 0 degree vane position corresponds with the actuator fully closed when mounting the actuator could result in severe damage to the machine.

**Figure 15. Installed stepper IGV actuator**


4. The IGV ships in a mid-position. The first time the IGV is powered up, it will drive closed. This may mean travel as much as 1 inch. Disconnect the IGV actuator from the IGV linkage until fully retracted.

## Running the IPC Bus

There are several ways to string the IPC communication bus on the chiller. The Symbio™ retrofit kit includes a general wire kit that has several different types of wires. An example of a wiring layout can be seen in [Figure 16, p. 20](#). Each application will vary depending on the options. You may have extra cables, or may be short needed cables. Extra cables can be ordered



## Installation

through your local Trane Parts Center. Refer to *Tracer® CH530/CH531 Pluggable Connector System - General Service Bulletin* (PART-SVB16\*-EN) for identification of individual cables.

### ⚠ WARNING

#### Hazardous Voltage w/Capacitors!

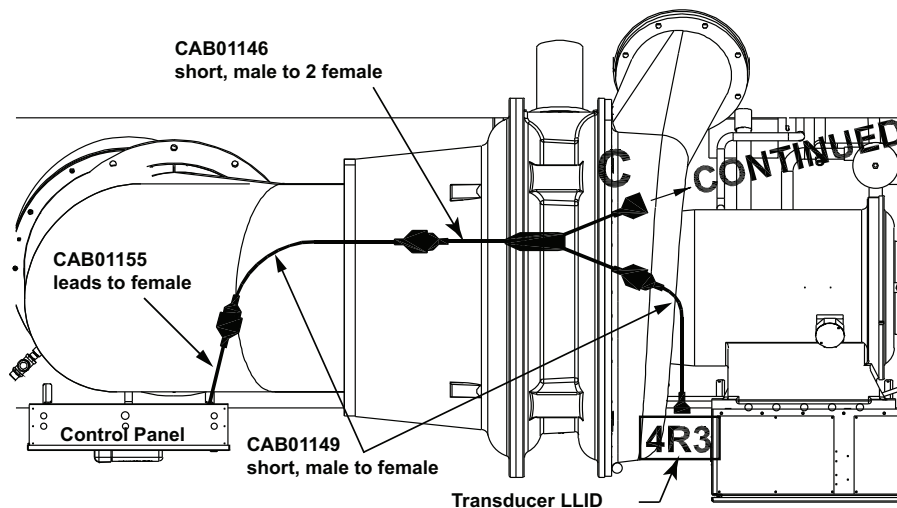
Failure to follow instructions below could result in death or serious injury. Disconnect all electric power, including remote disconnects and wait for DC capacitors to discharge before servicing. Refer to the manufacturer's recommendations for proper discharge time as DC bus capacitors retain hazardous voltages after input power has been disconnected. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged before touching any internal components.

### ⚠ WARNING

#### PPE for Arc/Flash Required!

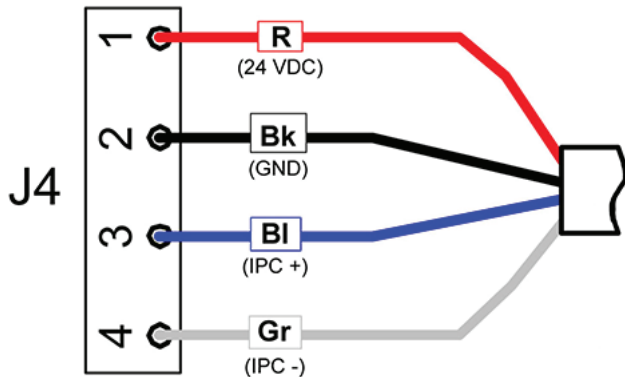
Failure to wear appropriate PPE could result in death or serious injury. On this unit, if the handle shield is cracked the circuit breaker could arc/flash when reset. To avoid being injured, technicians **MUST** put on all necessary Personal Protective Equipment (PPE), in accordance with NFPA70E for arc/flash protection, **PRIOR** to entering the starter panel cabinet.

Figure 16. Sample of IPC cable routing



To connect the IPC bus to the control panel LLIDs, thread the bus into the control panel via a knockout or other entry. The CAB01155 connector has a female plug on one end and four stripped leads on the other end. Attach the four stripped leads to the power supply in the control panel.



**Figure 17. Connecting the stripped leads to the power supply**


Make sure all devices and LLIDs are connected together in some way. Use the correct cables so that you don't have any open plugs when finished. Avoid placing wire ties directly over plug connectors. This may press on the locking mechanism and over time the plugs may release.

**Notes:**

- R. Red wire for 24 Volts direct current
- Bk. Black wire for ground
- Bl. Blue wire for IPC+ connection
- Gr. Gray wire for IPC- connection

**Table 6. Cables shipped for various options**

	CAB01146 branch M <sup>(a)</sup> to 2 F 500 mm	CAB01147 branch M to 2F 1000 mm	CAB01148 branch M to 3F 500 mm	CAB01149 extension M to F 1000 mm	CAB01150 extension M to F 2000 mm	CAB01152 extension M to leads 1000 mm	CAB01154 extension M to receptacle 1 M	CAB01155 extension F to leads 1000 mm
Standard panel cables	5	5	5	10	9	1	2	2
Actuator-stepper		1						
Oil protection—full, low pressure or high pressure		1		1				
Heat recovery / aux condenser		1	1		1			
Hot gas bypass—electric actuator		1		1				
Hot gas bypass—pulse actuator		1	1					
Cold water reset		1			8			
Enhanced protection	1	2	1	3				
Chilled/tower water flow display, standard accuracy		2						
Heat recovery / aux condenser water flow display, standard accuracy		1						

(a) The letters M and F represent male and female connectors.

## Purge Control Installation

**Important:** Be sure to retain all existing purge safety controls!

The purge power line connections for the power to the unit should be wired per the purge wiring diagram. In general the 115 Vac power for the purge originates from the unit control panel. In the new control panel a circuit breaker 1Q2 is provided to power the purge. A neutral connection can be found on the 1X1 terminal strip.

## PRGA and PRGB Purifier Purge

Older model Purifier purges can be connected to the Tracer<sup>®</sup> AdaptiView™ control panel. A compressor run contact will be used to give the purge an auto start contact when the chiller is running. Use similar wiring options as discussed for PRGC models. The exception is that a pilot relay needs to be driven from the Quad relay output. The contacts of the quad relay are only rated for 2.8 A pilot duty, 7.2 A resistive at 120 Vac and 1/3 HP, 7.2 FLA at 240 Vac, 5 A general purpose. Refer to the

existing purge wiring diagram to determine the connection points for this auto start contact.

## PRGC Purifier Purge

The PRGC Purifier™ purge uses UCP2-based communications and does not communicate with Tracer® AdaptiView™ controls. A PRGC requires a compressor running signal connected to J26, 1 and 2 on 3U1 in the purge to operate in the auto or adaptive modes. Use the Compressor Running contact closure from the quad relay LLID - 1A8, connected to 115 Vac purge power source.

## PRGD, PRGG and PRGF EarthWise™ Purge

If a stand-alone EarthWise purge (CH530 control) exists on the chiller, it will need some hardware changes to work with the Symbio™ retrofit controls. If the purge is a new installation with the Symbio, then skip to [Step 9](#).

1. The Compressor running LLID (3A6) will not be needed, disconnect and remove.
2. The Condenser Saturated Refrigerant Temperature LLID (purge liquid temperature) will not be needed, disconnect and remove.
3. The existing 120-27 Vac transformer and DC power supply in the purge is undersized and should be removed. The purge control will be powered by the Symbio panel power supply.
4. Remove and save purge power supply LLID.
5. Remove IPC bus cable from power supply LLID. (Ensure remaining LLIDs are still connected to IPC bus).
6. It is optional to remove and discard the wires (303A, 304A, and 318A) from control power transformer to this power supply LLID (3A5).
7. Disconnect the cable from the DynaView to the power supply LLID.
8. Remove the tilt bracket from the purge base. DynaView can remain attached to the tilt bracket panel.
9. Connect the IPC bus from the control panel to the IPC bus for the purge using an IPC bus cable.

### ⚠ WARNING

#### Hazardous Voltage w/Capacitors!

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

Disconnect all electric power, including remote disconnects and wait for DC capacitors to discharge before servicing. Refer to the manufacturer's recommendations for proper discharge time as DC bus capacitors retain hazardous voltages after input power has been disconnected. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged before touching any internal components.

### ⚠ WARNING

#### PPE for Arc/Flash Required!

Failure to wear appropriate PPE could result in death or serious injury.

On this unit, if the handle shield is cracked the circuit breaker could arc/flash when reset. To avoid being injured, technicians **MUST** put on all necessary Personal Protective Equipment (PPE), in accordance with NFPA70E for arc/flash protection, **PRIOR** to entering the starter panel cabinet.

Figure 18. CABO1151 or CABO1153 - Frame to panel LLID adapter, male to white LLID connector



## LonTalk® Option Installation

Symbio™ 800 system uses a U60 LON module through the USB connection instead of the LCI-C LLID.

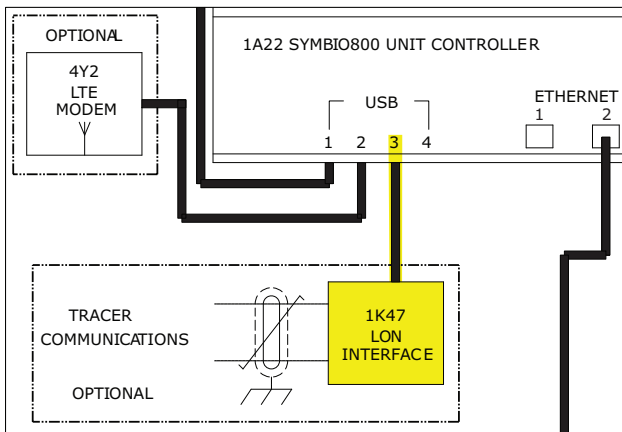
1. Install the U60 LON module (Superseded to KIT18458, Kit; Echelon Module Field Install Kit) on the DIN rail on the door, put it at left side of Symbio 800.
2. Connect U60 LON module to Symbio 800 by USB cable which is provide with the module connect this cable to any one of the four USB ports under the Symbio 800 controller.
3. Connect U60 LON module to the BAS system using shielded cable.



Figure 19. LON



Figure 20. LON wiring, ref. 50712733



## Communication Option Installation

Symbio™ 800 system supports up to 3 wireless interfaces at same time, these are,

- Wi-Fi mobile APP for BAS interface.
- Air-Fi® BACnet® via Zigbee® for component interface.
- LTE 4G modem interface for remote communications.

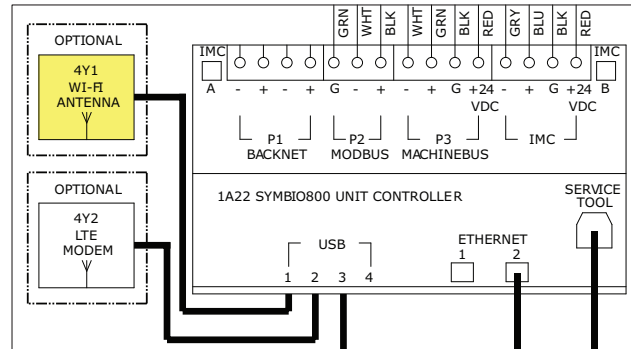
### Wi-Fi Installation

Refer to *Trane® Wi-Fi Module - Installation Instructions* (BAS-SVN042\*-EN) for more information. Mounting and wiring of Wi-Fi module (MOD03122).

1. Drill a 1.36 inch holes on the top of polycarbonate box, securely fasten the Wi-Fi module by gasket and nut which provided by module.
2. Connect Wi-Fi module to Symbio 800 by USB cable which provide by module, plug USB MICRO-B side to bottom of

Wi-Fi module and USB-A side to any one of the four USB ports under the Symbio 800 controller.

Figure 21. Wi-Fi wiring, ref. 50712733



### Air-Fi® Installation

Refer to *Air-Fi® Wireless System - Installation, Operation, and Maintenance* (BAS-SVX40\*-EN) for more information. Mounting and wiring of Air-Fi module (0185-0424-0100).

1. Drill a 0.87 inch holes on the top of polycarbonate box, align this hole with thread hole on the module, and securely fasten the Air-Fi module by M4 screw.
2. Connect Air-Fi module to Symbio 800 by Modbus® cable.
3. Remove the cover of module, connect 4 wires cable into 4 wire connector and plug in Air-Fi® module, connect other side of cable into two 2 wire connectors and plug them into Symbio 800 controller IMC terminal.

Figure 22. Connecting wiring harness

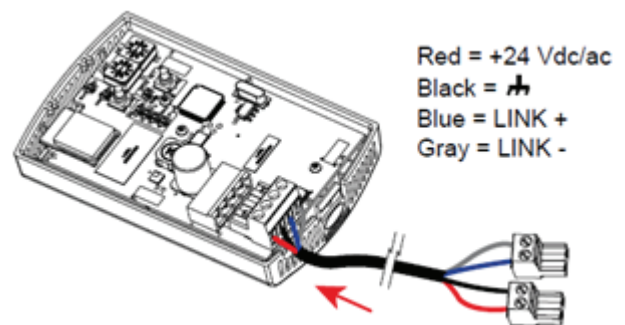


Figure 23. Wiring harness

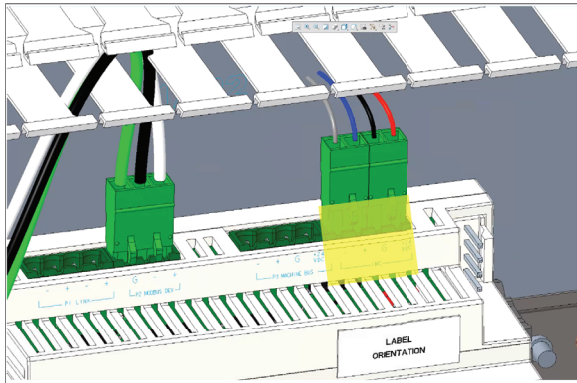
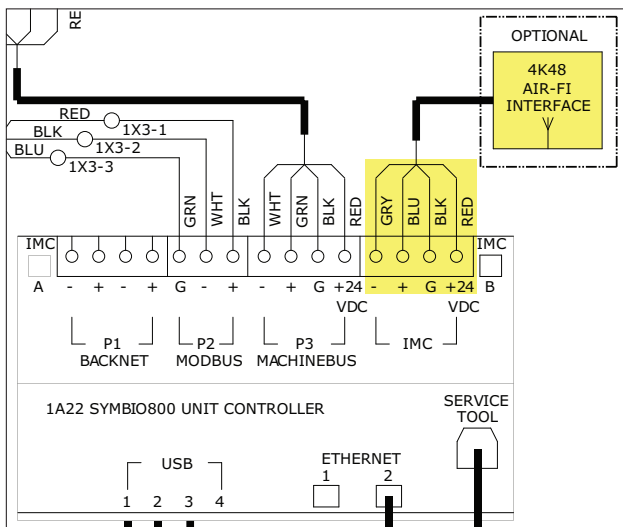


Figure 24. Air-Fi® wiring, ref. 50712733

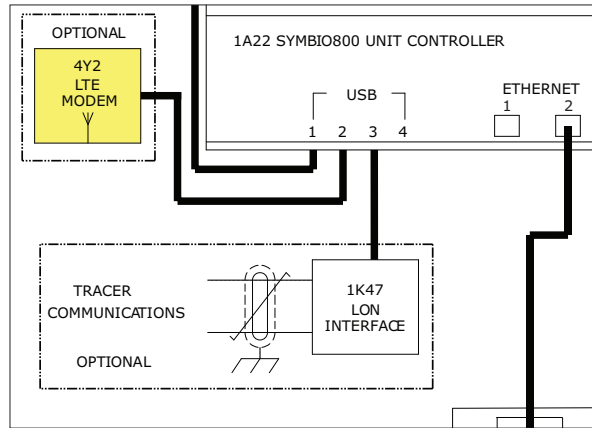


### LTE Modem Installation

Modem part is MOD03184, MODULE; CELLULARLE USB 2.9 METER CABLE. Refer to provided literature for setup and operation details.

1. Drill a 1.36 inch holes on the top of polycarbonate box, securely fasten the LTE modem by gasket and nut which provided by modem.
2. Connect LTE modem to Symbio™ 800 by USB cable which provide by module, plug USB MICRO-B side to bottom of LTE modem and USB-A side to any one of the four USB ports under the Symbio 800 controller.

Figure 25. LTE modem wiring, ref. 50712733



### Communication Device Mounting

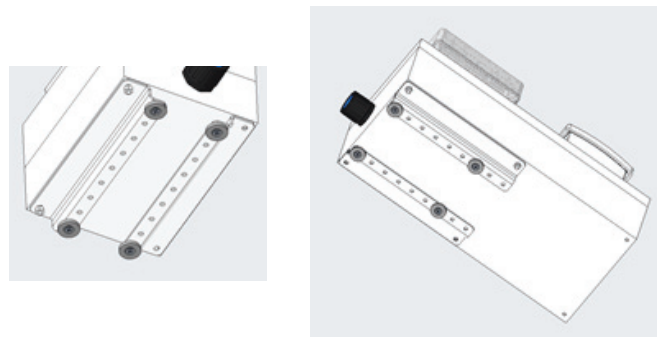
These devices are intended to be mounted on polycarbonate boxes. There are two installation approaches,

1. Each device is mounted independently on a small box (0185-0426-0100).
2. Multiple devices are mounted on a large box (0185-0427-0100).

All devices connect Symbio 800 by standard USB or Modbus® cable. For installation standard application need to field drill a 1.09 inch hole on side of box for a snap bushing. This bush can be replaced as field straight connector and conduit (3/4 inch size) as NEMA 4 applications.

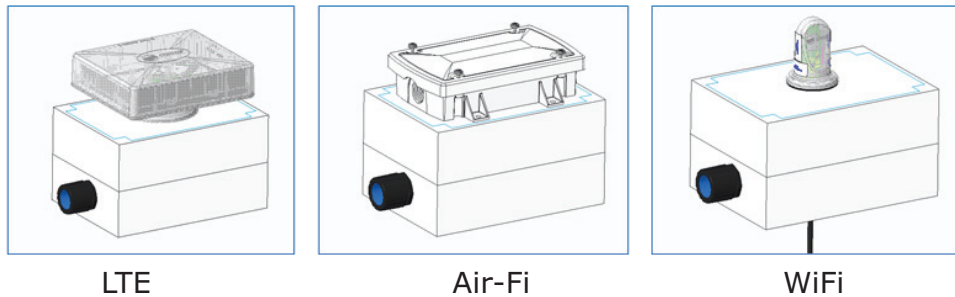
The boxes have magnets for flexible attachment to the Symbio panel.

Figure 26. Polycarbonate box with magnets



The single box is 7 in. Long x 5 in. Wide x 5 in. Tall

**Figure 27. Boxes**



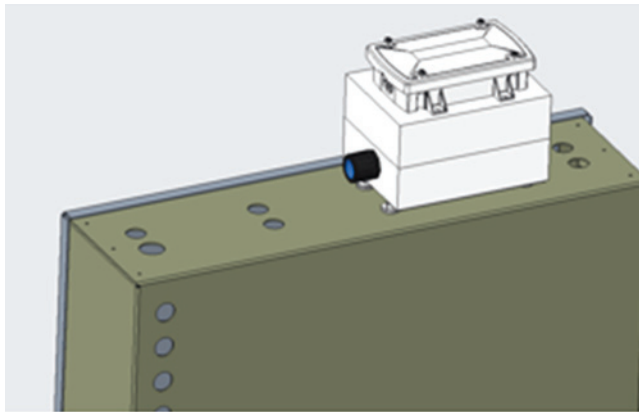
LTE

Air-Fi

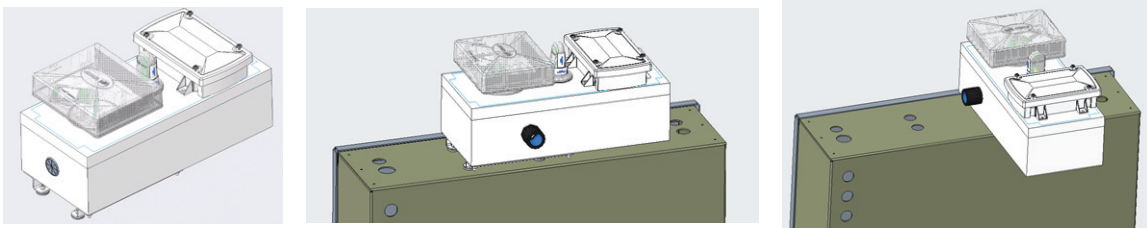
WiFi

The triple box is 15.5 in. Long x 6 in. Wide x 4 in. Tall

**Figure 28. Box mounting**



**Figure 29. Boxes**



## Water Flow Measurement

### Standard Accuracy Option

Water flow is determined by measuring pressure drop across heat exchanger using water pressure transducer LLID's. Standard flow measurement transducers can be ordered for condense, evaporator and auxiliary/heat recovery heat exchangers. The standard accuracy part is (0185-3475-0100), there are two transducer (0185-3475-0100) provided per heat exchanger. Field connect by male to 2 female 1000mm branch cable (CAB01147) which provided in package.

Figure 30. Pressure transducer LLID's

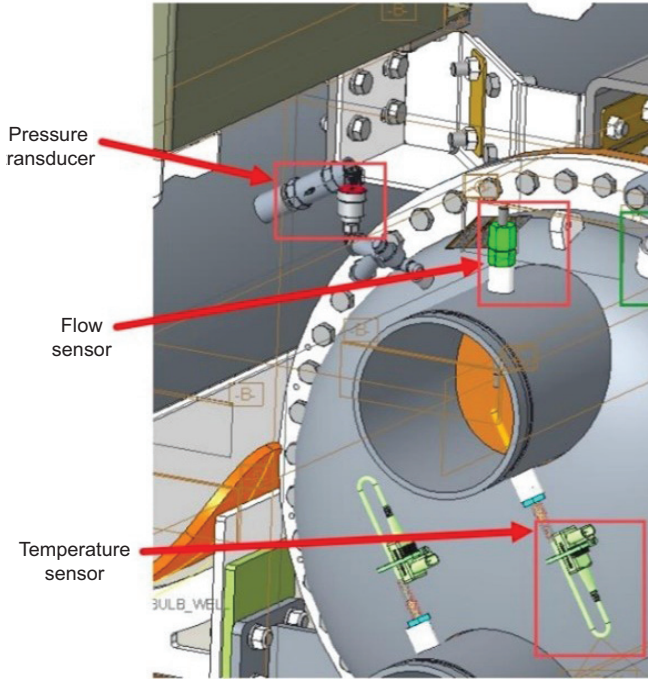


Figure 32. Fabricated Marine – 3/4 inch NPTI port

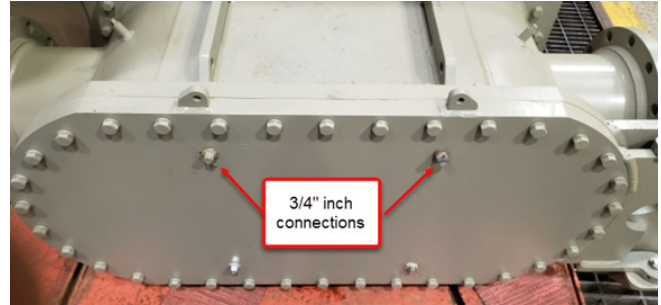
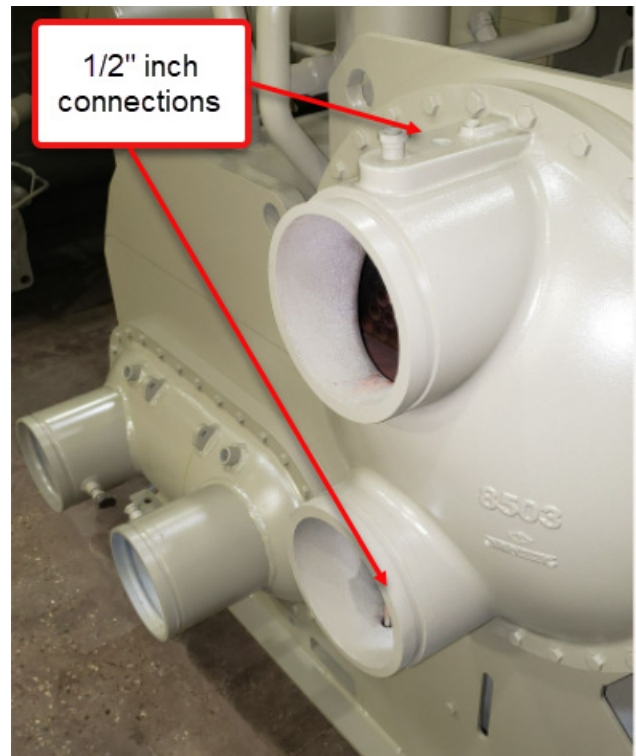


Figure 33. Cast – 1/2 inch NPTI port



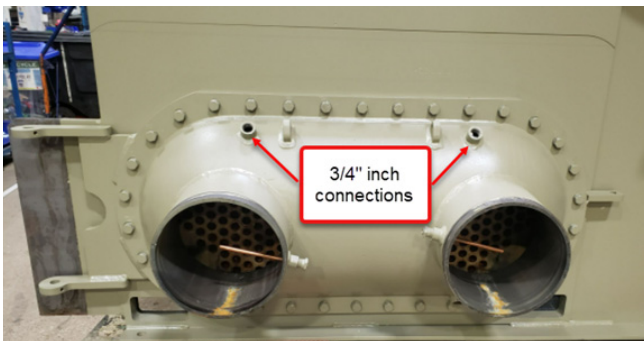
## Mounting

### Mounting of flow measurement assembly

This guidance is for mounting transducers on a wide variety of water boxes including marine type, non-marine type, for both 150 and 300 PSI applications in both fabricated steel and cast-iron construction.

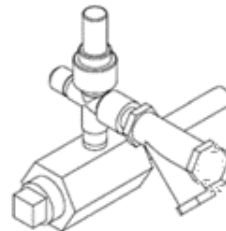
### Water box types

Figure 31. Fabricated Non Marine – 3/4 inch NPTI port



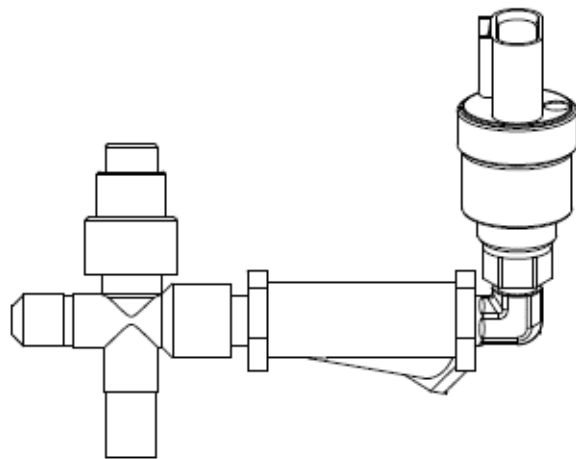
### Preparation of Wells

Install the provided well using bushings as needed.



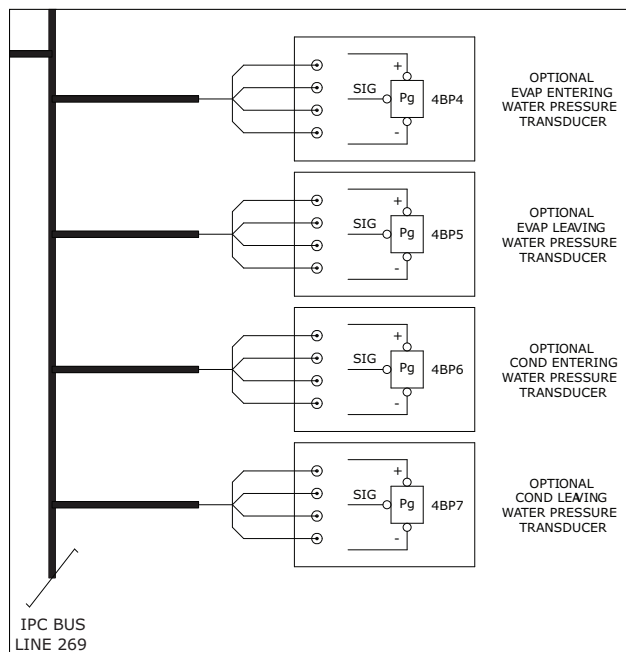


### Water box valve mounting



Mount transducers on the entering and leaving side water box locations with the strainer horizontal, the strainer cleanout port pointing down and the transducer facing upwards and connect to unit control buss. After system is filled, loosen the transducer in its threaded fitting. Then crack the isolation valve until water starts dripping from threads. Close the valve and re-tighten the transducer, and then reopen the valve for use.

**Figure 34. Standard accuracy flow meter wiring, ref. 50712746**



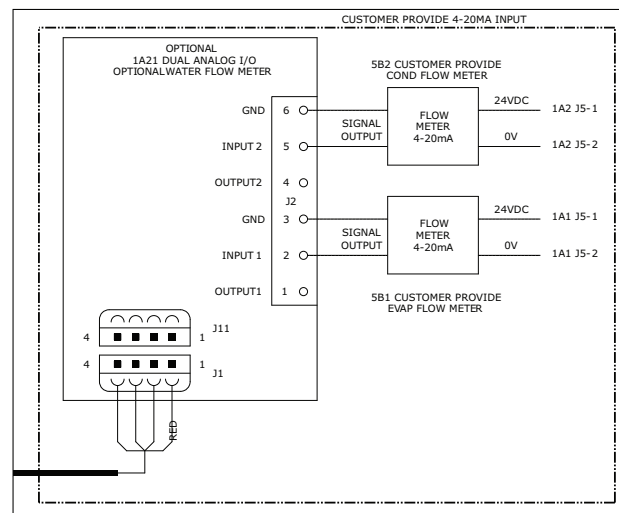
### High Accuracy, Customer Provided Meter Option

The high accuracy customer provided meter option provides an analog input/output LLID to monitor a customer provided high accuracy meter 0-10 Vdc or 4 – 20 mA outputs. (Rosemont, etc.) This option allows monitoring of condenser, evaporator flow and auxiliary heat exchangers.

Install needed DAIO LLID(s) (BRD04873) in CVRF control panel:

1. LLID (1A21) is needed for EVAP and COND water flow. Connect flow meter wires to 1A21-J2-1 and 1A21-J2-1 for EVAP, 1A21-J2-4 and 1A21-J2-5 for COND.
2. LLID (1A28) is need for HR Aux/COND water flow. Connect flow meter wires 1A28-J2-1 and 1A28-J2-1 for HR flow or Aux COND.

**Figure 35. High accuracy customer meter wiring, ref. 50712746**

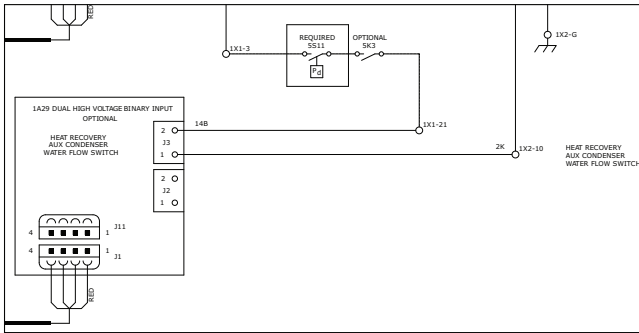


### Heat Recovery/Aux COND Option

When heat recovery/Aux COND option is selected, a DHVBI LLID (BRD04874) is required as 1A29, wires matrix show as following,

Wire#	AWG	From	To
14B	16	1A29-J3-2	1x1-21
2K	16	1A29-J3-1	1x2-10

**Figure 36. HR/Aux COND flow switch wiring, ref. 50712747**



## Energy Meter Option Installation

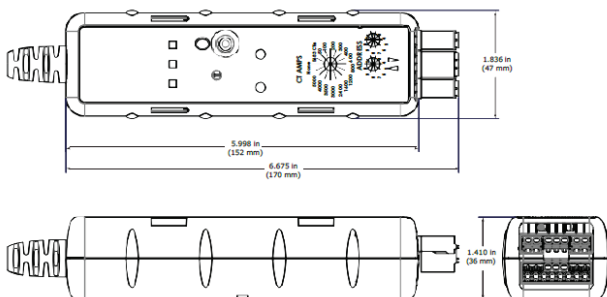
The Trane energy meter provides instrument grade accuracy power, volts and amps monitoring of Symbio™ controls installations. It has 1% accuracy for measuring both real power and energy and reactive power and energy. All data measured by the meter is communicated via Modbus® to Symbio control system. See *Energy Meter For CTV Symbio 800 Upgrade Systems - Installation Instructions (BAS-SVN224\*-EN)* for more information.

**Figure 37. Energy meter**

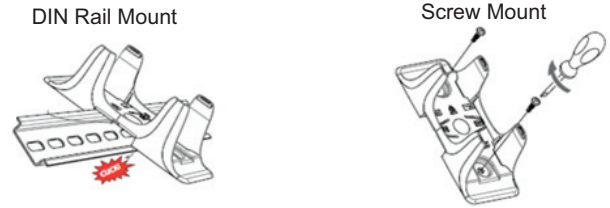


The meter is connected to line voltage of up to 480 volts and should be mounted within the starter cabinet. It is provided with a mounting bracket that can either be mounted on DIN rail or directly to the starter cabinet wall using provided bracket.

**Figure 38. Mounting bracket dimensions**



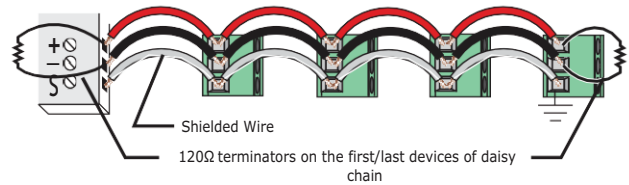
**Figure 39. Mounting bracket**



The meter is connected to Modbus communications and is self-powered by the unit voltage potential inputs. Review meter literature for setup and operation details.

Modbus communications is by shielded 14 – 26 AWG cable from meter to Symbio module. Please install 120 OHM resistors at first and last modules on Modbus daisy chain.

**Figure 40. Shielded cable**



The communications wiring will be terminated at the Modbus distribution terminal (1X3) beside Symbio 800 using the 3 poles connector which provide in energy meter kits.

**Figure 41. Distribution terminal**

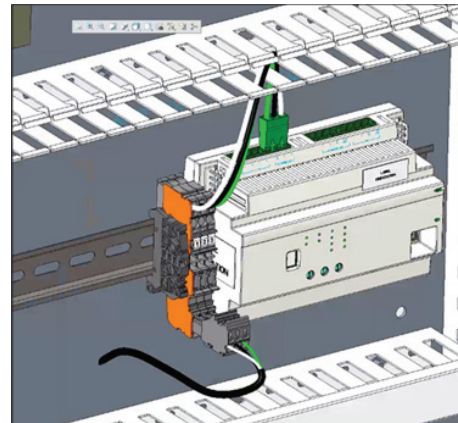
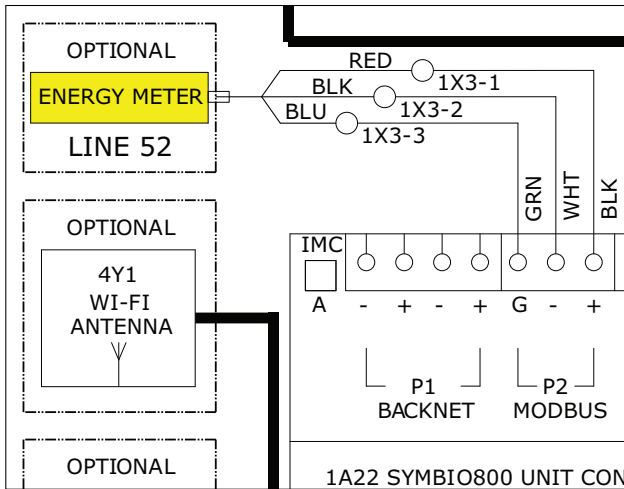




Figure 42. Modbus® wiring, ref. 50712733



### 480 Volts and Lower Installations

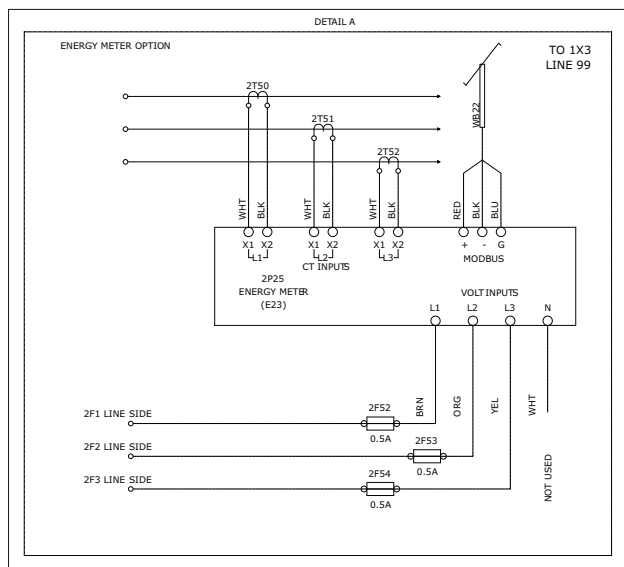
**POTENTIAL INPUT** – Install provided fused inputs to line voltage per schematic.

**CURRENT INPUT** – Install provided Rogowski CTs per schematic.

Figure 43. Rogowski CTs



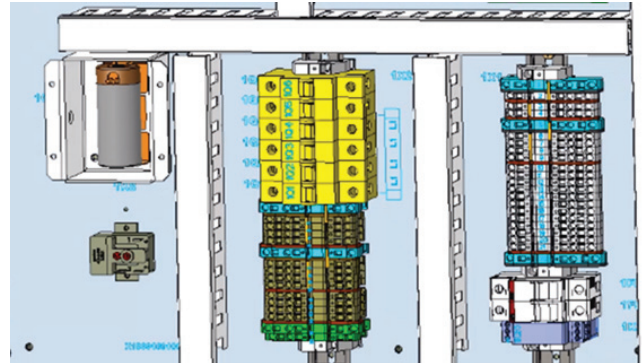
Figure 44. Energy meter wiring, 480V and low application, ref. 50712756



## Oil Pump Control

The Symbio™ control panel allows control of Line voltage oil pumps directly with the LLID relay output.

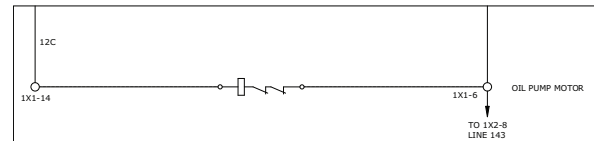
Figure 45. Oil pump starter capacitor and starter relay



### Line Voltage Pump Installation

1. Remove start relay, start capacitor and related wiring from Symbio panel and discard. These items will not be used in this application.
2. Wire oil pump contactor coil between terminals 1X1-14 and 1X1-6 as per schematic.

Figure 46. Line voltage oil pump wiring, ref. 50712732





# Starter Work

## ⚠ WARNING

### Electrical Fault!

Failure to follow instructions below could result in death or serious injury from burns or electric shocks. Tracer<sup>®</sup> AdaptiView™ wye-delta starter timing is different from UCP2 wye-delta starter timing. Symbio™ 800 uses contactor auxiliary switches to prevent simultaneous closure of run and shorting contactors. Starter wiring changes **MUST** be made per drawings listed in [“Wiring Diagram Matrix,” p. 42](#) to prevent an electric fault condition.

## ⚠ 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.

**Important:** Symbio™ 800 requires a closed transition starter. If the existing starter is an open transition style, it must be replaced.

## Starter Control Planning

## ⚠ WARNING

### Electrical Fault!

Failure to follow instructions below could result in severe injury and equipment damage. Tracer<sup>®</sup> Adaptiview™ requires the use of contactor auxiliary switches to prevent simultaneous closure of run and shorting contactors. Existing mechanical interlocks will wear out and fail if not used in combination with contactor auxiliary and result in the contactors exploding. Starter wiring documented in [“Wiring Diagram Matrix,” p. 42](#), **MUST** be made to prevent an electrical fault condition.

The starter work required varies significantly from one application to the next. These instructions are somewhat generic. Detailed plans have to be worked out using these instructions as a guide along with your specific starter wiring and hardware information. Use the existing starter wiring and the Symbio™ ship with starter wiring diagrams for determining your exact wiring.

The 3-phase starter module can control the starter using one of two methods:

- Direct control of each starter contactor.
- Pilot relay interface to the existing contactors.

Both methods result in similar operation of the starter. When the module is wired for direct control all functions of the dry run test can be performed. The pilot relay method must be used when the contactor coils are voltages other than 115 Vac. If both direct control or pilot relay control can be used on your application, select the method that best suits your needs.

The wiring diagrams for direct control are referenced in [“Wiring Diagram Matrix,” p. 42](#). Also use [“Wiring Diagram Matrix,” p. 42](#) for pilot relay diagrams, sometimes referred to as customer supplied starter wiring. Pilot relays are field provided.

Retain any special options and determine how they might fit into the new method of control. Keep a detailed record of your revisions to help with future troubleshooting.

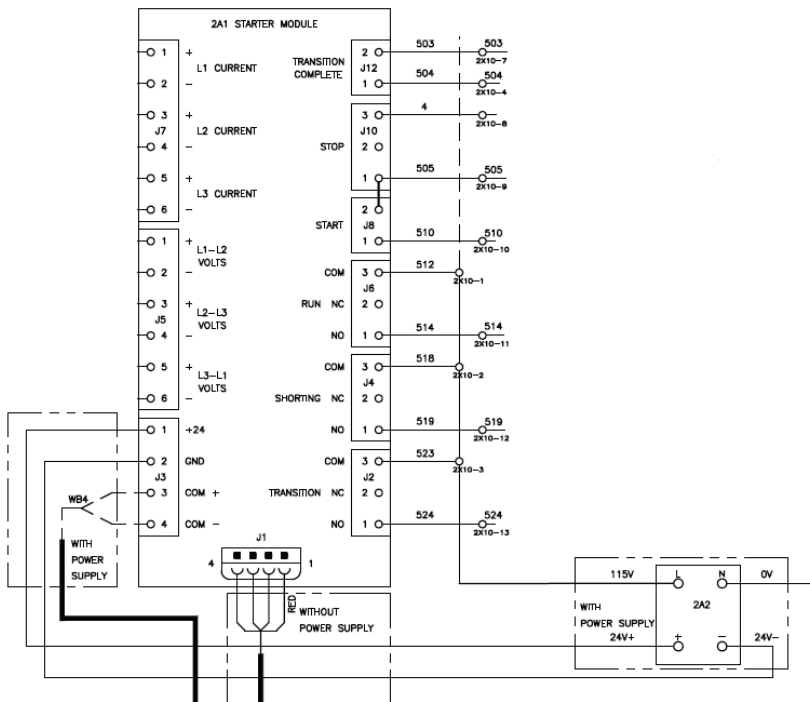
Starter panel conversion varies with existing starter type and starter control voltage. For reference, [“Wiring Diagram Matrix,” p. 42](#) lists the electrical schematics for typical Symbio™ wiring for wye-delta, across-the-line, primary reactor, auto transformer, and solid-state starters.

**Important:** *To ensure that the starter panel retrofit procedure is performed properly, carefully review the instructions in this section. Record a detailed description of all electrical changes made during the starter retrofit process. Be sure to add a copy of this report to the chiller record file for future reference.*

The instructions that follow detail the rework of a typical wye-delta starter for direct control by Symbio™ and the starter module LLID. The kit now includes the 2K11 starter interlock relay.

While this conversion procedure specifically applies to wye-delta starters, it can be adapted to successfully modify other types of starters for operation with a Symbio starter module.

Figure 47. Starter sub panel customer connections 5071-0496



**Notes:**

- Be sure to refer to the wiring diagrams listed in “Wiring Diagram Matrix,” p. 42 as you review the following instructions. The wire numbers and component designations indicated in these steps appear in these figures. Actual existing numbers may vary for your unit. Service literature that includes sample original unit wiring can be found in CVHE-M-7 or CVHE-IN-8.
- To simplify future chiller trouble analysis, Trane recommends removing all existing, non-essential components from the starter panel enclosure.

- Mount starter sub-box on starter panel as shown in Figure 49, p. 32 using hardware provided. When drilling holes in starter cabinet, take care to avoid getting metal shavings into starter cabinet.
  - Drill 3/4 inch or 1 inch hole through panel and starter cabinet, near top of cabinet, to accommodate wires from sub-box to starter. Add grommet to hole.
- Mounting and pre-wiring of components on back panel.
  - Mount starter sub-panel on the back panel.
  - Label components using labels provided.
  - Attach starter module LLID to IPC bus.

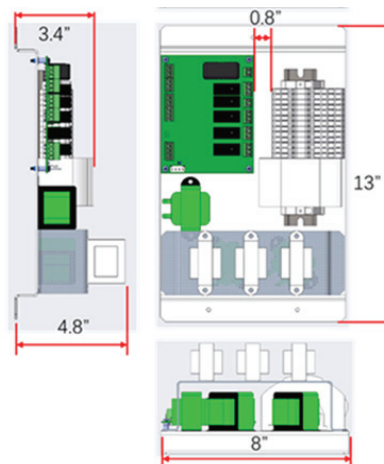
## Starter Sub-Box Installation

The starter sub-box is intended for remote mount starter installations where due to their custom nature there isn't room for mounting the sub-panel in the starter enclosure and/or such an installation inside the enclosure would be inconvenient or un-safe.

As the Symbio™ starter sub-panel provides a direct replacement for a UCP2 starter module it is expected that the sub-box will be rarely required, however a description of its installation is provided in case it is needed.

- Installing the Starter Panel sub-box.
- Mounting of the optional starter sub-box:
  - Remove door from box. Door can be hinged on either side of cabinet.

Figure 48. Starter sub-panel with PTs, CTs and power supply



## Starter Sub-Panel

The Symbio™ starter module is provided on an assembled sub-panel that is a direct replacement for the UCP2 starter module mounted in conventional starters and AFD applications. The sub panel has three significant options:

- It has the option of a 24 Vdc power supply to be used on remote mount starters and drives.
- It has the option of pre-installed 600 V or less current transformers.

- It comes in a starter and AFD configuration. The AFD configuration includes the needed LLIDS for UCP2 AFD control.

Each subpanel It is also provided as standard with a mounting bracket that allows mounting of factory installed AFD LLIDs or field installed secondary current transformers or pilot relays when needed.

A description of the sub-panel's types and uses is below:

**Table 7. Sub-panel types**

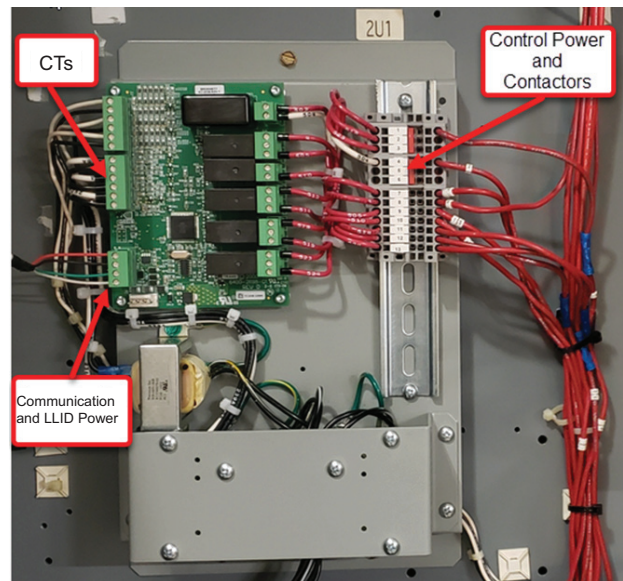
Model#Digit 33	Application	Part Number	Description	Starter Mount Type	PTs Configuration	Selection FACT/FCOD
E	Starter Module with plate for medium voltage unit starter	0185-0421-0100	Starter module on sub plate W/O power supplier, W/O PT	Unit mount	MV starter	STYP/STUN; TPOT=NONE
A	Starter Module with plate for low voltage unit starter	0185-0433-0100	Starter module on sub plate W/O power supplier, W/ PT	Unit mount	LV Starter	STYP/STUN; TPOT=CPTA,CPTB,CPTC,CPTD, CPT E,CPT F
F	Starter Module with plate for medium voltage remote starter	0185-0422-0100	Starter module on sub plate W/ power supplier, W/O PT	Remote mount	MV starter	STYP/STRE; TPOT=NONE
B	Starter Module with plate for low voltage remote starter	0185-0435-0100	Starter module on sub plate W/ power supplier, W/ PT	Remote mount	LV Starter	STYP/STRE; TPOT=CPTA,CPTB,CPTC,CPTD, CPT E,CPT F
C	Starter Module with plate for unit AFD	0185-0434-0100	AFD Starter module on sub plate W/O power supplier, W/O PT	Unit mount	AFD starter already has LV PTs	STYP/AFUN; TPOT=NONE,CPTB,CPTC,CPTD, CPT E,CPT F
D	Starter Module with plate for remote AFD	0185-0437-0100	AFD Starter module on sub plate W/ power supplier, W/O PT	Remote mount	AFD starter already has LV PTs	STYP/AFRE; TPOT=NONE,CPTB,CPTC,CPTD, CPT E,CPT F

**Figure 49. Mounting starter sub-box**



Starter control and power wires are connected to the terminal block on the right side of the sub-panel. CTs and starter module communications and power wires are connected directly to starter module on the left side.

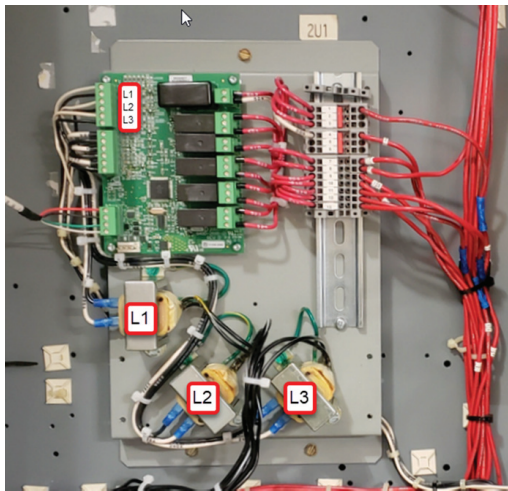
**Figure 50. Starter sub-panel**



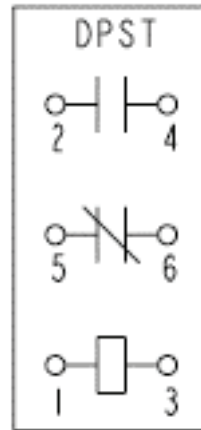
Medium voltage potential transformer outputs are directly wired to starter module current inputs L1, L2, and L3 per the schematic drawing. Low voltage L1, L2, and L3 potential signals are connected to the potential transformer white and black leads on the sub-panel in the order below.

**Note:** If replacing a UCP2 starter module, you can remove and discard the 27 Vac UCP2 starter module transformer as it is not required for the CH530 type starter module operation.

**Figure 51. Low voltage potential transformer connections**



**Figure 53. Pilot relay switching configuration**



**Important Note for Wye Delta and Auto Transformer Starter Applications**

Per the schematics, Wye Delta and Auto Transformer starter require normally closed contactor interlock signals for proper operation. In the case that the starters do not have available auxiliary contacts, pilot relays can be substituted per the schematic notes below. If space is available, the relay(s) can be mounted on the sub-panel bracket.

**Figure 52. Pilot relay terminal locations**

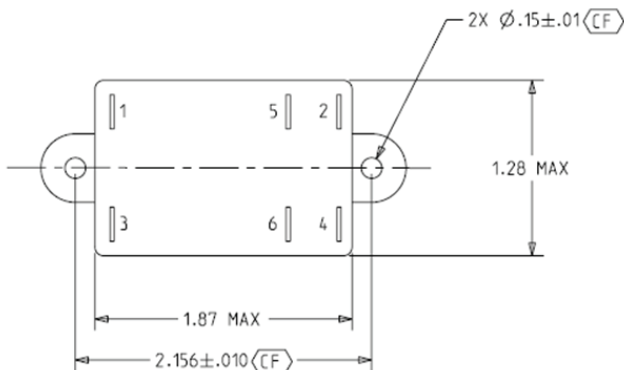
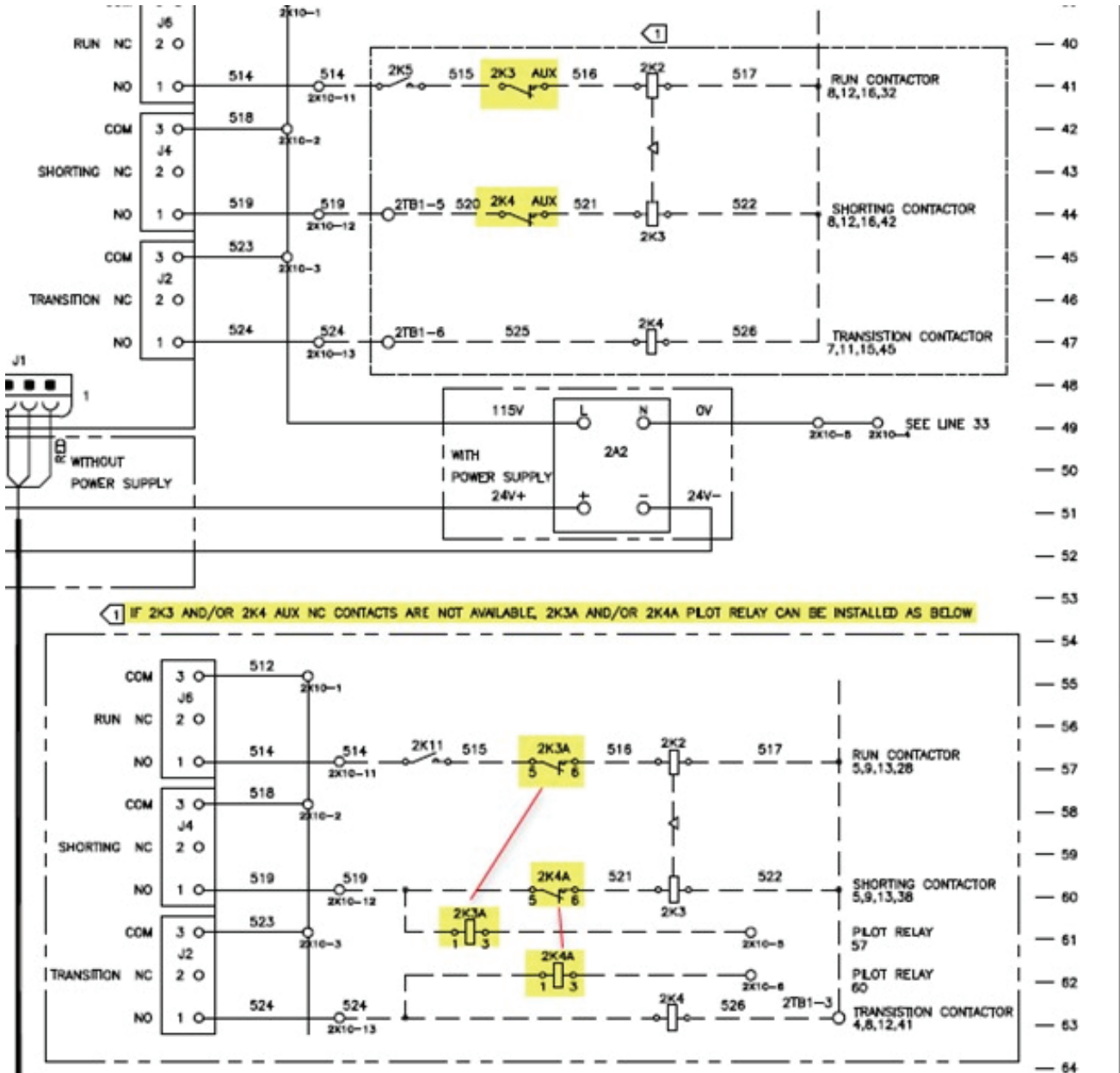
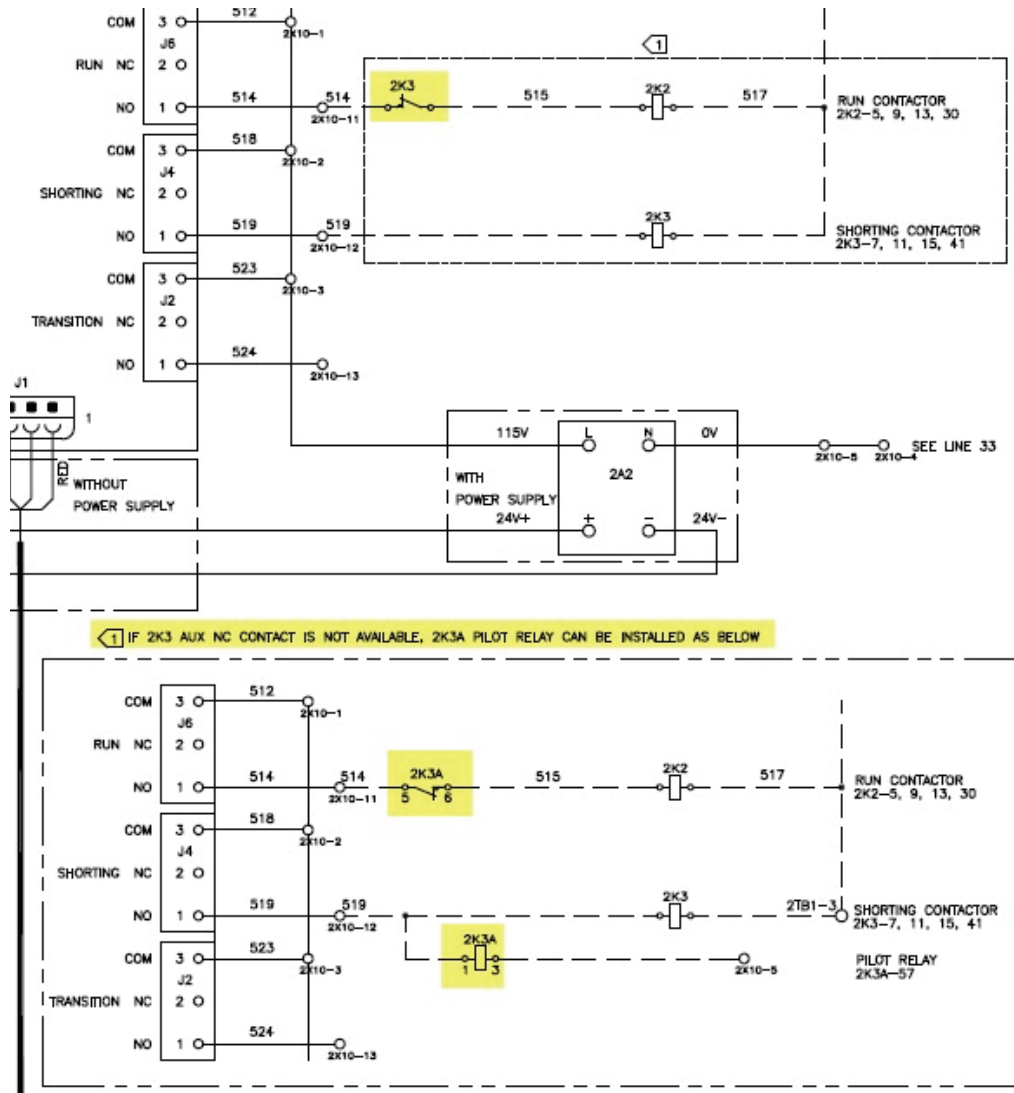




Figure 54. Wye delta interlock and pilot relay wiring



**Figure 55. Autotransformer interlock and pilot relay wiring**


## Starter Sub-Panel Installation

The starter module LLID, and CTs and any turn-down transformers can be mounted on the sub-panel.

Installation steps are as follows:

1. Install sub-panel in starter enclosure or in sub-box as desired.
2. Install secondary current transformers if needed on the bracket.
3. Power and communications.
  - a. For unit mount starters.
    - i. Use global connector to provide power and communications to starter module.
  - b. For remote mount starters.
    - i. Use provided power supply to power starter power module, Do not connect control panel power to starter module.
    - ii. Use existing communications cable to connect Symbio™ communications bus to starter module.
4. Wire Starter control interface per schematic.

## Control Power Transformer

If the existing starter does not have 115 Vac 3 kVA of additional control power, install a transformer (field supplied) that will provide 115 Vac to the Symbio™ control panel. (As just described, transformer requirements are: line voltage primary/ 115 Vac secondary, minimum capacity 3 kVA.)

## Current Transformers, CTs

### ⚠ WARNING

#### Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

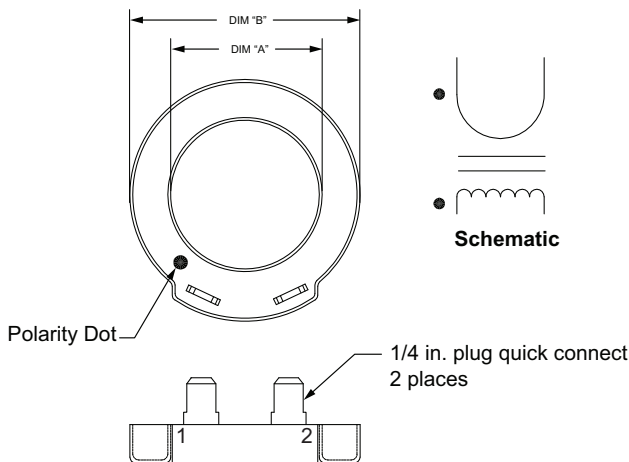
### ⚠ WARNING

#### PPE for Arc/Flash Required!

Failure to wear appropriate PPE could result in death or serious injury. On this unit, if the handle shield is cracked the circuit breaker could arc/flash when reset. To avoid being injured, technicians MUST put on all necessary Personal Protective Equipment (PPE), in accordance with NFPA70E for arc/flash protection, PRIOR to entering the starter panel cabinet.

Three new current transformers CTs (donut shape) are optional to re-work the starter. If used, install these three new CTs as shown on wiring diagram. Pay careful attention to the polarity dot and its orientation. The polarity dot should face incoming power, in other words, towards the disconnect.

Figure 56. Current transformer, single turn-down



Wire the leads from the CT plug quick connects to the starter module as shown on the wiring diagram. Use receptacle insulated quick connect terminals.

The application of Symbio™ chiller controls to a medium voltage chiller recommends specific use of the dual current transformer (CT) application, rather than a single CT which is a common option on low voltage applications (600 Vac or less). Refer to CVRD-SVN11\*-EN for wiring of medium voltage CT applications.

The dual CT installation uses a primary CT that reduces the amperage to less than 5 amps. A second CT is then used to reduce the current input to the starter module to a nominal 100 mA value. Use dual CT data tables in the startup and programming manual *Tracer AdaptiView™ Panel Upgrade - Programming Guide* (CVRE-SVP01\*-EN), or the latest version.

It is recommended that you confirm the correct CT has been provided before starting installation. Before wiring the starter module and CT be sure to confirm incoming power phasing. If Phase A, B, and C are wired in the wrong order the controls will not allow the motor to start. Use the phase meter on the low voltage side of the potential transformer. Do NOT use the meter on the primary side where there is medium voltage because it probably exceeds the safe operating voltage range of most service meters.

**Table 8. CT specifications for single transformer per phase**

Actual Motor RLA (A)	CT Part Number	CT Ratio (A:A)	CT Rating (A)	Diameter <sup>(a)</sup> (inches)		Primary Turns	CT Meter Scale
				Inside A	Inside B		
67-100	TRR02028	40:00.1	100	2	3.35	1	100
100-150	TRR00715	30:00.1	150	2	3.35	1	150
134-200	TRR02029	20:00.1	200	2	3.35	1	200
184-275	TRR02030	35:00.1	275	2	3.35	1	275
267-400	TRR02031	40:00.1	400	2.5	3.95	1	400
334-500	TRR01142	20:00.1	500	2.5	3.95	1	500
467-700	TRR01255	40:00.1	700	2.5	3.95	1	700
667-1000	TRR01405	40:00.1	1000	2.5	3.95	1	1000
964-1400	TRR01597	20:00.1	1400	3.5	5.25	1	1400
1200-1800	TRR01580	00:00.1	1800	4	6.5	1	1800

(a) Refer to [Figure 56, p. 36](#) for location of diameter A and B.

## CT Work

### **⚠ WARNING**

#### **Hazardous Voltage w/Capacitors!**

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

### **⚠ WARNING**

#### **PPE for Arc/Flash Required!**

Failure to wear appropriate PPE could result in death or serious injury. On this unit, if the handle shield is cracked the circuit breaker could arc/flash when reset. To avoid being injured, technicians MUST put on all necessary Personal Protective Equipment (PPE), in accordance with NFPA70E for arc/flash protection, PRIOR to entering the starter panel cabinet.

The existing CTs can be reused for UCP2. This is true for applications with a single CT or two CTs per phase. The output of both CT applications is in the 100 mA range that the Symbio™ starter module requires.

When reusing CTs it may be necessary to confirm all the polarity of existing wiring is correct per these instructions.

In some cases starters shipped with ammeters. The meters can remain if they have their own CTs.

When using existing CTs having a nominal chiller current to 5 amp ratio (i.e., 200:5), it is necessary to install or have ordered secondary CTs. In this case, two CTs are used per phase to either achieve the necessary turn-down or for metering convenience. The first stage consists of either the X13580271010 (TRR01287), X13580272010 (TRR01288), X13580048010 (TRR00448) and X13580048020 (TRR00449) (each of these CTs have a 5 amp secondary). The second stage consists of small CT transformers that reduce the nominal 3.6 amp signal to the 100 mA value used by the starter module. The existing 5 amp CTs cannot be used if they do not match the required ratio in [Table 8, p. 37](#).

The part number on the secondary CT is X13580266-01, Trane part number TRR00975, three required per starter.



## Starter Work

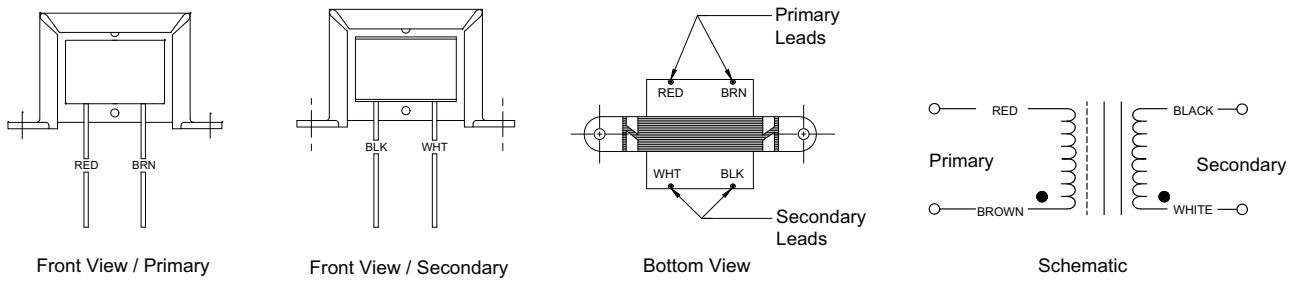
**Table 9. CT specifications for two transformers per phase**

Actual Motor RLA (A)	Primary CT Number	Second CT Number	CT Ratio (A:A)	CT Rating (A)	Inside Dia. (inches)	Primary Turns	CT Meter Scale
8.0--12.0	TRR01288	TRR00975	50:05:00	50	1.25	3	12
12.0--18.0	TRR01288	TRR00975	50:05:00	50	1.25	2	18
18.0--27.0	TRR01289	TRR00975	75:05:00	75	1.25	2	27
24.0--36.0	TRR01288	TRR00975	50:05:00	50	1.25	1	36
36.0--54.0	TRR01289	TRR00975	75:05:00	75	1.25	1	54
48.0--72.0	TRR01287	TRR00975	100:05:00	100	1.75	1	72
24.0--36.0	TRR00448	TRR00975	150:05:00	150	2.5	3	36
28.8--43.2	TRR00448	TRR00975	180:05:00	180	2.5	3	43.2
36.0--54.0	TRR00448	TRR00975	150:05:00	150	2.5	2	54
43.2--64.8	TRR00448	TRR00975	180:05:00	180	2.5	2	64.8
48.0--72.0	TRR00448	TRR00975	200:05:00	200	2.5	2	72
60.0--90.0	TRR00449	TRR00975	250:05:00	250	2.5	2	90
72.0--108.0	TRR00448	TRR00975	150:05:00	150	2.5	1	108
86.4--129.6	TRR00448	TRR00975	180:05:00	180	2.5	1	129.6
96.0--144.0	TRR00448	TRR00975	200:05:00	200	2.5	1	144
120--180	TRR00449	TRR00975	250:05:00	250	2.5	1	180
144--216	TRR00449	TRR00975	300:05:00	300	2.5	1	216
168--252	TRR00449	TRR00975	350:05:00	350	2.5	1	252
192--288	TRR00450	TRR00975	400:05:00	400	2.5	1	288
240--360	TRR00450	TRR00975	500:05:00	500	2.5	1	360
288--432	TRR00450	TRR00975	600:05:00	600	2.5	1	432
336--504	TRR00451	TRR00975	700:05:00	700	2.5	1	504
384--576	TRR00451	TRR00975	800:05:00	800	2.5	1	576
480--720	TRR00451	TRR00975	1000:05:00	1000	2.5	1	720
480--720	TRR00655	TRR00975	1000:05:00	1000	4	1	720
576--864	TRR00499	TRR00975	1200:05:00	1200	2.5	1	864
576--864	TRR00655	TRR00975	1200:05:00	1200	4	1	864
720--1080	TRR00499	TRR00975	1500:05:00	1500	2.5	1	1080
720--1080	TRR00655	TRR00975	1500:05:00	1500	4	1	1080
864--1296	TRR00453	TRR00975	1800:5, X1-X2	1800	4	1	126
1008--1512	TRR00453	TRR00975	2100:5, X1-X3	2100	4	1	1512
1200--1800	TRR00453	TRR00975	2500:5, X1-X4	2500	4	1	1800

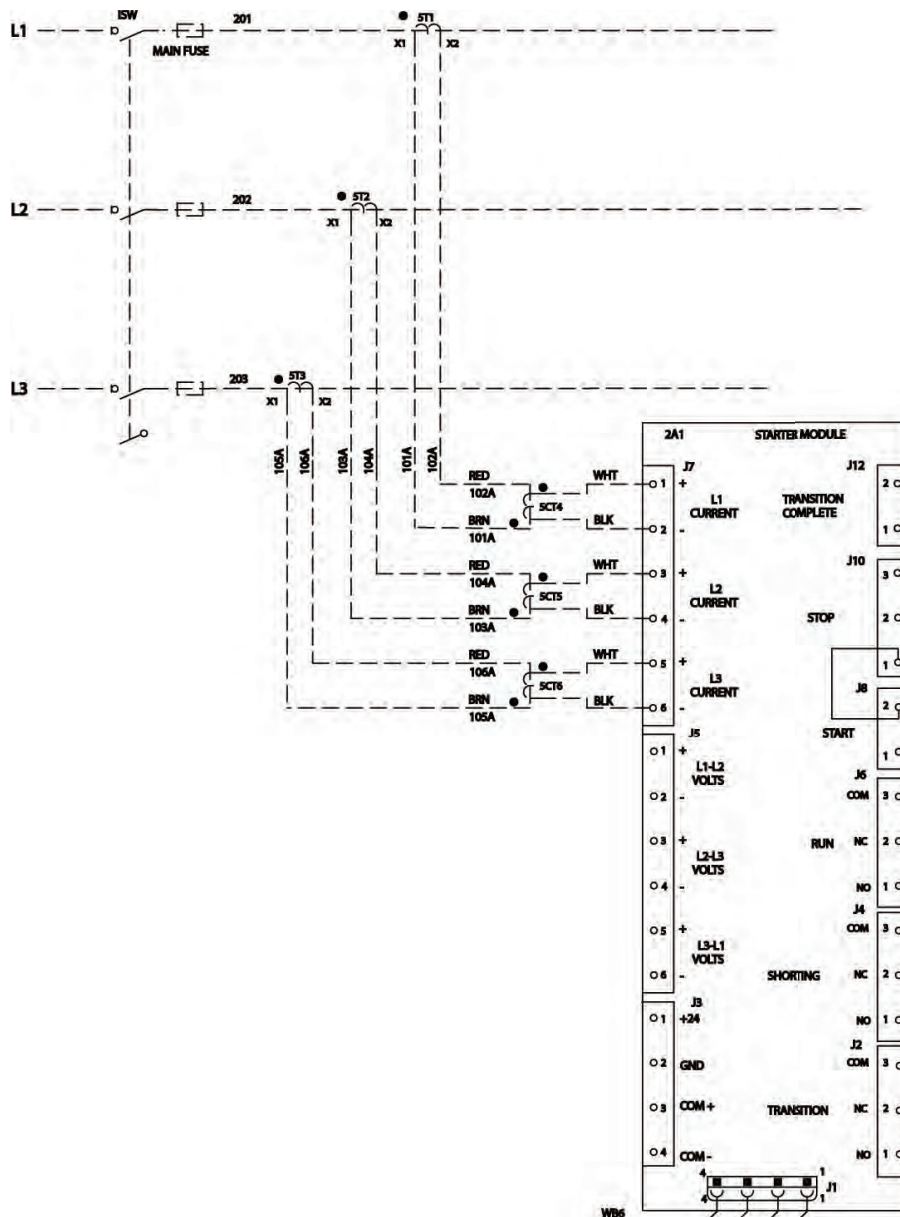
The secondary CT used in the two transformer per phase is shown in [Figure 57, p. 39](#). For a typical wiring diagram used for wiring low voltage applications using dual CTs, two transformers per phase, see [Figure 58, p. 39](#).



**Figure 57. Secondary CT used with 5 amp primary CT, X13580266-01, TRR00975**



**Figure 58. Dual CT wiring example**



## Potential Transformers, Optional PTs

**⚠ WARNING**

**Hazardous Voltage w/Capacitors!**

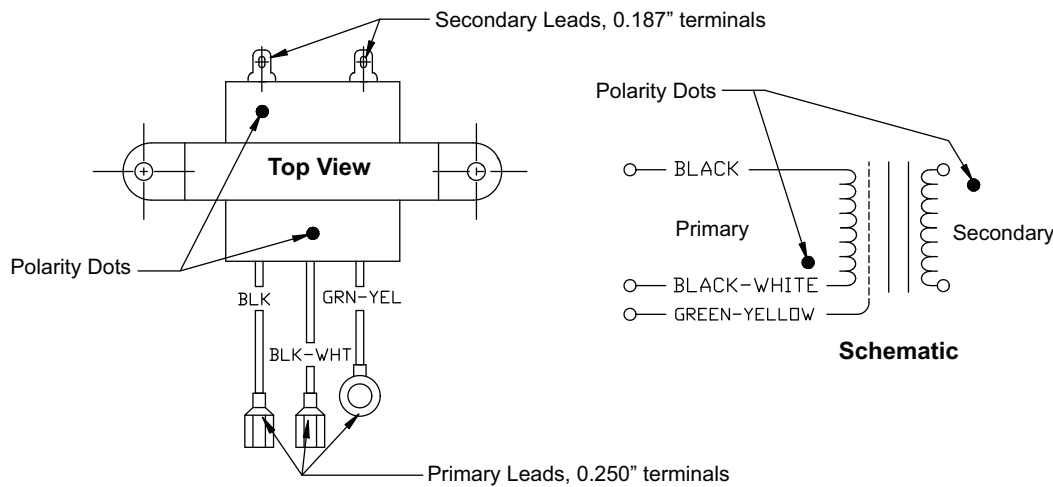
Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

**⚠ WARNING**

**PPE for Arc/Flash Required!**

Failure to wear appropriate PPE could result in death or serious injury. On this unit, if the handle shield is cracked the circuit breaker could arc/flash when reset. To avoid being injured, technicians **MUST** put on all necessary Personal Protective Equipment (PPE), in accordance with NFPA70E for arc/flash protection, **PRIOR** to entering the starter panel cabinet.

Figure 59. Potential transformer, X13590079-01, TRR00713



Install the optional potential transformers (PTs). The potential transformers are used to measure line voltage. The wiring must have the correct polarity for them to work correctly.

For applications greater than 600 Vac, a large medium voltage PT is used to step from line voltage to 115 Vac and a second PT steps the voltage to less than 30 Vac. The large PT is a three phase type except for the 6600 Vac where three single phase PTs are used. Refer to CVRD-SVN11\*-EN, for detailed wiring instructions.

For applications less than 600 Vac a single PT per phase like that shown in [Figure 59, p. 40](#) is used to step the signal down to a voltage less than 30 Vac for input into the starter module. The black leads are connected to the line from phases A-B, B-C and C-A. The green ground wire is connected to chassis ground. Field provided wires connect the Starter module to the terminals on the PTs.

The part number on the less than 600 volt PT is X13590079-01, Trane part number TRR00713, three required per starter.

**Note:** Fuses (2F1, 2F2 and 2F3) must be installed with the optional potential transformers (see ["Wiring Diagram Matrix," p. 42](#) for a list of the appropriate wiring diagram examples). Use [Table 5, p. 8](#) to size the fuses.

## Starter Wiring

### ⚠ 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

#### Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

### ⚠ WARNING

#### PPE for Arc/Flash Required!

Failure to wear appropriate PPE could result in death or serious injury. On this unit, if the handle shield is cracked the circuit breaker could arc/flash when reset. To avoid being injured, technicians **MUST** put on all necessary Personal Protective Equipment (PPE), in accordance with NFPA70E for arc/flash protection, **PRIOR** to entering the starter panel cabinet.

### NOTICE

#### Module Damage!

Failure to follow the following instruction could result in equipment damage. Do **NOT** connect the secondaries of the line-to-120 Vac potential transformer to the starter module!

**Table 10. Starter wiring**

Wire #	From Terminal	To Terminal
236A	2U1 J3-3	2A1 J5-1
237A	2U1 J3-4	2A1 J5-2
238A	2U1 J3-5	2A1 J5-3
239A	2U1 J3-6	2A1 J5-4
240A	2U1 J3-7	2A1 J5-5
241A	2U1 J3-8	2A1 J5-6
101A	2U1 J5-1	2A1 J7-1
102A	2U1 J5-2	2A1 J7-2
103A	2U1 J5-3	2A1 J7-3
104A	2U1 J5-4	2A1 J7-4
105A	2U1 J5-5	2A1 J7-5
106A	2U1 J5-6	2A1 J7-6
503	2U1 J4-2	2A1 J12-2
504	2U1 J4-1	2A1 J12-1
4B	2U1 J6-3	2A1 J10-3
507	2U1 J8-2	2K11 coil +
510	2U1 J8-1	2A1 J8-1
512	2U1 J10-3	2A1 J6-3
516	2U1 J10-1	2K3 AUX NC
518	2U1 J12-3	2A1 J4-3
521	2U1 J12-1	2K4 AUX NC
523	2U1 J14-3	2A1 J2-3
524	2U1 J14-1	2A1 J2-1
Additional wires		
Wire #	From Terminal	To Terminal
508	2K11 coil -	2TB1-2
506	2K11 NO	2K1 AUX NO
505	2A1 J10-1	2K11 NO
514	2A1 J6-1	2K11 NO
515	2K11 NO	2K3 AUX NC
519	2A1 J4-1	2K4 AUX NC
IPC cable connected to either J1 or J3 1-4.		
Remove		
2T4 and all wires connected to it.		
Comm Link wires connected to 2U1 J1-1,2.		



# Wiring Diagram Matrix

**Table 11. Wiring diagrams matrix**

TYPE	NUMBER
<b>CONTROL</b>	
UNIT CONTROLS	50712733
UNIT AND OPTION	50712740
OPTION	50712746
OPTION	50712747
LEGEND	50712748
FIELD CONNECTION DIA	50712750
COMM PANEL DIA	50712779
<b>STARTERS</b>	
WYE-DELTA TS	50710511
X-LINE TS	50710512
PRIMARY REACTOR TS	50710513
AUTO X-FORMER TS	50710514
SOLID STATE TS	50710528
WYE-DELTA CS	50710523
X-LINE CS	50710524
PRIMARY REACTOR CS	50710525
AUTO X-FORMER CS	50710527
STARTER SUBPANEL VFD	50711536
ENERGY METER OPTION, 480V AND LOW	50712756
ENERGY METER OPTION, 575 AND 600V	50712757
ENERGY METER OPTION, MV WITH SINGLE STAGE PT	50712758
ENERGY METER OPTION, MV WITH DOUBLE STAGE PT	50712759





Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit [trane.com](https://trane.com) or [tranetechnologies.com](https://tranetechnologies.com).

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice. We are committed to using environmentally conscious print practices.