Installation, Operation, and Maintenance

Modular Self-Contained

R–454B — 20–110 Tons — SCWM

⚠ 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.

November 2025

PKG-SVX030B-EN

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

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

Important Responsible Refrigerant Practices

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

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury.

Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/ sleeves, butyl gloves, safety glasses, hard hat/ bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

⚠ WARNING

Follow EHS Policies!

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

- **All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Trane personnel should always follow local regulations.**

⚠ WARNING

R-454B Flammable A2L Refrigerant!

Failure to use proper equipment or components as described below could result in equipment failure, and possibly fire, which could result in death, serious injury, or equipment damage.

The equipment described in this manual uses R-454B refrigerant which is flammable (A2L). Use ONLY R-454B rated service equipment and components. For specific handling concerns with R-454B, contact your local representative.

⚠ WARNING

Cancer and Reproductive Harm!

This product can expose you to chemicals including lead and bisphenol A (BPA), which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Copyright

Trademarks

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

Revision History

Updates include

- Added the Warranty section.
- Added 90–110 tonnages to the General Data, Electrical Data, and Weights tables.
- Updates to the Dimensional Data chapter.
- Updates to the Dimensional Data chapter.
- Additional figures added to Typical Unit Layout section.

Table of Contents

Overview

Note: *One copy of this document ships inside the control panel of each unit and is customer property. It must be retained by the unit's maintenance personnel.*

This manual describes proper installation, operation, and maintenance procedures for water cooled systems. By carefully reviewing the information within this manual and following the instructions, the risk of improper operation and/or component damage will be minimized. It is important that periodic maintenance be performed to help assure trouble free operation. A maintenance schedule is provided at the end of this manual. Should equipment failure occur, contact a qualified service organization with qualified, experienced HVAC technicians to properly diagnose and repair this equipment.

This manual covers installation, operation, and maintenance of 20-110 tons Commercial Modular Self-Contained products with R-454B refrigerant.

R-454B Compressors

- Use crankcase heaters which must be energized 24 hours prior to compressor start.

  Note: *This unit is equipped with stator heating capabilities that eliminates the need for a crankcase heater on the variable speed compressor only. All fixed speeds must utilize a crankcase heater.*

- Contains POE oil which readily absorbs potentially damaging moisture from air.
- Control box includes a phase monitor to detect phase loss, line voltage imbalance, and reversal.

Modular Self-Contained Unit Components

Modular self-contained units are complete HVAC systems used in floor-by-floor applications.

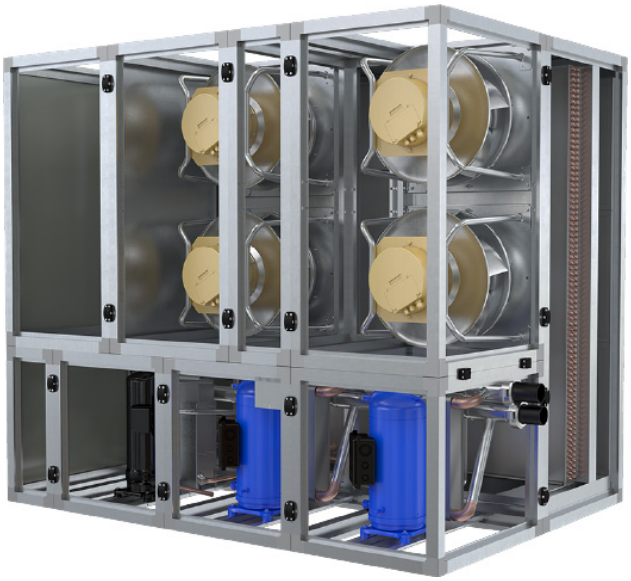
- A cassette design for easily transporting components into the building even in the most demanding environments.
- Left or right hand power connections.
- Left or right hand water connections.
- Factory installed options.

The hermetically sealed scroll compressor motors utilize internal motor protection and time delays to prevent excessive cycling.

Units utilize 1–4 refrigerant circuits and ship as cassettes with a small nitrogen charge and full oil charge. Each circuit includes filter drier, pressure relief valve, moisture indicating sight glass, thermostatic expansion valve with sensing bulb and externally equalized, and high pressure cutout. The water cooled condensers are brazed plate heat exchangers and are chemically cleanable with **Clean in Place** as option. Every unit comes with a 20 mesh cleanable screen that should be installed on the water inlet of the unit upstream of all condensers, and also come with differential pressure to indicate when screen should be cleaned.

Fan Array consists of 2–6 Direct Drive Plenum fans with each fan equipped with ECM motors.

Figure 1. Modular self-contained signature series unit components



Standard Controls

Standard controls supplied with the unit include the Symbio 500 unit controls and the TD-7 touch screen display. All basic setup parameters are preset from the factory.

TD-7 Touch Screen Display

The TD-7 is unit mounted and accessible without opening the unit's front panel. It allows easy setpoint adjustment using the TD-7 touch screen. In addition, the TD-7 displays all unit operating parameters and conditions in a backlit color screen.

For more information on TD-7 display, see the Tracer® TD-7 Display IOM, BAS-SVX50*-EN.

Symbio 500 Unit Controller

The Symbio 500 provides smart unit control with safety features and control relays for external devices. The Symbio 500 controller supports the following communication protocols for integration to either a Trane or non-Trane Building Automation System (BAS):

- BACnet® MS/TP
- BACnet IP (CM2 module required)
- BACnet over Zigbee (Air-Fi® Wireless)

Note: *When unit is selected with BACnet/IP option a Symbio CM2 is included to allow TD7 and BACnet/IP connections. If unit is selected as BACnet MS/TP or Air-Fi and BACnet/IP is required, a CM2 and additional configuration will be required to enable the second Ethernet port.*

The Modular Series self-contained unit is controlled by a microelectronic programmable control system that has been programmed from the factory specifically for the Modular Series self-contained application. If additional input or output points are needed, expansion modules can be used.

See the Owner's section of this manual for a detailed description of the controls points provided.

Optional Controls

Optional controls include a disconnect switch, dirty filter switch, water flow switch, supply air temperature reset, or external setpoint inputs. Morning warm-up operation is available on all units with heat installed or a heat interface ordered.

Note: *A water flow switch is required for the installation, either supplied from the factory or field-provided.*

The static pressure probe, supply air temperature reset sensor options ship separate, but with the unit for field installation. For more detailed information on the unit control options, see the Owner's section of this manual.

Note: *The disconnect switch can be provided by manufacturer or customer, but must be installed for operation.*

Unit Nameplate

The unit nameplate identifies the unit model number. It is located on the door of the starter panel. Marking to the equipment should continue to be visible and legible. Markings and signs that are illegible shall be corrected.

Model Number Description

Digit 1 — Unit Model

S = Self-Contained

Digit 2 — Unit Type

C = Commercial

Digit 3 — Condenser

W = Water-cooled

Digit 4 — Construction

M = Modular

Digit 5— Refrigerant

5 = R–454B

Digit 6, 7, 8 — Capacity

020 = 20 Tons
025 = 25 Tons
030 = 30 Tons
035 = 35 Tons
04M = 40 Tons Slim
040 = 40 Tons
04N = 40 Tons New York
050 = 50 Tons
060 = 60 Tons
06N = 60 Tons New York
06S = 60 Tons Split Coil
070 = 70 Tons
080 = 80 Tons
08N = 80 Tons New York
09 = 90 Tons
100 = 100 Tons
110 = 110 Tons

Digit 9 — Unit Voltage

F = 208–230/60/3
4 = 460/60/3

Digit 10, 11 — Design Sequence

**

Digit 12 — Number of Fans

1 = 1 Fan
2 = 2 Fans
3 = 3 Fans
4 = 4 Fans
5 = 5 Fans
6 = 6 Fans
7 = 7 Fans
8 = 8 Fans

Digit 13 — Compressor Technology

V = Variable Speed

Digit 14— Control Valves

0 = None
H = Head Pressure Control Valves

Digit 15 — Condenser Cleanable Options

0 = None

Digit 16 — Economizer

0 = No Economizer
W = With Water Side Economizer
H = 2-position damper ventilation interface
J = Airside economizer interface
K = Airside economizer interface with comparative enthalpy

Digit 17 — Water Connections

L = Left Hand Connections
R = Right Hand Connections

Digit 18 — Unit Water Connections

1 = Victaulic
2 = Pipe Connections

Digit 19 — Air Discharge

H = Horizontal Discharge
V = Vertical Discharge

Digit 20 — Electrical Connections

L = Left Hand Connections
R = Right Hand Connections

Digit 21 — Unit Electrical Connections

1 = Disconnect Switch
2 = Terminal Block

Digit 22 — Drain Pan

G = Galvanized Drain Pan
S = Stainless Steel Drain Pan

Digit 23 — For Future Use

0

Model Number Description

Digit 24 – Filter Type

A = 2 inch — MERV 8
B = 4 inch — MERV 8
C = 2 inch Pre MERV 8, 4 inch Post MERV 13
D = 2 inch 0 MERV 13
E = 2 inch — MERV 13

Digit 25 — Heater

0 = None
1 = Hydronic
4 = Hydronic Remote
5 = Electric Remote (3 Stage Max On/Off)
6 = Electric Remote SCR
7 = Gas Remote
8 = Steam Remote

Digit 26 — Shipping Method

M = Modular

Digit 27 — Unit Isolators

0 = None
A = Isopads

Digit 28 — Air Volume / Temperature Control

A = VAV Control Scheme (Fixed DA Temp)
B = VAV Control Scheme (Return Air Reset)
C = VAV Control Scheme (Space Temp Reset)
D = CV Control Scheme

Digit 29 — Agency Listing

0 = None
E = ETL listing

Digit 30 — Options

0 = None

Digit 31 — Space Sensor Options

0 = None
1 = Space Sensor Only

Digit 32 — For Future Use

0

Digit 33 — Industrial Options

0 = None
A = Protective Coating Evaporator Coil
B = Protective Coating Evap Coil + WSE

Digit 34 — Discharge Plenum

0 = None
S = Std plenum with field-cut holes

Digit 35 — For Future Use

0

Digit 36 — For Future Use

0

Digit 37 — Controller

3 = Symbio 500 — BAS Communication Option
4 = Symbio 500 — Air-Fi(R)
5 = Symbio 500 — BACnet/IP

Digit 38 — For Future Use

0

Digit 39 — Major Design Version

A = 1.0

Digit 40 — Design Special

0 = None
S = Design Special

General Data

Table 1. SCWM water-cooled self-contained, 20 to 50 tons

Tonnage	20 Ton	25 Ton	30 Ton	35 Ton	40 Ton	40 Ton NY	50 Ton
Compressor Data							
Quantity	2	2	2	2	2	3	3
Unit Capacity (MBH)	304	304	354	382	420	491	593
Circuits	2	2	2	2	2	3	3
Evaporator Coil Data							
Rows	4	4	4	4	4	4	4
Sq. Ft.	15.6	15.6	21.9	21.9	26.6	26.6	38.0
Fins/in	13	13	12	12	12	12	12
Number of Coils	1	1	1	1	1	1	1
Condenser Data							
Minimumum GPM w/o Econ[a]	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Minimum GPM w/ Econ	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maximum GPM	70	70	140	140	140	210	210
Evaporator Fan Data							
Quantity	2	2	2	2	3	3	3
Diameter	500 mm	500 mm	500 mm	500 mm	500 mm	500 mm	500 mm
Power consumption kW (208/280V)	11.3	11.3	11.3	11.3	11.3	11.3	11.3
Power consumption kW (460V)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Design cfm[b]	5500	6875	8250	9625	11000	11000	13750
Maximum Design cfm	8000	10000	12000	14000	16000	16000	20000
Refrigerant Charge, lbs. R-454B[c]							
Circuit A	14.5	14.5	14.5	14.5	14.5	14.5	14.5
Circuit B	14.5	14.5	14.5	14.5	14.5	14.5	14.5
Circuit C	x	x	x	x	x	14.5	14.5
Circuit D	x	x	x	x	x	x	x
Circuit E	x	x	x	x	x	x	x
Circuit F	x	x	x	x	x	x	x
Filter Data, Water-Cooled Units							
Number - Size (in.)	6 - 24"x 24"		6 - 24"x 24"		9 - 24"x 20"		12 - 24"x 20"
Number of Compressors							
14 Ton - Variable Speed	1	1	1	1	1	1	1
12.5 Ton - Fixed Speed	1	1	0	0	0	0	0
14.5 Ton - Fixed Speed	0	0	0	0	0	2	0
16 Ton - Fixed Speed	0	0	1	0	0	0	1
19 Ton - Fixed Speed	0	0	0	1	0	0	1

Table 1. SCWM water-cooled self-contained, 20 to 50 tons (continued)

Tonnage	20 Ton	25 Ton	30 Ton	35 Ton	40 Ton	40 Ton NY	50 Ton
23 Ton - Fixed Speed	0	0	0	0	1	0	0
16 Ton - Tandem Fixed Speed	0	0	0	0	0	0	0
18 Ton - Tandem Fixed Speed	0	0	0	0	0	0	0
Number of fans/unit							
No. of fans	2				3		

(a) All performance data is provided in the Performance Selection Program.
(b) Minimum air flow at part load is 35 percent of full load design CFM.
(c) Refrigerant charge shown is a general guideline, charge to sub-cooling as described in IOM. Note that occasionally a TXV adjustment may need to be made but only after adequate sub-cooling has been reached.

Table 2. SCWM water-cooled self-contained, 60 to 110 tons

Tonnage	60 Ton	60 Ton NY	60 Ton Split	70 Ton	80 Ton	80 Ton NY	90 Ton	100 Ton	110 Ton
Compressor Data									
Quantity	3	3	4	4	4	4	6	6	6
Unit Capacity (MBH)	674	674	691	847	897	847	1094	1201	1238
Circuits	3	3	4	4	4	4	6	6	6
Evaporator Coil Data									
Rows	4	4	4	4	4	4	4	4	4
Sq. Ft.	38.0	38.0	35.4	53.1	53.1	53.1	59.4	59.4	59.4
Fins/in	12	12	12	12	12	12	12	12	12
Number of Coils	1	1	2	2	2	2	2	2	2
Condenser Data									
Minimumum GPM w/o Econ(a)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Minimum GPM w/ Econ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maximum GPM	210	210	280	280	280	280	420	420	420
Evaporator Fan Data									
Quantity	4	4	4	5	5	5	8	8	8
Diameter	500 mm	500 mm	500 mm	500 mm	500 mm	500 mm	500 mm	500 mm	500 mm
Power consumption kW (208/280V)	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3
Power consumption kW (460V)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Design cfm(b)	16500	16500	16500	19250	22000	22000	24750	27500	30250
Maximum Design cfm	24000	24000	24000	28000	32000	32000	33750	35000	35750
Refrigerant Charge, lbs. R-454B(c)									
Circuit A	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
Circuit B	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
Circuit C	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
Circuit D	x	x	x	x	x	x	14.5	14.5	14.5
Circuit E	x	x	x	x	x	x	14.5	14.5	14.5
Circuit F	x	x	14.5	14.5	14.5	14.5	14.5	14.5	14.5

Table 2. SCWM water-cooled self-contained, 60 to 110 tons (continued)

Tonnage	60 Ton	60 Ton NY	60 Ton Split	70 Ton	80 Ton	80 Ton NY	90 Ton	100 Ton	110 Ton
Filter Data, Water-Cooled Units									
Number - Size (in.)	12 - 24"x 20"		12 - 24"x 24"	12 - 24"x 20"			18 - 24" x 20"		
Number of Compressors									
14 Ton - Variable Speed	1	1	1	1	1	1	1	1	1
12.5 Ton - Fixed Speed	0	0	0	0	0	0	0	0	0
14.5 Ton - Fixed Speed	0	0	2	0	0	0	2	0	0
16 Ton - Fixed Speed	0	0	0	0	0	0	2	2	0
19 Ton - Fixed Speed	0	2	0	2	0	2	0	2	4
23 Ton - Fixed Speed	2	0	0	0	2	0	0	0	0
16 Ton - Tandem Fixed Speed	0	0	1	0	0	0	1	0	0
18 Ton - Tandem Fixed Speed	0	0	0	1	1	1	0	1	1
Number of fans/unit									
No. of fans	4			5			8	8	

(a) All performance data is provided in the Performance Selection Program.
(b) Minimum air flow at part load is 35 percent of full load design CFM.
(c) Refrigerant charge shown is a general guideline, charge to sub-cooling as described in IOM. Note that occasionally a TXV adjustment may need to be made but only after adequate sub-cooling has been reached.

Table 3. SCWM EER/IEER ratings

Tonnage	Model Number		Nameplate Voltage	EER	IEER (VAV)	AHRI Net Cooling Capacity (MBH)
20	SCWM5020F		208-230/60/3	15.2	20.5	304
	SCWM50204		460/60/3	15.2	20.5	304
25	SCWM5025F		208-230/60/3	15.2	20.5	304
	SCWM50254		460/60/3	15.2	20.5	304
30	SCWM5030F		208-230/60/3	15.4	19.7	354
	SCWM50304		460/60/3	15.4	19.7	354
35	SCWM5035F		208-230/60/3	14.9	19.7	382
	SCWM50354		460/60/3	14.9	19.7	382
40	SCWM5040F		208-230/60/3	15.0	19.7	420
	SCWM504MF	Slim	208-230/60/3	15.0	19.7	420
	SCWM504NF	NY	208-230/60/3	15.9	19.7	491
	SCWM50404		460/60/3	15.0	19.7	420
	SCWM504M4	Slim	460/60/3	15.0	19.7	420
	SCWM504N4	NY	460/60/3	15.9	19.7	491
50	SCWM5050F		208-230/60/3	15.8	18.6	593
	SCWM50504		460/60/3	15.8	18.6	593

Table 3. SCWM EER/IEER ratings (continued)

Tonnage	Model Number		Nameplate Voltage	EER	IEER (VAV)	AHRI Net Cooling Capacity (MBH)
60	SCWM5060F		208-230/60/3	14.6	18.6	674
	SCWM506SF	Split	208-230/60/3	15.3	19.7	674
	SCWM506NF	NY	208-230/60/3	14.6	18.6	674
	SCWM50604		460/60/3	14.6	18.6	674
	SCWM506S4	Split	460/60/3	15.3	19.7	674
	SCWM506N4	NY	460/60/3	14.6	18.6	674
70	SCWM5070F		208-230/60/3	15.7	20.4	847
	SCWM50704		460/60/3	15.7	20.4	847
80	SCWM5080F		208-230/60/3	14.7	20.4	897
	SCWM508NF	NY	208-230/60/3	14.7	20.4	897
	SCWM50804		460/60/3	14.7	20.4	897
	SCWM508N4	NY	460/60/3	14.7	20.4	897
90	SCWM5090F		208-230/60/3	15.6	19.8	1094
	SCWM50904		460/60/3	15.6	19.8	1094
100	SCWM5100F		208-230/60/3	15.2	19.8	1201
	SCWM51004		460/60/3	15.2	19.8	1201
110	SCWMN5110F		208-230/60/3	15.1	19.8	1238
	SCWM51104		460/60/3	15.1	19.8	1238

Notes:

1. Cooling only.
2. Cooling performance is rated at 80F EDB/67F EWB with 85 EWT for water-cooled performance.
3. EER, IEER, and AHRI Net Cooling Capacity are tested in accordance with the AHRI 340/360 (I-P) and certified to 10 CFR Part 431 from the US Department of Energy.

Table 4. SCWM water volumes

Tonnage	Water Volume in U.S. Gallons/Liters			
	w/o Economizer		With Chem. Cleanable Econ, Add	
	Gallons	Liters	Gallons	Liters
20	6.4	24.2	11.6	43.9
25	6.4	24.2	11.6	43.9
30	6.4	24.2	13.5	51.1
35	6.4	24.2	13.5	51.1
40	6.4	24.2	15.6	59.1
40NY	9.7	36.7	18.9	71.5
50	9.7	36.7	22.0	83.3
60/60 NY	9.7	36.7	22.0	83.3
60 Split	12.9	48.9	26.7	101.1
70	12.9	48.9	31.3	118.5
80/80 NY	12.9	48.9	31.3	118.5
90	19.5	73.8	39.5	149.5

Table 4. SCWM water volumes (continued)

Tonnage	Water Volume in U.S. Gallons/Liters			
	w/o Economizer		With Chem. Cleanable Econ, Add	
	Gallons	Liters	Gallons	Liters
100	19.5	73.8	39.5	149.5
110	19.5	73.8	39.5	149.5

Table 5. SCWM refrigerant circuits, number of compressors by circuit

Tonnage	Model No.	Circuit					
		A	B	C	D	E	F
20	SCWM5020	14T VS	12.5T FS	N/A	N/A	N/A	N/A
25	SCWM5025	14T VS	12.5T FS	N/A	N/A	N/A	N/A
30	SCWM5030	14T VS	16T FS	N/A	N/A	N/A	N/A
35	SCWM5035	14T VS	19T FS	N/A	N/A	N/A	N/A
40	SCWM5040	14T VS	23T FS	N/A	N/A	N/A	N/A
40 Slim	SCWM504M	14T VS	23T FS	N/A	N/A	N/A	N/A
40 NY	SCWM504N	14T VS	14.5T FS	14.5T FS	N/A	N/A	N/A
50	SCWM5050	14T VS	19T FS	16T FS	N/A	N/A	N/A
60	SCWM5060	14T VS	23T FS	23T FS	N/A	N/A	N/A
60 Split	SCWM506S	14T VS	14.5T FS	14.5T FS	N/A	N/A	16T FST
60 NY	SCWM506N	14T VS	19T FS	19T FS	N/A	N/A	N/A
70	SCWM5070	14T VS	19T FS	19T FS	N/A	N/A	18T FST
80	SCWM5080	14T VS	23T FS	23T FS	N/A	N/A	18T FST
80 NY	SCWM508N	14T VS	19T FS	19T FS	N/A	N/A	18T FST
90	SCWM5090	14T VS	16T FS	16T FS	14.5T FS	14.5T FS	16T FST
100	SCWM5100	14T VS	19T FS	19T FS	16T FS	16T FS	18T FST
110	SCWM5110	14T VS	19T FS	19T FS	19T FS	19T FS	18T FST

Note: VS - Variable Speed Compressor, FS - Fixed Speed Compressor, FST -Fixed Speed Tandem

Table 6. Waterside economizer coil physical data

Model	Tonnage	Rows	FPF	Height	Length
MSC	20	4	120	75	30
MSC	25	4	120	75	30
MSC	30	4	120	75	42
MSC	35	4	120	75	42
MSC	40	4	120	75	51
MSC	50	4	120	75	73
MSC	60	4	120	75	73
MSC[a]	60 Split	4	120	75	34
MSC[a]	70	4	120	75	51
MSC[a]	80	4	120	75	51
MSC[a]	90	4	144	75	57

Table 6. Waterside economizer coil physical data (continued)

Model	Tonnage	Rows	FPF	Height	Length
MSC[a]	100	4	144	75	57
MSC[a]	110	4	144	75	57

[a] Split coils

Table 7. Hot water coil physical data

Model	Tonnage	Rows	FPF	Height	Length
MSC	20	2	120	75	30
MSC	25	2	120	75	30
MSC	30	2	120	75	42
MSC	35	2	120	75	42
MSC	40	2	120	75	51
MSC	50	2	120	75	73
MSC	60	2	120	75	73
MSC[a]	60 Split	2	120	75	34
MSC[a]	70	2	120	75	51
MSC[a]	80	2	120	75	51
MSC[a]	90	2	120	75	57
MSC[a]	100	2	120	75	57
MSC[a]	110	2	120	75	57

[a] Spit coils

Important: *All performance data is provided in the Performance Selection Program. Contact your local Trane Sales office for more information.*

Pre-Installation

Receiving

Receiving Checklist

Complete the following checklist immediately after receiving unit shipment to detect possible shipping damage:

- Inspect individual cartons before accepting. Check for rattles, bent carton corners, or other visible indications of shipping damage.
- If a unit appears damaged, inspect it immediately before accepting the shipment. Make specific notations concerning the damage on the freight bill. Do not refuse delivery.
- Inspect the unit for concealed damage before it is stored and as soon as possible after delivery. Report concealed damage to the freight line within the allotted time after delivery. Check with the carrier for their allotted time to submit a claim.
- Do not move damaged material from the receiving location. It is the receiver's responsibility to provide reasonable evidence that concealed damage did not occur after delivery.
- Do not continue unpacking the shipment if it appears damaged. Retain all internal packing, cartons, and crate. Take photos of damaged material if possible.
- Notify the carrier of the damage immediately by phone and mail. Request an immediate joint inspection of the damage by the carrier and consignee.

  Note: *Notify your Trane representative of the damage and arrange for repair. Have the carrier inspect the damage before making any repairs to the unit.*

Ship-Separate Accessories

Field installed components ship separately inside cassette labeled **Ship-With Components** or on individual pallet.

Contractor Installation Responsibilities

Complete the following checklist before beginning final unit installation:

- Verify the unit size and tagging with the unit nameplate.
- Make certain the floor or foundation is level, solid, and sufficient to support the unit and accessory weights. Level or repair the floor before positioning the unit if necessary.
- Allow minimum recommended clearances for routine maintenance and service. Allow space at end of the unit for servicing. Refer to the unit submittals for dimensions. See also the "Service Clearances," p. 27 section in the ",".
- Electrical connection knockouts are on the top, of the starter panel.
- Allow adequate space for piping access and panel removal. Locate and properly identify condenser water piping, refrigerant piping, and condensate drain connections depending upon your application.

  Note: *Unit height and connection locations will change if using vibration isolators.*
- Electrical supply power must meet specific balance and voltage requirements as described in chapter " Installation - Mechanical".
- The installer is responsible for providing a condenser main, standby water pump, cooling tower, pressure gauges, and all components for waterside piping.

Unit Inspection

To protect against loss due to damage incurred in transit, perform inspection immediately upon receipt of the unit.

Exterior Inspection

If the job site inspection reveals damage or material shortages, file a claim with the carrier immediately. Specify the type and extent of the damage on the bill of lading before signing. Notify the appropriate sales representative.

Important: *Do not proceed with installation of a damaged unit without sales representative's approval.*

- Visually inspect the complete exterior for signs of shipping damages to unit or packing material.
- Verify the nameplate data matches the sales order and bill of lading.
- Verify the unit is properly equipped and there are no material shortages.
- Verify the power supply complies with the unit nameplate specifications.

Inspection for Concealed Damage

Visually inspect the components for concealed damage as soon as possible after delivery and before it is stored.

If concealed damage is discovered:

- Notify the carrier's terminal of the damage immediately by phone and by mail.
- Concealed damage must be reported within 15 days.
- Request an immediate, joint inspection of the damage with the carrier and consignee.
- Stop unpacking the unit.
- Do not remove damaged material from receiving location.
- Take photos of the damage, if possible.
- The owner must provide reasonable evidence that the damage did not occur after delivery.

Repair

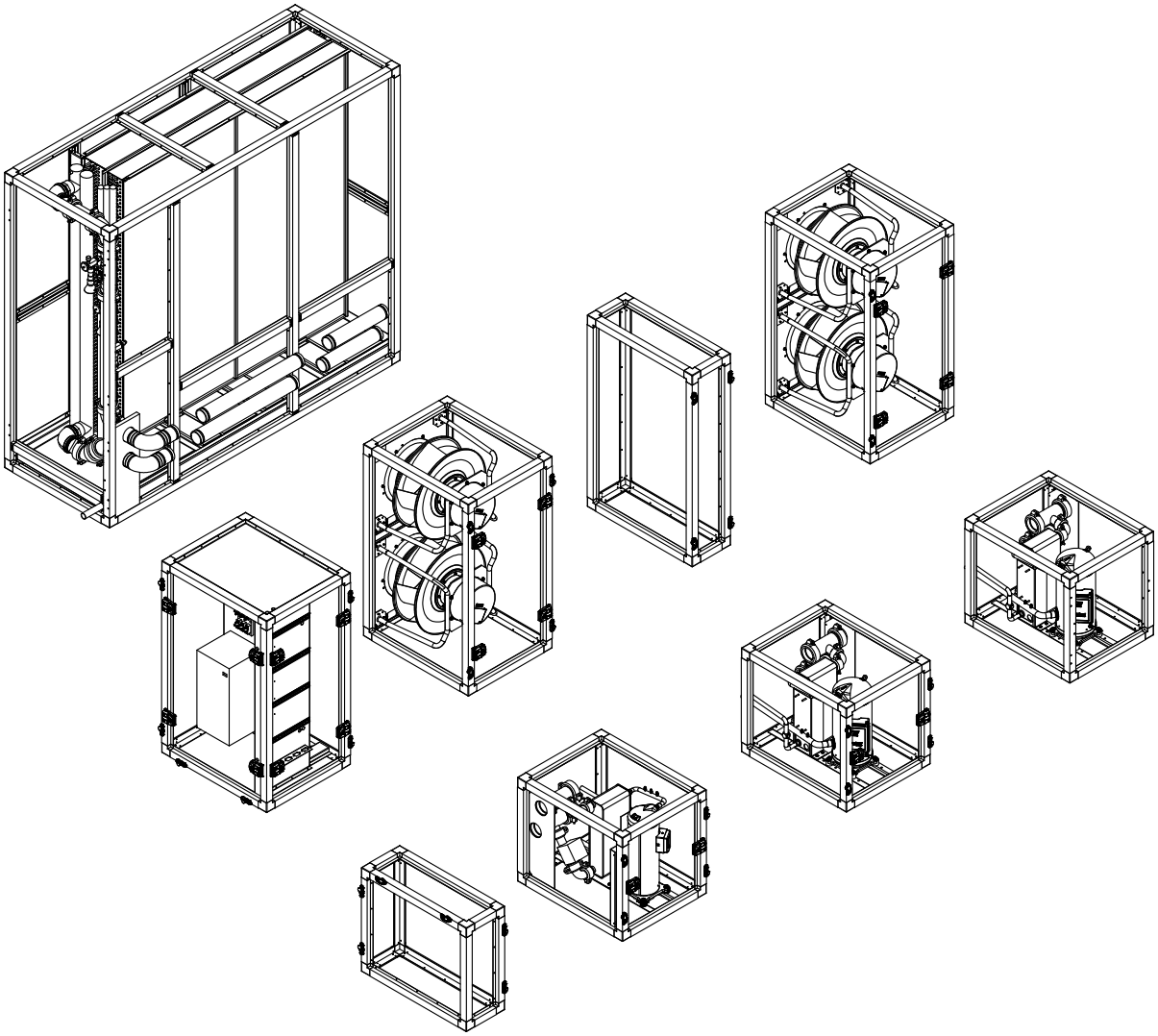
Notify the appropriate sales representative before arranging unit installation or repair.

Important: *Do not repair unit until the damage has been inspected by the carrier's representative.*

Unpacking

Modular Self-Contained units ship dis-assembled. Figure 2, p. 18 illustrates a typical shipping package.

Figure 2. Typical unit shipping package



Dimensional Data

Figure 3. Unit dimensions (in inches)

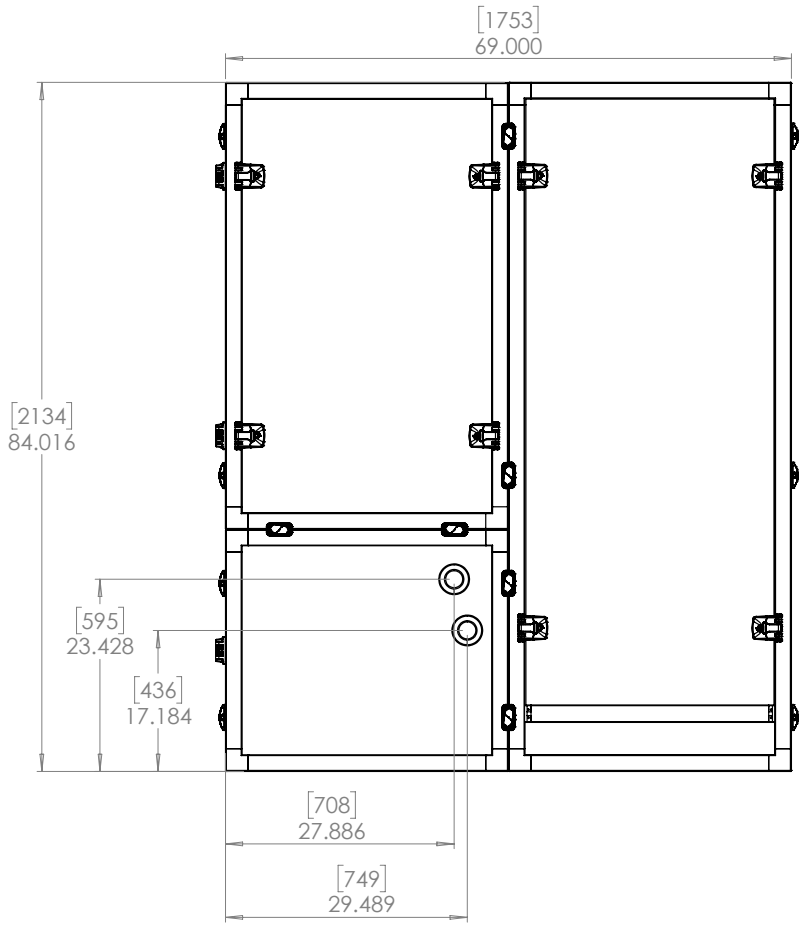
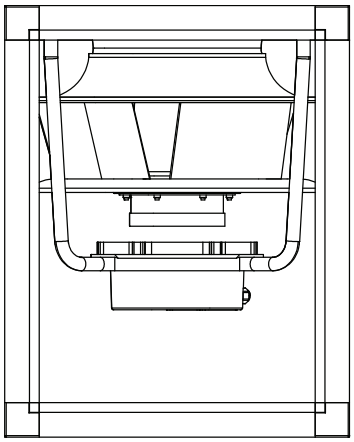


Table 8. Unit dimensions (in inches)

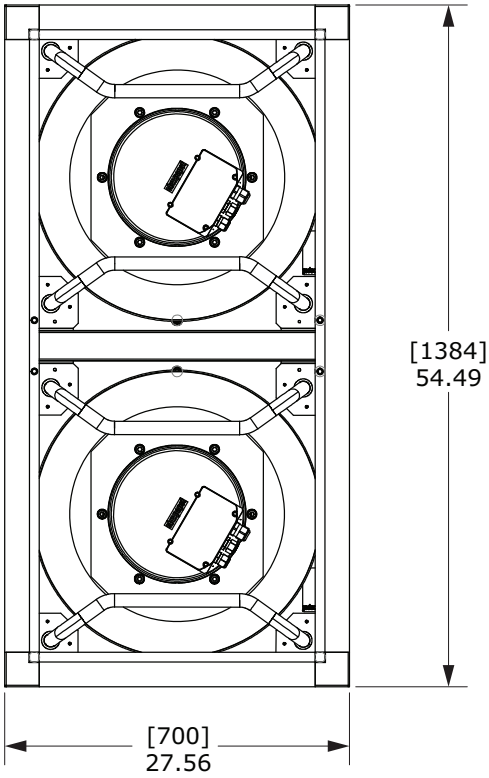
Model	Width	Height	Depth
020	55.2	84	69
025	55.2	84	69
030	67.7	84	69
035	67.7	84	69
40M	82.7	84	69
040/40N	95.5	84	69
050	95.5	84	69
060/60N	95.5	84	69
06S	99.3	84	69
070	127	84	69
080/08N	127	84	69
090	140	84	69
100	140	84	69
110	140	84	69

Note: Does not include condensate drain connection. Add an additional 1.5 inch to width to account for drain connection.

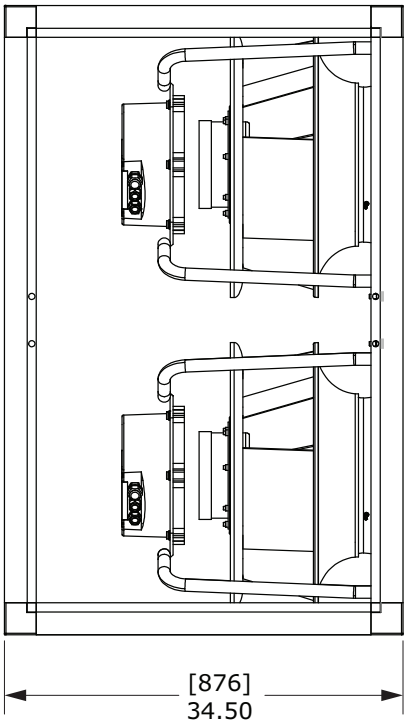
Figure 4. Fan assembly footprint (in mm/inches)



TOP VIEW



FRONT VIEW



SIDE VIEW

Figure 5. Variable speed compressor assembly footprint (in mm/inches)

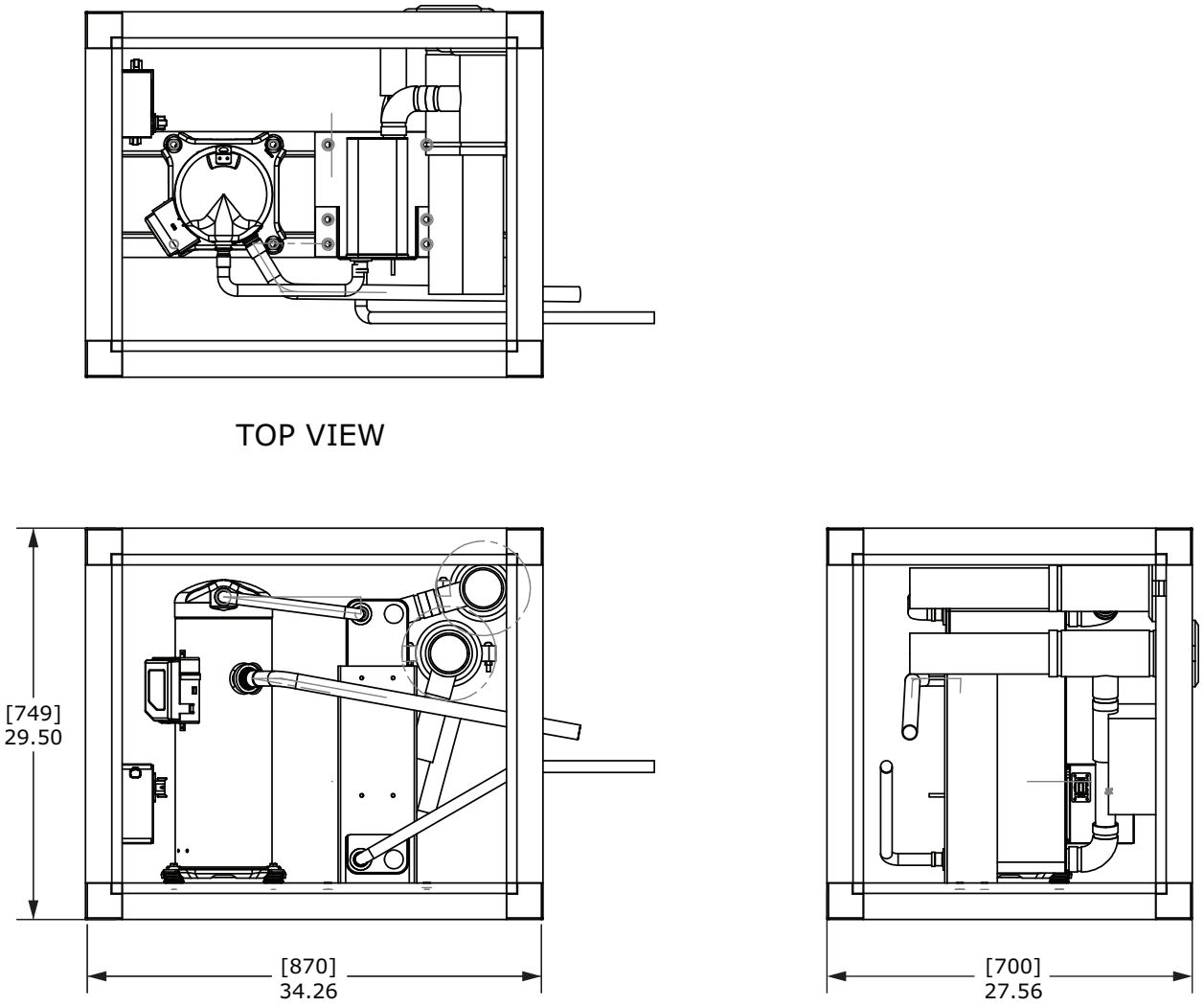


Figure 6. 20–80T starter cassette assembly footprint (in inches)

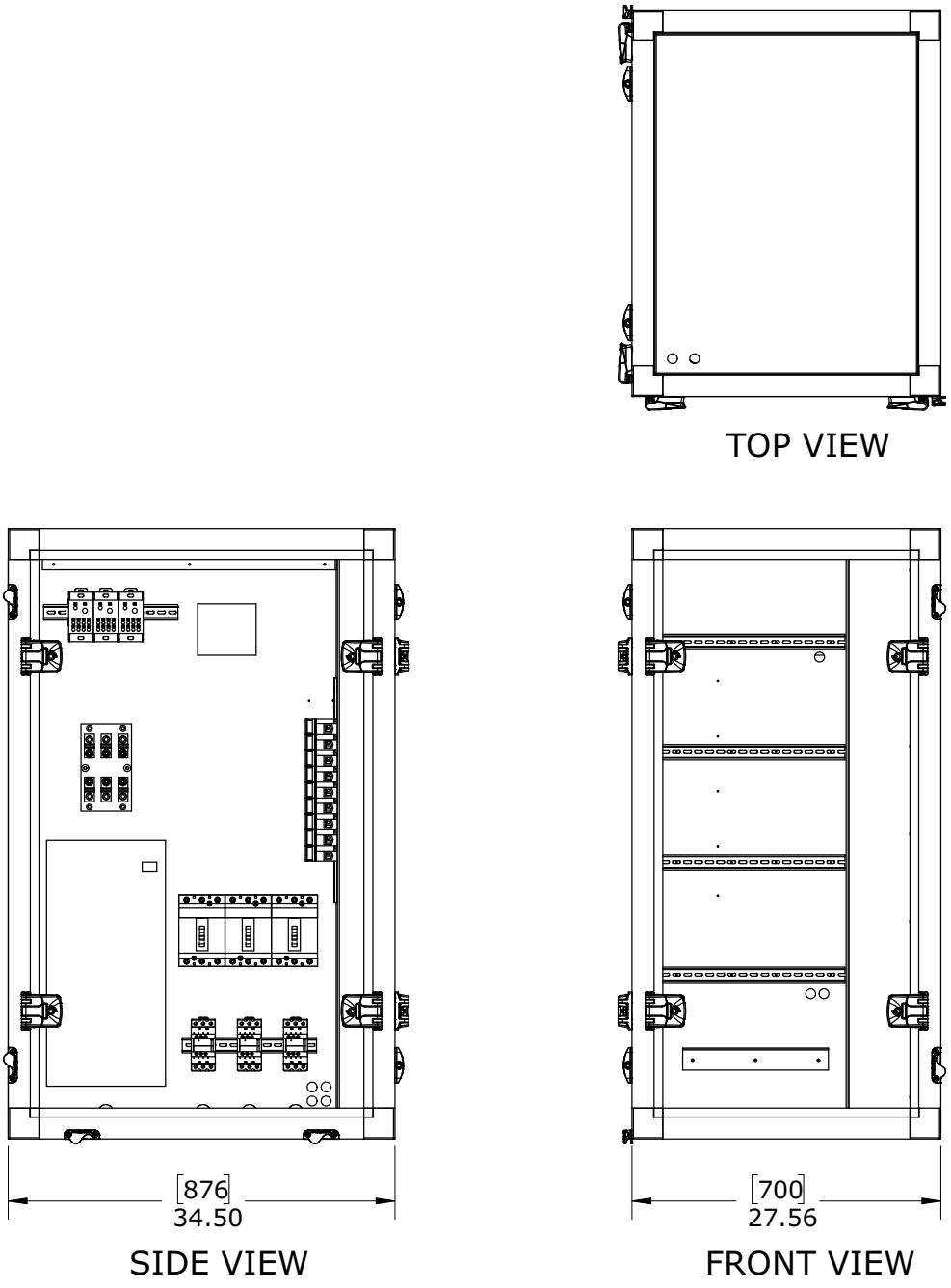
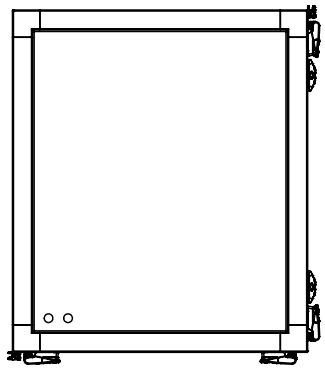
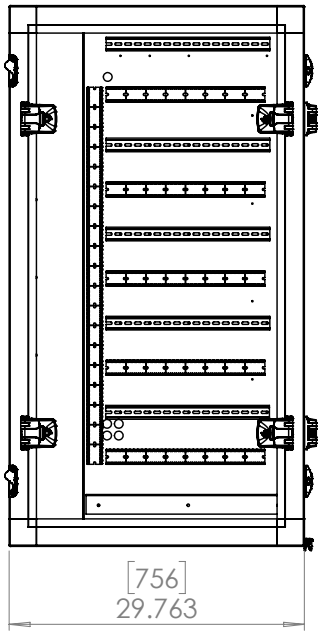


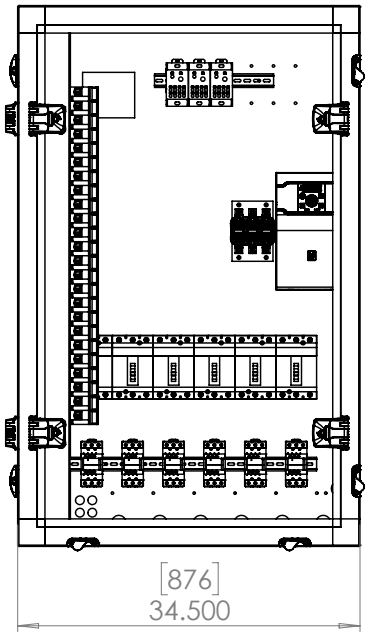
Figure 7. 100T starter cassette assembly footprint (in inches)



TOP VIEW



FRONT VIEW



SIDE VIEW

Dimensional Data

Figure 8. Evaporator cassette assembly footprint (in inches)

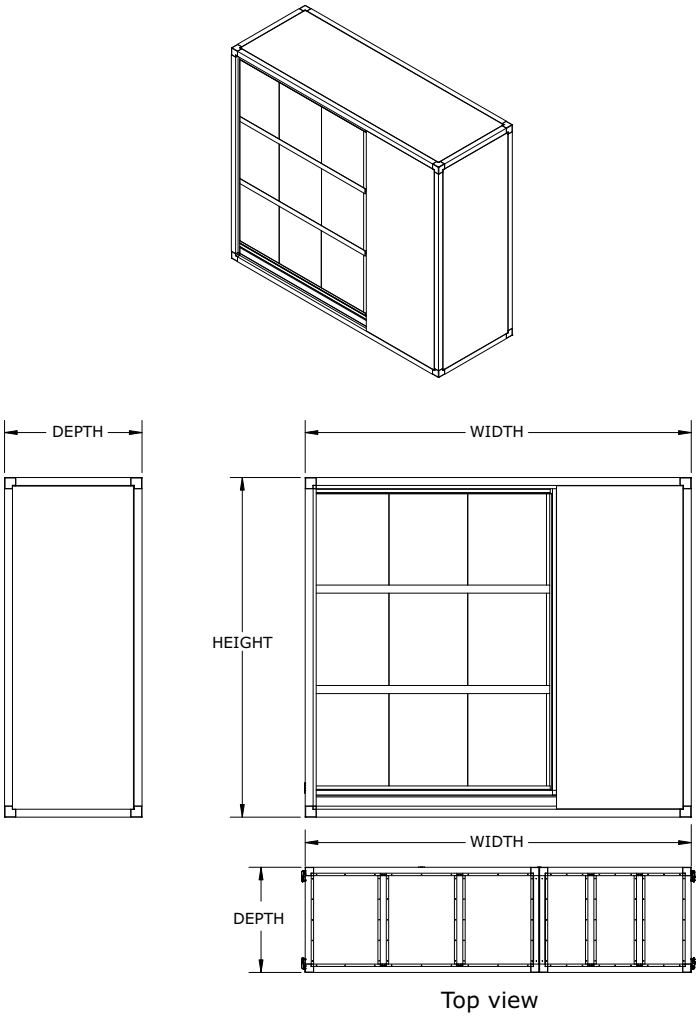


Table 9. Evaporator cassette dimensions (in inches)

Model	Width	Height	Depth
020	55.2	84	34.5
025	55.2	84	34.5
030	67.7	84	34.5
035	67.7	84	34.5
40M	63.7	84	34.5
040/40N	95.5	84	34.5
050	95.5	84	34.5
060/60N	95.5	84	34.5
06S[a]	49.7	84	34.5
070[a]	63.5	84	34.5
080/08N[a]	63.5	84	34.5
090[a]	70	84	34.5
100[a]	70	84	34.5

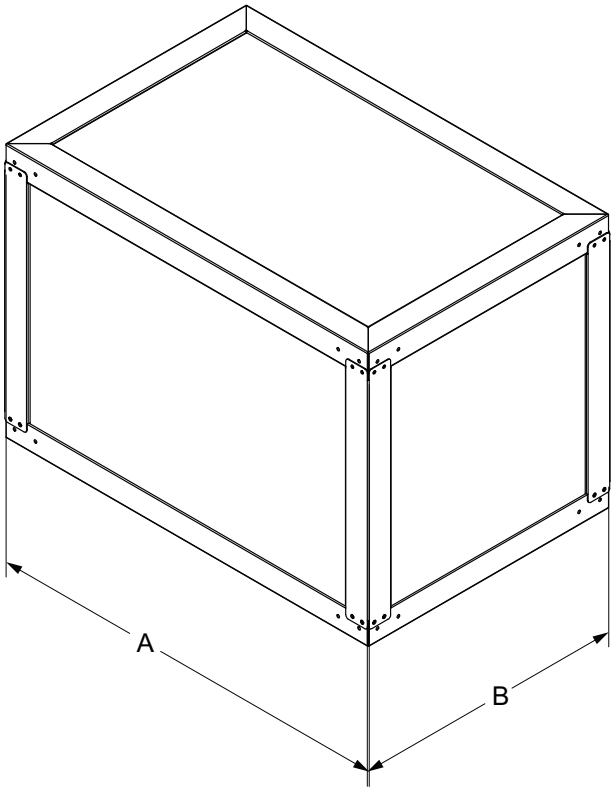
Table 9. Evaporator cassette dimensions (in inches) (continued)

110[a]	70	84	34.5

Note: Does not include condensate drain connection. Add an additional 1.5 inch to width to account for drain connection.

[a] Split coils

Figure 9. Standard plenum (option)



Note: *Custom height plenums available upon request.*

Figure 10. Discharge opening for 30 and 35 ton

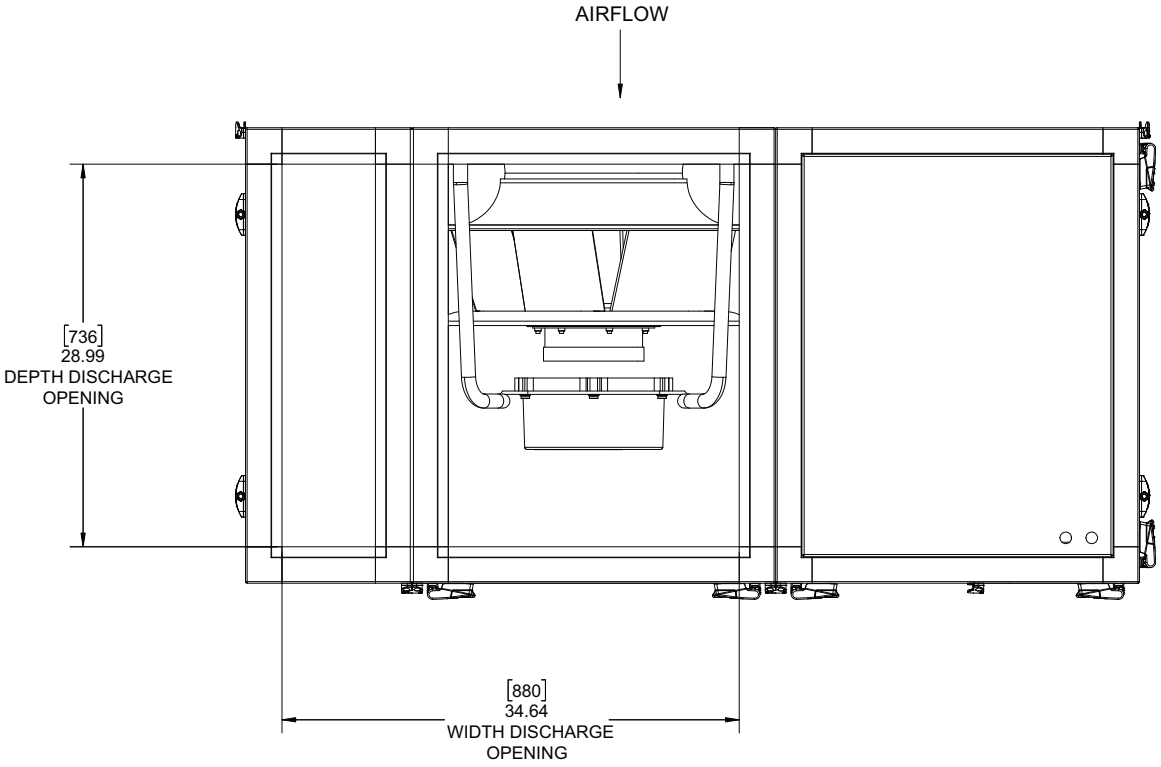


Figure 11. Discharge opening for 40 to 60 ton

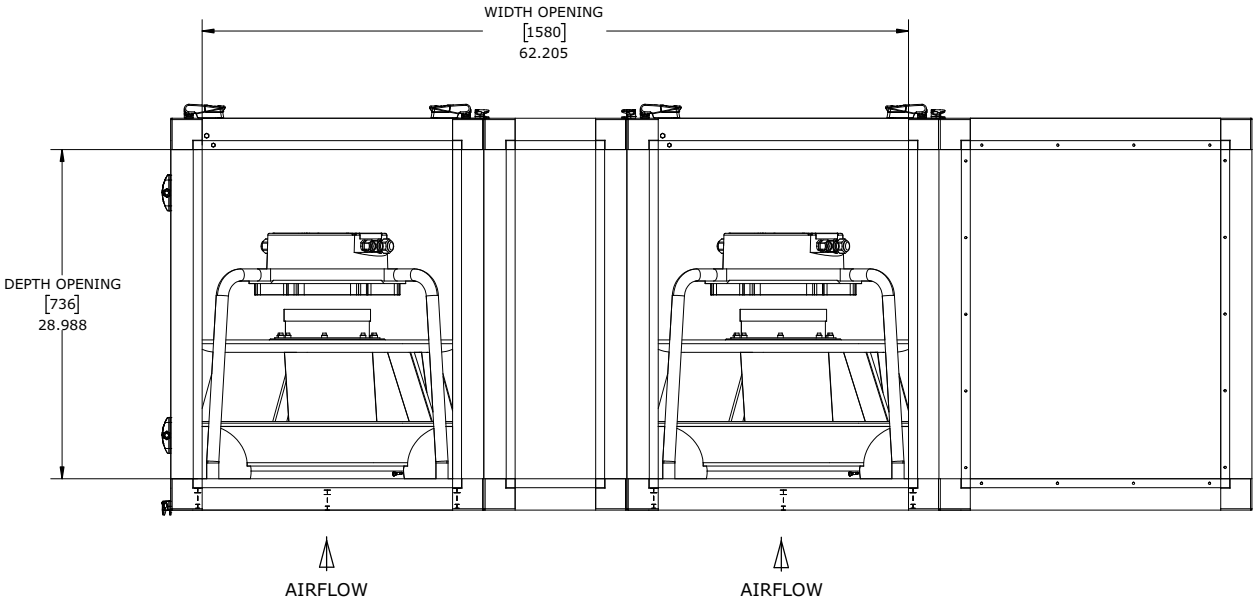


Figure 12. Discharge opening for 70 to 80 ton

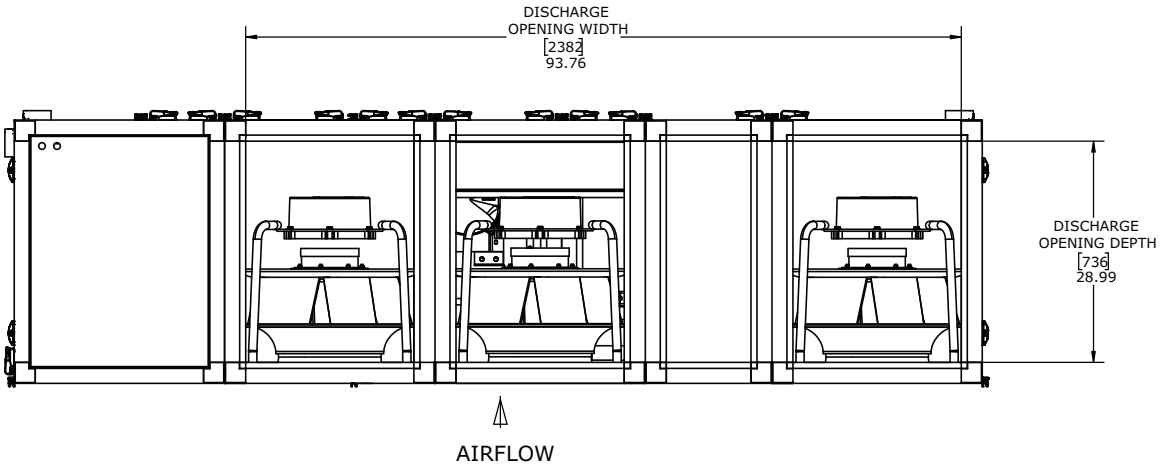
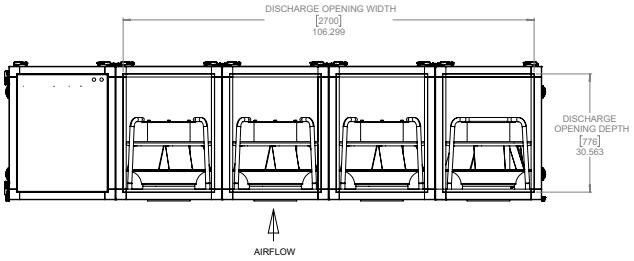


Figure 13. Discharge opening for 90 to 110 ton



Service Clearances

Table 10. Service/code clearance requirements

Side		Distance - in. (mm)	Purpose
Front		42 (1066)	Fans, Compressors, Condensers, Refrigeration access
Left	Left Hand Starter	42 (1066)	NEC Code Requirement (Starter Panel)
	Right Hand Starter	9 (229)	
Right	Left Hand Starter	9 (229)	NEC Code Requirement (Starter Panel)
	Right Hand Starter	42 (1066)	
Inlet		18 (457)	Provides uniform air flow

Weights

Table 11. Unit weights

Tonnage	Overall Dimensions (in)	Base Weight		Waterside Economizer (Dry Weight)	
		(lbs)	(kg)	(lbs)	(kg)
20	70" x 84" x 56"	1776	805	191	87
25	70" x 84" x 56"	1776	805	191	87
30	70" x 84" x 68"	2208	1002	244	111
35	70" x 84" x 68"	2208	1002	244	111
40	70"x 84" x 95.5"	2719	1233	289	131
40 Slim	70"x 84" x 82.7"	2562	1162	289	131
50	70"x 84" x 95.5"	3276	1486	397	180
60	70"x 84" x 95.5"	3384	1535	397	180
60 Split	70"x 84" x 99.3"	3790	1719	438	199
70	70"x 84" x 126"	4646	2107	578	262
80	70"x 84" x 126"	4646	2107	578	262
90	70"x 84" x 140"	5416	2457	672	305
100	70"x 84" x 140"	5416	2457	672	305
110	70"x 84" x 140"	5416	2457	672	305

Table 12. Unit shipping weights (fan cassette)

Tonnage	Fan Cassette Dimensions (in)	Number of Dual	Fan Weight (Two Fans)	Number of Single	Fan Weight (Single Fan)	Total Fan Weight (lbs)
20	34.5"x 54.5"x 27.6"	1	408	-	-	308
25	34.5"x 54.5"x 27.6"	1	408	-	-	308
30	34.5"x 54.5"x 27.6"	1	408	-	-	408
35	34.5"x 54.5"x 27.6"	1	408	-	-	408
40	34.5"x 54.5"x 27.6"	1	408	1	308	716
50	34.5"x 54.5"x 27.6"	1	408	1	308	716
60	34.5"x 54.5"x 27.6"	2	408	-	-	816
60 Split	34.5"x 54.5"x 27.6"	2	408	-	-	816
70	34.5"x 54.5"x 27.6"	2	408	1	308	1124
80	34.5"x 54.5"x 27.6"	2	408	1	308	1124
90	34.5"x 54.5"x 27.6"	3	408	-	-	1224
100	34.5"x 54.5"x 27.6"	3	408	-	-	1224
110	34.5"x 54.5"x 27.6"	3	408	-	-	1224

Table 13. Unit shipping weights (compressor cassette)

Compressor Cassette (Tonnage, Variable or Fixed)	Compressor Cassette Dimensions (in)	Compressor Cassette Weight (lbs)
14T VS	34.5"x 29.5"x 27.6"	325
12.5T FS	34.5"x 29.5"x 27.6"	352

Table 13. Unit shipping weights (compressor cassette) (continued)

Compressor Cassette (Tonnage, Variable or Fixed)	Compressor Cassette Dimensions (in)	Compressor Cassette Weight (lbs)
14.5T FS	34.5"x 29.5"x 27.6"	382
16T FS	34.5"x 29.5"x 27.6"	385
19T FS	34.5"x 29.5"x 27.6"	385
23T FS	34.5"x 29.5"x 27.6"	439
Dual 14.5T FS (B & C)	34.5"x 29.5"x 44"	635
Dual 14.5T FS (D & E)	34.5"x 29.5"x 42.5"	670
Dual 16T FS	34.5"x 29.5"x 42.5"	670
Dual 19T FS	34.5"x 29.5"x 42.5"	670
8/8T Tandem FS	34.5"x 29.5"x 27.6"	400
9/9T Tandem FS	34.5"x 29.5"x 27.6"	400

Table 14. Unit shipping weights (starter cassette)

Tonnage	Starter Cassette Dimensions (in)	Starter Cassette Weight (lbs)
20	34.5"x 54.5"x 27.6"	323
25	34.5"x 54.5"x 27.6"	323
30	34.5"x 54.5"x 27.6"	323
35	34.5"x 54.5"x 27.6"	323
40	34.5"x 54.5"x 27.6"	323
50	34.5"x 54.5"x 27.6"	323
60	34.5"x 54.5"x 27.6"	323
60 Split	34.5"x 54.5"x 27.6"	323
70	34.5"x 54.5"x 27.6"	323
80	34.5"x 54.5"x 27.6"	323
90	34.5"x 54.5"x 29.75"	340
100	34.5"x 54.5"x 29.75"	340
110	34.5"x 54.5"x 29.75"	340

Table 15. Unit shipping weights (evaporator cassette)

Tonnage	Evaporator Cassette Dimensions (in)	Total Weight of Cassette (lbs) (excl. Economizer)
20	34.5" x 84" x 55.2"	468
25	34.5" x 84" x 55.2"	468
30	34.5" x 84" x 68"	610
35	34.5" x 84" x 68"	610
40 Slim	34.5" x 84" x 82.7"	707
40	34.5" x 84" x 95.5"	707
50	34.5" x 84" x 95.5"	985
60	34.5" x 84" x 95.5"	985
60 Split[(a)]	34.5" x 84" x 49.7"	520
70[(a)]	34.5" x 84" x 63.5"	707
80[(a)]	34.5" x 84" x 63.5"	707

Table 15. Unit shipping weights (evaporator cassette) (continued)

Tonnage	Evaporator Cassette Dimensions (in)	Total Weight of Cassette (lbs) (excl. Economizer)
90[a]	34.5" x 84" x 70"	776
100[a]	34.5" x 84" x 70"	776
110[a]	34.5" x 84" x 70"	776

[a] Split coils

A2L Information

A2L Work Procedures

⚠ WARNING

Risk of Fire — Flammable Refrigerant!

Failure to follow instructions below could result in death or serious injury, and equipment damage.

- **To be repaired only by trained service personnel.**
- **Do not puncture refrigerant tubing.**
- **Dispose of properly in accordance with federal or local regulations.**
- **The equipment shall be stored in a room without continuously operating ignition sources.**

⚠ 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.

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

The units described in this manual use R-454B refrigerant. Use ONLY R-454B rated service equipment or components with these units. For specific handling concerns with R-454B, contact your local Trane representative.

Installation, repair, removal, or disposal should be performed by trained service personnel.

At all times, Trane's maintenance and service guidelines shall be followed. If in doubt, contact Trane technical support for assistance.

Installation / Code Compliance

Verify the equipment refrigerant charge is in accordance with the room area limitation as described in Minimum Room Area Limits section. Ensure that there are labels on the equipment stating it contains a flammable refrigerant.

Servicing

Prior to initiating work on equipment, check the area with an appropriate refrigerant detector. Ensure the service personnel are properly trained regarding work in potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed, or intrinsically safe. Be aware that the refrigerant does not contain an odor.

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available on hand. A dry powder or CO_2 fire extinguisher should be located adjacent to the charging area.

At all times, Trane's maintenance and service guidelines shall be followed. If in doubt, contact Trane technical support for assistance.

All maintenance staff and others working in the local area shall be instructed on the nature of the work being carried out. Work in confined spaces shall be avoided.

Ignition Source Mitigation

Do not use any sources of ignition when working on the refrigeration system.

Keep all ignition sources, including cigarette smoking, away from the site of installation, repair, removal or disposal, during which refrigerant can potentially be released to the surrounding space.

Survey the area around the equipment before initiating work to ensure no flammable hazards or ignition risks are present.

"No Smoking" signs shall be displayed.

Do not use devices that can be a source of ignition to accelerate defrosting of components. Use only defrost and cleaning procedures recommended by Trane. Do not pierce or burn.

Ventilation

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere. If present, check that the ventilation system, including outlets, are operating adequately and are not obstructed.

Refrigerating Equipment

Refrigerant piping or components should not be installed in locations where substances which may corrode them are present.

Check that equipment hazard markings are visible and legible. Replace them if they are not.

For equipment using secondary fluids, like water or glycol, check that refrigerant is not present in the secondary fluid loop before conducting any hot work.

Electrical Devices

Do not apply power to the circuit if a fault exists which compromises safety. If the fault cannot be corrected immediately, but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so all parties are advised.

Initial safety checks shall include:

- Cabling is not subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. Account for the effects of aging or continual vibration from sources such as compressors or fans.
- Capacitors are discharged. This shall be done in a safe manner to avoid possibility of sparking.
- No live electrical components and wiring are exposed while charging, recovering, or purging the system.
- Verify continuity of earth bonding.
- Replace electrical components with Trane replacement parts, or those meeting the same ratings and qualified for flame arrest protection, UL LZGH2 category.

Leak Detection

Never use an open flame to detect leaks. A halide torch should not be used. Use only approved leak detection methods per this instruction manual.

The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Verify the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL gas (25% maximum) is confirmed.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

Examples of leak detection fluids are:

- Bubble method
- Fluorescent method agents

If a leak is suspected, all naked flames shall be removed/ extinguished.

If a refrigerant leak is found which requires brazing, all refrigerant shall be recovered from the system, or isolated (by means of shut-off valves) in a part of the system remote from the leak.

Refrigerant Removal and Evacuation

Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (special cylinders for the recovery of refrigerant, for example). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration.

The following procedure shall be adhered to:

1. Safely remove refrigerant following local and national regulations.
2. Evacuate.
3. Purge the circuit with inert gas.
4. Evacuate (optional for A2L).
5. Continuously flush or purge with inert gas when using flame to open circuit.
6. Open the circuit.

Prior to refrigerant removal, open all appropriate valves, including solenoid and electronic expansion valves (EXVs). Use control settings, where available. When not available, manually open all electronically controlled valves using acceptable service procedures.

The recovery equipment shall be in good working order with instructions available. Equipment shall be suitable for the recovery of the flammable refrigerant. For specific handling concerns, contact the manufacturer. Ensure all hose connections are checked for tightness to avoid refrigerant leaks.

In addition, a set of calibrated weighing scales shall be available and in good working order.

The refrigerant shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. Do not mix refrigerants in recovery unit and especially not in cylinders.

Refrigerant recovery unit should be purged with an inert gas after each use or before using with a different refrigerant Class – for example, A2L to A1.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

The system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times.

Compressed air or oxygen shall not be used for purging refrigerant systems.

The system shall be vented down to atmospheric pressure to enable work to take place.

The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Refrigerant Charging

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Prior to refrigerant charging, open all appropriate valves, including solenoid and electronic expansion valves (EXVs). Use control settings, where available. When not available, manually open all electronically controlled valves using acceptable service procedures.

Verify the equipment refrigerant charge is in accordance with the room area limitation as described in Minimum Room Area Limits section.

Decommissioning

Before carrying out the decommissioning procedure, it is essential that the trained service personnel is completely familiar with the equipment and all its details. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate system electrically.
3. Before attempting the procedure, ensure that:
    a. Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
    b. All personal protective equipment is available and being used correctly.
    c. The recovery process is supervised at all times by a competent person.
    d. Recovery equipment and cylinders conform to the appropriate standards.
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that cylinder is situated on the scales before recovery takes place.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not overfill cylinders (no more than 80% volume liquid charge).
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
11. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.
12. When equipment has been decommissioned, attach a signed and dated label stating it has been decommissioned and emptied of refrigerant.
13. Ensure that there are labels on the equipment stating it contains flammable refrigerant.

A2L Application Considerations

This product is listed to UL standard 60335-2-40, Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, which defines safe design and use strategies for equipment using A2L refrigerants. This standard limits the refrigerant concentration in a space in the event of a refrigerant leak. To meet the requirements, the UL standard defines minimum room area, refrigerant charge limit, minimum circulation airflow and/or ventilation airflow requirements, and limits the use of ignition sources in spaces. The standard may require a unit refrigerant leak detection system.

For equipment with R-454B and charge amounts less than or equal to 3.91 lbs per circuit, this UL standard does not prescribe a room area limit and does not require a refrigerant leak detection system or any circulation airflow or ventilation airflow mitigation strategies. However, ignition sources in ductwork must be evaluated.

Depending on the application, a specific requirement of ANSI/ASHRAE Standard 15, Safety Standard for Refrigeration Systems, could be more stringent than UL 60335-2-40 requirements. See *Refrigeration Systems and Machinery Rooms Application Considerations for*

Compliance with ASHRAE® Standard 15-2022 Application Engineering Manual (APP-APM001*-EN) for more information.

Ignition Sources in Ductwork

Do not install open flames in the ductwork. Hot surfaces exceeding 700°C (1290°F) should not be installed in the ductwork unless the average airflow velocity is not less than 1.0 m\s (200 ft\min) across the heater and proof of airflow is verified before system is energized.

Electric heaters can exceed the surface temperature limit if airflow distribution is poor, or insufficient airflow is provided over the heater.

Surface temperatures of most gas heaters do not exceed the surface temperature limits due to ANSI construction requirements.

Ignition Sources in Unit

This unit does not contain any ignition sources. All potential ignition sources, (including factory or field installed accessory electric heaters, gas heaters, relays, and contactors) were evaluated during product UL listing.

Minimum Room Area Limits (Refrigerant charge greater than 3.91 lb per circuit)

Equipment with R–454B charge amounts greater than 3.91 lb per circuit may require additional circulation or ventilation airflow mitigation strategies. In this case, two minimum room area (A_{min}) thresholds:

- The first threshold defines when equipment serving a single room is required to provide circulation airflow, either continuous or activated by a leak detection system. A ducted system requires circulation airflow unless the smallest room it serves is larger than the adjusted A_{min} threshold. This product contains a leak detection system if a circuit charge is greater than 3.91 lbs. As a result, no further leak detection system evaluation is required.
- The second threshold defines when additional ventilation airflow is required. If the room area, A or TA, is below the adjusted A_{min} or TA_{min} threshold, additional ventilation is required to remove refrigerant in the event of a leak. See the UL 60335-2-40 Clause GG.8 and ANSI\ASHRAE Standard 15 Section 7 for natural and mechanical ventilation requirements.

See the minimum room area table below.

Table 16. Minimum room area

	Room Area[a]	
Tonnage	**m^2**	**ft^2**
020	15.4	166.3
025	15.4	166.3
030	15.4	166.3
035	15.4	166.3
40M	15.4	166.3
040/40N	15.4	166.3
050	15.4	166.3
060/60N	15.4	166.3
06S	15.4	166.3
070	15.4	166.3
080/08N	15.4	166.3
090	15.4	166.3
100	15.4	166.3
110	15.4	166.3

[a] Based on 2.5m ceiling height.

Minimum Room Area (A_{min}) Adjustments

Use equation below to adjust the minimum room area, as applicable, based on the unit's installation height, altitude, and occupancy level it serves.

$$A_{min.adj} = \text{Nameplate } A_{min} \times \text{Altitude Adj} \times \text{Height Adj} \times F_{occ}$$

Multiply the altitude adjustment factor in the table below by A_{min} listed on the unit nameplate or in the Installation, Operation, and Maintenance (IOM) manual.

Table 17. Altitude adjustment factor

Altitude (ft)	Sea Level to 2000	2001 to 4000	4001 to 6000	6001 to 8000	8001 to 10000	10001 to 12000	12001 to 14000	14001 to 15000	Over 15000
A_{min} Adjustment	1	1.05	1.11	1.17	1.24	1.32	1.41	1.51	1.57

In addition, A_{min} can be adjusted if the unit is installed in a room at a height that is higher than the minimum height shown on the unit. To adjust A_{min}, multiply by the ratio of the unit minimum release height (in meters) / actual release height (in meters). Use 0.6 m in the ratio for unit minimum installation heights less than or equal to 0.6 m.

For institutional occupancies, ASHRAE Standard 15 applies an additional adjustment factor F_{occ} to the amount of a charge allowed in a space. To calculate the adjusted A_{min} for institutional occupancies, multiply the A_{min} on the nameplate by two.

EXAMPLE 1: 20 Ton Packaged Rooftop Multi-Zone VAV System Serving an Institutional Occupancy Space

The packaged unit serves 7600 ft.^{2} of a nursing home located at an attitude of 4000 ft. The unit has two equally charged 10 ton refrigeration circuits. Each circuit has 12 lbs of refrigerant with a minimum room area requirement of 180 ft.^{2} with a 2.2 m release height.

$$TA_{min.adj} = 180\ ft.^2 \times 1.05 \times 2 = 378\ ft.^2$$

No additional ventilation is required.

EXAMPLE 2: 10 Ton Split System Serving a Single Commercial Occupancy Space

The split system serves a 1500 ft.^{2} manufacturing space at 5000 ft. altitude. The final installed charge of the single circuit 10 ton unit is 20 lb. The unit has an open return with a release height of 1 m and ducted supply air. The unit A_{min} is 660 ft.^{2}.

$$A_{min.adj} = 660\ ft.^2 \times 1.11 = 733\ ft.^2$$

No additional ventilation is required.

Determining Room Area (A or TA)

The room area (A) is the room area enclosed by the projection to the floor of the walls, partitions, and doors of the space that the equipment serves. For ducted systems, total room area (TA) of all rooms connected by ducts, may be used instead of A.

Rooms connected by drop ceilings only are not considered a single room.

Rooms on the same floor of the building, and connected by an open passageway, can be considered part of the same room if the passageway is a permanent opening, extends to the floor and is intended for people to walk through.

Adjacent rooms on the same floor of the building and connected by permanent openings in the walls and/or doors between rooms (including gaps between the wall and the floor), can be considered part of the same room if the openings meet the following criteria.

- The opening is permanent and cannot be closed.
- Openings extending to the floor, such as door gaps, need to be at least 20 mm above the floor covering surface.
- Natural ventilations opening areas must meet the requirements of ANSI\ASHRAE Standard 15-2022, Section 7.2.3.2.

Rooms that are connected by a mechanical ventilation system can be considered a single room area if the mechanical ventilation system meets the requirements of ANSI\ASHRAE Standard 15-2022, Section 7.6.4.

Leak Detection System (Refrigerant charge greater than 3.91 lb per circuit)

The leak detection system consists of one or more refrigerant detection sensors. When the system detects a leak, the following mitigation actions will be initiated until refrigerant has not been detected for at least 5 minutes:

- Energize the supply fan(s) to deliver a required minimum amount of circulation airflow.
- Disable compressor operation.
- Provide an output signal that can be used to fully open zone dampers and/or VAV boxes and disable electric heat in VAV boxes.
- Provide an output signal that can be used to energize additional mechanical ventilation (if needed).
- Units without airflow proving will disable electric heat sources.

Building fire and smoke systems may override this function.

If the refrigerant sensor has a fault, is at the end of its life, or is disconnected, the unit will initiate the mitigation actions. Mitigation actions may be verified by disconnecting the sensor.

The refrigerant sensors do not need service. Use only manufacturer-approved sensors when replacement is required.

A2L Mitigation Airflow

Table 18. A2L mitigation airflow

Unit Tonnage	Total Refrigerant Charge (kg)	Min Airflow (m3h)
20	14	1386
25	14	1386
30	14	1386
35	14	1386
40	14	1386
50	21	2079
60	21	2079
70	28	2772
80	28	2772
90	42	4158
100	42	4158
110	42	4158

Installation - Mechanical

Unit Handling

⚠ WARNING

Improper Unit Lift!

Failure to properly lift unit in a LEVEL position could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage.

Test lift unit approximately 24 inches (61 cm) to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

- Unit can be moved into space using 4-wheel Dollies, Hand Truck, or Pallet Jack.
- Be careful not to damage cassette bottom panel during movement.
- The unit was designed so that all components can be moved through a standard commercial width doorway and make a turn in a standard commercial width hallway. Certain circumstances may still require the Evaporator Cassette to be disassembled to move it into the mechanical room. For disassembly instructions, please contact Sales at (770) 988 8338.

Installation Preparation

Before installing the unit, perform the following procedures to ensure proper unit operation, refer Figure 2, p. 18.

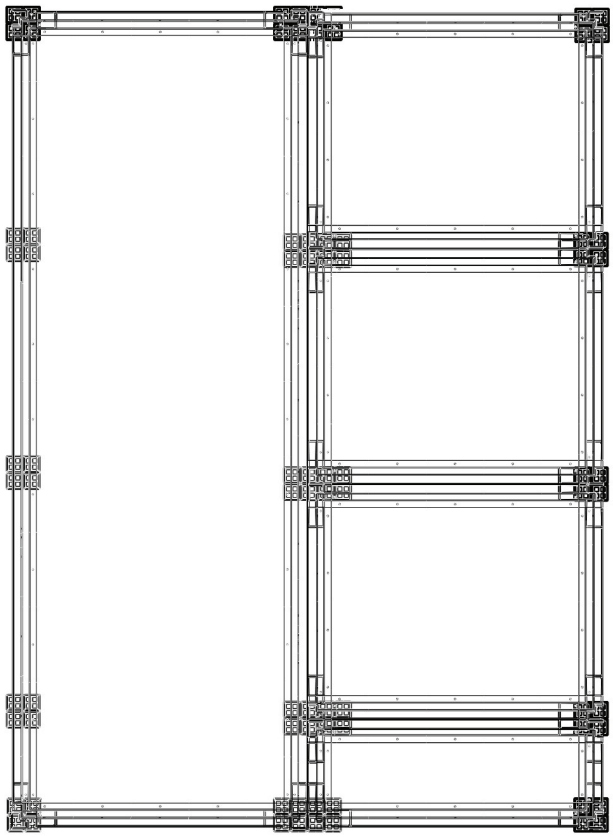
1. Position the evaporator module and skid assembly in its final location.
2. Remove the skids from under the unit. See Figure 2, p. 18. If you find internal damage, file a claim immediately to the delivering carrier.
3. Remove the protective shipping covers from the cassettes.
4. Set the evaporator into place before proceeding. Place the evaporator on the isolator pads (see next section) if the unit has the isolator option.

Unit Vibration Isolator Option (Isopads)

Important: *Vibration isolation is not necessary for the unit since the factory internally isolates the compressors, thus creating double isolation. Trane strongly recommends that you consult a vibration specialist when considering double isolation. In general, Trane does not recommend double- isolation.*

1. Cut appropriate sized waffles from the sheets provided. In general, a 2x2 pattern works well under each cassette.
2. Place the pads at each intersection of the Condensing Unit Cassettes.
3. Align the remaining pads along the back side (filter side) of the Evaporator Cassette.

Figure 14. Isolator pads locations



Notes:

- *The unit is equipped with a positively sloped drain pan to help indoor air quality (IAQ) and does not require one corner of the unit to be pitched.*
- *Unit is not internally trapped. Installer must externally trap the condensate line.*

Typical Unit Layout

Figure 15. Typical unit dimensions (in inches)

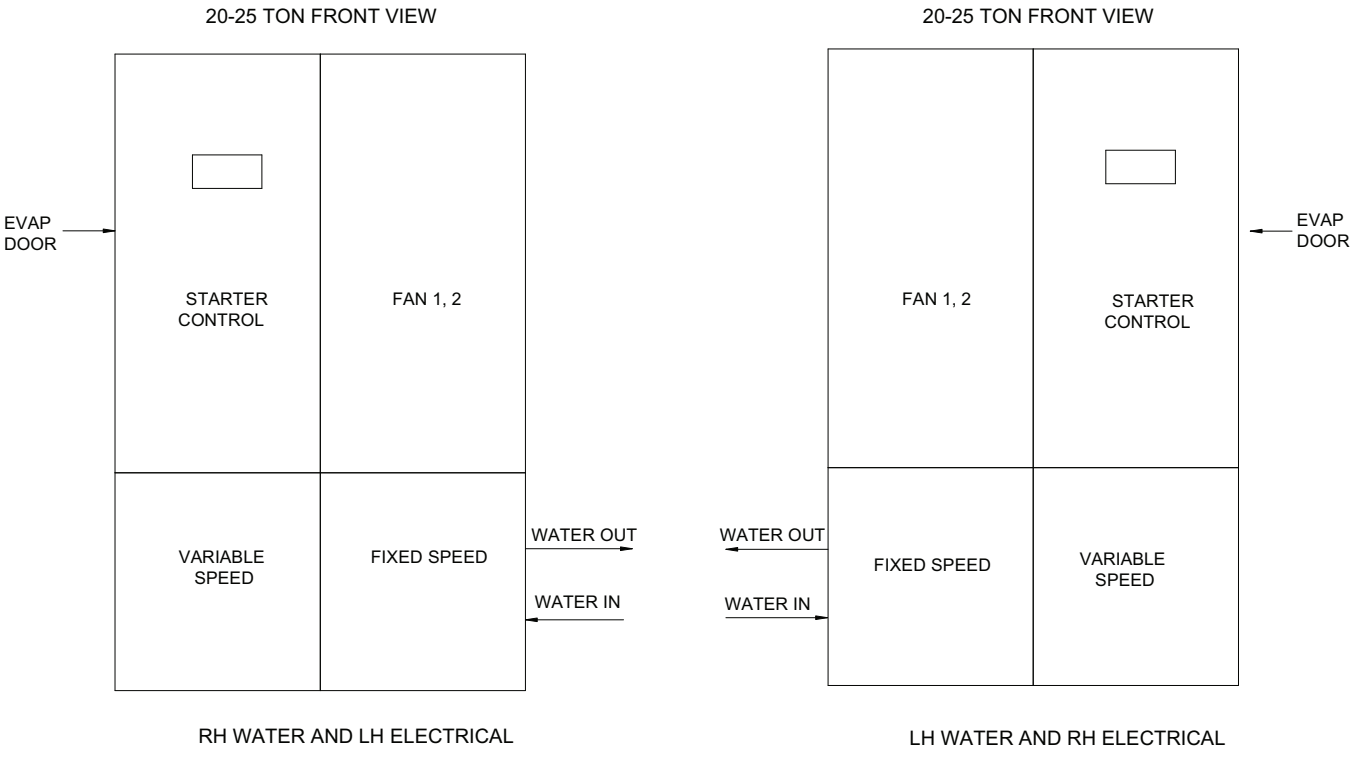


Figure 16. Typical unit layout (30 and 35 tons)

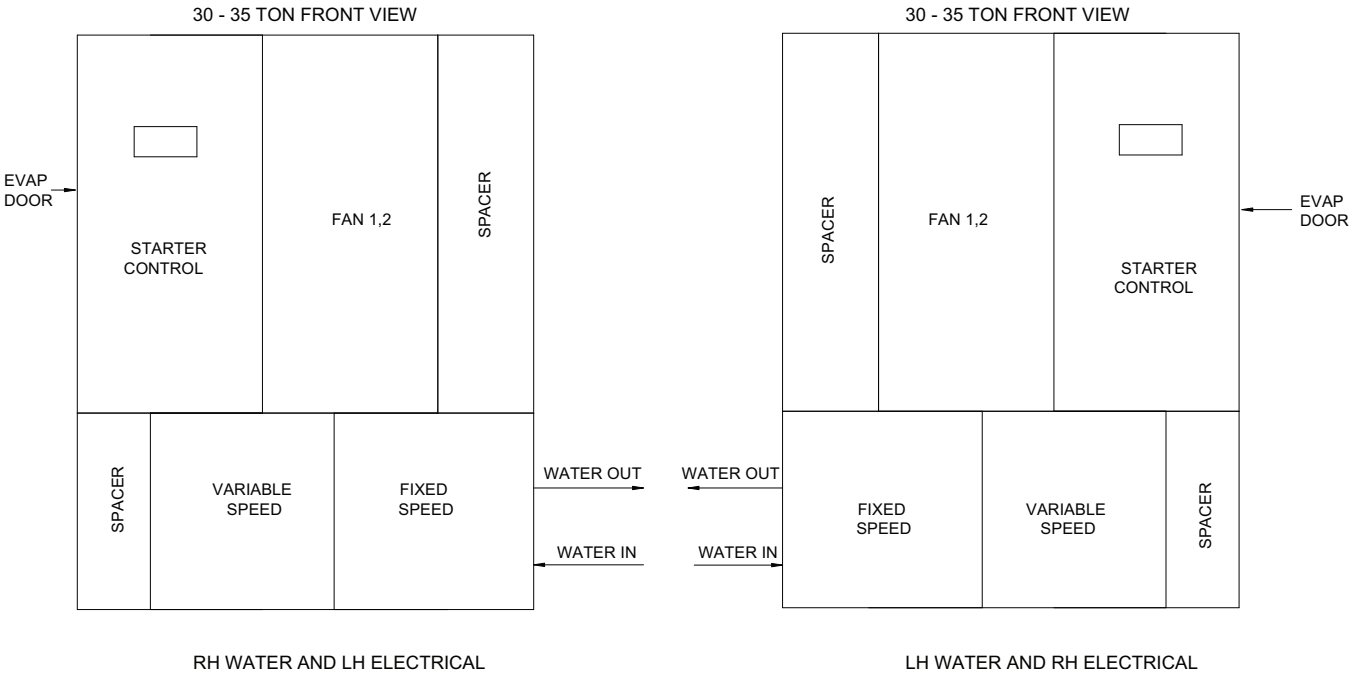


Figure 17. Typical layout of units (40 to 80 tons) left hand electrical and right hand water

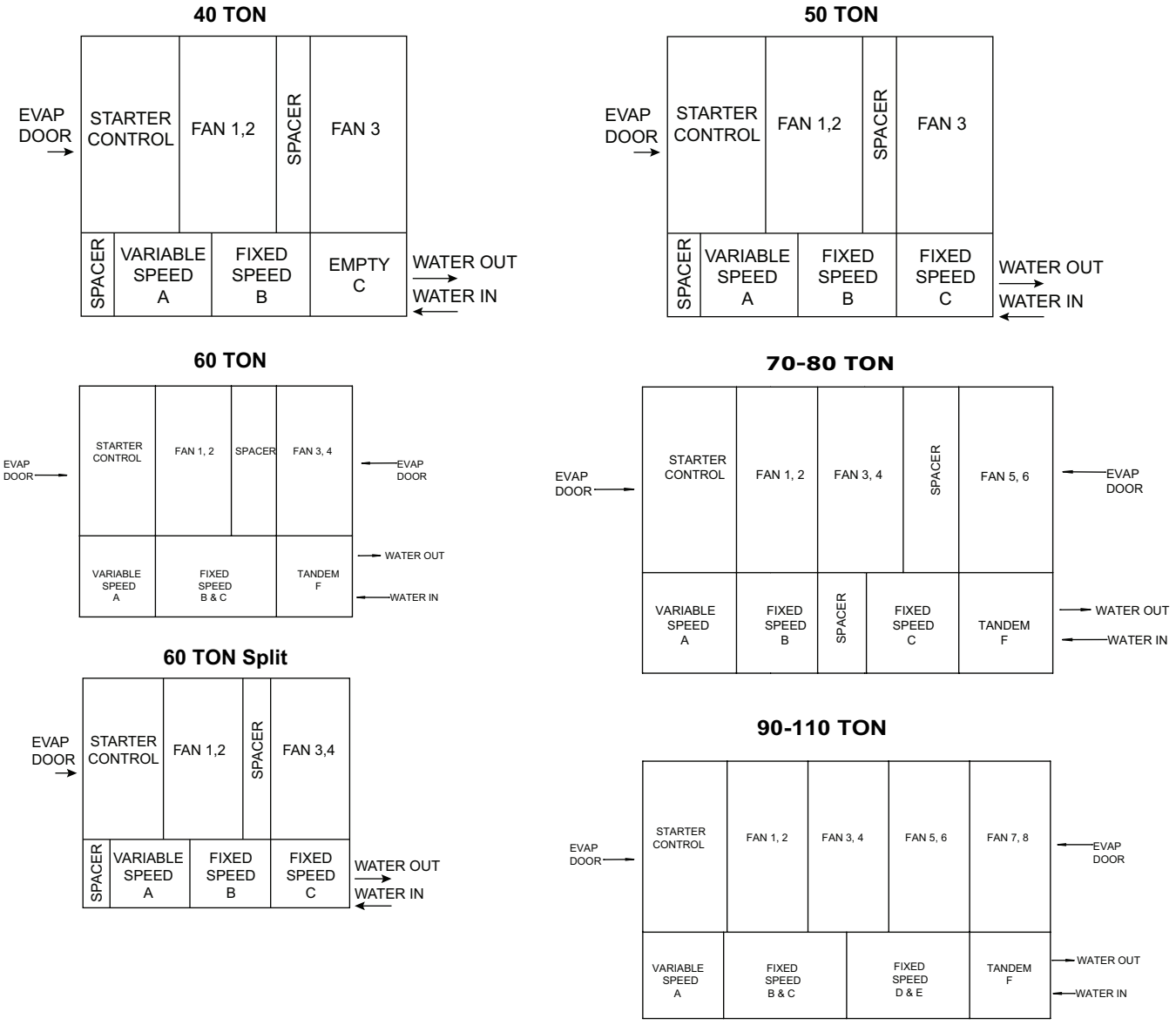
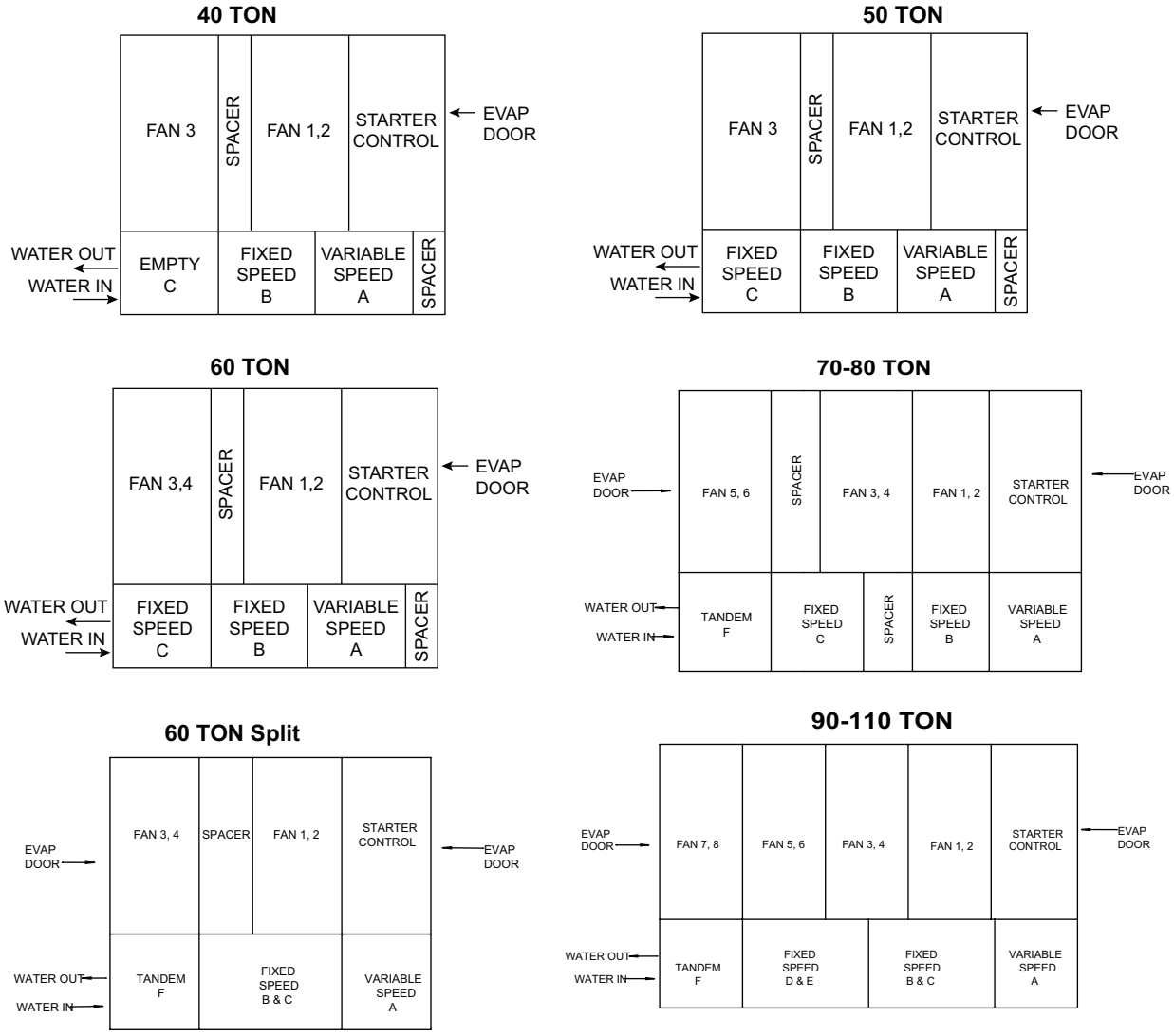


Figure 18. Typical layout of units (40 to 80 tons) right hand electrical and left hand water



Installation Summary

The steps below provide a summary of installation steps for installing the modular self-contained unit. Read all installation instructions before starting the installation as the below is not a complete summary of all steps required.

Recommended Tool List

Note: *This is a general list only. Other standard tools will be required.*

- 7/8-inch deep socket
- 11/16-inch deep socket
- Adapter for sockets to drill
- Cordless impact drill
- 5/16 Socket Bit - To be used in the impact drill
- 3/8 Socket Bit
- Phillips bit #2 for drill
- Extensions bit holder for drill - long and short
- Right angle driver for drill (Skew Driver)
- 5/32 hex key (TEE handle if possible)
- 5/16 or 8mm hex key (TEE handle if possible)
- 5mm Hex Key (TEE handle if possible)
- 6mm hex key socket (Intelliclamps)
- Minimum of 4 vice clamps (cassette joining)
- Rubber mallet
- Tube cutter for 1 3/8 copper pipe.
- Furniture Dollies: 6 to 8

Note: *The installation images below depict a 60 ton, right hand electrical unit, left hand water unit. Water connections will always be opposite of the electrical cassette. For a left hand electrical unit, the installation will be reversed. The second set of pictures depict the installation for an 80 ton right hand electrical unit. There is additional detail provided in these pictures to show the interconnecting piping and the sealing of the unit.*

60 Ton Right Hand Unit

1. Place evaporator into final location.

2. Add spacer cassette.

3. Add variable speed compressor A condensing unit.

4. Add fixed speed compressor B condensing unit.

5. Add fixed speed compressor C condensing unit.

6. Add starter/control panel cassette.

7. Add fans 1 and 2 fan cassette.

8. Add fan spacer cassette.

9. Add fans 3 and 4 fan cassette.

80 Ton Right Hand Unit

1. Place evaporators at their final location.

2. Start by attaching compressor spacer to evaporator first.

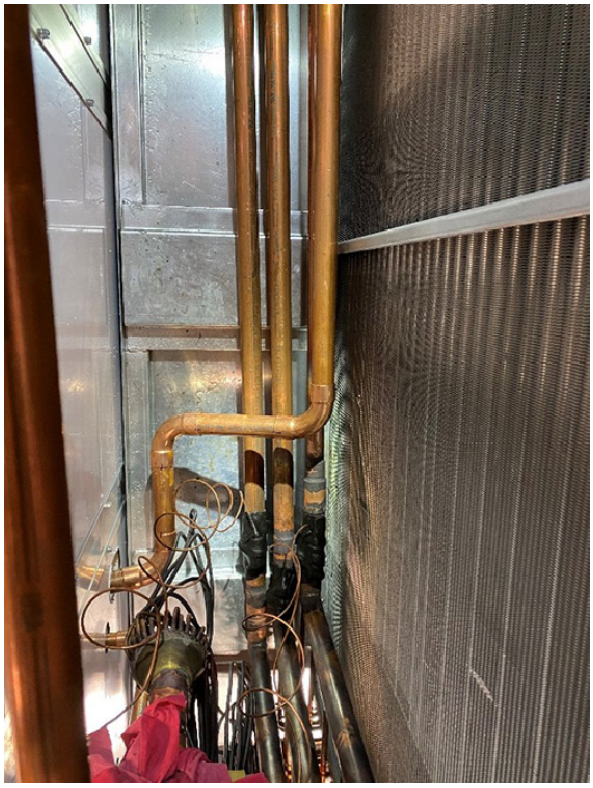
3. Secure with intelleclamps.

4. Unbraze caps from both evaporator and compressor first. Line up compressor A piping to the corresponding evaporator holes.

5. Push compressor A into evaporator.

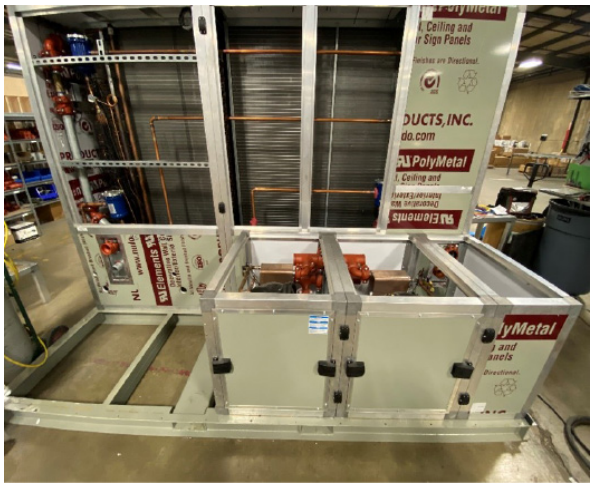
6. Secure compressor A to spacer with intelleclamps.

7. Complete piping and braze everything for compressor A.



8. Unbraze caps and line up compressor B.

9. Push compressor B in and clamp down to compressor A using intellaclamps.

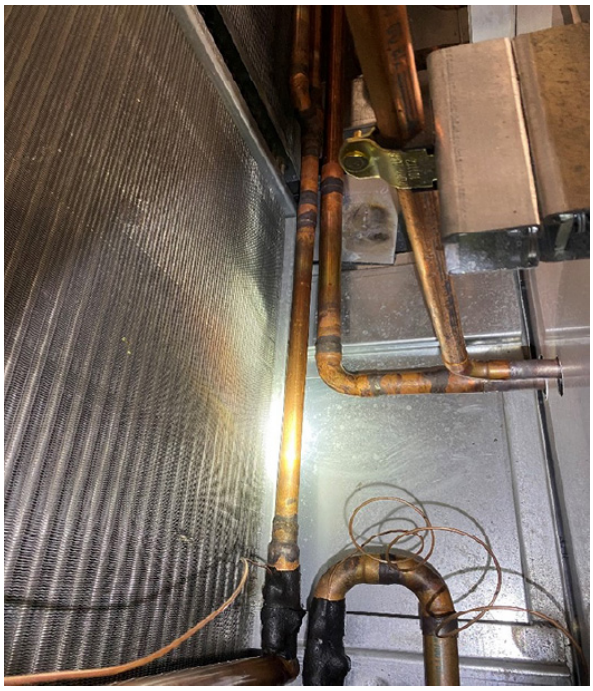


10. Build IC pipe and braze compressor B.

11. Unbraze caps and line up compressor C.

12. Push compressor C in and clamp down to compressor B using intellaclamps.

13. Build IC pipe and braze compressor C.



14. Unbraze caps and line up compressor D.

15. Push compressor D in and clamp down to compressor C using intellaclamps.

16. Clamp compressor D side to evaporator using intellaclamps.

Sealing of Unit (To Prevent Air Leaks)

1. Apply aluminum tape across the gap on top of the compressors.

2. Apply gasket around evaporator opening.

3. Apply caulk all around all fan cassette seem/gaps for good seal.

⚠ WARNING

High Pressure Water!

Failure to follow instructions below could result in death or serious injury, and equipment damage. Provide relief valve on system water piping to prevent instantaneous release of high pressure water.

NOTICE

Proper Water Treatment Required!

The use of untreated or improperly treated water could result in scaling, erosion, corrosion, algae or slime.

Use the services of a qualified water treatment specialist to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

Condenser water piping connections are located on the right or left hand side of the unit (depending upon configuration required). All field-installed piping must conform to applicable local, state, and federal codes. To complete condenser water connections follow the procedure below.

1. Evaporator module should be in its final location and isopads installed if necessary, see Figure 14, p. 36
2. Set condensing unit and spacer cassettes in place just in front of evaporator module and line up refrigerant connections.
3. Install 3-inch water pipe between condensing unit cassettes ensuring that condenser water bracket is in place on each cassette to support the water pipes. Depending upon the tonnage and right hand/left hand configuration, there will be one or more sets of 3-inch pipe that will need to be installed between cassettes. Refer to the following figures for typical installation.

Figure 19. Condenser water bracket

Figure 20. Condenser cassettes-1

Figure 21. Condenser cassettes-2

4. Ensure that 3-inch tee strainer (ship with) is installed on inlet water connection.
5. Attach the water supply line to the inlet of the tee strainer, and the return line to the outlet connection. If the unit has a waterside economizer and/or control valves, these components will need to be installed at this time.
6. If using a cooling tower, refer to for a typical piping circuit from the unit.
7. Ensure the water pressure to the unit does not exceed 400 psig.
8. It is recommended that water pressure is applied prior to fan cassette installation.
9. Install differential pressure switch on the water inlet and water outlet. Unit control scheme will trend water pressure drop and alert user when internal 20 mesh screen needs to be cleaned.
10. Fill and leak check water side connections.

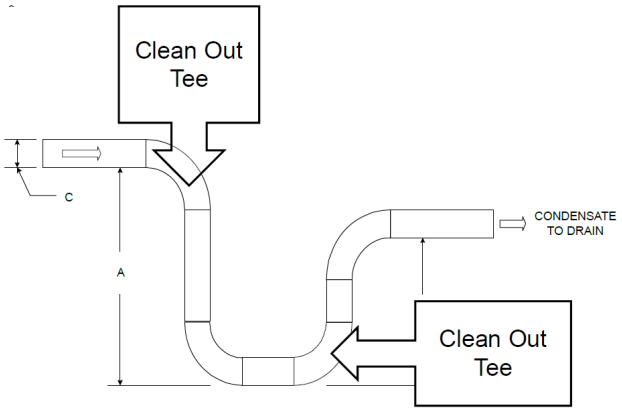
Note: *To prevent water pump damage, design system piping to provide relief when using energy saving waterside economizer valves.*

Condensate Drain Connections

Note: *Unit is not internally trapped. Installer will need to provide an external trap for unit to operate properly.*

Condensate drains must be sized and sloped correctly in order to allow proper condensate flow. The Modular Self Contained unit is under a negative pressure at the condensate outlet. The unit drain pans have a 1/8" per foot slope or higher, but do not contain an internal trap. To ensure proper condensate piping and drainage the unit must be placed on a level pad or surface with the units drain outlet at least 3.5" above the drainage termination point. This is to allow enough room to configure the P trap correctly. All horizontal drainage piping should be sloped at 1/8" per foot and supported every 4'. The unit has a 1 ½" NPT male condensate connection stub located on the bottom of the evaporator section. The unit condensate can be piped using between 1 ½ to 7/8" OD copper, or 1 ½ to ¾ " OD iron pipe. See figure 1 for recommended piping arrangement.

Figure 22. Condensate P-trap



Note: *MSC units with a split coil design have two individual drain pans. These pans are joined together when the evaporator modules are fastened. To ensure proper performance the 7/8" OD drain nipple of the secondary pan must be inserted into the sealing grommet of the primary drain pan, see figure 2.*

Note: *Recommended pipe lengths were calculated at 3" W. C. total external static pressure using standard 1½" piping. In the abnormal event that the unit is expected to operate above 3" W.C., use the formula below to calculate pipe lengths.*

Total external static pressure can be obtained with a manometer by setting the unit discharge static setpoint 0.5" above the expected operating static. For example, if the operating static is 1.5", set the discharge static to 2.0" during measurement.

Please note that the default Duct Static Pressure Safety Lockout is set at 2.0" and may need to be increased if operating above 2" of supply static. Drill a hole in the center of the evaporator access door to insert the probe downstream of the evaporator coil and upstream of the fan array. Ensure the hole location is not near the evaporator coil to prevent damage.

Add this measurement to the current operating static on the unit's display to calculate the total external static. Be sure

to return static settings to normal and plug the hole once measurements are complete.

1. A = 6” Recommended, or (1.5 x total external static + C)
2. B = 3” Recommended, or (.5 x total external static + C)
3. C = Unit Condensate pipe 1 ½”

Figure 23. Joined drain pan installation

Ensure the transfer tube is free from burrs, as these can sometimes damage the grommet or dislodge it from the secondary pan. Run your fingers along the outside end of the transfer tube; if burrs are felt, use a file to remove them. Always make sure the grommet is seated correctly over the transfer tube and aligned with the hole of the secondary drain pan.

General Waterside Recommendations for Cooling Towers

Cooling tower control affects the unit cycle rates. Condenser water temperature swings from 10°F to15°F may cause excessive compressor, water valve, and unit cycling. Set the tower controls to minimize compressor/unit cycling.

Waterside Piping Arrangements

Install a condenser water pump between the cooling tower (either open or closed) and the self-contained unit. Lay out the remainder of the system condenser piping in reverse returns. This helps balance the system by equalizing the length of supply and return pipes. Multi-story buildings may use a direct return system with balancing valves at each floor.

Install the supply riser and its return in close proximity. Furnish both with permanent thermometers to check the waterside balance during start-up and routine maintenance checks.

Include strainers at each pump inlet and unit. Install drain valves at the riser base to allow drainage points for system flushing during start-up and routine maintenance. For condenser draining and header removal, include a shutoff/ balancing valve on the entering and leaving waterside pipes, drain tees, and unions of each unit.

Note: *Unit does not have floor drains.*

Figure 24. Condenser water piping components for cooling tower system

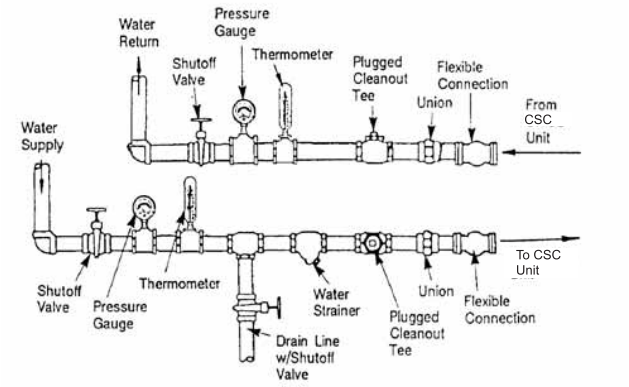
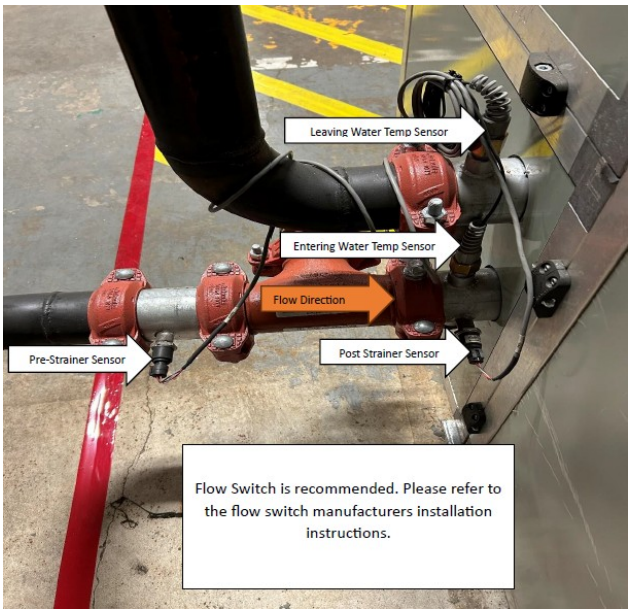


Figure 25. Modular self contained condenser water sensor installation



Water Quality Requirements

Modular Self Contained units with steel/copper/stainless steel heat exchangers and/or piping connections, these values should be as follows:

- pH: 7.5 to 8.5

- Chloride: 125 mg/L (or ppm) maximum
- Sulfate: 35 mg/L (or ppm) maximum
- Glycol mixture can help to maintain pH within this range. But keep in mind glycol has a different specific weight and thermodynamic properties from water.
- In addition using water with low electrical conductivity and low oxygen content is highly recommended to limit potential corrosion damage.
- A pH of 8.5 should be an ABSOLUTE upper limit because aluminum and zinc are amphoteric and can start to corrode at higher pH.

Do not allow the entering water temperature to go below 54°F (12.2°C) on units with constant water flow (basic piping).This will cause the compressors to shut down and the mechanical cooling function will lockout. The economizer (if enabled) will continue to function. The compressors will reset when the entering water temperature reaches 58°F (15°C).

Units with variable water flow (intermediate piping) have a modulating condensing pressure control valve that allows compressor operation down to entering water temperatures of 35°F (2°C).

For more information on constant and variable water flow, see the “Sequence of Operations,” p. 93.

Note: *Units with a waterside economizer can be set from the human interface panel for variable or constant water flow.*

Water Piping Verification

- Make return and supply water connections to the unit and/or waterside economizer piping package with recommended valves and piping components.
- Install unions to allow waterside maintenance.
- Install cooling tower and standby pumps.
- Treat water to prevent algae, slime, and corrosion.
- Prevent refrigerant piping from rubbing against other objects.

Refrigerant System

Modular Self-Contained Units ship with a dry nitrogen holding charge.

Before installing refrigerant piping, verify holding charge is present. Momentarily depress the MSC suction or discharge line (and condenser liquid line) access port valves.

If charge is present, continue with piping installation.

If no nitrogen escapes the access valve, leak test the unit refrigerant system to determine the leak source, and repair. See Maintenance section, “,”. After finding leak, remove test pressure and repair leak using proper brazing procedures. See Maintenance section, “Brazing Procedures,” p. 89. Retest unit(s) to ensure all leaks are repaired. Continue with piping installation.

Braze suction and liquid lines between evaporator module and condensing unit cassettes.

See Maintenance section, “,” /“Brazing Procedures,” p. 89.

Figure 26. Braze suction and liquid lines

Interconnecting Piping

Refrigerating pipe or components must be installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

Refrigerant piping must be properly sized and applied. These two factors have a significant effect on both system performance and reliability.

Install interconnecting piping using proper installation and brazing procedures.

Note: *For liquid line filter drier core installation and flange torque specifications please reference Emerson STAS Installation Guide.*

Work on only one circuit at a time to minimize system exposure to potentially harmful moisture in the air.

Before installing piping verify compressor oil levels are near top of sight glass or above.

Note: *MSC units (and replacement compressors) ship fully charged with POE oil from the factory. Scroll compressors use POE 32 oil, DO NOT substitute.*

Capped discharge and liquid line connections are located near bottom, left side of the condensing unit cassette.

Remove caps with a tube cutter to minimize risk of getting chips inside piping.

Cleanliness is extremely important during system installation to minimize residual contaminants, such as oxidization and scale.

Tightly strap TXV bulbs to horizontal run of each suction line and insulate. TXV bulbs are secured to the suction line from the factory. Verify that sensing bulbs are tightly secured to the suction line after brazing each compressor module. Attach vacuum pump and begin evacuation as soon as piping installation is complete. This starts system dehydration and helps prevent POE compressor oil contamination. This will also indicate large leaks if vacuum does not hold (below 400 microns and hold for 2 hours). Complete Leak Test and Evacuation (for procedures, see "," and "System Evacuation Procedures," p. 89 in Maintenance section) before starting "Preliminary Refrigerant Charging," p. 51.

Note: *Use Type L refrigerant grade copper tubing only.*

Important: *Failure to tighten bulb to suction line, can result in erratic operation of unit.*

NOTICE

Compressor Damage!

POE oil is hygroscopic – it absorbs water directly from the air. This water is nearly impossible to remove from the compressor oil and can result in compressor failures.

To prevent POE oil from absorbing water, the system should not remain open for longer than necessary. When open, dry nitrogen should flow through the piping. Only new oil containers should be used for service and maintenance. Always use the smallest container size required for the job requirements. Always leave the oil container tightly sealed until time of use. Do not reuse oil that has been opened.

Preliminary Refrigerant Charging

⚠ WARNING

Confined Space Hazards!

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

Do not work in confined spaces where refrigerant or other hazardous, toxic, or flammable gas may be leaking. Refrigerant or other gases could displace available oxygen to breathe, causing possible asphyxiation or other serious health risks. Some gases may be flammable and/or explosive. If a leak in such spaces is detected, evacuate the area immediately and contact the proper rescue or response authority.

⚠ WARNING

Explosion Hazard!

Failure to properly regulate pressure could result in a violent explosion, which could result in death, serious injury, or equipment or property-only-damage.

When using dry nitrogen cylinders for pressurizing units for leak testing, always provide a pressure regulator on the cylinder to prevent excessively high unit pressures. Never pressurize unit above the maximum recommended unit test pressure as specified in applicable unit literature.

⚠ WARNING

Hazardous Pressures!

Failure to follow instructions below could result in a violent explosion, which could result in death or serious injury.

If a heat source is required to raise the tank pressure during removal of refrigerant from cylinders, use only warm water or heat blankets to raise the tank temperature. Do not exceed a temperature of 150°F. Do not under any circumstances apply direct flame to any portion of the cylinder.

⚠ CAUTION

Refrigerant at Freezing Temperature!

Direct contact with liquid refrigerant could result in minor or moderate injury.

Avoid contact with skin. If working with refrigerant is necessary, you MUST wear all Personal Protective Equipment (PPE) including eye protection, safety gloves, long sleeves, and pants. In case of contact, treat the injury similar to frostbite. Slowly warm the affected area with lukewarm water and seek immediate medical attention.

NOTICE

Compressor Damage!

Failure to follow these instructions could result in compressor failure.

If it becomes necessary to remove or recharge the system with refrigerant, it is important that the following actions are taken.

- **To prevent cross contamination of refrigerants and oils, use only dedicated R–454B service equipment.**
- **Disconnect unit power before evacuation and do not apply voltage to compressor while under vacuum.**
- **Due to presence of POE oil, minimize system open time. Do not exceed 1 hour.**
- **When recharging R-454B refrigerant, follow procedures outlined in the Start-Up section of this IOM.**
- **Allow the crankcase heater to operate a minimum of 24 hours before starting the unit.**

Charging and Wiring the Unit

⚠ WARNING

R-454B Flammable A2L Refrigerant!

Failure to use proper equipment or components as described below could result in equipment failure, and possibly fire, which could result in death, serious injury, or equipment damage.

The equipment described in this manual uses R-454B refrigerant which is flammable (A2L). Use ONLY R-454B rated service equipment and components. For specific handling concerns with R-454B, contact your local representative.

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

Use the following steps to charge and wire the system:

1. Verify system leak check and evacuation are complete before adding refrigerant. See “,” and “System Evacuation Procedures,” p. 89.
2. While unit is evacuating, place starter/control module into position, but do not connect to main power until all work is complete.
3. Terminate compressor power connections, control harness, and chassis communication harness. Control harnesses are color coded for easy installation.

Figure 27. Fixed speed compressor power and communication wiring

Figure 28. Variable speed power and communication wiring

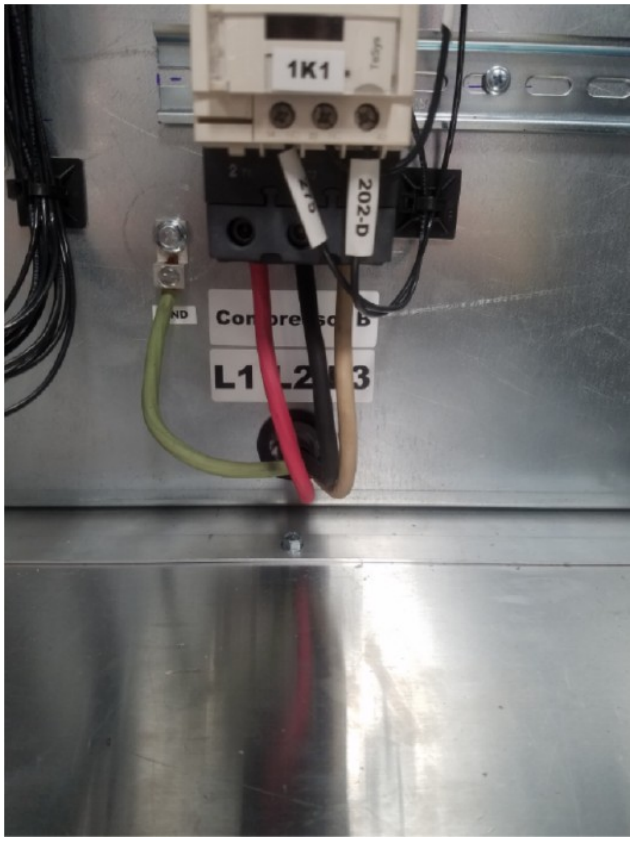
Figure 29. Fixed speed compressor power and communication wire routing

Figure 30. Compressor communication terminations

Note: *Pluggable connectors are color coded and individually keyed for ease of installation.*

Figure 31. Compressor power wire routing to starter panel

Figure 32. Compressor power terminations



4. Verify oil is present in each compressor sight glass. (Adjust if necessary).
5. Verify all service valves are open.
6. See MSC General Data for unit refrigerant charge.
7. Liquid charge 10 lbs of R–454B initially. This will be adequate for compressor startup. More charge will be added after compressors are started. Use an accurate scale to measure and record preliminary amount of refrigerant added to each circuit.

Note: *Adding initial refrigerant charge can freeze standing water inside of the heat exchanger and cause serious damage. If water is present in heat exchangers at initial charge ensure condenser water is flowing and all valves are opened. Set all compressor regulating valves to constant flow or open them manually.*

8. Turn field-supplied unit disconnect **ON** to energize crankcase heaters on fixed speed compressors. Verify crankcase heaters are operating.
9. Record charge amount added.
10. If total charge is not reached see Final Refrigerant Charge in Start-up.

Note: *The nameplate refrigerant charge is a guideline. Please follow IOM charging instructions.*

11. Verify wiring is complete.

12. Install 3D-Intelliclamp™ between all cassettes.

Figure 33. 3D-Intelliclamp™

Fan Installation

1. Place fan and fan spacer cassettes above the condensing unit cassettes.
2. Connect fan control harness and fan power connections. Control harnesses are color coded for easy installation.
3. Install 3D-Intelliclamp™ between remaining cassettes.

Figure 34. Fan power and communication wire routing

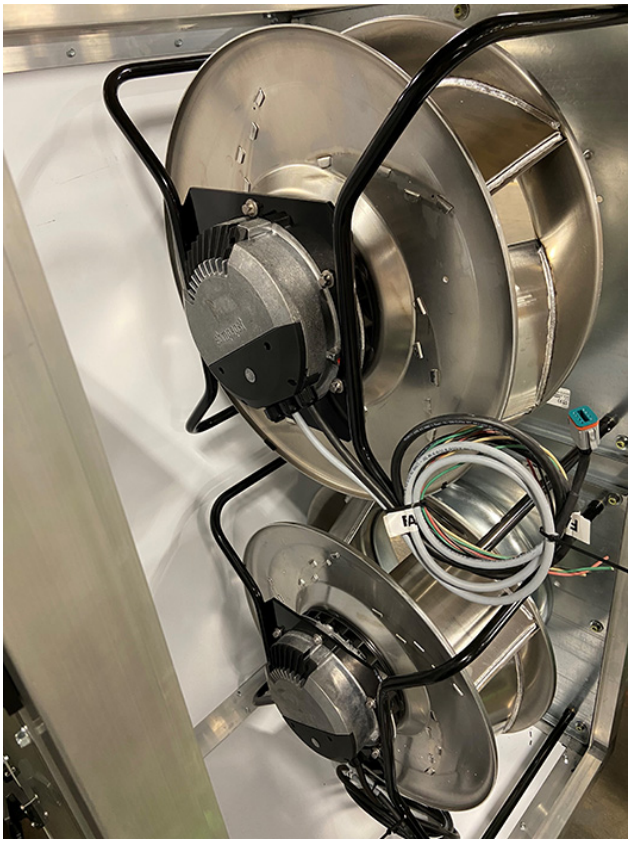


Figure 35. Fan power and communication wiring

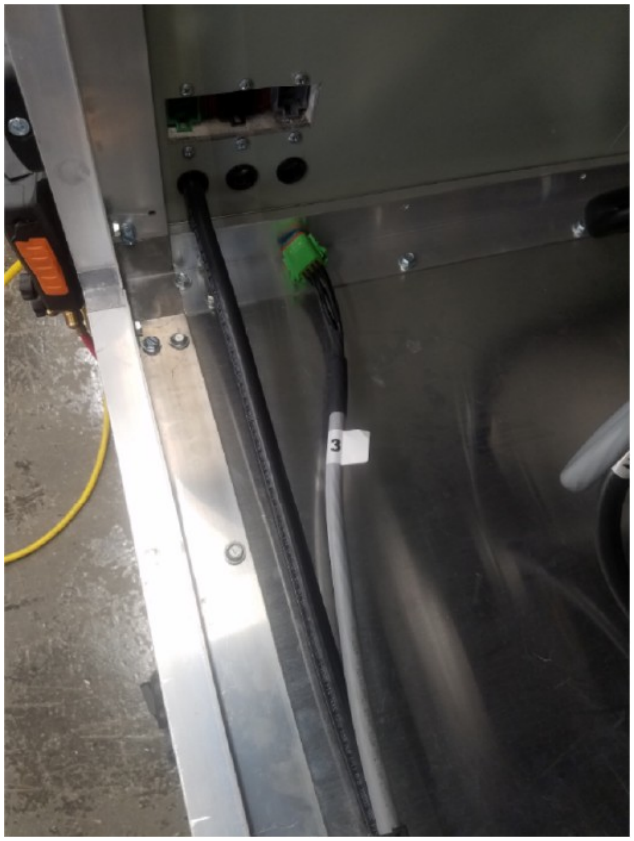


Figure 36. Fan communication terminations - pluggable connectors are color coded for ease of installation

Figure 37. Fan power terminations

Duct Connections

⚠ 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.

Return air enters the rear of the unit and conditioned supply air discharges through the top. Attach supply air ductwork directly to the unit's top panel, around the fan discharge opening. A duct collar is not provided.

Note: *Units equipped with flexible horizontal discharge plenum option may include a duct collar when holes are factory cut. If discharge openings are field-cut, refer to the following "Installation — Plenum" section.*

Install all air ducts according to the National Fire Protection Association standards for the Installation of Air Conditioning and Ventilation Systems other than Residence Type (NFPA 90A) and Residence Type Warm Air Heating and Air Conditioning Systems (NFPA 90B).

Make duct connections to the unit with a flexible material such as heavy canvas. If a fire hazard exists, Trane recommends using Flexweave 1000, type FW30 or equivalent canvas. Use three inches for return duct and three inches for discharge duct. Keep material loose to absorb fan vibration.

- If using return ductwork to the unit, secure it with three inches of flexible duct connector.
- Extend discharge duct upward without change in size or direction for at least three fan diameters.
- Use 3" flexible duct connection on discharge ductwork.

Note: *Compressors and fan assembly are internally isolated. External isolation devices (spring mounting isolators) are at discretion of a vibration specialist consulted by building or HVAC system designer.*

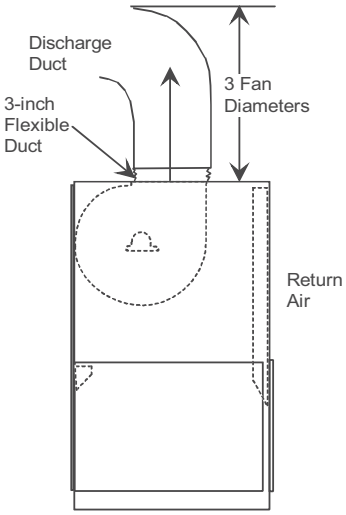
Run the ductwork straight from the opening for a minimum of three fan diameters. See Figure 38, p. 58. Extend remaining ductwork as far as possible without changing size or direction. Do not make abrupt turns or transitions near the unit due to increased noise and excessive static losses. Use elbows with splitters or turning vanes to minimize static losses.

Poorly constructed turning vanes may cause airflow generated noise. Align the fan outlet properly with the ductwork to decrease noise levels in the duct and to increase fan performance. To complete trunk ductwork to the VAV terminal units, refer to the VAV box manuals for specific requirements. Check total external static pressures against fan characteristics to be sure the required airflow is available throughout the ductwork.

To achieve maximum acoustical performance, minimize the duct static pressure setpoint.

Ensure the ventilation machinery and outlets are operating adequately and are not obstructed.

Figure 38. Duct connection recommendations



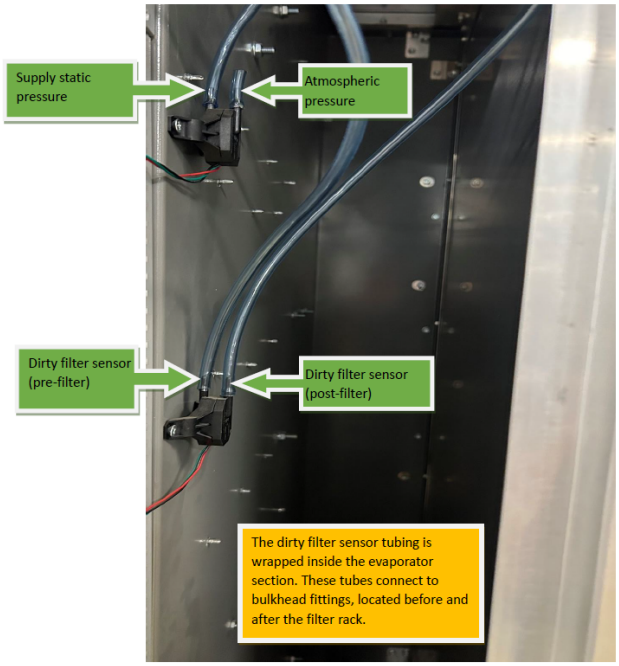
Final Installation

1. Confirm all 3D-Intelliclamp™ have been installed.

Figure 39. 3D-Intelliclamp™

2. Connect static pressure tubing located to the right of the control panel:
   a. Discharge static
   b. Filter inlet
   c. Filter outlet

Figure 40. Modular self contained static pressure sensor tubing installation



3. Complete field wiring connections on field terminal strip:
   a. E-Stop
   b. Occupied
   c. External auto/stop
   d. Entering air temperature
   e. Discharge air temperature

Electrical Installation

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

1. With main power still dis-connected.
   a. Circuit breakers on.
   b. Place fuses in fan fuse holder.
   c. One fuse pulled on control power transformer primary.

d. Fan fuse holders connected, ie, closed.

e. Variable speed compressor fuses installed.

2. At the terminal block or disconnect switch.
   a. Verify:
      - No continuity between phases.
      - No continuity between each phase and ground.
   b. Do not hi-pot with variable speed compressor drives or fan fuses installed or fixed speed compressor motor protection module connected.
3. Once all these items above have been verified:
   a. Replace control power transformer primary fuse.
4. Connect main power and ground.
5. With fixed speed compressor circuit breakers, and fan fuse holders open, and variable speed compressor enable plug removed, apply power to unit using the unit or remote mounted disconnect switch.

   Important: *With a phase rotation meter, verify clockwise rotation at the terminal block using standard electrical safety procedures.*
6. After clockwise rotation is confirmed, remove main power unit and verify the unit is de-energized.
7. With fixed speed compressor circuit breakers still open, and variable speed compressor enable plug still removed, close fan fuse holders and re-apply power.

TD-7 Installation

1. Hold faceplate on front side of Low Voltage door and install TD-7 onto front of Low Voltage door.

Figure 41. TD-7 Face plate

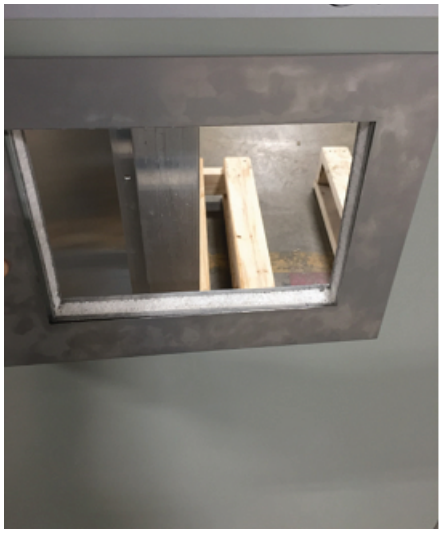


Figure 42. TD-7 Installation on front

2. Attach brackets on back side of Low Voltage door to secure the TD-7 to the door.

Figure 43. TD-7 Installation on back with brackets

Note: *Refer to the TD-7 Installation Manual for wiring and installation instructions.*

Installation - Electrical

Unit Wiring Diagrams

Specific unit wiring diagrams are provided on the inside of the control panel door. Use these diagrams for connections or trouble analysis.

Supply Power Wiring

It is the responsibility of the installer to provide power supply wiring to the unit terminal block or the non-fused disconnect switch option. Wiring should conform to NEC and all applicable code requirements.

Verify that the power supply available is compatible with the unit's nameplate ratings. Use only copper conductors to connect the power supply to the unit. Connect the three phase wires to the power terminal block or the non-fused disconnect switch in the control box terminals. Refer to specific wiring diagrams and fuse information in the control panel. Ensure that knockouts for the electrical supply are made on the steel panel and not the insulated foam panel. This will allow for verification that all conductors are correctly positioned before closing the access panel as well as allow the access panel to be fitted without risk of damage to the conductors or their insulation. All NEC installation requirements must be followed. The size of the hole must be compliant with the minimum opening requirements found in tables 25.4DV.1, 25.4DV.2 and Annex 101.DVB of UL 60335-2-40 as well as the NEC.

⚠ WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels 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 following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

NOTICE

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as the equipment was not designed or qualified to accept other types of conductors.

NOTICE

Motor Damage!

Correct phase sequence is critical. If phase sequence of the incoming line voltage is not correct, it could result in motor damage.

Voltage Range

Voltages must be within ±10% the nameplate voltage. Ensure the unit voltage is balanced by measuring at the compressor terminals. Voltage imbalance on three phase systems can cause motor overheating and premature failure. Maximum allowable imbalance is 2.0%.

Voltage Imbalance

Read the voltage at the compressor terminals to determine if it is balanced. Voltage imbalance on three phase systems can cause motor overheating and premature failure. The maximum allowable imbalance is 2.0 percent. Voltage imbalance is defined as 100 times the sum of the deviation of the three voltages from the average (without regard to sign) divided by the average voltage. For example, if the three measured voltages are 221, 230, and 227, the average voltage would be:

(221 + 230 + 227) / 3 = 226 volts

The percentage of voltage imbalance is then:
100 x (226 – 221) / 226 = 2.2%

Phase Monitor

Unit is equipped with phase monitor in control box. The phase monitor will protect against phase loss, imbalance and reversal of line voltage. If a fault occurs, the red LED will energize. While the fault condition is present, the phase monitor interrupts the 115V control circuit. If no faults are observed, a green LED will be energized.

Control Power

NOTICE

Component Damage!

Failure to follow instructions below could result in immediate or premature component failures.

Unit transformers are sized to provide power to the unit only. Do not use these transformers to supply power to field equipment.

In this example, 2.2% imbalance is not acceptable. When a voltage imbalance of more than 2.0% exists, check the voltage at the unit disconnect switch. If the imbalance at the unit disconnect switch does not exceed 2.0%, faulty unit wiring is causing the imbalance. Conduct a thorough inspection of the unit electrical wiring connections to locate the fault, and make any repairs necessary.

Access the connection terminal block through the control panel on the upper left side of the unit. All wiring should conform to NEC and applicable local code requirements.

Confirm all wiring connections are secure. Reference the unit specific diagrams inside the control panel.

Note: *Unit transformers IT1, IT3, IT4 and IT5 are sized to provide power to the unit only.*

Selection Procedures

- RLA = Rated Load Amps
- Compressor LRA = Locked Rotor Amps
- Compressor Input = VFD drive Input
- Compressor Output = VFD drive output
- Voltage utilization range is ±10%

Determination of Minimum Circuit Ampacity (MCA)

MCA = 1.25 x Largest motor amps/VFD Input + the sum of the remaining motor amps.

Determination of Max Fuse (MFS) and Max Circuit Breaker (MCB) Sizes

MFS and MCB = 2.25 x Largest motor amps (RLA)/VFD input) + the sum of the remaining motor amps.

If the rating value calculation does not equal a standard over current protective device rating, use the next lower standard rating as the maximum.

Table 19. Electrical service sizing data — motors — 20 to 110 tons

Ton-nage	Model Number		Unit Wiring					Motor Data													
								Compressor (EA)											Fan (EA)		
								Fixed Speed Size 1			Fixed Speed Size 2			Fixed Speed Size 3			Variable Speed		VSD		
			Nameplate Voltage	Voltage Range	MCA	MOP	Disc	Qty	RLA	LRA	Qty	RLA	LRA	Qty	RLA	LRA	Qty	Max In-put (A)	Qty	kW	FLA
20	SCW-M5020F		208-230/60/3	187-253	124.0	175	200	1	33.3	255	NA	-	-	NA	-	-	1	53.1	2	3.75	11.3
	SCW-M50204		460/60/3	414-506	63.0	90	100	1	15.4	140	NA	-	-	NA	-	-	1	27.6	2	3.9	6
25	SCW-M5025F		208-230/60/3	187-253	124.0	175	200	1	33.3	255	NA	-	-	NA	-	-	1	53.1	2	3.75	11.3
	SCW-M50254		460/60/3	414-506	63.0	90	100	1	15.4	140	NA	-	-	NA	-	-	1	27.6	2	3.9	6
30	SCW-M5030F		208-230/60/3	187-253	137.0	175	200	1	45.9	355.5	NA	-	-	NA	-	-	1	53.1	2	3.75	11.3
	SCW-M50304		460/60/3	414-506	68.0	90	100	1	20.6	141	NA	-	-	NA	-	-	1	27.6	2	3.9	6
35	SCW-M5035F		208-230/60/3	187-253	140.0	175	200	1	49	386.3	NA	-	-	NA	-	-	1	53.1	2	3.75	11.3
	SCW-M50354		460/60/3	414-506	72.0	90	100	1	24	182	NA	-	-	NA	-	-	1	27.6	2	3.9	6
40	SCW-M5040F		208-230/60/3	187 - 253	169.0	225	200	1	63.7	528.2	NA	-	-	NA	-	-	1	53.1	3	3.75	11.3
	SCW-M504M-F	Slim	208-230/60/3	187-253	169.0	225	200	1	63.7	528.2	NA	-	-	NA	-	-	1	53.1	3	3.75	11.3
	SCW-M504N-F	NY	208-230/60/3	187-253	184.0	225	200	2	40.8	270.0	NA	-	-	NA	-	-	1	53.1	3	3.75	11.3
	SCW-M50404		460/60/3	414-506	88.0	110	100	1	33.1	246.9	NA	-	-	NA	-	-	1	27.6	3	3.90	6.0
	SCW-M504-M4	Slim	460/60/3	414-506	88.0	110	100	2	33.1	246.9	NA	-	-	NA	-	-	1	27.6	3	3.90	6.0
	SCW-M504-N4	NY	460/60/3	414-506	92.0	110	100	2	19.4	147.0	NA	-	-	NA	-	-	1	27.6	3	3.90	6.0

Table 19. Electrical service sizing data — motors — 20 to 110 tons (continued)

Tonnage	Model Number		Unit Wiring					Motor Data													
								Compressor (EA)											Fan (EA)		
								Fixed Speed Size 1			Fixed Speed Size 2			Fixed Speed Size 3			Variable Speed		VSD		
			Nameplate Voltage	Voltage Range	MCA	MOP	Disc	Qty	RLA	LRA	Qty	RLA	LRA	Qty	RLA	LRA	Qty	Max Input (A)	Qty	kW	FLA
50	SCW-M5050F		208-230/60/3	187-253	197.0	250	400	1	49.0	386.3	1	45.9	355.5	NA	-	-	1	53.1	3	3.75	11.3
	SCW-M50504		460/60/3	414-506	98.0	125	200	2	24.0	182.0	1	20.6	141.0	NA	-	-	1	27.6	3	3.90	6.0
60	SCW-M5060F		208-230/60/3	187 - 253	244.0	300	400	2	63.7	528.2	NA	-	-	NA	-	-	1	53.1	4	3.75	11.3
	SCW-M506S-F	Split	208-230/60/3	187-253	244.0	250	400	2	40.8	270.0	2	24.4	200.0	NA	-	-	1	53.1	4	3.75	11.3
	SCW-M506N-F	NY	208-230/60/3	187-253	212.0	250	400	2	49.0	386.3	NA	-	-	NA	-	-	1	53.1	4	3.75	11.3
	SCW-M50604		460/60/3	414-506	127.0	150	200	2	33.1	246.9	NA	-	-	NA	-	-	1	27.6	4	3.90	6.0
	SCW-M506S4	Split	460/60/3	414-506	122.0	125	200	3	19.4	147.0	2	11.9	103.0	NA	-	-	1	27.6	4	3.90	6.0
	SCW-M506-N4	NY	460/60/3	414-506	108.0	125	200	3	24.0	182.0	NA	-	-	NA	-	-	1	27.6	4	3.90	6.0
70	SCW-M5070F		208-230/60/3	187-253	280.0	300	400	2	49.0	386.3	2	28.7	207.5	NA	-	-	1	53.1	5	3.75	11.3
	SCW-M50704		460/60/3	414-506	138.0	150	200	2	24.0	182.0	2	12.4	100.2	NA	-	-	1	27.6	5	3.90	6.0
80	SCW-M5080F		208-230/60/3	187-253	312.0	350	400	2	63.7	528.2	2	28.7	207.5	NA	-	-	1	53.1	5	3.75	11.3
	SCW-M508N-F	NY	208-230/60/3	187-253	280.0	300	400	2	49.0	386.3	2	28.7	207.5	NA	-	-	1	53.1	5	3.75	11.3
	SCW-M50804		460/60/3	414-506	158.0	175	200	2	33.1	246.9	2	12.4	100.2	NA	-	-	1	27.6	5	3.90	6.0
	SCW-M508-N4	NY	460/60/3	414-506	138.0	150	200	2	24.0	182.0	2	12.4	100.2	NA	-	-	1	27.6	5	3.90	6.0

Table 19. Electrical service sizing data — motors — 20 to 110 tons (continued)

Ton-nage	Model Number		Unit Wiring					Motor Data													
								Compressor (EA)												Fan (EA)		
								Fixed Speed Size 1			Fixed Speed Size 2			Fixed Speed Size 3			Variable Speed		VSD		
			Nameplate Voltage	Voltage Range	MCA	MOP	Disc	Qty	RLA	LRA	Qty	RLA	LRA	Qty	RLA	LRA	Qty	Max In-put (A)	Qty	kW	FLA
90	SCW-M5090F		208-230/60/3	187-253	382.0	400	400	2	45.9	355.5	2	40.8	270.0	2	24.4	200.0	1	53.1	8	3.75	11.3
	SCW-M50904		460/60/3	414-506	188.0	200	200	2	20.6	141.0	2	19.4	147.0	2	11.9	103.0	1	27.6	8	3.90	6.0
100	SCW-M5100F		208-230/60/3	187-253	407.0	450	600	2	49.0	386.3	2	45.9	355.5	2	28.7	207.5	1	53.1	8	3.75	11.3
	SCW-M51004		460/60/3	414-506	198.0	225	400	2	24.0	182.0	2	20.4	141.0	2	12.4	100.2	1	27.6	8	3.90	6.0
110	SCWM-N5110F		208-230/60/3	187-253	413.0	450	600	4	49.0	386.3	2	28.7	207.5	NA	-	-	1	53.1	8	3.75	11.3
	SCW-M51104		460/60/3	414-506	205.0	225	400	4	24.0	182.0	2	12.4	100.2	NA	-	-	1	27.6	8	3.90	6.0

Notes:

1. MCA: Minimum Circuit Ampacity is 125% of the largest compressor RLA or Drive input current, plus 100% of the other compressor (s) RLA, plus the sum of the condenser fan RLA, plus any other load rated at 1 AMP or more.
2. Maximum Breaker Overcurrent Protection (MOP): 225% of the largest compressor RLA or VSD drive Input, plus 100% of the other compressor(s) RLA, plus the sum of the condenser fan Motor/Drive FLA, plus any other load rated at 1 AMP or more.
3. Recommended disconnect switch: 110% to 115% of the sum of the RLA of the compressors, VSD drive input, fan motor/drive and controls FLA.
4. RLA: Rated in accordance with UL standard 1995
5. Local codes may take precedence.
6. Fix speed compressor are across the line starting, the VSD compressors are controlled by VSD drive. Compressors will never start simultaneously.
7. Voltage utilization range is ±10 percent.

Static Pressure Sensor Installation (VAV units only)

Supply air static pressure controls the inverter option. A bulkhead fitting and a roll of vinyl tubing is provided for direct insertion into ductwork. If a specific head assembly or remote location is desired, then this material will be the responsibility of the installer. There are two pressure transducers mounted on the side of the control panel. The top is the static pressure transducer and the bottom is the filter differential transducer.

Sensor Location

1. Install static pressure sensor in specified location or section of ductwork most critical to the VAV operation.
2. If installation location is remote to transducer in control panel, do not exceed 250 feet for ¼-inch OD tubing or 500 feet for 3/8-inch OD tubing.

Installing the Tubing Sensor

1. Unscrew the ¼-inch bulkhead fitting provided.
2. Drill ½-inch hole in ductwork at desired location.
3. Insert external end of bulkhead fitting through the hole from inside the duct.
4. Insert ¼-inch tubing through both halves of union bulkhead fitting into ductwork.
5. Screw internal end and tighten onto ductwork.
6. Run the opposite end of tubing through hole in the top of the control panel cabinet.
7. Connect to the push-on connection at the top pressure transducer in the control panel.

Note: *Please refer back to* *Figure 40, p. 58.*

Note: *If plastic tubing pulls away from a connection, trim it back before replacing it on the fitting. Stretched tubing may leak and cause faulty control.*

Zone Sensor option used for Discharge Air Reset by Space Temperature

Zone Temperature Sensor, BAYSENS077 (Optional Item)

This zone sensor includes an internal thermistor and should be mounted in the zone, Model Number Digit 31=1. This sensor is available for use with all zone sensor options to provide remote sensing capabilities.

Zone Sensor Installation

⚠ 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.

NOTICE

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as the equipment was not designed or qualified to accept other types of conductors.

Note: *For additional information regarding the safe discharge of capacitors, see PROD-SVB06*-EN.*

All sensor options ship in the main control panel and are field installed. Programmable option installation procedures.

Mounting Location

Mount the sensor on the wall in an area with good air circulation at an average temperature. Avoid mounting space temperature sensor is areas subject to the following conditions:

- Drafts or dead spots behind doors or in corners
- Hot or cold air from ducts
- Radiant heat from the sun or appliances
- Concealed pipes and chimneys
- Unheated or non-cooled surfaces behind the sensor, such as outside walls
- Airflows from adjacent zones or other units

To mount the sensors, remove the dust cover and mount the base on a flat surface or 2-inch x 4-inch junction box. Sensors ship with mounting screws.

Mounting the Subbase

Remove the zone sensor cover from subbase, and mount subbase on the wall or on a 2-inch x 4-inch junction box. Route wires through the wire access hole in the subbase. See Figure 44, p. 66. Seal the hole in the wall behind the subbase.

Notes:

- *Guidelines for wire sizes and lengths are shown in Table 20, p. 66. The total resistance of these low voltage wires must not exceed 2.5 ohms per conductor. Any resistance greater than 2.5 ohms may cause the control to malfunction due to excessive voltage drop.*
- *Do not run low-voltage control wiring in same conduit with high-voltage power wiring.*

Wiring

1. Run wires between the unit control panel and the zone sensor subbase. To determine the number of wires required, refer to the unit wiring diagrams.
2. Connect the wiring to the appropriate terminals at the unit control panel and at the zone sensor subbase. In general, zone sensor connections to the unit use the convention of connecting zone sensor terminals to like numbered unit terminals (1 to 1, 2 to 2, etc.).The connection detail is shown on the unit wiring diagrams, which are located in the unit control panel.
3. Replace the zone sensor cover back on the subbase and snap securely into place.

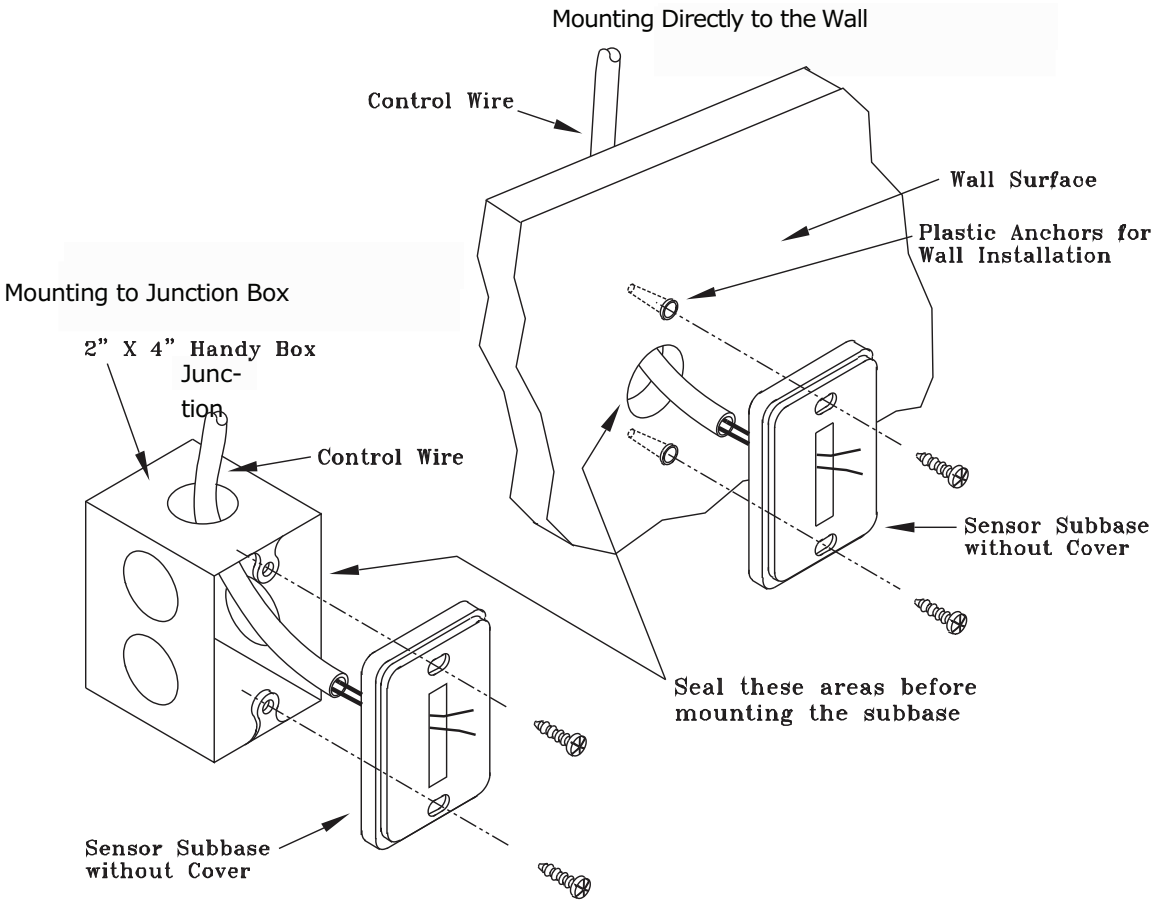
Standard Remote Sensor (BAYSENS077)

When using the remote sensor, BAYSENS077, mount it in the space that is to be controlled. Wire according to the interconnecting wiring diagrams on the unit.

Table 20. Zone sensor maximum lengths and wire size

Distance from Unit to Controller	Recommended Wiring Size
0-150 feet	22 gauge
151-240 feet	20 gauge
241-385 feet	18 gauge
386-610 feet	16 gauge
611-970 feet	14 gauge

Figure 44. Typical zone sensor installation



Control Sequences of Operation

General Support Sequences

Occupied/Unoccupied Switching

There are many sources and types of occupancy. These have an effect on the operation of the unit. All sources are arbitrated (prioritized) into a final occupancy status. Only one method can be used.

Sources of occupancy:

- Occupancy Request is a communicated value from a Building Automation System (BAS) schedule.
- Occupancy Input is locally wired to the Symbio™ 500 which uses a closed contact for Occupied and an open contact for Unoccupied. Use the field terminal block (2TB3) to land the dry contact to the unit.
- Using the Symbio 500 UI a schedule can be created to control unit occupancy locally. This should only be done when there is no BAS front-end, or the occupancy input is not used. The user would create a Multistate Schedule and place the Occupancy Request multistate value in the schedule.

Occupied Status Definition

- **Occupied Operation**: The unit is running in a normal mode providing temperature and ventilation control to the normal occupied setpoints and comfort demands of the occupants.
- **Unoccupied Operation**: The unit is typically shut down and is not providing temperature control to the normal occupied setpoints. No ventilation is required or provided. Temperature control is determined by energy conservation and building protection thresholds.
- **Occupied Bypass Operation**: The unit is temporarily in an Occupied state for some period of time and will automatically return to unoccupied operation when the bypass timer expires. The Occupied Bypass Timer is a user-adjustable field. However, setting the timer to 0 minutes effectively disables Timed Override at the equipment controller.
- **Occupied Standby Operation**: Standby does not apply to a discharge air controller. These units treat Standby as Occupied. Space temperature control units in an Occupied-Standby state are controlling to occupied standby temperature setpoints. Normal operation will resume when Occupancy Status goes to an Occupied state.

Power-Up Start Delay

Anytime power is applied to the unit or the controller is reset, and the unit is able to run, an internal Power-Up Start Delay of 75 seconds is enforced to allow all sensors and timers to get to their starting states.

Normal Unit Starting

When Front Panel Auto Stop, Stop modes, overrides, and diagnostic shutdowns are removed, the controller will start unit operation. The supply fan starts and increases to the minimum Hz setting and must prove On. Unit mode fan only is displayed on the user interface. The supply fan will run for 5 minutes before transitioning into an active heat or cool mode.

External Auto/Stop Input

A normally closed (N.C.) switch wired to the customer connection (2TB3) may be used to shut down all unit operations. When opened, a controlled shutdown will occur on the unit and an Auto reset alarm will be generated. The switch must be rated for 12 ma @ 24 VDC minimum.

Front Panel Auto Stop

The Front Panel Auto Stop binary value is located in the upper left-hand corner of the TD7 display when on the home screen. Place it into Auto to run the unit normally or Stop to shut the unit down in a controlled manner.

Supply Fan Support Sequences

Multiple identical fans are arranged in the fan cabinet to meet the customer airflow and static requirements. Each fan assembly has its own motor with an electronically commutated motor (ECM). The fan speed, start/stop command, and fault status are controlled and monitored individually by the unit controller.

Occupied Fan Operation (VAV Units Only)

When the unit is occupied and no alarms are present that prohibit the fan(s) to run, all fans that are available will start up and operate at 30% speed for 45 seconds. The fans will then modulate to maintain the Duct Static Pressure at the Duct Static Pressure Setpoint. The fans are commanded off during the unoccupied mode.

Supply Air Static Pressure High Limit (VAV Units Only)

During normal operation, the Supply Air Static is monitored. If at any time the static pressure exceeds the software high static limit (defaulted at 2.0 inches from the factory) the unit will immediately shut down and generate a diagnostic.

For the unit to resume operation, the Alarm Reset must be toggled from the TD7. The software high static limit can be user adjusted at the TD7.

Occupied Fan Operation (CV Units Only)

When the unit is occupied and no alarms are present that prohibit the fan(s) to run, all fans that are available will start up and operate at 30% speed for 45 seconds. The fans will

then maintain the fan speed at the fan speed setpoint. The fans are commanded off during the unoccupied mode.

Harmonic Offset

The fan wall at certain frequencies may produce a harmonic which can produce a noise. A Harmonic offset is included in the setpoint menu on the TD7. From the factory this is set to -2%, which will run the even numbered fans 2% less than the odd number fans to avoid this harmonic from developing. This value is adjustable in the TD7 in the event that -2% is not enough based on the final installation of the unit

Temperature Control Support Sequences

Heat/Cool Mode (VAV Units Only)

The unit is in Cooling mode by default. The front-end Building Automation System (BAS) will switch the Heat/Cool Mode request multistate value between the Heating and Cooling modes to get the desired control.

Heat/Cool Mode (CV Units Only)

The unit will automatically switch between Heat and Cool mode based on the conditions of the space temperature. If the space temperature is above the Occupied Cooling Setpoint the unit will transition to cooling mode. If the space temperature is below the Occupied Heating Setpoint the unit will transition to heating mode.

Discharge Air Temperature Control

After the startup delay has completed, indicating the fans have status and the unit is ready to enter normal operations, the unit controller will begin to control the discharge air temperature at its setpoint. This is accomplished by staging the DX compressors and Water side economizer in the Cool mode and the heating source in Heat mode.

Discharge Air Fixed Setpoint (VAV Units Only)

When the units is ordered with the Fixed Setpoint option, the controller will maintain the fixed discharge air setpoint. This setpoint can be adjusted in the TD7 under the setpoints section.

Discharge Air Reset Return Air Temperature (VAV Units Only)

When the unit is ordered with the Return Air Reset option the unit will calculate the discharge air setpoint based on the return air temperature compared against the return air setpoint. The return air setpoint is adjusted in the TD7 under the setpoints section. This option is also available when the unit is ordered as a Fixed Setpoint unit and can be changed in the TD7 under the unit setup menu.

Discharge Air Reset Space Temperature (VAV and CV Units Only)

When the unit is ordered with the Space Temperature Reset option the unit will calculate the discharge air setpoint based on the space temperature compared against the space temperature setpoint. The space temperature setpoint is adjusted in the TD7 under the setpoints section This option requires either a hardwired space temperature sensor to the customer terminal strip (1TB3) or a BACnet® communicated value to the Space Temperature BAS analog value. The unit can also be configured as a fixed setpoint discharge air control in the setup menu.

Cooling/Waterside Economizer

During occupied cooling mode, the waterside economizer option and mechanical cooling are used to control the supply air temperature. The supply air temperature setpoint is user defined at the human interface panel.

After the fans run for 5 minutes, and a call for cooling is calculated, the Cooling Tower/Pump Command is turned on. After the Condenser Water flow switch closes proving flow, the compressors and/or economizer will be allowed to start.

Waterside economizing enables when the unit's entering water temperature is less than the entering mixed air temperature. This is set at Waterside Economizer Enable Offset setpoint. The factory default is 7°F, but can be adjusted by the user at the TD7 or via BACnet®.

The economizer acts as the first stage of cooling. If the economizer is unable to maintain the supply air setpoint, the compressor module will bring on the compressors as required to meet the setpoint. If the unit does not include an economizer, only mechanical cooling will satisfy cooling requirements.

Compressor Control Support Sequences

NOTICE

Compressor Damage!

Do not operate with water loops with less than five minutes circulation time as it could result in poor superheat control and compressor damage.

The MSC uses a combination of one variable speed compressor (VS) and one, two, or three fixed speed compressors (FS), and a tandem set of two compressors for mechanical cooling. The VS compressor is always the first compressor on and last compressor off, except in the event of a VS Compressor or Circuit lockout. A balanced starts routine is used by the Unit Controller when starting FS compressors.

High Pressure Cutout Switch (HPC)

Each VS and FS compressor has an HPC installed in its discharge line. The switch is set to open at 553 psi +/- 15 and re-close at 424 +/-30.

Important: *The HPC is wired into each compressors Enable circuit, and the VS and FS compressor enable circuit are unique. The FS compressor enable circuit uses 24 Vac power sourced from the Control Power Transformer, where the VS compressor enable circuit uses 24 Vdc power sourced from the VS compressor drive. Inadvertently applying 24 Vac to the VS drive terminal block will permanently damage the drive.*

On the fixed speed compressors, if an HPC opens, the 24 Vac power that energizes the compressor start contactor is interrupted and the compressor will turn off. The Unit Controller will detect this and lock the circuit out on a High-Pressure Cutout.

On the variable speed compressor, a 24 Vdc signal originates from terminal number 14 on the 1U1 and is routed through the NC contact of the VS compressor HPC. That signals return must be sensed on terminal #3 of the 1U1. If that signal is lost due to an HPC or Emergency Stop input, the compressor will immediately shut down. The Unit Controller will detect HPC trip and lock the circuit out on a High-Pressure Cutout.

Compressor Input/Output Module

Each compressor has a dedicated XM30 input/output module that communicates digitally with the Unit Controller (XM30.8, 9, 10, and 11 for compressors A, B, C, and D, respectively). The XM30 module is used to sense its respective suction and discharge pressure sensor, suction temperature sensor, and control the condenser water regulating valve via a 0-10 Vdc output.

Compressor Pressure Sensors

Each compressor has its own set of suction and discharge pressure sensors. The sensors are powered by the 5 Vdc power supply 2U1. Their range is 0-600 psig and their voltage output is linearly proportional to the sensed pressure.

The discharge pressure sensor is used by the Unit Controller to do the following:

- Control the optional WRV (if equipped)
- Compute compressor differential pressure
- Warn the user if a high discharge pressure condition occurs
- Activate the VS compressor Limit Condition control function

The suction pressure sensor is used by the Unit Controller to do the following:

- Detect low suction pressures
- Compute compressor suction superheat
- Compute compressor differential pressure
- Activate the VS compressor Limit Condition control function

Compressor Suction Temperature

Each compressor has its own suction temperature thermistor. It is used to compute compressor suction superheat. If superheat is less than 4 degrees for 5 minutes, or more than 25 degrees for 10 minutes, the circuit is locked out on a fault and a diagnostic is annunciated.

Fixed Speed Compressor (FS)

Each FS compressor has two 24 Vac, 30W crankcase heaters. The power for these heaters is routed through a NC auxiliary contact on it's respective start contactor. This way the heater is energized whenever the compressor is Off.

In each FS compressor motor junction box is a 24 Vac powered CoreSense™ compressor protection module (MCSP). This module displays compressor status and diagnostics and provides the following protections:

- Motor temperature protection
- Missing phase protection
- Reverse phase protection
- Low control circuit voltage protection
- Short cycling detection and alert

If the CoreSense module detects a fault condition it opens a dry contact on the module interrupting power to that compressors run contactor coil. The power interruption is detected by the Unit Controller, which disables the compressor and annunciates a Compressor Safety Circuit diagnostic. After the cause of the fault is remedied, a

latching fault can be cleared by cycling 24 Vac module power.

Compressor Safety Circuit

Each fixed speed compressor has a Compressor Safety Circuit intended to protect the circuit from a variety of fault conditions and to distinguish those failures from HPC trips.

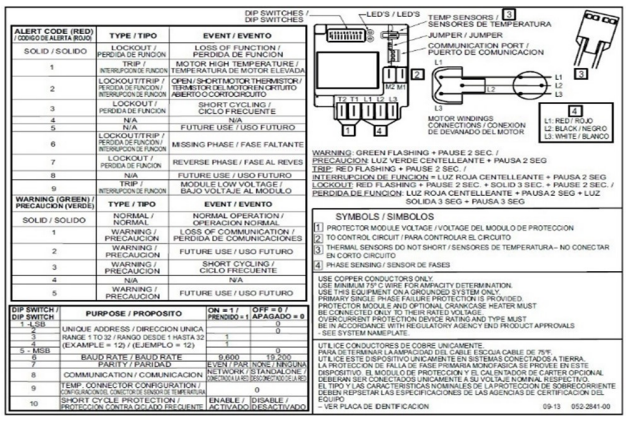
For each FS compressor, 24 Vac power is routed in order from the control power transformer (CPT) through its respective:

1. HPC
2. Phase Monitor dry contact
3. Delayed 'ON' timer relay
4. MCSP dry contact
5. Circuit breaker auxiliary-1CB1, 1CB2, or 1CB3
6. Start/Stop NO contact on the XM32 binary output module
7. Compressor start contactor coil-1K1, 1K2 or 1K3
8. From the compressor start contactor coil, the same 24 Vac signal is routed through the contactor NO auxiliary to an isolating relay-2K2, 2K4 or 2K8

If any of these devices contacts should open, 24 Vac is interrupted from the compressor start contactor and the compressor will shut off.

The Unit Controller can distinguish between an HPC switch opening and any of the other devices in the circuit opening. It will annunciate either High Pressure Cutout Compressor X or Compressor Safety Circuit X.

Figure 45. Fixed speed compressor protection module (MCSP) (90-110 Tons only)



ALERT CODE (RED) / CODIGO DE ALERTA (ROJO)	TYPE / TIPO	EVENT / EVENTO
SOLID / SOLIDO	LOCKOUT / PERDIDA DE FUNCION	LOSS OF FUNCTION / PERDIDA DE FUNCION
1	TRIP / INTERRUPCION DE FUNCION	MOTOR HIGH TEMPERATURE / TEMPERATURA DE MOTOR ELEVADA
2	LOCKOUT/TRIP / PERDIDA DE FUNCION / INTERRUPCION DE FUNCION	OPEN/SHORT MOTOR THERMISTOR / TERMISTOR DEL MOTOR EN CIRTUITO ABIERTO O CORTOCIRCUITO
3	LOCKOUT / PERDIDA DE FUNCION	SHORT CYCLING / CICLO FRECUENTE
4	N/A	N/A
5	N/A	FUTURE USE / USO FUTURO
6	LOCKOUT/TRIP / PERDIDA DE FUNCION / INTERRUPCION DE FUNCION	MISSING PHASE / FASE FALTANTE
7	LOCKOUT / PERDIDA DE FUNCION	REVERSE PHASE / FASE AL REVES
8	N/A	FUTURE USE / USO FUTURO
9	TRIP / INTERRUPCION DE FUNCION	MODULE LOW VOLTAGE / BAJO VOLTAJE AL MODULO
WARNING (GREEN) / PRECAUCION (VERDE)	**TYPE / TIPO**	**EVENT / EVENTO**
SOLID / SOLIDO	NORMAL / NORMAL	NORMAL OPERATION / OPERACION NORMAL
1	WARNING / PRECAUCION	LOSS OF COMMUNICATION / PERDIDA DE COMUNICACIONES
2	WARNING / PRECAUCION	FUTURE USE / USO FUTURO
3	WARNING / PRECAUCION	SHORT CYCLING / CICLO FRECUENTE
4	N/A	N/A
5	WARNING / PRECAUCION	FUTURE USE / USO FUTURO

DIP SWITCH / DIP SWITCH	PURPOSE / PROPOSITO	ON = 1 / PRENDIDO = 1	OFF = 0 / APAGADO = 0
1 - LSB	UNIQUE ADDRESS / DIRECCION UNICA		0
2	RANGE 1 TO 32 / RANGO DESDE 1 HASTA 32	1	0
3	(EXAMPLE = 12) / (EJEMPLO = 12)	1	0
4 - MSB			0
6	BAUD RATE / BAUD RATE	9,600	19,200
7	PARITY / PARIDAD	EVEN / PAR	NONE / NINGUNA
8	COMMUNICATION / COMUNICACION	NETWORK / STANDALONE / DIRECCION UNICA / DIRECCION DE LA RED	
9	TEMP. CONNECTOR CONFIGURATION / CONFIGURACION DEL CONECTOR DE SENSOR DE TEMPERATURA	0	
10	SHORT CYCLE PROTECTION / PROTECCION CONTRA CICLADO FRECUENTE	ENABLE / ACTIVADO	DISABLE / DESACTIVADO

Variable Speed Compressor (VS)

The VS compressor does not have an external crankcase heater (like FS compressors). Instead, whenever the VS compressor is off, a voltage is applied to the compressor motor stator such that the compressor does not rotate but heats the oil. The power for these heaters is routed through a N.C. auxiliary contact on its start contactor.

The VS drive, 1U1, has its own software to control and protect the VS compressor.

The drive receives the following signals from the Unit Controller:

- Controlled Start/Stop
- Speed signal
- Drive Reset
- Stator Heat Enable
- Emergency stop

Note: *The 24 Vdc voltage used in each of the circuits above (except the speed signal) originate from the VS drive.*

The drive provides the following signals to the Unit Controller:

- Compressor On status
- Drive Fault status

Upon a call for mechanical cooling, the Unit Controller issues the command to start the compressor via a dry contact closure on XM32.3. The compressor then runs at the requested speed commanded by the unit controller. The compressor then runs at whatever speed commanded by the Unit Controller. Similarly, when the 1U1 drive receives a Controlled Stop signal it runs the compressor off.

The VS compressor HPC is wired in series with the 1U1 E-stop circuit. A VS compressor HPC event or upon a Unit Controller remote Emergency Stop input will immediately stop the VS compressor and lockout its operation on a manually resettable diagnostic.

Compressor Limit Conditions

Because the MSC uses suction and discharge pressure sensors rather than limit switches, the Unit Controller can sense when a refrigerant circuit is approaching a high- or low-pressure limit condition.

Low Pressure Limit conditions can be caused by the following:

- Low discharge air temperature
- Low airflow
- Dirty air filters
- Malfunctioning expansion valve
- Low refrigerant charge
- Faulty suction pressure sensor

High Pressure Limit conditions can be caused by the following:

- Low condenser water flow
- High entering condenser water temperature
- Fouled entering condenser water strainer
- Malfunctioning expansion valve
- Refrigerant over charge

- Water regulating valve (WRV) malfunction
- Faulty discharge pressure sensor

The Unit Controller's TD7 will annunciate a Limit Condition if an FS compressor circuit enters one. If the unit is equipped with WRV, the Unit Controller can open the valve to allow more flow through the condenser to help mitigate HPC trip.

If the VS circuit enters either a high- or low-pressure limit condition the Unit Controller can reduce compressor speed to help mitigate either a Low or High pressure diagnostic trip.

Compressor Staging

Fixed speed compressors cycle and the variable speed compressor loads/unloads to maintain the operating state required by the temperature controls. In the event of a compressor failure, the next available compressor turns on. During normal conditions, compressors will not turn on until they have been off for at least three minutes. Normal operating conditions are established on an individual compressor basis. When a compressor starts, its timer also starts.

Compressor Lead/Lag

Compressor lead/lag is present in the controls for all units with two or more fixed speed compressors. Only Compressors 2 and 3 rotate. Balanced run hours is achieved by changing the fixed speed compressors sequence number when commanded to rotate.

Variable speed compressor A is always the first stage on and last stage to turn off for mechanical cooling.

The Tandem compressor (6A and 6B) have an independent lead/lag rotation to ensure balanced run hours are achieved by changing the fixed speed compressors sequence number when commanded to rotate

Thermostatic Expansion Valve

Refrigerant system reliability and performance is heavily dependent upon proper superheat. The importance of maintaining the proper superheat cannot be overemphasized. Accurate measurements of superheat will provide the following information:

- How well the expansion valve is controlling the refrigerant flow
- The efficiency of the evaporator coil
- The amount of protection the compressor is receiving against flooding

The expected range for superheat is 11-15°F at full load conditions. At part load, expect a properly adjusted expansion valve to control to 8-12°F superheat.

Note: *Expansion valves are mid seated from the manufacturer and may require adjustment to properly balance superheat.*

Systems operating with lower superheat could cause serious compressor damage due to refrigerant flood-back.

Airside Components Support Sequences

Two-Position Damper Interface

Units with two-position damper ventilation interface are equipped with the necessary control sequences to allow opening of a two-position outdoor air damper to deliver ventilation air to the return air stream of the unit. When the unit is in the occupied mode and the supply fans are running, a binary output will turn on sending 24 Vac to the two-position damper to allow ventilation air into the unit.

Airside Economizer Interface with OA Reference

Units with airside economizer interface are equipped with the necessary control sequences to allow using outside air for the first stage of cooling, in occupied or unoccupied mode and when ambient conditions are favorable for economizing. Inherent in the unit controller is the ability to suppress the setpoint below the normal unit setpoint. This allows the building to improve comfort levels when possible, and at the same time, optimize building mechanical cooling operation for peak operating efficiency. An outside air temperature and relative humidity sensor are field sourced and installed.

Economizer operation enables when the outside air enthalpy is less than 25 BTU’s/lb. (adjustable 19 to 28 BTU’s/lb). During occupied mode, the outside air damper opens to 15 percent (adjustable 0 to 50%) for ventilation purposes. An analog 2 to 10 Vdc output is provided to modulate the field-provided and installed damper actuators.

Airside Economizer Interface with Comparative Enthalpy

Units with airside economizer interface and comparative enthalpy are equipped with the necessary control sequences to allow using outside air for the first stage of cooling, in occupied or unoccupied mode and when ambient conditions are favorable for economizing. Inherent in the unit controller is the ability to suppress the setpoint below the normal unit setpoint. This allows the building to improve comfort levels when possible, and at the same time, optimize building mechanical cooling operation for peak operating efficiency. Outdoor and Return Air temperature and relative humidity sensors are field sourced and installed. Economizer operation enables when the outside air enthalpy is 3 BTU’s/lb. less than the return air enthalpy. During occupied mode, the outside air damper opens to 15 percent (adjustable 0 to 100%) for ventilation purposes. An analog 2 to 10 Vdc output is provided to modulate the field provided and installed damper actuators.

Waterside Components Support Sequences

NOTICE

Proper Water Treatment Required!

The use of untreated or improperly treated water could result in scaling, erosion, corrosion, algae or slime.

Use the services of a qualified water treatment specialist to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

Waterside components consist of water piping, water cooled condensers with optional water valves, water flow switch, water, and the economizer option.

Water Piping Options

Water piping is factory-installed with left-hand (standard) and right hand (optional) connections on units. Units with water regulating valves can be set to variable or constant flow. Units can be equipped with regulating valves without a waterside economizer. Also, units with waterside economizers can be set for either variable or constant water flow at the HI. See Figure 46, p. 72 for detailed piping configuration information.

With compatible piping configurations, the unit can be configured to provide:

- Constant water flow with basic or intermediate piping
- Variable water flow (head pressure control)

Constant water flow is for condenser pumping systems that are not capable of unloading the water-pumping system.

Variable water flow maximizes energy saving by unloading the water pumping system.

Basic Water Piping

This option is available on units without a waterside economizer and with condenser water applications above 54°F (12.2°C) that do not require condensing pressure control. Left hand water connections and piping are extended to the unit exterior. Manifold piping is factory installed.

Water Regulating Valve (WRV) (Optional)

If equipped, each compressor (Fixed or VS) uses a 24 Vac powered water regulating ball valve to control flow through the condenser. The Symbio™ 500 controller modulates the condenser flow to limit discharge pressure, help prevent high pressure cutout trips, and maintain a compressor minimum differential pressure.
The valve can also be used for condenser system chemical purge and condenser cooling loop system balance.

Water Flow Switch

A water flow switch is required to be installed in the condenser water pipe within the unit. It can be supplied from the factory as an option or it can be field-provided. When the flow switch detects a water flow loss prior to or during mechanical cooling, compressor operation locks out and a diagnostic code displays. If water flow is restored, the compressor operation automatically restores.

Note: *Water flow switches are not factory installed. If purchased with the unit the flow switch is a ship along component.*

Water Purge

This user-definable feature allows the user to select a purge schedule to automatically circulate water through the economizer and condensers periodically during non-operational times. This allows fresh chemicals to circulate in waterside heat exchangers.

Water Flow Control

With compatible piping configurations, the unit can be configured to provide variable water flow with the water regulating valve option only, which maximizes energy saving by unloading the water pumping system.

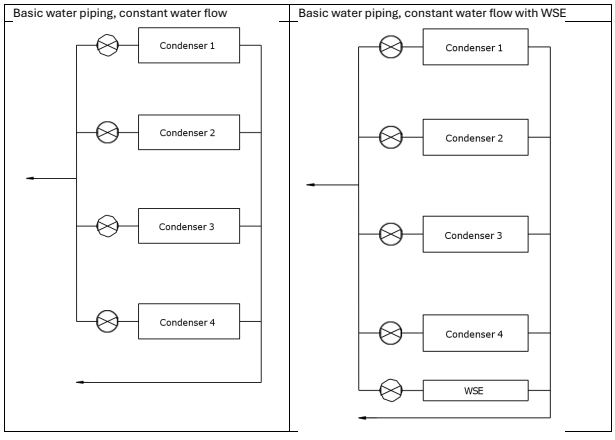
Waterside Economizer Option

The waterside economizer option takes advantage of cooling tower water to either pre-cool the entering air to aid the mechanical cooling process or, if the water temperature is low enough, provide total system cooling.

The waterside economizer includes a coil, modulating valves, controls, and piping. The coil construction is ½-inch (13 mm) OD seamless copper tubes expanded into aluminum fins. The evaporator and economizer coils share a common sloped (IAQ) drain pan. Drain pan options are either galvanized or stainless steel, and insulated.

The tubes are arranged in a staggered pattern to maximize heat transfer. The coil has round copper supply and return headers with removable clean-out and vent plugs.

Figure 46. Basic water piping, constant water flow



Unit Protection Support Sequences

Emergency Stop Input

A normally closed (N.C.) switch wired to the customer connection (2TB3) may be used during emergency situations to shut down all unit operations. When opened, an immediate shutdown occurs. An emergency stop diagnostic is entered into the user interface. The switch must be rated for 12 ma @ 24 VDC minimum.

Discharge Air High Temp Alarm (Software)

When the Discharge Air Temperature is above the Discharge Air High Temperature Cutout setpoint of 100 degrees for 5 minutes, the unit will perform a controlled shutdown. A Manual Reset alarm will be generated and need to be cleared before the unit can resume operating.

Discharge Air Low Temperature Alarm (Software)

When the Discharge Air Temperature is below the Discharge Air Temperature Cutout for 5 minutes, the unit will perform a controlled shutdown. A Manual Reset alarm will be generated and need to be cleared before the unit can resume operation.

Discharge Air Temperature Source Failure

When the Discharge Air Temperature is below the Discharge Air Temperature Cutout for 5 minutes, the unit will perform a controlled shutdown. A Manual Reset alarm will be generated and need to be cleared before the unit can resume operation.

Condenser Water Low Temperature Alarm (Software)

When either the entering or leaving condenser water temperature is below the Condenser Water Low Temperature cutout setpoint of 35 degrees for 5 minutes, the unit will perform a controlled shutdown. All Condenser water valves will be commanded open if installed, and a manual reset diagnostic will be generated and need to be cleared before the unit can resume operation.

Phase Monitor

Every unit includes a phase monitor. When a phase reversal is detected, the normally closed contacts will open, shutting down the compressors and fans, The unit controller will detect this and annunciate an alarm.

Refrigerant (R-454B) Detection and Mitigation Support Sequences

Equipment with R-454B refrigerant requires a refrigerant detection system based on the refrigerant charge. When the refrigerant detection system is in a normal state, the equipment provides normal heating, cooling, and ventilation.

Heat Cool Mode Status: Off

When the unit is in Off mode and a leak is detected or sensor fails, a diagnostic will trigger. Heat Cool Mode will transition to Fan Only. Compressor Operation is disabled, heating operation is disabled, and outdoor air dampers are closed all normal operation for Off mode).

The VAV Box Relay will be energized for Full Airflow at the VAV boxes. The main Building Management System will utilize either the VAV Box Relay, Refrigerant Mitigation Push binary output, or the Refrigerant Mitigation Active binary value to drive the VAV boxes full open. The supply fan will start and ramp to its minimum speed (10%) for 180 seconds to allow the VAV's to drive open. After 180 seconds expires, the fan(s) will ramp to maintain the duct static pressure at the duct static pressure setpoint (VAV units only) or the fan speed setpoint (CV units only). The DX Cooling will be disabled during this time.

Once the leak is cleared, the unit will continue to mitigate for five minutes. During this five-minute mitigation, the concentration or sensor failure diagnostics will clear but the mitigation diagnostic will remain. When the five-minute time expires, mitigation will terminate, and the unit will transition back to normal control.

Heat Cool Mode Status: Cool

When the unit is in Cool mode and a leak is detected or sensor fails (see the figure below), the same diagnostics will trigger.

The VAV Box Relay will be energized for Full Airflow at the VAV boxes. The main Building Management System will utilize either the VAV Box Relay, Refrigerant Mitigation Push binary output, or the Refrigerant Mitigation Active binary value to drive the VAV boxes full open. The supply fan will ramp to maintain the duct static pressure at the duct static pressure setpoint (VAV units only) or will continue to operate at the defined speed (CV units only). DX Cooling will be de-energized and compressor operation will be disabled. Heating will remain disabled, and the unit can continue to economize if the airside economizer interface option is installed.

Once the leak is cleared, the unit will continue to mitigate for five minutes. During this five-minute mitigation, the concentration or sensor failure diagnostics will clear but the mitigation diagnostic will remain. When the five-minute time expires, mitigation will terminate, and the unit will transition back to normal control.

Heat Cool Mode Status: Heat

When the unit is in Heat mode and a leak is detected or sensor fails (see the figure below), the same diagnostics will trigger.

The VAV Box Relay will be energized for Full Airflow at the VAV boxes. The main Building Management System will utilize either the VAV Box Relay, Refrigerant Mitigation Push binary output, or the Refrigerant Mitigation Active binary value to drive the VAV boxes full open. The supply fan will ramp to maintain the duct static pressure at the duct static pressure setpoint (VAV units only) or will continue to operate at the defined speed (CV units only). DX Cooling will be de-energized and compressor operation will be disabled. Heating will remain enabled and the unit can continue keep the outdoor air dampers at the minimum ventilation if the unit is equipped with an airside economizer interface. Once the leak is cleared, the unit will continue to mitigate for five minutes. During this five-minute mitigation, the concentration or sensor failure diagnostics will clear but the mitigation diagnostic will remain. When the five-minute time expires, mitigation will terminate, and the unit will transition back to normal control.

Note: *Refrigerant leak detection and mitigation actions are defined by UL requirements. Therefore, Supply Fan minimum speed is recommended to remain as defined by factory defaults.*

Optional Components Support Sequences

High Duct Temperature Thermostat

An optional factory-supplied temperature limit switch with reset element detects the supply air duct temperature. This sensor should be field installed downstream from the discharge in the supply air duct. If the supply air duct temperature exceeds 240°F (115.6°C), the unit shuts down and displays a diagnostic. A manual reset is required at the unit. High duct temperature can be adjusted at thermostat.

Dirty Air Filter Sensor Option

A factory installed differential pressure sensor senses the pressure differential across the filters. When the differential pressure exceeds a user selectable setting will display a diagnostic. The unit will continue to run until you replace the air filters.

Test Modes Support Sequences

In the TD7 under the Setup menu the Set Flow Switch binary value is located. If the unit is equipped with water regulating valves, this binary value is used to set the flow switch for the least amount of flow. When the value is set to true, 1 water regulating valve will open to 5% less than the minimum valve setpoint that is set at the factory. This valve will remain open for 20 minutes to allow adjustment of the switch. The 5% less than the minimum flow should prevent nuisance water flow loss alarms. The unit must be in a local stop condition in order for the override to put the unit into the test mode.

Unit Functional Test Mode

This testing mode needs to be performed in the exact steps listed below to get the unit to the desired condition. If the unit does not contain certain devices then that portion of the test can be skipped. Unit tests can not be performed if the Refrigerant Mitigation is active.

Fan Testing Steps

The fan(s) testing steps are the initial steps performed on the unit to get the fans at the proper condition to proceed with testing the heating or cooling. The test is started in the TD7 under the Setup menu by overriding the MJC MSC Testing Override. The MJC MSC Testing Status will indicate which step the unit is in. The testing Steps are listed below. To start the test override the multistate value to Start Test.

1. Test Inactive
2. Start Test

   The testing logic will not allow you to proceed until it runs through its safety check and ensures the unit is fully shut down. The status point will indicate when the test is ready to proceed. You can proceed to the exact test you want to perform or go 1 step at a time.
3. SF Cmd 1 On. This will turn on the Supply Fan Command relay to start fans 1-4 if all are installed.
4. SF Cmd 2 On. This will turn on the Supply Fan Command 2 relay to start fans 5-7 if all are installed
5. Fan 1 on at 30%.
6. Fan 1 off
7. Fan 2 on at 30%.
8. Fan 2 off
9. Fan 3 on at 30%.
10. Fan 3 off
11. Fan 4 on at 30%.
12. Fan 4 off
13. Fan 5 on at 30%.
14. Fan 5 off
15. Fan 6 on at 30%.
16. Fan 6 off
17. Fan 7 on at 30%.
18. Fan 7 off
19. All installed fans on at 25%
20. All installed fans on at 50%
21. All installed fans are in auto and either control to duct static or constant fan speed.

    After the fans are tested, the next steps will allow you to test the other functions of the unit

22. Cooling Test Start.
23. Heating Test Start.
24. Economizer Test Start
25. Test Disable/Auto Release.

Cooling Testing Steps

The DX Cooling can be tested by placing the MJC MSC Testing Override into the Cooling Test Start state. Once in this state, the MJC MSC Cooling Test Override to the Start Test off state to start the test (State 2).

Heating Testing Steps

The heating can be tested by placing the MJC MSC Testing Override into the Heating Test Start state. Once in this state, the MJC MSC Heating Test Override to the Start Test state to start the test (State 2).

1. Test Inactive
2. Start Test

   The test will not proceed to the next step until this state is verified. Once the MJC MSC Economizer Test Status indicates Test Ready, you can proceed with testing the following states.
3. Hydro 100% Open
4. Hydro 0% Open
5. Elect Stage 1 On
6. Elect Stage 1 Off
7. Elect Stage 2 On
8. Elect Stage 2 Off
9. Elect Stage 3 On
10. Elect Stage 3 Off
11. All Elect Stages On
12. All Elect Stages Off
13. Elect SCR 25%
14. Elect SCR 50%
15. Elect SCR 75%
16. Elect SCR 100%
17. Steam 25% Open
18. Steam 50% Open
19. Steam 75% Open
20. Steam 100% Open
21. Steam 0% Open
22. Test Complete/Auto Release. When at this step, it will shut down all heat and remove the overrides.

Economizer Testing Steps

The economizer can be tested by placing the MJC MSC Testing Override into the Economizer Test Start state. Once in this state, the MJC MSC Economizer Test Override to the All Comp off state to start the test (State 2). off state to start the test (State 2).

1. Test Inactive
2. Start Test

   The test will not proceed to the next step until this state is verified. Once the MJC MSC Economizer Test Status indicates Test Ready, you can proceed with testing the following states.
3. Open Economizer
4. Close Economizer
5. Test Complete/Auto Release

All Tests Complete

When all testing is complete, override the MJC MSC Testing Override to state 25, Testing Disable/Auto Release to end testing. This will safely shut down the unit and release all testing override and allow the unit to resume automatic control.

Controls

Unit Controller

The MSC Uses the Symbio 500 control platform for monitoring and control. The expanshion modules (XM) are used to expand the Symbio 500's I/O capabilities.

Note: *The number after the dot in the name (example XM30.#) is the IMC bus address, which is set using the rotatry switches on each module.*

The following modules are located in the controls cabinet on the unit.

Table 21. Modules within controls cabinet

Symbio 500	All units
TD-7	
XM90.1	All units
XM30.2	5 and 6 fan units
XM30.4	Economizer Interfaces ordered
XM30.14	Compressor 6
XM32.15	Compressor 6

Remotely mounted in the compressor cassettes, the following modules are used.

Table 22. Remotely mounted modules within compressor cassettes

XM30.7	Last section on the unit
XM30.8	Compressor 1 section
XM30.9	Compressor 2 section
XM30.10	Compressor 3 section
XM30.11	Compressor 4 section
XM30.13	Compressor 6 section

Table 23. Symbio 500 points list

Hardware Connection	Point Name	Point Setup
BO1	Cooling Tower Pump Request	Open = Off, Closed = On
BO2	Unit Alarm Output Command	Open = Normal, Closed = Alarm
BO3	VAV Box Command Open	Open = Normal, Closed = Drive Max
BO4	Compressor 1 Command	Open = Off, Closed = On
BO5	Compressor 2 Command	Open = Off, Closed = On
BO6	Compressor 3 Command	Open = Off, Closed = On
BO7	Compressor 4 Command	Open = Off, Closed = On

Table 23. Symbio 500 points list (continued)

Hardware Connection	Point Name	Point Setup
BO8	Supply Fan Start Stop Command	Open = Off, Closed = On
BO9	Supply Fan Start Stop Command 2	Open = Off, Closed = On
AI1	Discharge Air Temperature	10K Ohm Resistor Trane Type 2
AI2	Return Air Temperature Local	10K Ohm Resistor Trane Type 2
AI3		
AI4		
AI5	Space Tempertaure Sensor	10K Ohm Resistor Trane Type 2
UI1	Refrigerant Leak Detection System Input Compressor	Open = Alarm, Closed = Normal
UI2	Refrigerant Leak Detection System Input Evaporator	Open = Alarm, Closed = Normal
BI1	Emergency Stop	Open = Auto, Closed = Stop
BI2	Occupancy Input	Open = Unoccupied, Closed = Occupied
BI3	Phase Monitor Status	Open = Normal, Closed = Alarm
AO1/BI4	Ventilation Input Status	Open = Normal, Closed = Alarm
AO2/BI5	Outdoor Air Damper Command	2 Vdc = 0% Open, 10 Vdc = 100% Open
PI1	Duct Static Pressure Local	Honeywell Pressure Sensor
PI2	Primary Filter Differential Pressure Local	Honeywell Pressure Sensor

Table 24. XM9.1 (Requires 50VA Transformer) points list

Hardware Connection	Point Name	Point Setup
BO1	Heat Output 1	Open = Off, Closed = On
BO2	Heat Output 2	Open = Off, Closed = On
BO3	Heat Output 3	Open = Off, Closed = On
BO4	Outdoor Air Damper (2 Position)	Open = Closed, Closed = Open
BO5	Supply Fan Status Output	Open = Off, Closed = On

Table 24. XM9.1 (Requires 50VA Transformer) points list (continued)

Hardware Connection	Point Name	Point Setup
BO6	Compressor 1 E-Stop Shutdown	Open = Normal, Closed = Estop Active
BO7	Compressor 1 VFD Alarm Reset	Open = Normal, Closed = Reset
BO8	Compressor 5 Command	Open = Off, Closed = On
UI1	Condensate Overflow Switch	Open = Alarm, Closed = Normal
UI2	Safety Circuit Status Compressor 2	Open = Circuit Open, Closed = Circuit Closed
UI3	Safety Circuit Status Compressor 3	Open = Circuit Open, Closed = Circuit Closed
UI4	Safety Circuit Status Compressor 4	Open = Circuit Open, Closed = Circuit Closed
UI5	High Pressure Cutout Compressor 1	Open = Alarm, Closed = Normal
UI6	High Pressure Cutout Compressor 2	Open = Alarm, Closed = Normal
UI7	High Pressure Cutout Compressor 3	Open = Alarm, Closed = Normal
UI8	High Pressure Cutout Compressor 4	Open = Alarm, Closed = Normal
UI9	Compressor 1 VFD Vfault	Open = Alarm, Closed = Normal
UI10	Compressor 1 Status	Open = Off, Closed = On
UI11	ECM Fault Supply Fan 1	Open = Alarm, Closed = Normal
UI12	ECM Fault Supply Fan 2	Open = Alarm, Closed = Normal
UI13	ECM Fault Supply Fan 3	Open = Alarm, Closed = Normal
UI14	ECM Fault Supply Fan 4	Open = Alarm, Closed = Normal
UI15	Condenser Water Flow Switch	Open = No Flow, Closed = Flow
UI16	External Auto Stop Input Status	Open = Stop, Closed = Auto
AO1/UI17	Supply Fan 1 Speed Command	0 Vdc = 0%, 10 Vdc = 100%
AO2/UI18	Supply Fan 2 Speed Command	0 Vdc = 0%, 10 Vdc = 100%
AO3/UI19	Supply Fan 3 Speed Command	0 Vdc = 0%, 10 Vdc = 100%
AO4/UI20	Supply Fan 4 Speed Command	0 Vdc = 0%, 10 Vdc = 100%

Table 24. XM9.1 (Requires 50VA Transformer) points list (continued)

Hardware Connection	Point Name	Point Setup
AO5/UI21	Compressor 1 Variable Speed Command	0 Vdc = 0%, 10 Vdc = 100%
AO6/UI22	Heating Output 1 Command	Open = Off, Closed = On
AO7/UI23	Compressor 5 High Pressure Cutout	Open = Alarm, Closed = Normal
AO8/UI24	Compressor 5 Safety Circuit Status	Open = Circuit Open, Closed = Circuit Closed

Table 25. XM30.2 points list

AO1/UI1	Supply Fan 5 ECM Fault	Open = Alarm, Closed = Normal
AO2/UI2	Supply Fan 5 Speed Command	0 Vdc = 0%, 10 Vdc = 100%
AO3/UI3	Supply Fan 6 ECM Fault	Open = Alarm, Closed = Normal
AO4/UI4	Supply Fan 6 Speed Command	0 Vdc = 0%, 10 Vdc = 100%

Table 26. XM30.4 points list

AO1/UI1	Outdoor Air Temperature Local	10K Ohm Resistor Trane Type 2
AO2/UI2	Outdoor Air Relative Humidity Local	4 Ma = 0%, 20Ma = 100%
AO3/UI3	Return Air Humidity Local	4 Ma = 0%, 20Ma = 100%
AO4/UI4	Mixed Air Low Temperature Cutout Alarm	Open = Alarm, Closed = Normal

Table 27. XM30.7 points list

AO1/UI1	Condenser Water Entering Temperature	10K Ohm Resistor Trane Type 2
AO2/UI2	Condenser Water Leaving Temperature	10K Ohm Resistor Trane Type 2
AO3/UI3	Condenser Screen Pressure Drop High	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI
AO4/UI4	Condenser Screen Pressure Drop Low	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI

Table 28. XM30.8 points list

AO1/UI1	Discharge Gauge Pressure Compressor 1	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI
AO2/UI2	Suction Gauge Pressure Compressor 1	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI

Table 28. XM30.8 points list (continued)

AO3/UI3	Suction Temperature Compressor 1	10K Ohm Resistor Trane Type 2
AO4/UI4	Compressor 1 Condenser Regulating Valve	2 Vdc = 0% Open, 10 Vdc = 100% Open

Table 29. XM30.9 points list

AO1/UI1	Discharge Gauge Pressure Compressor 2	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI
AO2/UI2	Suction Gauge Pressure Compressor 2	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI
AO3/UI3	Suction Temperature Compressor 2	10K Ohm Resistor Trane Type 2
AO4/UI4	Compressor 2 Condenser Regulating Valve	2 Vdc = 0% Open, 10 Vdc = 100% Open

Table 30. XM30.10 points list

AO1/UI1	Discharge Gauge Pressure Compressor 3	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI
AO2/UI2	Suction Gauge Pressure Compressor 3	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI
AO3/UI3	Suction Temperature Compressor 3	10K Ohm Resistor Trane Type 2
AO4/UI4	Compressor 3 Condenser Regulating Valve	2 Vdc = 0% Open, 10 Vdc = 100% Open

Table 31. XM30.11 points list

AO1/UI1	Discharge Gauge Pressure Compressor 4	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI
AO2/UI2	Suction Gauge Pressure Compressor 4	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI
AO3/UI3	Suction Temperature Compressor 4	10K Ohm Resistor Trane Type 2
AO4/UI4	Compressor 4 Condenser Regulating Valve	2 Vdc = 0% Open, 10 Vdc = 100% Open

Table 32. XM30.13 points list

AO1/UI1	Discharge Gauge Pressure Circuit 6	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI
AO2/UI2	Suction Gauge Pressure Circuit 6	0.5 Vdc = 0 PSI, 4.5 Vdc = 500 PSI

Table 32. XM30.13 points list (continued)

AO3/UI3	Suction Temperature Circuit 6	10K Ohm Resistor Trane Type 2
AO4/UI4	Circuit 6 Condenser Regulating Valve	2 Vdc = 0% Open, 10 Vdc = 100% Open

Table 33. XM30.14 points list

AO1/UI1	High Pressure Cutout Circuit 6	Open = Circuit Open, Closed = Circuit Closed
AO2/UI2	Safety Circuit Status Compressor 6A	Open = Circuit Open, Closed = Circuit Closed
AO3/UI3	Safety Circuit Status Compressor 6B	Open = Alarm, Closed = Normal
AO4/UI4		

Table 34. XM30.15 points list

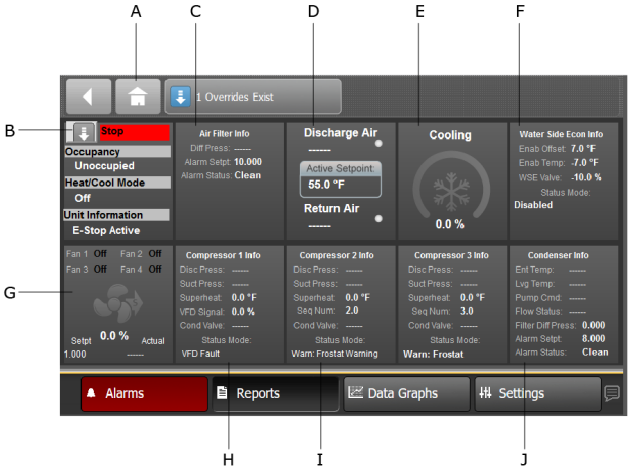
BO1	Compressor 6A Command	Open = Off, Closed = On
BO2	Compressor 6B Command	Open = Off, Closed = On
BO3		
BO4		

Navigating the TD-7

TD-7 Home Screen

To access the TD-7 home screen, press the **Home** button in the upper left of the screen.

Figure 47. Home screen



Screen Element	Description
A	Home button
B	Displays the local Auto Stop button and displays the occupancy, Heat/Cool Mode, and Unit Information.
C	Displays information about the Air Filter.
D	Displays the Discharge Air Temperature, Setpoint, and Return Air Temperature. A red light displays if the sensor fails.
E	Displays when cooling is active and indicates the % of cooling capacity currently utilized.
F	The Water Side Econ Info tile is included on units with an economizer installed. Displays a snapshot of economizer operations and the mode of the economizer.
G	Displays fan status (on, off), duct static pressure setpoint and actual, and fan percentage.
H	Compressor 1 is always the lead compressor. This tile displays the compressor pressures, superheat, VFD signal, condenser water values (if included), and operating mode.
I	Tiles for compressors 2-4 display, depending on the number of compressors installed. The VFD compressor is always the lead compressor. The fixed speed compressors rotate to even out run time. Compressor tiles displays the compressor pressures, superheat, VFD signal, condenser water values (if included), and operating mode.
J	Displays the entering and leaving temperatures, pump command, flow status, and the condenser alarm status.

TD-7 Reports

Unit Status Report

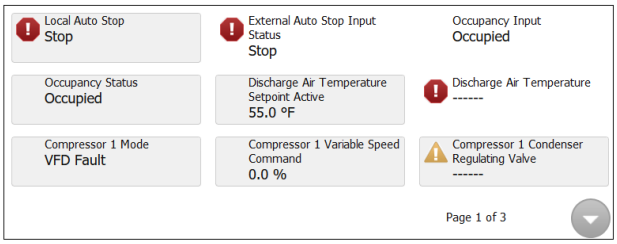
The Unit Status report provides an overview of how the unit is running and includes all available points that were pre-defined for the unit.

To access the Unit Status report:

1. Press the **Reports** button at the bottom of the screen.
2. Press **Unit Status** button.

Use the up and down arrows in the bottom right to scroll through the report.

Figure 48. Unit status report



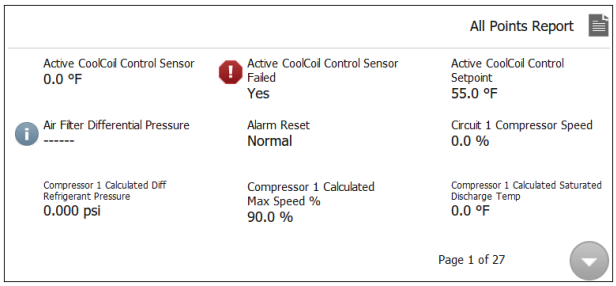
All Points Report

The All Points report provides details for all points for a unit. To access the All Points report:

1. Press the **Reports** button at the bottom of the screen.
2. Press the **All Points Report** button.

Use the up and down arrows in the bottom right to scroll through the report.

Figure 49. All points report



Starting the Unit

Before starting the unit, confirm:

- All checks are complete
- Alarms are cleared
- Compressors that you want to run are made available or locked out.

Local Auto/Stop Value

The Local Auto/Stop Value is used to stop by unit in a safe manner either locally in Tracer TU or at the TD-7 display. The factory default is set to **Auto**.

1. Navigate to the Home screen.
2. In the upper left tile, press the arrow next to either **Stop** or **Auto**.
3. To stop the unit, press the **Stop** button, or to put the unit in Auto default mode, press **Release Override**.

Figure 50. Local Auto/Stop

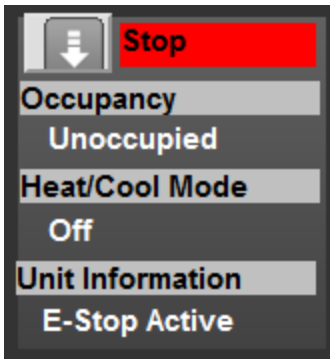
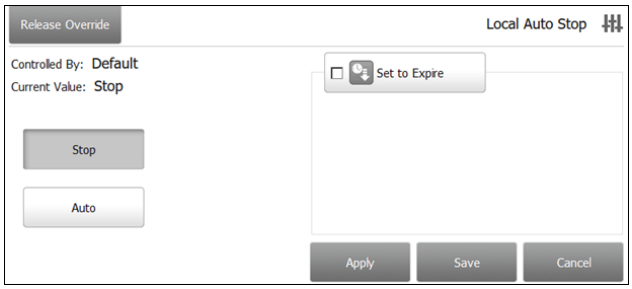


Figure 51. Stop or release override



Setpoint Adjustments

This section details control setpoints that can be modified from factory defaults and how to modify those setpoints.

Unit Setpoints

Table 35. Unit setpoints that can be modified in the TD-7

Setpoint Name	Description	Factory Default
Condenser Purge Time (on units with condenser valves only)	The amount of time (in minutes) that the compressor will open its condenser valve during purge mode when the unit is not operating.	20 minutes
Discharge Air Cooling Setpoint BAS	Used as the cooling setpoint on fixed setpoint units and on units that reset their discharge air temperature setpoint as the low value in the reset equation. This value should be set to the desired temperature needed for startup.	55° F
Discharge Air Cooling Setpoint Max BAS (reset DAT units only)	Sets the upper limit in the Reset Equation in Cooling Mode. This value can be adjusted to the desired maximum setpoint the discharge air should reach during cooling mode.	65° F
Discharge Air Heating Setpoint BAS (Units with Heat Only)	Used as the heating setpoint when the unit is in heating mode. This value should be set to the desired temperature needed for startup.	90° F
Discharge Air Low Temperature Cutout	Value that triggers a diagnostic when the discharge air temperature is below this value for 10 minutes. This value can be adjusted to the desired low air temperature, which triggers the diagnostic.	35° F
Duct Static Pressure Setpoint BAS	The duct static pressure setpoint is set by the analog value named duct static pressure setpoint BAS. This value should be set to the desired pressure needed for startup.	1 in (H_2O)
Duct Static Pressure Safety Lockout	Shuts down the unit if the duct static exceeds this setpoint. It should be set to the desired pressure needed for startup.	2 in (H_2O)
Dirty Air Filter DP	Generates a diagnostic for a dirty air filter when the differential pressure exceeds the setpoint.	10 in (H_2O)
Occupied Offset (DAT Reset Units Only)	Determines the occupied cooling and heating setpoints when the unit resets the discharge air temperature off either return or space temperature.	2° F
Occupied Standby Offset (DAT Reset Units Only)	Determines the occupied cooling and heating setpoints when the unit resets the discharge air temperature off either return or space temperature and is the occupied standby mode.	4° F
Space Temperature Setpoint BAS (DAT Reset by Space Temp Air Units Only)	Sets the space setpoint when the unit is selected to do discharge air reset based off the space temperature. This value is used to determine the occupied heating and cooling temperatures which reset the discharge air temperature setpoint.	72° F

Table 35. Unit setpoints that can be modified in the TD-7 (continued)

Setpoint Name	Description	Factory Default
Return Temperature Setpoint BAS (DAT Reset by Return Temp Air Units Only)	Sets the return setpoint when the unit is selected to do discharge air reset based off the return temperature. This value is used to determine the occupied heating and cooling temperatures which reset the discharge air temperature setpoint.	72° F
Water Side Economizer Enable Offset (Units with Water Side Economizer Only)	The temperature that the condenser entering water must be below the return air temperature before it will enable the economizer.	7° F
Water Side Economizer Sample Time (Units with Water Side Economizer Only)	Time that the controller will sample the water temperature for and compare it against the return air temperature to determine if the economizer can be enabled.	2 minutes

To modify any of the setpoints in the table above:

1. Press **Reports** at the bottom of the screen.
2. Press the **Unit Setpoints** button.
3. On the **Setpoint** report, locate the point in the menu. Use the arrows to scroll through the report if needed.
4. Use the up and down arrows to change the value, or press inside the box and type in the desired setpoint.
5. Press **Save.**

Unit Setup

Table 36. Unit setup setpoints that can be modified in the TD-7

Setpoint Name	Description	Factory Default
Condenser Control % of Design	Percent of the condenser pressure design the unit will control to and is user adjustable between 50-100%.	90%
Condenser Tee Strainer Sensor Calibration	The condenser water tee high and low pressure sensor can be calibrated to match the gauge readings or recorded readings by the balancer.	0
Condenser Purge Status (On Units with Condenser Valves Only)	Each compressor has its own condenser purge status value which indicates when the condenser valve is open in the purge mode. It can also be used to manually initiate the purge mode for each compressor.	Off
Condenser Water Flow Type (On Units with Condenser Valves Only)	Indicates if the unit is a constant or variable volume flow type unit. Even with the condenser water regulating valves installed on each compressor, the flow type can be changed. When the flow is changed from variable flow to constant flow, the water regulating valve will open to its maximum position when the unit is occupied. This can be done for constant volume flow systems that do not include a VFD Pump.	Variable flow
Water Side Economizer Lockout BAS (Units with Water Side Economizer Only)	The water side economizer can be locked out by the controls system.	Available
Compressor Lockout BAS	Each compressor can be locked out individually by the controls system.	Available
Fan Lockout BAS	Each fan can be locked out individually by the controls system. Fans should be made available prior to startup.	Available

To modify any of the setpoints in the table above:

1. Press **Reports** at the bottom of the screen.
2. Press the **Unit Setup** button.
3. On the **Setup** report, locate the point in the menu. Use the arrows to scroll through the report if needed.
4. Use the up and down arrows to change the value, or press inside the box and type in the desired setpoint.
5. Press **Save**.

Reports

To access Alarms, press the Alarms button in the lower left corner of the screen. If the Alarm tab is not blinking red, there are no alarms present.

Figure 52. Alarms tab

Compressor Alarms

If there is a compressor alarm, it will need to be manually reset after it is resolved. Each compressor needs to be reset manually:

1. Press **Reports** at the bottom of the display.
2. Press **Unit Setup**.
3. In the **Setup** report, locate the appropriate point. Use the arrows to scroll through the report if needed.
4. Select the specific compressor.
5. Change the value from Normal to **Reset**.
6. Press **Save**. The point will automatically revert to its default setting (Off).

Fan Alarms

If there is a fan alarm, it will need to be manually reset after it is resolved. There is one fan reset for the entire wall fan.

1. Press **Reports** at the bottom of the display.
2. Press **Unit Setup**.
3. In the **Setup** report, press **Supply Fan Failure Reset**. Use the arrows to scroll through the report if needed.
4. Press **Reset**.
5. Press **Save**.
6. When you want the fan to be available, press the **Release Override** button in the top left.

General Alarms

General alarms are alarms that are not tied to fans or compressors. They require a manual reset, and there is one alarm reset for these alarms.

To reset a general alarm:

1. Press **Reports** at the bottom of the display.
2. Press **Unit Setup**.
3. In the **Setup** report, press **Alarm Reset**. Use the arrows to scroll through the report if needed.
4. Press **Reset**.
5. Press **Save**.

Water Purge

NOTICE

Proper Water Treatment Required!

The use of untreated or improperly treated water could result in scaling, erosion, corrosion, algae or slime.

Use the services of a qualified water treatment specialist to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

During the unoccupied mode, water-cooled units will periodically circulate water through the condensers and waterside economizer if the user has enabled the purge function at the HI. The water purge function circulates water to introduce fresh water-treatment chemicals and help prevent water stagnation. The number of hours between each periodic purge, or purge duration, is user-defined at the HI between 1-999 hours. If the periodic purge timer expires while the unit is in occupied mode, it will wait for the next available unoccupied time before initiating water purge.

Contrary, if a request for cooling occurs during a purge sequence, purge will terminate and cooling will commence.

Pre-Startup

Before starting up units, perform the following procedure to confirm proper unit operation.

Pre-Startup Checklist

Complete this checklist after installing unit to verify all recommended installation procedures are complete before start-up. This does not replace the detailed instructions in the appropriate sections of this manual. Always read the entire section carefully to become familiar with the procedures.

Supply Fan

Confirm the fan rotates freely.

Ductwork

- Confirm trunk ductwork to VAV boxes is complete and secure to prevent leaks.
- Verify that all ductwork conforms to NFPA 90A or 90B and all applicable local codes.

Water-Cooled Unit Piping

Verify condensate drain, water piping drain plugs, economizer header, strainer pressure transducers, and condenser vent plug are installed.

Units with Hydronic Heat

Verify the entering water temperature sensor is installed upstream of the hydronic coil.

Electrical

Verify electrical connections are tight.

Components

- Verify liquid line service valve, and suction and discharge service valves if present, are open at start-up.

  Note: *Each compressor suction line contains a low pressure sensor that will shut the compressor down in low pressure situations.*

- Confirm system components are properly set and installed.

Start-Up

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

NOTICE

Compressor Damage!

Failure to follow instructions below will cause the compressor to operate in a vacuum and result in compressor damage.

Never manually or automatically pump down system below 7 psig.

NOTICE

Compressor Damage!

Failure to follow instructions could result in compressor damage.

Keep crankcase heaters on whenever refrigerant is in the system.

If crankcase heaters have not been on with refrigerant in the system, turn the crankcase heaters on for a minimum of 24 hours before starting compressors.

To start the unit, complete the following steps in order.

Review “,”“,”, if applicable. Confirm all steps were completed.

Final Refrigerant Charge

If full charge was not used during installation, follow these steps:

1. Determine remaining charge required by subtracting charge added during “,”“,” from the total.
2. With all circuit compressors running, SLOWLY meter remaining R-454B into the suction line from the LIQUID charging connection.

NOTICE

Compressor Damage!

Overcharging system could result in compressor failure and/or reduced compressor life.

Do not overcharge system. Excessive refrigerant charging can cause compressor liquid slugging at startup, and conditions where compressors and/or condenser fans short cycle.

NOTICE

Compressor Damage!

Failure to follow instructions below could result in compressor failure and/or reduced compressor life.

To prevent compressor liquid slugging, only add liquid in the suction line when the compressor is running. Use extreme caution to meter liquid refrigerant into the suction line slowly. If liquid is added too rapidly, compressor oil dilution and oil pumpout could occur.

3. Use an accurate scale to measure and record amount of R-454B added.
4. After unit has been operating for approximately 30 minutes at full load, measure and record operating pressures.
5. Repeat for other circuits.
6. Confirm, and adjust charge, if necessary, by checking subcooling at AHRI 340/360 full load operating conditions (80°/67°F db/wb entering evaporator, ~300 cfm/ton, 85°/95°F EWT/LWT).

   Some TXV superheat adjustment may be necessary, but only, after adequate subcooling has been reached.

   Water-cooled subcooling should be 8-10°F.

   Note: *Water-cooled subcooling should be 10.5°F – 12.5°F.*

Start-Up Procedure

Using the start-up log on the following pages, establish nominal conditions for consistent measurements as follows:

- Leaving air greater than 60°F
- Entering air temperature = 70 to 90°F
- Entering water temperature > 60°F

With all compressors running at full load:

1. Compute superheat from the suction line pressure and temperature at the compressor on each circuit. Adjust the thermal expansion valve settings if necessary. Superheat should be between 14 and 20°F.
2. Inspect refrigerant flow in the liquid line sight glass. Flow should be smooth and even, with no bubbles once the system has stabilized.

   Note: *Sight glass moisture indicator may show caution or wet at start-up. May need up to 12 hours of operation for system to reach equilibrium and correctly show moisture.*

Normal startup will occur provided Tracer™ Summit is not controlling the module outputs or the generic BAS is not keeping the unit off. To prevent Tracer Summit from affecting unit operation, remove Tracer wiring and make required changes to setpoint and sensor sources.

Start-Up Log

Unit:	
Unit Location:	
Unit Voltage	

Evaporator		
Evaporator fan motor horsepower:		
Evaporator fan motor amps:		
Evaporator fan rpm (actual):		
Evaporator system static (from test and balance report or actual readings)	**Supply duct static:**	**Return duct static:**
Evaporator system cfm (test and balance sheet or actual tested):		

Evaporator Air Conditioners (with all compressor operating)			
Entering		**Leaving**	
Dry-bulb °F:		**Dry-bulb °F:**	
Wet-bulb °F:		**Wet-bulb °F:**	

Circuit	**Compressor Amp Draw**		**Suction pressure, psig**	**Discharge pressure, psig**	**Superheat**	**Liquid line pressure, psig**	**Sub cooling °F**
	A	**B**					
Circuit A							
Circuit B							
Circuit C							
Circuit D							
Circuit E							
Circuit F							

Water-Cooled Units						
	Circuit A	**Circuit B**	**Circuit C**	**Circuit D**	**Circuit E**	**Circuit F**
Entering water temp °F						
Leaving water temp °F						
Entering water pressure psig						
Leaving water pressure psig						

Water-Cooled Units		
	Circuit A	**Circuit B**
Entering water temp °F		
Leaving water temp °F		
Entering water pressure psig		
Leaving water pressure psig		

Water-Cooled Units				
	Circuit A	Circuit B	Circuit C	Circuit D
Entering water temp °F				
Leaving water temp °F				
Entering water pressure psig				
Leaving water pressure psig				

Maintenance

Service Access

All service accessible areas are provided with hinged doors that allow doors to swing open or be removed completely.

To use as a hinge, simply open hinge handle, depress Y latch and swing door open.

To remove completely, open hinge handle and depress Y latch on back side of hinge. Work door off of unit being careful to not drop door.

Figure 53. Hinge

Note: *Evaporator door is 75 lbs and requires two-man lift to remove safely.*

Access unit controls through the front. The panel is secured with two quick release hinges. Hinged panels allow access to the fans and also the compressor and condensers. Hinges also allow for complete removal of panel. Left and right hinges allow for access to evaporator section and also allow for removable of the entire panel. Expansion valves and filter driers are easily accessible from here. Filters are accessible via a hinged panel.

Power is accessible through a hinged door on the unit (left hand is standard and right hand is optional). Hinge also allows for panel to be removed.

Air Filters

⚠ 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. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

Filter access doors are shared with the evaporator cassette access door. To replace throwaway filters, remove the dirty elements and install new filters with the filter directional arrows pointing toward the fan. Verify no air bypasses the filters. See Figure 54, p. 87 for proper filter placement.

Figure 54. Unit filter sizes

24 x 20	24 x 20	24 x 20	24 x 20
24 x 20	24 x 20	24 x 20	24 x 20
24 x 20	24 x 20	24 x 20	24 x 20

Electrical Components

Damaged sealed electrical components shall be replaced.

Intrinsically safe components that are damaged must be replaced.

Refrigerant System

If refrigerant system repair is required, Leak Test, Brazing and Evacuation Procedures are described.

Preliminary charging is described in the Installation–Mechanical section, “,”“,” and final charging is described in the Startup section, “,”.

Refrigerant systems that have been opened must have filter driers replaced and complete leak test and evacuation before recharging. Unit is equipped with replaceable filter core option for easy maintenance.

Refrigerant Leak Test Procedure

⚠ WARNING

Confined Space Hazards!

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

Do not work in confined spaces where refrigerant or other hazardous, toxic, or flammable gas may be leaking. Refrigerant or other gases could displace available oxygen to breathe, causing possible asphyxiation or other serious health risks. Some gases may be flammable and/or explosive. If a leak in such spaces is detected, evacuate the area immediately and contact the proper rescue or response authority.

⚠ WARNING

Explosion Hazard!

Failure to follow safe leak test procedures below could result in death or serious injury or equipment or property-only-damage.

Never use an open flame to detect gas leaks. Use a leak test solution for leak testing.

⚠ WARNING

Explosion Hazard!

Failure to follow these instructions could result in death or serious injury or equipment or property-only damage.

Use only dry nitrogen with a pressure regulator for pressurizing unit. Do not use acetylene, oxygen or compressed air or mixtures containing them for pressure testing. Do not use hydrogen mixtures containing refrigerant and air above atmospheric pressure for pressure testing as they may become flammable and could result in an explosion. Refrigerant, when used as a trace gas should only be mixed with dry nitrogen for pressurizing units.

⚠ WARNING

Explosion Hazard!

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

Do not exceed unit nameplate design pressures when leak testing system.

⚠ WARNING

R-454B Refrigerant under Higher Pressure than R-410A!

Failure to use proper equipment or components as described below, could result in equipment failing and possibly exploding, which could result in death, serious injury, or equipment damage.

The units described in this manual use R-454B refrigerant which operates at higher pressures than R-410A. Use ONLY R-454B rated service equipment or components with these units. For specific handling concerns with R-454B, please contact your local Trane representative.

⚠ 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.

Note: *These service procedures require working with refrigerant. Do not release refrigerant to the atmosphere! The service technician must comply with all federal, state, and local laws.*

When leak-testing refrigerant systems, observe all safety precautions. Leak test only one circuit at a time to minimize system exposure to potentially harmful moisture in the air.

System Repair

1. If system is water cooled with service valves, high and low side may be tested independently by closing liquid line angle valve and water cooled unit discharge line ball valve. Otherwise leave all valves open and DO NOT exceed low side design pressure.
2. Connect R-454B refigerant cylinder to charging port, add refrigerant to reach pressure of 12 to 15 psig.
3. Disconnect refrigerant cylinder. Connect dry nitrogen cylinder to high side charging port and increase pressure to 150 psig. DO NOT exceed unit nameplate design pressures. If testing complete system, low side design pressure is maximum.
4. Check piping and/or components as appropriate for leaks.
5. Recommend using electronic detector capable of measuring 0.1 oz/year leak rate.
6. If a leak is located, use proper procedures to remove the refrigerant/nitrogen mixture, break connections and make repairs. Retest for leaks.
7. Confirm all service valves are open.

Brazing Procedures

⚠ WARNING

Explosion Hazard and Deadly Gases!

Failure to follow all proper safe refrigerant handling practices could result in death or serious injury. Never solder, braze or weld on refrigerant lines or any unit components that are above atmospheric pressure or where refrigerant may be present. Always remove refrigerant by following the guidelines established by the EPA Federal Clean Air Act or other state or local codes as appropriate. After refrigerant removal, use dry nitrogen to bring system back to atmospheric pressure before opening system for repairs. Mixtures of refrigerants and air under pressure may become combustible in the presence of an ignition source leading to an explosion. Excessive heat from soldering, brazing or welding with refrigerant vapors present can form highly toxic gases and extremely corrosive acids.

Proper brazing techniques are essential when installing refrigerant piping. The following factors should be kept in mind when forming sweat connections:

1. When heating copper in the presence of air, copper oxide forms. To prevent copper oxide from forming inside the tubing during brazing, sweep an inert gas, such as dry nitrogen, through the tubing. A nitrogen flow of 1 to 3 cubic feet per minute is sufficient to displace the air in the tubing and prevent oxidation of the interior surfaces. Use a pressure regulating valve or flow meter to control the flow.
2. Confirm the tubing surfaces requiring brazing are clean, and that the tube ends are carefully reamed to remove any burrs.
3. Confirm the inner and outer tubes of the joint are symmetrical and have a close clearance, providing an easy slip fit. If the joint is too loose, the connection tensile strength is significantly reduced. Confirm the overlap distance is equal to the inner tube diameter.
4. Wrap each refrigerant line component with a wet cloth to keep it cool during brazing. Excessive heat can damage the internal components.

   Note: *Use 40-45% silver brazing alloy (BAg-7 or BAg-28) on dissimilar metals. Use BCup-6 brazing alloy on copper-to-copper joints.*
5. If using flux, apply it sparingly to the joint. Excess flux will contaminate the refrigerant system.
6. Apply heat evenly over the length and circumference of the joint.
7. Begin brazing when the joint is hot enough to melt the brazing rod. The hot copper tubing, not the flame, should melt the rod.
8. Continue to apply heat evenly around the joint circumference until the brazing material is drawn into the joint by capillary action, making a mechanically sound and gas-tight connection.
9. Visually inspect the connection after brazing to locate any pinholes or crevices in the joint. Use a mirror if joint locations are difficult to see.

System Evacuation Procedures

- Each refrigeration circuit must be evacuated before the unit can be charged and started.
- Use a rotary type vacuum pump capable of pulling a vacuum of 100 microns or less.
- Verify that the unit disconnect switch and the system control circuit switches are **OFF**.
- Oil in the vacuum pump should be changed each time the pump is used with high quality vacuum pump oil. Before using any oil, check the oil container for discoloration, which usually indicates moisture in the oil and/or water droplets. Moisture in the oil adds to what the pump has to remove from the system, making the pump inefficient.
- When connecting vacuum pump to refrigeration system, it is important to manifold vacuum pump to both high and low side of system (liquid line access valve and suction line access valve). Follow pump manufacturer's directions for proper methods of using vacuum pump.
- Lines used to connect the pump to the system should be copper and of the largest diameter that can practically be used. Using larger line sizes with minimum flow resistance can significantly reduce evacuation time.
- Rubber or synthetic hoses are not recommended for system evacuation. They have moisture absorbing characteristics that result in excessive rates of evaporation, causing pressure rise during standing vacuum test. This makes it impossible to determine if system has a leak, excessive residual moisture, or continual or high rate of pressure increase due to hoses.
- Install an electronic micron vacuum gauge in the common line ahead of the vacuum pump shutoff valve, as shown in Figure 55, p. 90. Close valves B and C, and open Valve A.
- Start vacuum pump. After several minutes the gauge reading will indicate the maximum vacuum the pump is capable of pulling. Rotary pumps should produce vacuums of 100 microns or less.

NOTICE

Motor Winding Damage!

Failure to follow instructions below could result in compressor motor winding damage.
Do not use a megohm meter or apply voltage greater than 50 VDC to a compressor motor winding while it is under a deep vacuum.

- Open valves B and C. Evacuate system to a pressure

of 300 microns or less. As vacuum is being pulled on system, it may appear that no further vacuum is being obtained, yet pressure is high. It is recommended during evacuation process to break vacuum to facilitate evacuation.

- To break the vacuum, shut valves A, B, and C and connect a refrigerant cylinder to charging port on manifold. Purge air from hose. Raise standing vacuum pressure in system to zero (0 psig) gauge pressure. Repeat process two or three times during evacuation.

Note: *It is unlawful to release refrigerant into the atmosphere. When service procedures require working with refrigerants, the service technician must comply with all Federal, State, and local laws.*

Standing Vacuum Test

Once 300 microns or less is obtained, close valve A and leave valves B and C open to allow the vacuum gauge to read the actual system pressure. Let system equalize for approximately 15 minutes. This is referred to as a standing vacuum test where time versus pressure rise. Maximum allowable rise over a 15 minute period is 200 microns. If pressure rise is greater than 200 microns but levels off to a constant value, excessive moisture is present. If pressure steadily continues to rise, a leak is indicated. Figure 56, p. 90 illustrates three possible results of standing vacuum test.

If a leak is encountered, repair the system and repeat the evacuation process until the recommended vacuum is obtained. Once the system has been evacuated, break the vacuum with refrigerant and complete the remaining Pre-Start procedures before starting the unit.

Figure 55. Typical vacuum pump hookup

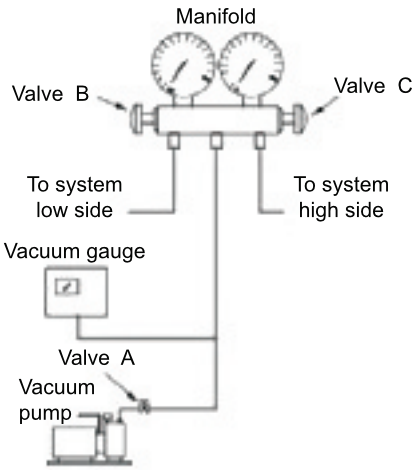
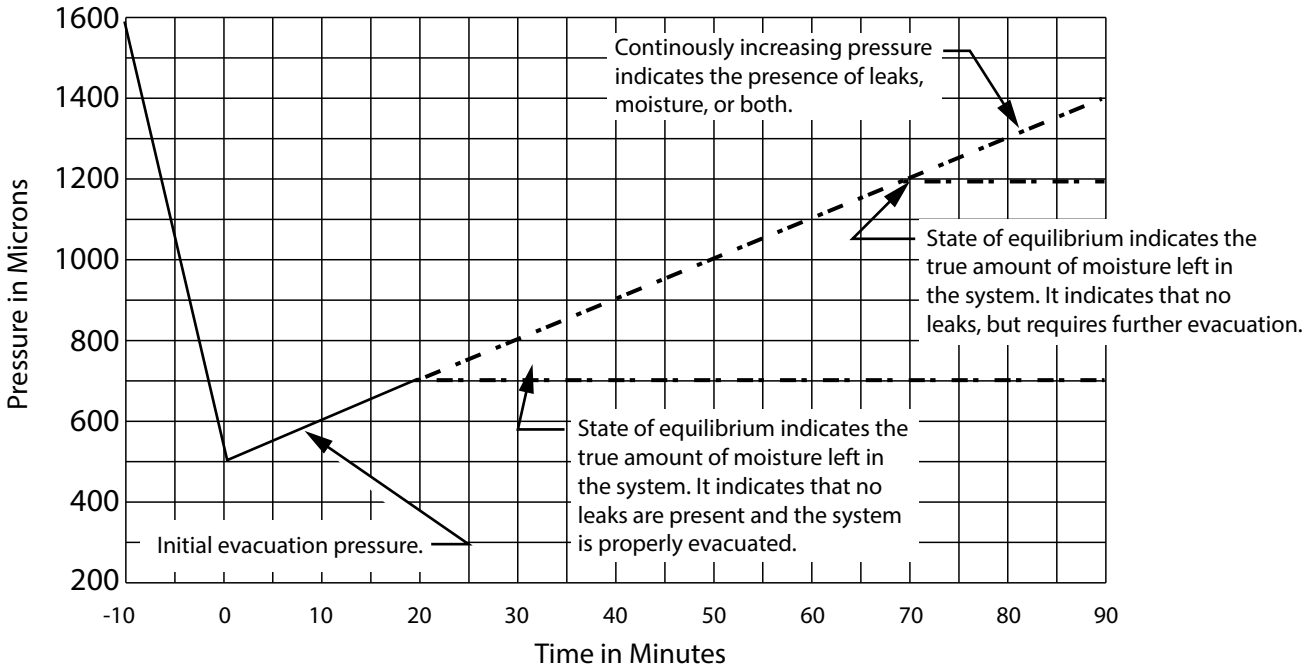


Figure 56. Evacuation time vs. pressure rise



Compressors

Scroll Compressor Failure Diagnosis and Replacement

If compressor failure is suspected, refer to *CSHD and CSHN/CSHL Compressors Installation and Service Installation Instructions* (COM-SVN01*-EN) for detailed information regarding compressor failure diagnosis and replacement of scroll compressors.

Components

Cleaning Coil Fin

⚠ WARNING

Hazardous Chemicals!

Failure to follow this safety precaution could result in death or serious injury. Coil cleaning agents can be either acidic or highly alkaline and can burn severely if contact with skin or eyes occurs.

Handle chemical carefully and avoid contact with skin. ALWAYS wear Personal Protective Equipment (PPE) including goggles or face shield, chemical resistant gloves, boots, apron or suit as required. For personal safety refer to the cleaning agent manufacturer's Materials Safety Data Sheet and follow all recommended safe handling practices.

⚠ 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. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

NOTICE

Coil Damage!

Failure to follow instructions below could result in coil damage.

Do not clean the refrigerant coil with hot water or steam as it could cause high pressure inside the coil tubing.

Do not use acidic chemical coil cleaners. Also, do not use alkaline chemical coil cleaners with a pH value greater then 8.5 (after mixing) without using an aluminum corrosion inhibitor in the cleaning solution.

- Keep coils clean to maintain maximum performance. For operation at its highest efficiency, clean the refrigerant coil often during periods of high cooling demand or when dirty conditions prevail. Clean the coil a minimum of once per year to prevent dirt buildup in the coil fins, where it may not be visible.
- Remove large debris from the coils and straighten fins before cleaning. Remove filters before cleaning.
- Clean refrigerant coils with cold water and detergent, or with one of the commercially available chemical coil cleaners. Rinse coils thoroughly after cleaning.
- Economizer and evaporator coils are installed so the evaporator is directly behind the economizer. To clean between the coils, remove the sheet metal block off. Access the block off by removing the corner panels on the left or right rear side of the unit.
- If the refrigerant coil is installed back to back with the waterside economizer coil, use a cleaner that is acceptable for cleaning both types of coils.

Inspecting and Cleaning Coils

Coils become externally fouled as a result of normal operation. Coil surface dirt reduces heat transfer ability and can cause comfort problems, increased airflow resistance and thus increased operating energy costs.

Inspect coils at least every six months or more frequently as dictated by operating experience. Cleaning frequently is dependent upon system operating hours, filter maintenance, efficiency, and dirt load. Following is the suggested method for cleaning steam and hot water coils.

Steam and Hot Water Coils

⚠ 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. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

1. Disconnect all electrical power to the unit.
2. Wear appropriate personal protective equipment (PPE).
3. Access both sides of the coil section.
4. Use a soft brush to remove loose debris from both sides of the coil.
5. Use a steam cleaning machine, starting from the top of the coil and working downward. Clean the leaving air side of the coil first, then the entering air side. Use a block-off to prevent steam from blowing through the coil and into a dry section of the unit.
6. Repeat step 5 as necessary. Confirm that the drain line is open following completion of the cleaning process.
7. Allow the unit to dry thoroughly before putting the system back into service.
8. Straighten any coil fins that may be damaged with a fin rake.
9. Replace all panels and parts and restore electrical power to the unit.
10. Confirm that contaminated material does not contact other areas of the equipment or building. Properly dispose of all contaminated materials and cleaning solutions.

Refrigerant Coils

⚠ 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. Verify with a CAT III or IV voltmeter rated per NFPA 70E that all capacitors have discharged.

1. Disconnect all electrical power to the unit.
2. Wear the appropriate personal protective equipment (PPE).
3. Access to the coil section of the unit (both sides).
4. Use a soft brush to remove loose debris from both sides of the coil.
5. Mix a high quality coil cleaning detergent with water according to the manufacturer's instructions. If the detergent is strongly alkaline after mixing (pH 8.5 or higher), it must contain an inhibitor. Carefully follow the cleaning solution manufacturer's instructions regarding product use.
6. Place the mixed solution in a garden pump-up sprayer or high pressure sprayer. If using a high pressure sprayer note the following:
   - Maintain a minimum nozzle spray angle of 15°.
   - Spray perpendicular to the coil face.
   - Protect other areas of the equipment and internal controls from contact with moisture or the cleaning solution.
   - Keep the nozzle at least 6 inches from the coil.
   - Do not exceed 600 psig.

Draining the Waterside Economizer Coil

NOTICE

Coil Freeze-Up!

Failure to follow instruction below could result in equipment damage.

Drain and vent coils when not in use. Trane recommends glycol protection in all possible freezing applications. Use a glycol approved for use with commercial cooling and heating systems and copper tube coils.

Drain plugs are in the piping below supply and return header for each coil. Use these plugs to drain the coil and piping. When draining the coil, open the vents at the top of the supply and return headers. Also, a drain plug is at the bottom of the inlet condenser manifold and in the outlet pipe near the left side of the unit. Remove these plugs to drain the condensers. Be sure to open the vent plugs at the top of the condenser inlet and outlet manifold. See .

When refilling the condenser/waterside economizer coil system with water, provide adequate water treatment to prevent the formation of scale or corrosion.

Chemically Cleaning the Condenser

NOTICE

Proper Water Treatment Required!

The use of untreated or improperly treated water could result in scaling, erosion, corrosion, algae or slime.

Use the services of a qualified water treatment specialist to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

Condensing water contains minerals that collect on the condenser tube walls. Cooling towers also collect dust and foreign materials that deposit in the condenser tube. The formation of scale or sludge in the condenser is indicated by a decreased water flow, low temperature difference between inlet and outlet water, and abnormally high condensing temperatures. To maintain maximum condenser efficiency, the condenser must remain free of built-up scale and sludge. Clean the condenser either mechanically or chemically.

Condensing water contains minerals that collect in the condenser. Cooling towers also collect dust and foreign materials that deposit in the condenser. The formation of scale or sludge in the condenser is indicated by a decreased water flow, low temperature difference between inlet and outlet water, and abnormally high condensing temperatures. To maintain maximum condenser efficiency, the condenser must remain free of built-up scale and debris. Clean the condenser chemically. This unit is equipped with removable and cleanable 20 mesh strainer. The unit is also equipped with differential pressure sensors that will alert the user when the strainer needs to be replaced. Proper maintenance and cleaning of the condenser is necessary to ensure proper performance of the unit.

1. Disconnect all electrical power to the unit.
2. Wear appropriate personal protective equipment (PPE).
3. Access both sides of the coil section.
4. Use a soft brush to remove loose debris from both sides of the coil.
5. Use a steam cleaning machine, starting from the top of the coil and working downward. Clean the leaving air side of the coil first, then the entering air side. Use a block-off to prevent steam from blowing through the coil and into a dry section of the unit.
6. Repeat step 5 as necessary. Confirm that the drain line

is open following completion of the cleaning process.

7. Allow the unit to dry thoroughly before putting the system back into service.
8. Straighten any coil fins that may be damaged with a fin rake.
9. Replace all panels and parts and restore electrical power to the unit.
10. Ensure that contaminated material does not contact other areas of the equipment or building. Properly dispose of all contaminated materials and cleaning solutions.

Chemical Cleaning of Condenser and Economizer Coil

Chemical cleaning removes scale deposits built up by minerals in the water. For a suitable chemical solution, consult a water treatment specialist. The condenser water circuit is composed of copper, steel, and cast iron. The chemical supply house should approve or provide all materials used in the external circulating system, along with the quantity of cleaning material, duration of cleaning time, and safety precautions necessary for handling the cleaning agent.

Sequence of Operations

Recognizing ScaleBreak®'s saturation point

Note: *Goodway Technologies ScaleBreak-MP is the recommended de-scaling solution.*

Understanding the cleaning effectiveness or scale dissolvability of ScaleBreak-MP during a cleaning is an important part of the procedural steps. This simple practice is designed to make sure the solutions activity level retains functionality. Performing these tests can be accommodated in two straightforward methods, by measuring the pH value of the circulating solution and mapping the readings or a simple calcium carbonate spot test of the circulating solution.

Testing the pH of the ScaleBreak-MP solution during a circulation is one method that will identify ScaleBreak-MP's activity level. The pH of ScaleBreak-MP starts out with a value of less than 3. As ScaleBreak-MP dissolves the deposits within the equipment, it absorbs the calcium into a liquid suspension, thus naturally neutralizing the solution. Frequent pH readings at intervals of every 10-15 minutes will allow you to map the solutions activity during a cleaning procedure.

Example: When testing the pH with a consistent pH reading below 3 and the solution abruptly rises, take additional readings to make sure this is a consistent pattern. If the pH has a consistent 5.5 reading or greater for multiple readings, the solution has become neutralized and it needs to add additional product to complete the cleaning. If its circulated for the recommended time duration, the pH did not go above 4 and its not visually seeing any additional bubbling and foaming, the cleaning is complete. You can now start flushing the piece of equipment with clean water.

A calcium carbonate spot test is performed by simply having a sample of your ScaleBreak-MP solution come in contact with a form of calcium carbonate. The calcium carbonate utilized can be a sample of the deposit you are cleaning, a calcium tablet or concrete. When you add the calcium to your ScaleBreak-MP solution, if the product is active, it will bubble and foam. If you add the calcium tablet and visualize little reaction, your solution is neutralized. You can perform this test with new ScaleBreak-MP so you understand how fresh product will react vs depleted. If your ScaleBreak-MP solution has lost its effectiveness, you will need to add fresh ScaleBreak-MP to complete the cleaning. If your ScaleBreak-MP remained active during the recommended cleaning duration, you can perform a clean water flush.

Note: *Deposits comprised primarily of rust (Fe_2O3) can give false pH readings. The pH value will remain low, yet the solution will be inactive. In situations where rust prevalent, the following calcium spot test is recommended.*

Circulation Pump Setup

Circulation pump can be setup completely external to the Modular Self Contained unit eliminating the need to remove panels for access. The entire system can be cleaned with this external setup.

Figure 57. Circulation pump

Figure 58. Typical setup for clean in place

Condenser in and out piping is factory equipped with a 3/4-inch internal NPT. Remove the plug that comes from the factory and install fittings as shown in this typical setup. It is recommended to install supply and return water valves.

Figure 59. Rear view of Circulation pump

Cleaning Instruction

Important: *When descaling the water side of a SWEP brazed plate heat exchanger please visit https://www.goodway.com/resources/calculators#/heat-exchanger to determine the amount of Goodway Scalebreak-MP needed and length of cleaning time. The information in the calculation tool allows you to adjust the amount of ScaleBreak-MP needed based on the thickness of scale in your SWEP BPHE. For more information visit www.goodway.com/swep.*

1. Isolate the heat exchanger from the system by closing the supply and return water valves.
2. Position a ball valve on the low point of the heat exchanger. This valve will function as the entry point for your ScaleBreak-MP cleaning and can be closed to prevent backflow if needed.
3. Attach your circulation hoses so you are pumping into the bottom of the heat exchanger and returning the fluid out the top.
4. Your exit point on top needs to be at the highest point of the exchanger. If the exit point is lower than the top of the plate pack, position the hose at a higher point. This action will insure the entire plate pack is flooded and ScaleBreak-MP comes in contact with all the interior wetted surfaces. It will also insure upper interior areas do not become air bound with CO_2 or foaming resulting from the cleaning.
5. Fill your exchanger with water and perform a hydrostatic test by turning your pump on and circulating the water. This action assures the exchanger is isolated and none of the ScaleBreak-MP will be needlessly lost.
6. You will need to bleed off enough water equal to the volume of ScaleBreak-MP required for the cleaning. If you relieve too much water, you can add some back to complete your circulation loop.
7. Water formed deposits will occupy volume, as a result, additional water may need to be added during the cleaning process as deposits are dissolved.
8. Periodically check your isolation valves as they may have initially seated against scale. As ScaleBreak-MP dissolves the scale, this action will help you avoid losing product.
9. Circulate the ScaleBreak-MP solution for the recommended timeframe as indicated by our calculation tool.
10. During your ScaleBreak-MP cleaning you will want to make sure your solution remains active. For this step, follow our “Testing ScaleBreak’s Effectiveness” procedure.
11. Once you have reached the recommended circulation time and your ScaleBreak-MP solution has completed the job, you can begin your flushing process.
12. Though ScaleBreak-MP is a biodegradable solution,

most facilities need to conform to pH discharge limits. ScaleBreak-MP® Neutralizer can be utilized to safely elevate your pH to meet your discharge limit so it can be flushed to the drain. Follow the instructions for this process in the ScaleBreak-MP Neutralizer information sheet.

13. To flush your heat exchanger, turn off your circulation pump, remove the return hose from your recirculation system and put it in a drain.
14. Add a fresh water hose to your recirculation bucket on your pump system and turn the pump back on.
15. Continue running clean water through the heat exchanger for 10-15 minutes or until the return water is running clear. This action will also flush out your pump system.
16. As an added safeguard you can reverse your hoses so you pump into the top and out the bottom. This action will flush away any debris that may have settled out the bottom of the exchanger.
17. Disconnect your hoses, close the valves you performed your circulation through and open the valves for the exchanger supply water.
18. Your heat exchanger can now be returned to service.

Notes:

- *Follow all local regulations for discharge.*
- *Follow all plant personal protective equipment guidelines as determined by your health and safety team.*
- *ScaleBreak-MP has very minimal corrosion rates, however, the application of ScaleBreak -Mp may reveal pre-existing under-deposit corrosion (UD) or microbiologically influenced corrosion (MIC). These types of corrosion can present themselves in the form of pitting, pin holes or similar types of damage.*
- *HCl based descaling solutions are one of the most common acid types used for descaling, however, it is NOT recommended for use brazed plate heat exchanger materials and may damage the equipment, and it therefore NOT recommended for use.*

Chemical Cleaning Economizer Coil

Chemical cleaning removes scale deposits built up by minerals in the water. For a suitable chemical solution, consult a water treatment specialist. The condenser water circuit is composed of copper, steel, and cast iron.

The chemical supply house should approve or provide all materials used in the external circulating system, along with the quantity of cleaning material, duration of cleaning time, and safety precautions necessary for handling the cleaning agent.

Piping Components

Water Valves

⚠ 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.

Water valves have a stern packing nut. If there is evidence of water leakage at the valve stem, proceed as follows:

1. Remove actuator motor from support plate.
2. Remove shaft coupling.
3. Torque the packing nut to 10-ft.-lbs. of torque.
4. Replace shaft coupling.
5. Replace actuator motor.

Flow Switch

Flow switches have a magnet on the vane assembly that attracts ferrous particulate. The particulate may build up on the magnet to the point that the vane will wedge and not operate properly. When the flow switch does not operate, remove and replace.

Maintenance Periodic Checklists

⚠ WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels 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 following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

Monthly Checklist

The following check list provides the recommended maintenance schedule to keep the commercial self-contained equipment running efficiently.

1. Inspect unit air filters. Clean or replace if airflow is blocked or if filters are dirty.
2. Inspect coils for excess moisture or icing. Icing on the coils may indicate low airflow supply, restricted airflow from dirty fins, evaporator frost protection sensor problems, or a shortage of refrigerant flowing through the coil.
3. Check that condensate from the evaporator and economizer coils flows freely through the condensate piping, traps, drain pan, and drainage holes. Remove algae and or any airflow obstructions.
4. Check the condition and tension of fan belts. Adjust tension if belts are floppy or squeal continually. Replace worn or fraying belts in matched sets.

   Note: *Check belt tension and adjust it at least twice daily the first days of new belt operation. Belt tension will rapidly decrease until the belts are run in.*
5. Check the liquid line sight glasses during operation. Bubbles in the sight glasses indicate a possible shortage of refrigerant or an obstruction in the liquid lines, e.g. dirty liquid line filter driers.
6. Inspect filter driers for leaks, flow obstructions, or temperature drop across the filter drier. A noticeable temperature differential, e.g. 5°F, in the liquid line may indicate an obstruction. Replace the filter drier if it appears clogged.
7. Inspect the optional waterside economizer coil. Clean the coil to prevent airflow restrictions through the fins.
8. Check and record operating pressures.

Semi-Annual Maintenance

⚠ WARNING

Rotating Components!

Failure to disconnect power before servicing could result in rotating components cutting and slashing technician which could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

1. Verify the fan motor is properly lubricated. Follow lubrication recommendations on the motor tag or nameplate. Contact the motor manufacturer for more information.
2. Lubricate fan bearings. For best results, lubricate bearings during unit operation. Refer to the “Fan Bearings” section for recommended grease.

   Note: *The bearings are manufactured using a special synthetic lithium-based grease designed for long life and minimum lube intervals. Over lubrication can be just as harmful as not enough.*
3. With power disconnected, manually rotate the fan wheel to check for obstructions in the housing or interference with fan blades. Remove obstructions and debris. Center the fan wheel if necessary.Inspect for any damage to fan blades and housing. Check impeller for wear/deposits/corrosion and damage.
4. Check the fan assembly sheave alignment. Tighten set screws to their proper torques.
5. Check water valves for leakage at valve stem packing nut.

   Note: *Perform this procedure monthly if the unit is in a coastal or corrosive environment.*

Annual Maintenance

Check and tighten all set screws, bolts, locking collars and sheaves.

1. Inspect, clean, and tighten all electrical connections.
2. Visually inspect the entire unit casing for chips or corrosion. Remove rust or corrosion and repaint surfaces.
3. Visually check for leaks in refrigerant piping.
4. Inspect fan, motor, and control contacts. Replace badly worn or eroded contacts.
5. Inspect the thermal expansion valve sensing bulbs for cleanliness, good contact with the suction line, and adequate insulation from ambient air.
6. Verify the superheat setting is 12°F to 17°F at the compressor.

When checking operating pressures and conditions, establish the following nominal conditions for consistent measurements.

- Leaving air temperature greater than 60°F.
- Entering air temperature is 80°F to 90°F.
- Entering water temperature greater than 65°F.
- Compressors running at full load.
- Drain the condensing water system and inspect it thoroughly for fouling; clean if necessary.

Diagnostics

Troubleshooting

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

Before proceeding with technical trouble charts or controls checkout, complete the following system analysis:

1. Measure actual supply voltage at the compressor and an motor terminals with the unit running. Voltage must be within the range listed on the motor nameplate. Phase imbalance must be less than 2.0 percent.
2. Check all wiring and connections to be sure that they are intact, secure and properly routed. The as wired system diagrams are provided in the unit control panel.
3. Check that all fuses are installed and properly sized.
4. Inspect air filters and coils to be sure that airflow to the unit is not restricted.
5. Check the zone thermostat settings.
6. Confirm the fan is rotating in the proper direction. If phasing is wrong at the main power terminal block, the fan and compressors will not run correctly.
7. Inspect ductwork and duct connections for tightness.

Operating Procedures

Install pressure gauges on the discharge and suction line access valves. When the unit has stabilized (after operating approximately 15 minutes at full load), record suction and discharge pressures. System malfunctions such as low airflow, line restrictions, incorrect refrigerant charge, malfunctioning of expansion valves, damaged compressors, etc. will result in pressure variations which are outside the normal range.

Note: *If phasing at the main incoming power terminal is incorrect, switch two of the three incoming power leads. If a compressor has been replaced and the phase is changed at the compressor, it will run backwards and discharge pressure will be very low. To resolve incorrect compressor wire phasing, change phasing at the compressor.*

It is important that pressures be measured under stable and constant conditions in order for the readings to be useful.

Voltage Imbalance

Voltage imbalance on three-phase systems can cause motor overheating and premature failure. Maximum allowable imbalance is 2.0 percent, and the readings used to determine it must be measured at the compressor terminals.

Voltage imbalance is defined as 100 times the sum of the division of the three voltages from the average voltage. If, for example, the three measured voltages are 221, 230, 227, the average is:

$$\frac{221 + 230 + 227}{3} = 226 \text{ volts}$$

Therefore, the percentage of voltage imbalance is:

100*(226-221)/226 = 2.2%

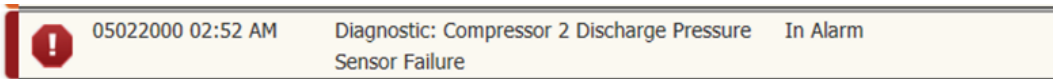
In this example, 2.2 percent imbalance of more than 2.0 percent exists, be sure to check the voltage at the unit disconnect and terminal block switch. If an imbalance at the unit disconnect switch does not exceed 2.0 percent, the imbalance is caused by faulty wiring within the unit. Be sure to conduct a thorough inspection of the unit electrical wiring connections to locate the fault, and make any repairs necessary.

Table 37. Potential unit issues and solutions

Problem	Possible Cause	Remedy
Drain pan is overflowing	Plugged drain line Unit not level	Clean drain line Level unit
Standing water in drain pan	Unit not level Plugged drain line	Level Unit Clean drain line
Wet interior insulation	Coil face velocity too high Improper trap design Drain pan leaks/overflowing Condensation on surfaces	Reduce fan speed Design trap per unit installation instructions Repair Leaks Insulate surfaces
Excess dirt in unit	Missing filters Filter bypass	Replace filters Reduce filter bypass
Microbial growth (mold)	Standing water in drain pan	See "Standing water in drain pan" above

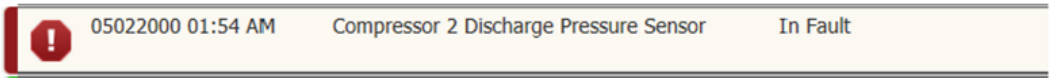
Table 38. Compressor alarming

Diagnostic: Compressor (1-4) Discharge Pressure Sensor Failure (In Alarm)



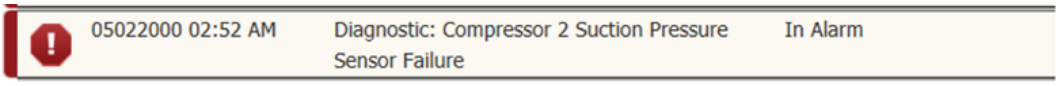
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this diagnostic is cleared.	The Pressure sensor is calculated to be in fault and the unit has locked out the compressor from operation.	• Sensor has lost its 5 Vdc Source Signal. Verify that the sensor has 5 Vdc. • Sensor is not wired properly: Verify wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • System has no charge: Verify that the system has a refrigerant charge. • Sensor has failed.	Manual Reset required once the sensor is in a Normal State. User must toggle the Compressor (1-4) Failure Reset.

Diagnostic: Compressor (1-4) Discharge Pressure Sensor Failure (In Fault)



Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this sensor is in a normal state.	The Pressure sensor is reading either Above or Below its minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor has lost its 5 Vdc Source Signal. Verify that the sensor has 5 Vdc. • Sensor is not wired properly: Verify wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. System has no charge: Verify that the system has a refrigerant charge. • Sensor has failed.	None, fault clears once sensor is in a normal state.

Diagnostic: Compressor (1-4) Suction Pressure Sensor Failure (In Alarm)



Notification Class	Action	Reason	Typical Causes	Reset Required

Table 38. Compressor alarming (continued)

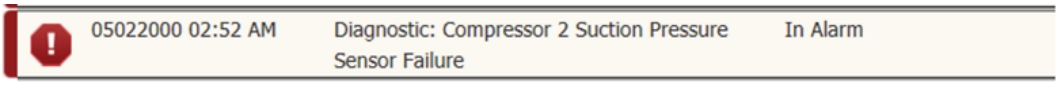
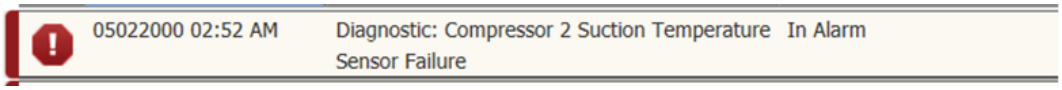
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this diagnostic is cleared.	The Pressure sensor is calculated to be in fault and the unit has locked out the compressor from operation.	• Sensor has lost its 5 Vdc Source Signal. Verify that the sensor has 5 Vdc. • Sensor is not wired properly: Verify wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • System has no charge: Verify that the system has a refrigerant charge. • Sensor has failed.	Manual Reset required once the sensor is in a Normal State. User must toggle the Compressor (1-4) Failure Reset.
Diagnostic: Compressor (1-4) Suction Pressure Sensor Failure (In Fault)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this sensor is in a normal state.	The Pressure sensor is reading either above is maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor has lost its 5 Vdc Source Signal. Verify that the sensor has 5 Vdc. • Sensor is not wired properly: Verify wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. System has no charge: Verify that the system has a refrigerant charge. • Sensor has failed.	None, alarm clears once sensor is in a normal state.
Diagnostic: Compressor (1-4) Suction Temperature Sensor Failure (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this diagnostic is cleared.	The Temperature sensor is calculated to be in fault and the unit has locked out the compressor from operation.	• Sensor is not wired properly: Verify wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has failed. Verify if sensor has any resistance on it, should be 8-12k of resistance on the thermistor.	Manual Reset required once the sensor is in a Normal State. User must toggle the Compressor (1-4) Failure Reset.

Table 38. Compressor alarming (continued)

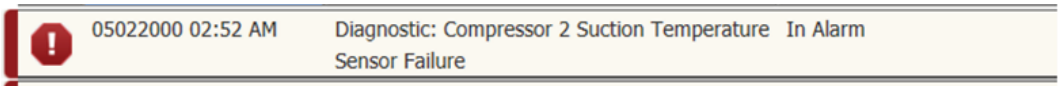
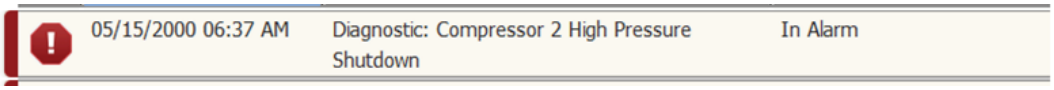
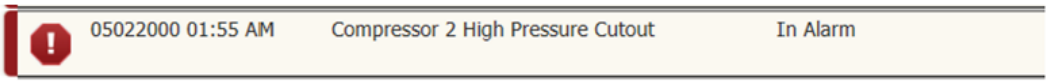
Diagnostic: Compressor (1-4) Suction Temperature Sensor Failure (In Fault)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this sensor is in a normal state.	The temperature sensor is reading either above is maximum value or below is minimum value, resulting in an Alarm Condition after 3 point updates.	• Sensor has lost its 5 Vdc Source Signal. Verify that the sensor has 5 Vdc. • Sensor is not wired properly: Verify wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. System has no charge: Verify that the system has a refrigerant charge. • Sensor has failed.	None, alarm clears once sensor is in a normal state.
Diagnostic: Compressor (1-4) High Pressure Shutdown (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this diagnostic is cleared.	The temperature sensor is reading either above is maximum value or below is minimum value, resulting in an Alarm Condition after 3 point updates.	• Sensor is not wired properly: Verify wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Discharge Pressure is too high and over the cutout threshold of the High Pressure Switch. Verify Condenser Pressure. • Cutout Switch has failed.	Manual Reset required once the sensor is in a Normal State. User must toggle the Compressor (1-4) Failure Reset.
Compressor (1-4) High Pressure Cutout (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**

Table 38. Compressor alarming (continued)

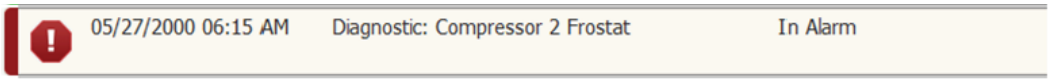
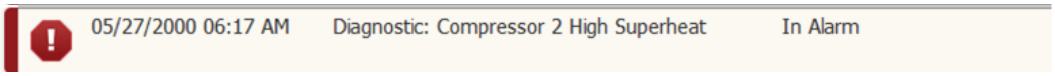
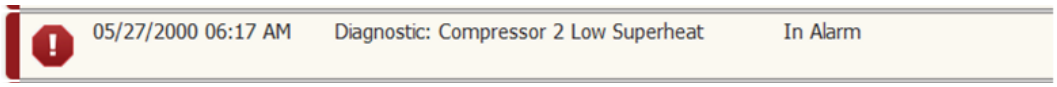
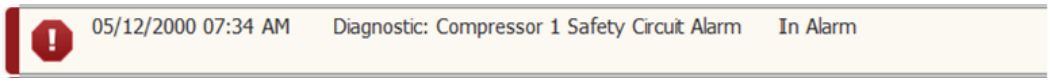
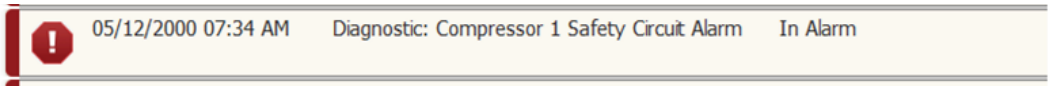
HVAC Critical Alarm.	The High Pressure cutout switch is reading a closed condition which indicates.	The temperature sensor is reading either above is maximum value or below is minimum value, resulting in an Alarm Condition after 3 point updates.	• Sensor is not wired properly: Verify wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Discharge Pressure is too high and over the cutout threshold of the High Pressure Switch. Verify Condenser Pressure. • Cutout Switch has failed.	None, alarm clears once sensor is in a normal state.
Diagnostic: Compressor (1-4) Frostat (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this diagnostic is cleared.	The Calculated Saturated Suction Refrigerant Temperature is below 32 degrees for 5 minutes.	• Low Airflow across the Evaporator. • Partially blocked Evaporator. • Dirty Air Filter. • Dirty Evaporator Coil.	Manual Reset required once the issue is resolved. User must toggle the Compressor (1-4) Failure Reset.
Diagnostic: Compressor (1-4) High Superheat (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this diagnostic is cleared.	The Calculated superheat is above 25 degrees for 10 minutes.	• Low Charge on unit. • Malfunctioning TXV. • Too high of a heat load. • Too much air across the evaporator.	Manual Reset required once the issue is resolved. User must toggle the Compressor (1-4) Failure Reset.
Diagnostic: Compressor (1-4) Low Superheat (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**

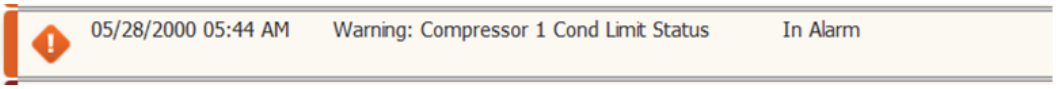
Table 38. Compressor alarming (continued)

HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this diagnostic is cleared.	The Calculated superheat is below 4 degrees for 5 minutes.	• Over Charge on unit. • Malfunctioning TXV. • Dirty Condenser tubes. • TXV Bulb is not strapped tightly to suction line. • Too little air across the evaporator.	Manual Reset required once the issue is resolved. User must toggle the Compressor (1-4) Failure Reset.
Diagnostic: Compressor 1 Safety Circuit Alarm (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this diagnostic is cleared.	The Compressor VFD has indicated that it's in fault or the Compressor is commanded on but does not indicate status.	• VFD has an issue. • Relay starting compressor is malfunctioning. • XM Module commanding compressor relay is failed or not communicating.	Manual Reset required once the issue is resolved. User must toggle the Compressor 1 Failure Reset.
Diagnostic: Compressor (2-4) Safety Circuit Alarm (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Compressor will be locked out and prevented from running until this diagnostic is cleared.	The Compressor Protection module has indicated an alarm or the Compressor is commanded on but does not indicate status.	• VFD has an issue. • Relay starting compressor is malfunctioning. • XM Module commanding compressor relay is failed or not communicating.	Manual Reset required once the issue is resolved. User must toggle the Compressor 1 Failure Reset.

Note: *These Alarms will affect the operation of the compressor.*

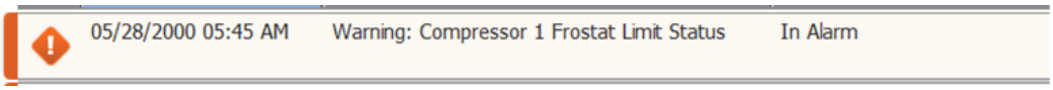
Table 39. Compressor warning

Warning: Compressor 1 Cond Limit Status (In Alarm)



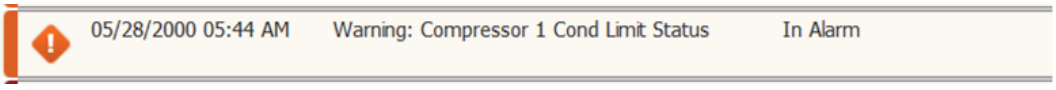
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Warning.	Compressor speed will be limited to keep the compressor from exceeding the Condenser Control Pressure Setpoint.	Head Pressure has exceeded the condenser Control Pressure Setpoint.	• High Condenser Water Temperature. • Malfunctioning TXV. • Non Condensable in the refrigerant. • Low water flow in the condenser, or no water flow. • Condenser Valve malfunctioning.	No Reset required, Warning clears when conditions no longer exists.

Warning: Compressor 1 Frostat Limit Status (In Alarm)



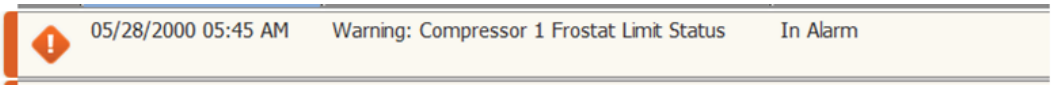
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Warning.	Compressor speed will be limited to keep the compressor from causing frost buildup on the evaporator coil.	The Saturated suction refrigerant temperature is calculated to be below 36 degrees.	• Low Airflow across the coil. • Malfunctioning TXV. • Dirty Air Filters. • Dirty Evaporator Coil.	No Reset required, Warning clears when conditions no longer exists.

Warning: Compressor (2-4) High Discharge Press Warning (In Alarm)



Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Warning.	No action is taken on the fixed speed compressor, this is an informational warning only.	Head Pressure has exceeded the condenser Control Pressure Setpoint.	• High Condenser Water Temperature. • Malfunctioning TXV. • Non Condensable in the refrigerant. • Low water flow in the condenser, or no water flow. • Condenser Valve malfunctioning.	No Reset required, Warning clears when conditions no longer exists.

Warning: Compressor (2-4) Frostat Warning (In Alarm)



Notification Class	Action	Reason	Typical Causes	Reset Required

Table 39. Compressor warning (continued)

HVAC Warning.	No action is taken on the fixed speed compressor, this is an informational warning only.	The Saturated suction refrigerant temperature is calculated to be below 36 degrees.	• Low Airflow across the coil. • Malfunctioning TXV. • Dirty Air Filters. • Dirty Evaporator Coil.	No Reset required, Warning clears when conditions no longer exists.

Note: *These warnings are generated to alert the end user to a potential condition.*

Table 40. Supply fan alarms

Supply Fan (1-6) Failure (In Fault)

Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Critical Alarm.	Fan will be locked out and prevented from running until this diagnostic is cleared.	The supply fan was commanded on and a VFD Fault was detected.	• VFD Fan circuit Breaker is open. • VFD Fan has over amped. • VFD Fan has lost a phase.	Manual Reset required once the issue is resolved. User must toggle the Supply Failure Reset.

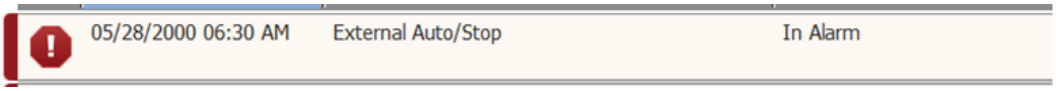
Note: *These failures are generated by each fan and will lock out that fan when active.*

Emergency Stop (In Alarm)

Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Critical Alarm.	Unit will shut down and be prevented from operating until the sensor is in a normal state.	The emergency stop input has an open condition which indicates an emergency stop command.	Emergency Stop Binary Input is open.	Manual reset required once the issue is resolved. User must toggle the alarm reset value.

Table 41. General unit alarming

External Auto/Stop (In Alarm)



Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Critical Alarm.	Unit will shut down and be prevented from operating until the sensor is in a normal state.	The external auto/stop input has an open condition which indicates an emergency stop command.	Emergency stop binary input is open.	None, alarm clears once sensor is in a normal state.

Local Auto/Stop (In Alarm)

Table 41. General unit alarming (continued)

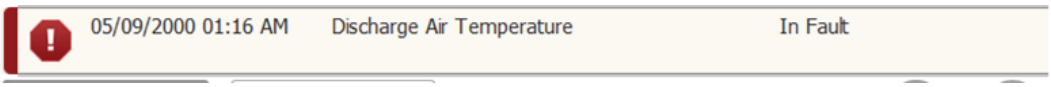
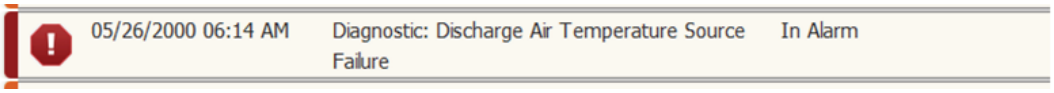
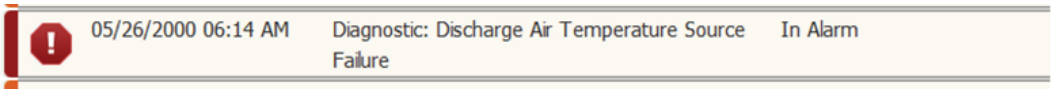
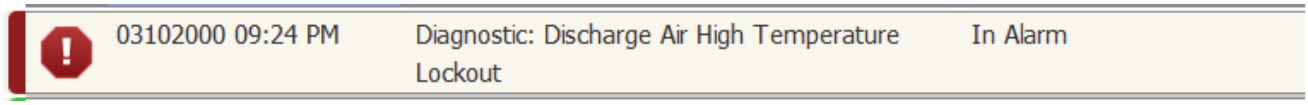
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Critical Alarm.	Unit will shut down and be prevented from operating until the sensor is in a normal state.	The local auto/stop value has been commanded to the local stop command.	Emergency stop binary input is open.	None, alarm clears once sensor is in a normal state.
Discharge Air Temperature (In Fault)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Unit will shut down and be prevented from running until this sensor is in a normal state.	The temperature sensor is reading either above is maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor is not wired properly: Verify sensor wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has Failed. Verify if sensor has any resistance on it, should be 8-12k of resistance on the thermistor.	None, alarm clears once sensor is in a normal state.
Diagnostic: Discharge Air Temperature Source Failure (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Unit will shut down and be prevented from running until this sensor is in a normal state.	The temperature sensor is reading either above is maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor is not wired properly: Verify sensor wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has Failed. Verify if sensor has any resistance on it, should be 8-12k of resistance on the thermistor.	Manual Reset Required once the issue is resolved. User must toggle the Alarm Reset value.
Diagnostic: Discharge Air Low Temperature Source Failure (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Unit will shut down and be prevented from running until this sensor is in a normal state.	The discharge air temperature is less than or equal to the Discharge Air Low Temperature Cutout for 10 minutes.	Cold entering air to the unit.	Manual Reset Required once the issue is resolved. User must toggle the Alarm Reset value.

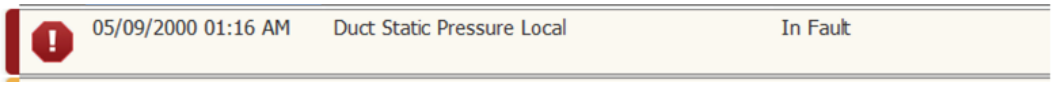
Table 41. General unit alarming (continued)

Diagnostic: Discharge Air High Temperature Source Failure (In Alarm)



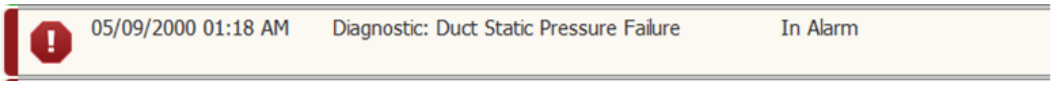
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Critical Alarm.	Unit will shut down and be prevented from running until this sensor is in a normal state.	The discharge air temperature is more than or equal to the Discharge Air High Temperature Cutout for 10 minutes.	• Hot Entering Air to the unit. • Hot Water valve stuck open.	Manual Reset Required once the issue is resolved. User must toggle the Alarm Reset value.

Duct Static Pressure Failure (In Fault)



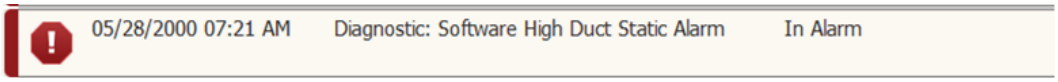
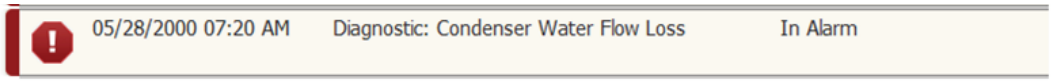
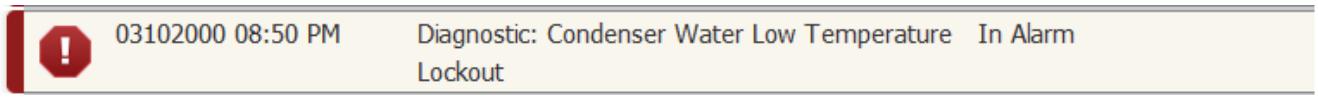
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Critical Alarm.	Unit will shut down and be prevented from running until this sensor is in a normal state.	The Pressure sensor is reading either above its maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor is not wired properly: Verify sensor wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has Failed. Use the Pressure Transducer Troubleshooting guide in the IOM to diagnose if the sensor is operating properly.	None, alarm clears once sensor is in a normal state.

Diagnostic: Duct Static Pressure Failure (In Fault)



Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Critical Alarm.	Unit will shut down and be prevented from running until this sensor is in a normal state.	The Pressure sensor is reading either above its maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor is not wired properly: Verify sensor wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has Failed. Use the Pressure Transducer Troubleshooting guide in the IOM to diagnose if the sensor is operating properly.	Manual Reset Required once the issue is resolved. User must toggle the Alarm Reset value.

Table 41. General unit alarming (continued)

Diagnostic: Software High Duct Static Alarm (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Unit will shut down and be prevented from running until this sensor is in a normal state.	The Duct Static Pressure sensor is reading above the Duct Static Pressure Safety Lockout Setpoint.	• VAV Boxes are closed down. • Restriction in ductwork.	Manual Reset Required once the issue is resolved. User must toggle the Alarm Reset value.
Diagnostic: Condenser Water Flow Loss (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	The Compressors will be shut down and prevented from running until the condition is resolved.	The Condenser Water Flow Switch input is open indicating a no water flow condition.	• Pumps not running. • Valves are closed. • Strainer is plugged.	Manual Reset Required once the issue is resolved. User must toggle the Alarm Reset value.
Diagnostic: Condenser Water Low Temperature Lockout (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Critical Alarm.	Unit will shut down and be prevented from running until this sensor is in a normal state.	The Condenser Water entering or leaving temperature is below 35 degrees for 10 minutes.	• Cold Outdoor temperatures at cooling tower. • Cold incoming air into the unit.	Manual Reset Required once the issue is resolved. User must toggle the Alarm Reset value.

Note: *These alarms are generated by sensors on the unit not related to the Fans or Compressors and will shut down the unit.*

Table 42. General unit warning

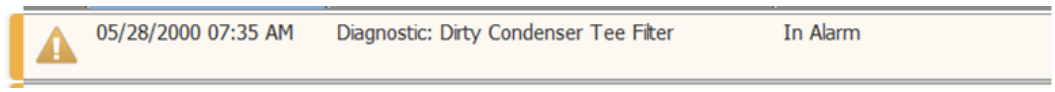
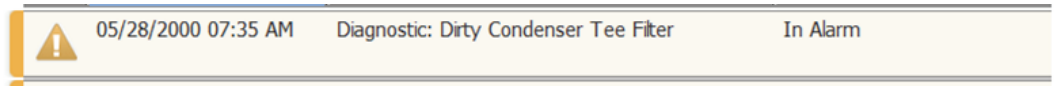
Diagnostic: Dirty Air Filter (In Alarm)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Service Required.	No action taken other than to notify end user of condition.	The Filter differential pressure is greater than the Dirty Air Filter DP Setpoint.	• Filters are dirty. • Fan speed is too great. • Failed Pressure sensor.	Manual Reset Required once the issue is resolved. User must toggle the Filter Alarm Reset value.
Diagnostic: Dirty Condenser Tee Filter (In Alarm)				
				

Table 42. General unit warning (continued)

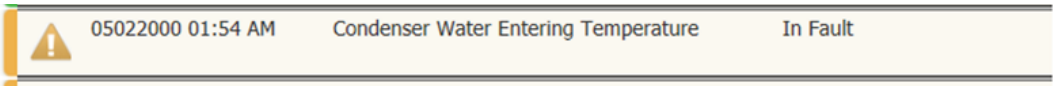
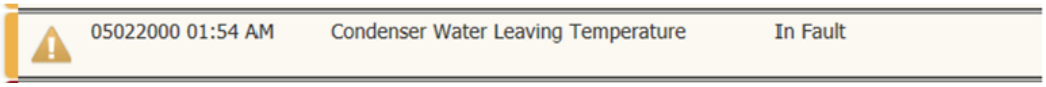
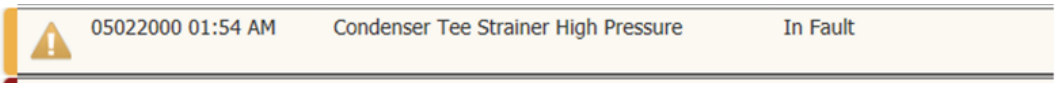
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	No action taken other than to notify end user of condition.	The Condenser Tee differential pressure is greater than the Condenser Tee Strainer Diff Pressure Alarm Setpoint for 1 minute.	• Failed Pressure sensor. • Strainer is dirty.	Manual Reset required once the issue is resolved. User must toggle the Alarm Reset value.
Condenser Water Entering Temperature (In Fault)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Service Required.	Only affects the Water Side Economizer, if installed, from operating until this sensor is in a Normal State.	The Pressure sensor is reading either above is maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor is not wired properly: Verify sensor wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has failed. Verify if sensor has any resistance on it, should be 8-12k of resistance on the thermistor.	None, alarm clears once sensor is in a normal state.
Condenser Water Leaving Temperature (In Fault)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Service Required.	Only affects the Water Side Economizer, if installed, from operating until this sensor is in a Normal State.	The Pressure sensor is reading either above is maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor is not wired properly: Verify sensor wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has failed. Verify if sensor has any resistance on it, should be 8-12k of resistance on the thermistor.	None, alarm clears once sensor is in a normal state.
Condenser Tee Strainer High Pressure (In Fault)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**

Table 42. General unit warning (continued)

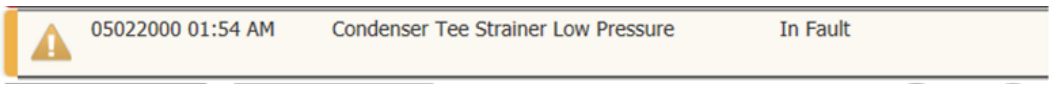
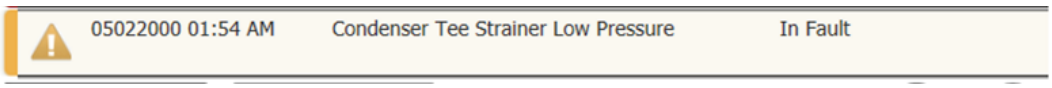
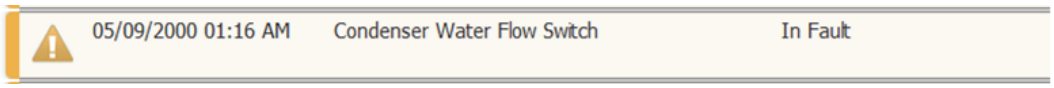
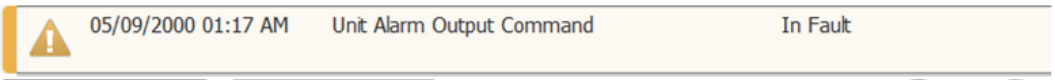
HVAC Service Required.	Affects the alarm for Dirty Strainer, preventing alarm from working properly.	The Pressure sensor is reading either above is maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor is not wired properly: Verify sensor wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has failed. Verify if sensor has any resistance on it, should be 8-12k of resistance on the thermistor.	None, alarm clears once sensor is in a normal state.
Tee Strainer Low Pressure (In Fault)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Service Required.	Affects the alarm for Dirty Strainer, preventing alarm from working properly.	The Pressure sensor is reading either above is maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor is not wired properly: Verify sensor wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has failed. Verify if sensor has any resistance on it, should be 8-12k of resistance on the thermistor.	None, alarm clears once sensor is in a normal state.
Condenser Tee Strainer Low Pressure (In Fault)				
				
Notification Class	**Action**	**Reason**	**Typical Causes**	**Reset Required**
HVAC Service Required.	Affects the alarm for Dirty Strainer, preventing alarm from working properly.	The Pressure sensor is reading either above is maximum value or below is minimum value, resulting in a Fault Condition after 3 point updates.	• Sensor is not wired properly: Verify sensor wiring to the XM Module. • XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Sensor has failed. Verify if sensor has any resistance on it, should be 8-12k of resistance on the thermistor.	None, alarm clears once sensor is in a normal state.
Condenser Water Flow Switch (In Fault)				

Table 42. General unit warning (continued)



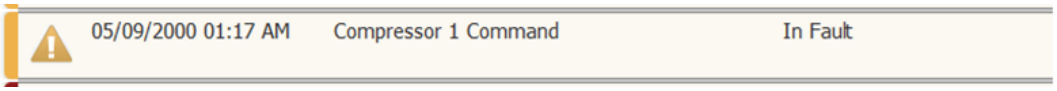
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	Output may not function properly.	The UC600 Controller has lost communications with the Output.	• XM Module is not communicating. Confirm the XM Module is up and talking to the UC600. • Output has gone bad on XM Module.	None, alarm clears once sensor is in a normal state.

Unit Alarm Output Command (In Fault)



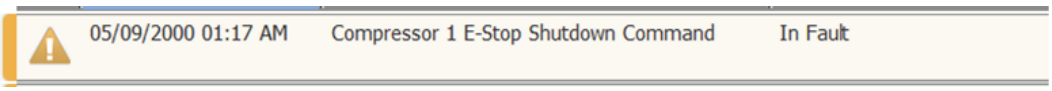
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	Output may not function properly.	The UC600 Controller has lost communications with the Output.	• XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Output has gone bad on XM Module.	None, alarm clears once sensor is in a normal state.

Unit Alarm Output Command (In Fault)



Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	Output may not function properly.	The UC600 Controller has lost communications with the Output.	• XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Output has gone bad on XM Module.	None, alarm clears once sensor is in a normal state.

Compressor 1 E-Stop Shutdown Command (In Fault)



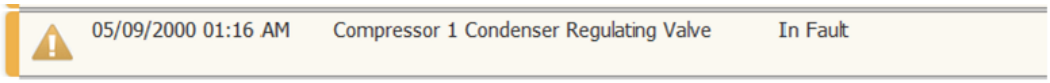
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	Output may not function properly.	The UC600 Controller has lost communications with the Output.	• XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Output has gone bad on XM Module.	None, alarm clears once sensor is in a normal state.

Compressor 1 VFD Alarm Reset (In Fault)

Table 42. General unit warning (continued)

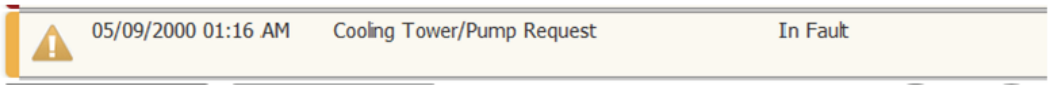
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	Output may not function properly.	The UC600 Controller has lost communications with the Output.	• XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Output has gone bad on XM Module.	None, alarm clears once sensor is in a normal state.

Compressor (1-4) Condenser Regulating Valve (In Fault) *If Installed*



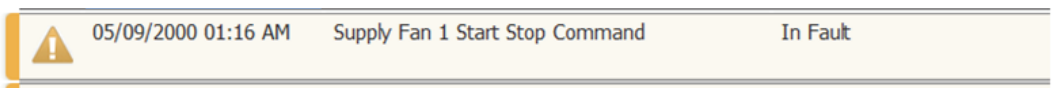
Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	Output may not function properly.	The UC600 Controller has lost communications with the Output.	• XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Output has gone bad on XM Module.	None, alarm clears once sensor is in a normal state.

Cooling Tower/Pump Request (In Fault)



Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	Output may not function properly.	The UC600 Controller has lost communications with the Output.	• XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Output has gone bad on XM Module.	None, alarm clears once sensor is in a normal state.

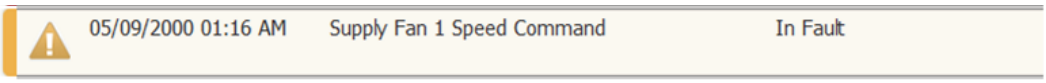
Supply Fan (1-6) Start Stop Command (In Fault)



Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	Output may not function properly.	The UC600 Controller has lost communications with the Output.	• XM Module is not communicating. Confirm the XM Module is up and talking to the Symbio 500. • Output has gone bad on XM Module.	None, alarm clears once sensor is in a normal state.

Supply Fan (1-6) Speed Command (In Fault)

Table 42. General unit warning (continued)



Notification Class	Action	Reason	Typical Causes	Reset Required
HVAC Service Required.	Output may not function properly.	The UC600 Controller has lost communications with the Output.	• XM Module is not communicating. confirm the XM Module is up and talking to the Symbio 500. • Output has gone bad on XM Module.	None, alarm clears once sensor is in a normal state.

Note: *These warnings are for informational purposes only and do not shut down or lock out any equipment on the unit.*

Notes

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

PKG-SVX030B-EN 09 Nov 2025
Supersedes PKG-SVX030A-EN (March 2025)