Installation, Operation and Maintenance

RTAG Air-Cooled Helical Rotary Liquid Chillers

Models: RTAG

100-500 ton units (60Hz)

572598690001

⚠SAFTY WARNING

Only qualified personal 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.

Dec 2022 **RTAG-SVX002C-EN**

TRANE TECHNOLOGIES

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Note that warnings, cautions and notices appear at appropriate intervals throughout this manual. Warnings are provided to alert installing contractors to potential hazards that could result in death or personal injury. Cautions are designed to alert personnel to hazardous situations that could result in personal injury, while notices indicate a situation that could result in equipment or property-damage only accidents.

Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

ATTENTION: Warnings, Cautions and Notices appear at appropriate sections throughout this literature. Read these carefully:

⚠WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

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

Important Responsible Refrigerant Practices

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

⚠WARNING

Contains Refrigerant!

System contains oil and 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.

Failure to follow proper procedures or the use of non-approved refrigerants, refrigerant substitutes, or refrigerant additives could result in death or serious injury or equipment damage.

⚠WARNING

USING PERSONAL PROTECTIVE EQUIPMENT (PPE)!

Dealing with refrigerant, Please always refer to the appropriate safety data sheets (MSDS) and the occupational safety and health (OSHA) guidelines, use proper breathing apparatus, pay attention to the eyes and body protection.Otherwise may cause serious injury or death.

⚠WARNING

ELECTRICAL COMPONENTS MAY BE CHARGED!

Installation, testing, maintenance and fault disposal of this equipment may need to be charged.Must be licensed qualified electrician or other formal charged operation training of personnel to perform the task. If charged operation did not follow all electrical safety prevention measures, may result in serious injury or death.

NOTICE

Using towing hook for container transport

RTAG unit is shipped with container, there are towing hooks on base at nameplate side.Must using these tow hooks to pull the unit out of the container.Dragging the unit from somewhere else caused the breakdown of the unit. Trane is not responsible.

Copyright

Trademarks

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

Notice

Uncharging refrigerant before welding, filled with nitrogen for protection, and use cooling method to protect the electron component. TRANE is not responsible for the equipment damage due to improper welding.

Revison History

- RTAG-SVX001H-EN (March 2022) for 60Hz, new manual.
- Change to Symbio800 platform
- Revised to include Release 2 models

Contents

Model Number Descriptions

Unit Model Number

An example of a typical unit model number is:

RTAG	190	E	C	A	0	X	0	A	L	W	S	F	F	N	L	1	S	B	X	X	X	E	M	0	X	G	R	Y	0	C	1	A	N	I	X	N	X	X
1~4	5~7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44

Model number digits are selected and assigned in accordance with the following definitions using the model number example shown above.

Digit 1-4 - Unit Model
RTAG = Air Cooled Series chiller

Digit 5-7 - Unit Nominal Tons
100 = 100 Nominal Tons
125 = 125 Nominal Tons
145 = 145 Nominal Tons
155 = 155 Nominal Tons
170 = 170 Nominal Tons
190 = 190 Nominal Tons
205 = 205 Nominal Tons
225 = 225 Nominal Tons
230 = 230 Nominal Tons
255 = 255 Nominal Tons
285 = 285 Nominal Tons
310 = 310 Nominal Tons
340 = 340 Nominal Tons
375 = 375 Nominal Tons
400 = 400 Nominal Tons
410 = 410 Nominal Tons
440 = 440 Nominal Tons
460 = 460 Nominal Tons
500 = 500 Nominal Tons

Digit 08 - Unit Voltage
E = 380V/60Hz/3Ph
F = 460V/60Hz/3Ph
G = 400V/60Hz/3Ph

Digit 09 - Manufacturing Location
C = Taicang, China

Digit 10,11 - Design Sequence
A0 = Factory Assigned

Digit 12 - Unit Type
H = High Efficiency
X = Extra Efficiency
P = Premium Seasonal Efficiency

Digit 13 - Safety Agency Listing
0 = No Safety Agency Listing

Digit 14 - Pressure Vessel Code
A = ASME Pressure Vessel Code

Digit 15 - Sound Treatment
S = Standard
X = Medium Low Noise (compressor or tube sound attenuation)
L = Low Noise(compressor + tube sound wrap)
M = Low Noise+night noise set back

Digit 16 - Unit Application
N = Standard Ambient 14 -114.8°F (-10 ~ 46°C)
H = High Ambient 14-125°F(-10 ~ 52°C)

Digit 17 - Relief Valve Option
S = Single Relief Valve
D = Dual Relief Valve With 3 Way Valve

Digit 18 - Flow Switch
X = No Flow Switch
F = Field Installed Flow Switch

Digit 19 - Water Connection
F = Flange

Digit 20 - Evaporator Application
N = Standard Cooling (above 4°C)
P = Process Cooling (4~ -10°C)

Digit 21 - Evaporator Water Pressure
L = 150psi
H = 300psi

Digit 22 - Evaporator Configurations
1 = 1 Pass Evaporator
2 = 2 Pass Evaporator

Digit 23 - Thermal Insulation
S = Standard Thermal Insulation

Digit 24 - Condenser Options
T = Copper tube/Al Fin Coil
B = Copper tube/Al Fin Coil, with black coated
C = Copper tube/Copper Fin Coil
E = E-Coated Tube Fin (Complete Coat Epoxy Coated Fins)

Digit 25 - Heat Recovery
X = No Heat Recovery

Digit 26 - Pump Package
X = Pump Signal On/Off

Digit 27 - Free Cooling
X = None

Digit 28 - Unit Operator Interface Language
E = English

Digit 29 - Remote Communications Options
X = None
B = BACnet Interface
M = Modbus Interface
L = Lontalk Interface

Digit 30 - Easy Remote Controller
0 = Without

Digit 31 - External Set Points & Capacity Outputs
X = None
S = Rapid restart – No UPS
A = External Set Points & Capacity Outputs
B = Rapid Restart, No UPS;External Set Points & Capacity Outputs

Digit 32 - Refrigerant Charge
F = Full Charge
N = Nitrogen
P = 12kg Charge

Digit 33 - Factory Tests
R = Standard Functional Test
P = Non-witnessed Performance Test,With Report
W = Customer-witnessed Performance Test,With Report

Digit 34 - Compressor Motor Starter Type
V = VFD
Y = Wye-delta Closed Transition

Digit 35 - Harmonic Filter
0 = None

Digit 36 - Power Line Connection Type
T = Terminal Block Connection
C = Circuit Breaker
D = Mech Disconnect Switch

Digit 37 - Incoming Power Line
1 = Single Point Power Connection
2 = Dual Point Power Connection

Digit 38 - Control Output Accessories Options
A = Alarm Relay Outputs

Digit 39 - Appearance Options
N = No Appearance Options

Digit 40 - Unit Isolation Installation Accessory
X = None
I = Neoprene Isolators

Digit 41- High Static Pressure
X = None

Digit 42 -Free Cooling Glycol Charge
N = None Glycol Charge in Factory

Digit 43 - Refrigerant Type
X = R134a
Z = R1234ze

Digit 44 - Special
X = None
S = Special Order

Model number discretion here only list RTAG standard units available option. There will be more options in future.

Main options implementation scheme:

Medium low noise option of Sound Treatment use sound wrap depends compressor configuration: M2,N5, N6 use tube sound wrap, N6E2 or N6E use compressor sound box. this option is only for unit nominal tonnage >225.

Low noise option of Sound Treatment use sound wrap to reduce the compressor, suction and discharge line, oil separator noise; low noise with night noise setback is implemented with both sound wrap and variable speed fan, adjust fan speed.

For Unit Application, High Ambient option is added oil cooler base on Standard ambient configuration; low ambient option implement with variable speed fan; and wide ambient temperature have both oil cooler and variable speed fan. But units with VFD or economizer always have oil cooler.

Alarm relay outputs can be connected to the sound & light alarm warning elements. It is highly recommended that users install the corresponding alarm elements with this function, so that when the unit encounters a fault, they can get the information in time and go to the troubleshooting.

CHHP Compressor Model Number

Digit 1~4 Compressor Type
CHHP = GP2 compressor series

Digit 5~7 Size Designation
0N2 = 120 TON
0N1 = 100 TON
0M2 = 85 TON
0M1 = 70 TON
0L2 = 60 TON
0L1 = 50 TON
0K2 = 40 TON
0K1 = 35 TON

Digit 8 Motor Voltage
A = 200-60-3
R = 220-50-3
C = 230-60-3
D = 380-60-3
H = 575-60-3
T = 460-60-3 or 400-50-3

Digit 9 Internal Relief
K = 450 psid

Digit 10~11 Design Sequence
** = Factory assigned

Digit 12 Capacity Limit
N = Standard Capacity Controls

Digit 13~15 Motor KW Rating
112 = 112 kW (N2/50Hz)
093 = 093 kW (N1/50Hz)
077 = 077 kW (M2/50Hz)
055 = 055 kW (M1/50Hz)
058 = 058 kW (L2/50Hz)
041 = 041 kW (K2/50Hz)
036 = 036 kW (K1/50Hz)
057 = 058 kW (L1/60Hz)
077 = 077 kW (M1/60Hz)
092 = 092 kW (M2/60Hz)

Digit 16 Volume Ratio
A = High Volume Ratio
N = Low Volume Ratio

CHHW Compressor Model Number

Digit 1~4 Compressor Type
CHHW = GP2.5 compressor Family

Digit 5 Economizer Port Detail
0 = No economizer port
E = Economizer port

Digit 6 Frame Size
N = N Frame

Digit 7 Compressor Capacity
5 = GP2.5 Smaller capacity (minor)
6 = GP2.5 Large capacity (major)

Digit 8 Motor Voltage
T = 400/460-50/60-3 used for 380-50-3
K = 460-60-3 (N6 only)
D = 380-60-3

Digit 9 Internal Relief
K = 450 pisd

Digit 10~11 Design Sequence
** = Factory assigned

Digit 12 Capacity Limit
N = Standard capacity

Digit 13~15 Motor KW Rating
093 = N5 50Hz
112 = N5 60Hz
112 = N6 50Hz
134 = N6 60Hz

Digit 16 Volume Ratio
A = High Volume Ratio

Overview

Preface

This manual includes RTAG air cooled screw chiller installation, operation and maintenance.Related services shall be done by a qualified professional and technical personnel.

Warranty

Warranty scope is suitable for the TRANE company's general terms and conditions.If without Trane’s written authorization, any equipment repair, modification, or operation beyond the operating limits of equipment, or modification of the equipment control system, and electrical wiring, the consequences are out of place in the warranty.User’s wrong operation, lack of maintenance and the guidance of the TRANE company breach will lose the warranty rights.

Unit Description

RTAG air cooled screw chiller (60Hz) have totally 19 models: 100,125,145,155,170,190,205,225,230,255,285,310,340,375,400,410,440,460,500. Premium seasonal efficiency (PSE) has 16 models : 100 to 460 ton; High efficiency (HE) has 16 models : 100 to 500 ton; Extra efficiency (XE) has 17 models : 100 to 500 ton. 460 Ton PSE unit is combined by two 230 Ton PSE units put together.RTAG 100 use one compressor, it’s single refrigerant cycle, single water loop; all other models have dual refrigerant cycle,which shares one water loop.

RTAG Units are helical-rotary type, air-cooled liquid chillers, with efficient brass finned air side heat exchanger, TRANE patent CHIL water side heat exchanger, and TRANE proprietary Symbio800 control. The compressor circuits are completely assembled, hermetic packages that are factory-piped, wired, leak-tested, dehydrated, and tested for proper control operation before shipment.

Chilled water inlet and outlet openings are covered for shipment. Each compressor has a separate compressor motor starter. The RTAG series features Trane's exclusive Adaptive Control™ logic, which monitors the control variables that govern the operation of the chiller unit.

For fixed speed compressor unloaders are solenoid actuated and oil pressure operated. For variable speed compressor has one more VFD unloader. Each refrigerant circuit is provided with filter, electronic expansion valve, and charging valves.

Variable speed compressor installation has requirement about elevation, temperature and relative humidity. Elevation should be lower than 1000 meter; temperature should be within the range of -18°C ~ +52°C; relative humidity should be smaller than 95%RH, no water condenses, the detail measurement for the application of exceed these limitation and other information please refer to the drive section. And variable speed unit Total Harmonic Distortion of Current at rating point full load < 40%.

The shell-and-tube type evaporator is manufactured in accordance with ASME standards. Each evaporator is fully insulated and is equipped with water drain and vent connections. Packaged units have heat tape and plug-in heater protection to -20°C as standard.

Inspection Checklist

In order to avoid the unnecessary losses in the transport process of goods, please complete the following check when the arrival of the Unit:

- When the unit arrival, please make sure the unit nameplate is consistent with order.
- Check the appearance of arrival goods and packaging materials have obvious damage or not.If there is damage, notify the carrier immediately, and indicate unit damaged status on carriers shipping records.
- Before storage, please check whether the unit is internal damage as soon as possible. deliver written report to the carrier about the discovered internal damage within 15 days from arrival of the goods.
- If discover the inner damage, please stop to remove the packing, also don't move away the damage the parts from the scene, try to take photos of the related damage. At the same time provide actively evidence that damage is not occurred after the arrival of the goods.
- Notify carriers immediately about founded damage, check the damage with combination of the carrier. Inform TRANE local office at the same time.Please DON’T repair or install any damaged units before carriers check it.
- The attachment check. Follow the delivery list, check the accessories and detachable parts, including specifications and other documents, and other options which are placed in electrical control cabinet.If found any missing or damaged, please notify the carrier and TRANE local offices.

Storage

Extended storage of the outdoor unit prior to installation requires the following pre-cautionary measures:

- Store the outdoor unit in a secure area.

- At least every three months (quarterly), check the pressure in the refrigerant circuits to verify that the refrigerant charge is intact. If it is not, contact a qualified service organization and the appropriate Trane sales office.

Unit Identification - Nameplates

RTAG nameplates: unit nameplate, compressor name-plate, evaporator nameplate and oil separator nameplate.

RTAG nameplate stick on the outer surface of the control panel, compressor nameplate stick on the compressor housing, evaporator nameplate stick on the heat exchanger shell, where its insulation has been open to look at it, oil separator nameplate stick on oil separator shell.

Unit Nameplate

Unit nameplate include following information, as Figure 1 Unit Nameplate:

- Model number
- Serial number
- Nominal tonnage
- Compressor quantity
- Fan quantity
- Rated Voltage / frequency / phase
- Rated power
- Refrigerant charge and type
- Oil charge and type
- Unit weight
- Unit dimension

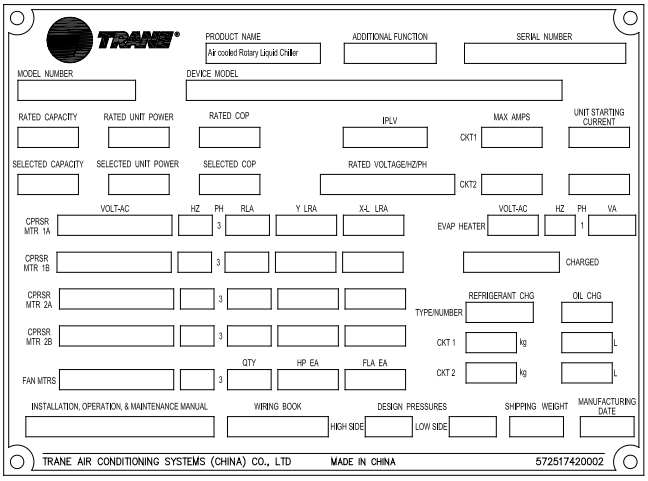


Figure 1. Unit Nameplate

Compressor nameplate

- Compressor model number.
- Compressor serial number.
- Compressor electrical characteristics.
- Utilization range.
- Recommended refrigerant

General Data

Table 1. General data - 100 - 225 Ton 380 Volt - 60Hz High efficiency (fixed speed fan) - R134a

Model	RTAG	100	125	145	155	170	190	205	225
Refrigerant					R134a				
Compressor									
Model		CHHW (N5)	CHHP (M1+L1)	CHHP (M1+M1)	CHHP (M2+M1)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)
Type					Horizontal semienclosed screw compressor				
Starter					YDEL				
Circuits		1	2	2	2	2	2	2	2
Min load	%	30%	15%	15%	15%	15%	15%	15%	15%
Must hold current(1A/1B)	A	243/-	170/-	170/-	200/-	200/-	243/-	243/-	293/-
Must hold current(2A/2B)	A	-	121/-	170/-	170/-	200/-	200/-	243/-	243/-
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	228	291	334	361	390	428	459	512
Rating WPD	psid	4.6	4.3	5.7	5	4.3	5.2	4.6	4.7
Min flow	gpm	130	175	175	200	230	230	265	351
Max flow	gpm	475	625	625	730	835	835	955	877
Water storage	lb	263	263	263	263	263	263	263	263
tube size	inch	4	5	5	5	6	6	6	6
Air side heat exchanger									
Fan type					Axial flow				
Quantity		6	8	8	8	8	10	10	12
power	kW/per	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fan speed	RPM	840	840	840	840	840	840	840	840
Single fan Airflow	CFM	8,828	8,828	8,828	8,828	8,828	8,828	8,828	8,828
Fan current	A	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	263	317	366	396	426	475	518	573
Control panel 2	A	-	-	-	-	-	-	-	-
Unit start up amps									
Control panel 1	A	443	406	455	511	541	655	698	703
Control panel 2	A	-	-	-	-	-	-	-	-
Refrigerant charge									
ckt 1	kg	94	80	76	76	76	81	82	94
	lb	207	176	168	168	168	179	181	207
ckt 2	kg	-	62	76	76	76	81	82	94
	lb	-	137	168	168	168	179	181	207
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	8	7	7	7	8	8	8	8
	gal	2.1	1.8	1.8	1.8	2.1	2.1	2.1	2.1
ckt 2	L	-	7	7	7	8	8	8	8
	gal	-	1.8	1.8	1.8	2.1	2.1	2.1	2.1
Dimension									
Length	inch	151	198	198	198	198	244	244	291
	mm	3,840	5,020	5,020	5,020	5,020	6,200	6,200	7,380
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin									
Shipping weight	lb	6,184	8,426	9,105	9,202	9,570	10,360	10,578	11,804
	kg	2,805	3,822	4,130	4,174	4,341	4,699	4,798	5,354
Operation weight	lb	6,526	8,920	9,621	9,747	10,146	10,959	11,211	12,066
	kg	2,960	4,046	4,364	4,421	4,602	4,971	5,085	5,473
Weight - Copper Fin									
Shipping weight	lb	6,885	9,687	10,692	10,789	11,158	11,936	12,154	13,695
	kg	3,123	4,394	4,850	4,894	5,061	5,414	5,513	6,212
Operation weight	lb	7,227	10,181	11,208	11,334	11,733	12,535	12,787	13,957
	kg	3,278	4,618	5,084	5,141	5,322	5,686	5,800	6,331

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 2. General data - 100 - 255 Ton 380 Volt - 60Hz Extra efficiency (fixed speed fan) - R134a

Model	RTAG	100	125	145	155	170	190	205	225	255
Refrigerant						R134a				
Compressor										
Model		CHHW (N5)	CHHP (M1+L1)	CHHP (M1+M1)	CHHP (M2+M1)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)	CHHP (M2,M2+M2)
Type						Horizontal semienclosed screw compressor				
Starter						YDEL				
Circuits		1	2	2	2	2	2	2	2	2
Min load	%	30%	15%	15%	15%	15%	15%	15%	15%	10%
Must hold current(1A/1B)	A	243/-	170/-	170/-	200/-	200/-	243/-	243/-	293/-	200/200
Must hold current(2A/2B)	A	-	121/-	170/-	170/-	200/-	200/-	243/-	243/-	200/-
Evaporator										
Type						Shell & Tube (CHIL)				
Rating flow	gpm	236	302	347	374	407	441	475	527	608
Rating WPD	psid	4.9	4	5.2	5.4	4.7	5.5	4.2	4.2	5.7
Min flow	gpm	130	190	190	200	230	230	290	358	406
Max flow	gpm	475	685	685	730	835	835	1,050	895	1,016
Water storage	lb	118	171	171	182	208	208	263	289	234
tube size	inch	4	5	5	5	6	6	6	6	6
Air side heat exchanger										
Fan type						Axial flow				
Quantity		6	10	10	10	10	12	12	14	16
power	kW/per	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fan speed	RPM	840	840	840	840	840	840	840	840	840
Single fan Airflow	CFM	8,828	8,828	8,828	8,828	8,828	8,828	8,828	8,828	8,828
Fan current	A	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unit Max RLA(Max Compr+Fan+Control)										
Control panel 1	A	263	322	371	401	431	480	523	578	434
Control panel 2	A	-	-	-	-	-	-	-	-	217
Unit start up amps										
Control panel 1	A	443	412	461	517	547	660	703	709	549
Control panel 2	A	-	-	-	-	-	-	-	-	333
Refrigerant charge										
ckt 1	kg	100	89	85	85	85	90	91	99	156
	lb	220	196	187	187	187	198	201	218	344
ckt 2	kg	-1	71	85	85	85	90	91	99	69
	lb	-	157	187	187	187	198	201	218	152
Oil charge (the oil type show on unit nameplate)										
ckt 1	L	8	7	7	7	8	8	8	8	16
	gal	2.1	1.8	1.8	1.8	2.1	2.1	2.1	2.1	4.2
ckt 2	L	-1	7	7	7	8	8	8	8	8
	gal	-	1.8	1.8	1.8	2.1	2.1	2.1	2.1	2.1
Dimension										
Length	inch	151	244	248	248	248	291	291	339	399
	mm	3,840	6,200	6,300	6,300	6,300	7,380	7,380	8,600	10,130
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin										
Shipping weight	lb	6,415	9,405	10,161	10,245	10,613	11,114	11,354	13,076	16,965
	kg	2,910	4,266	4,609	4,647	4,814	5,041	5,150	5,931	7,695
Operation weight	lb	6,766	9,954	10,732	10,829	11,228	11,753	12,050	13,364	17,198
	kg	3,069	4,515	4,868	4,912	5,093	5,331	5,466	6,062	7,801
Weight - Copper Fin										
Shipping weight	lb	7,361	10,981	12,145	12,229	12,597	13,005	13,245	15,280	19,484
	kg	3,339	4,981	5,509	5,547	5,714	5,899	6,008	6,931	8,838
Operation weight	lb	7,712	11,530	12,716	12,813	13,212	13,644	13,942	15,569	19,718
	kg	3,498	5,230	5,768	5,812	5,993	6,189	6,324	7,062	8,944

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 3. General data - 100 - 225 Ton 380 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R134a

Model	RTAG	100	125	145	155	170	190	205	225
Refrigerant					R134a				
Compressor									
Model		CHHW (N6)	CHHP (M2+L2)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)	CHHW (N6+N6)	CHHW (N6E2+N6E2)
Type					Horizontal semienclosed screw compressor				
Starter					VFD				
Circuits		1	2	2	2	2	2	2	2
Min load	%	36%	18%	18%	18%	18%	18%	18%	18%
Must hold current(1A/1B)	A	243/-	168/-	168/-	204/-	204/-	243/-	243/-	243/-
Must hold current(2A/2B)	A	-	117/-	168/-	168/-	204/-	204/-	243/-	243/-
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	232	299	346	369	396	432	469	511
Rating WPD	psid	4.7	3.9	5.2	5.2	4.5	5.3	4.1	4.7
Min flow	gpm	130	190	190	200	230	230	290	351
Max flow	gpm	475	685	685	730	835	835	1050	877
Water storage	lb	118	171	171	182	208	208	263	263
tube size	inch	4	5	5	5	6	6	6	6
Air side heat exchanger									
Fan type					Axial flow				
Quantity		6	10	10	10	10	12	12	12
power	kW/per	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Fan speed	RPM	910/200	910/200	910/200	910/200	910/200	910/200	910/200	910/200
Single fan Airflow	CFM	10,036	10,036	10,036	10,036	10,036	10,036	10,036	10,036
Fan current	A	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	269	326	377	413	449	496	535	534
Control panel 2	A	-	-	-	-	-	-	-	-
Unit start up amps									
Control panel 1	A	269	326	377	413	449	496	535	534
Control panel 2	A	-	-	-	-	-	-	-	-
Refrigerant charge									
ckt 1	kg	100	89	85	85	85	90	91	98
	lb	220	196	187	187	187	198	201	216
ckt 2	kg	-1	71	85	85	85	90	91	98
	lb	-	157	187	187	187	198	201	216
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	8	7	7	7	8	8	8	8
	gal	2.1	1.8	1.8	1.8	2.1	2.1	2.1	2.1
ckt 2	L	-1	7	7	7	8	8	8	8
	gal	-	1.8	1.8	1.8	2.1	2.1	2.1	2.1
Dimension									
Length	inch	156	249	249	249	249	296	296	296
	mm	3,970	6,330	6,330	6,330	6,330	7,510	7,510	7,510
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin									
Shipping weight	lb	7,033	10,243	10,999	11,083	11,451	11,951	12,192	12,641
	kg	3,190	4,646	4,989	5,027	5,194	5,421	5,530	5,734
Operation weight	lb	7,388	10,792	11,570	11,667	12,066	12,591	12,888	12,904
	kg	3,351	4,895	5,248	5,292	5,473	5,711	5,846	5,853
Weight - Copper Fin									
Shipping weight	lb	7,979	11,819	12,983	13,067	13,435	13,843	14,083	14,533
	kg	3,619	5,361	5,889	5,927	6,094	6,279	6,388	6,592
Operation weight	lb	8,333	12,368	13,554	13,651	14,050	14,482	14,780	14,795
	kg	3,780	5,610	6,148	6,192	6,373	6,569	6,704	6,711

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 4. General data - 255 - 500 Ton 380 Volt - 60Hz High efficiency (fixed speed fan) - R134a

Model	RTAG	255	285	310	340	375	400	440	500
Refrigerant					R134a				
Compressor									
Model		CHHP (M2,M2 + M2)	CHHP(M2), CHHW (N5) + CHHW(N5)	CHHW (N5,N5 + N5)	CHHW (N6,N5 + N6)	CHHP(M2), CHHW(N5) + CHHP(M2), CHHW(N5)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)	CHHW (N6E,N6E + N6E,N6E)
Type					Horizontal semienclosed screw compressor				
Starter					YDEL				
Circuits		2	2	2	2	2	2	2	2
Min load	%	10%	10%	10%	10%	7.5%	7.5%	7.5%	7.5%
Must hold current(1A/1B)	A	200/200	200/243	243/243	293/243	200/243	243/243	293/243	318/318
Must hold current(2A/2B)	A	200/-	243/-	243/-	293/-	200/243	243/243	293/243	318/318
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	593	678	725	797	883	944	1057	1154
Rating WPD	psid	5.5	5.7	5.2	6.2	5.9	5.6	4.6	5.5
Min flow	gpm	398	450	498	523	584	627	698	774
Max flow	gpm	995	1,125	1,244	1,308	1,460	1,567	1,744	1,935
Water storage	lb	234	265	301	301	332	369	455	455
tube size	inch	6	6	6	6	8	8	8	8
Air side heat exchanger									
Fan type					Axial flow				
Quantity		14	14	16	16	18	18	20	20
power	kW/per	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Fan speed	RPM	840	860	860	860	860	860	860	860
Single fan Airflow	CFM	8,828	11,478	11,478	11,478	11,478	11,478	11,478	11,478
Fan current	A	2.8	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	429	489	541	591	489	532	586	662
Control panel 2	A	217	270	270	319	489	532	586	662
Unit start up amps									
Control panel 1	A	544	669	721	721	669	712	717	792
Control panel 2	A	333	450	450	450	669	712	717	792
Refrigerant charge									
ckt 1	kg	140	140	158	162	148	148	171	184
	lb	309	309	348	357	326	326	377	406
ckt 2	kg	69	69	70	70	148	148	171	184
	lb	152	152	154	154	326	326	377	406
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	16	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	lb	8	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension									
Length	inch	354	354	399	399	445	445	465	465
	mm	8,995	8,995	10,130	10,130	11,310	11,310	11,810	11,810
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	97.6	97.6	97.6	97.6	97.6	97.6	97.6
	mm	2,501	2,480	2,480	2,480	2,480	2,480	2,480	2,480
Weight - Non Copper Fin									
Shipping weight	lb	15,699	16,184	17,699	17,734	20,309	20,640	22,481	22,481
	kg	7,121	7,341	8,028	8,044	9,212	9,362	10,197	10,197
Operation weight	lb	15,933	16,449	18,001	18,036	20,642	21,008	22,935	22,935
	kg	7,227	7,461	8,165	8,181	9,363	9,529	10,403	10,403
Weight - Copper Fin									
Shipping weight	lb	17,904	18,389	20,219	20,254	23,144	23,475	26,447	26,447
	kg	8,121	8,341	9,171	9,187	10,498	10,648	11,996	11,996
Operation weight	lb	18,137	18,653	20,521	20,556	23,477	23,843	26,901	26,901
	kg	8,227	8,461	9,308	9,324	10,649	10,815	12,202	12,202

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 5. General data - 285 - 500 Ton 380 Volt - 60Hz Extra efficiency (fixed speed fan) - R134a

Model	RTAG	285	310	340	375	400	410	440	500
Refrigerant					R134a				
Compressor									
Model		CHHP(M2), CHHW (N5) + CHHW(N5)	CHHW (N5,N5 + N5)	CHHW (N6,N5 + N6)	CHHP(M2), CHHW(N5) + CHHP(M2), CHHW(N5)	CHHW (N5,N5 + N5,N5)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)	CHHW (N6E,N6E + N6E,N6E)
Type					Horizontal semienclosed screw compressor				
Starter					YDEL				
Circuits		2	2	2	2	2	2	2	2
Min load	%	10%	10%	10%	7.5%	7.5%	7.5%	7.5%	7.5%
Must hold current(1A/1B)	A	200/243	243/243	293/243	200/243	243/243	243/243	293/243	318/318
Must hold current(2A/2B)	A	243/-	243/-	293/-	200/243	243/243	243/243	293/243	318/318
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	700	735	822	899	976	1000	1088	1180
Rating WPD	psid	6	5.3	6.6	5.1	5.1	5.3	4.9	5.8
Min flow	gpm	466	505	535	595	639	659	714	792
Max flow	gpm	1,165	1,263	1,338	1,488	1,598	1,647	1,785	1,980
Water storage	lb	265	301	301	369	403	403	455	455
tube size	inch	6	6	6	8	8	8	8	8
Air side heat exchanger									
Fan type					Axial flow				
Quantity		18	18	20	20	20	24	24	24
power	kW/per	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Fan speed	RPM	860	860	860	860	860	860	860	860
Single fan Airflow	CFM	11,478	11,478	11,478	11,478	11,478	11,478	11,478	11,478
Fan current	A	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	503	546	605	494	537	546	595	671
Control panel 2	A	274	274	324	494	537	546	595	671
Unit start up amps									
Control panel 1	A	683	726	735	674	717	726	726	801
Control panel 2	A	455	455	455	674	717	726	726	801
Refrigerant charge									
ckt 1	kg	165	166	186	167	167	174	190	202
	lb	364	366	410	368	368	384	419	445
ckt 2	kg	77	78	78	167	167	174	190	202
	lb	170	172	172	368	368	384	419	445
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	16	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	16	16	16	16	16
	gal	2.1	2.1	2.1	4.2	4.2	4.2	4.2	4.2
Dimension									
Length	inch	445	445	465	465	465	585	585	585
	mm	11,310	11,310	11,810	11,810	11,810	14,850	14,850	14,850
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6
	mm	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480
Weight - Non Copper Fin									
Shipping weight	lb	18,250	18,439	19,121	22,007	22,291	23,808	24,943	24,943
	kg	8,278	8,364	8,673	9,982	10,111	10,799	11,314	11,314
Operation weight	lb	18,514	18,742	19,423	22,375	22,694	24,211	25,397	25,397
	kg	8,398	8,501	8,810	10,149	10,294	10,982	11,520	11,520
Weight - Copper Fin									
Shipping weight	lb	21,085	21,275	22,271	25,973	26,257	27,589	29,703	29,703
	kg	9,564	9,650	10,102	11,781	11,910	12,514	13,473	13,473
Operation weight	lb	21,350	21,577	22,573	26,341	26,661	27,992	30,157	30,157
	kg	9,684	9,787	10,239	11,948	12,093	12,697	13,679	13,679

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 6. General data - 230 - 460 Ton 380 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R134a

Model	RTAG	230	285	310	340	375	400	440	460
Refrigerant					R134a				
Compressor									
Model		CHHW (N6E2+N6E2)	CHHW (N5,N5+N6)	CHHW (N6,N5 + N6E2)	CHHW (N6E2,N5 + N6E2)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)	CHHW (N6E2,N5 + N6E2,N5)	CHHW (N6E2+ N6E2 + N6E2 + N6E2)
Type					Horizontal semienclosed screw compressor				
Starter					VFD				
Circuits		2	2	2	2	2	2	2	4
Min load	%	18%	12%	12%	12%	9%	9%	9%	9%
Must hold current(1A/1B)	A	243/-	204/243	243/243	243/243	204/243	243/243	243/243	243/243
Must hold current(2A/2B)	A	243/-	243/-	243/-	243/-	204/243	243/243	243/243	243/243
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	524	664	735	764	864	926	1012	1048
Rating WPD	psid	4.2	5.4	5.3	5.7	5.7	5.4	4.3	4.2
Min flow	gpm	358	446	493	519	580	622	693	705
Max flow	gpm	896	1,115	1,233	1,297	1,450	1,555	1,732	1,762
Water storage	lb	289	265	301	301	332	369	455	578
tube size	inch	6	6	6	6	8	8	8	6
Air side heat exchanger									
Fan type					Axial flow				
Quantity		14	14	16	16	18	18	20	28
power	kW/per	1.5			1.65				1.5
Fan speed	RPM	910/200			970 / 200				910/200
Single fan Airflow	CFM	10,036			11,772				10,036
Fan current	A	3.8	4.7	4.7	4.7	4.7	4.7	4.7	3.8
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	542	497	540	540	497	531	536	542
Control panel 2	A	-	269	269	269	497	531	536	542
Unit start up amps									
Control panel 1	A	542	678	721	721	678	712	717	542
Control panel 2	A	-	269	269	269	678	712	717	542
Refrigerant charge									
ckt 1	kg	104	140	158	170	148	148	179	208
	lb	229	309	348	375	326	326	395	459
ckt 2	kg	104	69	75	75	148	148	179	208
	lb	229	152	165	165	326	326	395	459
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	8	16	16	16	16	16	16	16
	gal	2.1	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension									
Length	inch	343	362	408	408	455	455	465	685
	mm	8,700	9,200	10,350	10,350	11,560	11,560	11,810	17,410
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	97.6	97.6	97.6	97.6	97.6	97.6	98.5
	mm	2,501	2,480	2,480	2,480	2,480	2,480	2,480	2,501
Weight - Non Copper Fin									
Shipping weight	lb	14,134	16,956	18,470	18,506	21,081	21,411	22,921	28,268
	kg	6,411	7,691	8,378	8,394	9,562	9,712	10,397	12,822
Operation weight	lb	14,423	17,220	18,772	18,808	21,414	21,779	23,376	28,845
	kg	6,542	7,811	8,515	8,531	9,713	9,879	10,603	13,084
Weight - Copper Fin									
Shipping weight	lb	16,338	19,160	20,990	21,026	23,916	24,246	26,888	32,679
	kg	7,411	8,691	9,521	9,537	10,848	10,998	12,196	14,823
Operation weight	lb	16,627	19,425	21,292	21,328	24,249	24,615	27,342	33,257
	kg	7,542	8,811	9,658	9,674	10,999	11,165	12,402	15,085

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 $ft^2 \cdot °F \cdot h/Btu$.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 7. General data - 100 - 225 Ton 400 Volt - 60Hz High efficiency (fixed speed fan) - R134a

Model	RTAG	100	125	145	155	170	190	205	225
Refrigerant					R134a				
Compressor									
Model		CHHW (N5)	CHHP (M1+L1)	CHHP (M1+M1)	CHHP (M2+M1)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)
Type					Horizontal semienclosed screw compressor				
Starter					YDEL				
Circuits		1	2	2	2	2	2	2	2
Min load	%	30%	15%	15%	15%	15%	15%	15%	15%
Must hold current(1A/1B)	A	231/-	162/-	162/-	190/-	190/-	231/-	231/-	278/-
Must hold current(2A/2B)	A	-	115/-	162/-	162/-	190/-	190/-	231/-	231/-
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	228	291	334	361	390	428	459	512
Rating WPD	psid	4.6	4.3	5.7	5	4.3	5.2	4.6	4.7
Min flow	gpm	130	175	175	200	230	230	265	351
Max flow	gpm	475	625	625	730	835	835	955	877
Water storage	lb	263	263	263	263	263	263	263	263
tube size	inch	4	5	5	5	6	6	6	6
Air side heat exchanger									
Fan type					Axial flow				
Quantity		6	8	8	8	8	10	10	12
power	kW/per	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fan speed	RPM	840	840	840	840	840	840	840	840
Single fan Airflow	CFM	8,828	8,828	8,828	8,828	8,828	8,828	8,828	8,828
Fan current	A	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	250	301	348	376	405	451	492	544
Control panel 2	A	-	-	-	-	-	-	-	-
Unit start up amps									
Control panel 1	A	421	386	432	485	514	622	663	668
Control panel 2	A	-	-	-	-	-	-	-	-
Refrigerant charge									
ckt 1	kg	94	80	76	76	76	81	82	94
	lb	207	176	168	168	168	179	181	207
ckt 2	kg	-	62	76	76	76	81	82	94
	lb	-	137	168	168	168	179	181	207
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	8	7	7	7	8	8	8	8
	gal	2.1	1.8	1.8	1.8	2.1	2.1	2.1	2.1
ckt 2	L	-	7	7	7	8	8	8	8
	gal	-	1.8	1.8	1.8	2.1	2.1	2.1	2.1
Dimension									
Length	inch	151	198	198	198	198	244	244	291
	mm	3,840	5,020	5,020	5,020	5,020	6,200	6,200	7,380
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin									
Shipping weight	lb	6,184	8,426	9,105	9,202	9,570	10,360	10,578	11,804
	kg	2,805	3,822	4,130	4,174	4,341	4,699	4,798	5,354
Operation weight	lb	6,526	8,920	9,621	9,747	10,146	10,959	11,211	12,066
	kg	2,960	4,046	4,364	4,421	4,602	4,971	5,085	5,473
Weight - Copper Fin									
Shipping weight	lb	6,885	9,687	10,692	10,789	11,158	11,936	12,154	13,695
	kg	3,123	4,394	4,850	4,894	5,061	5,414	5,513	6,212
Operation weight	lb	7,227	10,181	11,208	11,334	11,733	12,535	12,787	13,957
	kg	3,278	4,618	5,084	5,141	5,322	5,686	5,800	6,331

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 8. General data - 100 - 255 Ton 400 Volt - 60Hz Extra efficiency (fixed speed fan) - R134a

Model	RTAG	100	125	145	155	170	190	205	225	255
Refrigerant						R134a				
Compressor										
Model		CHHW (N5)	CHHP (M1+L1)	CHHP (M1+M1)	CHHP (M2+M1)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)	CHHP (M2,M2+M2)
Type						Horizontal semienclosed screw compressor				
Starter						YDEL				
Circuits		1	2	2	2	2	2	2	2	2
Min load	%	30%	15%	15%	15%	15%	15%	15%	15%	10%
Must hold current(1A/1B)	A	231/-	162/-	162/-	190/-	190/-	231/-	231/-	278/-	190/190
Must hold current(2A/2B)	A	-	115/-	162/-	162/-	190/-	190/-	231/-	231/-	190/-
Evaporator										
Type						Shell & Tube (CHIL)				
Rating flow	gpm	236	302	347	374	407	441	475	527	608
Rating WPD	psid	4.9	4	5.2	5.4	4.7	5.5	4.2	4.2	5.7
Min flow	gpm	130	190	190	200	230	230	290	358	406
Max flow	gpm	475	685	685	730	835	835	1,050	895	1,016
Water storage	lb	118	171	171	182	208	208	263	289	234
tube size	inch	4	5	5	5	6	6	6	6	6
Air side heat exchanger										
Fan type						Axial flow				
Quantity		6	10	10	10	10	12	12	14	16
power	kW/per	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fan speed	RPM	840	840	840	840	840	840	840	840	840
Single fan Airflow	CFM	8,828	8,828	8,828	8,828	8,828	8,828	8,828	8,828	8,828
Fan current	A	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unit Max RLA(Max Compr+Fan+Control)										
Control panel 1	A	250	306	352	381	409	456	497	549	412
Control panel 2	A	-	-	-	-	-	-	-	-	206
Unit start up amps										
Control panel 1	A	421	391	438	491	520	627	668	674	522
Control panel 2	A	-	-	-	-	-	-	-	-	316
Refrigerant charge										
ckt 1	kg	100	89	85	85	85	90	91	99	156
	lb	220	196	187	187	187	198	201	218	344
ckt 2	kg	-1	71	85	85	85	90	91	99	69
	lb	-	157	187	187	187	198	201	218	152
Oil charge (the oil type show on unit nameplate)										
ckt 1	L	8	7	7	7	8	8	8	8	16
	gal	2.1	1.8	1.8	1.8	2.1	2.1	2.1	2.1	4.2
ckt 2	L	-1	7	7	7	8	8	8	8	8
	gal	-	1.8	1.8	1.8	2.1	2.1	2.1	2.1	2.1
Dimension										
Length	inch	151	244	248	248	248	291	291	339	399
	mm	3,840	6,200	6,300	6,300	6,300	7,380	7,380	8,600	10,130
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin										
Shipping weight	lb	6,415	9,405	10,161	10,245	10,613	11,114	11,354	13,076	16,965
	kg	2,910	4,266	4,609	4,647	4,814	5,041	5,150	5,931	7,695
Operation weight	lb	6,766	9,954	10,732	10,829	11,228	11,753	12,050	13,364	17,198
	kg	3,069	4,515	4,868	4,912	5,093	5,331	5,466	6,062	7,801
Weight - Copper Fin										
Shipping weight	lb	7,361	10,981	12,145	12,229	12,597	13,005	13,245	15,280	19,484
	kg	3,339	4,981	5,509	5,547	5,714	5,899	6,008	6,931	8,838
Operation weight	lb	7,712	11,530	12,716	12,813	13,212	13,644	13,942	15,569	19,718
	kg	3,498	5,230	5,768	5,812	5,993	6,189	6,324	7,062	8,944

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 9. General data - 100 - 225 Ton 400 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R134a

Model	RTAG	100	125	145	155	170	190	205	225
Refrigerant					R134a				
Compressor									
Model		CHHW (N6)	CHHP (M2+L2)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)	CHHW (N6+N6)	CHHW (N6E2+N6E2)
Type					Horizontal semienclosed screw compressor				
Starter					VFD				
Circuits		1	2	2	2	2	2	2	2
Min load	%	36%	18%	18%	18%	18%	18%	18%	18%
Must hold current(1A/1B)	A	231/-	160/-	160/-	194/-	194/-	231/-	231/-	231/-
Must hold current(2A/2B)	A	-	111/-	160/-	160/-	194/-	194/-	231/-	231/-
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	232	299	346	369	396	432	469	511
Rating WPD	psid	4.7	3.9	5.2	5.2	4.5	5.3	4.1	4.7
Min flow	gpm	130	190	190	200	230	230	290	351
Max flow	gpm	475	685	685	730	835	835	1050	877
Water storage	lb	118	171	171	182	208	208	263	263
tube size	inch	4	5	5	5	6	6	6	6
Air side heat exchanger									
Fan type					Axial flow				
Quantity		6	10	10	10	10	12	12	12
power	kW/per	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Fan speed	RPM	910/200	910/200	910/200	910/200	910/200	910/200	910/200	910/200
Single fan Airflow	CFM	10,036	10,036	10,036	10,036	10,036	10,036	10,036	10,036
Fan current	A	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	256	310	358	392	427	471	508	507
Control panel 2	A	-	-	-	-	-	-	-	-
Unit start up amps									
Control panel 1	A	256	310	358	392	427	471	508	507
Control panel 2	A	-	-	-	-	-	-	-	-
Refrigerant charge									
ckt 1	kg	100	89	85	85	85	90	91	98
	lb	220	196	187	187	187	198	201	216
ckt 2	kg	-1	71	85	85	85	90	91	98
	lb	-	157	187	187	187	198	201	216
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	8	7	7	7	8	8	8	8
	gal	2.1	1.8	1.8	1.8	2.1	2.1	2.1	2.1
ckt 2	L	-1	7	7	7	8	8	8	8
	gal	-	1.8	1.8	1.8	2.1	2.1	2.1	2.1
Dimension									
Length	inch	156	249	249	249	249	296	296	296
	mm	3,970	6,330	6,330	6,330	6,330	7,510	7,510	7,510
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin									
Shipping weight	lb	7,033	10,243	10,999	11,083	11,451	11,951	12,192	12,641
	kg	3,190	4,646	4,989	5,027	5,194	5,421	5,530	5,734
Operation weight	lb	7,388	10,792	11,570	11,667	12,066	12,591	12,888	12,904
	kg	3,351	4,895	5,248	5,292	5,473	5,711	5,846	5,853
Weight - Copper Fin									
Shipping weight	lb	7,979	11,819	12,983	13,067	13,435	13,843	14,083	14,533
	kg	3,619	5,361	5,889	5,927	6,094	6,279	6,388	6,592
Operation weight	lb	8,333	12,368	13,554	13,651	14,050	14,482	14,780	14,795
	kg	3,780	5,610	6,148	6,192	6,373	6,569	6,704	6,711

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 10. General data - 255 - 500 Ton 400 Volt - 60Hz High efficiency (fixed speed fan) - R134a

Model	RTAG	255	285	310	340	375	400	440	500
Refrigerant					R134a				
Compressor									
Model		CHHP (M2,M2 + M2)	CHHP(M2), CHHW (N5) + CHHW(N5)	CHHW (N5,N5 + N5)	CHHW (N6,N5 + N6)	CHHP(M2), CHHW(N5) + CHHP(M2), CHHW(N5)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)	CHHW (N6E,N6E + N6E,N6E)
Type					Horizontal semienclosed screw compressor				
Starter					YDEL				
Circuits		2	2	2	2	2	2	2	2
Min load	%	10%	10%	10%	10%	7.5%	7.5%	7.5%	7.5%
Must hold current(1A/1B)	A	190/190	190/231	231/231	278/231	190/231	231/231	278/231	302/302
Must hold current(2A/2B)	A	190/-	231/-	231/-	278/-	190/231	231/231	278/231	302/302
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	593	678	725	797	883	944	1057	1154
Rating WPD	psid	5.5	5.7	5.2	6.2	5.9	5.6	4.6	5.5
Min flow	gpm	398	450	498	523	584	627	698	774
Max flow	gpm	995	1,125	1,244	1,308	1,460	1,567	1,744	1,935
Water storage	lb	234	265	301	301	332	369	455	455
tube size	inch	6	6	6	6	8	8	8	8
Air side heat exchanger									
Fan type					Axial flow				
Quantity		14	14	16	16	18	18	20	20
power	kW/per	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Fan speed	RPM	840	860	860	860	860	860	860	860
Single fan Airflow	CFM	8,828	11,478	11,478	11,478	11,478	11,478	11,478	11,478
Fan current	A	2.8	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	408	465	514	561	465	505	557	629
Control panel 2	A	206	257	257	303	465	505	557	629
Unit start up amps									
Control panel 1	A	517	636	685	685	636	676	681	752
Control panel 2	A	316	428	428	428	636	676	681	752
Refrigerant charge									
ckt 1	kg	140	140	158	162	148	148	171	184
	lb	309	309	348	357	326	326	377	406
ckt 2	kg	69	69	70	70	148	148	171	184
	lb	152	152	154	154	326	326	377	406
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	16	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	lb	8	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension									
Length	inch	354	354	399	399	445	445	465	465
	mm	8,995	8,995	10,130	10,130	11,310	11,310	11,810	11,810
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	97.6	97.6	97.6	97.6	97.6	97.6	97.6
	mm	2,501	2,480	2,480	2,480	2,480	2,480	2,480	2,480
Weight - Non Copper Fin									
Shipping weight	lb	15,699	16,184	17,699	17,734	20,309	20,640	22,481	22,481
	kg	7,121	7,341	8,028	8,044	9,212	9,362	10,197	10,197
Operation weight	lb	15,933	16,449	18,001	18,036	20,642	21,008	22,935	22,935
	kg	7,227	7,461	8,165	8,181	9,363	9,529	10,403	10,403
Weight - Copper Fin									
Shipping weight	lb	17,904	18,389	20,219	20,254	23,144	23,475	26,447	26,447
	kg	8,121	8,341	9,171	9,187	10,498	10,648	11,996	11,996
Operation weight	lb	18,137	18,653	20,521	20,556	23,477	23,843	26,901	26,901
	kg	8,227	8,461	9,308	9,324	10,649	10,815	12,202	12,202

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 11. General data - 285 - 500 Ton 400 Volt - 60Hz Extra efficiency (fixed speed fan) - R134a

Model	RTAG	285	310	340	375	400	410	440	500
Refrigerant					R134a				
Compressor									
Model		CHHP(M2), CHHW (N5) + CHHW(N5)	CHHW (N5,N5 + N5)	CHHW (N6,N5 + N6)	CHHP(M2), CHHW(N5) + CHHP(M2), CHHW(N5)	CHHW (N5,N5 + N5,N5)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)	CHHW (N6E,N6E + N6E,N6E)
Type					Horizontal semienclosed screw compressor				
Starter					YDEL				
Circuits		2	2	2	2	2	2	2	2
Min load	%	10%	10%	10%	7.5%	7.5%	7.5%	7.5%	7.5%
Must hold current(1A/1B)	A	190/231	231/231	278/231	190/231	231/231	231/231	278/231	302/302
Must hold current(2A/2B)	A	231/-	231/-	278/-	190/231	231/231	231/231	278/231	302/302
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	700	735	822	899	976	1000	1088	1180
Rating WPD	psid	6	5.3	6.6	5.1	5.1	5.3	4.9	5.8
Min flow	gpm	466	505	535	595	639	659	714	792
Max flow	gpm	1,165	1,263	1,338	1,488	1,598	1,647	1,785	1,980
Water storage	lb	265	301	301	369	403	403	455	455
tube size	inch	6	6	6	8	8	8	8	8
Air side heat exchanger									
Fan type					Axial flow				
Quantity		18	18	20	20	20	24	24	24
power	kW/per	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Fan speed	RPM	860	860	860	860	860	860	860	860
Single fan Airflow	CFM	11,478	11,478	11,478	11,478	11,478	11,478	11,478	11,478
Fan current	A	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	478	519	575	469	510	519	565	637
Control panel 2	A	260	260	308	469	510	519	565	637
Unit start up amps									
Control panel 1	A	649	690	698	640	681	690	690	761
Control panel 2	A	432	432	432	640	681	690	690	761
Refrigerant charge									
ckt 1	kg	165	166	186	167	167	174	190	202
	lb	364	366	410	368	368	384	419	445
ckt 2	kg	77	78	78	167	167	174	190	202
	lb	170	172	172	368	368	384	419	445
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	16	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	16	16	16	16	16
	gal	2.1	2.1	2.1	4.2	4.2	4.2	4.2	4.2
Dimension									
Length	inch	445	445	465	465	465	585	585	585
	mm	11,310	11,310	11,810	11,810	11,810	14,850	14,850	14,850
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6
	mm	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480
Weight - Non Copper Fin									
Shipping weight	lb	18,250	18,439	19,121	22,007	22,291	23,808	24,943	24,943
	kg	8,278	8,364	8,673	9,982	10,111	10,799	11,314	11,314
Operation weight	lb	18,514	18,742	19,423	22,375	22,694	24,211	25,397	25,397
	kg	8,398	8,501	8,810	10,149	10,294	10,982	11,520	11,520
Weight - Copper Fin									
Shipping weight	lb	21,085	21,275	22,271	25,973	26,257	27,589	29,703	29,703
	kg	9,564	9,650	10,102	11,781	11,910	12,514	13,473	13,473
Operation weight	lb	21,350	21,577	22,573	26,341	26,661	27,992	30,157	30,157
	kg	9,684	9,787	10,239	11,948	12,093	12,697	13,679	13,679

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 $ft^2 \cdot °F \cdot h/Btu$.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 12. General data - 230 - 460 Ton 400 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R134a

Model	RTAG	230	285	310	340	375	400	440	460
Refrigerant					R134a				
Compressor									
Model		CHHW (N6E2+N6E2)	CHHW (N5,N5 + N6)	CHHW (N6,N5 + N6E2)	CHHW (N6E2,N5 + N6E2)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)	CHHW (N6E2,N5 + N6E2,N5)	CHHW (N6E2 + N6E2 + N6E2 + N6E2)
Type					Horizontal semienclosed screw compressor				
Starter					VFD				
Circuits		2	2	2	2	2	2	2	4
Min load	%	18%	12%	12%	12%	9%	9%	9%	9%
Must hold current(1A/1B)	A	231/-	194/231	231/231	231/231	194/231	231/231	231/231	231/231
Must hold current(2A/2B)	A	231/-	231/-	231/-	231/-	194/231	231/231	231/231	231/231
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	524	664	735	764	864	926	1012	1048
Rating WPD	psid	4.2	5.4	5.3	5.7	5.7	5.4	4.3	4.2
Min flow	gpm	358	446	493	519	580	622	693	705
Max flow	gpm	896	1,115	1,233	1,297	1,450	1,555	1,732	1,762
Water storage	lb	289	265	301	301	332	369	455	578
tube size	inch	6	6	6	6	8	8	8	6
Air side heat exchanger									
Fan type					Axial flow				
Quantity		14	14	16	16	18	18	20	28
power	kW/per	1.5			1.65				1.5
Fan speed	RPM	910/200			970 / 200				910/200
Single fan Airflow	CFM	10,036			11,772				10,036
Fan current	A	3.8	4.7	4.7	4.7	4.7	4.7	4.7	3.8
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	515	472	513	513	472	504	509	515
Control panel 2	A	-	256	256	256	472	504	509	515
Unit start up amps									
Control panel 1	A	515	644	685	685	644	676	681	515
Control panel 2	A	-	256	256	256	644	676	681	515
Refrigerant charge									
ckt 1	kg	104	140	158	170	148	148	179	208
	lb	229	309	348	375	326	326	395	459
ckt 2	kg	104	69	75	75	148	148	179	208
	lb	229	152	165	165	326	326	395	459
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	8	16	16	16	16	16	16	16
	gal	2.1	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension									
Length	inch	343	362	408	408	455	455	465	685
	mm	8,700	9,200	10,350	10,350	11,560	11,560	11,810	17,410
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	97.6	97.6	97.6	97.6	97.6	97.6	98.5
	mm	2,501	2,480	2,480	2,480	2,480	2,480	2,480	2,501
Weight - Non Copper Fin									
Shipping weight	lb	14,134	16,956	18,470	18,506	21,081	21,411	22,921	28,268
	kg	6,411	7,691	8,378	8,394	9,562	9,712	10,397	12,822
Operation weight	lb	14,423	17,220	18,772	18,808	21,414	21,779	23,376	28,845
	kg	6,542	7,811	8,515	8,531	9,713	9,879	10,603	13,084
Weight - Copper Fin									
Shipping weight	lb	16,338	19,160	20,990	21,026	23,916	24,246	26,888	32,679
	kg	7,411	8,691	9,521	9,537	10,848	10,998	12,196	14,823
Operation weight	lb	16,627	19,425	21,292	21,328	24,249	24,615	27,342	33,257
	kg	7,542	8,811	9,658	9,674	10,999	11,165	12,402	15,085

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2.°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 13. General data - 500 Ton 460 Volt - 60Hz High efficiency (fixed speed fan) - R134a

Model	RTAG	500
Refrigerant		
Compressor		
Model		CHHW (N6E,N6E+N6E,N6E)
Type		
Starter		
Circuits		2
Min load	%	7.5%
Must hold current(1A/1B)	A	242/242
Must hold current(2A/2B)	A	242/242
Evaporator		
Type		
Rating flow	gpm	1154
Rating WPD	psid	5.5
Min flow	gpm	774
Max flow	gpm	1,935
Water storage	lb	455
tube size	inch	8
Air side heat exchanger		
Fan type		
Quantity		20
power	kW/per	2.0
Fan speed	RPM	860
Single fan Airflow	CFM	11,478
Fan current	A	4.7
Unit Max RLA(Max Compr+Fan+Control)		
Control panel 1	A	547
Control panel 2	A	547
Unit start up amps		
Control panel 1	A	654
Control panel 2	A	654
Refrigerant charge		
ckt 1	kg	184
	lb	406
ckt 2	kg	184
	lb	406
Oil charge (the oil type show on unit nameplate)		
ckt 1	L	16
	gal	4.2
ckt 2	lb	16
	gal	4.2
Dimension		
Length	inch	465
	mm	11,810
Width	inch	88.4
	mm	2,245
Height	inch	97.6
	mm	2,480
Weight - Non Copper Fin		
Shipping weight	lb	22,481
	kg	10,197
Operation weight	lb	22,935
	kg	10,403
Weight - Copper Fin		
Shipping weight	lb	26,447
	kg	11,996
Operation weight	lb	26,901
	kg	12,202

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 460V/60Hz/3Ph.

Table 14. General data - 225 - 460 Ton 460 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R134a

Model	RTAG	225	230	285	310	340	375	400	440	460
Refrigerant						R134a				
Compressor										
Model		CHHW (N6E2+ N6E2)	CHHW (N6E2+ N6E2)	CHHW (N5,N5 + N6)	CHHW (N6,N5 + N6E2)	CHHW (N6E2,N5 + N6E2)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)	CHHW (N6E2,N5 + N6E2,N5)	CHHW (N6E2 + N6E2 + N6E2 + N6E2)
Type						Horizontal semienclosed screw compressor				
Starter						VFD				
Circuits		2	2	2	2	2	2	2	2	4
Min load	%	18%	18%	12%	12%	12%	9%	9%	9%	9%
Must hold current(1A/1B)	A	231/-	231/-	194/231	231/231	231/231	194/231	231/231	231/231	231/231
Must hold current(2A/2B)	A	231/-	231/-	231/-	231/-	231/-	194/231	231/231	231/231	231/231
Evaporator										
Type						Shell & Tube (CHIL)				
Rating flow	gpm	511	524	664	735	764	864	926	1012	1048
Rating WPD	psid	4.7	4.2	5.4	5.3	5.7	5.7	5.4	4.3	4.2
Min flow	gpm	351	358	446	493	519	580	622	693	705
Max flow	gpm	877	896	1,115	1,233	1,297	1,450	1,555	1,732	1,762
Water storage	lb	263	289	265	301	301	332	369	455	578
tube size	inch	6	6	6	6	6	8	8	8	6
Air side heat exchanger										
Fan type						Axial flow				
Quantity		12	14	14	16	16	18	18	20	28
power	kW/per	1.5	1.5	1.65						1.5
Fan speed	RPM	910/200	910/200	970 / 200						910/200
Single fan Airflow	CFM	10,036	10,036	11,772						10,036
Fan current	A	3.8	3.8	4.7	4.7	4.7	4.7	4.7	4.7	3.8
Unit Max RLA(Max Compr+Fan+Control)										
Control panel 1	A	441	447	410	446	446	410	438	442	447
Control panel 2	A	-	-	222	222	222	410	438	442	447
Unit start up amps										
Control panel 1	A	441	447	560	596	596	560	588	592	447
Control panel 2	A	-	-	222	222	222	560	588	592	447
Refrigerant charge										
ckt 1	kg	98	104	140	158	170	148	148	179	208
	lb	216	229	309	348	375	326	326	395	459
ckt 2	kg	98	104	69	75	75	148	148	179	208
	lb	216	229	152	165	165	326	326	395	459
Oil charge (the oil type show on unit nameplate)										
ckt 1	L	8	8	16	16	16	16	16	16	16
	gal	2.1	2.1	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension										
Length	inch	296	343	362	408	408	455	455	465	685
	mm	7,510	8,700	9,200	10,350	10,350	11,560	11,560	11,810	17,410
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	97.6	97.6	97.6	97.6	97.6	97.6	98.5
	mm	2,501	2,501	2,480	2,480	2,480	2,480	2,480	2,480	2,501
Weight - Non Copper Fin										
Shipping weight	lb	12,641	14,134	16,956	18,470	18,506	21,081	21,411	22,921	28,268
	kg	5,734	6,411	7,691	8,378	8,394	9,562	9,712	10,397	12,822
Operation weight	lb	12,904	14,423	17,220	18,772	18,808	21,414	21,779	23,376	28,845
	kg	5,853	6,542	7,811	8,515	8,531	9,713	9,879	10,603	13,084
Weight - Copper Fin										
Shipping weight	lb	14,533	16,338	19,160	20,990	21,026	23,916	24,246	26,888	32,679
	kg	6,592	7,411	8,691	9,521	9,537	10,848	10,998	12,196	14,823
Operation weight	lb	14,795	16,627	19,425	21,292	21,328	24,249	24,615	27,342	33,257
	kg	6,711	7,542	8,811	9,658	9,674	10,999	11,165	12,402	15,085

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 $ft^2 \cdot °F \cdot h/Btu$.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 460V/60Hz/3Ph.

Table 15. General data - 125 - 225 Ton 380 Volt - 60Hz High efficiency (fixed speed fan) - R1234ze

Model	RTAG	125	145	155	170	190	205	225
Refrigerant					R1234ze			
Compressor								
Model		CHHP (M1+L1)	CHHP (M1+M1)	CHHP (M2+M1)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)
Type					Horizontal semienclosed screw compressor			
Starter					YDEL			
Circuits		2	2	2	2	2	2	2
Min load	%	15%	15%	15%	15%	15%	15%	15%
Must hold current(1A/1B)	A	170/-	170/-	200/-	200/-	243/-	243/-	293/-
Must hold current(2A/2B)	A	121/-	170/-	170/-	200/-	200/-	243/-	243/-
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	223	256	277	301	330	355	394
Rating WPD	psid	2.5	3.4	3	2.6	3.1	2.8	2.8
Min flow	gpm	176	187	209	237	241	268	296
Max flow	gpm	376	431	468	508	556	600	663
Water storage	lb	263	263	263	263	263	263	263
tube size	inch	5	5	5	6	6	6	6
Air side heat exchanger								
Fan type					Axial flow			
Quantity		8	8	8	8	10	10	12
power	kW/per	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fan speed	RPM	840	840	840	840	840	840	840
Single fan Airflow	CFM	8,828	8,828	8,828	8,828	8,828	8,828	8,828
Fan current	A	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	317	366	396	426	475	518	573
Control panel 2	A	-	-	-	-	-	-	-
Unit start up amps								
Control panel 1	A	406	455	511	541	655	698	703
Control panel 2	A	-	-	-	-	-	-	-
Refrigerant charge								
ckt 1	kg	75	70	70	70	76	78	89
	lb	165	154	154	154	168	172	196
ckt 2	kg	57	70	70	70	76	78	89
	lb	126	154	154	154	168	172	196
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	7	7	7	8	8	8	8
	gal	1.8	1.8	1.8	2.1	2.1	2.1	2.1
ckt 2	L	7	7	7	8	8	8	8
	gal	1.8	1.8	1.8	2.1	2.1	2.1	2.1
Dimension								
Length	inch	198	198	198	198	244	244	291
	mm	5,020	5,020	5,020	5,020	6,200	6,200	7,380
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin								
Shipping weight	lb	8,426	9,105	9,202	9,570	10,360	10,578	11,804
	kg	3,822	4,130	4,174	4,341	4,699	4,798	5,354
Operation weight	lb	8,920	9,621	9,747	10,146	10,959	11,211	12,066
	kg	4,046	4,364	4,421	4,602	4,971	5,085	5,473
Weight - Copper Fin								
Shipping weight	lb	9,687	10,692	10,789	11,158	11,936	12,154	13,695
	kg	4,394	4,850	4,894	5,061	5,414	5,513	6,212
Operation weight	lb	10,181	11,208	11,334	11,733	12,535	12,787	13,957
	kg	4,618	5,084	5,141	5,322	5,686	5,800	6,331

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 16. General data - 125 - 255 Ton 380 Volt - 60Hz Extra efficiency (fixed speed fan) - R1234ze

Model	RTAG	125	145	155	170	190	205	225	255
Refrigerant					R1234ze				
Compressor									
Model		CHHP (M1+L1)	CHHP (M1+M1)	CHHP (M2+M1)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)	CHHP (M2,M2+M2)
Type					Horizontal semienclosed screw compressor				
Starter					YDEL				
Circuits		2	2	2	2	2	2	2	2
Min load	%	15%	15%	15%	15%	15%	15%	15%	10%
Must hold current(1A/1B)	A	170/-	170/-	200/-	200/-	243/-	243/-	293/-	200/200
Must hold current(2A/2B)	A	121/-	170/-	170/-	200/-	200/-	243/-	243/-	200/-
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	227	261	284	309	336	362	400	468
Rating WPD	psid	2.2	3	3.1	2.7	3.2	2.4	2.4	3.3
Min flow	gpm	192	206	224	244	264	298	328	315
Max flow	gpm	384	441	479	522	567	612	675	787
Water storage	lb	171	171	182	208	208	263	289	234
tube size	inch	5	5	5	6	6	6	6	6
Air side heat exchanger									
Fan type					Axial flow				
Quantity		10	10	10	10	12	12	14	16
power	kW/per	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fan speed	RPM	840	840	840	840	840	840	840	840
Single fan Airflow	CFM	8,828	8,828	8,828	8,828	8,828	8,828	8,828	8,828
Fan current	A	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	322	371	401	431	480	523	578	434
Control panel 2	A	-	-	-	-	-	-	-	217
Unit start up amps									
Control panel 1	A	412	461	517	547	660	703	709	549
Control panel 2	A	-	-	-	-	-	-	-	333
Refrigerant charge									
ckt 1	kg	85	78	78	78	85	87	93	147
	lb	187	172	172	172	187	192	205	324
ckt 2	kg	68	78	78	78	85	87	93	65
	lb	150	172	172	172	187	192	205	143
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	7	7	7	8	8	8	8	16
	gal	1.8	1.8	1.8	2.1	2.1	2.1	2.1	4.2
ckt 2	L	7	7	7	8	8	8	8	8
	gal	1.8	1.8	1.8	2.1	2.1	2.1	2.1	2.1
Dimension									
Length	inch	244	248	248	248	291	291	339	399
	mm	6,200	6,300	6,300	6,300	7,380	7,380	8,600	10,130
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin									
Shipping weight	lb	9,405	10,161	10,245	10,613	11,114	11,354	13,076	16,965
	kg	4,266	4,609	4,647	4,814	5,041	5,150	5,931	7,695
Operation weight	lb	9,954	10,732	10,829	11,228	11,753	12,050	13,364	17,198
	kg	4,515	4,868	4,912	5,093	5,331	5,466	6,062	7,801
Weight - Copper Fin									
Shipping weight	lb	10,981	12,145	12,229	12,597	13,005	13,245	15,280	19,484
	kg	4,981	5,509	5,547	5,714	5,899	6,008	6,931	8,838
Operation weight	lb	11,530	12,716	12,813	13,212	13,644	13,942	15,569	19,718
	kg	5,230	5,768	5,812	5,993	6,189	6,324	7,062	8,944

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2.°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 17. General data - 145 - 230 Ton 380 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R1234ze

Model	RTAG	145	155	170	190	205	225	230
Refrigerant					R1234ze			
Compressor								
Model		CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)	CHHW (N6+N6)	CHHW (N6E2+N6E2)	CHHW (N6E2+N6E2)
Type					Horizontal semienclosed screw compressor			
Starter					VFD			
Circuits		2	2	2	2	2	2	2
Min load	%	18%	18%	18%	18%	18%	18%	18%
Must hold current(1A/1B)	A	168/-	204/-	204/-	243/-	243/-	243/-	243/-
Must hold current(2A/2B)	A	168/-	168/-	204/-	204/-	243/-	243/-	243/-
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	258	279	302	331	360	397	398
Rating WPD	psid	2.9	3	2.6	3.1	2.4	2.8	2.4
Min flow	gpm	198	213	238	242	304	312	335
Max flow	gpm	436	470	509	558	608	668	670
Water storage	lb	171	182	208	208	263	263	289
tube size	inch	5	5	6	6	6	6	6
Air side heat exchanger								
Fan type					Axial flow			
Quantity		10	10	10	12	12	12	14
power	kW/per	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Fan speed	RPM	910/200	910/200	910/200	910/200	910/200	910/200	910/200
Single fan Airflow	CFM	10,036	10,036	10,036	10,036	10,036	10,036	10,036
Fan current	A	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	377	413	449	496	535	534	542
Control panel 2	A	-	-	-	-	-	-	-
Unit start up amps								
Control panel 1	A	377	413	449	496	535	534	542
Control panel 2	A	-	-	-	-	-	-	-
Refrigerant charge								
ckt 1	kg	78	78	78	85	87	93	98
	lb	172	172	172	187	192	205	216
ckt 2	kg	78	78	78	85	87	93	98
	lb	172	172	172	187	192	205	216
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	7	7	8	8	8	8	8
	gal	1.8	1.8	2.1	2.1	2.1	2.1	2.1
ckt 2	L	7	7	8	8	8	8	8
	gal	1.8	1.8	2.1	2.1	2.1	2.1	2.1
Dimension								
Length	inch	249	249	249	296	296	296	343
	mm	6,330	6,330	6,330	7,510	7,510	7,510	8,700
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin								
Shipping weight	lb	10,999	11,083	11,451	11,951	12,192	12,641	14,134
	kg	4,989	5,027	5,194	5,421	5,530	5,734	6,411
Operation weight	lb	11,570	11,667	12,066	12,591	12,888	12,904	14,423
	kg	5,248	5,292	5,473	5,711	5,846	5,853	6,542
Weight - Copper Fin								
Shipping weight	lb	12,983	13,067	13,435	13,843	14,083	14,533	16,338
	kg	5,889	5,927	6,094	6,279	6,388	6,592	7,411
Operation weight	lb	13,554	13,651	14,050	14,482	14,780	14,795	16,627
	kg	6,148	6,192	6,373	6,569	6,704	6,711	7,542

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 $ft^2 \cdot °F \cdot h/Btu$.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 18. General data - 255 - 440 Ton 380 Volt - 60Hz High efficiency (fixed speed fan) - R1234ze

Model	RTAG	255	285	310	340	375	400	440
Refrigerant					R1234ze			
Compressor								
Model		CHHP (M2,M2+M2)	CHHP(M2), CHHW (N5) + CHHW(N5)	CHHW (N5,N5+N5)	CHHW (N6,N5+N6)	CHHP(M2), CHHW(N5) + CHHP(M2), CHHW(N5)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)
Type					Horizontal semienclosed screw compressor			
Starter					YDEL			
Circuits		2	2	2	2	2	2	2
Min load	%	10%	10%	10%	10%	7.5%	7.5%	7.5%
Must hold current(1A/1B)	A	200/200	200/243	243/243	293/243	200/243	243/243	293/243
Must hold current(2A/2B)	A	200/-	243/-	243/-	293/-	200/243	243/243	293/243
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	460	524	557	611	688	734	811
Rating WPD	psid	3.2	3.3	3	3.5	3.5	3.3	2.8
Min flow	gpm	310	352	375	411	463	494	591
Max flow	gpm	774	880	937	1,028	1,157	1,234	1,364
Water storage	lb	234	265	301	301	332	369	455
tube size	inch	6	6	6	6	8	8	8
Air side heat exchanger								
Fan type					Axial flow			
Quantity		14	14	16	16	18	18	20
power	kW/per	1.0	2.0	2.0	2.0	2.0	2.0	2.0
Fan speed	RPM	840	860	860	860	860	860	860
Single fan Airflow	CFM	8,828	11,478	11,478	11,478	11,478	11,478	11,478
Fan current	A	2.8	4.7	4.7	4.7	4.7	4.7	4.7
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	429	489	541	591	489	532	586
Control panel 2	A	217	270	270	319	489	532	586
Unit start up amps								
Control panel 1	A	544	669	721	721	669	712	717
Control panel 2	A	333	450	450	450	669	712	717
Refrigerant charge								
ckt 1	kg	132	132	148	153	140	140	162
	lb	291	291	326	337	309	309	357
ckt 2	kg	65	65	66	66	140	140	162
	lb	143	143	146	146	309	309	357
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	lb	8	8	8	8	16	16	16
	gal	2.1	2.1	2.1	2.1	4.2	4.2	4.2
Dimension								
Length	inch	354	354	399	399	445	445	465
	mm	8,995	8,995	10,130	10,130	11,310	11,310	11,810
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	97.6	97.6	97.6	97.6	97.6	97.6
	mm	2,501	2,480	2,480	2,480	2,480	2,480	2,480
Weight - Non Copper Fin								
Shipping weight	lb	15,699	16,184	17,699	17,734	20,309	20,640	22,481
	kg	7,121	7,341	8,028	8,044	9,212	9,362	10,197
Operation weight	lb	15,933	16,449	18,001	18,036	20,642	21,008	22,935
	kg	7,227	7,461	8,165	8,181	9,363	9,529	10,403
Weight - Copper Fin								
Shipping weight	lb	17,904	18,389	20,219	20,254	23,144	23,475	26,447
	kg	8,121	8,341	9,171	9,187	10,498	10,648	11,996
Operation weight	lb	18,137	18,653	20,521	20,556	23,477	23,843	26,901
	kg	8,227	8,461	9,308	9,324	10,649	10,815	12,202

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 19. General data - 285 - 440 Ton 380 Volt - 60Hz Extra efficiency (fixed speed fan) - R1234ze

Model	RTAG	285	310	340	375	400	410	440
Refrigerant					R1234ze			
Compressor								
Model		CHHP(M2), CHHW (N5) + CHHW(N5)	CHHW (N5,N5+N5)	CHHW (N6,N5+N6)	CHHP(M2), CHHW(N5) + CHHP(M2), CHHW(N5)	CHHW (N5,N5+N5,N5)	CHHW (N5,N5+N5,N5)	CHHW (N6,N5+N6,N5)
Type					Horizontal semienclosed screw compressor			
Starter					YDEL			
Circuits		2	2	2	2	2	2	2
Min load	%	10%	10%	10%	7.5%	7.5%	7.5%	7.5%
Must hold current(1A/1B)	A	200/243	243/243	293/243	200/243	243/243	243/243	293/243
Must hold current(2A/2B)	A	243/-	243/-	293/-	200/243	243/243	243/243	293/243
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	534	562	623	690	751	763	826
Rating WPD	psid	3.4	3	3.7	3	3.0	3.1	2.9
Min flow	gpm	359	378	419	464	505	513	602
Max flow	gpm	898	945	1,048	1,161	1,263	1,282	1,389
Water storage	lb	265	301	301	369	403	403	455
tube size	inch	6	6	6	8	8	8	8
Air side heat exchanger								
Fan type					Axial flow			
Quantity		18	18	20	20	20	24	24
power	kW/per	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Fan speed	RPM	860	860	860	860	860	860	860
Single fan Airflow	CFM	11,478	11,478	11,478	11,478	11,478	11,478	11,478
Fan current	A	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	503	546	605	494	537	546	595
Control panel 2	A	274	274	324	494	537	546	595
Unit start up amps								
Control panel 1	A	683	726	735	674	717	726	726
Control panel 2	A	455	455	455	674	717	726	726
Refrigerant charge								
ckt 1	kg	156	156	176	157	157	164	180
	lb	344	344	388	346	346	362	397
ckt 2	kg	73	74	74	157	157	164	180
	lb	161	163	163	346	346	362	397
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension								
Length	inch	445	445	465	465	465	585	585
	mm	11,310	11,310	11,810	11,810	11,810	14,850	14,850
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	97.6	97.6	97.6	97.6	97.6	97.6	97.6
	mm	2,480	2,480	2,480	2,480	2,480	2,480	2,480
Weight - Non Copper Fin								
Shipping weight	lb	18,250	18,439	19,121	22,007	22,291	23,808	24,943
	kg	8,278	8,364	8,673	9,982	10,111	10,799	11,314
Operation weight	lb	18,514	18,742	19,423	22,375	22,694	24,211	25,397
	kg	8,398	8,501	8,810	10,149	10,294	10,982	11,520
Weight - Copper Fin								
Shipping weight	lb	21,085	21,275	22,271	25,973	26,257	27,589	29,703
	kg	9,564	9,650	10,102	11,781	11,910	12,514	13,473
Operation weight	lb	21,350	21,577	22,573	26,341	26,661	27,992	30,157
	kg	9,684	9,787	10,239	11,948	12,093	12,697	13,679

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 20. General data - 285 - 460 Ton 380 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R1234ze

Model	RTAG	285	310	340	375	400	440	460
Refrigerant					R1234ze			
Compressor								
Model		CHHW (N5,N5+N6)	CHHW (N6,N5+N6E2)	CHHW (N6E2, N5 + N6E2)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)	CHHW (N6E2,N5 + N6E2,N5)	CHHW (N6E2 + N6E2 + N6E2 + N6E2)
Type					Horizontal semienclosed screw compressor			
Starter					VFD			
Circuits		2	2	2	2	2	2	4
Min load	%	12%	12%	12%	9%	9%	9%	9%
Must hold current(1A/1B)	A	204/243	243/243	243/243	204/243	243/243	243/243	243/243
Must hold current(2A/2B)	A	243/-	243/-	243/-	204/243	243/243	243/243	243/243
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	516	573	591	677	733	788	796
Rating WPD	psid	3.2	3.1	3.3	3.4	3.3	2.6	2.4
Min flow	gpm	347	385	397	455	493	574	705
Max flow	gpm	867	964	992	1,138	1,232	1,324	1,762
Water storage	lb	265	301	301	332	369	455	578
tube size	inch	6	6	6	8	8	8	6
Air side heat exchanger								
Fan type					Axial flow			
Quantity		14	16	16	18	18	20	28
power	kW/per				1.65			1.5
Fan speed	RPM				970 / 200			910/200
Single fan Airflow	CFM				11,772			10,036
Fan current	A	4.7	4.7	4.7	4.7	4.7	4.7	3.8
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	497	540	540	497	531	536	542
Control panel 2	A	269	269	269	497	531	536	542
Unit start up amps								
Control panel 1	A	678	721	721	678	712	717	542
Control panel 2	A	269	269	269	678	712	717	542
Refrigerant charge								
ckt 1	kg	132	149	162	140	140	170	196
	lb	291	328	357	309	309	375	432
ckt 2	kg	65	71	71	140	140	170	196
	lb	143	157	157	309	309	375	432
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension								
Length	inch	362	408	408	455	455	465	685
	mm	9,200	10,350	10,350	11,560	11,560	11,810	17,410
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	97.6	97.6	97.6	97.6	97.6	97.6	98.5
	mm	2,480	2,480	2,480	2,480	2,480	2,480	2,501
Weight - Non Copper Fin								
Shipping weight	lb	16,956	18,470	18,506	21,081	21,411	22,921	28,268
	kg	7,691	8,378	8,394	9,562	9,712	10,397	12,822
Operation weight	lb	17,220	18,772	18,808	21,414	21,779	23,376	28,845
	kg	7,811	8,515	8,531	9,713	9,879	10,603	13,084
Weight - Copper Fin								
Shipping weight	lb	19,160	20,990	21,026	23,916	24,246	26,888	32,679
	kg	8,691	9,521	9,537	10,848	10,998	12,196	14,823
Operation weight	lb	19,425	21,292	21,328	24,249	24,615	27,342	33,257
	kg	8,811	9,658	9,674	10,999	11,165	12,402	15,085

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 $ft^2 \cdot °F \cdot h/Btu$.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 380V/60Hz/3Ph.

Table 21. General data - 125 - 225 Ton 400 Volt - 60Hz High efficiency (fixed speed fan) - R1234ze

Model	RTAG	125	145	155	170	190	205	225
Refrigerant					R1234ze			
Compressor								
Model		CHHP (M1+L1)	CHHP (M1+M1)	CHHP (M2+M1)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)
Type					Horizontal semienclosed screw compressor			
Starter					YDEL			
Circuits		2	2	2	2	2	2	2
Min load	%	15%	15%	15%	15%	15%	15%	15%
Must hold current(1A/1B)	A	162/-	162/-	190/-	190/-	231/-	231/-	278/-
Must hold current(2A/2B)	A	115/-	162/-	162/-	190/-	190/-	231/-	231/-
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	223	256	277	301	330	355	394
Rating WPD	psid	2.5	3.4	3	2.6	3.1	2.8	2.8
Min flow	gpm	176	187	209	237	241	268	296
Max flow	gpm	376	431	468	508	556	600	663
Water storage	lb	263	263	263	263	263	263	263
tube size	inch	5	5	5	6	6	6	6
Air side heat exchanger								
Fan type					Axial flow			
Quantity		8	8	8	8	10	10	12
power	kW/per	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fan speed	RPM	840	840	840	840	840	840	840
Single fan Airflow	CFM	8,828	8,828	8,828	8,828	8,828	8,828	8,828
Fan current	A	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	301	348	376	405	451	492	544
Control panel 2	A	-	-	-	-	-	-	-
Unit start up amps								
Control panel 1	A	386	432	485	514	622	663	668
Control panel 2	A	-	-	-	-	-	-	-
Refrigerant charge								
ckt 1	kg	75	70	70	70	76	78	89
	lb	165	154	154	154	168	172	196
ckt 2	kg	57	70	70	70	76	78	89
	lb	126	154	154	154	168	172	196
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	7	7	7	8	8	8	8
	gal	1.8	1.8	1.8	2.1	2.1	2.1	2.1
ckt 2	L	7	7	7	8	8	8	8
	gal	1.8	1.8	1.8	2.1	2.1	2.1	2.1
Dimension								
Length	inch	198	198	198	198	244	244	291
	mm	5,020	5,020	5,020	5,020	6,200	6,200	7,380
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin								
Shipping weight	lb	8,426	9,105	9,202	9,570	10,360	10,578	11,804
	kg	3,822	4,130	4,174	4,341	4,699	4,798	5,354
Operation weight	lb	8,920	9,621	9,747	10,146	10,959	11,211	12,066
	kg	4,046	4,364	4,421	4,602	4,971	5,085	5,473
Weight - Copper Fin								
Shipping weight	lb	9,687	10,692	10,789	11,158	11,936	12,154	13,695
	kg	4,394	4,850	4,894	5,061	5,414	5,513	6,212
Operation weight	lb	10,181	11,208	11,334	11,733	12,535	12,787	13,957
	kg	4,618	5,084	5,141	5,322	5,686	5,800	6,331

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 22. General data - 125 - 255 Ton 400 Volt - 60Hz Extra efficiency (fixed speed fan) - R1234ze

Model	RTAG	125	145	155	170	190	205	225	255
Refrigerant					R1234ze				
Compressor									
Model		CHHP (M1+L1)	CHHP (M1+M1)	CHHP (M2+M1)	CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)	CHHP (M2,M2+M2)
Type					Horizontal semienclosed screw compressor				
Starter					YDEL				
Circuits		2	2	2	2	2	2	2	2
Min load	%	15%	15%	15%	15%	15%	15%	15%	10%
Must hold current(1A/1B)	A	162/-	162/-	190/-	190/-	231/-	231/-	278/-	190/190
Must hold current(2A/2B)	A	115/-	162/-	162/-	190/-	190/-	231/-	231/-	190/-
Evaporator									
Type					Shell & Tube (CHIL)				
Rating flow	gpm	227	261	284	309	336	362	400	468
Rating WPD	psid	2.2	3	3.1	2.7	3.2	2.4	2.4	3.3
Min flow	gpm	192	206	224	244	264	298	328	315
Max flow	gpm	384	441	479	522	567	612	675	787
Water storage	lb	171	171	182	208	208	263	289	234
tube size	inch	5	5	5	6	6	6	6	6
Air side heat exchanger									
Fan type					Axial flow				
Quantity		10	10	10	10	12	12	14	16
power	kW/per	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Fan speed	RPM	840	840	840	840	840	840	840	840
Single fan Airflow	CFM	8,828	8,828	8,828	8,828	8,828	8,828	8,828	8,828
Fan current	A	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Unit Max RLA(Max Compr+Fan+Control)									
Control panel 1	A	306	352	381	409	456	497	549	412
Control panel 2	A	-	-	-	-	-	-	-	206
Unit start up amps									
Control panel 1	A	391	438	491	520	627	668	674	522
Control panel 2	A	-	-	-	-	-	-	-	316
Refrigerant charge									
ckt 1	kg	85	78	78	78	85	87	93	147
	lb	187	172	172	172	187	192	205	324
ckt 2	kg	68	78	78	78	85	87	93	65
	lb	150	172	172	172	187	192	205	143
Oil charge (the oil type show on unit nameplate)									
ckt 1	L	7	7	7	8	8	8	8	16
	gal	1.8	1.8	1.8	2.1	2.1	2.1	2.1	4.2
ckt 2	L	7	7	7	8	8	8	8	8
	gal	1.8	1.8	1.8	2.1	2.1	2.1	2.1	2.1
Dimension									
Length	inch	244	248	248	248	291	291	339	399
	mm	6,200	6,300	6,300	6,300	7,380	7,380	8,600	10,130
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin									
Shipping weight	lb	9,405	10,161	10,245	10,613	11,114	11,354	13,076	16,965
	kg	4,266	4,609	4,647	4,814	5,041	5,150	5,931	7,695
Operation weight	lb	9,954	10,732	10,829	11,228	11,753	12,050	13,364	17,198
	kg	4,515	4,868	4,912	5,093	5,331	5,466	6,062	7,801
Weight - Copper Fin									
Shipping weight	lb	10,981	12,145	12,229	12,597	13,005	13,245	15,280	19,484
	kg	4,981	5,509	5,547	5,714	5,899	6,008	6,931	8,838
Operation weight	lb	11,530	12,716	12,813	13,212	13,644	13,942	15,569	19,718
	kg	5,230	5,768	5,812	5,993	6,189	6,324	7,062	8,944

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 23. General data - 145 - 230 Ton 400 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R1234ze

Model	RTAG	145	155	170	190	205	225	230
Refrigerant					R1234ze			
Compressor								
Model		CHHP (M2+M2)	CHHW(N5) +CHHP(M2)	CHHW (N5+N5)	CHHW (N6+N5)	CHHW (N6+N6)	CHHW (N6E2+N6E2)	CHHW (N6E2+N6E2)
Type					Horizontal semienclosed screw compressor			
Starter					VFD			
Circuits		2	2	2	2	2	2	2
Min load	%	18%	18%	18%	18%	18%	18%	18%
Must hold current(1A/1B)	A	160/-	194/-	194/-	231/-	231/-	231/-	231/-
Must hold current(2A/2B)	A	160/-	160/-	194/-	194/-	231/-	231/-	231/-
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	258	279	302	331	360	397	398
Rating WPD	psid	2.9	3	2.6	3.1	2.4	2.8	2.4
Min flow	gpm	198	213	238	242	304	312	335
Max flow	gpm	436	470	509	558	608	668	670
Water storage	lb	171	182	208	208	263	263	289
tube size	inch	5	5	6	6	6	6	6
Air side heat exchanger								
Fan type					Axial flow			
Quantity		10	10	10	12	12	12	14
power	kW/per	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Fan speed	RPM	910/200	910/200	910/200	910/200	910/200	910/200	910/200
Single fan Airflow	CFM	10,036	10,036	10,036	10,036	10,036	10,036	10,036
Fan current	A	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	358	392	427	471	508	507	515
Control panel 2	A	-	-	-	-	-	-	-
Unit start up amps								
Control panel 1	A	358	392	427	471	508	507	515
Control panel 2	A	-	-	-	-	-	-	-
Refrigerant charge								
ckt 1	kg	78	78	78	85	87	93	98
	lb	172	172	172	187	192	205	216
ckt 2	kg	78	78	78	85	87	93	98
	lb	172	172	172	187	192	205	216
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	7	7	8	8	8	8	8
	gal	1.8	1.8	2.1	2.1	2.1	2.1	2.1
ckt 2	L	7	7	8	8	8	8	8
	gal	1.8	1.8	2.1	2.1	2.1	2.1	2.1
Dimension								
Length	inch	249	249	249	296	296	296	343
	mm	6,330	6,330	6,330	7,510	7,510	7,510	8,700
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	98.5	98.5	98.5	98.5	98.5	98.5
	mm	2,501	2,501	2,501	2,501	2,501	2,501	2,501
Weight - Non Copper Fin								
Shipping weight	lb	10,999	11,083	11,451	11,951	12,192	12,641	14,134
	kg	4,989	5,027	5,194	5,421	5,530	5,734	6,411
Operation weight	lb	11,570	11,667	12,066	12,591	12,888	12,904	14,423
	kg	5,248	5,292	5,473	5,711	5,846	5,853	6,542
Weight - Copper Fin								
Shipping weight	lb	12,983	13,067	13,435	13,843	14,083	14,533	16,338
	kg	5,889	5,927	6,094	6,279	6,388	6,592	7,411
Operation weight	lb	13,554	13,651	14,050	14,482	14,780	14,795	16,627
	kg	6,148	6,192	6,373	6,569	6,704	6,711	7,542

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 24. General data - 255 - 440 Ton 400 Volt - 60Hz High efficiency (fixed speed fan) - R1234ze

Model	RTAG	255	285	310	340	375	400	440
Refrigerant					R1234ze			
Compressor								
Model		CHHP (M2,M2+M2)	CHHP(M2), CHHW (N5) + CHHW(N5)	CHHW (N5,N5+N5)	CHHW (N6,N5+N6)	CHHP(M2), CHHW(N5) + CHHP(M2), CHHW(N5)	CHHW (N5,N5+N5,N5)	CHHW (N6,N5 + N6,N5)
Type					Horizontal semienclosed screw compressor			
Starter					YDEL			
Circuits		2	2	2	2	2	2	2
Min load	%	10%	10%	10%	10%	7.5%	7.5%	7.5%
Must hold current(1A/1B)	A	190/190	190/231	231/231	278/231	190/231	231/231	278/231
Must hold current(2A/2B)	A	190/-	231/-	231/-	278/-	190/231	231/231	278/231
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	460	524	557	611	688	734	811
Rating WPD	psid	3.2	3.3	3	3.5	3.5	3.3	2.8
Min flow	gpm	310	352	375	411	463	494	591
Max flow	gpm	774	880	937	1,028	1,157	1,234	1,364
Water storage	lb	234	265	301	301	332	369	455
tube size	inch	6	6	6	6	8	8	8
Air side heat exchanger								
Fan type					Axial flow			
Quantity		14	14	16	16	18	18	20
power	kW/per	1.0	2.0	2.0	2.0	2.0	2.0	2.0
Fan speed	RPM	840	860	860	860	860	860	860
Single fan Airflow	CFM	8,828	11,478	11,478	11,478	11,478	11,478	11,478
Fan current	A	2.8	4.7	4.7	4.7	4.7	4.7	4.7
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	408	465	514	561	465	505	557
Control panel 2	A	206	257	257	303	465	505	557
Unit start up amps								
Control panel 1	A	517	636	685	685	636	676	681
Control panel 2	A	316	428	428	428	636	676	681
Refrigerant charge								
ckt 1	kg	132	132	148	153	140	140	162
	lb	291	291	326	337	309	309	357
ckt 2	kg	65	65	66	66	140	140	162
	lb	143	143	146	146	309	309	357
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	lb	8	8	8	8	16	16	16
	gal	2.1	2.1	2.1	2.1	4.2	4.2	4.2
Dimension								
Length	inch	354	354	399	399	445	445	465
	mm	8,995	8,995	10,130	10,130	11,310	11,310	11,810
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	98.5	97.6	97.6	97.6	97.6	97.6	97.6
	mm	2,501	2,480	2,480	2,480	2,480	2,480	2,480
Weight - Non Copper Fin								
Shipping weight	lb	15,699	16,184	17,699	17,734	20,309	20,640	22,481
	kg	7,121	7,341	8,028	8,044	9,212	9,362	10,197
Operation weight	lb	15,933	16,449	18,001	18,036	20,642	21,008	22,935
	kg	7,227	7,461	8,165	8,181	9,363	9,529	10,403
Weight - Copper Fin								
Shipping weight	lb	17,904	18,389	20,219	20,254	23,144	23,475	26,447
	kg	8,121	8,341	9,171	9,187	10,498	10,648	11,996
Operation weight	lb	18,137	18,653	20,521	20,556	23,477	23,843	26,901
	kg	8,227	8,461	9,308	9,324	10,649	10,815	12,202

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 25. General data - 285 - 440 Ton 400 Volt - 60Hz Extra efficiency (fixed speed fan) - R1234ze

Model	RTAG	285	310	340	375	400	410	440
Refrigerant					R1234ze			
Compressor								
Model		CHHP(M2), CHHW (N5) + CHHW(N5)	CHHW (N5,N5+N5)	CHHW (N6,N5 + N6)	CHHP(M2), CHHW(N5) + CHHP(M2), CHHW(N5)	CHHW (N5,N5 + N5,N5)	CHHW (N5,N5 + N5,N5)	CHHW (N6,N5 + N6,N5)
Type					Horizontal semienclosed screw compressor			
Starter					YDEL			
Circuits		2	2	2	2	2	2	2
Min load	%	10%	10%	10%	7.5%	7.5%	7.5%	7.5%
Must hold current(1A/1B)	A	190/231	231/231	278/231	190/231	231/231	231/231	278/231
Must hold current(2A/2B)	A	231/-	231/-	278/-	190/231	231/231	231/231	278/231
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	534	562	623	690	751	763	826
Rating WPD	psid	3.4	3	3.7	3	3.0	3.1	2.9
Min flow	gpm	359	378	419	464	505	513	602
Max flow	gpm	898	945	1,048	1,161	1,263	1,282	1,389
Water storage	lb	265	301	301	369	403	403	455
tube size	inch	6	6	6	8	8	8	8
Air side heat exchanger								
Fan type					Axial flow			
Quantity		18	18	20	20	20	24	24
power	kW/per	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Fan speed	RPM	860	860	860	860	860	860	860
Single fan Airflow	CFM	11,478	11,478	11,478	11,478	11,478	11,478	11,478
Fan current	A	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	478	519	575	469	510	519	565
Control panel 2	A	260	260	308	469	510	519	565
Unit start up amps								
Control panel 1	A	649	690	698	640	681	690	690
Control panel 2	A	432	432	432	640	681	690	690
Refrigerant charge								
ckt 1	kg	156	156	176	157	157	164	180
	lb	344	344	388	346	346	362	397
ckt 2	kg	73	74	74	157	157	164	180
	lb	161	163	163	346	346	362	397
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension								
Length	inch	445	445	465	465	465	585	585
	mm	11,310	11,310	11,810	11,810	11,810	14,850	14,850
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	97.6	97.6	97.6	97.6	97.6	97.6	97.6
	mm	2,480	2,480	2,480	2,480	2,480	2,480	2,480
Weight - Non Copper Fin								
Shipping weight	lb	18,250	18,439	19,121	22,007	22,291	23,808	24,943
	kg	8,278	8,364	8,673	9,982	10,111	10,799	11,314
Operation weight	lb	18,514	18,742	19,423	22,375	22,694	24,211	25,397
	kg	8,398	8,501	8,810	10,149	10,294	10,982	11,520
Weight - Copper Fin								
Shipping weight	lb	21,085	21,275	22,271	25,973	26,257	27,589	29,703
	kg	9,564	9,650	10,102	11,781	11,910	12,514	13,473
Operation weight	lb	21,350	21,577	22,573	26,341	26,661	27,992	30,157
	kg	9,684	9,787	10,239	11,948	12,093	12,697	13,679

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 26. General data - 285 - 460 Ton 400 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R1234ze

Model	RTAG	285	310	340	375	400	440	460
Refrigerant					R1234ze			
Compressor								
Model		CHHW (N5,N5+N6)	CHHW (N6,N5+N6E2)	CHHW (N6E2,N5 + N6E2)	CHHW (N5,N5+N5,N5)	CHHW (N6,N5+N6,N5)	CHHW (N6E2,N5 + N6E2,N5)	CHHW (N6E2+ N6E2 + N6E2 + N6E2)
Type					Horizontal semienclosed screw compressor			
Starter					VFD			
Circuits		2	2	2	2	2	2	4
Min load	%	12%	12%	12%	9%	9%	9%	9%
Must hold current(1A/1B)	A	194/231	231/231	231/231	194/231	231/231	231/231	231/231
Must hold current(2A/2B)	A	231/-	231/-	231/-	194/231	231/231	231/231	231/231
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	516	573	591	677	733	788	796
Rating WPD	psid	3.2	3.1	3.3	3.4	3.3	2.6	2.4
Min flow	gpm	347	385	397	455	493	574	705
Max flow	gpm	867	964	992	1,138	1,232	1,324	1,762
Water storage	lb	265	301	301	332	369	455	578
tube size	inch	6	6	6	8	8	8	6
Air side heat exchanger								
Fan type					Axial flow			
Quantity		14	16	16	18	18	20	28
power	kW/per	1.65						1.5
Fan speed	RPM	970 / 200						910/200
Single fan Airflow	CFM	11,772						10,036
Fan current	A	4.7	4.7	4.7	4.7	4.7	4.7	3.8
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	472	513	513	472	504	509	515
Control panel 2	A	256	256	256	472	504	509	515
Unit start up amps								
Control panel 1	A	644	685	685	644	676	681	515
Control panel 2	A	256	256	256	644	676	681	515
Refrigerant charge								
ckt 1	kg	132	149	162	140	140	170	196
	lb	291	328	357	309	309	375	432
ckt 2	kg	65	71	71	140	140	170	196
	lb	143	157	157	309	309	375	432
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension								
Length	inch	362	408	408	455	455	465	685
	mm	9,200	10,350	10,350	11,560	11,560	11,810	17,410
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	97.6	97.6	97.6	97.6	97.6	97.6	98.5
	mm	2,480	2,480	2,480	2,480	2,480	2,480	2,501
Weight - Non Copper Fin								
Shipping weight	lb	16,956	18,470	18,506	21,081	21,411	22,921	28,268
	kg	7,691	8,378	8,394	9,562	9,712	10,397	12,822
Operation weight	lb	17,220	18,772	18,808	21,414	21,779	23,376	28,845
	kg	7,811	8,515	8,531	9,713	9,879	10,603	13,084
Weight - Copper Fin								
Shipping weight	lb	19,160	20,990	21,026	23,916	24,246	26,888	32,679
	kg	8,691	9,521	9,537	10,848	10,998	12,196	14,823
Operation weight	lb	19,425	21,292	21,328	24,249	24,615	27,342	33,257
	kg	8,811	9,658	9,674	10,999	11,165	12,402	15,085

Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2.°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 400V/60Hz/3Ph.

Table 27. General data - 225 - 230 Ton 460 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R1234ze

Model	RTAG	225	230
Refrigerant		R1234ze	
Compressor			
Model		CHHW (N6E2+N6E2)	CHHW (N6E2+N6E2)
Type		Horizontal semienclosed screw compressor	
Starter		VFD	
Circuits		2	2
Min load	%	18%	18%
Must hold current(1A/1B)	A	231/-	231/-
Must hold current(2A/2B)	A	231/-	231/-
Evaporator			
Type		Shell & Tube (CHIL)	
Rating flow	gpm	397	398
Rating WPD	psid	2.8	2.4
Min flow	gpm	312	335
Max flow	gpm	668	670
Water storage	lb	263	289
tube size	inch	6	6
Air side heat exchanger			
Fan type		Axial flow	
Quantity		12	14
power	kW/per	1.5	1.5
Fan speed	RPM	910/200	910/200
Single fan Airflow	CFM	10,036	10,036
Fan current	A	3.8	3.8
Unit Max RLA(Max Compr+Fan+Control)			
Control panel 1	A	441	447
Control panel 2	A	-	-
Unit start up amps			
Control panel 1	A	441	447
Control panel 2	A	-	-
Refrigerant charge			
ckt 1	kg	93	98
	lb	205	216
ckt 2	kg	93	98
	lb	205	216
Oil charge (the oil type show on unit nameplate)			
ckt 1	L	8	8
	gal	2.1	2.1
ckt 2	L	8	8
	gal	2.1	2.1
Dimension			
Length	inch	296	343
	mm	7,510	8,700
Width	inch	88.4	88.4
	mm	2,245	2,245
Height	inch	98.5	98.5
	mm	2,501	2,501
Weight - Non Copper Fin			
Shipping weight	lb	12,641	14,134
	kg	5,734	6,411
Operation weight	lb	12,904	14,423
	kg	5,853	6,542
Weight - Copper Fin			
Shipping weight	lb	14,533	16,338
	kg	6,592	7,411
Operation weight	lb	14,795	16,627
	kg	6,711	7,542

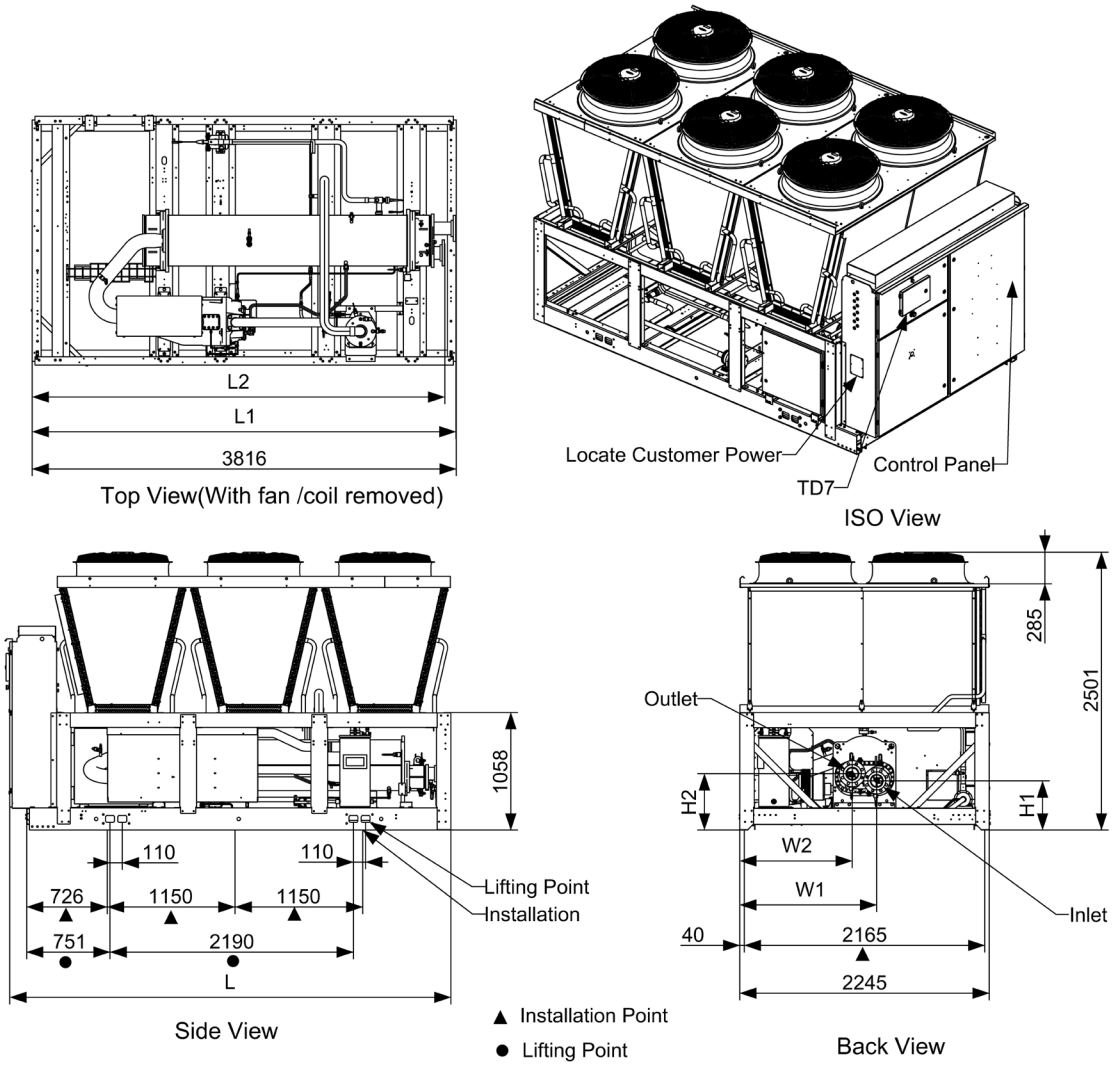
Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft^2·°F·h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 460V/60Hz/3Ph.

Table 28. General data - 285 - 460 Ton 460 Volt - 60Hz Premium seasonal efficiency (variable speed fan) - R1234ze

Model	RTAG	285	310	340	375	400	440	460
Refrigerant					R1234ze			
Compressor								
Model		CHHW (N5,N5+N6)	CHHW (N6,N5+N6E2)	CHHW (N6E2,N5 + N6E2)	CHHW (N5,N5+N5,N5)	CHHW (N6,N5+N6,N5)	CHHW (N6E2,N5 + N6E2,N5)	CHHW (N6E2+N6E2 + N6E2 + N6E2)
Type					Horizontal semienclosed screw compressor			
Starter					VFD			
Circuits		2	2	2	2	2	2	4
Min load	%	12%	12%	12%	9%	9%	9%	9%
Must hold current(1A/1B)	A	194/201	231/201	231/201	194/201	231/201	231/201	231/231
Must hold current(2A/2B)	A	231/-	231/-	231/-	194/201	231/201	231/201	231/231
Evaporator								
Type					Shell & Tube (CHIL)			
Rating flow	gpm	516	573	591	677	733	788	796
Rating WPD	psid	3.2	3.1	3.3	3.4	3.3	2.6	2.4
Min flow	gpm	347	385	397	455	493	574	705
Max flow	gpm	867	964	992	1,138	1,232	1,324	1,762
Water storage	lb	265	301	301	332	369	455	578
tube size	inch	6	6	6	8	8	8	6
Air side heat exchanger								
Fan type					Axial flow			
Quantity		14	16	16	18	18	20	28
power	kW/per				1.65			1.5
Fan speed	RPM				970 / 200			910/200
Single fan Airflow	CFM				11,772			10,036
Fan current	A	4.7	4.7	4.7	4.7	4.7	4.7	3.8
Unit Max RLA(Max Compr+Fan+Control)								
Control panel 1	A	410	446	446	410	438	442	447
Control panel 2	A	222	222	222	410	438	442	447
Unit start up amps								
Control panel 1	A	560	596	596	560	588	592	447
Control panel 2	A	222	222	222	560	588	592	447
Refrigerant charge								
ckt 1	kg	132	149	162	140	140	170	196
	lb	291	328	357	309	309	375	432
ckt 2	kg	65	71	71	140	140	170	196
	lb	143	157	157	309	309	375	432
Oil charge (the oil type show on unit nameplate)								
ckt 1	L	16	16	16	16	16	16	16
	gal	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	L	8	8	8	16	16	16	16
	gal	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension								
Length	inch	362	408	408	455	455	465	685
	mm	9,200	10,350	10,350	11,560	11,560	11,810	17,410
Width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4
	mm	2,245	2,245	2,245	2,245	2,245	2,245	2,245
Height	inch	97.6	97.6	97.6	97.6	97.6	97.6	98.5
	mm	2,480	2,480	2,480	2,480	2,480	2,480	2,501
Weight - Non Copper Fin								
Shipping weight	lb	16,956	18,470	18,506	21,081	21,411	22,921	28,268
	kg	7,691	8,378	8,394	9,562	9,712	10,397	12,822
Operation weight	lb	17,220	18,772	18,808	21,414	21,779	23,376	28,845
	kg	7,811	8,515	8,531	9,713	9,879	10,603	13,084
Weight - Copper Fin								
Shipping weight	lb	19,160	20,990	21,026	23,916	24,246	26,888	32,679
	kg	8,691	9,521	9,537	10,848	10,998	12,196	14,823
Operation weight	lb	19,425	21,292	21,328	24,249	24,615	27,342	33,257
	kg	8,811	9,658	9,674	10,999	11,165	12,402	15,085

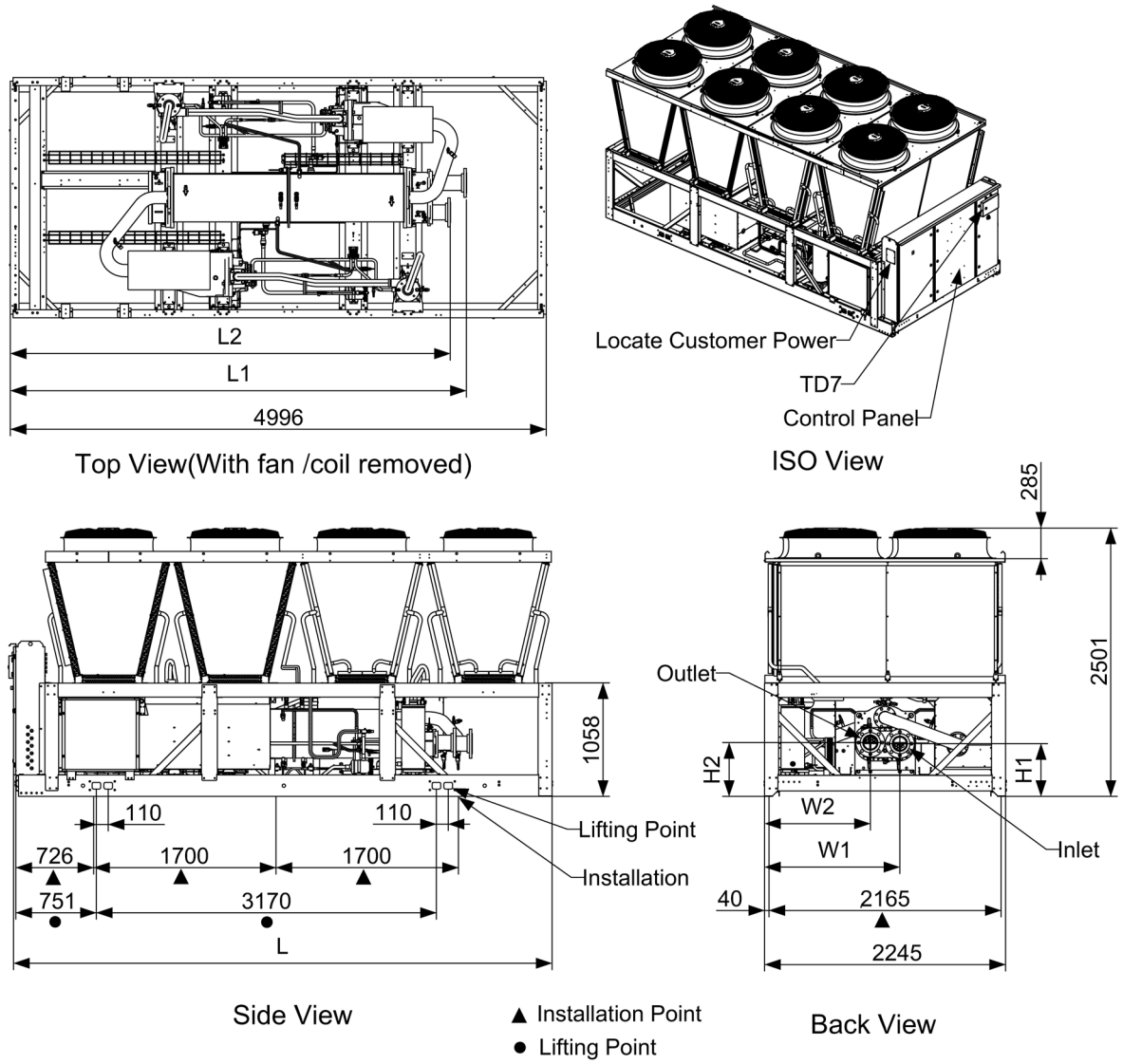
Note:
1. Data Containing : Temperature of Inlet/outlet : 54/44 °F, Ambient Temperature: 95°F, Scaling factor: 0.001 $ft^2 \cdot °F \cdot h/Btu$.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could be selected according to unit voltage, but the current value in table is based on 460V/60Hz/3Ph.

Dimension



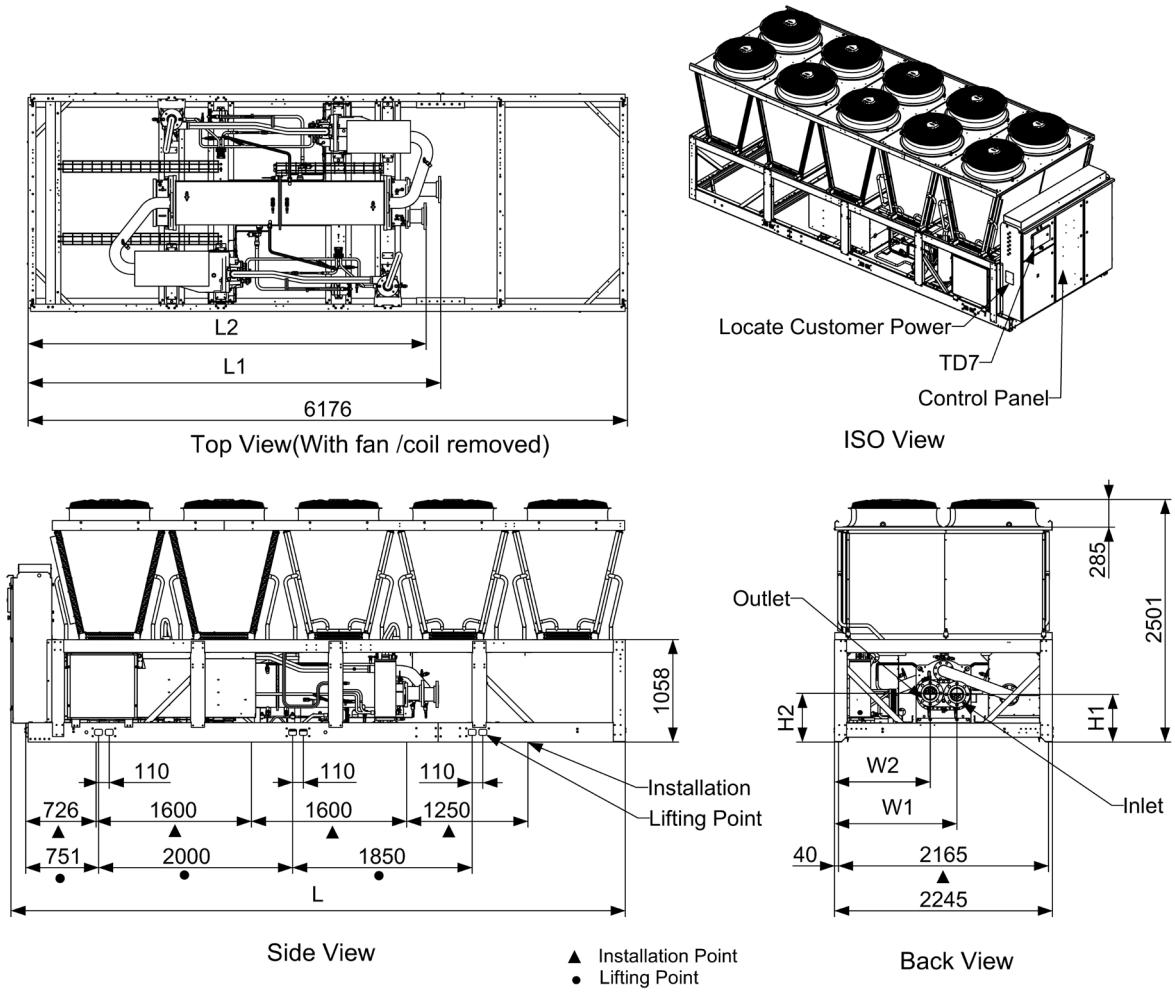
	Water box	H1 (mm)	H2 (mm)	W1 (mm)	W2 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High and Extra eff) (mm)	L (Premium seasonal eff) (mm)
RTAG 100 H	150PSI	468	478	1252	992	3619	3619	4"	3840	---
	300PSI	443	508	1233	1013	3813	3713	4"	3840	---
RTAG 100 X RTAG 100 P	150PSI	468	478	1252	992	3619	3619	4"	3840	3970
	300PSI	443	508	1233	1013	3813	3713	4"	3840	3970

Figure 2. Dimension - RTAG 100 H/X/P



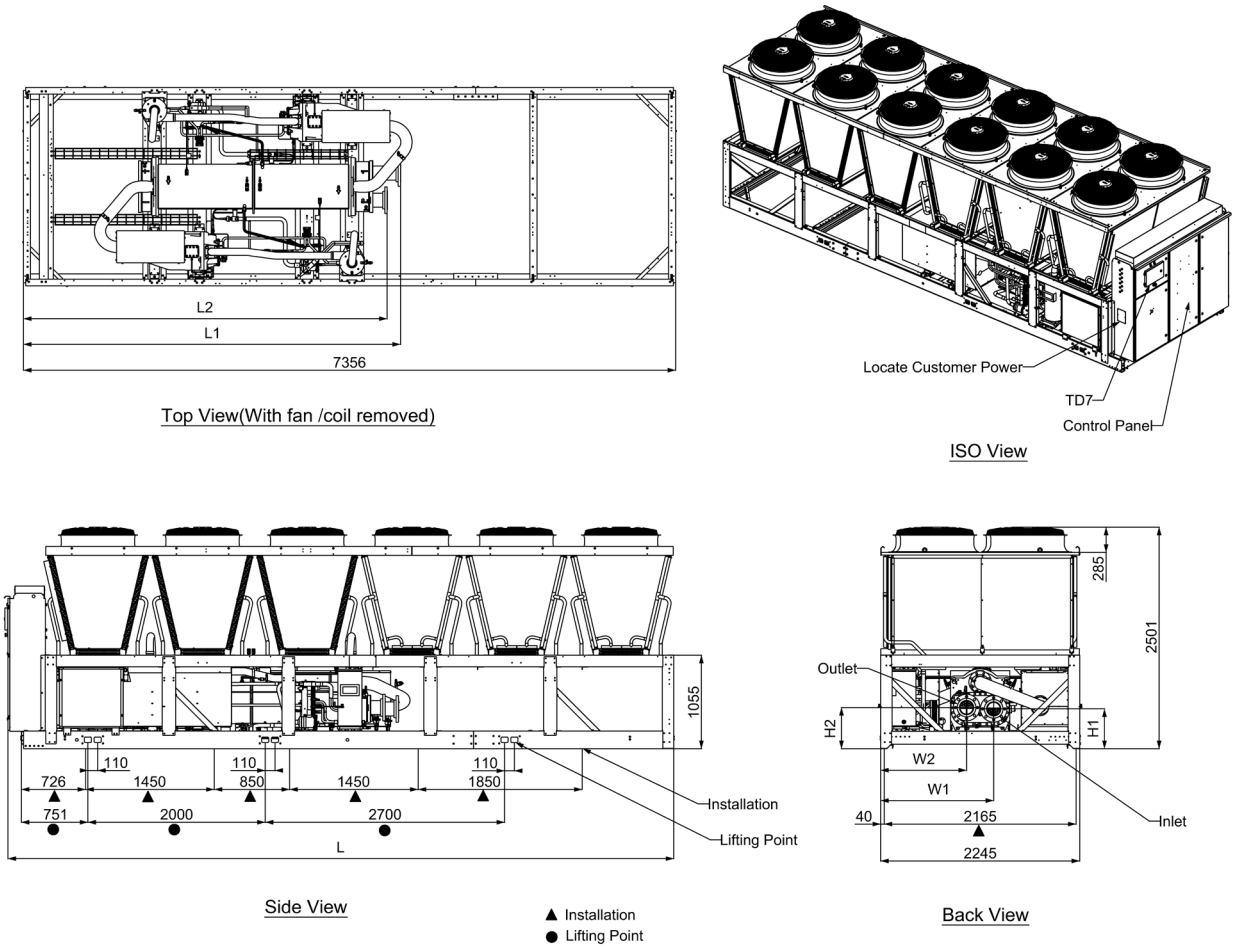
	Water box	H1 (mm)	H2 (mm)	W1 (mm)	W2 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (mm)
RTAG 125 H RTAG 145H RTAG 155H	150PSI	492	500	1260	985	3905	3905	5"	5020
	300PSI	492	500	1260	985	4249	4099	5"	5020
RTAG 170 H	150PSI	450	465	1275	970	3938	3938	5"	5020
	300PSI	450	465	1275	970	4250	4100	5"	5020

Figure 3. Dimension - RTAG 125/145/155/170H



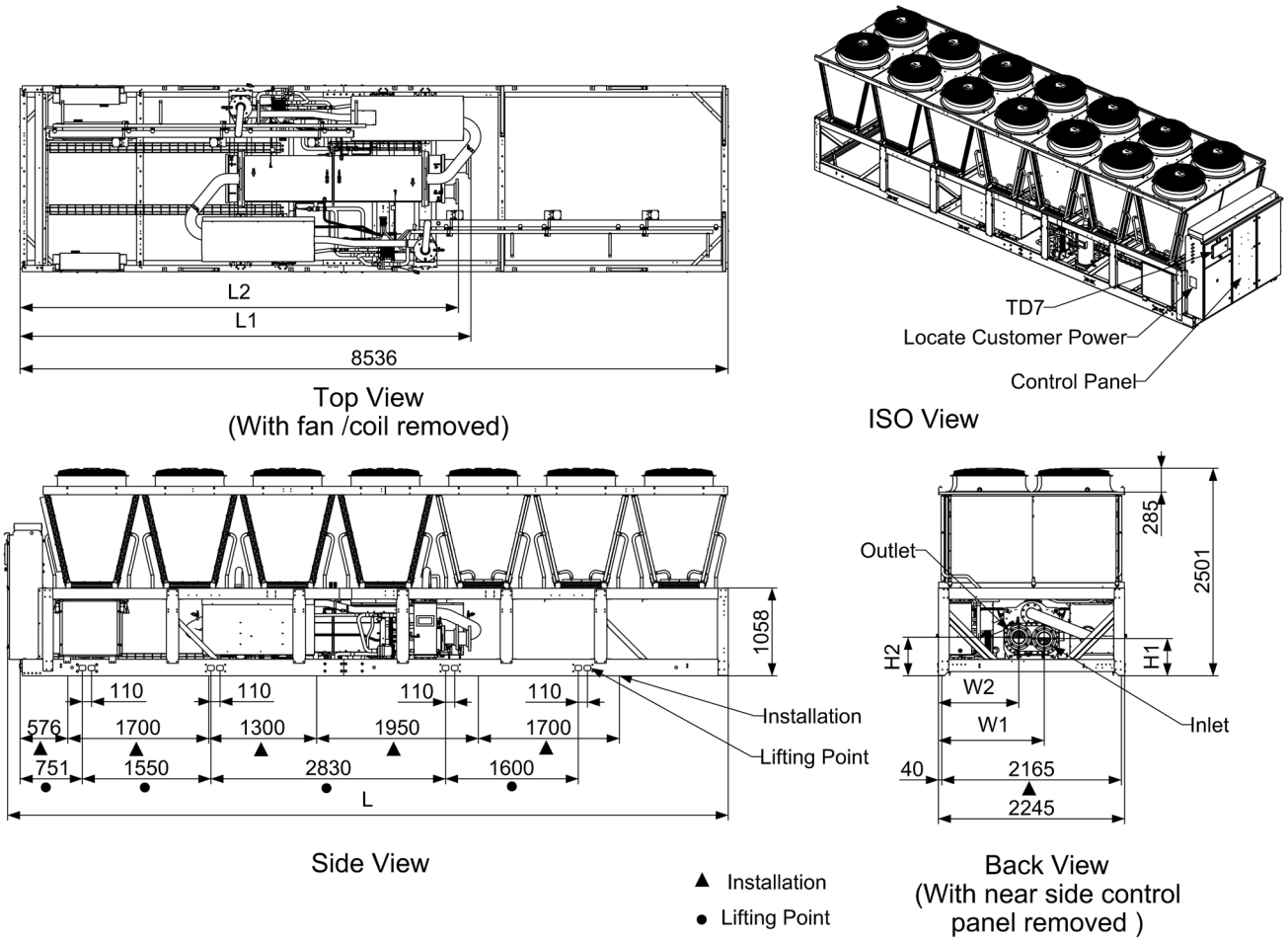
	Water box	H1 (mm)	H2 (mm)	W1 (mm)	W2 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High and Extra eff) (mm)	L (Premium seasonal eff) (mm)
RTAG 125 X	150PSI	492	500	1260	985	3905	3905	5"	6200	6330
RTAG 125 P	300PSI	492	500	1260	985	4249	4099	5"	6200	6330
RTAG 145 X	150PSI	492	500	1260	985	3905	3905	5"	6200	6330
RTAG 145 P	300PSI	492	500	1260	985	4249	4099	5"	6200	6330
RTAG 155 X	150PSI	492	500	1260	985	3905	3905	5"	6200	6330
RTAG 155 P	300PSI	492	500	1260	985	4249	4099	5"	6200	6330
RTAG 170 X	150PSI	450	465	1275	970	3938	3938	6"	6200	6330
RTAG 170 P	300PSI	450	465	1275	970	4250	4100	6"	6200	6330
RTAG 190 H	150PSI	450	465	1275	970	3938	3938	6"	6200	---
	300PSI	450	465	1275	970	4250	4100	6"	6200	---
RTAG 205 H	150PSI	450	465	1275	970	3938	3938	6"	6200	---
	300PSI	450	465	1275	970	4250	4100	6"	6200	---

Figure 4. Dimension - RTAG 190/205H,125/145/155/170X,125/145/155/170P



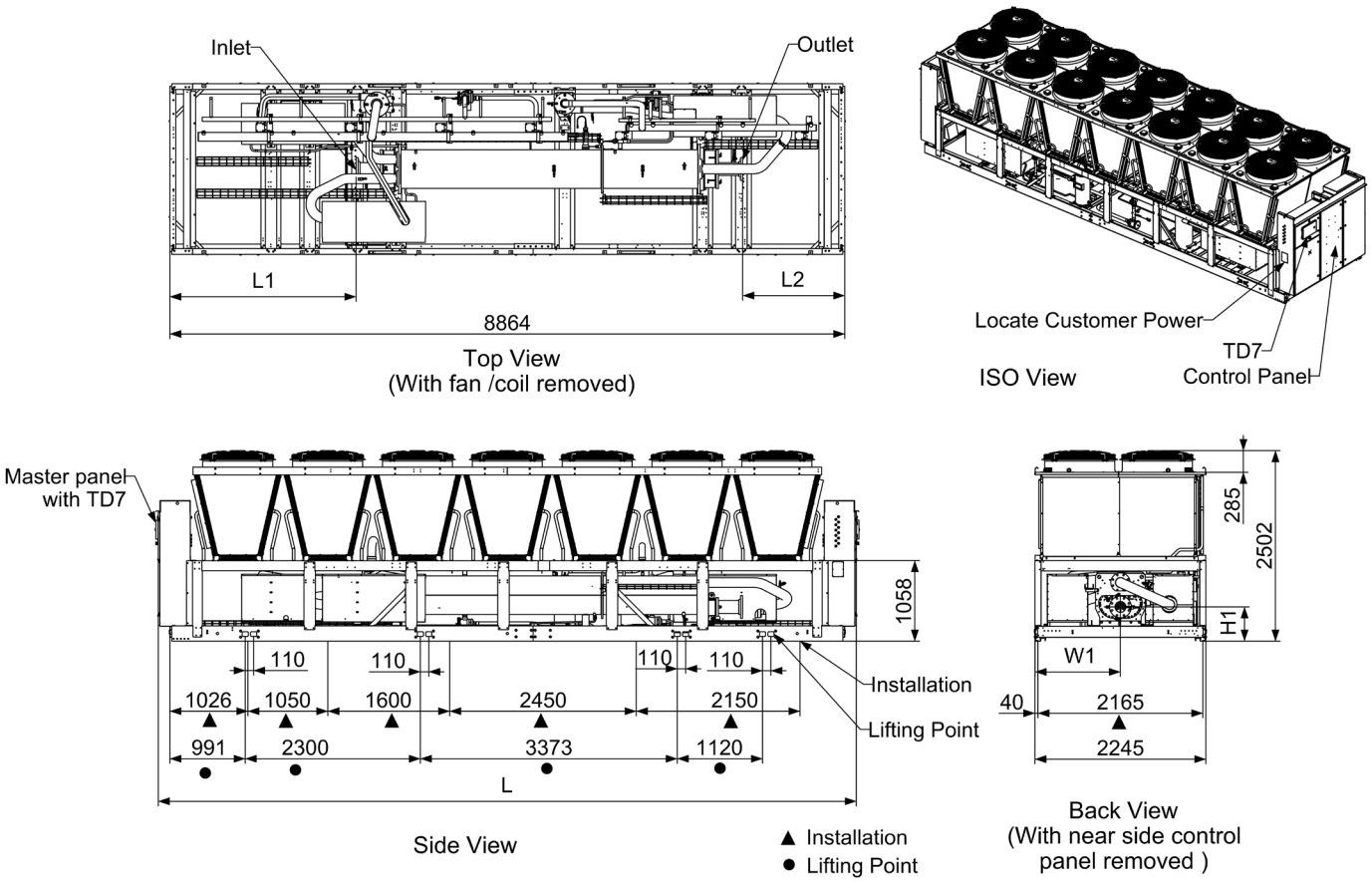
	Water box	H1 (mm)	H2 (mm)	W1 (mm)	W2 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High and Extra eff) (mm)	L (Premium seasonal eff) (mm)
RTAG 190 X	150PSI	450	465	1275	970	3938	3938	6"	7380	7510
RTAG 190 P	300PSI	450	465	1275	970	4250	4100	6"	7380	7510
RTAG 205 X	150PSI	450	465	1275	970	3938	3938	6"	7380	7510
RTAG 205 P	300PSI	450	465	1275	970	4250	4100	6"	7380	7510
RTAG 225 H	150PSI	450	465	1275	970	3938	3938	6"	7380	7510
RTAG 225 P	300PSI	450	465	1275	970	4250	4100	6"	7380	7510

Figure 5. Dimension - RTAG 225H,190/205X,190/205/225P



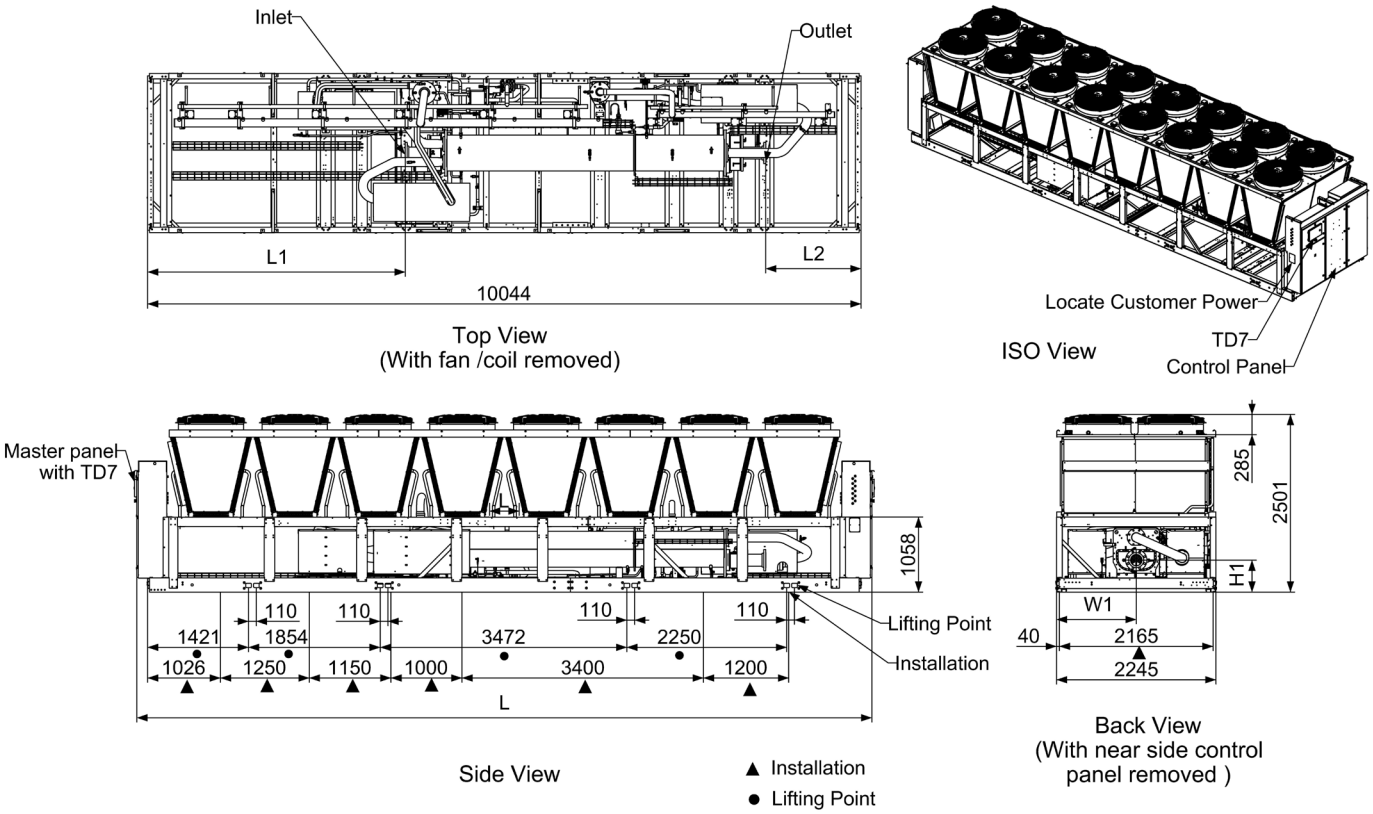
	Water box	H1 (mm)	H2 (mm)	W1 (mm)	W2 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (mm)
RTAG 225 X	150PSI	450	465	1275	970	5118	5118	6"	8600
RTAG 230 P	300PSI	450	465	1275	970	5430	5280	6"	8730

Figure 6. Dimension - RTAG 225X/230P



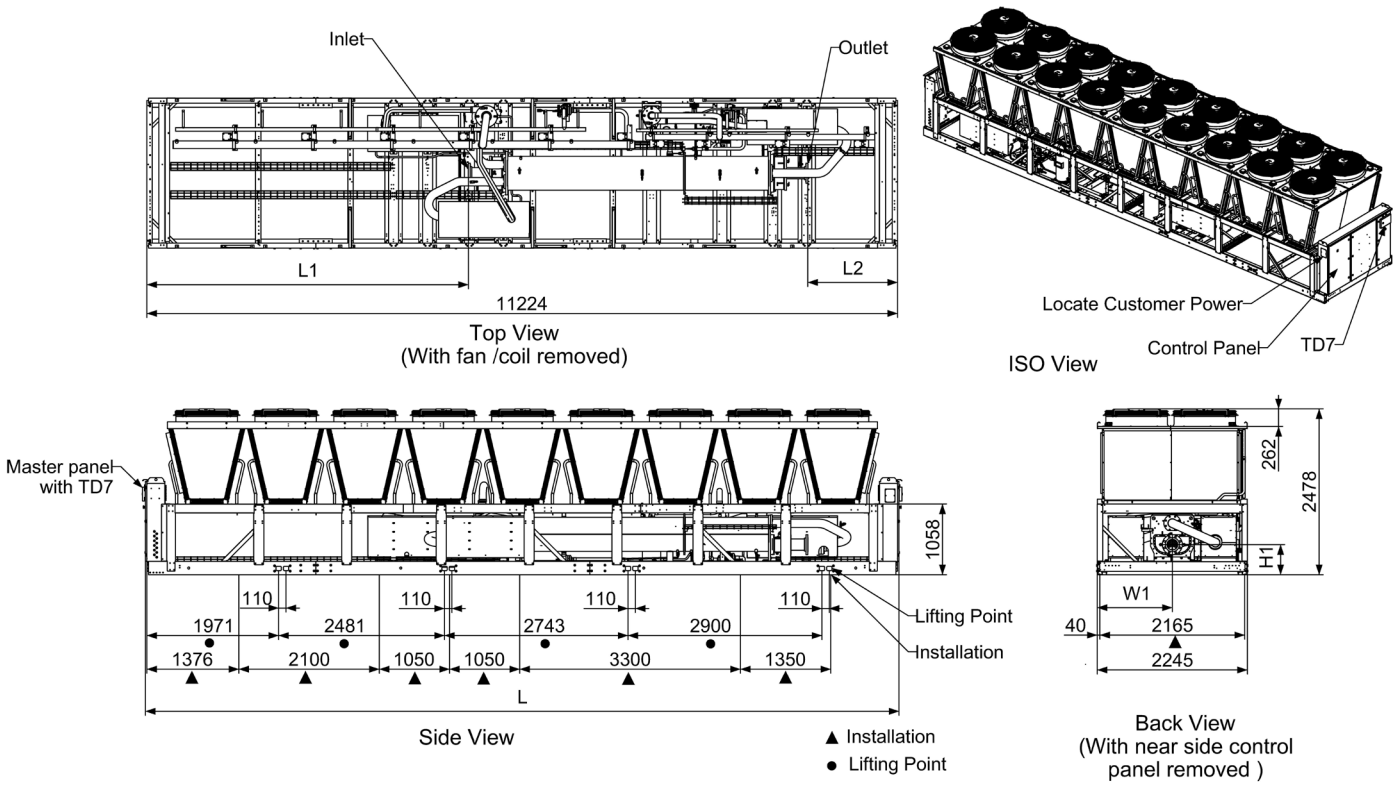
	Water box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High and Extra eff) (mm)	L (Premium seasonal eff) (mm)
RTAG 255H	150PSI	450	1120	2698	1593	6"	8995	---
	300PSI	450	1120	2447	1343	6"	8995	---
RTAG 285 H	150PSI	450	1120	2698	1593	6"	8995	---
	300PSI	450	1120	2447	1343	6"	8995	---
RTAG 285 P	150PSI	450	1120	2698	1593	6"	---	9210
	300PSI	450	1120	2447	1343	6"	---	9210

Figure 7. Dimension - RTAG 255/285H,285P



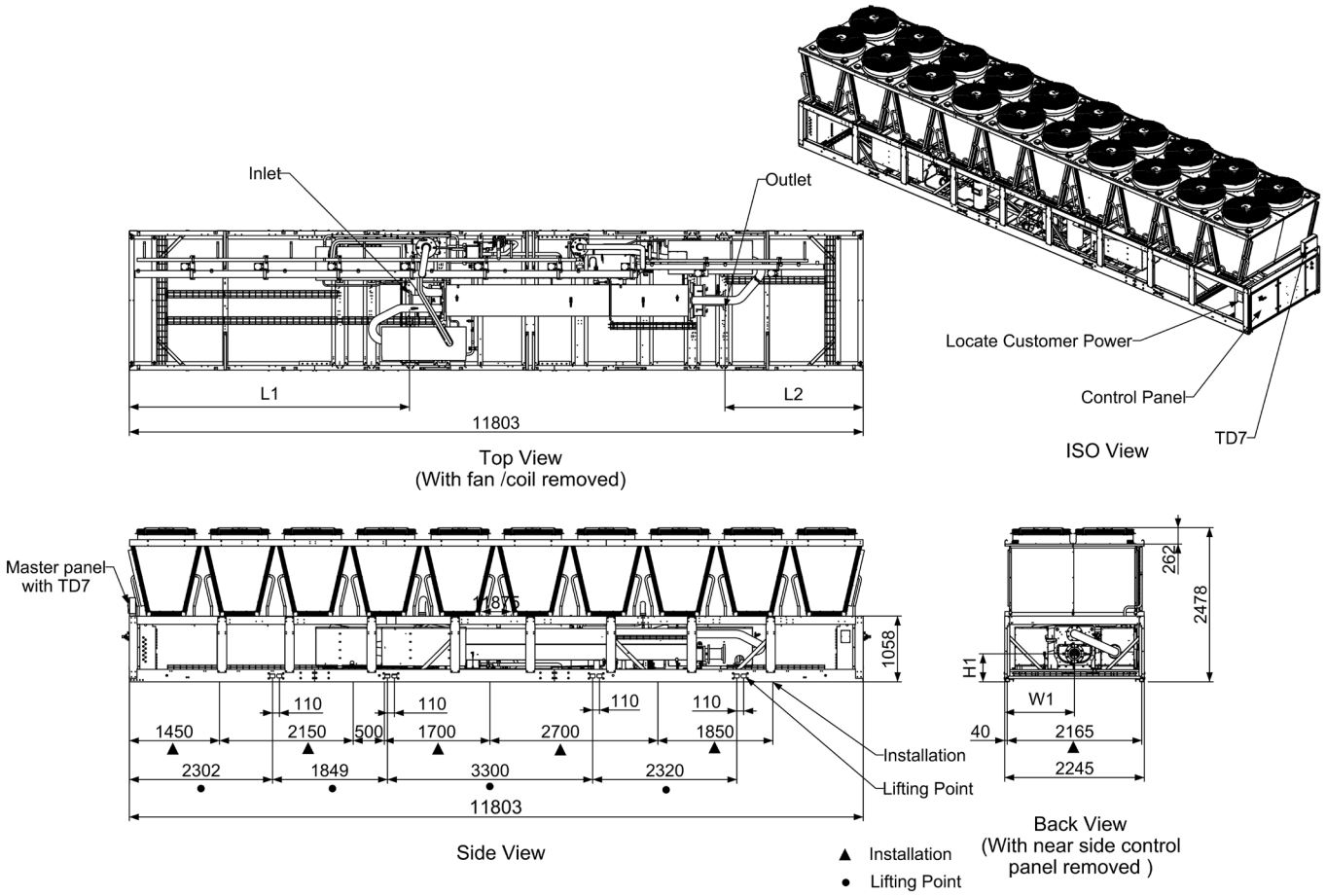
	Water box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High and Extra eff) (mm)	L (Premium seasonal eff) (mm)
RTAG 255 X	150PSI	450	1120	3877	1593	6"	10130	---
	300PSI	450	1120	3627	1343	6"	10130	---
RTAG 310 H	150PSI	450	1120	3877	1593	6"	10130	10390
RTAG 310 P	300PSI	450	1120	3627	1343	6"	10130	10390
RTAG 340 H	150PSI	450	1120	3877	1593	6"	10130	10390
RTAG 340 P	300PSI	450	1120	3627	1343	6"	10130	10390

Figure 8. Dimension - RTAG 255X,310/340H,310/340P



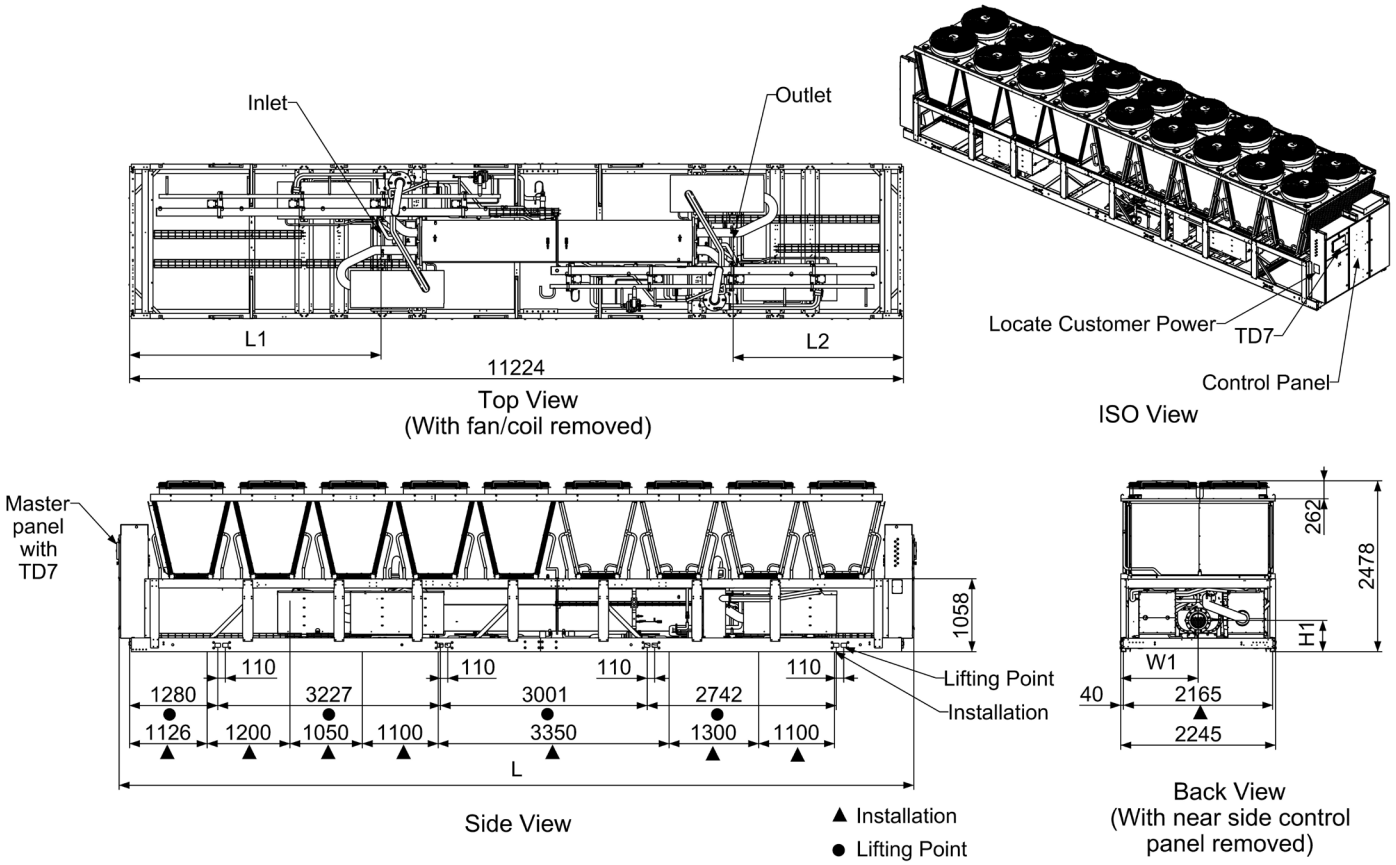
	Water box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (mm)
RTAG 285 X	150PSI	450	1120	5058	1593	6"	11310
RTAG 310 X	300PSI	450	1120	4807	1343	6"	11310

Figure 9. Dimension - RTAG 285/310X



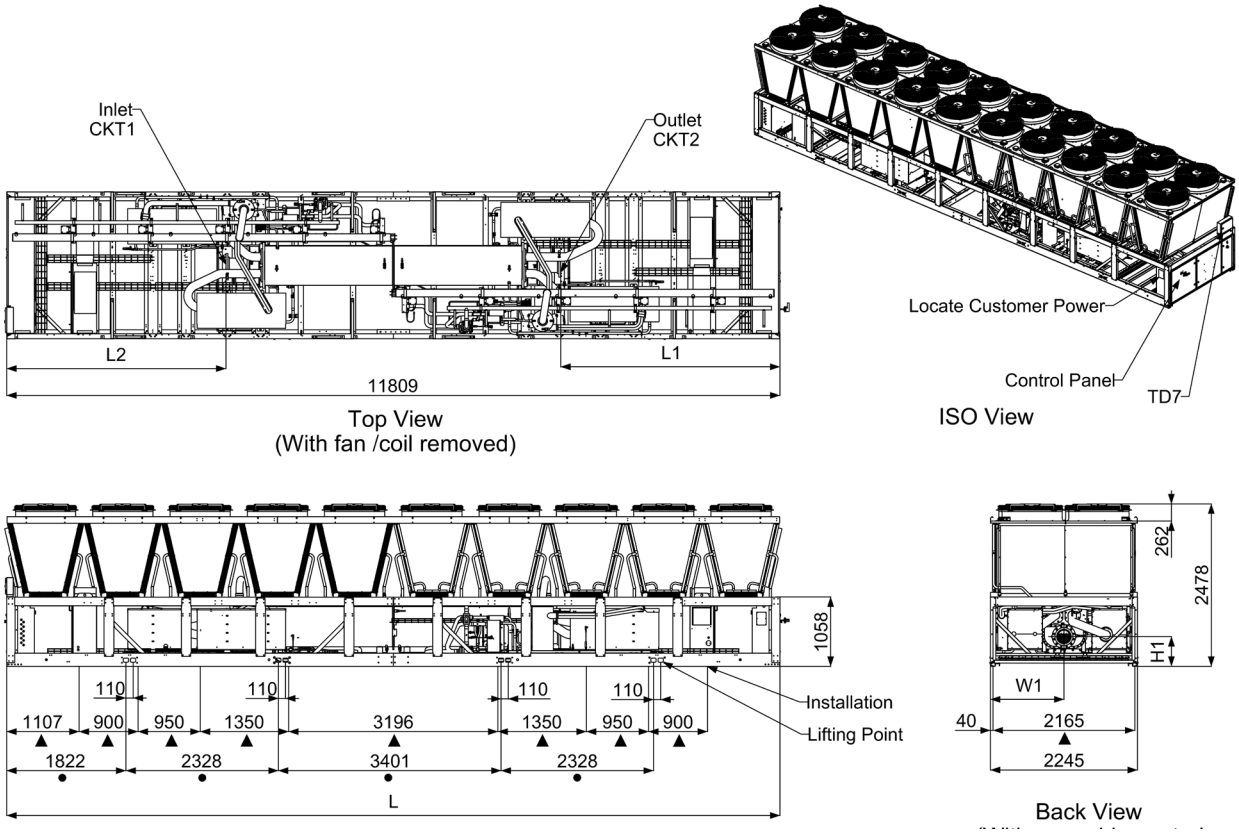
	Water box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe
RTAG 340 X	150PSI	450	1120	4758	2473	6"
	300PSI	450	1120	4508	2222	6"

Figure 10. Dimension - RTAG 340X



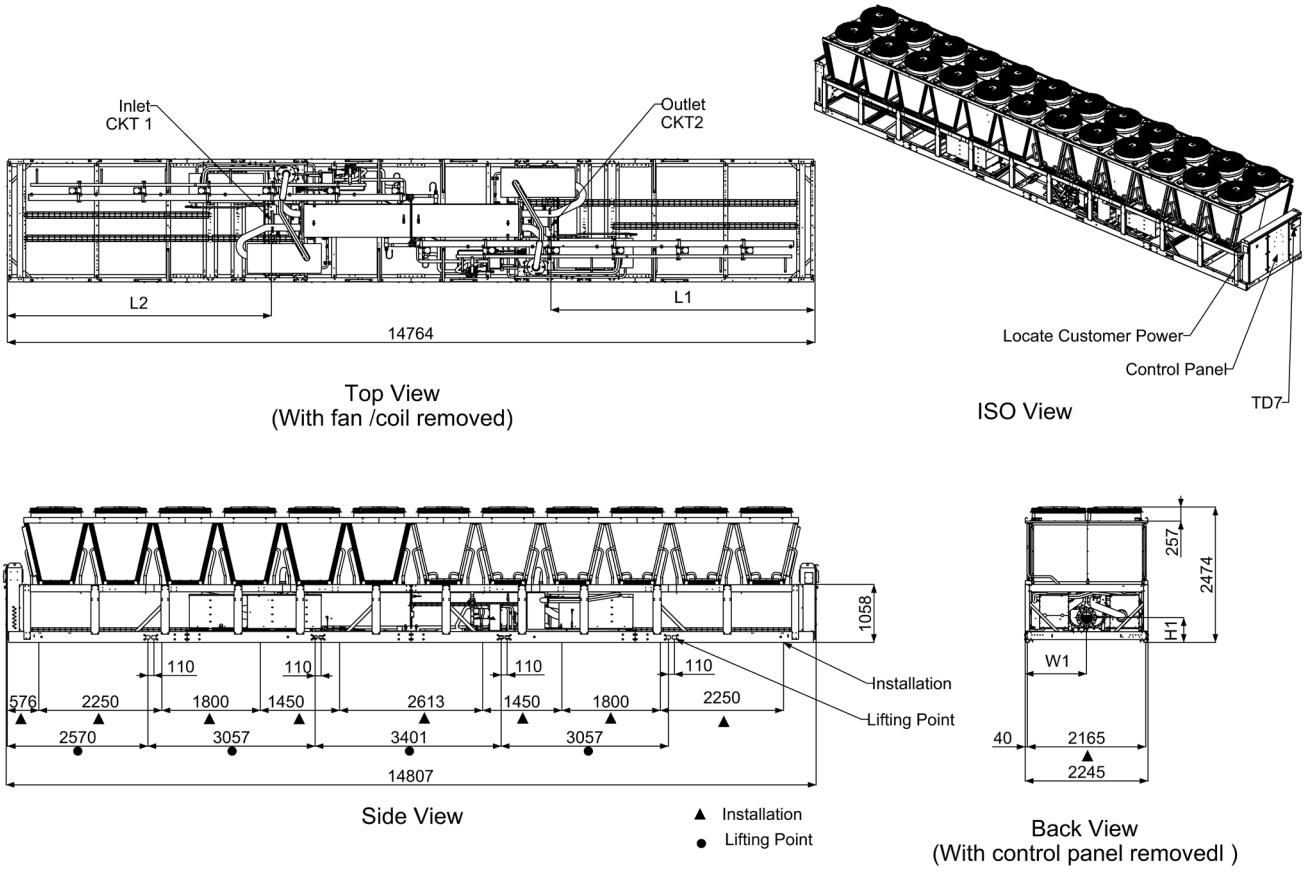
	Water box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High and Extra eff) (mm)	L (Premium seasonal eff) (mm)
RTAG 375 H RTAG 375 P	150PSI	453	1120	3882	2703	8"	11310	11560
	300PSI	453	1120	3647	2469	8"	11310	11560
RTAG 400 H RTAG 400 P	150PSI	453	1120	3882	2703	8"	11310	11560
	300PSI	453	1120	3647	2469	8"	11310	11560

Figure 11. Dimension - RTAG 375/400H,375/400P



	Water box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High and Extra eff) (mm)	L (Premium seasonal eff) (mm)
RTAG 375 X	150PSI	453	1120	3582	3582	8"	11810	---
	300PSI	453	1120	3348	3348	8"	11810	---
RTAG 400 X	150PSI	453	1120	3582	3582	8"	11810	---
	300PSI	453	1120	3348	3348	8"	11810	---
RTAG 440 H RTAG 440 P	150PSI	453	1120	3582	3582	8"	11810	11810
	300PSI	453	1120	3348	3348	8"	11810	11810
RTAG 500 H	150PSI	453	1120	3582	3582	8"	11810	---
	300PSI	453	1120	3348	3348	8"	11810	---

Figure 12. Dimension - RTAG 375/400X,440H,440P,500H



	Water box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe
RTAG 410 X	150PSI	453	1120	5062	5062	8"
	300PSI	453	1120	4828	4828	8"
RTAG 440 X	150PSI	453	1120	5062	5062	8"
	300PSI	453	1120	4828	4828	8"
RTAG 500 X	150PSI	453	1120	5062	5062	8"
	300PSI	453	1120	4828	4828	8"

Figure 13. Dimension - RTAG 410/440/500X

Installation - Mechanical

Installation Responsibilities

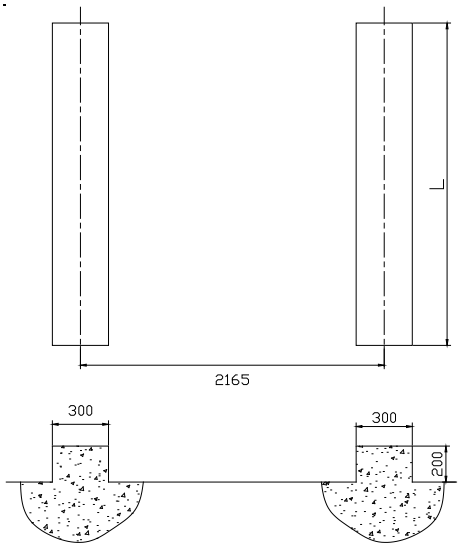
Table 29. Installation resposibilities

Type	Trane Provide Trane install	Trane Provide Field install	Field Provide Field install
Base			• Meet the requirements of installation base
Lifting			• Safety chain,u -joint adapter,hanging beam
Isolator		• Rubber isolator(option)	
Electrical	• Terminal block connection,-mech disconnect switch and circuit breaker(option,premium unit only have last two type) • Control panel		• The circuit breaker or fuse way switch (option) • Electric line to connect the unit starter • Wire specifications follow the requirement of NEC standard and unit attachments • Terminal box • Ground wire • Bas wiring (optional) • The control voltage wiring • Chilled water pump contactor and wiring, including interlock • Optional relay and wiring
Water pipe	• Vend point and purge valve on water box	• Water flow switch(option, attached)	• Pressure gauge and coupling on water pipe • Temperature sensor • Filter • Hose • Globe valve and balance valve on water pipe • Drain pipe:connect to water box • Water pipe insulation • Water pipe support
Relief valve	• Dual-relief valve or single relief valve(option)		
Insulation	• Unit insulation		• External water pipe insulation

Attention Items

Pre-installation, the contractor must realize the following items:

- Build a sufficient bearing rigidity, smooth installation platform as Figure 14, to support the equipment operation weight.
- If unit is shipped by container, unit will be equipped with several nylon pads under the base,which can protect the base from wear during transportation. Be sure to remove these nylon pads before installation.
- After the unit is in place, adjust the levelness of unit, the levelness deviation must be controlled within 6.0 mm (1/4 "). Trane company is not responsible for the equipment problem caused by the unreasonable foundation design.
- Suggest to leave enough space for coil cleaning. Install the attached sensor and connect to Symbio800.
- Contractor must provide flow switch or differential pressure switch which could interlock with water pump to make sure system water flow.
- Install drain valve at bottom of evaporator water box. Install vent valve at top of evaporator water box.
- Install filter and flow switch at inlet of water pump and evaporator.
- Provide all connection electric wire.
- Install evaporator heater and separated water pipe and other parts, make sure unit can run at low ambient temperature.



Unit Tonnage	Efficiency	L (mm)
100	High	3880
	Extra	3880
	Premium	4010
125; 145; 155; 170	High	5060
190; 205	High	6240
125; 145; 155; 170	Extra	6240
	Premium	6370
190; 205	Extra	7420
	Premium	7550
225	High	7420
	Premium	7550
225	Extra	8640
230	Premium	8770
255; 285	High	9035
	Premium	9250
255	Extra	10170
310; 340	High	10170
	Premium	10430
285; 310	Extra	11350
340	Extra	11850
375; 400	High	11350
	Premium	11600
375; 400	Extra	11850
440	High	11850
	Premium	11850
410; 440	Extra	14860
460	Premium	17450
500	High	11850
	Extra	14860

Figure 14. Installation platform

Storage Requirement

If unit will be stored before installation,please follow requirement below:

- Store the outdoor unit in a secure area.
- At least every three months (quarterly), check the pressure in the refrigerant circuits to verify that the refrigerant charge is intact. If it is not, contact a qualified service organization and the appropriate Trane sales office.
- Close the discharge and liquid line isolation valves.

Note: *Report any damage incurred during handling or installation to the Trane sales office immediately.*

Clearance

Provide enough space around the outdoor unit to allow the installation and maintenance personnel unrestricted access to all service points. Refer to submittal drawings for the unit dimensions. A minimum of 4 feet (1.2 m) is recommended for compressor service. Provide sufficient clearance for the opening of control panel doors. Refer to Figure 15 for minimum clearances. In all cases, local codes which require additional clearances will take precedence over these recommendations.

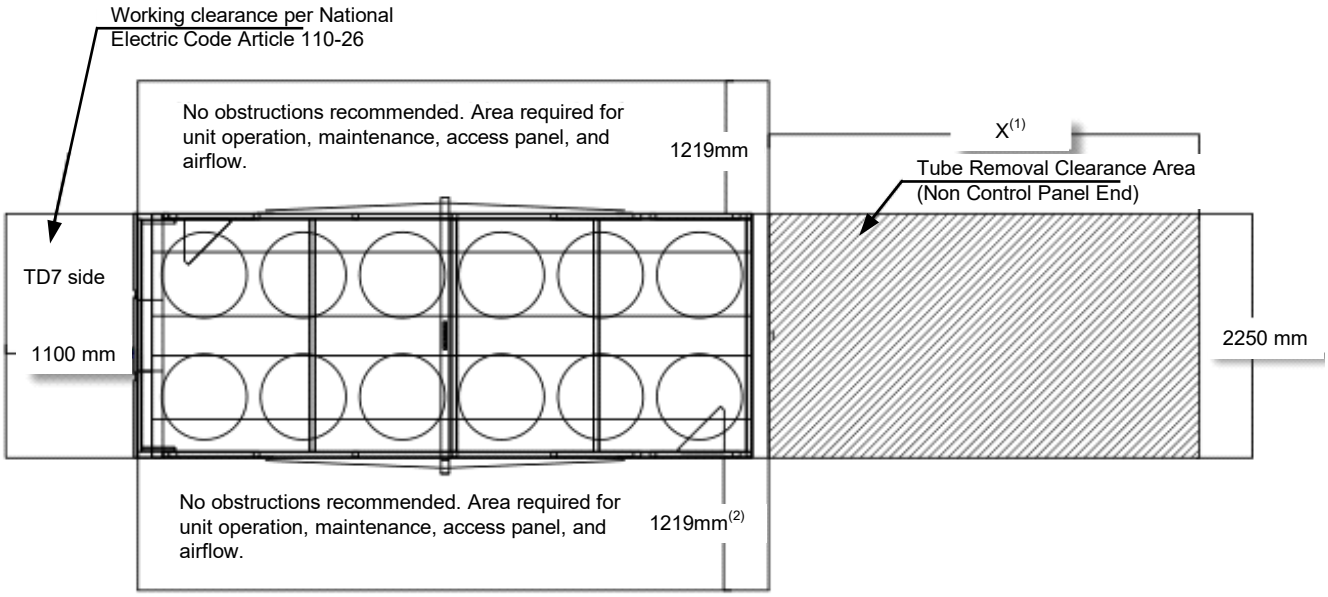
Unobstructed flow of condenser air is essential to maintain chiller capacity and operating efficiency. When determining unit placement, give careful consideration to assuring a sufficient flow of air across the condenser heat transfer surface. Two detrimental conditions are possible and must be avoided if optimum performance is to be achieved: warm air recirculation and coil starvation.

Warm air recirculation occurs when discharge air from the condenser fans is recycled back to the condenser coil inlet. Coil starvation occurs when free airflow to (or from) the condenser is restricted.

Both warm air recirculation and coil starvation cause reduction in unit efficiency and capacity due to the in-creased head pressures.

Debris, trash, supplies etc. should not be allowed to ac-cumulate in the vicinity of the unit. Supply air movement may draw debris into the condenser coil, blocking spaces between coil fins and causing coil starvation. Special consideration should be given to low ambient units. Condenser coils and fan discharge must be kept free of snow or other obstructions to permit adequate airflow for satisfactory unit operation.

In situations where equipment must be installed with less clearance than recommended, such as frequently occurs in retrofit and rooftop applications, restricted air flow is common. The Main Processor will direct the unit to make as much chilled water as possible given the actual installed conditions. Consult your Trane sales engineer for more details.



Note:

1.Tube removal clearance area (recommend the side far from operation interface), please keep enough space for tube removal: NTON<=225ton tech tube length is 2200mm, NTON> 225ton tech tube length is 4000mm, and need remove the control panel at this side.
2.if coil box need hoisted out from the side for maintenance, please leave a space of 2250mm for maintenance.

Figure 15. Installation clearance

NOTICE

No block above unit vent and no ventilating duct.Make sure there isn't any heat cource within 5 meter distance of the unit, such as air compressor exhause duct, boiler and so on. The inlet air temperature shall not exceed the unit selection of condenser temperature range.

If the installation filed is limited, can not meet the min-inum service room, or the unit surrounding and top have wall or other blocks, please contract Trane local agency, to make sure it is feasible.

Drainage

Provide a large capacity drain for water vessel drain-down during shutdown or repair. The evaporator is provided with a drain connection. All local and national codes apply. The vent on the top of the evaporator water-box is provided to prevent a vacuum by allowing air into the evaporator for complete drainage

⚠CAUTION

Electrical Dangrous !

No ponding in installation field, make sure the drain pipe is unobstructed to avoid water entering the control panel, and damage the unit or lead to electric leakage,and people injury or death.

In heavy snowflow region or long-term ambient temperature below 0°C region, must raise the unit to avoid the snows..

Unit Lifting

Please read unit lifting label before any operation:

1.Only lifting unit at unit marked position,Do not fork lift unit. Lifting must use the corresponding appliance, refer to Figure 16 ~ Figure 18.

2.Lifting chains/cables will not be the same length. Adjust to keep unit level while lifting. The minimum lifting Angle (Angle between the sling and the horizontal plane) is 60°. follow the Figure 16, Figure 17, Figure 18 and Table 30,Table 31.

3.Make sure each cord and lifting plug capability is bigger than unit shipping weight.

4.Protect the coil surface to avoid fin damage during lifting

5.Lifting carefully, raising unit slowly and stable, no vibration and tilt.

6.Remove the lifting instrument after unit take its the place

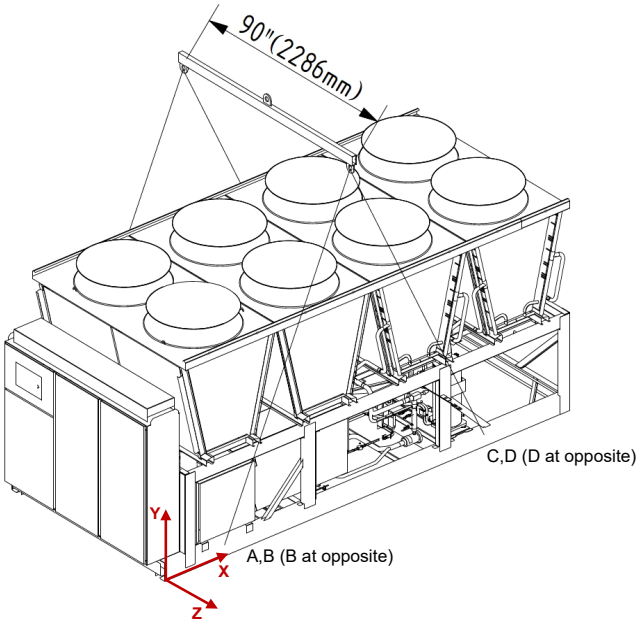


Figure 16. Unit lifting schematic (4 points)

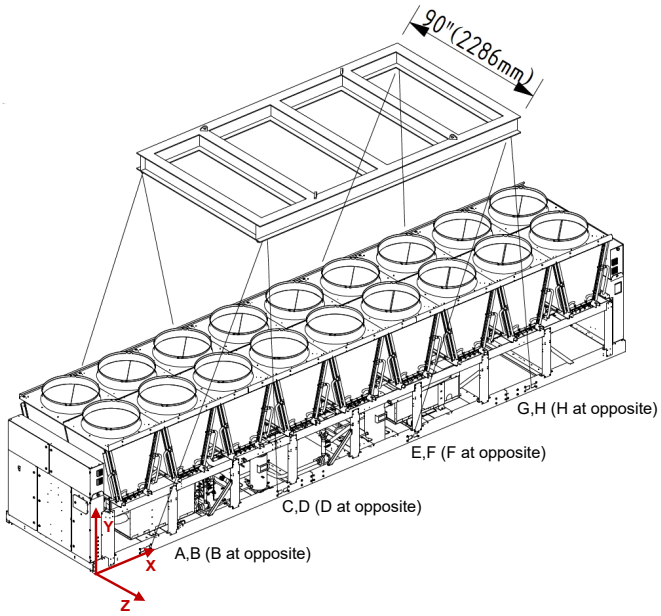


Figure 18. Unit lifting schematic (8 points)

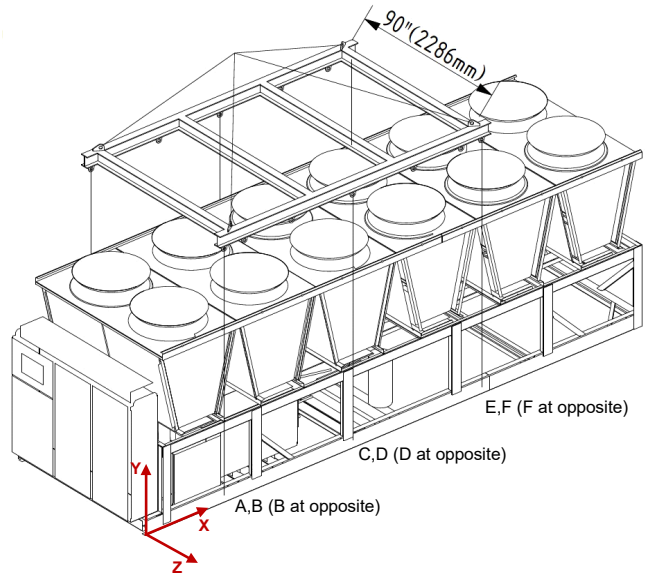


Figure 17. Unit lifting schematic (6 points)

Table 30. Lifting Weights and CG Dimensions - Non-copper fins

Tonnage	Efficiency	A (kg)	B (kg)	C (kg)	D (kg)	E (kg)	F (kg)	G (kg)	H (kg)	Shipping weight (kg)	Xcg (mm)	Ycg (mm)	Zcg (mm)
100	High	911	580	751	564	-	-	-	-	2805	1789	914	-911
125	High	1080	828	887	1027	-	-	-	-	3822	2394	944	-1085
145	High	1117	878	950	1185	-	-	-	-	4130	2443	946	-1117
155	High	1139	885	960	1190	-	-	-	-	4174	2438	941	-1111
170	High	1173	917	999	1251	-	-	-	-	4341	2449	926	-1117
190	High	826	613	925	994	640	701	-	-	4699	2711	941	-1100
205	High	832	617	943	1043	646	718	-	-	4798	2718	933	-1109
100	Extra	933	601	782	594	-	-	-	-	2910	1797	935	-918
125	Extra	764	590	822	825	619	646	-	-	4266	2708	984	-1080
145	Extra	784	608	871	955	670	721	-	-	4609	2749	987	-1108
155	Extra	800	611	885	960	670	721	-	-	4647	2742	983	-1103
170	Extra	823	628	925	1014	683	742	-	-	4814	2741	968	-1108
190	Extra	775	555	1096	1216	690	709	-	-	5041	3029	995	-1101
205	Extra	780	561	1122	1276	691	720	-	-	5150	3029	985	-1110
100	Premium	1112	779	744	556	-	-	-	-	3190	1677	923	-943
125	Premium	994	817	796	800	606	634	-	-	4646	2497	972	-1082
145	Premium	1013	833	846	931	657	709	-	-	4989	2550	976	-1107
155	Premium	1027	837	861	936	657	709	-	-	5027	2545	971	-1103
170	Premium	1049	854	899	992	670	730	-	-	5194	2550	958	-1108
190	Premium	1009	779	1068	1188	678	699	-	-	5421	2824	994	-1100
205	Premium	1015	782	1093	1248	683	710	-	-	5530	2828	985	-1108
225	High	801	581	1168	1321	728	754	-	-	5354	3030	982	-1112
255	High	841	1109	1205	1064	651	885	560	806	7121	4292	925	-1214
285	High	860	1154	1228	1093	673	925	572	836	7341	4299	923	-1221
310	High	598	742	1518	1504	785	913	816	1152	8028	5142	952	-1201
340	High	600	744	1520	1506	787	915	818	1154	8044	5142	952	-1201
375	High	926	1171	1407	1325	1004	1170	1244	964	9212	5882	939	-1126
400	High	934	1178	1449	1344	1018	1205	1255	980	9362	5885	933	-1126
440	High	1143	1465	1341	1155	1176	1320	1441	1155	10197	5893	973	-1120
500	High	1143	1465	1341	1155	1176	1320	1441	1155	10197	5893	973	-1120
225	Extra	308	350	1239	952	954	1268	440	419	5931	3858	988	-1129
255	Extra	588	721	1432	1428	754	880	791	1101	7695	5141	955	-1201
285	Extra	779	914	1323	1418	794	867	889	1294	8278	6006	1005	-1214
310	Extra	780	915	1362	1435	808	871	896	1296	8364	5999	1001	-1208
340	Extra	792	971	1414	1455	732	831	1042	1434	8673	6039	1004	-1210
375	Extra	1125	1450	1293	1130	1150	1270	1426	1138	9982	5893	981	-1120
400	Extra	1134	1456	1330	1142	1162	1308	1432	1147	10111	5893	973	-1120
410	Extra	1192	1457	1410	1340	1327	1426	1435	1213	10799	7357	1012	-1120
440	Extra	1285	1504	1484	1384	1400	1468	1530	1260	11314	7357	1032	-1120
500	Extra	1285	1504	1484	1384	1400	1468	1530	1260	11314	7357	1032	-1120
225	Premium	1036	805	1140	1293	717	744	-	-	5734	2840	982	-1110
230	Premium	308	350	1239	952	954	1268	440	419	5931	3858	988	-1129
285	Premium	960	1255	1213	1079	650	903	684	946	7691	4304	912	-1217
310	Premium	712	860	1494	1477	774	901	913	1249	8378	5136	943	-1198
340	Premium	714	862	1496	1479	776	903	915	1251	8394	5136	943	-1198
375	Premium	1029	1277	1386	1313	1000	1159	1342	1057	9562	5871	930	-1126
400	Premium	1036	1283	1435	1331	1007	1194	1353	1074	9712	5875	924	-1126
440	Premium	1205	1530	1330	1140	1159	1306	1507	1219	10397	5893	964	-1120

Table 31. Lifting Weights and CG Dimensions - Copper fins

Tonnage	Efficiency	A (kg)	B (kg)	C (kg)	D (kg)	E (kg)	F (kg)	G (kg)	H (kg)	Shipping weight (kg)	Xcg (mm)	Ycg (mm)	Zcg (mm)
100	High	990	659	830	644	-	-	-	-	3123	1789	914	-911
125	High	1223	971	1030	1170	-	-	-	-	4394	2394	944	-1085
145	High	1297	1058	1130	1365	-	-	-	-	4850	2443	946	-1117
155	High	1319	1065	1140	1370	-	-	-	-	4894	2438	941	-1111
170	High	1353	1097	1179	1431	-	-	-	-	5061	2449	926	-1117
190	High	945	732	1044	1113	759	821	-	-	5414	2711	941	-1100
205	High	951	736	1062	1162	765	837	-	-	5513	2718	933	-1109
100	Extra	1041	708	889	701	-	-	-	-	3339	1797	935	-918
125	Extra	883	709	941	944	739	765	-	-	4981	2708	984	-1080
145	Extra	934	758	1021	1105	820	871	-	-	5509	2749	987	-1108
155	Extra	950	761	1035	1110	820	871	-	-	5547	2742	983	-1103
170	Extra	973	778	1075	1164	833	892	-	-	5714	2741	968	-1108
190	Extra	918	698	1239	1359	833	852	-	-	5899	3029	995	-1101
205	Extra	923	704	1265	1419	834	863	-	-	6008	3029	985	-1110
100	Premium	1219	886	851	663	-	-	-	-	3619	1677	923	-943
125	Premium	1113	936	915	919	725	753	-	-	5361	2497	972	-1082
145	Premium	1163	983	996	1081	807	859	-	-	5889	2550	976	-1107
155	Premium	1177	987	1011	1086	807	859	-	-	5927	2545	971	-1103
170	Premium	1199	1004	1049	1142	820	880	-	-	6094	2550	958	-1108
190	Premium	1152	922	1211	1331	821	842	-	-	6279	2824	994	-1100
205	Premium	1158	925	1236	1391	826	853	-	-	6388	2828	985	-1108
225	High	944	724	1311	1464	871	897	-	-	6212	3030	982	-1112
255	High	966	1234	1330	1189	776	1010	686	931	8122	4292	925	-1214
285	High	985	1279	1353	1219	798	1050	697	961	8342	4299	923	-1221
310	High	741	885	1661	1647	928	1056	959	1295	9172	5142	952	-1201
340	High	743	887	1663	1649	930	1058	961	1297	9188	5142	952	-1201
375	High	1087	1332	1568	1486	1165	1331	1405	1124	10498	5882	939	-1126
400	High	1095	1339	1610	1505	1179	1365	1416	1140	10649	5885	933	-1126
440	High	1368	1690	1566	1380	1401	1545	1666	1380	11997	5893	973	-1120
500	High	1368	1690	1566	1380	1401	1545	1666	1380	11997	5893	973	-1120
225	Extra	434	475	1364	1077	1079	1393	566	544	6932	3858	988	-1129
255	Extra	731	864	1575	1571	897	1023	934	1244	8839	5141	955	-1201
285	Extra	940	1075	1483	1579	955	1028	1050	1455	9565	6006	1005	-1214
310	Extra	941	1076	1523	1596	969	1032	1057	1457	9651	5999	1001	-1208
340	Extra	971	1150	1593	1634	911	1010	1220	1613	10102	6039	1004	-1210
375	Extra	1350	1675	1518	1355	1375	1495	1651	1363	11781	5893	981	-1120
400	Extra	1359	1681	1555	1367	1387	1533	1657	1372	11911	5893	973	-1120
410	Extra	1407	1672	1625	1555	1541	1640	1650	1428	12516	7357	1012	-1120
440	Extra	1555	1774	1754	1654	1670	1738	1800	1530	13475	7357	1032	-1120
500	Extra	1555	1774	1754	1654	1670	1738	1800	1530	13475	7357	1032	-1120
225	Premium	1179	948	1283	1436	860	887	-	-	6592	2840	982	-1110
230	Premium	434	475	1364	1077	1079	1393	566	544	6932	3858	988	-1129
285	Premium	1086	1380	1338	1204	775	1028	809	1072	8692	4304	912	-1217
310	Premium	855	1003	1637	1620	917	1044	1056	1392	9522	5136	943	-1198
340	Premium	857	1005	1639	1622	919	1046	1058	1394	9538	5136	943	-1198
375	Premium	1190	1438	1546	1474	1160	1320	1502	1218	10849	5871	930	-1126
400	Premium	1197	1444	1596	1491	1167	1355	1514	1235	10999	5875	924	-1126
440	Premium	1430	1755	1555	1365	1384	1531	1732	1444	12197	5893	964	-1120

Isolator Installation

The most effective form of isolation is to locate the unit away from any sound sensitive area. Structurally transmitted sound can be reduced by elastomeric vibration eliminators. Spring isolators are not recommended. Consult an acoustical engineer in critical sound applications.For maximum isolation effect, isolate water lines and electrical conduit.Wall sleeves and rubber isolated piping hangers can be used to reduce the sound transmitted through water piping.To reduce the sound transmitted through electrical conduit, use flexible electrical conduit. State and local codes on sound emissions should always be considered. Since the environment in which a sound source is located affects sound pressure, unit placement must be carefully evaluated.

The optional isolator is rubber isolator,follow following installation steps:

1. Install the isolators according to Figure 19 & Table 32 location, and Table 33 & Table 34 isolator selections.
2. Secure the isolators to the mounting surface using the mounting slots in the isolator base plate according to Figure 20. Do not fully tighten the isolator mounting bolts at this time.
3. Align the mounting holes in the base of the unit with the threaded positioning pins on the top of the isolators.
4. Lower the unit onto the isolators and secure the isolator to the unit with a nut. Maximum isolator deflection should be 1/4 inch (6 mm).
5. Level the unit carefully. Fully tighten the isolator mounting bolts.

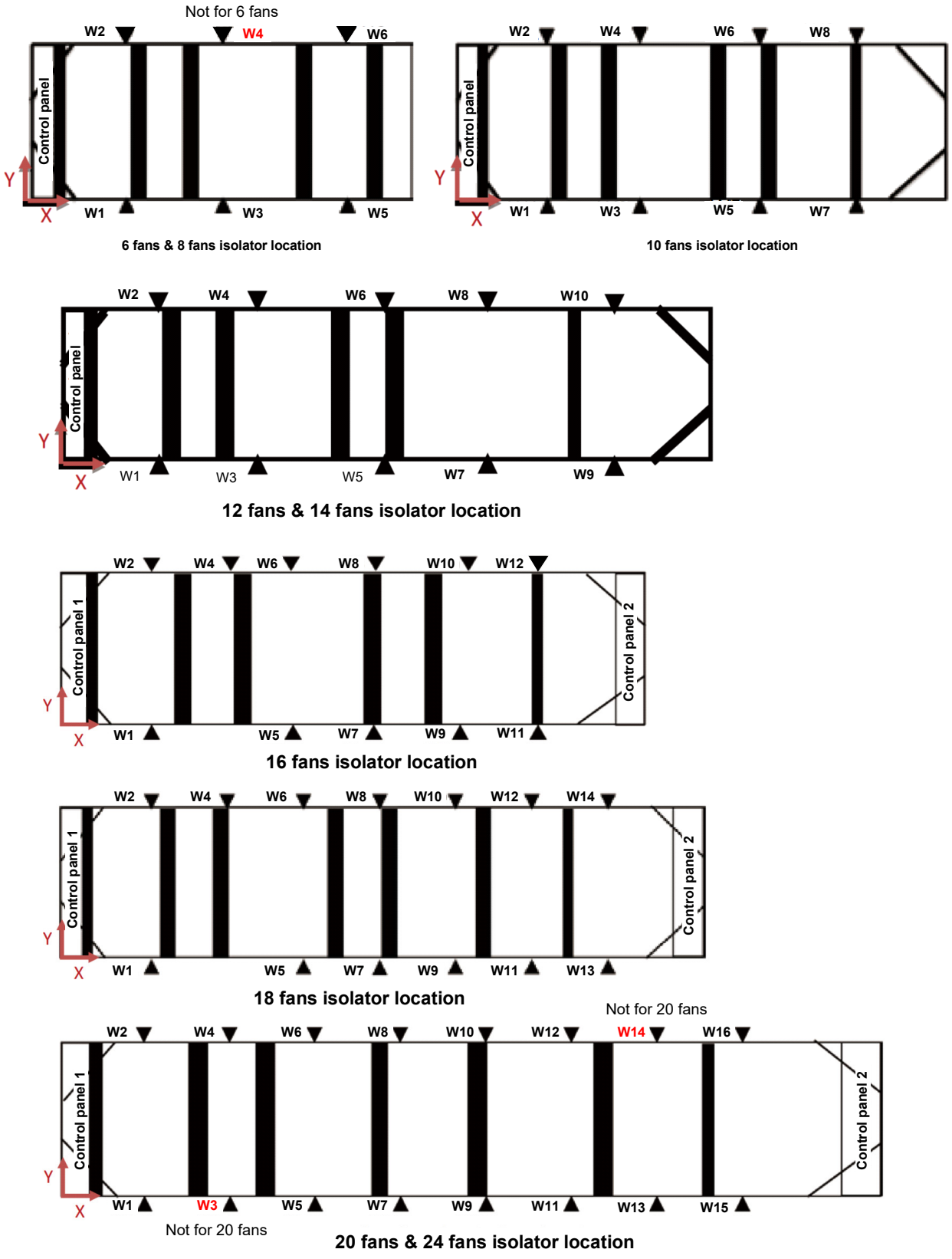


Figure 19. Isolator location

Detail dimension of rubber isolator:

Part number	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	H (mm)	L (mm)	M (mm)	W (mm)	Color
X10140305640	76.2	12.7	127	14.2	9.7	69.9	158.8	40.6±6.35	117.6	Charcoal
X10140305630	76.2	12.7	127	14.2	9.7	69.9	158.8	40.6±6.35	117.6	Lime
X10140305620	76.2	12.7	127	14.2	9.7	69.9	158.8	40.6±6.35	117.6	Brick Red
X10140305610	76.2	12.7	127	14.2	9.7	69.9	158.8	40.6±6.35	117.6	Brown

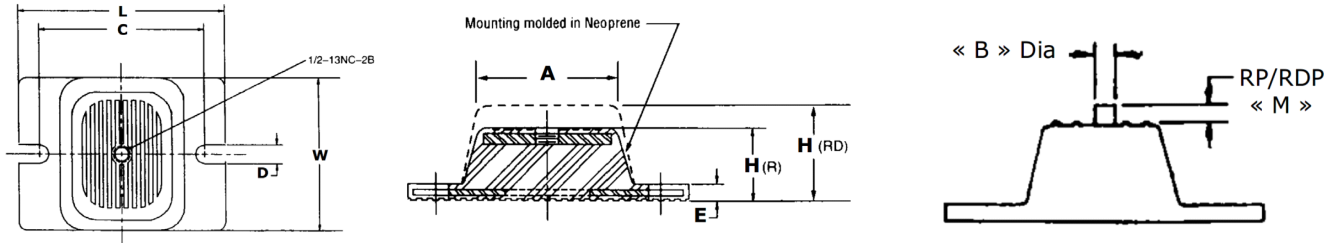


Figure 20. Ruber isolator dimension

Table 32. Unit Isolators

Unit Type	Fan count	Isolator location at X axis (mm)								Isolator Quantity
		W1, 2	W3, 4	W5, 6	W7, 8	W9, 10	W11, 12	W13, 14	W15, 16	
100H; 100X 100P	6	726	1876	3026	--	--	--	--	--	5
125H; 145H 155H; 170H	8	726	2426	4126	--	--	--	--	--	6
125X; 145X 155X; 170X 125P; 145P 155P; 170P	10	726	2326	3926	5176	--	--	--	--	8
190H; 205H	10	726	2326	3926	5176	--	--	--	--	8
190X; 205X 190P; 205P 225P; 225H	12	726	2176	3026	4476	6326	--	--	--	10
225X; 230P	14	576	2276	3576	5526	7226	--	--	--	10
255H; 285H 285P	14	1026	2076	3676	6126	8276	--	--	--	10
255X 310H; 340H 310P; 340P	16	1026	2276	3426	4426	7826	9026	--	--	11
285X; 310X	18	1376	3476	4526	5576	8876	10226	--	--	11
375H; 400H 375P; 400P	18	1126	2326	3376	4476	7826	9126	10226	--	13
340X	20	1450	3600	4100	5800	8500	10350	--	--	11
375X; 400X 440H; 500H 440P	20	1107	2007	2957	4307	7503	8853	9803	10703	14
410X; 440X 500X	24	576	2826	4626	6076	8689	10139	11939	14189	16

Table 33. Unit Isolator Selections - Non-copper Fins

Unit Type	Isolator color at each location																Isolator
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	Quantity
100H; 100X	Brick Red	Brick Red	Brick Red	--	Brown	Brick Red	--	--	--	--	--	--	--	--	--	--	5
100P	Brick Red	Brick Red	Brick Red	--	Brown	Brown	--	--	--	--	--	--	--	--	--	--	5
125H; 145H 155H; 170H	Brick Red	Brown	Brick Red	Brick Red	Brown	Brick Red	--	--	--	--	--	--	--	--	--	--	6
125X; 145X 155X; 170X 190H; 205H	Brick Red	Brown	Brick Red	Brick Red	Brown	Brick Red	Brown	Brown	--	--	--	--	--	--	--	--	8
125P; 145P 155P; 170P	Brick Red	Brick Red	Brick Red	Brick Red	Brown	Brick Red	Brown	Brown	--	--	--	--	--	--	--	--	8
190P; 205P 225P	Brick Red	Brick Red	Brick Red	Brown	Brown	Brick Red	Brown	Brown	Brown	Brown	--	--	--	--	--	--	10
190X; 205X 225H	Brown	Brown	Brick Red	Brown	Brown	Brick Red	Brown	Brown	Brown	Brown	--	--	--	--	--	--	10
225X; 230P	Brown	Brown	Brick Red	Brown	Brick Red	Brick Red	Brick Red	Brick Red	Brown	Brown	--	--	--	--	--	--	10
255H; 285H	Brown	Brick Red	Brick Red	Brick Red	Brown	Brown	Brick Red	Brick Red	Brown	Brick Red	--	--	--	--	--	--	10
285P	Brown	Brick Red	Brick Red	Brick Red	Brown	Brown	Brick Red	Brick Red	Brick Red	Brick Red	--	--	--	--	--	--	10
255X;310H 340H	Brown	Brown	--	Brown	Brick Red	Brown	Brick Red	Brick Red	Brick Red	Brick Red	Brown	Brick Red	--	--	--	--	11
310P; 340P	Brick Red	Brown	--	Brown	Brick Red	Brown	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	--	--	--	--	11
285X; 310X	Brick Red	Brown	--	Brown	Brick Red	Brown	Brick Red	Brick Red	Brick Red	Brick Red	Brown	Brick Red	--	--	--	--	11
340X	Brick Red	Brick Red	--	Brick Red	Lime	Brick Red	Lime	Brick Red	Brick Red	Lime	Brick Red	Lime	--	--	--	--	11
375H; 400H	Brown	Brown	--	Brown	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brown	--	--	13
375P; 400P	Brick Red	Brown	--	Brown	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brown	--	--	13
375X; 400X 440H; 500H 440P	Brown	Brown	--	Brown	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brown	--	Brown	Brown	14
410X; 440X 500X	Brown	Brown	Brown	Brown	Lime	Lime	Brown	Brown	Brown	Brown	Lime	Lime	Brown	Brown	Brown	Brown	16

Table 34. Unit Isolators Selections - Copper Fins

Unit Type	Isolator color at each location																Isolator
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	Quantity
100H; 100X 100P	Brick Red	Brick Red	Brick Red	--	Brick Red	Brick Red	--	--	--	--	--	--	--	--	--	--	5
125H; 145H 155H	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	Brick Red	--	--	--	--	--	--	--	--	--	--	6
170H	Brick Red	Brick Red	Lime	Brick Red	Brick Red	Lime	--	--	--	--	--	--	--	--	--	--	6
125X; 145X 155X; 170X 190H; 205H 125P; 145P 155P; 170P	Lime	Lime	Lime	Lime	Lime	Lime	Brown	Brown	--	--	--	--	--	--	--	--	8
190P; 205P	Lime	Lime	Lime	Brown	Brown	Lime	Brown	Brown	Brown	Brown	--	--	--	--	--	--	10
225P;225H	Brick Red	Brick Red	Brick Red	Brown	Brown	Brick Red	Brown	Brown	Brown	Brown	--	--	--	--	--	--	10
190X; 205X	Brick Red	Brick Red	Lime	Brick Red	Brick Red	Lime	Brick Red	Brick Red	Brick Red	Brick Red	--	--	--	--	--	--	10
225X; 230P	Brown	Brown	Lime	Lime	Lime	Lime	Lime	Lime	Brown	Brown	--	--	--	--	--	--	10
255H; 285H 285P	Brick Red	Brick Red	Lime	Lime	Brick Red	Brick Red	Brick Red	Lime	Brick Red	Lime	--	--	--	--	--	--	10
255X;310H 340H;310P 340P;285X 310X	Brick Red	Brick Red	--	Brick Red	Lime	Brick Red	Lime	Lime	Brick Red	Lime	Brick Red	Lime	--	--	--	--	11
340X	Lime	Lime	--	Lime	Lime	Lime	Lime	Lime	Lime	Lime	Lime	Lime	--	--	--	--	11
375H; 400H 375P; 400P	Brick Red	Brick Red	--	Brick Red	Lime	Brick Red	Lime	Lime	Brick Red	Lime	Lime	Lime	Lime	Brick Red	--	--	13
375X; 400X 440H; 500H 440P	Brick Red	Brick Red	--	Brick Red	Lime	Lime	Lime	Lime	Lime	Lime	Lime	Lime	Brick Red	--	Brick Red	Brick Red	14
410X; 440X 500X	Brick Red	Brick Red	Brick Red	Brick Red	Char-coal	Char-coal	Brick Red	Brick Red	Brick Red	Brick Red	Char-coal	Char-coal	Brick Red	Brick Red	Brick Red	Brick Red	16

Evaporator Water Piping

Thoroughly flush all water piping to the unit before making the final piping connections to the unit.

NOTICE

Evaporator Damage!

The chilled water connections to the evaporator are to be"Flange"type connections. Do not attempt to weld these connections, as the heat generated from welding can cause microscopic and macroscopic fractures on the cast iron waterboxes that can lead to premature failure of the waterbox

NOTICE

Use Piping Strainers!

To prevent evaporator damage, pipe strainers must be installed in the water supplies to protect components from water born debris. Trane is not responsible for equipment-only-damage caused by water born debris.

NOTICE

Unit Damage!

Before complete the external water pipe leak detection, cleaning, do not connect to unit water side heat exchanger, so as to avoid impurities into the unit interior and cause damage.

Water side heat exchanger tipical piping connection schematic is shown in Figure 21 :

1. Pressure gauges should be installed on both inlet and outlet water pipe to monitor water inlet/outlet pressure; which should located on straight line and keep away from elbow, keep at same level as possible as could, to reduce the error due to installation height; Or bridge joint single guage, through the valve opening and closing to select pressure measure points.

Note: *For multiple units installation, please install pressure gauge for each units inlet/outlet pipe.*

2. The vibration-proof hose can prevent the vibration propagation along the water pipe.
3. Install temperature sensor on inlet/outlet water pipe to monitor filed inlet /outlet water temperature.
4. Inlet water pipe must install filter to avoid impurity entering into system. Filters screen shall not be less than 20 meshs.
5. Install balance valve on outlet water pipe to adjust water flow rate, and install service valve to switch off water flow during maintainence.
6. Intall flow switch on inlet water pipe to avoid low flow rate.
7. Install vent valve on water box top to discharge air in water loop; intall purge valve on bottom of water box, the purge piping arraged in site. ***Drain valve on evaporator is open when it leaves the factory. Please make sure to close the drain valve before starting at first time.***
8. Install automatical vent valve on the highest point of water loop.
9. All external water pipe should complete leakage detection, cleaning, insulating and fixed support.

NOTICE

Unit Damage!

To avoid the damage of equipment, water side leakage detecting pressure must not exceed the tube side design pressure which is indicated on heat exchanger nameplate.

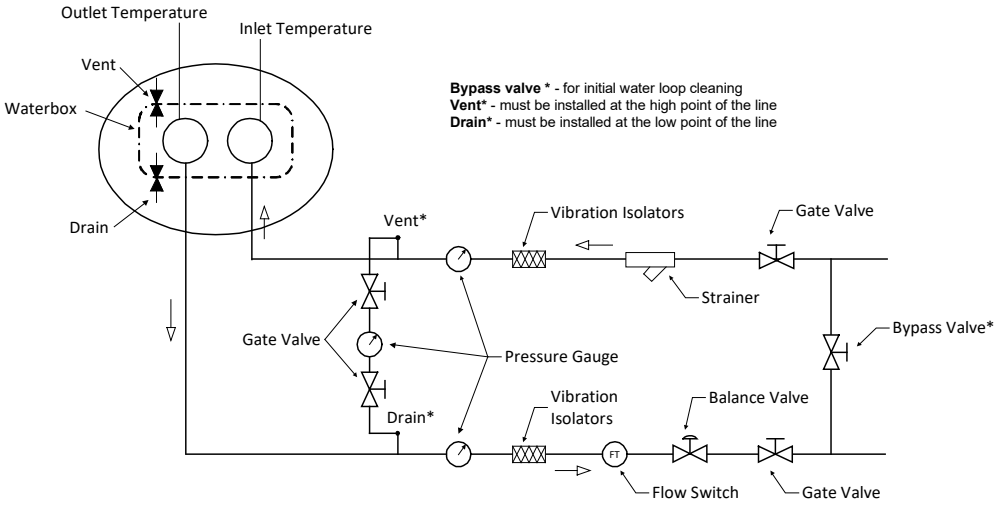


Figure 21. Water side heat exchanger typical piping connection schematic

Entering Chilled Water Piping

- Air vents (to bleed air from system).
- Water pressure gauges with shutoff valves.
- Vibration eliminators.
- Shutoff (isolation) valves. Thermometers (if desired).
- Clean-out tees.
- Pipe strainer.

Leaving Chilled Water Piping

- Air vents (to bleed air from system).
- Water pressure gauges with shutoff valves. Vibration eliminators.
- Shutoff (isolation) valves.
- Thermometers.
- Clean-out tees.
- Balancing valve.
- Flow Switch

System Minimum Water Volume

Water loop systems minimum volume, include chiller, water piping and indoor unit, all these water flow should not lesss than 9L/kW,in order to keep the unit steady operation and accurate controlled water temperature. If the volume is lower than this minimum value, should install a water tank with similar volume,which have build-in baffer to get well mixed wate.

Water Flow Switch

To protect the unit, water loop must be installed flow switch and interlocked with water pump. once the the water flow of heat exchanger was below Table 1 ~ Table 28 required minimum flow, water flow switch can stop the compressor operation.Water flow switch is accessories, its general installation requirements outlined below, see Figure 22:

- Shall be vertically installed in horizontal pipelines or installed on the vertical tube upward flow direction.
- Please keep away from the elbow, orifice or valve , before and after the switch keep at least 5 times the pipe diameter of straight pipe.
- Flow switch target slice should be selected and cut according to Table 35 before uasage.
- Control the screw-in depth of the water flow switch, make sure the arrow on the switch is consistent with the direction of flow.
- To prevent switch vibrate, no air in water loop.
- To make sure the flow switch could cutoff at flow smaller than minimum water flow, according to Figure 23.
- Water flow switch should be interlocked with water pump control, specific electrical wiring way see Schematic Diagram.

For the other type flow switch, the specific installation and maintenance requirements can be found in the flow switch instructions, which is attached with the unit.

NOTICE

Water flow protection!

TRANE chiller Symbio800 controller with has 6 seconds delay responds to water flow switch cutout before unit turn off. If unit has abnormal downtime, please contact the TRANE air conditioning maintenance organization.

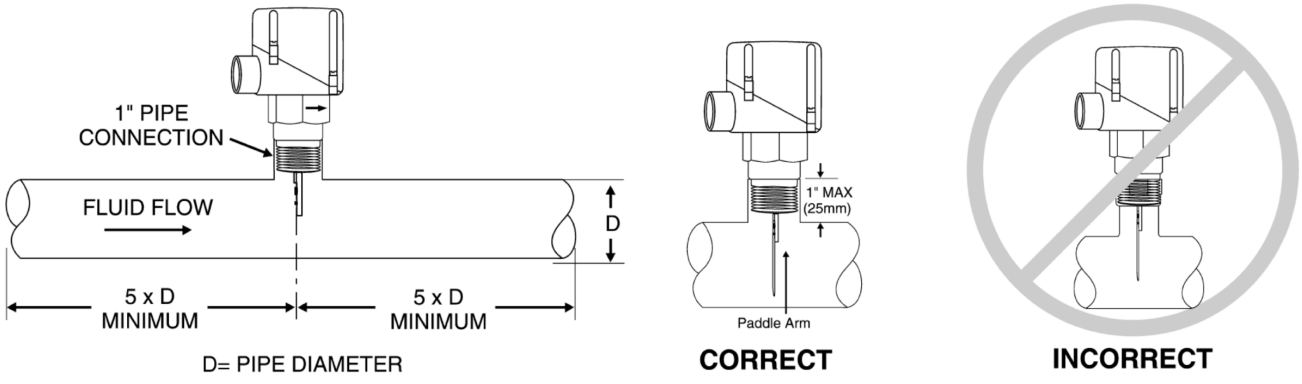
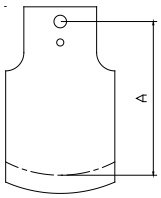
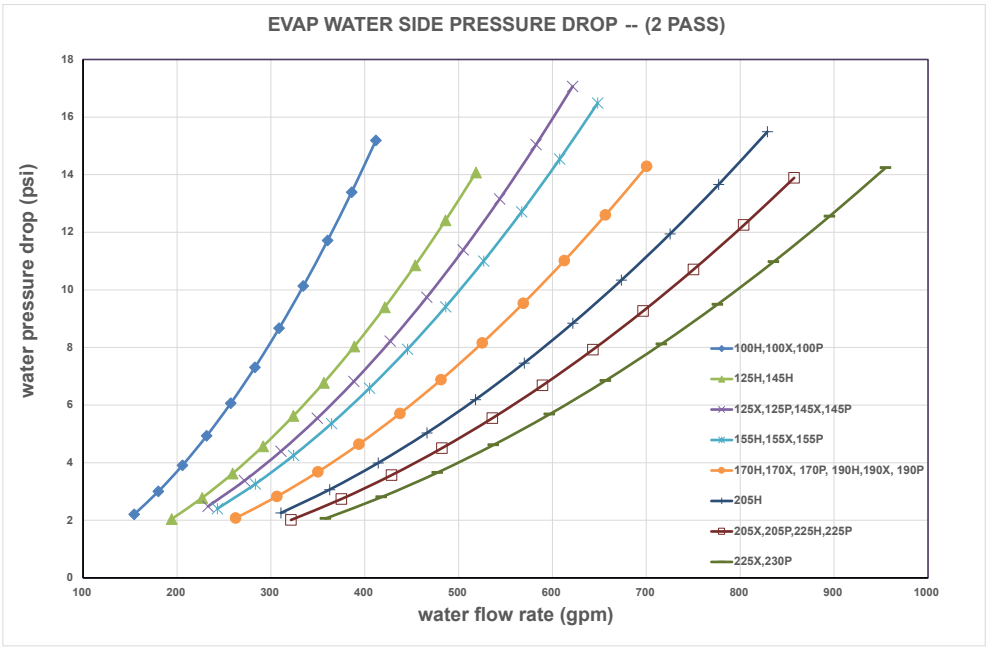


Figure 22. Water flow switch installation schemetric

Table 35. Target slice length

UNIT	Water pipe	Slice length A (mm)
100	4”	30
125; 145; 155	5”	39
170; 190	6”	41.5
205	6”	44.5
225;230	6"	31
255;285;310;340	6"	30
375	8"	46
400		40
410		40
440		34
500		34





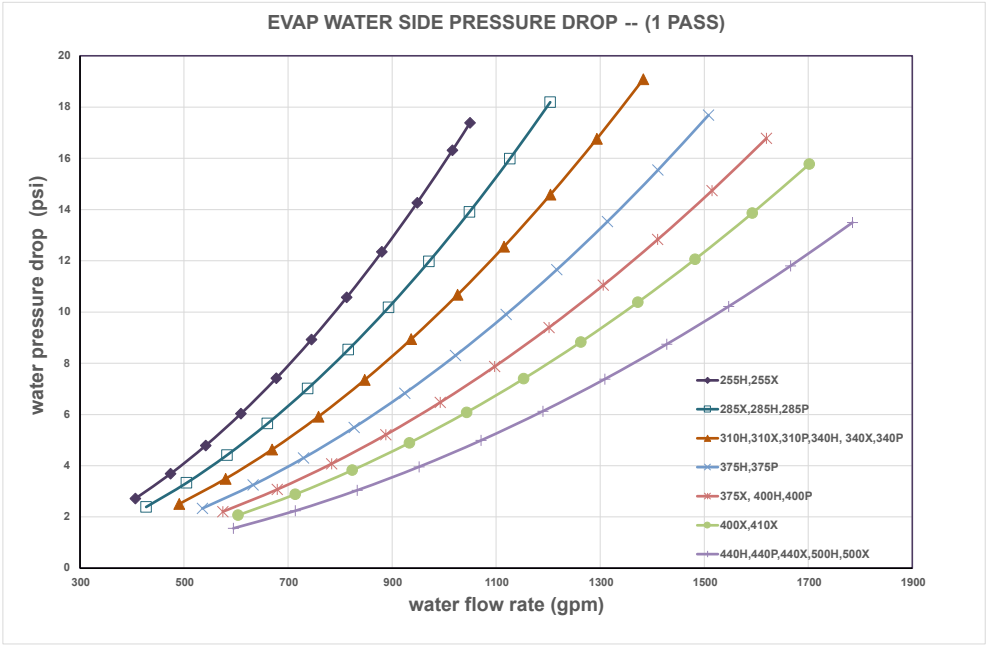


Figure 23. Water flow pressure drop curve

Water Treatment

Water side heat exchanger much apply with treated and filted water, water property quality should within the range Table 36 Water quality requirements, to avoid the demage of unit. Detail method please consulting experts in water treatment.

Table 36. Water quality requirements

Water property	reqirements
NH^3	<2 ppm
NH^{4+}	<2 ppm
Cl_2	<1 ppm
Cl-	< 300 ppm
H_2S*	<0.05 ppm
SO_4^{2-}	< 70 ppm
CO_2†	<5 ppm
Fe^{2+}/Fe^{3+}	<0.2 ppm
O_2	< 5 ppm
NO_3	<100 ppm
Si	< 0.1 ppm
Al	<0.2 ppm
Mn	<0.1 ppm
hardness	71.2<…<151.3mg/l $CaCO_3$
resistance	>3000ohm.cm
conductivity	200<…<600μS/cm
pH	7.5<…<9

NOTICE

Unit demage!

Using improper handling or untreated water may cause unit on fouling, wear, corrosion, moss and damage. TRANE company is not responsible for the equipement damage due to improper handling or untreated water or salt water.

Freeze Protection

If the unit will remain operational at subfreezing ambient temperatures, the chilled water system must be protected from freezing.

- Water box and shell surface are factory-installed heaters and insulated on the packaged unit evaporator and will help protect it from freezing in ambient temperatures down to -20°F (-29°C).
- Control panal does not check the electric heater operation status, which need to be made by qualified technical. Manually inspect electric heating power, and confirm the performance of the electric heater, to avoid catastrophic damage to the water side heat exchanger. User could install optional electric heating failure alarm device, when there is a electric heater disconnecting, it will send out sound and light alarm. detail electrical connection mode as shown in Schematic Diagram
- Install heat tape on all water piping, pumps, water box nozzles and other components that may be damaged if exposed to freezing temperatures. Heat tape must be designed for low ambient temperature applications. Heat tape selection should be based on the lowest expected ambient temperature.

NOTICE

Water side heater demage!

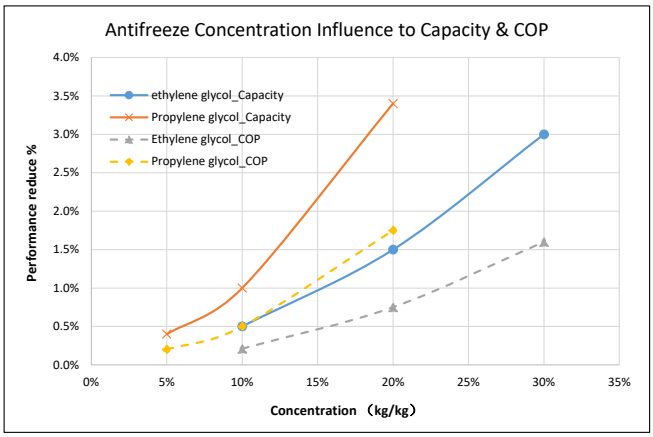
Water side electic heater is separated power supply in field, which needs 230V single phase.

NOTICE

Water side heater demage!

Electric heater could only be engaged after water heat exchanger is filled with water, if heat exchanger is drained away water, must switch off the electric heater, to avoid demage of heater.

- If unit need be operating at low temperature condition for long term, using antifreeze in water loop is necessary to prevent the evaporator tube from being frozen and broken. The type and concentration of antifreeze will affect the unit performance. Below chart give the performance deviation percentage of two kinds of antifreeze comparing to standard unit performance.



Low Refrigerant Temperature Cutout and Glycol Requirements

The tables below show the low evaporator temperature cutout for different glycol levels. Additional glycol beyond what is required for freeze protection will adversely effect unit performance. The unit efficiency will be reduced and the saturated evaporator temperature will be reduced. For some operating conditions this effect can be significant.

Always use the applied actual percent glycol to establish the low refrigerant cutout and low water temperature cutout setpoints.

Note: *Tables below should not be interpreted as suggesting operating ability or performance characteristics at all tabulated glycol percentages. Full unit simulation is required for proper prediction of unit performance for specific operating conditions. For information on specific conditions, contact Trane product support.*

Table 37. Ethylene glycol — low refrigerant temperature cutout (LRTC) and low water temperature cutout(LWTC)

Unit Sizes 125 to 230 ton				Unit Sizes 255 to 500 ton			
Glycol Percentage(%)	Solution Freeze Point(°F)	Minimum Recommended LRTC (°F)	Minimum Recommended LWTC (°F)	Glycol Percentage(%)	Solution Freeze Point(°F)	Minimum Recommended LRTC (°F)	Minimum Recommended LWTC (°F)
0	32.0	28.6	35.0	0	32.0	32.0	37.0
2	31.0	27.6	34.0	2	31.0	29.5	36.0
4	29.7	26.3	32.7	4	29.7	28.2	34.7
5	29.0	25.6	32.0	5	29.0	27.5	34.0
6	28.3	24.9	31.3	6	28.3	26.8	33.3
8	26.9	23.5	29.9	8	26.9	25.4	31.9
10	25.5	22.1	28.5	10	25.5	24.0	30.5
12	23.9	20.5	26.9	12	23.9	22.4	28.9
14	22.3	18.9	25.3	14	22.3	20.8	27.3
15	21.5	18.1	24.5	15	21.5	20.0	26.5
16	20.6	17.2	23.6	16	20.6	19.1	25.6
18	18.7	15.3	21.7	18	18.7	17.2	23.7
20	16.8	13.4	19.8	20	16.8	15.3	21.8
22	14.7	11.3	17.7	22	14.7	13.2	19.7
24	12.5	9.1	15.5	24	12.5	11.0	17.5
25	11.4	8.0	14.4	25	11.4	9.9	16.4
26	10.2	6.8	13.2	26	10.2	8.7	15.2
28	7.7	4.3	10.7	28	7.7	6.2	12.7
30	5.1	1.7	8.1	30	5.1	3.6	10.1
32	2.3	-1.1	5.3	32	2.3	0.8	7.3
34	-0.7	-4.1	5.0	34	-0.7	-2.2	5.0
35	-2.3	-5.0	5.0	35	-2.3	-3.8	5.0
36	-3.9	-5.0	5.0	36	-3.9	-5.0	5.0
38	-7.3	-5.0	5.0	38	-7.3	-5.0	5.0
40	-10.8	-5.0	5.0	40	-10.8	-5.0	5.0
42	-14.6	-5.0	5.0	42	-14.6	-5.0	5.0
44	-18.6	-5.0	5.0	44	-18.6	-5.0	5.0
45	-20.7	-5.0	5.0	45	-20.7	-5.0	5.0
46	-22.9	-5.0	5.0	46	-22.9	-5.0	5.0
48	-27.3	-5.0	5.0	48	-27.3	-5.0	5.0
50	-32.1	-5.0	5.0	50	-32.1	-5.0	5.0

Table 38. Propylene glycol — low refrigerant temperature cutout (LRTC) and low water temperature cutout(LWTC)

Unit Sizes 125 to 230 ton				Unit Sizes 255 to 500 ton			
Glycol Percentage(%)	Solution Freeze Point(°F)	Minimum Recommended LRTC (°F)	Minimum Recommended LWTC (°F)	Glycol Percentage(%)	Solution Freeze Point(°F)	Minimum Recommended LRTC (°F)	Minimum Recommended LWTC (°F)
0	32.0	28.6	35.0	0	32.0	32.0	37.0
2	31.0	27.6	34.0	2	31.0	29.5	36.0
4	29.9	26.5	32.9	4	29.9	28.4	34.9
5	29.3	25.9	32.3	5	29.3	27.8	34.3
6	28.7	25.3	31.7	6	28.7	27.2	33.7
8	27.6	24.2	30.6	8	27.6	26.1	32.6
10	26.4	23.0	29.4	10	26.4	24.9	31.4
12	25.1	21.7	28.1	12	25.1	23.6	30.1
14	23.8	20.4	26.8	14	23.8	22.3	28.8
15	23.1	19.7	26.1	15	23.1	21.6	28.1
16	22.4	19.0	25.4	16	22.4	20.9	27.4
18	20.9	17.5	23.9	18	20.9	19.4	25.9
20	19.3	15.9	22.3	20	19.3	17.8	24.3
22	17.6	14.2	20.6	22	17.6	16.1	22.6
24	15.7	12.3	18.7	24	15.7	14.2	20.7
25	14.8	11.4	17.8	25	14.8	13.3	19.8
26	13.8	10.4	16.8	26	13.8	12.3	18.8
28	11.6	8.2	14.6	28	11.6	10.1	16.6
30	9.3	5.9	12.3	30	9.3	7.8	14.3
32	6.8	3.4	9.8	32	6.8	5.3	11.8
34	4.1	0.7	7.1	34	4.1	2.6	9.1
35	2.7	-0.7	5.7	35	2.7	1.2	7.7
36	1.3	-2.1	5.0	36	1.3	-0.2	6.3
38	-1.8	-5.0	5.0	38	-1.8	-3.3	5.0
40	-5.2	-5.0	5.0	40	-5.2	-5.0	5.0
42	-8.8	-5.0	5.0	42	-8.8	-5.0	5.0
44	-12.6	-5.0	5.0	44	-12.6	-5.0	5.0
45	-14.6	-5.0	5.0	45	-14.6	-5.0	5.0
46	-16.7	-5.0	5.0	46	-16.7	-5.0	5.0
48	-21.1	-5.0	5.0	48	-21.1	-5.0	5.0
50	-25.8	-5.0	5.0	50	-25.8	-5.0	5.0

Installation - Electrical

General Recommendations

All wiring must comply with local codes. Typical field wiring diagrams can be referred in other separated manual. Minimum circuit ampacities and other unit electrical data are on the unit nameplate and Table 39 & Table 40&Table 41. See the unit order specifications for actual electrical data. Specific electrical schematic diagram is shipped with the unit.

⚠WARNING

Hazardous Voltage !

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout / tagout (LOTO) procedures to ensure the power can't be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

⚠CAUTION

Use Copper Conductors Only !

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors may result in equipment damage.

NOTICE

Any change of the protection set points might result in the loss of related guarantee rights without the authorization or approval from Trane Company.

Important !

Do not allow conduit to interfere with other compo-nents, structural members or equipment. Control voltage (115V) wiring in conduit must be separate from conduit carrying low voltage (<30V) wiring. To prevent control malfunctions, do not run low voltage wiring (<30V) in conduit with conductors carrying more than 30 volts.

Installer-Supplied Components

Customer wiring interface connections are shown in the electrical schematics and connection diagrams that are shipped with the unit. The installer must provide the following components if not ordered with the unit:

- Power supply wiring (in conduit) for all field-wired connections.
- All control (interconnecting) wiring (in conduit) for field supplied devices.
- Fused-disconnect switches or circuit breakers.

Power Supply Wiring

⚠WARNING

Ground Wire !

All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with local codes. Failure to follow this instruction could result in death or serious injuries.

All power supply wiring must be sized and selected accordingly by the project engineer in accordance with local codes.

All wiring must comply with local codes. The installing (or electrical) contractor must provide and install the system interconnecting wiring, as well as the power supply wiring. It must be properly sized and equipped with the appropriate fused disconnect switches.

The type and installation location(s) of the fused disconnects must comply with all applicable codes.

Entrance for income power wiring is located on the left side of the control panel. The wiring is passed through this entrance and connected to the terminal blocks, optional unit mounted disconnects, or circuit breakers. Refer to Figure 24 & Figure 25

To provide proper phasing of 3-phase input, make connections as shown in field wiring diagrams and as stated on the WARNING label in the starter panel. For additional information on proper phasing, refer to "Unit Voltage Phasing." Proper equipment ground must be provided to each ground connection in the panel (one for each customer supplied conductor per phase).

115 volt field-provided connections (either control or power) are made through knockouts on the right/left side of the panel . Additional grounds may be required for each 115 volt power supply to the unit. Green lugs are provided for 115V customer wiring.

Table 39. Electrical data - High Efficiency at all ambient operation

			Motor Data						
			Compressor (Each)				Fan (Each)		
Unit Size	Rated Voltage	Unit Power Conns	Qty	RLA Comp1A, Comp1B/ Comp2A,Comp2B	XLRA Comp1A,Comp1B/ Comp2A, Comp2B	YLRA Comp1A,Comp1B/ Comp2A, Comp2B	Qty Ckt1/Ckt2	kW	FLA
100	380/60/3	1	1	203	1306	424	6	1	2.8
100	400/60/3	1	1	192	1240	402	6	1	2.8
125	380/60/3	1	2	142/101	801/566	260/177	5/3	1	2.8
125	400/60/3	1	2	134/95	760/537	247/168	5/3	1	2.8
145	380/60/3	1	2	142/142	801/801	260/260	4/4	1	2.8
145	400/60/3	1	2	134/134	760/760	247/247	4/4	1	2.8
155	380/60/3	1	2	167/142	973/801	316/260	4/4	1	2.8
155	400/60/3	1	2	158/134	924/760	300/247	4/4	1	2.8
170	380/60/3	1	2	167/167	973/973	316/316	4/4	1	2.8
170	400/60/3	1	2	158/158	924/924	300/300	4/4	1	2.8
190	380/60/3	1	2	203/167	1306/973	424/316	5/5	1	2.8
190	400/60/3	1	2	192/158	1240/924	402/300	5/5	1	2.8
205	380/60/3	1	2	203/203	1306/1306	424/424	5/5	1	2.8
205	400/60/3	1	2	192/192	1240/1240	402/402	5/5	1	2.8
225	380/60/3	1	2	244/203	1306/1306	424/424	6/6	1	2.8
225	400/60/3	1	2	231/192	1240/1240	402/402	6/6	1	2.8
255	380/60/3	2	3	167,167/167	973,973/973	316,316/316	9/5	1	2.8
255	400/60/3	2	3	158,158/158	924,924/924	300,300/300	9/5	1	2.8
285	380/60/3	2	3	167,203/203	973,1306/1306	316,424/424	9/5	2	4.7
285	400/60/3	2	3	158,192/192	924,1240/1240	300,402/402	9/5	2	4.7
310	380/60/3	2	3	203,203/203	1306,1306/1306	424,424/424	11/5	2	4.7
310	400/60/3	2	3	192,192/192	1240,1240/1240	402,402/402	11/5	2	4.7
340	380/60/3	2	3	244,203/244	1306,1306/1306	424,424/424	11/5	2	4.7
340	400/60/3	2	3	231,192/231	1240,1240/1240	402,402/402	11/5	2	4.7
375	380/60/3	2	4	167,203/167,203	973,1306/973,1306	316,424/316,424	9/9	2	4.7
375	400/60/3	2	4	158,192/158,192	924,1240/924,1240	300,402/300,402	9/9	2	4.7
400	380/60/3	2	4	203,203/203,203	1306,1306/1306,1306	424,424/424,424	9/9	2	4.7
400	400/60/3	2	4	192,192/192,192	1240,1240/1240,1240	402,402/402,402	9/9	2	4.7
440	380/60/3	2	4	244,203/244,203	1306,1306/1306,1306	424,424/424,424	10/10	2	4.7
440	400/60/3	2	4	231,192/231,192	1240,1240/1240,1240	402,402/402,402	10/10	2	4.7
500	380/60/3	2	4	255,255/255,255	1306,1306/1306,1306	424,424/424,424	10/10	2	4.7
500	400/60/3	2	4	243,243/243,243	1240,1240/1240,1240	402,402/402,402	10/10	2	4.7
500	460/60/3	2	4	211,211/211,211	1065,1065/1065,1065	346,346/346,346	10/10	2	4.7

Note:

1. RLA-Rated load amps.
2. XLRA-Locked rotor amps are based on full winding starts.
3. YLRA-Locked rotor amps in Wye configuration.
4. Customer need to provide an isolated power 230V/60Hz/1Ph to heat the Evaporator. For single circuit chiller, there are three heaters and heaters total power is 1200W; For dual circuit chiller, there are four heaters and heaters total power is 1600W.

Table 40. Electrical data – Extra Efficiency at all ambient operation

			Motor Data						
			Compressor (Each)				Fan (Each)		
Unit Size	Rated Voltage	Unit Power Conns	Qty	RLA Comp1A, Comp1B/ Comp2A,Comp2B	XLRA Comp1A,Comp1B/ Comp2A, Comp2B	YLRA Comp1A,Comp1B/ Comp2A, Comp2B	Qty Ckt1/Ckt2	kW	FLA
100	380/60/3	1	1	203	1306	424	6	1	2.8
100	400/60/3	1	1	192	1240	402	6	1	2.8
125	380/60/3	1	2	142/101	801/566	260/177	6/4	1	2.8
125	400/60/3	1	2	134/95	760/537	247/168	6/4	1	2.8
145	380/60/3	1	2	142/142	801/801	260/260	5/5	1	2.8
145	400/60/3	1	2	134/134	760/760	247/247	5/5	1	2.8
155	380/60/3	1	2	167/142	973/801	316/260	5/5	1	2.8
155	400/60/3	1	2	158/134	924/760	300/247	5/5	1	2.8
170	380/60/3	1	2	167/167	973/973	316/316	5/5	1	2.8
170	400/60/3	1	2	158/158	924/924	300/300	5/5	1	2.8
190	380/60/3	1	2	203/167	1306/973	424/316	6/6	1	2.8
190	400/60/3	1	2	192/158	1240/924	402/300	6/6	1	2.8
205	380/60/3	1	2	203/203	1306/1306	424/424	6/6	1	2.8
205	400/60/3	1	2	192/192	1240/1240	402/402	6/6	1	2.8
225	380/60/3	1	2	244/203	1306/1306	424/424	7/7	1	2.8
225	400/60/3	1	2	231/192	1240/1240	402/402	7/7	1	2.8
255	380/60/3	2	3	167,167/167	973,973/973	316,316/316	11/5	1	2.8
255	400/60/3	2	3	158,158/158	924,924/924	300,300/300	11/5	1	2.8
285	380/60/3	2	3	167,203/203	973,1306/1306	316,424/424	12/6	2	4.7
285	400/60/3	2	3	158,192/192	924,1240/1240	300,402/402	12/6	2	4.7
310	380/60/3	2	3	203,203/203	1306,1306/1306	424,424/424	12/6	2	4.7
310	400/60/3	2	3	192,192/192	1240,1240/1240	402,402/402	12/6	2	4.7
340	380/60/3	2	3	244,203/244	1306,1306/1306	424,424/424	14/6	2	4.7
340	400/60/3	2	3	231,192/231	1240,1240/1240	402,402/402	14/6	2	4.7
375	380/60/3	2	4	167,203/167,203	973,1306/973,1306	316,424/316,424	10/10	2	4.7
375	400/60/3	2	4	158,192/158,192	924,1240/924,1240	300,402/300,402	10/10	2	4.7
400	380/60/3	2	4	203,203/203,203	1306,1306/1306,1306	424,424/424,424	10/10	2	4.7
400	400/60/3	2	4	192,192/192,192	1240,1240/1240,1240	402,402/402,402	10/10	2	4.7
410	380/60/3	2	4	203,203/203,203	1306,1306/1306,1306	424,424/424,424	12/12	2	4.7
410	400/60/3	2	4	192,192/192,192	1240,1240/1240,1240	402,402/402,402	12/12	2	4.7
440	380/60/3	2	4	244,203/244,203	1306,1306/1306,1306	424,424/424,424	12/12	2	4.7
440	400/60/3	2	4	231,192/231,192	1240,1240/1240,1240	402,402/402,402	12/12	2	4.7
500	380/60/3	2	4	255,255/255,255	1306,1306/1306,1306	424,424/424,424	12/12	2	4.7
500	400/60/3	2	4	243,243/243,243	1240,1240/1240,1240	402,402/402,402	12/12	2	4.7

Note:

1. RLA-Rated load amps.
2. XLRA-Locked rotor amps are based on full winding starts.
3. YLRA-Locked rotor amps in Wye configuration.
4. Customer need to provide an isolated power 230V/60Hz/1Ph to heat the Evaporator. For single circuit chiller, there are three heaters and heaters total power is 1200W; For dual circuit chiller, there are four heaters and heaters total power is 1600W.

Table 41. Electrical data – PSE at all ambient operation

			Motor Data						
			Compressor (Each)				Fan (Each)		
Unit Size	Rated Voltage	Unit Power Conns	Qty	RLA Comp1A, Comp1B/ Comp2A,Comp2B	XLRA Comp1A,Comp1B/ Comp2A, Comp2B	YLRA Comp1A,Comp1B/ Comp2A, Comp2B	Qty Ckt1/Ckt2	kW	FLA
100	380/60/3	1	1	203	1306	424	6	1.5	3.8
100	400/60/3	1	1	192	1240	402	6	1.5	3.8
125	380/60/3	1	2	140/98	973/747	316/229	6/4	1.5	3.8
125	400/60/3	1	2	133/93	924/709	300/217	6/4	1.5	3.8
145	380/60/3	1	2	140/140	973/973	316/316	5/5	1.5	3.8
145	400/60/3	1	2	133/133	924/924	300/300	5/5	1.5	3.8
155	380/60/3	1	2	170/140	1306/973	424/316	5/5	1.5	3.8
155	400/60/3	1	2	161/133	1240/924	402/300	5/5	1.5	3.8
170	380/60/3	1	2	170/170	1306/1306	424/424	5/5	1.5	3.8
170	400/60/3	1	2	161/161	1240/1240	402/402	5/5	1.5	3.8
190	380/60/3	1	2	203/170	1306/1306	424/424	6/6	1.5	3.8
190	400/60/3	1	2	192/161	1240/1240	402/402	6/6	1.5	3.8
205	380/60/3	1	2	203/203	1306/1306	424/424	6/6	1.5	3.8
205	400/60/3	1	2	192/192	1240/1240	402/402	6/6	1.5	3.8
225	380/60/3	1	2	203/203	1306/1306	424/424	6/6	1.5	3.8
225	400/60/3	1	2	192/192	1240/1240	402/402	6/6	1.5	3.8
225	460/60/3	1	2	192/192	1065/1065	346/346	6/6	1.5	3.8
230	380/60/3	1	2	203/203	1306/1306	424/424	7/7	1.5	3.8
230	400/60/3	1	2	192/192	1240/1240	402/402	7/7	1.5	3.8
230	460/60/3	1	2	192/192	1065/1065	346/346	7/7	1.5	3.8
285	380/60/3	2	3	170,203/203	1306,1306/1306	424,424/424	9/5	1.65	4.7
285	400/60/3	2	3	161,192/192	1240,1240/1240	402,402/402	9/5	1.65	4.7
285	460/60/3	2	3	161,168/192	1065,1065/1065	346,346/346	9/5	1.65	4.7
310	380/60/3	2	3	203,203/203	1306,1306/1306	424,424/424	11/5	1.65	4.7
310	400/60/3	2	3	192,192/192	1240,1240/1240	402,402/402	11/5	1.65	4.7
310	460/60/3	2	3	192,168/192	1065,1065/1065	346,346/346	11/5	1.65	4.7
340	380/60/3	2	3	203,203/203	1306,1306/1306	424,424/424	11/5	1.65	4.7
340	400/60/3	2	3	192,192/192	1240,1240/1240	402,402/402	11/5	1.65	4.7
340	460/60/3	2	3	192,168/192	1065,1065/1065	346,346/346	11/5	1.65	4.7
375	380/60/3	2	4	170,203/170,203	1306,1306/1306,1306	424,424/424,424	9/9	1.65	4.7
375	400/60/3	2	4	161,192/161,192	1240,1240/1240,1240	402,402/402,402	9/9	1.65	4.7
375	460/60/3	2	4	161,168/161,168	1065,1065/1065,1065	346,346/346,346	9/9	1.65	4.7
400	380/60/3	2	4	203,203/203,203	1306,1306/1306,1306	424,424/424,424	9/9	1.65	4.7
400	400/60/3	2	4	192,192/192,192	1240,1240/1240,1240	402,402/402,402	9/9	1.65	4.7
400	460/60/3	2	4	192,168/192,168	1065,1065/1065,1065	346,346/346,346	9/9	1.65	4.7
440	380/60/3	2	4	203,203/203,203	1306,1306/1306,1306	424,424/424,424	10/10	1.65	4.7
440	400/60/3	2	4	192,192/192,192	1240,1240/1240,1240	402,402/402,402	10/10	1.65	4.7
440	460/60/3	2	4	192,168/192,168	1065,1065/1065,1065	346,346/346,346	10/10	1.65	4.7
460	380/60/3	2	4	203,203/203,203	1306,1306/1306,1306	424,424/424,424	14/14	1.65	4.7
460	400/60/3	2	4	192,192/192,192	1240,1240/1240,1240	402,402/402,402	14/14	1.65	4.7
460	460/60/3	2	4	192,192/192,192	1065,1065/1065,1065	346,346/346,346	14/14	1.65	4.7

Note:

1. RLA-Rated load amps.
2. XLRA-Locked rotor amps are based on full winding starts.
3. YLRA-Locked rotor amps in Wye configuration.
4. Customer need to provide an isolated power 230V/60Hz/1Ph to heat the Evaporator. For single circuit chiller, there are three heaters and heaters total power is 1200W; For dual circuit chiller, there are four heaters and heaters total power is 1600W.

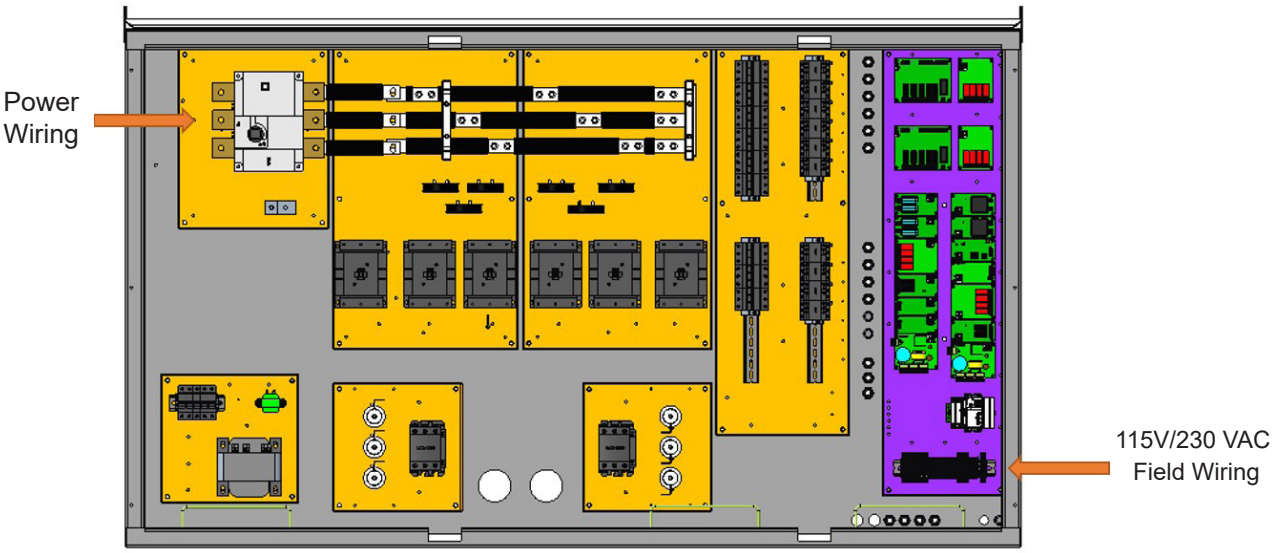


Figure 24. Power Entrance of fixed panel

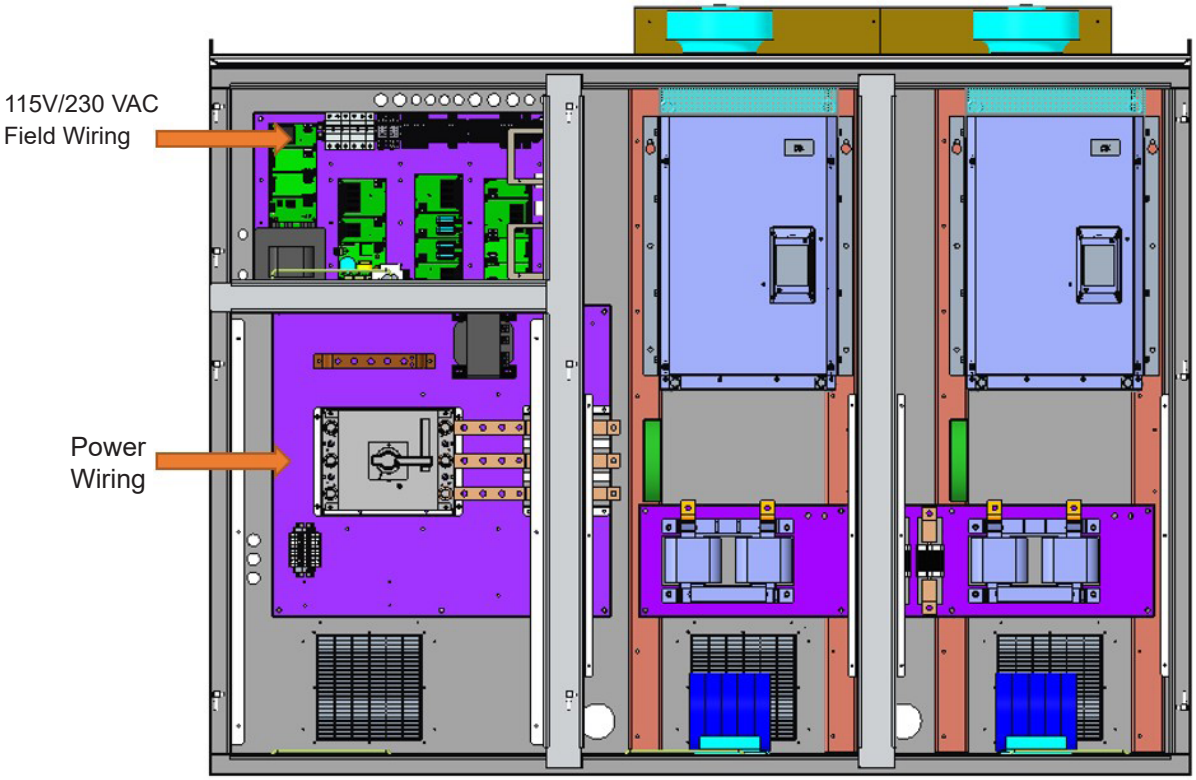


Figure 25. Power Entrance of AFD panel

Control Power Supply

The unit is equipped with a control power transformer, it is not necessary to provide additional control power voltage to the unit.

All units are factory-connected for appropriate labeled voltages.

Interconnecting Wiring

Heat Power Supply

The evaporator shell is insulated from ambient air and protected from freezing temperatures by two thermo-statically-controlled immersion heaters and two strip heaters .Whenever the water temperatures drops to approximately 37ºF(2.8ºC) ,the thermostat energized the heaters .The heaters will provide protection from ambient temperatures down to -4ºF(-20ºC).

It is required to provide an independent power source (230V 50Hz -15amp) ,with a fused-disconnect.

⚠CAUTION

Heater Tape!

Control panel main controller Symbio800 does not check for loss of power to the heat tape nor does it verify thermostat operation .A qualified technician must verify power to the heat tape and confirm operation of the heat tape thermostat to avoid catastrophic damage to the evaporator.

Chilled Water Flow (Pump) Interlock

The Model RTAG Series chiller requires a field-supplied control voltage contact input through a flow proving switch 5B5 and an auxiliary contact 5K9 AUX. Connect the proving switch and auxiliary contact to 1K14 J2-1 and 1X5-27. Refer to the field wiring for details.

The auxiliary contact can be BAS signal, starter contactor auxiliary or any signal which indicates the pump is running. A flow switch is still required and cannot be omitted.

Chilled Water Pump Control

An evaporator water pump output relay closes when the chiller is given a signal to go into the Auto mode of operation from any source. The contact is opened to turn off the pump in the event of most machine level diagnostics to prevent the build up of pump heat.

The relay output from 1K16 is required to operate the Evaporator Water Pump (EWP) contactor. Contacts should be compatible with 115/240 VAC control circuit. The EWP relay operates in different modes depending on Symbio800 or Tracer commands, if available. Normally the AUTO mode, regardless of where the auto command is coming from, the normally open relay is energized. When the chiller exits the AUTO mode, the relay is timed open for an adjustable (using Tracer TU) 0 to 30 minutes. The non-AUTO modes in which the pump is stopped, include Reset (88), Stop (00), External Stop (100), Remote Display Stop (600), Stopped by Tracer (300), Low Ambient Run Inhibit (200).

When unit stops, if the evaporator inlet and outlet water temperature is lower than a certain protection set value, the controller of RTAG will command the water pump to start to prevent the evaporator from freezing. If customer does not allow RTAG unit to control the pump, the evaporator is at risk of freezing. It is the responsibility of the installation contractor or customer to ensure that the water pump is started on when is required by the chiller.

Table 42. Pump Realy Operation

Chiller Mode	Relay Operation
Auto	Instant close
Tracer Override	Close
Stop	Timed Open
Diagnostics	Instant Open

When going from Stop to Auto, the EWP relay is energized immediately. If evaporator water flow is not established in 4 minutes and 15 sec., the Symbio800 de-energizes the EWP relay and generates a non-latching diagnostic. If flow returns (e.g. someone else is controlling the pump), the diagnostic is cleared, the EWP is re-energized, and normal control resumed.

If evaporator water flow is lost once it had been established, the EWP relay remains energized and a non-latching diagnostic is generated. If flow returns, the diagnostic is cleared and the chiller returns to normal operation.

In general, when there is either a non-latching or latching diagnostic, the EWP relay is turned off as though there was a zero time delay. Exceptions (see above table) whereby the relay continues to be energized occur with:

A Low Chilled Water Temp. diagnostic (non-latching) (unless also accompanied by an evaporator Leaving Water Temperature Sensor Diagnostic) or

A starter contactor interrupts failure diagnostic, in which a compressor continues to draw current even after commanded to have shutdown or

A Loss of Evaporator Water Flow diagnostic (non-latching) and the unit is in the AUTO mode, after initially having proven evaporator water flow.

Alarm and Status Relay Outputs (Programmable Relays)

A programmable relay concept provides for enunciation of certain events or states of the chiller, selected from a list of

likely needs, while only using four physical output relays, as shown in the field wiring diagram. The four relays are provided (generally with a Quad Relay Output The relay's contacts are isolated Form C (SPDT), suitable for use with 120 VAC circuits drawing up to 2.8 amps inductive, 7.2 amps resistive, or 1/3 HP and for 240 VAC circuits drawing up to 0.5 amp resistive.

The list of events/states that can be assigned to the pro-grammable relays can be found in Table 43. The relay will be energized when the event/state occurs.

Table 43. Alarm and Status Relay Output Configuration Table

	Description
Alarm - Latching	This output is true whenever there is any active diagnostic that requires a manual reset to clear, that affects the Chiller, or the Circuit. This classification does not include informational diagnostics.
Alarm - Auto Reset	This output is true whenever there is any active diagnostic that could automatically clear, that affects the Chiller, or the Circuit. This classification does not include informational diagnostics.
Alarm	This output is true whenever there is any diagnostic affecting any component, whether latching or automatically clearing. This classification does not include informational diagnostics
Alarm Ckt 1	This output is true whenever there is any diagnostic effecting Refrigerant Circuit 1, whether latching or automatically clearing, including diagnostics affecting the entire chiller. This classification does not include informational diagnostics.
Chiller Limit Mode (with a 20 minute filter)	This output is true whenever the chiller has been running in one of the Unloading types of limit modes (Condenser, Evaporator, Current Limit or Phase Imbalance Limit) continuously for the last 20 minutes.
Circuit 1 Running	This output is true whenever compressor is running (or commanded to be running) on Refrigerant Circuit 1, and false when no compressor is commanded to be running on that circuit.
Chiller Running	This output is true whenever compressor is running (or commanded to be running) on the chiller and false when no compressor is commanded to be running on the chiller.
Maximum Capacity	This output is true whenever the chiller has reached maximum capacity or had reached its maximum capacity and since that time has not fallen below 70% average current relative to the rated ARI current for the chiller. The output is false when the chiller falls below 70% average current and, since that time, had not reestablished maximum capacity.

Relay Assignments Using Tracer TU

Symbio800 Service Tool (Tracer TU) is used to install the Alarm and Status Relay Option package and assign any of the above list of events or status to each of the four relays provided with the option. The relays to be programmed are referred to by the relay's terminal numbers on the LLID board 1K17.

The default assignments for the four available relays of the RTAG Alarm and Status Package Option are:

Table 44. Default Assignments

Relay	
Relay 1 Terminals J2 -12,11,10:	Alarm
Relay 2 Terminals J2 - 9,8,7:	Chiller Running
Relay 3 Terminals J2-6,5,4:	Maximum Capacity
Relay 4 Terminals J2-3,2,1:	Chiller Limit

If any of the Alarm/Status relays are used, provide electrical power, 115 VAC with fused disconnect to the panel and wire through the appropriate relays (terminals on 1K17). Provide wiring (switched hot, neutral, and ground connections) to the remote annunciation devices. Do not use power from the chiller's control panel transformer to power these remote devices. Refer to the field diagrams which are shipped with the unit.

Low Voltage Wiring

⚠WARNING

Ground Wire !

All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with local codes. Failure to follow this instruction could result in death or serious injuries.

The remote devices described below require low voltage wiring. All wiring to and from these remote input devices to the Control Panel must be made with shielded, twisted pair conductors. Be sure to ground the shielding wire only at the panel.

Note: *To prevent control malfunctions, do not run low voltage wiring (<30 V) in conduit with conductors carrying more than 30 volts.*

Emergency Stop

Symbio800 provides auxiliary control for a customer specified/installed latching trip out .When this customer-furnished remote contact 5K24 is provided ,the chiller will run normally when the contact is closed .When the contact opens ,the unit will trip on a manually resettable diagnostic .This condition requires manual reset at the chiller switch on the front of the control panel.

Connect low voltage leads to terminal strip locations on 1K18 J2-3 and 4. Refer to the field diagrams that are shipped with the unit.

Sliver or gold-plated contacts are recommended .These customer-furnished contacts must be compatible with 24VDC. 12 mA resistive load.

External Auto/Stop

If the unit requires the external Auto/Stop function, the installer must provide leads from the remote contacts 5K23 to the proper terminals on 1K18 J2-1 and 2. The chiller will run normally when the contacts are closed. When either contact opens, the compressor(s), if operating, will go to the RUN: UNLOAD operating mode and cycle off. Unit operation will be inhibited. Closure of the contacts will permit the unit to return to normal operation.

Field-supplied contacts for all low voltage connections must be compatible with dry circuit 24 VDC for a 12 mA resistive load. Refer to the field diagrams that are shipped with the unit.

External Chilled Water Setpoint (ECWS) Option

The Symbio800 provides inputs that accept either 4-20 mA or 2-10 VDC signals to set the external chilled water setpoint (ECWS). This is not a reset function. The input defines the set point. This input is primarily used with generic BAS (building automation systems).The chilled water setpoint set via the Symbio800 or through digital communication with Tracer. The arbitration of the various chilled water setpoint sources is described in the flow charts at the end of the section.

The chilled water setpoint may be changed from a remote location by sending either a 2-10 VDC or 4-20 mA signal to the 1K19, J2-5 and 6. The 2 VDC(4 mA)and 10VDC(20mA)each correspond to a-12 and 18°C (10 and 65°F) external chilled water setpoint.

The following equations apply:

	Voltage Signal	Current Signal
As generated from external source	VDC=0.1455*(ECWS)+0.5454	mA=0.2909(ECWS)+1.0909
As processed by Symbio800	ECWS=6.875*(VDC)-3.75	ECWS=3.4375(mA)-3.75

If the ECWS input develops an open or short, the LLID will report either a very high or very low value back to the main processor. This will generate an informational diagnostic and the unit will default to using the Front Panel (TD7) Chilled Water Setpoint.

Tracer TU Service Tool is used to set the input signal type from the factory default of 2-10 VDC to that of 4-20 mA. Tracer TU is also used to install or remove the External Chilled Water Setpoint option as well as a means to enable and disable ECWS.

External Current Limit Setpoint (ECLS) Option

Similar to the above, the Symbio800 also provides for an optional External Current Limit Setpoint that will accept either a 2-10 VDC (default) or a 4-20 mA signal. The Current Limit Setting can also be set via the Tracer TU or through digital communication with Tracer (Comm 3). The arbitration of the various sources of current limit is described in the flow charts at the end of this section. The External Current Limit Setpoint may be changed from a remote location by hooking up the analog input signal to the 1K19, J2-2 and 3. Refer to the following paragraph on Analog Input Signal Wiring Details.The following equations apply for ECLS:

	Voltage Signal	Current Signal
As generated from external source	VDC+0.133*(%)-6.0	mA=0.266*(%)-12.0
As processed by Symbio800	%=7.5*(VDC)+45.0	%=3.75*(mA)+45.0

If the ECLS input develops an open or short, the LLID will report either a very high or very low value back to the man processor. This will generate an informational diagnostic and the unit will default to using the Front Panel (TD7) Current Limit Setpoint.

The Tracer TU Service Tool must be used to set the input signal type from the factory default of 2-10 VDC to that of 4-20 mA current. Tracer TU must also be used to install or remove the External Current Limit Setpoint Option for field installation, or can be used to enable or disable the feature (if installed).

ECLS and ECWS Analog Input Signal Wiring Details:

Both the ECWS and ECLS can be connected and setup as either a 2-10 VDC (factory default), 4-20 mA, or resistance input (also a form of 4-20mA) as indicated below. Depending on the type to be used, the Tracer TU Service Tool must be used to configure the LLID and Symbio800 for the proper input type that is being used. This is accomplished by a setting change on the Custom Tab of the Configuration View within Tracer TU.

Important: *For proper unit operation, BOTH the ECLS and ECWS settings MUST be the same (2-10 VDC or 4-20mA), even if only one input is to* be used.

The J2-3 and J2-6 terminal is chassis grounded and terminal J2-1 and J2-4 can be used to source 12 VDC. The ECLS uses terminals J2-2 and J2-3. ECWS uses terminals J2-5 and J2-6. Both inputs are only compatible with high-side current sources.

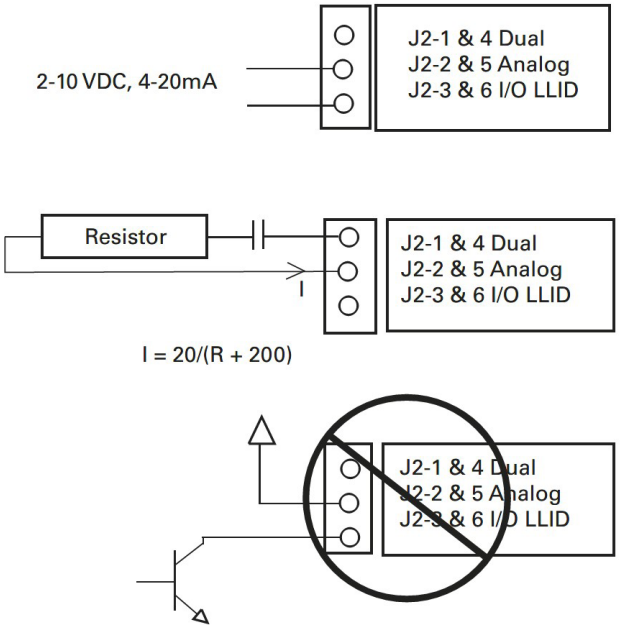


Figure 26. Wiring Examples for ECLS and ECWS

Chilled Water Reset (CWR)

Symbio800 resets the chilled water temperature setpoint based on return water temperature. Return Reset is standard.

The following shall be selectable:

- One of three Reset Types: None, Return Water Temperature Reset, or Constant Return Water Temperature Reset.
- Reset Ratio Set Points.
- Start Reset Set Points.
- Maximum Reset Set Points.

The equations for each type of reset are as follows:

Return

CWS' = CWS + RATIO (START RESET - (TWE - TWL))

and CWS' > or = CWS

and CWS' - CWS < or = Maximum Reset

where

CWS' is the new chilled water set point or the "reset CWS"

CWS is the active chilled water set point before any reset has occurred, e.g. normally Front Panel, Tracer, or ECWS

RESET RATIO is a user adjustable gain

START RESET is a user adjustable reference

TWE is evaporator entering water temperature

TWL is evaporator leaving water temperature

MAXIMUM RESET is a user adjustable limit providing the maximum amount of reset.

For all types of reset, CWS' - CWS < or = Maximum Reset.

The values for "RESET RATIO" for each of the reset types are:

Reset Type	Reset Ratio Range	Increment English Units	Increment SI Units	Factory Default Value
Return	10 to 120%	1%	1%	50%

The values for "START RESET" for each of the reset types are:

Reset Type	Reset Ratio Range	Increment English Units	Increment SI Units	Factory Default Value
Return	2.2 to 16.67 °C (4 to 30°F)	0.1 °F	0.1 °C	5.56 °C (10 °F)

The values for “MAXIMUM RESET” for each of the reset types are:

Reset Type	Reset Ratio Range	Increment English Units	Increment SI Units	Factory Default Value
Return	0.0 to 11.11 °C (0 to 20 °F)	0.1 °F	0.1 °C	2.78 °C (5 °F)

In addition to Return, the MP provides a menu item for the operator to select a Constant Return Reset. Constant Return Reset will reset the leaving water temperature set point so as to provide a constant entering water temperature. The Constant Return Reset equation is the same as the Return Reset equation except on selection of Constant Return Reset, the MP will automatically set Ratio, Start Reset, and Maximum Reset to the following.

RATIO = 100%

START RESET = Design Delta Temp.

MAXIMUM RESET = Design Delta Temp.

The equation for Constant Return is then as follows:

CWS' = CWS + 100% (Design Delta Temp. - (TWE - TWL))

and CWS' > or = CWS

and CWS' - CWS < or = Maximum Reset

When any type of CWR is enabled, the MP will step the Active CWS toward the desired CWS' (based on the above equations and setup parameters) at a rate of 1 degree F every 5 minutes until the Active CWS equals the desired CWS'. This applies when the chiller is running.

When the chiller is not running the CWS is reset immediately (within one minute) for Return Reset and at a rate of 1 degree F every 5 minutes for Outdoor Reset. The chiller will start at the Differential to Start value above a fully reset CWS or CWS' for both Return and Outdoor Reset.

Communications Interface options

This option allows the Tracer Symbio800 controller to exchange information (e.g. operating setpoints and Auto/Standby commands) with a higher-level control device, such as a Tracer Summit or a multiple-machine controller. A shielded, twisted pair connection establishes the bi-directional communications link between the Tracer Symbio800 and the building automation system.

Note: *To prevent control malfunctions, do not run low voltage wiring (<30 V) in conduit with conductors carrying more than 30 volts.*

⚠WARNING

Ground Wire !

All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with local codes. Failure to follow this instruction could result in death or serious injuries.

Field wiring for the communication link must meet the following requirements:

- All wiring must be in accordance with the NEC and local codes.
- Communication link wiring must be shielded, twisted pair wiring (Belden 8760 or equivalent). See the table below for wire size selection:

Table 45. Wire size

Wire Size	Maximum Length of Communication Wire
14 AWG (2.5 mm^2)	5,000 FT (1525 m)
16 AWG (1.5 mm^2)	2,000 FT (610 m)
18 AWG (1.0 mm^2)	1,000 FT (305 m)

- The communication link cannot pass between buildings.
- All units on the communication link can be connected in a “daisy chain” configuration.

LonTalk Communications Interface for Chillers (LCI-C)

Symbio800 provides an optional LonTalk Communication Interface (LCI-C) between the chiller and a Building Automation System (BAS). An LCI-C LLID shall be used to provide "gateway" functionality between a LonTalk compatible device and the Chiller. The inputs/outputs include both mandatory and optional network variables as established by the LonMark® Functional Chiller Profile 8040.

Installation Recommendations

- 22 AWG Level 4 unshielded communication wire recommended for most LCI-C
- Installations
- LCI-C link limits: 4500 feet, 60 devices
- Termination resistors are required
- 105 ohms at each end for Level 4 wire
- 82 ohms at each end for Trane "purple" wire
- LCI-C topology should be daisy chain
- Zone sensor communication stubs limited to 8 per link, 50 feet each (maximum)
- One repeater can be used for an additional 4500 feet, 60 devices, 8 communication stubs

BACnet Communications Interface for Chillers (BCI-C)

The RTAG controller Symbio800 has an BACnet Communication Interface for Chillers (BCI-C), It is a non-programmable communications module that allows the RTAG unit to communicate on a BACnet communications network.

BACnet Data Points and Configuration Property Definitions

The BCI-C device allows certain models of Trane chillers with Symbio800 controls to communicate with BACnet systems and devices using BACnet MS/TP. This section includes information about:

- BACnet protocol implementation conformance statement (PICS)
- Object types: descriptions and configuration (refer to Table 47)
- BACnet protocol: data link layers, device address binding, networking options, and character sets
- Object data points and configurations

BACnet Protocol Implementation Con-for-mance Statement (PICS)

Standardized Device Profile (Annex L)

Profile Description	Supported Profile
BACnet Advanced Application Controller (B-AAC)	
BACnet Application Specific Controller (B-ASC)	√
BACnet Building Controller (B-BC)	
BACnet Operator Workstation (B-OWS)	
BACnet Smart Actuator (B-SA)	
BACnet Smart Sensor (B-SS)	

Note: *For more information, see RTAG-SVP00*-EN*

Table 46. LonTalk Points List

LonTalk Communications Interface

Inputs	Variable type		SNVT_Type
Chiller Enable/Disable	binary	start(1)/stop(0)	SNVT_switch
Chilled Water Setpoint	analog	temperature	SNVT_temp_p
Current Limit Setpoint	analog	% current	SNVT_lev_percent
Chiller Mode			SNVT_hvac_mode
Outputs	**Variable type**		**SNVT_Type**
Chiller On/Off	binary	on(1)/off(0)	SNVT_switch
Active Chilled Water Setpoint	analog	temperature	SNVT_temp_p
Percent RLA	analog	% current	SNVT_lev_percent
Active Current Limit Setpoint	analog	% current	SNVT_lev_percent
Leaving Chilled Water Temperature	analog	temperature	SNVT_temp_p
Entering Chilled Water Temperature	analog	temperature	SNVT_temp_p
Entering Condenser Water Temperature	analog	temperature	SNVT_temp_p
Leaving Condenser Water Temperature	analog	temperature	SNVT_temp_p
Alarm Description	Note 1		SNVT_str_asc
Chiller Status	Note 2		SNVT_chlr_status

Note 1 Alarm Description denotes alarm severity and target.
Severity: no alarm, warning, normal shutdown, immediate shutdown
Target: Chiller, Platform, Ice Building (Chiller is refrigerant circuit and Platform is control circuit)

Note 2 Chiller Status describes Chiller Run Mode and Chiller Operating Mode. Run Modes: Off, Starting, Running, Shutting Down
Operating Modes: Cool, Ice Build
States: Alarm, Run Enabled, Local Control, Limited, CHW Flow, Cond Flow

Interoperability Building Blocks (Annex K)

Data Sharing Description	Supported BIBB
Data Sharing-COV-B (DS-COV-B)	
Data Sharing-Read Property-A (DS-RP-A)	√
Data Sharing-Read Property-B (DS-RP-B)	√
Data Sharing-Read PropertyMultiple-B (DS-RPM-B)	√
Data Sharing-Write Property-A (DS-WP-A)	√
Data Sharing-Write Property-B (DS-WP-B)	√
Data Sharing-Write PropertyMultiple-B (DS-WPM-B)	√
Alarm and Event Management Description	**Supported BIBB**
Alarm and Event-ACKI-B (AE-ACK-B)	√
Alarm and Event-Alarm Summary-B (AE-ASUM-B)	√
Alarm and Event-Enrollment Summary-B (AE-ESUM-B)	√
Alarm and Event-Information-B (AE-INFO-B)	√
Alarm and Event-Notification Internal-B (AE-N-I-B)	√
Trending Description	**Supported BIBB**
Trending-Automated Trend Retrieval-B (T-ATR-B)	√
Trending-viewing and Modifying Trends Internal-B (T-VMT-I-B)	√
Device Management Description	**Supported BIBB**
Device Management-Backup and Restore-B (DM-BR-B)	√
Device Management-Device Communication Control-B (DM-DCC-B)	√
Device Management-Dynamic Device Binding-A (DM-DDB-A)	√
Device Management-Dynamic Device Binding-B (DM-DDB-B)	√
Device Management-Dynamic Object Binding-B (DM-DOB-B)	√
Device Management-List Manipulation-B (DM-LM-B)	√
Device Management-Object Creation and Deletion-B (DM-OCD-B)	√
Device Management-Private Transfer-A (DM-PT-A)	√
Device Management-Private Transfer-B (DM-PT-B)	√
Device Management-Reinitialize Device-B (DM-RD-B)	√
Device Management-TimeSynchronization-B (DM-TS-B)	√

Segmentation Capability

Segmentation Description	Supported Segment
Segmented Requests/ Window Size: 1	√
Segmented Responses/ Window Size: 1	√

Object Type

Table 47. Descriptions and configurations

Object Type	Required Properties Read	Properties Written[a]	Optional Properties Read	Ability to Create	Ability to Delete
Analog	• Object_Identifier	• Object_Name	• Description	Yes	Yes, only user created objects
Input	• Object_Name	• Description	• Reliability		
	• Object_Type	• Out_Of_Service	• Min_Pres_Value		
	• Present_Value	• Present_Value	• Max_Pres_Value		
	• Status_Flags	• Reliability	• COV_Increment		
	• Event_State	• Min_Pres_Value	• Time_Delay		
	• Out_Of_Service	• Max_Pres_Value	• Notification _Class		
	• Units	• COV_Increment	• High_Limit		
		• Time_Delay	• Low_Limit		
		• Notification_Class	• Deadband		
		• High_Limit	• Limit_Enable		
		• Low_Limit	• Event_Enable		
		• Deadband	• Acked_Transitions		
		• Limit_Enable	• Notify_Type		
		• Event_Enable	• Event_Time_Stamps		
		• Notify_Type			
Analog	• Object_Identifier	• Object_Name	• Description	Yes	Yes, only user created objects
Output	• Object_Name	• Description	• Reliability		
	• Object_Type	• Out_Of_Service	• Min_Pres-Value		
	• Present_Value	• Present_Value	• Max_Pres_Value		
	• Status_Flags	• Reliability	• COV_Increment		
	• Event_State	• Min_Pres_Value	• Time_Delay		
	• Out_Of_Service	• Max_Pres_Value	• Notification _Class		
	• Units	• Relinquish_Default	• High_Limit		
	• Priority_Array	• COV_Increment	• Low_Limit		
	• Relinquish_Default	• Time_Delay	• Deadband		
		• Notification_Class	• Limit_Enable		
		• High_Limit	• Event_Enable		
		• Low_Limit	• Acked_Transitions		
		• Deadband	• Notify_Type		
		• Limit_Enable	• Event_Time_Stamps		
		• Event_Enable			
		• Notify_Type			
Analog	• Object_Identifier	• Object_Name	• Description	Yes	Yes, only user created objects
Value	• Object_Name	• Description	• Reliability		
	• Object_Type	• Out_Of_Service	• Priority_Array		
	• Present_Value	• Present_Value	• Relinquish_Default		
	• Status_Flags	• Reliability	• COV_Increment		
	• Event_State	• Relinquish_Default	• Time_Delay		
	• Out_Of_Service	• COV_Increment	• Notification_Class		
	• Units	• Time_Delay	• High_Limit		
		• Notification_Class	• Low_Limit		
		• High_Limit	• Deadband		
		• Low_Limit	• Limit_Enable		
		• Deadband	• Event_Enable		
		• Limit_Enable	• Acked_Transitions		
		• Event_Enable	• Notify_Type		
		• Notify_Type	• Event_Time_Stamps		
Binary	• Object_Identifier	• Object_Name	• Description	Yes	Yes, only user created objects
Input	• Object_Name	• Description	• Inactive_Text		
	• Object_Type	• Out_Of_Service	• Active_Text		
	• Present_Value	• Inactive_Text	• Change_Of_State_Time		
	• Status_Flags	• Active_Text	• Change_Of_State_Count		
	• Event_State	• Present_Value	• Time_Of_State_Count_Reset		
	• Out_Of_Service	• Reliability	• Elapsed_Active_Time		
	• Polarity	• Change_Of_State_Count	• Time_Of_Active_Time_Reset		
		• Elapsed_Active_Time	• Time_Delay		
		• Time_Delay	• Notification_Class		
		• Notification_Class	• Alarm_Value		
		• Alarm_Value	• Event_Enable		
		• Event_Enable	• Acked_Transitions		
		• Acked_Transitions	• Notify_Type		
		• Notify_Type	• Event_Time_Stamps		
			• Reliability		

Object Type	Required Properties Read	Properties Written[a]	Optional Properties Read	Ability to Create	Ability to Delete
Binary Output	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Polarity • Priority_Array • Relinquish_Default	• Object_Name • Description • Out_Of_Service • Inactive_Text • Active_Text • Present_Value • Reliability • Change_Of_State_Count • Elapsed_Active_Time • Minimum_On_Time • Minimum_Off_Time • Relinquish_Default • Time_Delay • Notification_Class • Event_Enable • Acked_Transitions • Notify_Type	• Description • Inactive_Text • Active_Text • Change_Of_State_Time • Change_Of_State_Count • Time_Of_State_Count_Reset • Elapsed_Active_Time • Time_Of_Active_Time_Reset • Minimum_On_Time • Minimum_Off_Time • Time_Delay • Notification_Class • Feedback_Value • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps • Reliability	Yes	Yes, only user created objects
Binary Value	• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Polarity	• Object_Name • Description • Out_Of_Service • Inactive_Text • Active_Text • Present_Value • Reliability • Change_Of_State_Count • Elapsed_Active_Time • Minimum_On_Time • Minimum_Off_Time • Relinquish_Default • Time_Delay • Notification_Class • Alarm_Value • Event_Enable • Acked_Transitions • Notify_Type	• Description • Inactive_Text • Active_Text • Change_Of_State_Time • Change_Of_State_Count • Time_Of_State_Count_Reset • Elapsed_Active_Time • Time_Of_Active_Time_Reset • Priority_Array • Relinquish_Default • Minimum_On_Time • Minimum_Off_Time • Time_Delay • Notification_Class • Alarm_Value • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps • Reliability	Yes	Yes, only user created objects
Device	• Object_Identifier • Object_Name • Object_Type • System_Status • Vendor_Name • Vendor_Identifier • Model_Name • Firmware_Revision • Application_Software_Version • Protocol_Version • Protocol_Revision • Protocol_Services_Supported • Protocol_Object_Types_Supported • Object_List • Max_APDU_Length_Accepted • Segmentation_Supported • APDU_Timeout • Number_Of_APDU_Retries • Device_Address_Binding • Database_Revision	• Object_Name • Location • Description • APDU_Segment_Timeout • APDU_Timeout • Number_Of_APDU_Retries • Backup_Failure_Timeout	• Location • Description • Max_Segments_Accepted • APDU_Segment_Timeout • Max_Master • Max_Info_Frames • Local_Time • Local_Date • Configuration_Files • Last_Restore_Time • Backup_Failure_Timeout • Active_COV_Subscriptions	None	None
Event Enrollment Object	• Object_Identifier • Object_Name • Object_Type • Event_Type • Notify_Type • Event_Parameters • Object_Property_Reference • Event_State • Event_Enable • Acked_Transitions • Notification_Class • Event_Time_Stamps	• Object_Name • Notify_Type • Event_Parameters • Object_Property_Reference • Event_Enable • Notification_Class	• None	Yes	Yes, only user created objects

Object Type	Required Properties Read	Properties Written[(a)]	Optional Properties Read	Ability to Create	Ability to Delete
Multistate	• Object_Identifier	• Object_Name	• State_Text	Yes	Yes, only user created objects
Input	• Object_Name	• Description	• Reliability		
	• Object_Type	• State_Text	• Time_Delay		
	• Present_Value	• Out_Of_Service	• Notification_Class		
	• Status_Flags	• Present_Value	• Alarm_Values		
	• Event_State	• Reliability	• Fault_Values		
	• Out_Of_Service	• Time_Delay	• Event_Enable		
	• Number_Of_States	• Notification_Class	• Acked_Transitions		
		• Alarm_Values	• Notify_Type		
		• Fault_Values	• Event_Time_Stamps		
		• Event_Enable			
		• Notify_Type			
Multistate	• Object_Identifier	• Object_Name	• State_Text	Yes	Yes, only user created objects
Output	• Object_Name	• Description	• Reliability		
	• Object_Type	• State_Text	• Relinquish_Default		
	• Present_Value	• Out_Of_Service	• Time_Delay		
	• Status_Flags	• Present_Value	• Notification_Class		
	• Event_State	• Reliability	• Feedback_Values		
	• Out_Of_Service	• Time_Delay	• Event_Enable		
	• Number_Of_States	• Notification_Class	• Acked_Transitions		
	• Priority_Array	• Event_Enable	• Notify_Type		
	• Relinquish Default	• Notify_Type	• Event_Time_Stamps		
Multistate	• Object_Identifier	• Object_Name	• State_Text	Yes	Yes, only user created objects
Value	• Object_Name	• Description	• Reliability		
	• Object_Type	• State_Text	• Relinquish_Default		
	• Present_Value	• Out_Of_Service	• Time_Delay		
	• Status_Flags	• Present_Value	• Notification_Class		
	• Event_State	• Reliability	• Alarm_Values		
	• Out_Of_Service	• Priority_Array	• Fault_Values		
	• Number_Of_States	• Relinquish_Default	• Event_Enable		
		• Time_Delay	• Acked_Transitions		
		• Notification_Class	• Notify_Type		
		• Alarm_Values	• Event_Time_Stamps		
		• Fault_Values			
		• Event_Enable			
		• Notify_Type			
Notification	• Object_Identifier	• Object_Name	None	Yes	Yes, only user created objects
Class	• Object_Name	• Priority			
	• Object_Type	• Ack_Required			
	• Notification_Class	• Recipient_List			
	• Priority				
	• Ack_Required				
	• Recipient_List				
Trend	• Object_Identifier	• Object_Name	• Start_Time	Yes	Yes, only user created objects
	• Object_Name	• Log_Enable	• Stop_Time		
	• Object_Type	• Start_Time	• Log_DeviceObjectProperty		
	• Log_Enable	• Stop_Time	• Log_Interval		
	• Stop_When_Full	• Log_DeviceObjectProperty	• Stop_When_Full		
	• Buffer_Size	• Log_Interval	• Buffer_Size		
	• Log_Buffer	• Stop_When_Full	• Notification_Threshold		
	• Record_Count	• Buffer_Size	• Records_Since_Notification		
	• Total_Record_Count	• Log_Buffer	• Last_Notify_Record		
	• Event_State	• Record_Count	• Notification_Class		
		• Notification_Threshold	• Event_Enable		
		• Notification_Class	• Acked_Transitions		
		• Event_Enable	• Event_Time_Stamps		
		• Notify_Type			

(a) Properties written for Present_Value and Reliability only if Out_of_Service is TRUE

BACnet Protocol

Data Link Layer Options

Data Link Layer Description Option	Supported Option
ANSI/ATA 878.1, 2.5 Mb ARCNET (Clause 8)	
ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), Baud Rate(s)	
BACnet IP, (Annex J)	
BACnet IP, (Annex J), Foreign Device	
ISO 8802-3, Ethernet (Clause 7)(10Base2, 10Base5, 10BaseT, Fiber)	
LonTalk, (Clause 11), Medium	
MS/TP Master (Clause 9), Baud Rate(s): 9600, 19200, 38400, 76800, and 115200 @1.5% Nominal Baud Rate	√
MS/TP Slave (Clause 9), Baud Rate(s)	
Other	
Point-to-Point, EIA 232 (Clause 10), Baud Rate(s): 9600, 19200, 38400	
Point-to-Point, Modem (Clause 10), Baud Rate(s): 9600, 19200, 38400	

Device Address Binding

Device Address Binding	Supported?
Static Device Binding Supported	√

Networking Options

Networking Descriptions	Supported Option
Annex H, BACnet Tunneling	√
BACnet/IP Broadcast Management Device (BBMD)	√
Does the BBMD Support Registrations by Foreign Devices?	√
Router	√

Character Sets

Indicates support for multiple characters sets, but does not imply that all character sets are supported simultaneously.Maximum supported string length is 64 bytes (any character set).

Character Set Descriptions	Supported
ANSI X3.4	√
IBM/Microsoft DBCS	
ISO 10646 (UCS-4)	
ISO 10646 (UCS2)	√
ISO 8859-1	√
JIS C 6226	

Controls

Symbio800 Overview

This section covers information pertaining to the Sym-bioTM 800 controller hardware.

The Symbio™ 800 controller is a factory-installed, application specific and programmable controller designed to control chillers and large packaged HVAC equipment. A 7 inch user interface features a touchsensitive color screen that provides facility managers at-a-glance operating status, performance monitoring, scheduling changes, and operating adjustments. Other advanced features include automated controller back-up, and optional features such as secure remote connectivity, wireless building communications, mobile device connectivity, and custom programming with expandable I/O.

For more information, see Symbio800 Installation, Operation, and Maintenance manual BAS-SVX080*- EN.

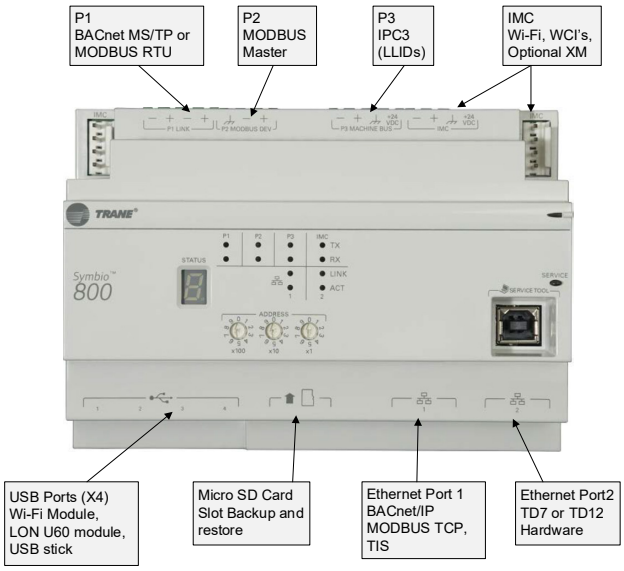


Figure 27. Front View of Symbio800

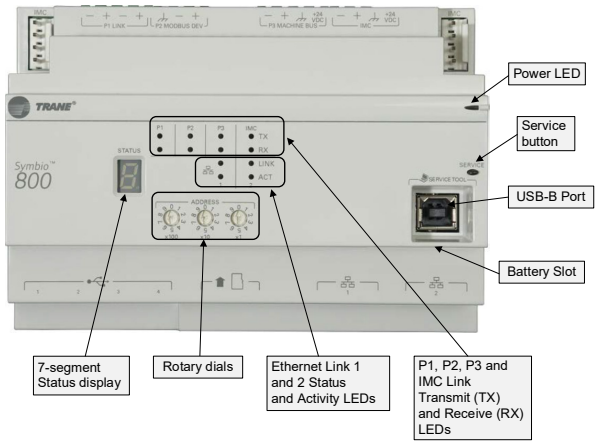


Figure 28. Wiring locations and connection ports

Tracer AdaptiView TD7 Display

Operator Interface

Information is tailored to operators, service technicians, and owners. When operating a chiller, there is specific information you need on a day-to-day basis-setpoints, limits, diagnostic information, and reports. Day-to-day operational information is presented at the display. Logically organized groups of information — chiller modes of operation, active diagnostics, settings and reports put information conveniently at your fingertips.

Operator Display Screen

Display Loading Data

Home Screen, Auto Mode

Figure 29. TD7 screens

Home Screen

The home screen (Figure 30) provides the most frequently needed chiller status information on "touch targets" (the entire white rectangular areas) for each chiller component. Touching any touch target displays a screen containing more chiller status information related to each component.

Figure 30. Home screen

Table 48. Home screen items

Description	Resolution	Units
Top Level Mode Ckt1		
Top Level Mode Ckt 2		
Outdoor Air Temperature	XXX.X	°F /°C
Percent Air Flow Ckt1/Ckt2	XXX.X/XXX.X	%
Active Chilled Water Setpoint	XXX.X	°F /°C
Chiller Load Command	X.X	%
Evaporator Water Flow Status	Flow/No Flow	
Evap Entering/Leaving Water Temp	XXX.X/XXX.X	°F /°C

View Operating Modes

On the Reports screen, touch Operating Modes to view the current operating status of the chiller in terms of the top-level operating mode and submodes.

Note: *You can also access the Chiller Operating Modes screen from the chiller status button in the upper left: corner of the screen*

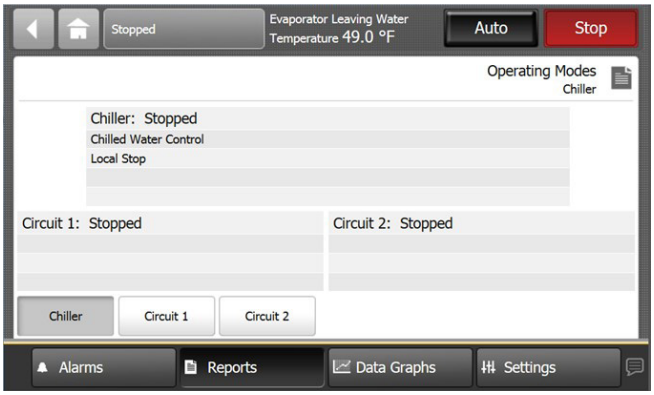


Figure 31. Chiller operating modes

Touch Circuit 1 or Circuit 2 on Operating Modes screen to view circuit and compressor modes and sub modes.

Table 49. Operating modes - chiller

Chiller Modes	Description
MP Resetting	**The main processor is going through reset**
	No chiller sub-modes.
Stopped	**The chiller is not running either circuit and cannot run without intervention. Further information is provided by the sub-mode:**
Local Stop	Chiller is stopped by TD7 Stop button command- cannot be remotely overridden.
Immediate Stop	Chiller is stopped by the TD7 Panic Stop (by pressing Stop then Immediate Shutdown in succession) - previous shutdown was manually commanded to shutdown immediately.
No Circuits Available	The entire chiller is stopped by circuit diagnostics or lockouts that may automatically clear.
Diagnostic Shutdown- Manual Reset	The chiller has been shut down on a latching diagnostic that requires manual intervention to reset.
Chilled Water Control	Chiller is running to provide a chilled water temperature per the active chilled water setpoint (may be as arbitrated from various sources). (For cooling only units, this mode may be suppressed.)
Starting is Inhibited by Low Ambient Temperature	The chiller is inhibited based on the outdoor air temperature.
Starting is Inhibited by External Source	The chiller is inhibited from starting or running by the "external stop" hardwired input.
Power Up Delay Inhibit: min:sec	On power up, the chiller will wait for the Power Up Delay Timer to expire.
Run Inhibit	**The chiller is currently being inhibited from starting (and running), but may be allowed to start if the inhibiting or diagnostic condition is cleared. Further information is provided by the submode:**
No Circuits Available	The entire chiller is stopped by circuit diagnostics or lockouts that may automatically clear.
Start Inhibited by BAS	The chiller is stopped by Tracer® or other Building Automation System (BAS).
Starting is Inhibited by External Source	The chiller is inhibited from starting or running by the "external stop" hardwired input.
Diagnostic Shutdown - Auto Reset	The entire chiller is stopped by a diagnostic that may automatically clear.
Starting is Inhibited by Low Ambient Temperature	The chiller is inhibited based on the outdoor air temperature.
Power Up Delay Inhibit: min:sec	On power up, the chiller will wait for the Power Up Delay Timer to expire.
Chilled Water Control	Chiller is running to provide a chilled water temperature per the active chilled water setpoint (may be as arbitrated from various sources). (For cooling only units, this mode may be suppressed.)
Auto	**The chiller is not currently running but can be expected to start at any moment given that the proper conditions and interlocks are satisfied. Further information is provided by the submode:**
Waiting For Evaporator Water Flow	The chiller will wait up to 20 minutes in this mode for evaporator water flow to be established per the flow switch hardwired input.
Waiting for A Need to Cool	The chiller will wait indefinitely in this mode, for an evaporator leaving water temperature higher than the Chilled Water Setpoint plus some control dead-band.
Chilled Water Control	Chiller is running to provide a chilled water temperature per the active chilled water setpoint (may be as arbitrated from various sources). (For cooling only units, this mode may be suppressed.)
Waiting to Start	**The chiller is not currently running and there is a call for cooling but lead circuit start is delayed by certain interlocks or proofs.**
	No chiller sub-modes.
Running	**The chiller, circuit, and compressor are currently running. Further information is provided by the sub-mode:**
Chilled Water Control	Chiller is running to provide a chilled water temperature per the active chilled water setpoint (may be as arbitrated from various sources). (For cooling only units, this mode may be suppressed.)
Maximum Capacity	The chiller is operating at its maximum capacity.
Capacity Control Softloading	The control is limiting the chiller loading due to capacity based softloading settings.
Demand Limit Softloading	The chiller is running, and loading of individual compressors may be limited by a gradual filter of the chiller's softloading demand limit setpoint. The starting demand limit and the settling time of this filter is user adjustable as part of the demand limit softload feature. The mode will be displayed as long as the Demand Limit Softloading is ramping or "settling".
Running - Limited	**At least one circuit on the chiller is currently running, but the operation of any of the circuits on the chiller is being actively limited by a chiller level limit. Other sub modes that apply to the Chiller Running top level modes may also be displayed here. Refer to the list of circuit limit modes for circuit limits that will cause display of this Chiller Level Running Limit mode.**
Demand Limit	The chiller is running and the compressor capacity is unloaded or restricted to load slowly or not at all to keep the chiller from exceeding the demand limit set by the customer.
Demand Limit Softloading	The chiller is running, and loading of individual compressors may be limited by a gradual filter of the chiller's softloading demand limit setpoint. The starting demand limit and the settling time of this filter is user adjustable as part of the demand limit softload feature. The mode will be displayed as long as the Demand Limit Softloading is ramping or "settling".

Chiller Modes	Description
Shutting Down	**The chiller is still running but shutdown is imminent. The chiller is going through a compressor run-unload or extended operational pumpdown of the lag circuit/compressor (or all circuits simultaneously).**
Evaporator Water Pump Off Delay min:sec	The evaporator water pump is continuing to run past the shutdown of the compressors, executing the pump off delay timer.
Local Stop, Maximum Capacity	Chiller is in the process of being stopped by TD7 Stop button command
Misc	**These sub-modes may be displayed in most of the top level circuit modes.**
Manual Evaporator Pump Override	The evaporator water pump relay is on due to a manual command.
Diagnostic Evaporator Water Pump Override	The evaporator water pump relay is on due to a diagnostic.
Manual Compressor Control Signal	Chiller capacity control is being controlled by Operator Display or Service Tool.
Noise Reduction Request	The Noise Reduction Request feature has been activated. If the unit is running, fans will be running at lower speed.
Evaporator Water Pump X Locked Out	Evaporator Water Pump X has been locked out by manual override from TD7 or TU.
Waiting for BAS Communications	The chiller has not detected communication with the BAS. This mode is only supported by LonTalk systems. Depending on configurations and Setpoint source setting, lack of communication may cause the chiller to shut down and or become inhibited from starting, but if so, the "Starting is Inhibited by BAS" mode will also occur.

Table 50. Operating modes - circuit

Circuit Level Modes	Description
Stopped	**The circuit is not running, and cannot run without intervention.**
Front Panel Circuit Lockout	The circuit is manually locked out by the circuit lockout setting - the nonvolatile lockout setting is accessible through either the Operator Display or Service Tool.
External Circuit Lockout	The respective circuit is locked out by the external circuit lockout binary input.
No Compressors Available	The circuit cannot run because necessary compressors are being prevented from running.
Diagnostic Shutdown - Manual Reset	The circuit has been shut down on a latching diagnostic that requires manual intervention to reset.
Run Inhibit	**The given circuit is currently being inhibited from starting (and running), but may be allowed to start if the inhibiting or diagnostic condition is cleared.**
Diagnostic Shutdown - Auto Reset	The circuit has been shutdown on a diagnostic that may clear automatically.
No Compressors Available	The circuit cannot run because necessary compressors are being prevented from running.
Auto	**The circuit is not currently running but can be expected to start at any moment given that the proper conditions are satisfied.**
Calibrating EXV	This submode is displayed when the EXV is performing a calibration. A calibration is only performed when the chiller is not running and never more frequently than once every 24 hours.
Waiting to Start	**The chiller is going through the necessary steps to allow the lead circuit to start.**
Start Inhibited Waiting For Oil	The compressor (and thus its circuit) will wait up to 2 minutes in this mode for oil level to appear in the oil tank.
Waiting For EXV Preposition	The circuit will wait for the time it takes the EXV to get to its commanded pre-position prior to starting the compressor. This is typically a relatively short delay and no countdown timer is necessary (less than 15 seconds)
Running	**A compressor on the given circuit is currently running.**
Establishing Minimum Capacity – Low Vi Minimum Speed	The compressor(GP4 VVi) is being forced to a higher speed than desired for capacity control, in order to maintain compressor bearing reliability while in the Low Vi state.
Establishing Min Capacity – Inverted Start	The compressor(GP4 VVi) is being forced to a higher speed than desired for capacity control, in order to maintain compressor discharge superheat.
Establishing Min Capacity – Inverted Start	The compressor(GP4 VVi) is being forced to a higher speed than desired for capacity control, in order to maintain compressor discharge superheat.
Condenser Pressure Limit	The circuit is experiencing condenser pressures at or near the condenser limit setting. Compressors on the circuit will be unloaded to prevent exceeding the limits.
Evaporator Temperature Limit	The circuit is experiencing saturated evaporator temperatures at or near the Low Refrigerant Temperature Cutout setting. Compressors on the circuit will be unloaded to prevent tripping.
EXV Capacity Limit	The EXV is near or beyond 95% wide open, and the capacity of the circuit (compressor speed) is being held or reduced in order to prevent loss of oil return or insufficient drive cooling.
Establishing Minimum Capacity - Low Differential Pressure	For circuits with manifolded compressors only, the compressor(s) are being loaded to meet requested capacity. See Low Compressor Differential Pressure Limit spec. Note: This mode can be displayed at a Compressor level as well.
Shutting Down	**The circuit is preparing to de-energize the compressor.**
Operational Pumpdown	The circuit is in the process shutting down by performing an operational pumpdown just prior to stopping the last running compressor. The EXV is commanded closed. Pumpdown will terminate when both the liquid level and the evap pressure are low (below specific criteria) or after a specific time has expired.

Circuit Level Modes	Description
Misc.	**These sub modes may be displayed in most of the top level circuit modes.**
Diagnostic Shutdown - Manual Reset	The circuit has been shut down on a latching diagnostic that requires manual intervention to reset.

Table 51. Operating modes - compressor

Compressor Level Modes	Description
Stopped	**The compressor is not running, and cannot run without intervention.**
Diagnostic Shutdown - Manual Reset	The compressor has been shut down on a latching diagnostic that requires manual intervention to reset.
Front Panel Compressor Lockout	Compressor is manually locked out by the compressor lockout setting - the nonvolatile lockout setting is accessible through either the Operator Display or Service Tool.
Low Oil Flow Cool Down Time min:sec	See oil flow protection spec.
Run Inhibit	**The given compressor is currently being inhibited from starting (and running), but may be allowed to start if the inhibiting or diagnostic condition is cleared.**
Diagnostic Shutdown - Auto Reset	The compressor has been shut down on a diagnostic that may clear automatically.
Auto	**The compressor is not currently running but can be expected to start at any moment given that the proper conditions are satisfied.**
Running	**A compressor on the given circuit is currently running.**
Minimum Capacity - High Discharge Temperature	The compressor is running with high discharge temperatures and is being forced loaded to its step load point, without regard to the leaving water temperature control, to prevent tripping on high compressor discharge temperature.
Establishing Minimum Capacity - High Oil Temperature	The compressor is running with high oil temperatures and is being force loaded to its step load point, without regard to the leaving water temperature control, to prevent tripping on high compressor oil temperature.
Running - Limit	**The compressor is currently running, but the operation of the chiller/compressor is being actively limited by the controls. Further information is provided by the sub-mode. See the section below regarding criteria for annunciation of limit modes**
Current Limit	The compressor is running and its capacity is being limited by high currents. The current limit setting is 120% RLA (to avoid overcurrent trips) or lower as set by the compressor's "share" of the active current limit (demand limit) setting for the entire chiller.
Hot Start Limit	This mode will occur if the compressor's suction saturated temperature exceeds the Hot Start Threshold Temperature at the point at which the step load for the respective circuit would be desired. This is often the case in a high water temperature pulldown. While in this mode, the compressor will not be allowed to load past its minimum load capacity step, but it will not inhibit other compressors from staging on. This mode is necessary to prevent nuisance trips due to compressor overcurrent or high pressure cutout. Reasonable pulldown rates can still be expected despite this limit, since the compressor's capacity even at partial load is much greater at high suction saturated temperatures.
Compressor Differential Pressure Limit	The compressor is running and is inhibited to load or unload in order to prevent conditions that would exceed safety trip points. See High Compressor Differential Pressure Limitation spec.
Compressor Pressure Ratio Limit	The compressor is running and is inhibited to load or unload in order to prevent conditions that would exceed safety trip points. See High Compressor Differential Pressure Limitation spec.
Establishing Minimum Capacity - Low Differential Pressure	For manifolded compressors only, the Compressor's Low Differential Pressure Protection Integral has risen to 30% of its trip value. This will force load the female load step on that circuit's compressor. Note: This mode can be displayed at a Circuit level as well.
Oil Return Limit	A compressor is in this limit due to low discharge superheat. The oil return solenoid valve will be cycled closed/open which allows the discharge gas temperature and the corresponding discharge superheat to increase, improving oil quality to the compressor.
Shutting Down	**The circuit is preparing to de-energize the compressor.**
Compressor Unloading	The compressor is in its run unload time. The run unload time must expire before the compressor will shut down. (The unload time is typically about 5 seconds.)
Misc.	**The circuit is preparing to de-energize the compressor.**
Service Pumpdown	The compressor is currently performing a service pumpdown.
Restart Inhibit min:sec	If there is accumulated Restart Inhibit Time, it must expire before a compressor is allowed to start.

Alarms

You can use the display to view alarms and to reset them. Alarms are communicated to the display immediately upon detection.

Viewing the Alarms Screen

Touch the Alarms button in the home screen menu to view the Alarms screen. A table of active alarms appears that is organized chronologically with the most recent at the top of the list, as shown in Figure 32. This example shows the default view, which appears each time you return to the screen. List can be sorted by any of the other columns if desired.

Note: *A page number appears in the lower right corner of the screen. If a screen contains more than one page, up/down arrows also appear for viewing the other pages.*

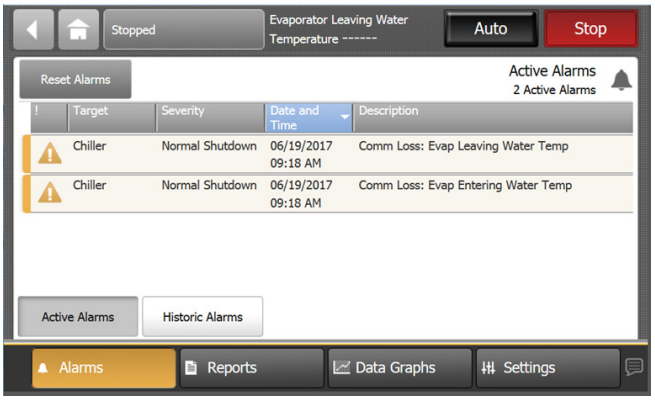


Figure 32. Alarm screen

The Alarms screen is accessible by depressing the Alarms enunciator. A verbal description will be provided.

A scrollable list of the last active Alarms is presented. Performing a "Reset Alarms" will reset all active Alarms regardless of type, machine or circuit. The scrollable list will be sorted by time of occurrence.

"Alarms" Key Behavior:

- Alarm Shutdown (immediate) has occurred: Flash red
- Alarm Shutdown (normal) has occurred: Flash yellow
- Informational warning is present: Flash blue
- No alarms present: Default button color, not flashing

Reports

You can use the Tracer display to view a variety of reports and to create and edit a custom report. All reports contain live data that refreshes every 2-5 seconds.

Viewing the Reports Screen

Touch the Reports button in the main menu area (Figure 30) to view the Reports screen. The Reports screen contains the following buttons:

- Custom Report 1
- Custom Report 2
- Custom Report 3
- Evaporator
- Condenser
- Compressor
- Motor About
- Operating Modes
- Log Sheet
- ASHRAE Chiller Log

Each button links to the report named on the button.

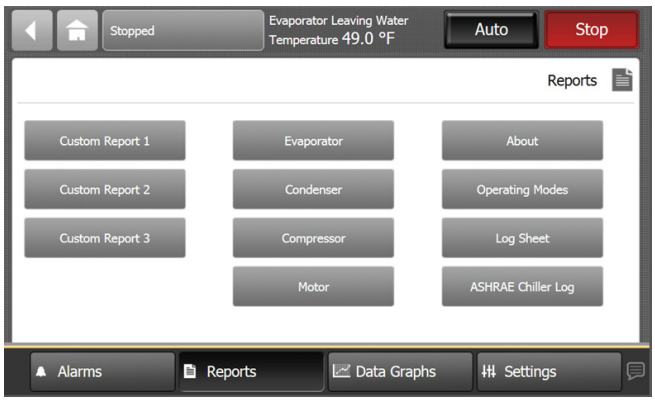


Figure 33. Report screen

The Reports tab allows a user to select from a list of reports headings. Each report will generate a list of status items as defined in the tables that follow.

Editing a Custom Report

You can edit the custom report by adding, removing, or reorder data as follows:

1. On the Custom Report screen, touch Edit. The Edit Custom Report screen appears.
2. Add, remove, or re-order as follows:
   a. To add an item to the custom report, touch it. It responds by changing to blue. You can use the arrows to scroll through the rest of the items that can be added to the custom report. Then touch Add to move the selected item to the box on the right side of the screen.
   b. To remove an item from the custom report, touch it. It responds by changing to blue. You can use the arrows to scroll through the rest of the items that can be removed from the custom report. Then touch Remove

to move the selected item to the box on the left side of the screen.

c. To re-order items in the custom report, touch it. It responds by changing to blue. Use the arrows to change the order of a highlighted item.

3. To save and view your edited custom report, touch Save.

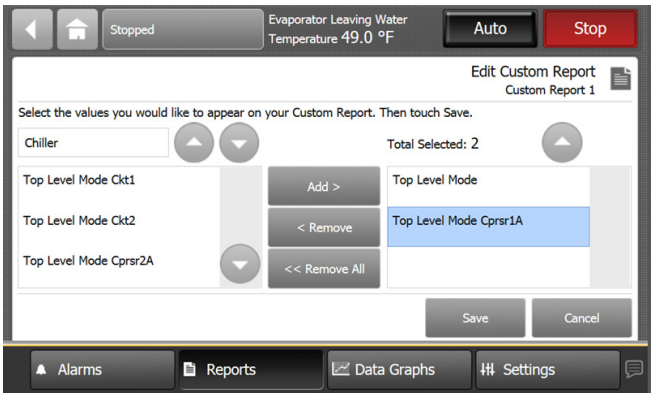


Figure 34. Edit custom report screen

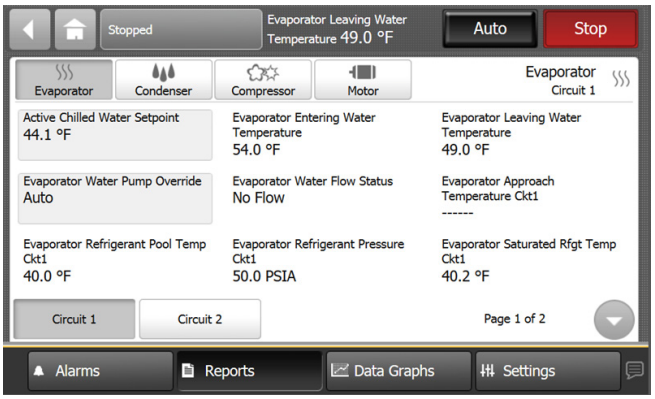


Figure 35. Report evaporator screen

Table 52. Report evaporator screen items

Description	Resolution	Units
Active Chilled Water Setpoint	XXX.X	°F /°C
Evaporator Entering Water Temperature	XXX.X	°F /°C
Evaporator Leaving Water Temperature	XXX.X	°F /°C
Evaporator Water Pump Override	Auto/On	
Evaporator Water Flow Status	Flow/No Flow	
Evaporator Approach Temperature CktX	XXX.X	°F /°C
Evaporator Refrigerant Pool Temp CktX	XXX.X	°F /°C
Evaporator Refrigerant Pressure CktX	XXX.X	°F /°C
Evaporator Saturated Rfgt Temp CktX	XXX.X	°F /°C
Oil return Solenoid Valve CprsrXA	Open/Closed	
Oil return Solenoid Valve CprsrXB	Open/Closed	
EXV Percent Open CktX	XXX.X	%

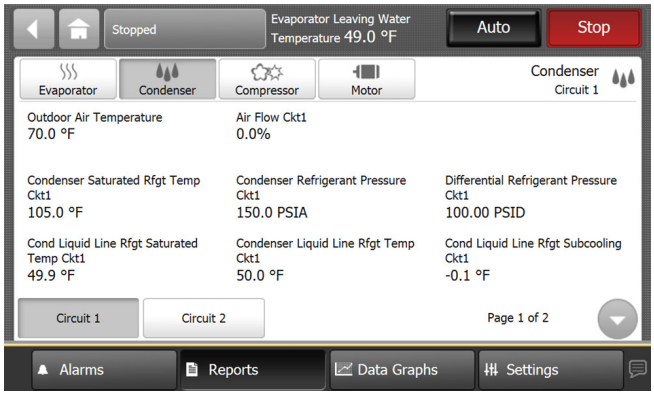


Figure 36. Report condenser screen

Table 53. Report condenser screen items

Description	Resolution	Units
Outdoor Air Temperature	XXX.X	°F /°C
Percent Air Flow Ckt1/Ckt2	XXX.X	%
Condenser Saturated Rfgt Temp CktX	XXX.X	°F/°C
Condenser Refrigerant Pressure CktX	XXX.X	PSI/kPa
Differential Refrigerant Pressure CktX	XXX.X	PSID/kPaD
Cond Liquid Line Rfgt Saturated Temp CktX	XXX.X	°F /°C
Condenser Liquid Line Rfgt Temp CktX	XXX.X	°F /°C
Condenser Liquid Line Rfgt Subcooling CktX	XXX.X	°F/°C
EXV Percent Open CktX	XXX.X	%
Condenser Liquid Line Rfgt Pressure CktX	XXX.X	PSI/kPa
Condenser Refrigerant Tank Valve CktX	Open/Closed	

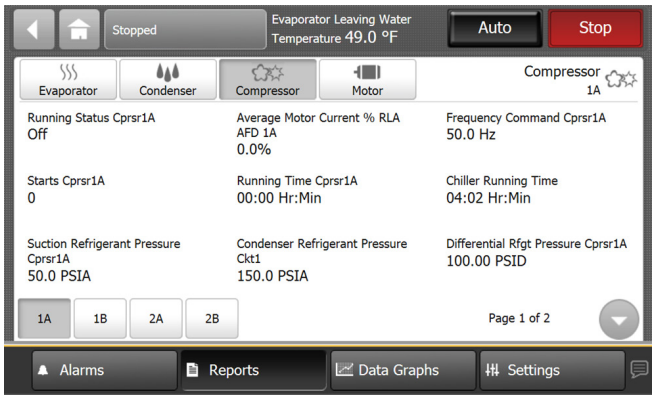


Figure 37. Report compressor screen

Table 54. Report compressor screen items

Description	Resolution	Units
Running Status	On/Off	
Average Line Current % RLA Starter XX	XXX.X	%
Average Motor Current % RLA AFD XX	XXX.X	%
Frequency Command CprsrXX	XX.X	Hz
Starts CprsrXX	XXXX	
Running Time CprsrXX	XXXX.XX	Hr:Min
Chiller Running Time	XXXX.XX	Hr:Min
Suction Refrigerant Pressure CpsrXX	XXX.X	PSI/kPa
Condenser Refrigerant Pressure CktX	XXX.X	PSI/kPa
Differential Rfgt Pressure Cprsr XX	XXX.XX	PSI/kPa
Oil Loss Level Sensor	Wet/Dry	
Discharge Temperature CprsrXX	XXX.X	°F /°C
Discharge Superheat CprsrXX	XXX.X	°F/°C
Oil Pressure CprsrXX	XXX.X	PSI/kPa
Oil Temperature CprsrXX	XXX.X	°F/°C
Economizer Valve Percent Open CprsrXX	XXX.X	%
Economizer Discharge Pressure CprsrXX	XX.X	PSI/kPa
Economizer Discharge Temperature CprsrXX	XXX.X	°F/°C
Economizer Superheat CprsrXX	XXX.X	°F/°C

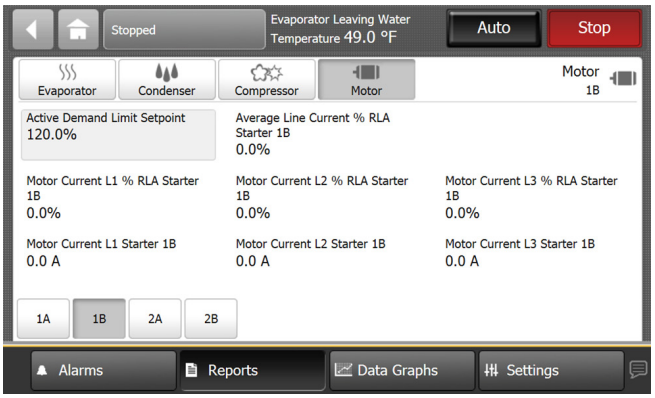


Figure 38. Report motor screen

Table 55. Report motor screen items

Description	Resolution	Units
Active Demand Limit Setpoint	XXX.X	%
Average Line Current %RLA Starter XX	XXX.X	%
Average Motor Current %RLA AFD XX	XXX.X	%
Frequency Command Cprsr XX	XX.X	Hz
Motor Current L1 % RLA Starter XX	XXX.X	%
Motor Current L2 % RLA Starter XX	XXX.X	%
Motor Current L3 % RLA Starter XX	XXX.X	%
Motor Current L1 Starter XX	XXX.X	Amps
Motor Current L2 Starter XX	XXX.X	Amps
Motor Current L3 Starter XX	XXX.X	Amps
Motor Voltage AB Starter XX	XXXX.X	Volts
Motor Voltage BC Starter XX	XXXX.X	Volts
Motor Voltage CA Starter XX	XXXX.X	Volts

Equipment Settings

You can use the TD7 display to monitor and change a variety of equipment settings.

Viewing the Settings Screen

Touch the Settings button in the main menu area to view the Settings screen. Equipment Settings identifies a column of buttons located on the screen (see the outlined column in Figure 39). The buttons are:

- Chiller Settings
- Feature Settings
- Chiller Water Reset
- Manual Control Settings
- Service Settings

Each of these buttons provide access to a screen that contains additional buttons related to each topic. This section provides detailed information about these screens.

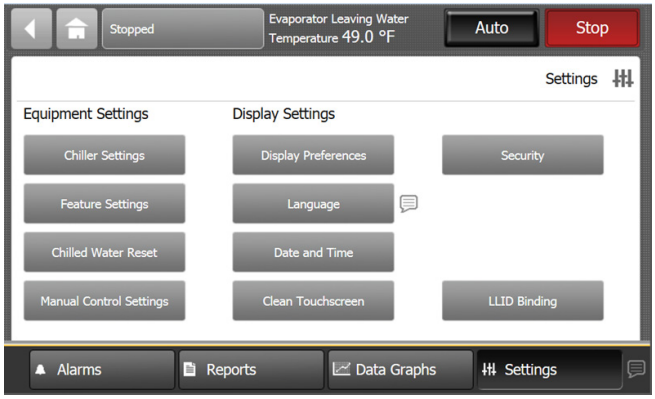


Figure 39. Setting screen

Viewing and Changing Equipment Settings

Each button in the Equipment Settings column on the Settings screen takes you to a menu screen that contains a group of buttons. Each button displays the name of a setting and its current value (Figure 40). Touch any button to view a screen where you can change the setting for the feature shown on the button.

Note: *A page number appears in the lower right corner of the screen. If a screen contains more than one page, up/down arrows also appear for viewing the other pages, as in* Figure 40*.*

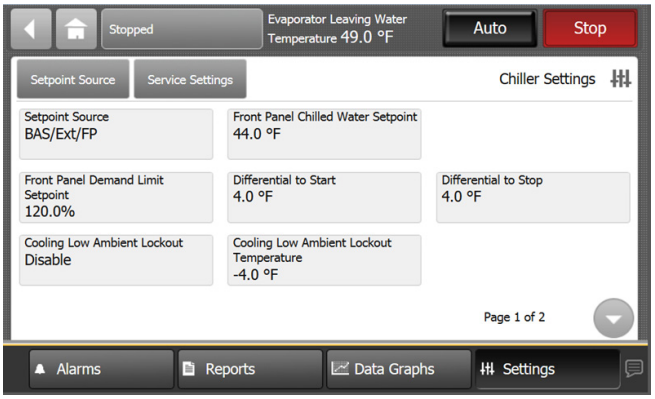


Figure 40. Equipment setting screen (Chiller setting shown)

To change an equipment setting, follow this procedure:

1. Touch one of the button in the Equipment Settings column on the Settings screen, such as Chiller Settings. The corresponding screen appears (in this case, the Chiller Settings screen).
2. Touch the button that shows the equipment setting you want to change. A screen that allows you to change the equipment setting appears. There are two types of these screens:
   a. For screens with button selections (Figure 41), touch the button that represents the setting you want. The button becomes shaded, and a Save button appears at the bottom of the screen.
   b. For screens with numerical keypads (Figure 42), touch the appropriate numbers to change the current value. The new value appears above the keypad.
3. Touch Save to complete the change. The current value is updated in the upper left side of the screen, demonstrating that the change has been communicated to the Tracer Symbio800 controller. The screen you were previously viewing appears.

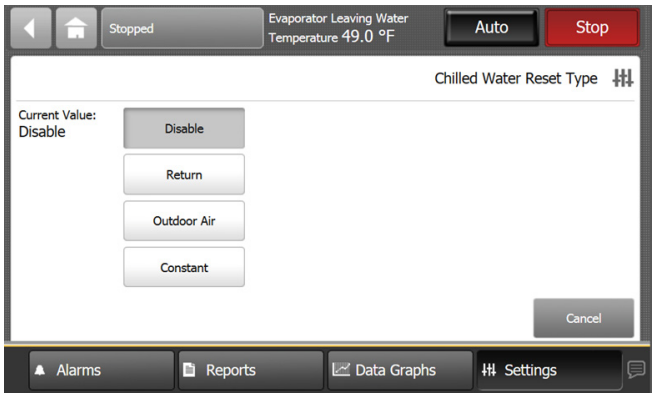


Figure 41. Chilled water reset type screen

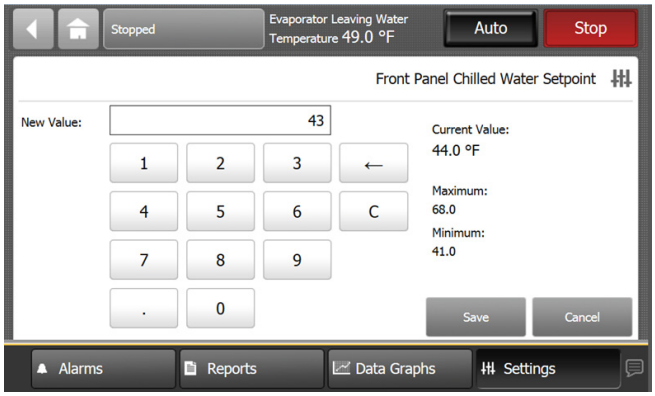


Figure 42. Changed chilled water setpoint screen

Keypad features

- When you enter a new number, the value in the New value field is deleted and replaced with the new entry.
- The backspace (arrow) key deletes the characters you previously entered.
- If the keypad is used to enter a setpoint that is out of range, an error dialog will appear when you touch the Save button.
- Keypads that allow negative numbers have positive and negative number (+/-) keys.

Table 56. Settings screen items

Description	
Chiller Settings	
Setpoint Source	
Front Panel Chilled Water Setpoint	
Auxiliary Chilled Water Setpoint	
Front Panel Demand Limit Setpoint	
Differential to Start	
Differential to Stop	
Cooling Low Ambient Lockout	
Cooling Low Ambient Lockout Temperature	
Condenser Pressure Limit Setpoint	
Evaporator Water Pump Off Delay	
High Evaporator Water Temp Cutout	
Low Evaporator Water Temp Cutout	
Low Refrigerant Temperature Cutout	
Demand Limit Startup Target	
Demand Limit Softload Time	
Capacity Control Softload Time	
Front Panel Noise Reduction Request	
Noise Reduction Cond Fan Speed Clamp	
Power-Up Start Delay	
Chiller Power Demand Time Period	
Local Atmospheric Pressure	
Feature Settings	
External Chiller Water Setpoint Enable	
External Demand Limit Setpoint Enable	
Staging Sequence	
Chilled Water Reset Type	
Return Water Reset Ratio	
Return Water Start Ratio	
Return Water Maximum Reset	
Outdoor Air Reset Ratio	
Outdoor Air Start Reset	
Outdoor Air Maximum Reset	
Mode Overrides	
Manual Capacity Control	Auto/Manual
Evaporator Water Pump Override	Auto/On
Evaporator Water Pump Lockout Pump 1	Not Locked Out/ Locked Out
Evaporator Water Pump Lockout Pump 2	Not Locked Out/ Locked Out
Front Panel Circuit Lockout Ckt1	Not Locked Out/ Locked Out
Front Panel Circuit Lockout Ckt2	Not Locked Out/ Locked Out
EXV Manual Control Override Ckt1	Auto/Manual
EXV Manual Control Override Ckt2	Auto/Manual
Front Panel Compressor Lockout Cprsr 1A	Not Locked Out/ Locked Out
Service Pumpdown Command Cprsr1A	Abort/Start
Front Panel Compressor Lockout Cprsr 2A	Not Locked Out/ Locked Out
Service Pumpdown Command Cprsr2A	Abort/Start

Service Settings

Setpoints on the Service Settings screen are only intended for use by experienced service personnel. Setpoints include security, if enabled.

The Service Settings screen is found through Chiller Settings, and includes a warning message for the user.

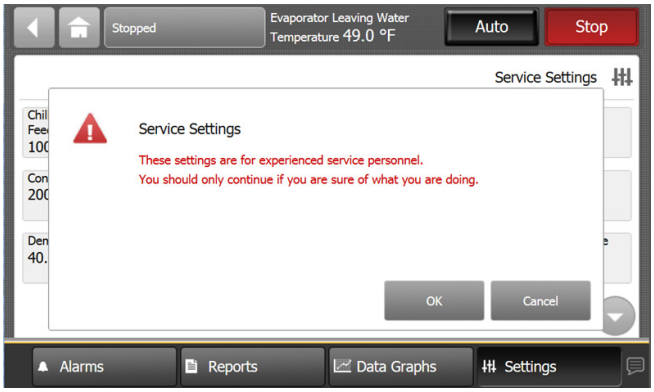


Figure 43. Warning message

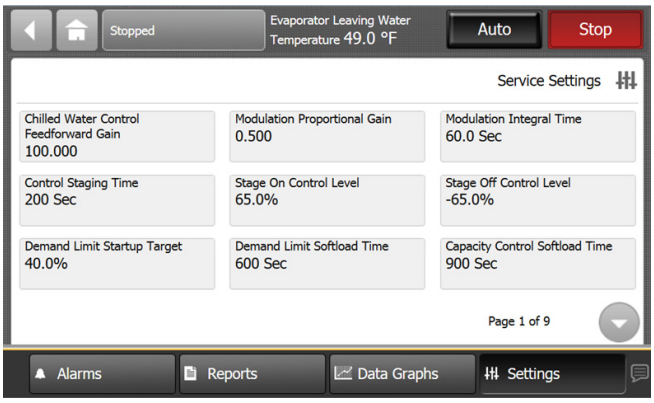


Figure 44. Service settings screen

Display Settings

You can use the Tracer AdaptiView display to change the format of the information that appears on the display, and to clean the touch screen.

Touch the Settings button in the main menu area to view the Settings screen. Display Settings identifies a column of buttons located on the screen (see Figure 45). The buttons are:

- Display Preferences
- Language
- Date and Time
- Clean Display

Each button provide access to a screen that is related to the button name.

Viewing and Changing Display Preferences

On the Settings screen, touch Display Preferences to view a screen containing these buttons:

- Date Format
- Date Separator
- Time Format
- Unit System
- Pressure Units
- Number Format

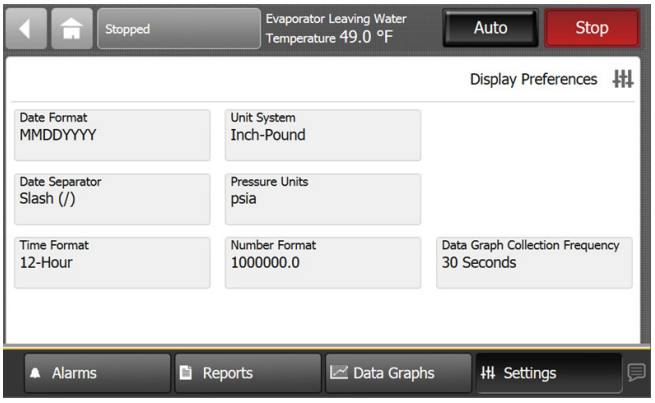


Figure 45. Display preference screen

Each of the buttons shows the name of a display preference and its format (current value). Touch any of these buttons to view a screen where you can change the format. The button representing the format currently used is shaded (see the "MMDDYYYY" button).

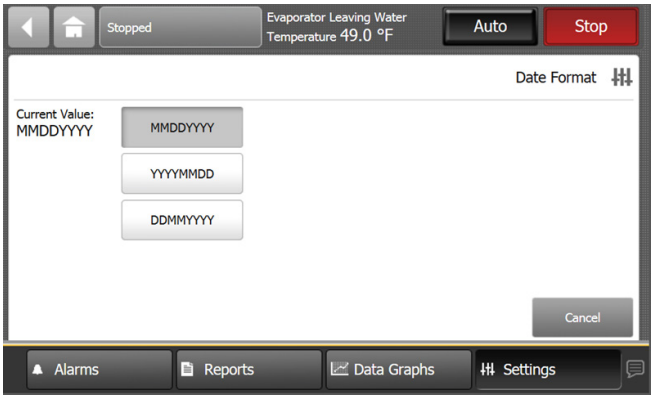


Figure 46. Date format page

To change the format:

1. Touch the button that shows that format you prefer.
2. Touch Save to confirm your selection and to return to the Display Preferences screen.

Date Format

Use the Date Format screen to choose from the following date formats:

- MMDDYYYY (default)
- YYYYMMDD
- DDMMYYYY

Date Separator

Use the Date Separator screen to choose from the following date formats:

- None
- Slash (default)
- Hyphen

Time Format

Use the Time Format screen to choose from the following time formats:

- 12 hour (default)
- 24 hour

Units System

Use the Display Units screen to choose from the following display units:

- SI
- Inch-Pounds (default)

Pressure Units

Use the Pressure Units screen to choose from the following pressure units:

- kPaA (default if "SI" is chosen for display units)
- kPaG
- PSIA (default if "Inch-Pound" is chosen for display units)
- PSIG

Number Format

- 1000000.0
- 1000000,0

Laungage Settings

Figure 47. Language page

The language that is currently in use on the display is expressed as the current value on the Language screen. The button that displays the current value is shaded (see the

"English" button in Figure 47 as an example).

To change the language:

1. Touch the button that identifies the language you prefer.
2. Touch Save to confirm your selection and to return to the Settings screen.

Date and Time Settings

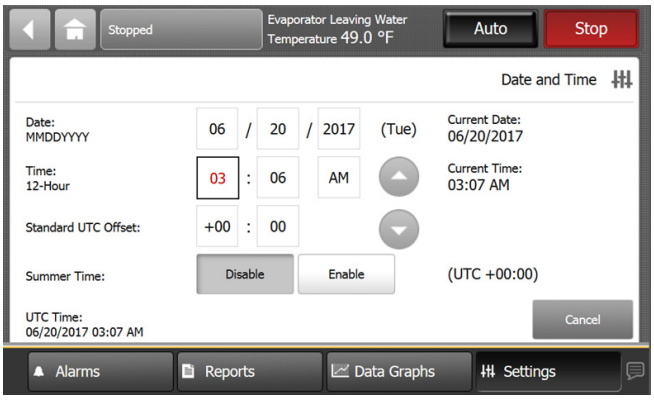


Figure 48. Date and time screen

The current date and time for the display is expressed as the current value. The current value appears below the center line on the screen.

Above the center line, the following date and time attributes appear:

- Month
- Day
- Year
- Hour
- Minute
- AM/PM

To change the date or time:

1. Touch the square presenting the attribute you want to change. The square becomes highlighted.
2. Touch the up or down arrow key on the screen until the your desired selection appears. Repeat the process for any other attributes you want to change.
3. Touch Save to confirm your selection and return to the Settings screen.

Note: *Alternately, fields can be edited by touching the highlighted square a second time to access a keypad.*

Cleaning the Display

On the Settings screen, touch Clean Display to disable the Tracer AdaptiView display screen for 5 seconds after finger is removed. This process allows screen cleaning without it responding to touch. During this time, the screen is black with a number in the center that counts down the seconds. After 5 seconds, the Settings screen re-appears.

Figure 49. Countdown screen

Security Settings

If security is enabled, the Tracer AdaptiView display requires that you log in with a four-digit security PIN to make setting changes that are protected by security. This feature prevents unauthorized personnel from doing so. There are two levels of security, each allowing specific changes to be made.

You can view all data without logging in. The log-in screen appears only when you try to change a setting that is protected by security, or when you touch the Log in button from the Settings screen.

Disabling/Enabling Security

The Tracer AdaptiView display gives you the ability to disable or enable the security feature that allows a user to log in and log out.

To disable security, you must be logged in:

1. From the Settings screen, touch the Security button. The Security screen appears (Figure 50).

Note: *If you are logged out, the Log in screen appears.*

2. Touch the Disable button. The button becomes shaded.
3. Touch Save. The Settings screen appears with only the Security button visible. The Log in/Logout button is gone.

To enable security:

1. From the Settings screen, touch the Security button. The Security screen appears (Figure 50).
2. Touch the Enable button. The button becomes shaded.
3. Touch Save. The Settings screen appears with a Log out button, in addition to the Security button.

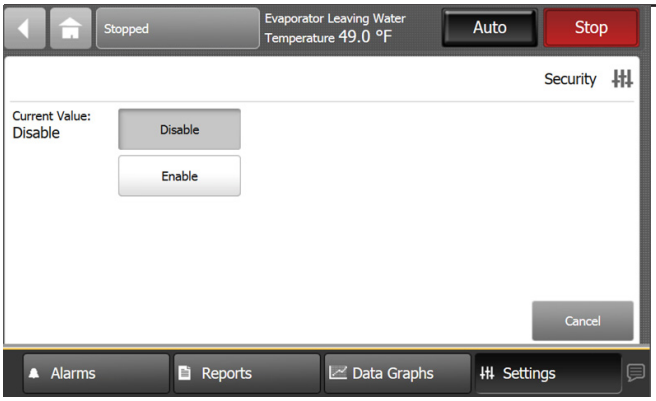


Figure 50. Security screen - disable

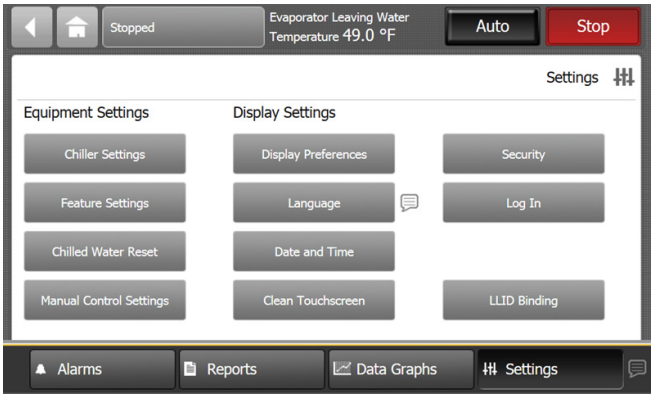


Figure 51. Security settings screen

Logging In

There are two levels of security:

- Security Level 1 allows users to change a limited group of secure settings. The default security PIN is 1111.
- Security Level 2 allows users to change all secure settings. The default security PIN is 7123.

A technician must use the Tracer TU service tool to define a different PIN, or to recall a PIN that has been forgotten.

When defining a PIN in Tracer TU, the technician enters a 4-digit PIN that corresponds with the desired level of

Security.

To log in:

1. Touch the Log in button. The Log in screen appears (Figure 52).
2. Use the keypad to enter your PIN.
   a. The PIN is a four-digit number, which was configured for your system with the Tracer TU service tool.
   b. As you enter the number, the PIN remains hidden by asterisks.

Note: *If you enter an invalid PIN, an error message appears on the Log in screen.*

3. Touch Save.
   a. If you viewed the Log in screen from touching Log in on the Settings screen, the Settings screen appears with a Log out button on it.
   b. If the Log in screen appeared when you tried to change a setting, you return to that setting screen.

Note: *The PIN is valid until 30 minutes of inactivity passes, or until you log out.*

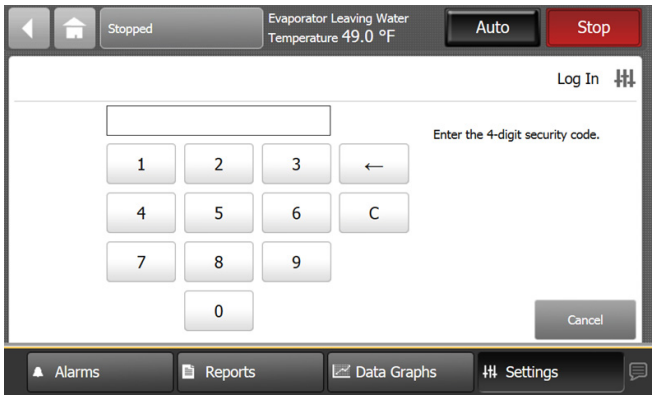


Figure 52. Log in screen

Logging Out

To log out:

1. Touch the Log out button. A confirmation screen appears (Figure 53).
2. Touch Yes to confirm that you want to log out. The Settings screen appears with a Log in button on it.

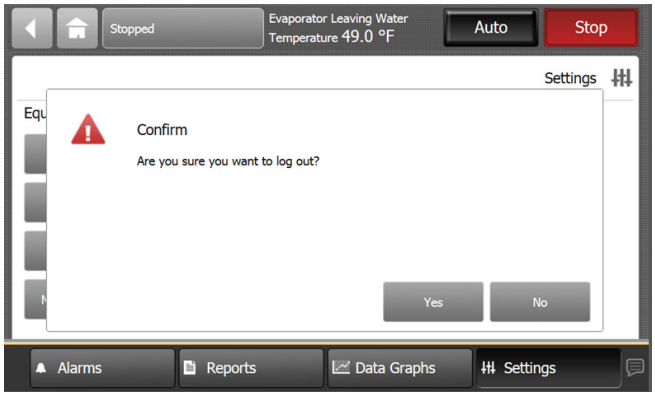


Figure 53. Log out confirmation screen

Tracer TU

The AdaptiView™ TD7 operator interface allows for daily operational tasks and setpoint changes. However, to adequately service Sintesis chillers, Tracer® TU service tool is required. (Non-Trane personnel, contact your local Trane office for software purchase information.) Tracer TU adds a level of sophistication that improves service technician effectiveness and minimizes chiller downtime. This portable PC-based service-tool software supports service and maintenance tasks, and is required for software upgrades, configuration changes and major service tasks.

Tracer TU serves as a common interface to all Trane® chillers, and will customize itself based on the properties of the chiller with which it is communicating. Thus, the service technician learns only one service interface.

The panel bus is easy to troubleshoot using LED sensor verification. Only the defective device is replaced. Tracer TU can communicate with individual devices or groups of devices.

All chiller status, machine configuration settings, customizable limits, and up to 100 active or historic diagnostics are displayed through the service-tool software interface.

LEDs and their respective Tracer TU indicators visually confirm the availability of each connected sensor, relay, and actuator.

Tracer TU is designed to run on a customer's laptop, connected to the Tracer AdaptiView control panel with a USB cable. Your laptop must meet the following hardware and software requirements:

- 1 GB RAM (minimum)
- 1024 x 768 screen resolution
- Ethernet 10/100 LAN card
- Available USB 2.0 port
- Microsoft® Windows® 7 Enterprise or Professional operating system (32-bit or 64-bit) or Windows 8.1.

Important: *Tracer TU V8.6 was the final release to support Windows XP. Beginning with Tracer TU V9.0, you will need to migrate to Windows 7 or Windows 8.1 operating system.*

Notes:

- Tracer TU is designed and validated for this minimum laptop configuration. Any variation from this configuration may have different results. Therefore, support for Tracer TU is limited to only those laptops with the configuration previously specified.
- For more information, see TTU-SVN01*-EN Tracer TU Getting Started Guide

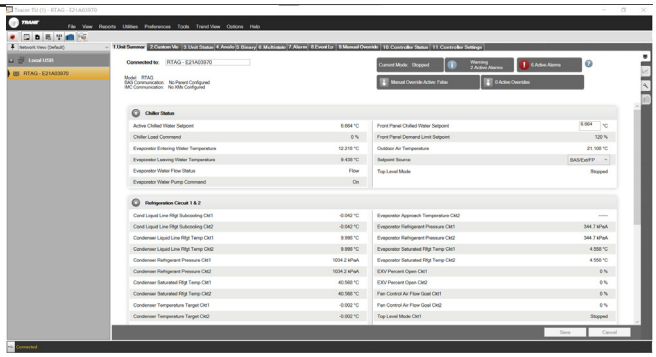


Figure 54. Tracer TU

Sequence of Operation

NOTICE

Equipment Damage !

Ensure that the compressor and oil sump heaters have been operating properly for a minimum of 24 hours before starting. Failure to do so could result in equipment damage.

This section will provide basic information on chiller operation for common events. With microelectronic controls, ladder diagrams cannot show today's complex logic, as the control functions are much more involved than older pneumatic or solid state controls.

Adaptive control algorithms can also complicate the exact sequence of operations. This section illustrates common control sequences.

Software Operation Overview

The Software Operation Overview shown in Figure 55 is a diagram of the five possible software states. This diagram can be thought of as a state chart, with the arrows and arrow text depicting the transitions between states.

- The text in the circles is the visible top level operating mode displayed on TracerTM AdaptiView.
- The shading of each software state circle corresponds to the shading on the time lines that show the state the chiller is in.

There are five generic states that the software can be in:

- Power Up
- Stopped
- Starting
- Running
- Stopping

RTAG Sequence of Operation: Chiller State Chart

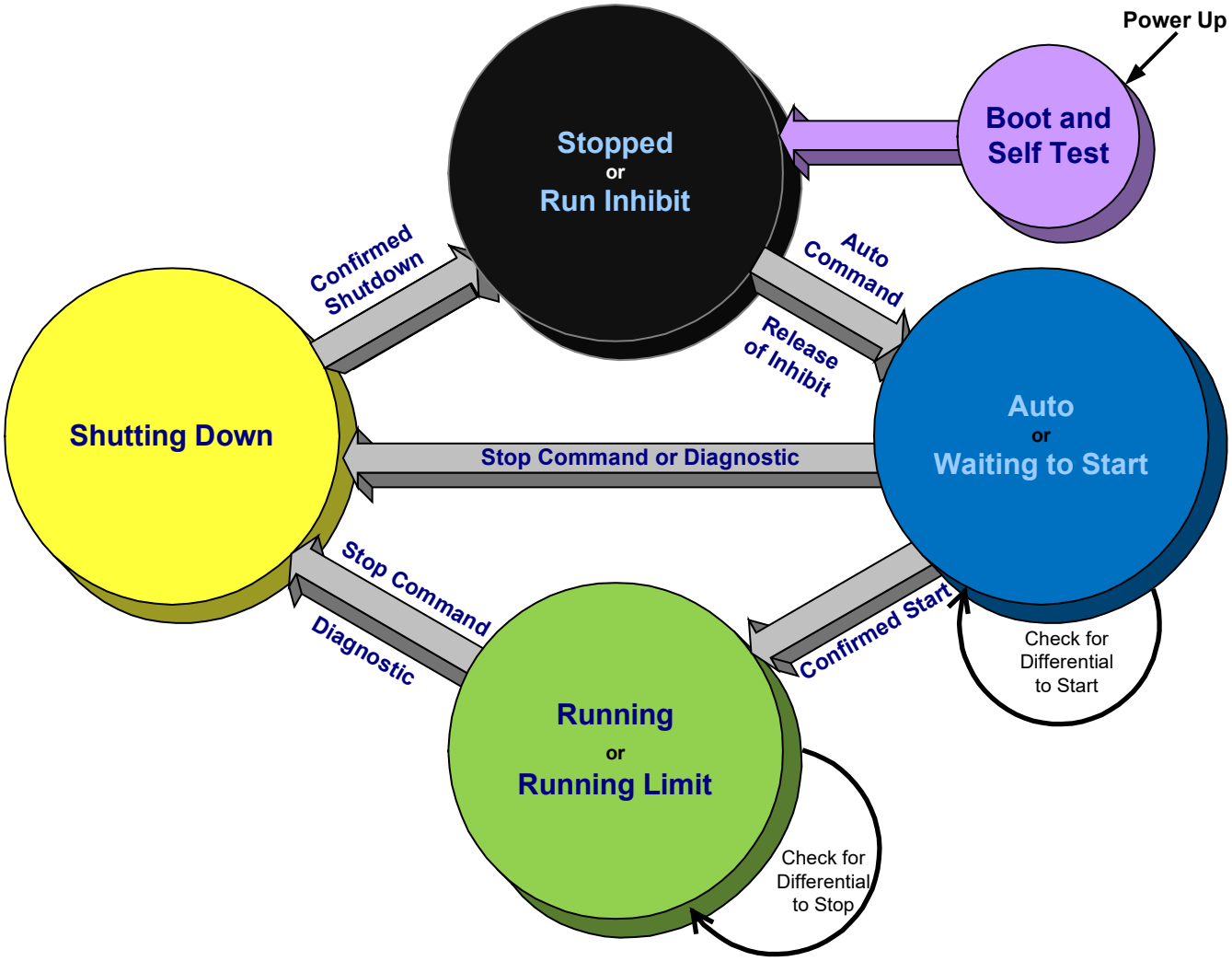


Figure 55. Software operation overview

Timelines

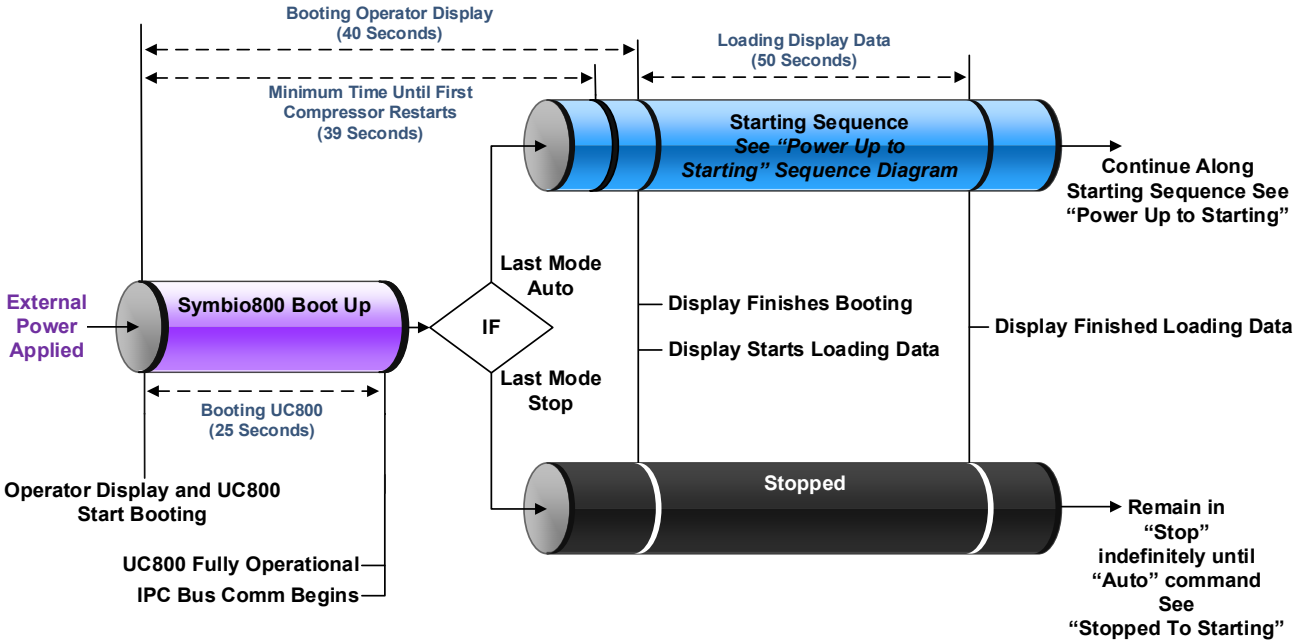
The time line indicates the upper level operating mode, as it would be viewed on the Tracer AdaptiView.

- The shading color of the cylinder indicates the software state.
- Text in parentheses indicates sub-mode text as viewed on Tracer AdaptiView.
- Text above the time line cylinder is used to illustrate inputs to the Main Processor. This may include user input to the Tracer AdaptiView Touch screen, control inputs from sensors, or control inputs from a Generic BAS.
- Boxes indicate control actions such as turning on relays, or pulsing compressor load or unload solenoids.
- Smaller cylinders under the main cylinder indicate diagnostic checks.
- Text outside a box or cylinder indicates time based functions.
- Solid double arrows indicate fixed timers.
- Dashed double arrows indicate variable timers.

Important: *Sequence of events timelines include options that may not be available on specific unit configurations.*

Power Up Diagram

Figure 56 shows the respective TD-7 AdaptiView screens during a power up of the Symbio800 and display. This process takes 25 seconds for the Symbio800 and 90 seconds for the display. On all power ups, the software model always will transition through the 'Stopped' Software state independent of the last mode. If the last mode before power down was 'Auto', the transition from 'Stopped' to 'Starting' occurs, but it is not apparent to the user.



Display will show either Auto or Stop button active once it is fully loaded

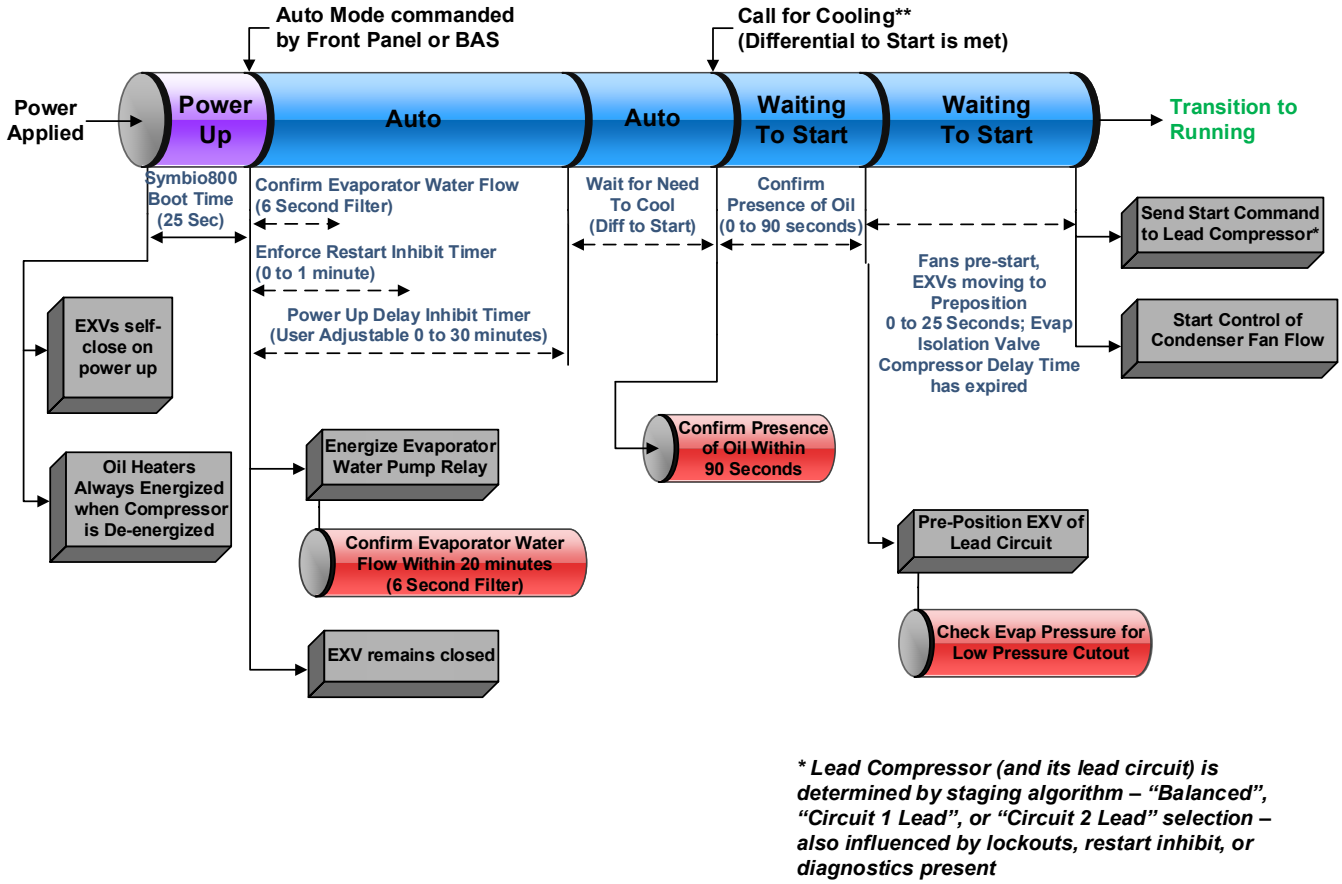
Figure 56. Sequence of operation: power up diagram

Power Up to Starting

Figure 57 diagram shows the timing from a power up event to energizing the first compressor. The shortest allowable time would be under the following conditions:

- No motor restart inhibit time left from subsequent starts
- Evaporator Water flow occurs quickly with pump on command
- Power up Start Delay set to 0 minutes
- Need to cool (differential to start) already exists
- Oil level is detected immediately

The above conditions would allow for a minimum power up to starting the first compressor time of about 45 seconds (variations may exist due to options installed). Note that it is not advisable to start a chiller "cold" the oil heaters should be in operation for a sufficient length of time prior to first start. Consult the chiller's IOM for specifics.



Lead Compressor (and its lead circuit) is determined by staging algorithm – "Balanced", "Circuit 1 Lead", or "Circuit 2 Lead" selection – also influenced by lockouts, restart inhibit, or diagnostics present

Figure 57. Sequence of events: power up to starting

Stopped to Starting

Figure 58 shows the timing from a stopped mode to energizing the first compressor. The shortest allowable time would be under the following conditions:

- No motor restart inhibit time left from subsequent starts
- Evaporator Water flow occurs quickly with pump on command
- Need to cool (differential to start) already exists

The above conditions would allow a compressor to start in about 20 seconds.

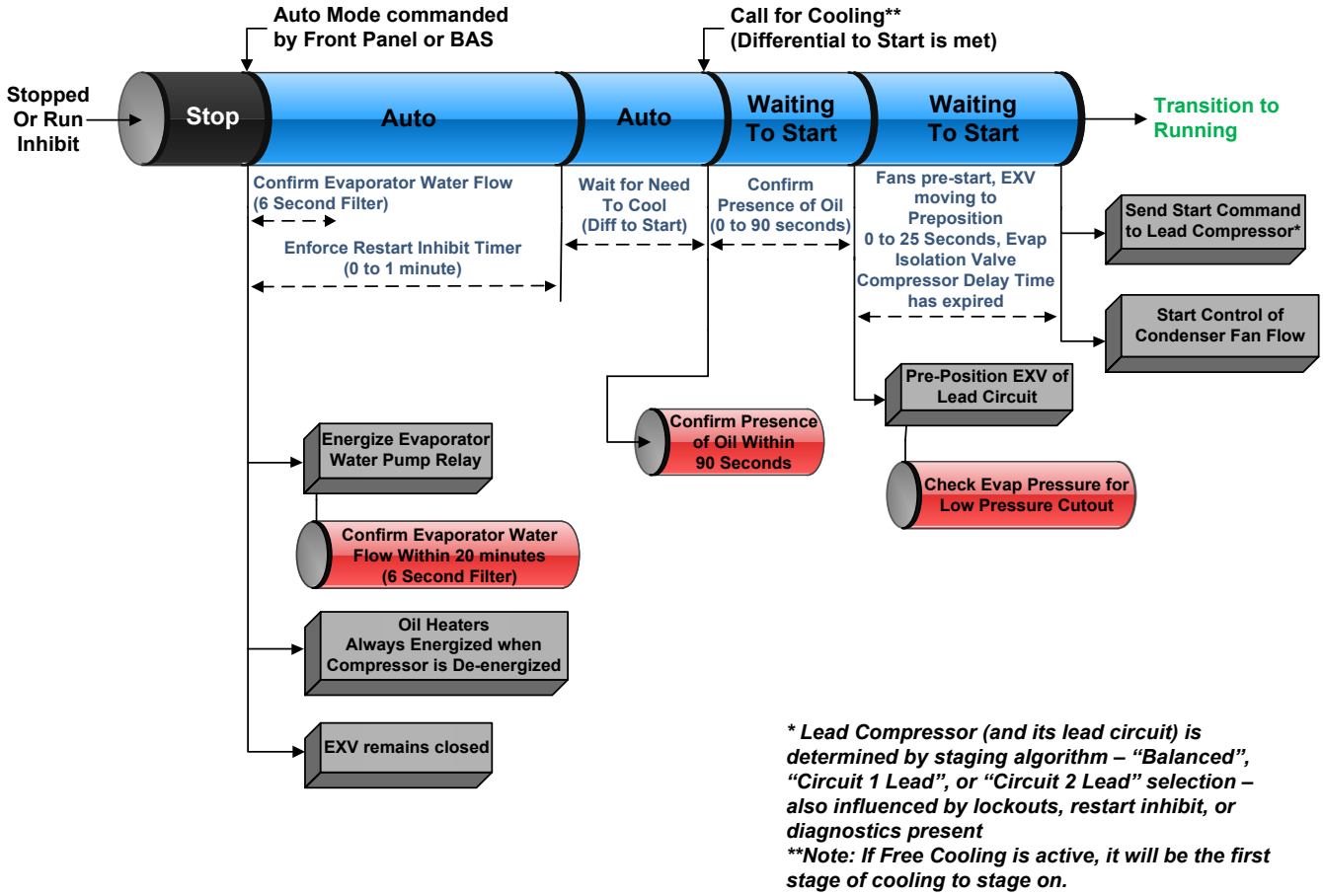
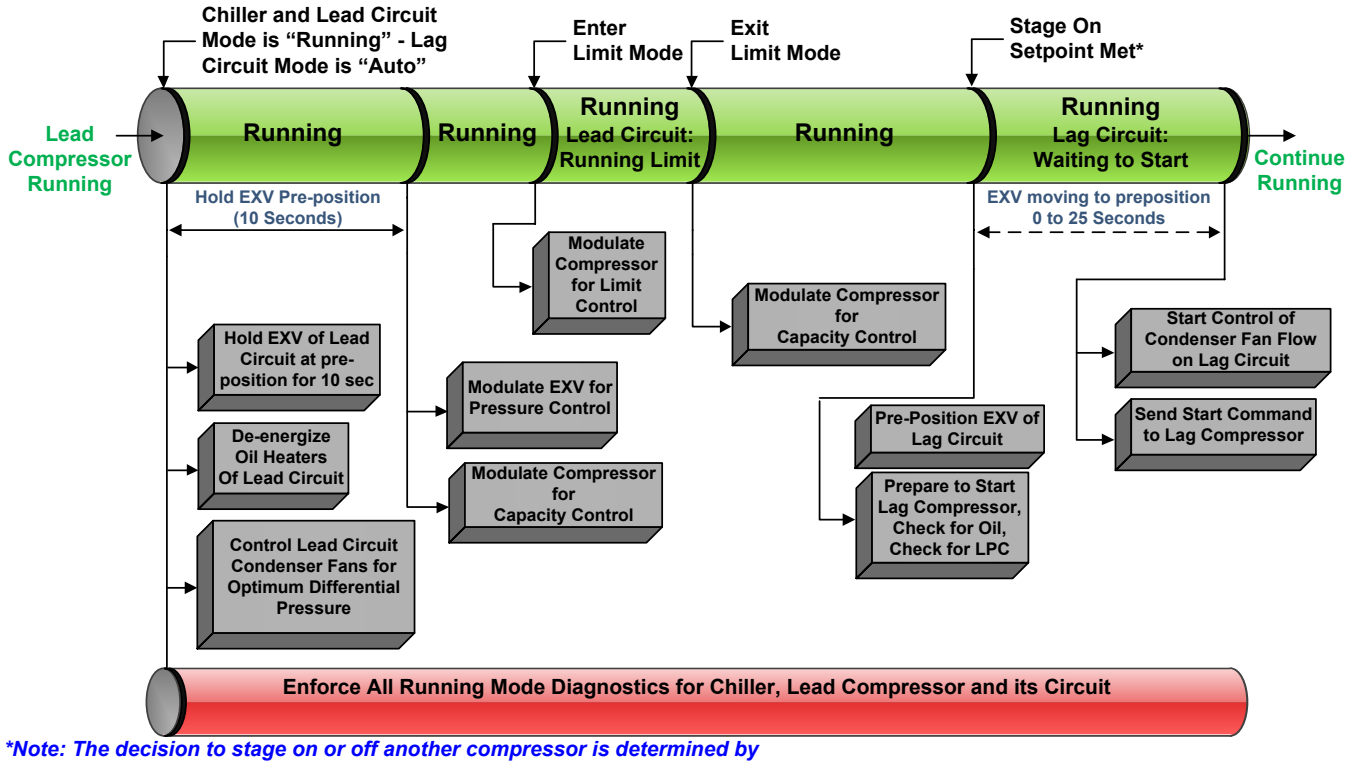


Figure 58. Sequence of events: stopped to starting

Running (Lead Compressor/Circuit Start and Run)

Figure 59 shows a typical start and run sequence for the lead compressor and its circuit

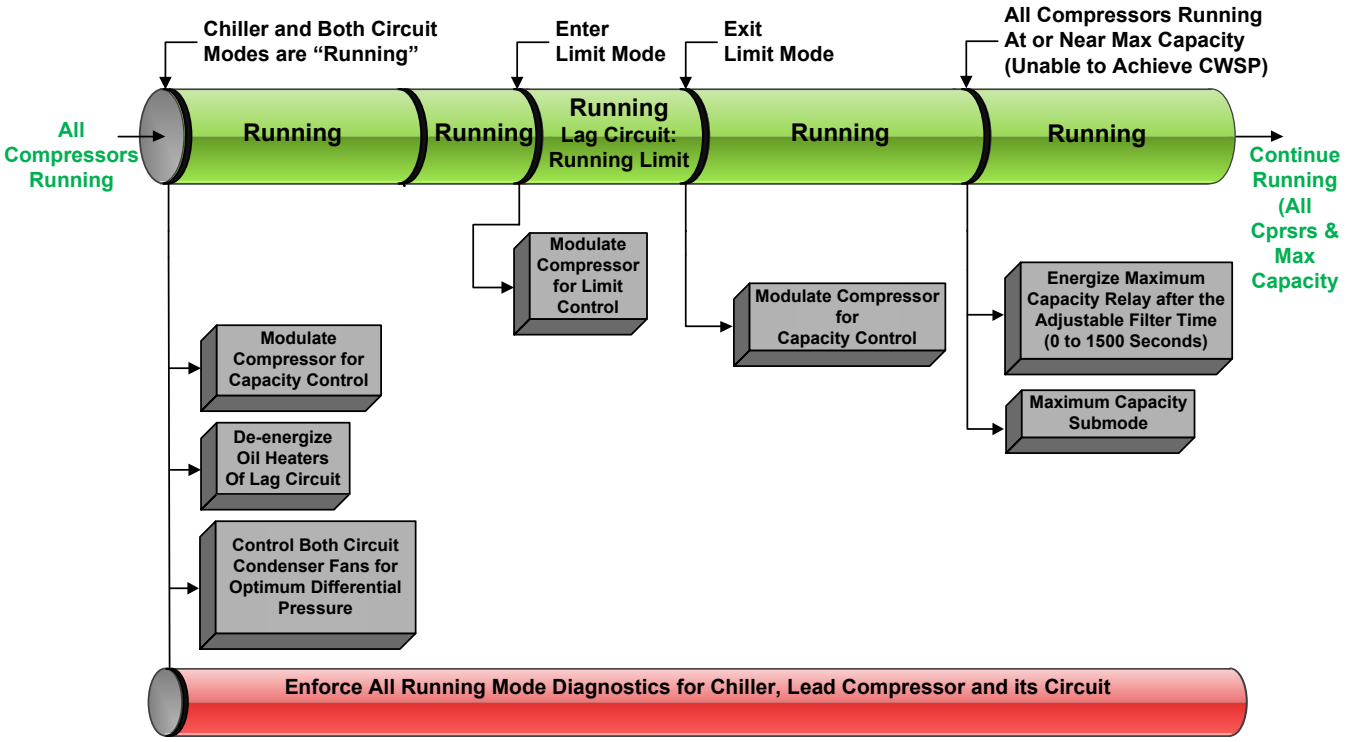


**Note: The decision to stage on or off another compressor is determined by the Average Running Compressor Load Command, Water Temperature Error, and Time Since Last Stage Circuit X Lead: A compressor on the selected circuit will lead followed by a compressor on the alternate circuit, given an appropriately increasing chiller load. Additional compressors will alternate between lead and lag circuits. Variable speed compressors will always be the first compressors to start and last compressors to stop.*

Figure 59. Sequence of operation: running (lead compressor/circuit start and run)

Running (Lag Compressor/Circuit Start and Run)

Figure 60 shows a typical start and run sequence for the lag compressor and its circuit

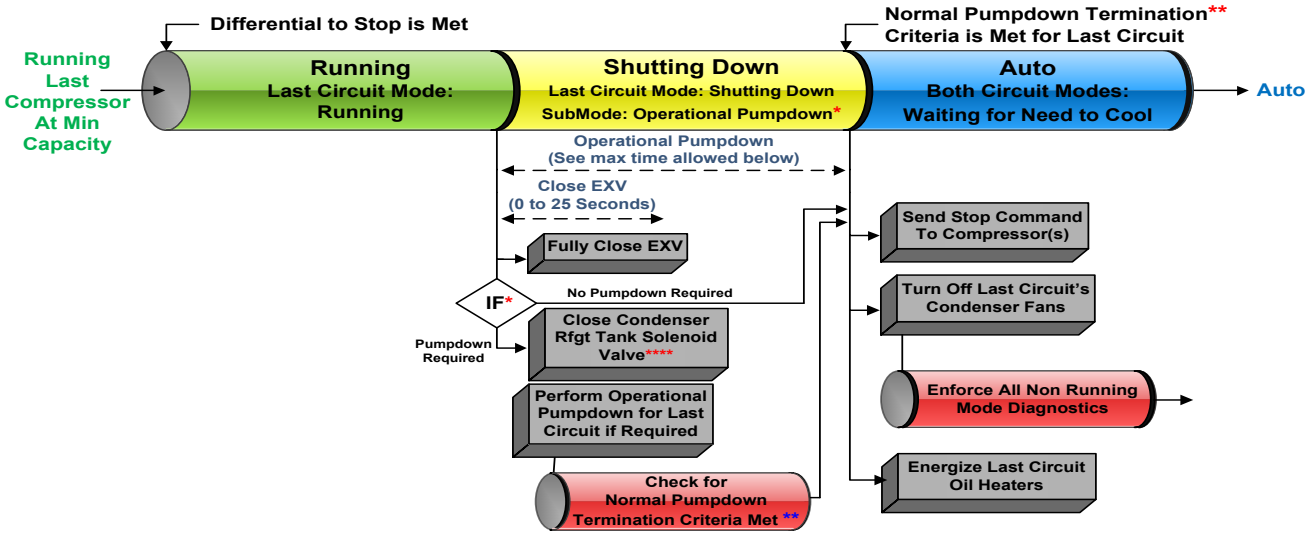


*Note: The decision to stage on or off another compressor is determined by the Average Running Compressor Load Command, Water Temperature Error, and Time Since Last Stage

Figure 60. Sequence of operation: running (lag compressor/circuit start and run)

Satisfied Setpoint

Figure 61 shows the normal transition from Running to shutting down due to the Evap Leaving water temp falling below the differential to stop setpoint.



*Operational Pumpdown is required if the Outdoor Air Temperature is less than 50F, or the Entering Evaporator Water Temperature is greater than (outdoor air temperature – 10°F). With AFD, compressors will be at max speed for operational pumpdown.

** Operational pumpdown is terminated normally in the following configurations when:
Water with 2-Pass Evaporator:
-The evaporator (suction) pressure is at or below the "Pumpdown Termination Pressure" setting OR LERTC saturated pressure (28.6F), which ever is greater
-The condenser (compressor discharge) pressure exceeds 315psia.
-The compressor pressure ratio exceeds 8.
-The system differential pressure exceeds 265psid or < 25min.
Glycol with 2-Pass Evaporator:
The evaporator (suction) pressure is at or below the "Pumpdown Termination Pressure" setting OR LERTC saturated pressure (per guidance -5F minimum), which ever is greater
-The condenser (compressor discharge) pressure exceeds 315psia.
-The compressor pressure ratio exceeds 8.
-The system differential pressure exceeds 265psid or < 25min.

Water with Single Pass Evaporator:
-The evaporator (suction) pressure is at or below the "Pumpdown Termination Pressure" setting OR LERTC saturated pressure (32F), which ever is greater
-The condenser (compressor discharge) pressure exceeds 315psia.
-The compressor pressure ratio exceeds 12.3
-The system differential pressure exceeds 265psid.
Glycol with Single Pass Evaporator:
-The evaporator (suction) pressure is at or below the "Pumpdown Termination Pressure" setting OR LERTC saturated pressure (per guidance -5F minimum), which ever is greater
-The condenser (compressor discharge) pressure exceeds 315psia.
-The compressor pressure ratio exceeds 12.3
-The system differential pressure exceeds 265psid.

The maximum allowed time for Operational Pumpdown is Max Pumpdown Time setting (default to 120 sec.) * number of compressors configured on the circuit.

***Automatic evaporator isolation valve control will close valve if Outdoor Ambient Air Temperature at circuit shutdown is less than evaporator leaving water cutout setpoint plus 3°C.

****If Condenser Refrigerant Tanks are installed

Figure 61. Sequence of events: satisfied setpoint

Unloading Unstaging

Figure 62 shows the normal transition from full load to minimum load while the chiller is running

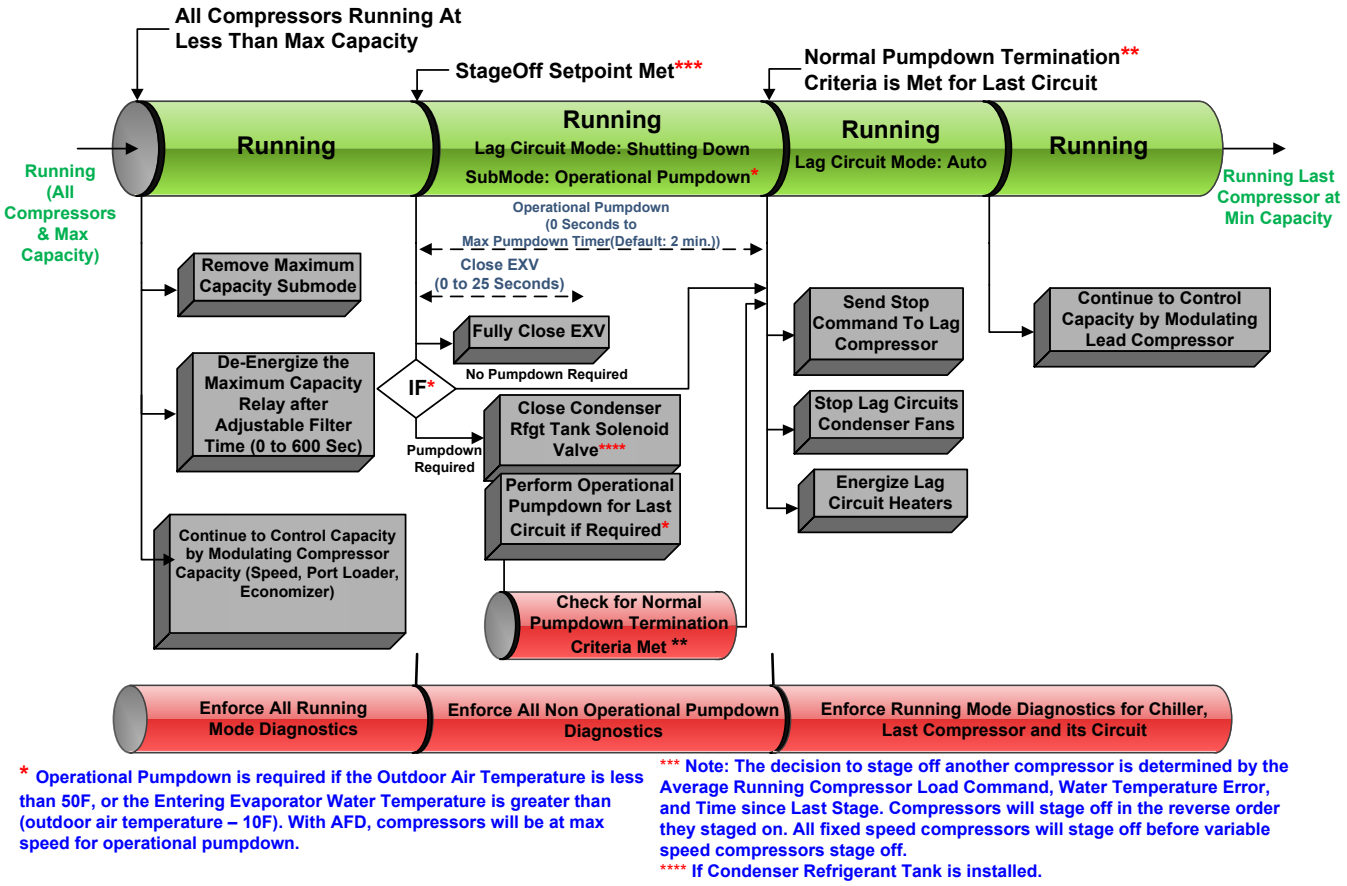


Figure 62. Sequence of events: Unloading unstaging

Normal Shutdown to Stopped or Run Inhibit

Figure 63 shows the transition from Running through a Normal (friendly) shutdown. The dashed lines on the top attempt to show the final mode if you enter the stop via various inputs.

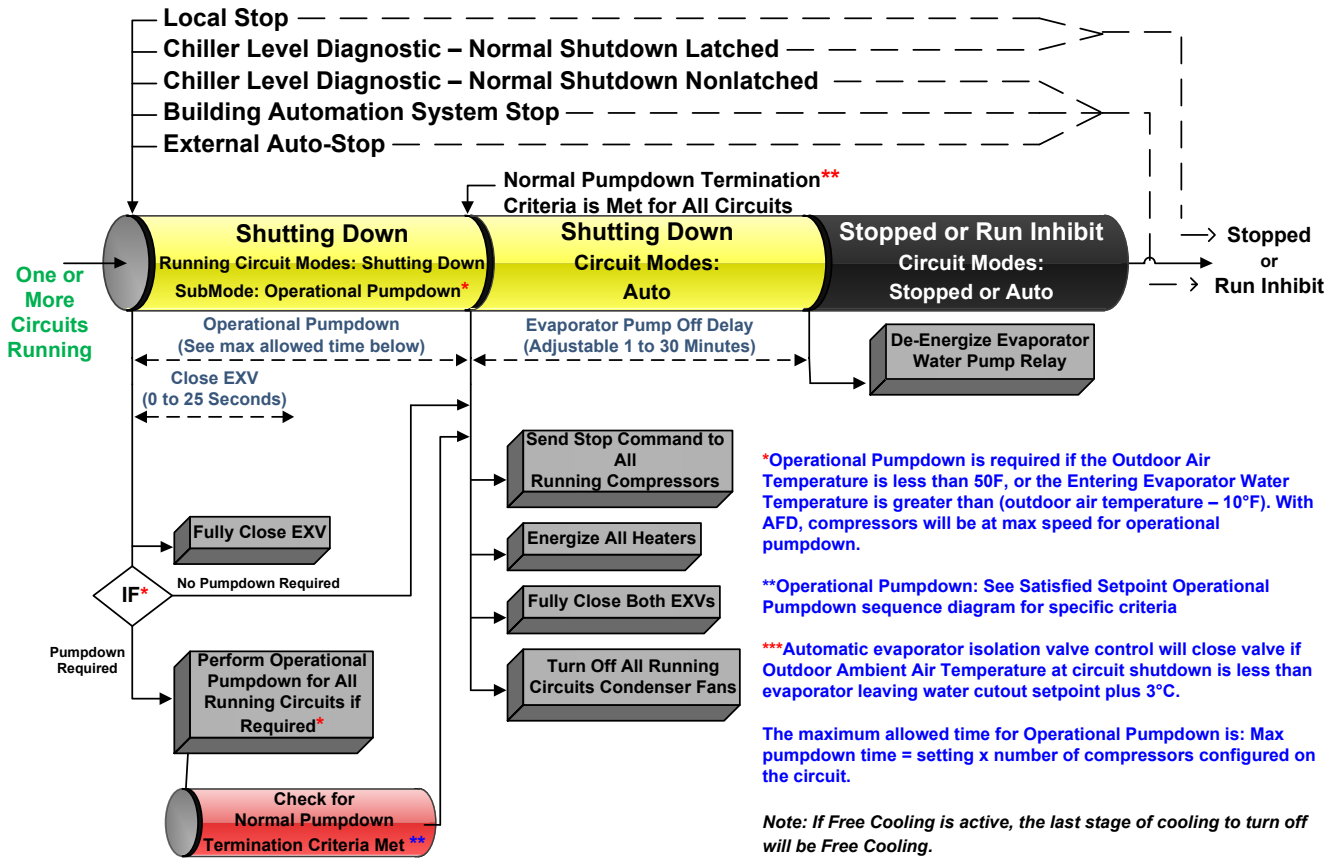


Figure 63. Sequence of events: normal shutdown to stopped or run inhibit

Immediate Shutdown to Stopped or Run Inhibit

Figure 64 shows the transition from Running through an immediate shutdown. The dashed lines on the top attempt to show the final mode if you enter the stop via various inputs.

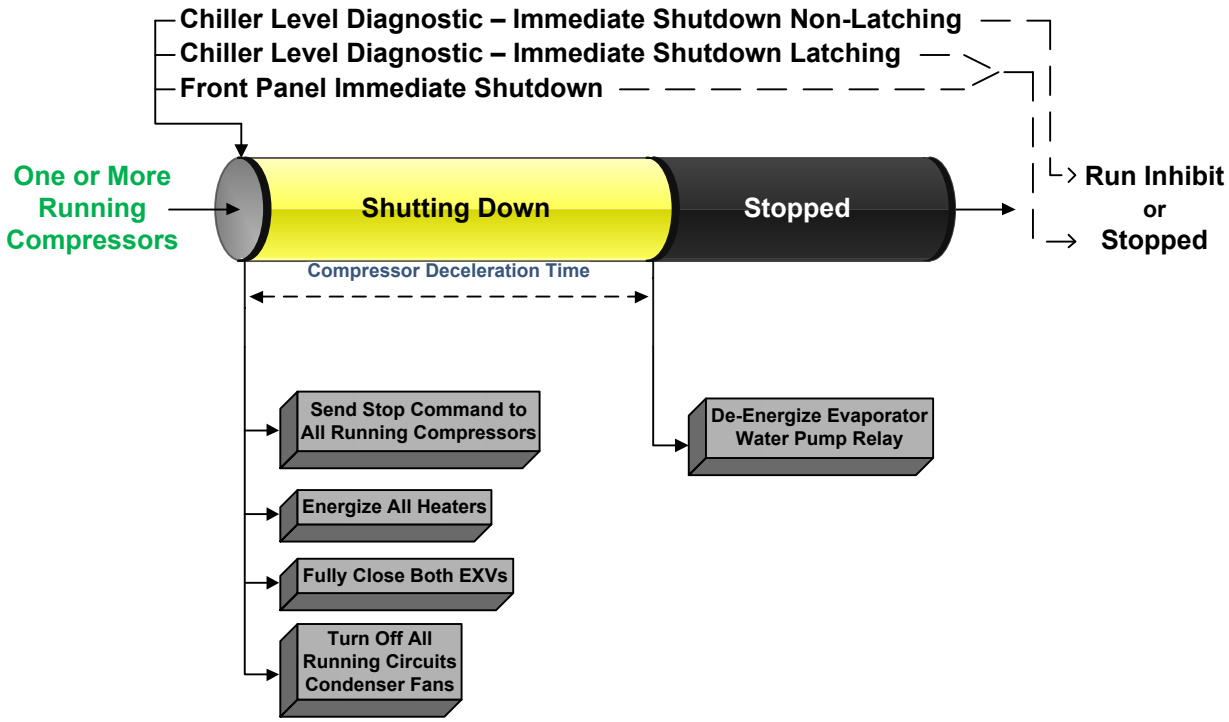


Figure 64. Sequence of events: immediate shutdown to stopped or run inhibit

Diagnostics

Diagnostic Name (Text) and Source

Diagnostic Name Source: Diagnostics may be shown in the spec with a source of "xy"In this case, letter "x" can be either "1" or "2" (signifying which circuit) and letter "y" can be "A" or "B" (signifying which compressor on that circuit).

Affects Target: Defines the "target" or what is affected by the diagnostic. Usually either the entire Chiller, or a particular Circuit or Compressor is affected by the diagnostic (the same one as the source), but in special cases functions are modified or disabled by the diagnostic. None implies that there is no direct affect to the chiller, sub components or functional operation.

Design Note: TU does not support the display of certain targets on its Diagnostics pages although the functionality implied by this table is supported. Targets such as Evap Pump, Ice Mode, Heat Mode, Chilled Water Reset, External Setpoints etc. - are displayed as simply "Chiller" even though they do not imply a chiller shutdown - only a compromise of the specific feature.

Severity: Defines the severity of the above effect. Immediate means immediate shutdown of the affected portion; for AFD generated diagnostics, Immediate implies immediately de-energized compressor windings, while Immediate (decel) implies controlled deceleration to compressor stop. Normal means normal or friendly shutdown of the affected portion, Special Action means a special action or mode of operation (limp along) is invoked, but without shutdown, and Info means an Informational Note or Warning is generated. Design Note: TU does not support display of "Special Action" on its Diagnostics pages, so that if a diagnostic has a special action defined in the table below, it will be displayed only as "Informational Warning" as long as no circuit or chiller shutdown results. If there is a shutdown and special action defined in the table, then the TU Diagnostics Page display will indicate the shutdown type only.

Persistence: Defines whether or not the diagnostic and its effects are to be manually reset (Latched), or can be either manually or automatically reset when and if the condition returns to normal (Nonlatched).

Active Modes [Inactive Modes]: States the modes or periods of operation that the diagnostic is active in and, as necessary, those modes or periods that it is specifically "not active" in as an exception to the active modes. The inactive modes are enclosed in brackets, [ ]. Note that the modes used in this column are internal and not generally annunciated to any of the formal mode displays.

Criteria: Quantitatively defines the criteria used in generating the diagnostic and, if nonlatching, the criteria for auto reset. If more explanation is necessary a hot link to the Functional Specification is used.

Reset Level: Defines the lowest level of manual diagnostic reset command which can clear the diagnostic. The manual diagnostic reset levels in order of priority are: Local or Remote. For example, a diagnostic that has a reset level of Remote, can be reset by either a remote diagnostic reset command or by a local diagnostic reset command.

Help Text: Provides for a brief description of what kind of problems might cause this diagnostic to occur. Both control system component related problems as well as chiller application related problems are addressed (as can possibly be anticipated). These help messages will be updated with accumulated field experience with the chillers.

AFD Diagnostics

Table 57. AFD diagnostics

Diagnostic Name and Source	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
AFD Fault - xA	Cprsr	Immediate	NonLatch	All	AFD Fault. Numerous drive faults can cause this general fault including High Pressure Cutout for AFD compressors. See Service Literature xxxx for a list of fault codes and description.	Local
AFD Motor Current Overload - xA	Circuit	Immediate	Latch	All	Compressor current exceeded overload time vs. trip characteristic. Must trip = 132% RLA, Must hold=125%	Local
AFD Interrupt Failure - xA	Chiller	Immediate Shutdown and Special Action	Latch	AFD Intended to be OFF	Respective AFD is reporting that it is still running the compressor when the MP has commanded the drive/compressor to be Off. Detection time shall be 10 seconds minimum and 15 seconds maximum.	Local

Starter Diagnostics

Table 58. Starter diagnostics

Diagnostic Name and Source	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Starter Did Not Transition - xy	Cprsr	Immediate	Latch	On the first check after transition.	The Starter Module did not receive a transition complete signal in the designated time from its command to transition. The Must Hold time from the Starter Module transition command is 1 second. The Must Trip time from the transition command is 6 seconds. Actual design is 2.5 seconds. This diagnostic is active only for Y-Delta, Auto-Transformer, Primary Reactor, and X-Line Starters.	Local
Phase Reversal - xy	Cprsr	Immediate	Latch	Compressor energized to transition command [All Other Times]	A phase reversal was detected on the incoming current. On a compressor startup, the phase reversal logic must detect and trip in a maximum of .3 second from compressor start.	Local
Starter Dry Run Test - xy	Cprsr	Immediate	Latch	Starter Dry Run Mode	While in the Starter Dry Run Mode either 50 % Line Voltage was sensed at the Potential Transformers or 10% RLA Current was sensed at the Current Transformers.	Local
Phase Loss - xy	Cprsr	Immediate	Latch	Start Sequence and Run modes	a) No current was sensed on one or two of the current transformer inputs while running or starting (See Non-latching Power Loss Diagnostic for all three phases lost while running). Must hold = 20% RLA. Must trip = 5% RLA. Time to trip shall be longer than guaranteed reset on Starter Module at a minimum, 3 seconds maximum. Actual design trip point is 10%. The actual design trip time is 2.64 seconds. b) If Phase reversal protection is enabled and current is not sensed on one or more current transformer inputs. Logic will detect and trip in a maximum of 0.3 seconds from compressor start.	Local

Diagnostic Name and Source	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Power Loss - xy	Cprsr	Immediate	NonLatch	All compressor running modes [all compressor starting and non-running modes]	The compressor had previously established currents while running and then all three phases of current were lost. Design: Less than 10% RLA, trip in 2.64 seconds. This diagnostic will preclude the Phase Loss Diagnostic and the Transition Complete Input Opened Diagnostic from being called out. To prevent this diagnostic from occurring with the intended disconnect of main power, the minimum time to trip must be greater than the guaranteed reset time of the Starter module. Note: This diagnostic prevents nuisance latching diagnostics due to a momentary power loss – It does not protect motor/compressor from uncontrolled power reapplication. See Momentary Power Loss Diagnostic for this protection. This diagnostic is not active during the start mode before the transition complete input is proven. Thus a random power loss during a start would result in either a “Starter Fault Type 3” or a “Starter Did Not Transition” latching diagnostic.	Remote
Severe Current Imbalance - xy	Circuit	Immediate	Latch	All Running Modes	A 30% Current Imbalance has been detected on one phase relative to the average of all 3 phases for 90 continuous seconds.	Local
Starter Failed to Arm/ Start - xy	Cprsr	Immediate	Latch	All	Starter failed to arm or start within the allotted time (15 seconds).	Local
Starter Fault Type I - xy	Cprsr	Immediate	Latch	Starting - Y Delta Starters Only	This is a specific starter test where 1M(1K1) is closed first and a check is made to ensure that there are no currents detected by the CT's. If currents are detected when only 1M is closed first at start, then one of the other contactors is shorted.	Local
Starter Fault Type II - xy	Cprsr	Immediate	Latch	Starting All types of starters	a. This is a specific starter test where the Shorting Contactor (1K3) is individually energized and a check is made to ensure that there are no currents detected by the CT's. If current is detected when only S is energized at Start, then 1M is shorted. b. This test in a. above applies to all forms of starters (Note: It is understood that many starters do not connect to the Shorting Contactor.).	Local
Starter Fault Type III - xy	Cprsr	Immediate	Latch	Starting [Adaptive Frequency Starter Type]	As part of the normal start sequence to apply power to the compressor, the Shorting Contactor (1K3) and then the Main Contactor (1K1) were energized. 1.6 seconds later there were no currents detected by the CT's for the last 1.2 Seconds on all three phases. The test above applies to all forms of starters except Adaptive Frequency Drives.	Local
Transition Complete Input Shorted - xy	Cprsr	Immediate	Latch	Pre-Start	The Transition Complete input was found to be shorted before the compressor was started. This is active for all electromechanical starters.	Local
Transition Complete Input Opened - xy	Cprsr	Immediate	Latch	All running modes	The Transition Complete input was found to be opened with the compressor motor running after a successful completion of transition. This is active only for Y-Delta, Auto-Transformer, Primary Reactor, and X-Line Starters. To prevent this diagnostic from occurring as the result of a power loss to the contactors, the minimum time to trip must be greater than the trip time for the power loss diagnostic.	Local
Motor Current Overload - xy	Circuit	Immediate	Latch	Cprsr Energized	Compressor current exceeded overload time vs. trip characteristic. Must trip = 140% RLA, Must hold=125%, nominal trip 132.5% in 30 seconds	Local

Diagnostic Name and Source	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Starter Contactor Interrupt Failure - xy	Chiller	Immediate and Special Action	Latch	Starter Contactor not Energized [Starter Contactor Energized]	Detected compressor currents greater than 10% RLA on any or all phases when the compressor was commanded off. Detection time shall be 5 second minimum and 10 seconds maximum. On detection and until the controller is manually reset: generate diagnostic, energize the appropriate alarm relay, continue to energize the Evap Pump Output, and continue to command the affected compressor off, fully unload the effected compressor and command a normal stop to all other compressors. For as long as current continues, perform liquid level, oil return, and fan control on the circuit effected. During contactor interrupt failure, circuit will not be confirmed off, so THR unit sequence should continue running. If THR turns off due to a diagnostic or lockout during contactor interrupt failure, the circuit reverts to air-cooled condenser fan control within 1 second.	Local
Over Voltage	Chiller	Normal	NonLatch	Pre-Start and Any Ckt(s) Energzd	Nom. trip: 60 seconds at greater than 112.5%, ± 2.5%, Auto Reset at 110% or less for 10 continuous seconds.	Remote
Under Voltage	Chiller	Normal	NonLatch	Pre-Start and Any Ckt(s) Energzd	Nom. trip: 60 seconds at less than 87.5%, ± 2.8% at 200V ± 1.8% at 575V, Auto Reset at 90% or greater for 10 continuous seconds.	Remote
Starter Comm Loss: Main Processor - xy	Cprsr	Immediate	Latch	All	The Starter module detected a continual loss of communication with the main processor for greater than the Communications Loss Time bound setpoint.	Local
Starter Module Memory Error Type 1 - xy	Cprsr	Warning	Latch	All	Checksum on RAM copy of the Starter LLID configuration failed. Configuration recalled from EEPROM.	Local
Starter Module Memory Error Type 2 - xy	Cprsr	Immediate	Latch	All	Checksum on EEPROM copy of the Starter LLID configuration failed. Default configuration loaded into RAM and EEPROM.	Local

Main Processor Diagnostics

Table 59. Main processor diagnostics

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
MP: Reset Has Occurred	Platform	Warning	NonLatch	All	The main processor has successfully come out of a reset and built its application. A reset may have been due to a power up, installing new software or configuration. This diagnostic is immediately and automatically cleared and thus can only be seen in the Historic Diagnostic List in Tracer TU.	Remote
Unexpected Starter Shutdown - xy	Cprsr	Normal	NonLatch	All Cprsr Running modes, Starting, Running and Preparing to Shutdown	The Starter module status reported back that it is stopped when the MP thinks it should be running and no Starter diagnostic exist. This diagnostic will be logged in the active buffer and then automatically cleared. This diagnostic could be caused by intermittent communication problems from the Starter to the MP, or due to mis-binding	Local
High Motor Winding Temperature – xA	Cprsr	Immediate	Latch	All	The respective compressor’s motor winding thermostat is detected to be open. The compressor shall stop within 5 seconds of this diagnostic.	Local
AFD %RLA Feedback - xA	Cprsr	Normal	Latch	All	Out-Of-Range Low or Hi or bad LLID	Remote

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Low Refrigerant Temperature	Circuit	Immediate	Latch	All Ckt Running Modes	The warmer of either Evaporator Refrigerant Pool Temperature or Active Rfgt Sat Temp for the respective circuit dropped below the Low Refrigerant Temperature Cutout Setpoint for 2250°F-sec (12°F-sec max rate for early circuit startup period) while the circuit was running. The minimum LRTC setpoint is -5°F the point at which oil separates from the refrigerant. The integral is held nonvolatile though power down, is continuously calculated, and can decay or build during the circuit off cycle as conditions warrant.	Remote
Low Oil Flow - xy	Cprsr	Immediate	Latch	Cprsr Energized and Delta P above 15 Psid	The intermediate oil pressure sensor for this compressor was out of the acceptable pressure range for 15 seconds, while the Delta Pressure was greater than 15 Psid (172.4 kPa).: Acceptable range is 0.50 > (PC-PI) / (PC-PE) for the first 2.5 minutes of operation, and 0.28 > (PC-PI) / (PC-PE) thereafter.	Local
Loss of Oil for Compressor (Running)	Circuit	Immediate	Latch	Starter Contactor Energized	In running modes, Oil Loss Level Sensor detects lack of oil in the oil sump feeding the compressor (distinguishing a liquid flow from a vapor flow).	Local
Loss of Oil for Compressor (Stopped)	Circuit	Immediate and Special Action	Latch	Compressor Pre-start [all other modes]	Oil Loss Level Sensor detects a lack of oil in the oil sump feeding the compressor for 90 seconds after EXV preposition is completed (and before EXV equalization, if applicable) on an attempted circuit start. Note: Compressor start is delayed pending oil detection during that time, but not allowed once the diagnostic occurs.	Local
No Differential Refrigerant Pressure - xy	Cprsr	Immediate	NonLatch	Compressor running on Circuit	The system differential pressure was below 7.7 Psid (53 kPa) for 6 seconds after the 11 seconds ignore time relative to cprsr/circuit startup had expired. In a two compressor circuit, the lower of the two suction pressure is used for circuit DP. Note: This diagnostic will be cleared automatically within 10s.	Remote
No Differential Refrigerant Pressure Lockout - xy	Cprsr	Immediate	Latch	Compressor running on Circuit	Diagnostic No Differential Refrigerant Pressure is triggered 3 times with one hour.	Remote
Low Differential Refrigerant Pressure - xy	Cprsr	Immediate	Latch	Cprsr Energized	For startup, please refer to oil flow protection spec. For running, the system differential pressure for the respective circuit was below the greater of 25 psid (240.5 kPa) or the pressure ratio listed in the table in GP2 Compressor Type FSpec while the compressor is running for a period of time dependent on the deficit (15 sec ignore time from circuit start) – refer to the Oil Flow Protection specification for the time to trip function.	Remote
High Differential Refrigerant Pressure - xy	Cprsr	Normal	Latch	Cprsr Energized	GP2 Cprsr: The differential pressure for the respective circuit was above 275 Psid (1890 kPa) for 2 consecutive samples 5 seconds apart.	Remote
High Refrigerant Pressure Ratio - xy	Cprsr	Immediate	Latch	Cprsr Energized	The pressure ratio for the respective circuit exceeded 12.3 for 1 contiguous minute while any compressor is running or in service pumpdown. This pressure ratio is a fundamental limitation of the HiVi compressor. The pressure ratio is defined as Pcond (abs)/Pevap(abs).	Remote
High Oil Temperature - xy	Cprsr	Immediate	Latch	All [compressor run unload or compressor not running]	The oil temperature entering the compressor exceeded 199.4°F.	Remote
Oil Temperature Sensor - xy	Cprsr	Normal	Latch	All	Bad Sensor or LLID	Remote

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
High Compressor Refrigerant Discharge Temp - xy	Cprsr	Immediate	Latch	All [compressor run unload or compressor not running]	The compressor discharge temperature exceeded 199.4°F (without oil cooler) or 230ºF (with oil cooler). This diagnostic will be suppressed during Stopping mode or after the compressor has stopped. Note: As part of the Compressor High Temperature Limit Mode (aka Minimum Capacity Limit), the compressor shall be forced loaded as the filtered discharge temperature reaches 190ºF (without oil coolers), or 220ºF (with oil coolers).	Remote
Low Discharge Superheat - xy	Cprsr	Normal	Latch	Any Running Mode	While Running Normally, the Discharge Superheat was less than the Low Discharge Superheat Setpoint for more than 7800 degree F seconds. At circuit startup, the Discharge Superheat will be ignored for 5 minutes.	Remote
Compressor Discharge Refrigerant Temperature Sensor - xy	Cprsr	Immediate	Latch	All	Bad Sensor or LLID	Remote
Very Low Discharge Superheat - xy	Ckt	Normal	Latch	Any Running Mode	See Compressor Minimum Superheat Protection section in the Oil Flow Protection spec for specific criteria. Generally, this diagnostic indicates a likelihood of an evaporator carryover (flooded evap)condition.	
	Cprsr	Warning	NonLatch	Remote	When restart inhibit warning is enabled, the warning exists when unit has been inhibited from starting and is cleared when a start of a compressor is possible (Start-to-Start Timer expires)	Remote
	Ckt	Normal	Latch	Any Running Mode	See Compressor Minimum Superheat Protection section in the Oil Flow Protection spec for specific criteria. Generally, this diagnostic indicates a likelihood of an evaporator carryover (flooded evap)condition.	
Remote	Chiller	Warning and Special Action	NonLatch	All	The BAS was setup as "installed" at the MP and the Lontalk LCIC lost communications with the BAS for 15 contiguous minutes after it had been established. Refer to Section on Setpoint Arbitration to determine how setpoints and operating modes may be affected by the comm loss. The chiller follows the value of the Tracer Default Run Command which can be previously written by Tracer and stored nonvolatile by the MP (either use local or shutdown). Note that this diagnostic is never operational for BacNet Communication interface (BCIC) and only operational with a LonTalk Communication interface (LCIC) if so configured by the BAS or Tracer system.	Remote
External Chilled Water Setpoint	Chiller	Warning	Latch	All	a. Function Not "Enabled": no diagnostics. b. "Enabled ": Out-Of-Range Low or Hi or bad LLID, set diagnostic, default CWS to next level of priority (e.g. Front Panel SetPoint).	Remote
External Demand Limit Setpoint	Chiller	Warning	Latch	All	a. Not "Enabled": no diagnostics. b. "Enabled ": Out-Of-Range Low or Hi or bad LLID, set diagnostic, default CLS to next level of priority (e.g. Front Panel SetPoint.)	Remote
Inverted Evaporator Water Temperature	Chiller	Warning	NonLatch	Any Ckt Energized [No Ckts Energized]	The entering evaporator water temp fell below the leaving evaporator water temp by more than 2°F for 180 °F-sec, minimum trip time 30 seconds. Diagnostic will auto clear if the leaving water temp – entering water temp < 2°F. It can warn of improper flow direction through the evaporator, misbound water temperature sensors, improper sensor installation, partially failed sensors, or other system problems. Note that either entering or leaving water temp sensor or the water system could be at fault.	Remote

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Evaporator Entering Water Temperature Sensor	Chiller	Normal	Latch	All	Bad Sensor or LLID. Note: Entering Water Temp Sensor is used in EXV pressure control as well as ice making so it must cause a unit shutdown even if ice or CHW reset is not installed.	Remote
Evaporator Leaving Water Temperature Sensor	Chiller	Normal	Latch	All	Bad Sensor or LLID	Remote
Condenser Refrigerant Pressure Sensor	Circuit	Immediate	Latch	All	Bad Sensor or LLID	Remote
Suction Refrigerant Pressure Sensor - xy	Cprsr	Immediate	Latch	All	Bad Sensor or LLID	Remote
Evaporator Refrigerant Pool Temperature Sensor	Circuit	Warning and Special Action	Latch	All	Bad Sensor or LLID. Note: The Evap Pool Temp Sensors are used for evaporator freeze protection (running and non-running). Invalidate evaporator pool temperature sensor measurement if this diagnostic is active. If evaporator isolation valves are installed, revert to Evaporator Shell Refrigerant Saturated Temperature for freeze protection functions. If evaporator isolation valves are not installed, revert to Evaporator Saturated Temperature for freeze protection functions.	Remote
Evaporator Refrigerant Pool Temperature Sensor Error	Circuit	Warning and Special Action	Latch	Ckt Energized [Ckt Not Energized]	The evaporator refrigerant pool temperature measurement is larger than the evaporator entering water temperature by more than 4°C (7.2°F) for 5 continuous minutes. There is an ignore time of 2 minutes following circuit startup. The trip criteria is not evaluated (and time above the threshold is not counted) until the ignore time passes. Invalidate evaporator pool temperature sensor measurement if this diagnostic is active. If evaporator isolation valves are installed, revert to Evaporator Shell Refrigerant Saturated Temperature for freeze protection functions. If evaporator isolation valves are not installed, revert to Evaporator Saturated Temperature for freeze protection functions.	Local
Liquid Line Temperature Sensor	Circuit	Normal	Latch	All	Bad Sensor or LLID. Note: This is the subcooled liquid line temp sensor.	Remote
Liquid Line Pressure Sensor	Circuit	Normal	Latch	All	Bad Sensor or LLID. Note: This is the subcooled liquid line pressure sensor.	Remote
Evaporator Approach Error	Circuit	Immediate	Latch	Respective circuit running	The Evaporator approach temperature for the respective circuit (ELWT – Evap Sat Temp Ckt x) is negative by more than 10°F for 1 minute continuously while the circuit / compressor is operating. Either the Evap Leaving Water Temp sensor or Evap Suction Rfgt Pressure Sensor Ckt x is in error.	Remote
Oil Pressure Sensor - xy	Cprsr	Immediate	Latch	All	Bad Sensor or LLID	Remote
Oil Flow Protection Fault - xy	Cprsr	Immediate	Latch	Starter Contactor Energized [all Stop modes]	The Intermediate Oil Pressure Sensor for this cprsr is reading a pressure either above its respective circuit's Condenser Pressure by 15 Psid or more, or below its respective compressor Suction Pressure 10 Psid or more for 30 seconds continuously.	Local
Low Suction Refrigerant Pressure	Circuit	Immediate	Latch	Cprsr Prestart and Cprsr Energized	a. The Suction Pressure dropped below 10 Psia just prior to compressor start (after EXV preposition). b. During Early Startup Period: the Suction Pressure fell below a pressure equal to Condenser Pressure ÷ 8 but as limited to not less than 6 or greater than10 psia. c. After Early Startup Period expires: The Suction Pressure fell below 16 Psia.	Local

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Very Low Evaporator Rfgt Pressure - xy	Chiller	Immediate	Latch	All	The respective circuit's evaporator pressure dropped below 80% of the current Low Evap Refrigerant Press Cutout setting (see above) or 8 psia, whichever is less, regardless of the running state of the circuit's compressor. Note: Unlike previous products, even if the circuit associated with the suction pressure sensor is locked out, it will not defeat the protection afforded by this diagnostic.	Local
Low Evaporator Water Temp (Unit On)	Chiller	Immediate and Special Action	NonLatch	Any Ckt[s] Energzd [No Ckt(s) Energzd]	The evaporator entering or leaving water temperature fell below the cutout setpoint for 30 degree F Seconds while the compressor was running. Automatic reset occurs when both of the temperature rises 2 °F (1.1°C) above the cutout setting for 2 minutes. This diagnostic shall not de-energize the Evaporator Water Pump Output.	Remote
Low Evaporator Water Temp (Unit Off)	Chiller	Special Action	NonLatch	Unit in Stop Mode, or in Auto Mode and No Ckt(s) Energzd [Any Ckt Energzd]	Either the entering or leaving evaporator water temp. fell below the leaving water temp cutout setting for 30 degree F seconds while the Chiller is in the Stop mode, or in Auto mode with no compressors running. Energize Freeze Avoidance Request Relay and Evap Water Pump Relay until diagnostic auto resets, then de-energize the Freeze Avoidance Request Relay and return to normal evap pump control. Automatic reset occurs when both temps rise 2°F (1.1°C) above the cutout setting for 5 minutes, or either circuit starts. This diagnostic even while active, does not prevent operation of either circuit.	Remote
Low Evaporator Rfgt Temp Circuit 1: Unit Off	Chiller	Special Action	NonLatch	Unit in Stop Mode, or in Auto Mode and No Ckt's Energzd [Any Ckt Energzd]	The respective circuit's LERTC Integral was seen to be > 0 while the chiller is in the Stop mode, or in Auto mode with no compressors running for at least one minute. The LERTC integral is increased if the Evap Refrigerant Pool Temp is below the value of the Low Evap Rfgt Temp Cutout + 2°F. Energize Evap Water Pump and Off-Cycle Freeze Avoidance Request Relay until diagnostic auto resets, then return to normal evap pump control and de-energize the Freeze Avoidance Request. Automatic reset occurs when the respective Evap Rfgt Pool Temp rises 4°F (1.1°C) above the LERTC cutout setting for 1 minute and the Chiller Off LERTC Integral = 0.This diagnostic even while active, does not prevent operation of either circuit.	Remote
Low Evaporator Rfgt Temp Circuit 2: Unit Off	Chiller	Special Action	NonLatch	Unit in Stop Mode, or in Auto Mode and No Ckt's Energzd [Any Ckt Energzd]	The respective circuit's LERTC Integral was seen to be > 0 while the chiller is in the Stop mode, or in Auto mode with no compressors running for at least one minute. The LERTC integral is increased if the Evap Refrigerant Pool Temp is below the value of the Low Evap Rfgt Temp Cutout + 2°F. Energize Evap Water Pump and Off-Cycle Freeze Avoidance Request Relay until diagnostic auto resets, then return to normal evap pump control and de-energize the Freeze Avoidance Request. Automatic reset occurs when the respective Evap Rfgt Pool Temp rises 4°F (1.1°C) above the LERTC cutout setting for 1 minute and the Chiller Off LERTC Integral = 0.. This diagnostic even while active, does not prevent operation of either circuit.	Remote
Evaporator Water Flow Overdue	Chiller	Normal	NonLatch	Estab. Evap. Water Flow on going from STOP to AUTO or Evap Pump Override.	Evaporator water flow was not proven within 20 minutes of the Evaporator water pump relay being energized in normal "Stop" to "Auto" transition. If the pump is overridden to "On" for certain diagnostics, the delay on diagnostic callout shall be only 255 seconds. The pump command status will not be effected by this diagnostic in either case.	Local

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Evaporator Water Flow Overdue – Pump 1	Chiller	Warning and Special Action	NonLatch	All	After the pump request was activated, the evaporator water flow overdue wait time elapsed before water flow was established. Special action is to keep the evap pump request active in a diagnostic override mode. See Evaporator_ Water_Pump_Control.doc	Local
Evaporator Water Flow Overdue – Pump 2	Chiller	Warning and Special Action	NonLatch	All	After the pump request was activated, the evaporator water flow overdue wait time elapsed before water flow was established. Special action is to keep the evap pump request active in a diagnostic override mode. See Evaporator_ Water_Pump_Control.doc	Local
Evaporator Water Flow Lost	Chiller	Immediate	NonLatch	[All Stop modes]	A. The Evaporator water flow switch input was open for more than 6 contiguous seconds (or 20 seconds for thermal dispersion type flow switch). B. This diagnostic does not de-energize the evap pump output. C. 6 seconds of contiguous flow shall clear this diagnostic. (further review needed when implementing thermal dispersion for Pueblo)	Local
Evaporator Water Flow Lost – Pump 1	Chiller	Warning and Special Action	NonLatch	All	For dual evaporator pump configurations only. Evaporator Water Flow Lost diagnostic occurred while Pump 1 was the selected pump. Specific details of special action are described in Evaporator_Water_Pump_Control.doc	Local
Evaporator Water Flow Lost – Pump 2	Chiller	Warning and Special Action	NonLatch	All	For dual evaporator pump configurations only. Evaporator Water Flow Lost diagnostic occurred while Pump 2 was the selected pump. Specific details of special action are described in Evaporator_Water_Pump_Control.doc	Local
Evaporator Pump 1 Fault	Chiller	Immediate or Warning and Special Action	NonLatch	All	For systems with no evaporator pump, a single evaporator pump, or a single inverter driving dual evaporator pumps, an immediate shutdown shall be performed. For multiple pump systems, detection of a pump fault will generally cause pump control to switch to the redundant pump. For single inverter, dual pump configuration, switching to the redundant pump can only happen after the fault is cleared. Specific details of special action are described in Evaporator_ Water_Pump_Control.doc	Local
Evaporator Pump 2 Fault	Chiller	Immediate or Warning and Special Action	NonLatch	All	For systems with no evaporator pump, a single evaporator pump, or a single inverter driving dual evaporator pumps, an immediate shutdown shall be performed. For multiple pump systems, detection of a pump fault will generally cause pump control to switch to the redundant pump. For single inverter, dual pump configuration, switching to the redundant pump can only happen after the fault is cleared. Specific details of special action are described in Evaporator_ Water_Pump_Control.doc	Local
Evap Pump 1 Starts Run Time Written	Chiller	Warning	NonLatch	All	Diagnostic is triggered when the Evap Pump 1 Starts Run Time is manually over written. Diagnostic automatically clears and is immediately placed into the Historic Diagnostic Log.	Local
Evap Pump 2 Starts Run Time Written	Chiller	Warning	NonLatch	All	Diagnostic is triggered when the Evap Pump 2 Starts Run Time is manually over written. Diagnostic automatically clears and is immediately placed into the Historic Diagnostic Log.	Local

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
High Evaporator Refrigerant Pressure	Chiller	Immediate	NonLatch	All	The evaporator refrigerant pressure of either circuit has risen above 190 psig. The evaporator water pump relay will be de-energized to stop the pump regardless of why the pump is running. The diagnostic will auto reset and the pump will return to normal control when all of the evaporator pressures fall below 185 psig. The primary purpose is to stop the evaporator water pump and its associated pump heat from causing refrigerant side pressures, close to the evaporator relief valve setting, when the chiller is not running, such as could occur with Evap Water Flow Overdue or Evaporator Water Flow Loss Diagnostics.	Remote
High Evaporator Water Temperature	Chiller	Warning and Special Action	NonLatch	Only effective if either 1) Evap Wtr Flow Overdue, 2) Evap Wtr Flow Loss, or 3) Low Evap Rfgt Temp,-Unit Off, diagnostic is active.	Either the leaving or the entering water temperature exceeded the high evap water temp limit (TU service menu settable –default 105°F (65.55°C), range 80°F (26.67°C)-150°F(65.55°C) for 15 continuous seconds. The evaporator water pump relay will be de-energized to stop the pump but only if it is running due one of the diagnostics listed on the left. The diagnostic will auto reset and the pump will return to normal control when both the entering and leaving temperatures fall 5°F below the trip setting. The primary purpose is to stop the evaporator water pump and its associated pump heat from causing excessive waterside temperatures and waterside pressures when the chiller is not running but the evap pump is on due to either Evap Water Flow Overdue, Evaporator Water Flow Loss , or Low Evap Temp – Unit Off Diagnostics. This diagnostic will not auto clear solely due to the clearing of the enabling diagnostic.	Remote
High Pressure Cutout - xy	Cprsr	Immediate	Latch	All	A high pressure cutout was detected; trip at 315 ± 5 PSIG. For AFD compressor configurations, the HPC is connected directly to the AFD and the Symbio800 will get an AFD Fault – xA diagnostic when the HPC is tripped.	Local
Excessive Condenser Pressure	Circuit	Immediate	Latch	All	The condenser pressure sensor of this circuit has detected a condensing pressure in excess of the design high side pressure as limited by the particular compressor type.	Remote
Emergency Stop Feedback Input	Chiller	Immediate	Latch	All	a. Emergency stop feedback input is open. An external interlock has tripped. Time to trip from input opening to unit stop shall be 0.1 to 1.0 seconds.	Local
Outdoor Air Temperature Sensor	Chiller	Normal	Latch	All	Bad Sensor or LLID.	Remote
Pumpdown Terminated By Time	Circuit	Warning	Latch	Service Pumpdown	Service Pumpdown cycle for this circuit was terminated abnormally due to excessive time. Reference Service Pumpdown spec for maximum time allowed.	Local
Chiller Service Recommended	Chiller	Warning	Latch	Service Messages Enabled	Chiller service interval time has elapsed. Chiller service is recommended.	Remote
Evap Water Pump 1 Svc Recommended	Chiller	Warning	Latch	Service Messages Enabled	Pump service recommended as service interval hours have elapsed.	Remote
Evap Water Pump 2 Svc Recommended	Chiller	Warning	Latch	Service Messages Enabled	Pump service recommended as service interval hours have elapsed.	Remote
Mfr Maintenance Recommended - xy	Cprsr	Warning	Latch	Service Messages Enabled	Compressor service recommended as service interval hours have elapsed.	Remote
Water System Differential Pressure	Chiller	Warning	Latch	All	Bad Sensor or LLID	Remote
Evaporator Differential Water Pressure	Chiller	Warning	Latch	All	While the water pumps are running, the difference between the Evaporator Entering Water Pressure and Evaporator Leaving Water Pressure reading is a negative number. A negative number will trigger this diagnostic.	Remote

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Evaporator Entering Water Pressure	Chiller	Warning	Latch	All	Bad Sensor or LLID	Remote
Evaporator Leaving Water Pressure	Chiller	Warning	Latch	All	Bad Sensor or LLID	Remote
MP: Invalid Configuration	N/A	N/A	Latch	All	MP has an invalid configuration based on the current software installed.	Remote
LCI-C Software Mismatch: Use BAS Tool	Chiller	Warning	NonLatch	All	The neuron software in the LCI-C module does not match the chiller type. Download the proper software into the LCI-C neuron. To do this, use the Rover service tool, or a LonTalk® tool capable of downloading software to a Neuron 3150®.	Remote
Starts/Hours Modified - xy	Cprsr	Warning	NonLatch	All	The current value for the cumulative starts and or hours for the given compressor have been modified by a write override from TU.	Remote
Software Error 1001: Call Trane Service	Chiller	Immediate	Latch	All	A high level software watchdog has detected a condition in which there was a continuous 1 minute period of compressor operation, with neither Evaporator water flow nor a" contactor interrupt failure" diagnostic active. The presence of this software error message suggests an internal software problem has been detected. The events that led up to this failure, if known, should be recorded and transmitted to Trane Controls Engineering.	Local
Software Error 1002: Call Trane Service	Chiller	Immediate	Latch	All	Reported if state chart misalignment in stopped or inactive state occurred while a compressor was seen to be operating and this condition lasted for at least 1 minute (cprsr operation due to Service Pumpdown or with Contactor Interrupt Failure diagnostic is excluded). The presence of this software error message suggests an internal software problem has been detected. The events that led up to this failure, if known, should be recorded and transmitted to Trane Controls Engineering.	Local
Software Error 1003: Call Trane Service	Chiller	Immediate	Latch	All	Reported if state chart misalignment occurred inferred from the Capacity Control, Circuit, or Compressor State Machines remaining in the Stopping state for more than 3 minutes. The presence of this software error message suggests an internal software problem has been detected. The events that led up to this failure, if known, should be recorded and transmitted to Trane Controls Engineering.	Local

Communication Diagnostics

Notes:

- The following communication loss diagnostics will not occur unless that input or output is required to be present by the particular configuration and installed options for the chiller.
- Communication diagnostics (with the exception of “Excessive Loss of Comm” are named by the Functional name of the input or output that is no longer being heard from by the Main Processor. Many LLIDs, such as the Quad Relay LLID, have more than one functional output associated with it. A comm loss with such a multiple function board, will generate multiple diagnostics. Refer to the Chiller’s wiring diagrams to relate the occurrence of multiple communication diagnostics back to the physical LLID boards that they have been assigned to (bound).
- Communication loss diagnostics shall be timed based on action (target status) and not annunciation on the operator display.

Table 60. Communications diagnostics

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Comm Loss: External Auto/Stop	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Emergency Stop Feedback Input	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: External Ckt Lockout	Circuit	Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. MP will nonvolatile hold the lockout state (enabled or disabled) that was in effect at the time of comm loss.	Remote
Comm Loss: Outdoor Air Temperature	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Leaving Water Temperature	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Entering Water Temperature	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Note: Entering Water Temp Sensor is used in EXV pressure control as well as ice making & CHW reset, so it must cause a unit shutdown even if Ice or CHW reset is not installed.	Remote
Comm Loss: External Chilled Water Setpoint	Chiller	Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Chiller shall discontinue use of the External Chilled Water Setpoint source and revert to the next higher priority for setpoint arbitration	Remote
Comm Loss: External Demand Limit Setpoint	Chiller	Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Chiller shall discontinue use of the External Demand limit setpoint and revert to the next higher priority for Demand Limit setpoint arbitration.	Remote
Comm Loss: Motor Winding Thermostat Compressor xA	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Water Flow Switch	Chiller	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Suction Refrigerant Pressure - xy	Cprsr	Immediate	Latch	All [Ckt/Cprsr lock out]	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Condenser Refrigerant Pressure	Circuit	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Comm Loss: Oil Pressure - xy	Cprsr	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Oil Temperature - xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Oil Supply Temperature Sensor	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Oil Loss Level Sensor Input	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Oil Return Line Solenoid Valve -xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Oil Return Purge Valve –x	Circuit	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Thermosiphon Heating Valve –x	Circuit	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Compressor Discharge Rfgt Temperature - xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Slide Valve Load - xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Slide Valve Unload - xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Step Load - xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Variable Vi Valve – CprsrXY	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Economizer Valve – xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Economizer Discharge Pressure – xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Economizer Discharge Temp – xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Water Pump 1 Relay	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Water Pump 2 Relay	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Starter xy	Cprsr	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Local
Comm Loss: Speed Command - xA	Cprsr	Normal	NonLatch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 15-30 second period.	Remote
Comm Loss: %RLA Indication Output(Vdc)	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 15-30 second period.	Remote
Comm Loss: Local BAS Interface	Chiller	Warning	NonLatch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Use last valid BAS setpoints. Diagnostic is cleared when successful communication is established with the LonTalk LLID (LCIC) or BacNet LLID (BCIC).	Remote
Comm Loss: Programmable Relay Board 1	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Comm Loss: Programmable Relay Board 2	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: High Pressure Cutout Switch - xy	Cprsr	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Auxiliary Setpoint Command	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 15-30 second period.	Remote
Comm Loss: Energy Meter Pulse Input	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Ext Noise Reduction Request	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Fan Inverter Speed Command	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 15-30 second period.	Remote
Comm Loss: Fan Inverter Speed Command, Shared Circuit 1 & 2	Circuit	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 15-30 second period. This is a warning, as it is conceivable that the circuit may run without the center shared fan deck working if there are many other coils/fans on the circuits.	Remote
Comm Loss: Condenser Fan Enable	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Fan Board 1 Relay X	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Fan Board 2 Relay X	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Condenser Fan Enable, Shared Circuit 1&2	Circuit	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. This is a warning, as it is conceivable that the circuit may run without the center shared fan deck working if there are many other coils/fans on the circuits.	Remote
Comm Loss: Condenser Refrigerant Tank Valve	Circuit	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Refrigerant Pool Temperature	Circuit	Special Action and Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Invalidate evaporator pool temperature sensor measurement if this diagnostic is active. If evaporator isolation valves are installed, revert to Evaporator Shell Refrigerant Saturated Temperature for freeze protection functions. If evaporator isolation valves are not installed, revert to Evaporator Saturated Temperature for freeze protection functions.	Remote
Comm Loss: Liquid Line Temperature	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period Note: The Subcooled Liquid Line Temperature Sensors are used for determination of charge and accurate tonnage predictions	Remote
Comm Loss: Liquid Line Pressure	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Electronic Expansion Valve	Circuit	Normal	Latch	All	Continual loss of communication between the MP and the EXV Step Status has occurred for a 30 second period, OR EXV Steps Maximum Position has not been received. If EXV Steps Maximum Position has not been received, MP will periodically request EXV Steps Maximum Position, since it is only transmitted upon request.	Remote

Control

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
Comm Loss: Evaporator Pump 1 Fault Input	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Pump 2 Fault Input	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Water Pump Inverter 1 Fault Input	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Water System Differential Pressure	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Differential Water Pressure	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Pump Inverter 1 Run Command	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Water Pump Inverter Speed	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Water Pump Inverter Frequency Input	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Entering Water Pressure	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
Comm Loss: Evaporator Leaving Water Pressure	Chiller	Warning	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote

Operating Principles

This charpter describes the overall operating principles of the RTAG design. The detail information of a specific unit see the attached documents of unit.

Refrigerant Circuit

The refrigerant cycle of the RTAG chiller is similar to that of other Trane air cooled screw chillers. Which includes single circuit , two circuits system and two circuits duplex system. RTAG100 is single circuit, with one rotary screw compressor; while others are two circuits, with a rotart screw compressor per circuit, and one chilled water loop . The sytem schematic of two circuits is shown in Figure 65 & Figure 66.

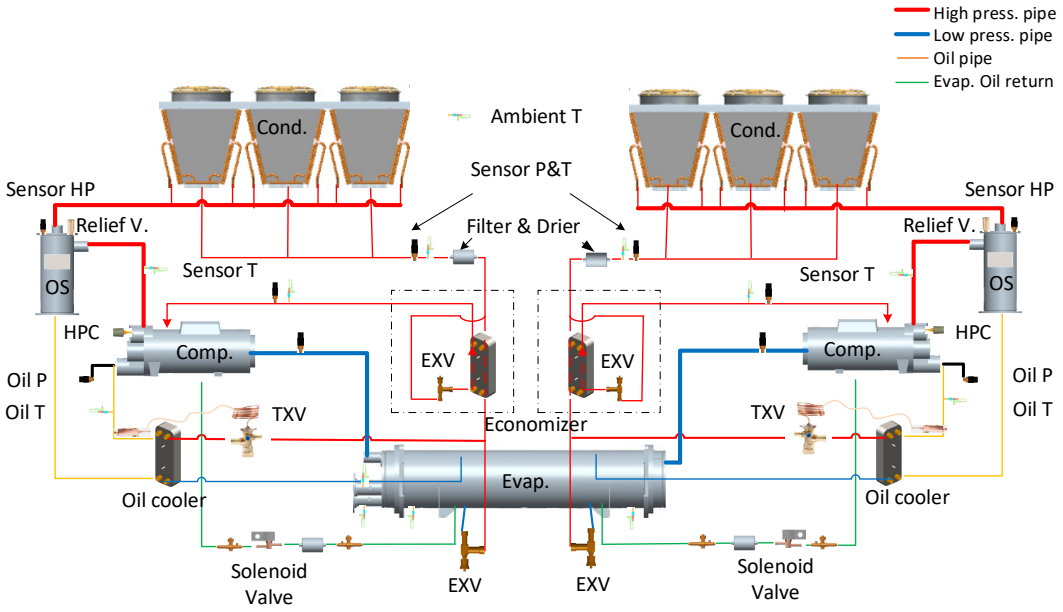


Figure 65. System schematic - R134a

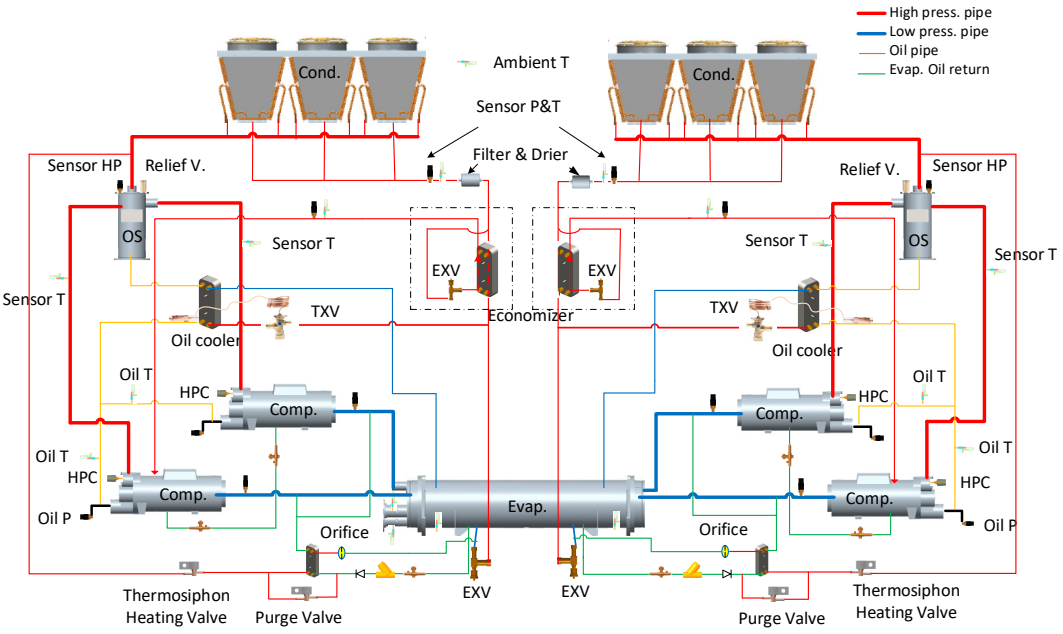


Figure 66. System schematic - R1234ze

Refrigerant Cycle

The refrigerant cycle of unit without economizer (NTON: 100 ~ 205 for all efficiency series, 225 ~ 440 for high & extra efficiency, 285, 375, 400 for premium seasonal efficiency) is represented in the pressure enthalpy diagram in Figure 67. Key state points are indicated on the figure. The cycle for the full load ARI design point is represented in the plot. The RTAG chiller uses a shell and tube evaporator design with refrigerant evaporating on the shell side and water flowing inside tubes having enhanced surfaces (states 4 to 1). The suction lines are designed to minimize pressure drop (states 1 to 1b). The compressor is a twin rotor helical rotary compressor designed similarly to the compressors offered in other Trane screw compressor based chiller (states 1b to 2). The discharge lines include a highly efficient oil separation system that removes 99% of the oil from the refrigerant stream going to the heat exchangers (states 2 to 2b). De-superheating, condensing and sub-cooling are accomplished in fin and tube air cooled heat exchanger where refrigerant is condensed inside the 7mm tube (states 2b to 3b). Refrigerant flow through the system is balanced by an electronic expansion valve (states 3b to 4).

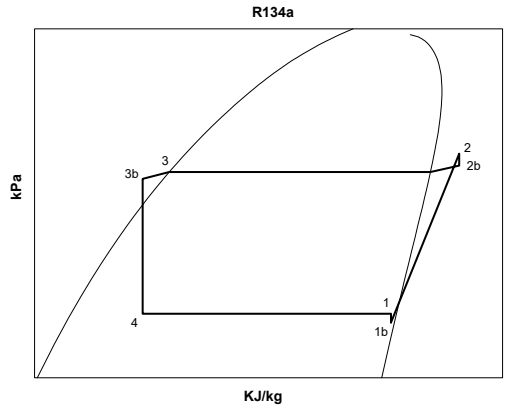


Figure 67. Pressure Enthalpy (P-h) diagram of RTAG

Figure 68 show the refrigerant cycle of pressure enthalpy diagram of RTAG with economizer unit (NTON: 500 for 440 for High & Extra efficiency, 225, 230, 310, 340, 440, 440 for premium seasonal efficiency). Comparing to Figure 67, the leaving condenser refrigerant (states 5) don't enter EXV, which is separated into two parts. The minor parts pass through minor EXV (states 5-6), enters brazed plates heat exchanger economizer, evaporating in economizer (states 6-7), the superheated refrigerant gas entering compressor auxiliary port (states 7). The major parts of refrigerant leaving condenser also enter economizer and be cooled again (states 5-3b), the super cooled major refrigerant go through EXV (states 3b-4), enters evaporator(4-1).

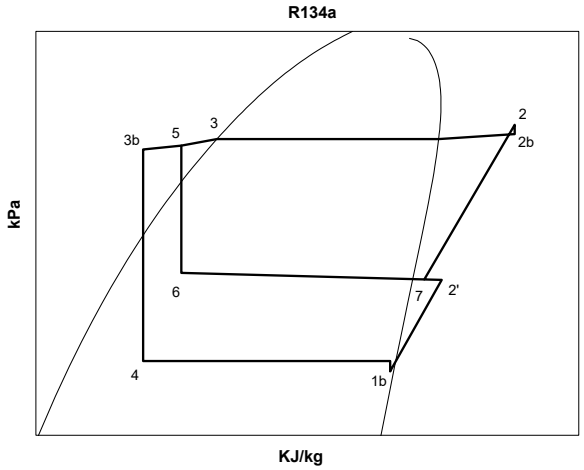


Figure 68. Pressure Enthalpy (P-h) diagram of RTAG with Economizer

R134a/R1234ze Refrigerant

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 properly qualified. All local and International regulations in what handling, reclaiming, recovering and recycling, must be followed.

R134a/R1234ze is a medium pressure refrigerant. It may not be used in any condition that would cause the chiller to operate in a vacuum without a purge system. RTAG is not equipped with a purge system. Therefore, the RTAG chiller may not be operated in a condition that would result in a saturated condition in the chiller of -26°C or lower.

NOTICE

R134a/R1234ze require the use of specific POE oils as designated on the unit nameplate. To avoid compressor damage and insure the performance requirement, use the listed oil as designated on nameplate

Compressor

The compressor is a semi-hermetic, direct-drive rotary type compressor. Each compressor has only four moving parts: two rotors that provide compression and male and female load-control valves. The male rotor is attached to the motor and the female rotor is driven by the male rotor.The rotors and motor are supported by bearings.

The helical rotary compressor is a positive displacement device. Refrigerant vapor from the evaporator is drawn into the suction opening of the compressor (state 1b), through a suction strainer screen across the motor (which provides

motor cooling) and into the intake of the compressor rotors. The gas is then compressed and discharged through a check valve and into the discharge line (state 2).

There is no physical contact between the rotors and the compressor housing.The rotors contact each other at the point where the driving action between the male and female rotors occurs. Oil is injected into the rotors of the compressor, coating the rotors and the compressor housing interior. Although this oil does provide rotor lubrication, its primary purpose is to seal the clearance spaces between the rotors and compressor housing. A positive seal between these internal parts enhances compressor efficiency by limiting leakage between the high pressure and low pressure cavities. dictated by the position of the loading valve relative to the rotors. When the valve slides toward the discharge end of the rotors compressor capacity is reduced.

RTAG high efficiency units and extra efficiency units apply fixed speed compressor, which capacity control is accomplished by means of a female step load-control valve and a male control valve. The female step valve is the first stage of loading after the compressor starts and the last stage of unloading before the compressor shuts down. The male control valve is positioned by a piston cylinder along the length of the male rotor. Compressor capacity is dictated by the position of the loading valve relative to the rotors. When the valve slides toward the discharge end of the rotors compressor capacity is reduced.

For premium seasonal efficiency unit apply varied speed compressor, capacity control is combined action of slide valve and variable frequency driver.

Figure 69, each compressor has an interior replaceable core oil filter. It can remove the impurity which may block the check valve or oil channel of oil, to avoid the excessive wear of rotors and bearing.

Some RTAG unit has economizer, its compressor has a gas inlet at female rotor compression chamber , where refrigerant gas from economizer is inhaled. Compressor with economizer inlet is shown below (Figure 70).

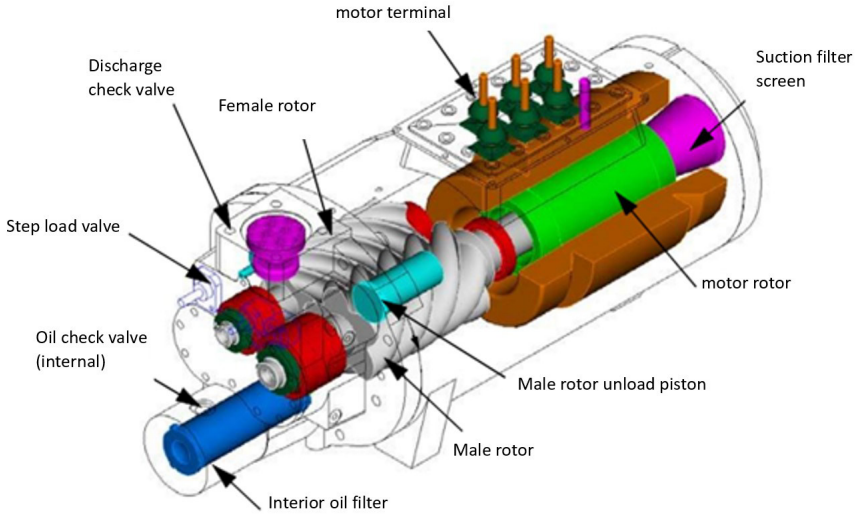


Figure 69. Compressor inner configuration

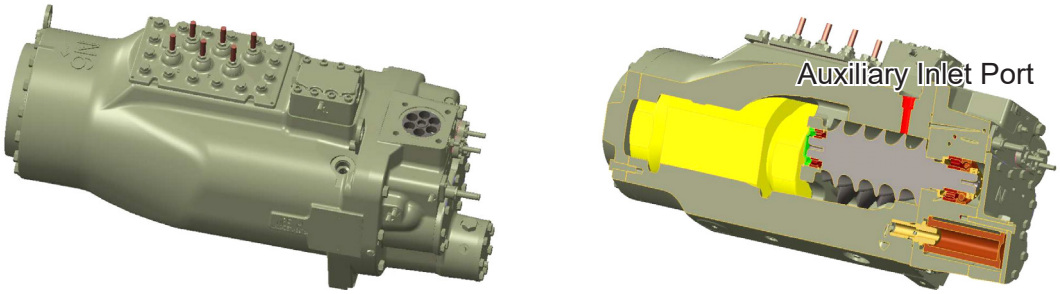


Figure 70. Compressor with Auxiliary Inlet Port

Condenser Fan

The condenser and subcooler consist of 7mm inner-grooved copper tube which contain the refrigerant, large fins are in the air flow side and fans that draw air through the fins and tubes. Heat is transferred from the refrigerant through the tubes and fins to the air. High pressure gas from the compressor enters the tubes of the condenser through a distribution header (state 2b). As refrigerant flows through the tubes, the heat of compression and cooling load are rejected to the air. In this process the refrigerant is de-superheated, condensed (states 2b to 3) and finally subcooled (states 3 to 3b) to a temperature slightly above the ambient air temperature. The subcooled liquid refrigerant is collected in the leaving header where it is transferred to the liquid line (state 3b).

The air flow rate of fan is controlled according to principle of getting maximum efficiency, meanwhile considering the system pressure differential. If a warm enough ambient is sensed, all the fans will run. If the ambient is cooler, some fans are shut off. Fan staging depends on the chiller load, evaporator pressure, condenser effectiveness, ambient temperature, and numbers and sizes of fans installed on the circuit.

Evaporator

RTAG evaporator is CHIL evaporator which is patented by Trane. It is divided into two area: high efficiency boil area and high oil concentration area. A distributor is installed in bottom of high efficiency boil area. Two phase refrigerant (state 4) inject towards to heat exchange through the distributor. The uplifted bubbles enforce the disturb of refrigerant, so the heat exchange efficiency is high. The liquid refrigerant-oil mixture continune flow to high oil concentration area and go on evaporating, oil concentration further increase, and finally go back to compressor.for R134a system, or compressor suction through thermosiphon oil return system for R1234ze system. Refrigerant vapor exits the evaporator through the suction line (state 1).

The material of evaporator shell is carbon steel, and tube is internally and externally finned seamless copper tubes, mechanically expanded into the tube sheets. Tubes are cleanable with dismountable water boxes. Tubes diameter exterior is 19mm. Each tube is individually replaceable. The evaporator is designed, tested and stamped in accordance with ASME Pressure regulation for a refrigerant side working pressure of 1.38MPa. Water side working pressure has two kinds: 1.03MPa (150psig) and 2.06MPa (300psig) . Standard water connections are Flange.

Expansion Valve

RTAG adopt EXV to control refrigerant flow. As refrigerant passes through the valve the pressure is dropped substantially, which results in vaporization of some of the refrigerant. So two phase refrigerant enter the distribution of evaporator (state 4), then spray on tube of evaporator evenly.

A TXV (Thermal Expansion Valve) is applied in oil cooler circuits.

Oil Separator

To enhance the performance of the heat exchanger surfaces an oil separator is placed in the discharge line between the compressor and the condenser. RTAG oil separator is centrifuge type. The refrigerant gas is discharged by the compressor, entering oil separator cylinder from the tangential direction of the upper part of it. Oil drop will be thrown out from the refrigerant gas due to the centrifugal force produced by the rotating in the cylinder. Oil that is removed from the refrigerant falls along the cylinder wall by gravity into the oil sump, and then returned to the compressor. The refrigerant vapor, get rid of the oil, is discharged from the top of the oil separator, flow into the condenser. Approximately 99.5% of the oil is removed from the refrigerant in the separator.

Oil system

See Figure 65 & Figure 66 System Schematic. Screw compressors require large quantities of oil for lubricating and sealing the rotors and lubricating the bearings, pushing slide valve. The oil mixed with refrigerant at the discharge of the compressor, majority of it is separated and flow to bottom of oil separator, minority enters system circuits with refrigerant. Oil in the oil sump of separator is discharge from oil separator by high pressure when compressor is working. It flows through oil cooler, angle valve, compressor inner filter and shut off valve, then is divided into two ways: one injects to rotors from the top shell of compressor, to lubricate rotors, and seal the gaps between rotors and compressor shell. Another way inject to the bearing chamber to lubricate bearing, then go back to suction port of rotor through oil circuits in the compressor shell. Once oil is injected into the compressor rotors, it mixes with the refrigerant again and is delivered back to the oil separator. Very little amount of oil pasts the oil separator, and flows through the condenser, subcooler and expansion valve into the evaporator. This part of oil is collected with refrigerant at rich oil range of CHIL evaporator. For R134a system, it is returned through a line that is connected to the compressor. For R1234ze system, it is returned to the compressor suction pipe through the thermosiphon system.

For R1234ze system, when compressor is running, thermosiphon heating valve is always opened. The purge valve of the thermosiphon oil return system is opened intermittently during the operation stage according to the configuration (three configurations are “Disable”, “Start only” and “Continuous”. “Continuous” is recommended). Both valves enable the high-pressure hot temperature refrigerant to blow the refrig-

erant and oil mixture into the suction pipe.

An internal, pilot operated shutoff valve is provided to prevent oil flow from oil separator into the compressor when the compressor is not running. When the compressor is shut down, the thermosiphon heating valve and the purge valve in thermosiphon system will also be cut off. Since there is no heat source anymore, the refrigerant and oil mixture in the evaporator can not be vaporized and go back to the compressor due to the height difference and resistance along the way.

Pre-Start Checkout

Installation Checklist

Complete this checklist as the unit is installed, and verify that all recommended procedures are accomplished before the unit is started. Fill out "Table 62. RTAG Start-up Test Log". This checklist does not replace the detailed instructions given in the "Installation Mechanical" and "Installation Electrical" sections of this manual. Read both sections completely, to be familiar with the installation procedures, prior beginning the work.

Check precedure

When installation is complete, before starting the unit, the following prestart procedures must be reviewed and verified:

1. Inspect all wiring connections in the compressor power circuits (disconnects, terminal block, contactors, compressor junction box terminals and so forth) to ensure they are clean and tight.
2. Open all refrigerant valves in the discharge, liquid, and oil return lines, open and inlet/outlet valve in water loop; Operation of angle valve in liquid line: In the face of valve stem, rotate stem clockwise is close and counter-clockwise is open) ; Operation of ball valve in oil return line: ball valve open/close status see Figure 71.

Open

Close

Figure 71. Ball Valve Open/Close status

3. Check the power-supply voltage to the unit at the main-power fused-disconnect switch. Voltage must be within the voltage use range which is stamped on the unit nameplate. Voltage fluctuation must not exceed 10%.Voltage imbalance must not exceed 2%.
4. Check the unit power phasing L1-L2-L3 in the starter to ensure that it has been installed in a "A-B-C" phase sequence.
5. Check and confirm all the fans can rotate freely.
6. Fill the evaporator chilled-water circuit. Vent the system while it is being filled. Open the vents on the top of the evaporator water box while filling and close when filling is completed.
7. Start the chilled-water pump to begin circulation of the water. Inspect all piping for leakage and make any necessary repairs.
8. With water circulating through the system, adjust the water flow to meet the range of Table 1 through Table 28 and check the water pressure drop through the evaporator according to "Figure 23. Water flow pressure drop curve"
9. Adjust the chilled-water flow switch for proper operation
10. Stop the chilled-water pump
11. Electric evaporator heater with separated single-phase 230V.
12. Maintain power supply, so that compressor and oil electric heater could work. Switch button on control touch screen should be in stop state.
13. Check oil level in oil separator.
14. Check and set, as required, all symbio800 TD7 menu items
15. Energize the compressor and oil separator heaters 24 hours, prior to unit start up.
16. 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 an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

NOTICE

Equipment Damage!

Confirm the terminal blocks and the compressor power line has tightened (including circuit breaker, contactor, compressor connector terminals, etc.). Loose connections can cause overheating and under-voltage conditions at the compressor motor.

NOTICE

Compressor Damage!

Catastrophic damage to the compressor will occur if the refrigerant circuit or water circuit are closed on unit start-up.

NOTICE

Compressor Damage!

It is imperative that L1, L2, L3 in the starter be connected in the A-B-C phase sequence to prevent equipment damage due to reverse rotation.

NOTICE

Equipment Damage!

Low ambient temperatures, ensure the power supply of evaporator heater so as to avoid the evaporator freezing damage.

NOTICE

Compressor Damage!

Ensure that the compressor and oil separator heaters have been operating for a minimum of 24 hours before first starting after a long down time. Failure to do so may result in equipment damage.

Unit Voltage Power Supply

Unit voltage must meet the criteria given in the installation Electrical Section. Measure each lead of the supply voltage at the main power fused-disconnect switch for the unit. If the measured voltage on any lead is not within the specified range, notify the supplier of the power and correct the situation before operating the unit.

NOTICE

Equipment Damage!

Provide adequate voltage to the unit. Failure to do so can cause control components to malfunction and shorten the life of relay contact, compressor motors and contactors.

Unit Voltage Imbalance

Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. The maximum allowable unbalance is 2%. Voltage imbalance is determined using the following calculations:

$$\% \text{ Imbalance} = \frac{(V_x - V_{ave}) \times 100}{V_{ave}}$$

$$V_{ave} = \frac{(V_1 + V_2 + V_3)}{3}$$

V_x = phase with greatest difference from V_{ave} (without regard to the sign)

For example, if the three measured voltages are 221, 230, and 227 volts, the average would be:

(221+230+227)/3 =226

The percentage of the imbalance is then:

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

This exceeds the maximum allowable (2%) by 0.2 percent.

Unit Voltage Phasing

It is important that proper rotation of the compressors be established before the unit is started. Proper motor rotation requires confirmation of the electrical phase sequence of the power supply. The motor is internally connected for clockwise rotation with the incoming power supply phases A-B-C. When rotation is clockwise, the phase sequence is usually called “ABC”, when counterclockwise “CBA”

This direction may be reversed by interchanging any two of the line wires . It is this possible interchange of wiring that makes a phase sequence indicator necessary if the operator is to quickly determine the phase rotation of the motor.

Proper compressor motor electrical phasing can be quickly determined and corrected before starting the unit. Use a quality instrument, such as the Associated Research Model 45 Phase Sequence Indicator, and follow this procedure:

1. Stop the unit from TD7/Symbio800.
2. Open the electrical disconnect or circuit protection switch that provides line power to the line power terminal block(s) in the starter panel (or to the unit mounted disconnect).
3. Connect the phase-sequence indicator leads to the line power terminal block (L1-L2-L3).

Phase Seq. Lead	Terminal
Black (Phase A)	L1
Red (Phase B)	L2
Yellow (Phase C)	L3

4. Turn power on by closing the unit supply-power fused-disconnect switch.
5. Read the phase sequence on the indicator. The “ABC” LED on the face of the phase indicator will glow if phase is “ABC”. After service compressor terminal conncetion should be same as Schematic Diagram to make sure the compressor turn in right direction.
6. If the “CBA” indicator glows instead, open the unit main power disconnect and switch two line leads on the line power terminal block(s) (or the unit mounted disconnect). Re-close the main power disconnect and recheck the phasing.

7. Reopen the unit disconnect and disconnect the phase indicator

NOTICE

It is imperative that L1, L2, and L3 in the starter be connected in the A-B-C phase sequence to prevent equipment damage due to reverse rotation.

NOTICE

To prevent injury or death due to electrocution, take extreme care when performing service procedures with electrical power energized.

⚠CAUTION

Equipment Damage!

Do not interchange any load leads that are from the unit contactors or the motor terminals. Doing so may damage the equipment.

Water System Flow Rates

Establish a balanced chilled water flow through the evaporator. The flow rates should fall in the range of Table 1~Table 28 Evaporator Flow Rate(fall between the minimum and maximum values given on the pressure drop curves). Chilled water flow rates below the minimum values will result in laminar flow, which reduces heat transfer and causes either loss of EXV control or repeated nuisance, low temperature, cutouts. Flow rates that are too high can cause tube erosion in the evaporator.

Water System Pressure Drop

According to Figure 21, Measure the water-pressure drop through the evaporator by field installed pressure gauge on the system water piping. Use the same gauge for each measurement. Do not include valves, strainers, or fittings in the pressure drop readings. The water flow rate corresponding to the pressure drop reading must fall in the range of flow show in Table 1 ~ Table 28.

Unit Start Up and Shut Off Procedures

Start Up

If the present checkout, as discussed above charpter, has been completed, the unit is ready to start.

1. Make sure the STOP key display on the TD7
2. Adjust the set point values as necessary on the TD7 menus using Tracer TU, and fill in Table 64
3. Close the fused-disconnect switch for the chilledwater pump. Energize the pump(s) to start water circulation
4. Check all the service valves are open fro each circuit, for example, valve on liquid line, oil line etc
5. Make sure evaporator heater is energized right.
6. Ensure that the compressor and oil separator heaters have been operating for a minimum of 24 hours before starting. Failure to do so may result in equipment damage
7. Press the AUTO key. If the chiller control calls for cooling and all safety interlocks are closed, the unit will start. The compressor(s) will load and unload in response to the leaving chilled water temperature.
8. After the system has been operating for at least 30 minutes and has become stabilized, complete the remaining start up procedures, as follows
   a. Check the evaporator refrigerant pressure, the condenser refrigerant pressure, approach temperature, under Refrigerant Report on the TD7, they should in range of Table 61, when compressor in full load.
   b. Measure the system discharge superheat.

Table 61. Unit Running Status

Evaporator Approach		Condenser Approach	
Range (°C)	Calculation Method	Range (°C)	Calculation Method
2~4	Leaving water tempterature−saturated suction tempterature	12~20	Saturated discharge temperature − Ambient temperature

NOTICE

Compressor Damage!

Catastrophic damage to the compressor will occur if the oil line shut off valve or the angele valves are closed on unit start-up.

NOTICE

Equipment Damage!

Use only refrigerants specified on the unit nameplate (HFC 134a) and Trane oil specified on the unit nameplate. Failure to do so may cause compressor damage and improper unit operation.

⚠CAUTION

Avoid direct touch of refrigerant, otherwise skin may be frostbitten.

NOTICE

Efficiency Decrease!

According to the filling option, if whole charge option,Trane factory finish debugging operation, don’t need be charged before first start, else for nitrogen charging options or 12 kg filling options, filling unit must strictly follow Table 1 ~ Table 28 charge amount before starting.For later adding refrigerant, please find the leak point and complete the repair, do not add refrigerant randomly which may led to overcharge or lesscharge

Seasonal Unit Startup Procedure

Steps as below:

1. Close all valves and reinstall the drain plugs in the evaporator.
2. Service the auxiliary equipment according to the startup and maintenance instructions provided by the respective equipment manufacturers.
3. If the evaporator was previously drained, vent and fill the evaporator and chilled-water circuit. When all air is removed from the system (including each pass), install the vent plugs in the evaporator water boxes.
4. Open all the valves in the evaporator chilled-water circuits.
5. Open all refrigerant valves.
6. Check the adjustment and operation of each safety and operating control.
7. Close all disconnect switches.
8. Refer to the sequence for daily unit start up for the remainder of the seasonal start up.

System Restart after Extended Shutdown

1. Verify that the liquid-line service valves, oil line, are open (back seated).
2. Check the oil separator oil level (see Maintenance procedures section).
3. Fill the evaporator water circuit. Vent the system while it is being filled. Open the vent on the top of the evaporator while filling, and close it when filling is completed.
4. Close the fused-disconnect switches that provide power to the chilled-water pump.
5. Start the evaporator water pump and, while water is circulating, inspect all piping for leakage. Make any necessary repairs before starting the unit.
6. While the water is circulating, adjust the water flow and check the water pressure drops through the evaporator. Refer to “water-system flow rates” and “water-system pressure drop”.
7. Adjust the flow switch on the evaporator piping for proper operation.
8. Stop the water pump. The unit is now ready for startup as described “Startup procedures”

Temporary Shutdown and Restart

To shut the unit down for a short time, use the following procedure:

1. Press the STOP key on the TD7. The compressors will continue to operate and, after unloading for 20 seconds, will stop when the compressor contactors de-energize.
2. Stop the water circulation by turning off the chilled water pump at least one minute after the stop of the compressors.

NOTICE

Equipment Damage!

After unit shut down, should maintain unit power supply to ensure the power of the compressor, oil heater.During winter, the evaporator antifreeze heater must be power supply, electric heaters so as to avoid frost crack under low ambient temperature evaporator.

The unit will start normally, provided the following conditions exist:

1. The controller receives a call for cooling and the differential-to-start is above the setpoint.
2. All system operating interlocks and safety circuits are satisfied.

Extended Shutdown Procedure

The following procedure is to be followed if the system is to be taken out of service for an extended period of time (i.e. seasonal shutdown):

1. Test the unit for refrigerant leaks and repair as necessary.
2. Open the unit main electrical disconnect and unitmounted disconnect (if installed) and lock in the “OPEN” position.
3. Disconnect the evaporater heater, to avoid burn out of heater.
4. Open the electrical disconnect switches for the chilled-water pump. Lock the switches in the “OPEN”position
5. Close all chilled-water supply valves. Drain the water from the evaporator.
6. At least every three months (quarterly), check the refrigerant pressure in the unit to verify the refrigerant charge integrity.

NOTICE

Evaporator Anti-Freezing Heater Damage!

If Evaporator water is drained out, the evaporator anti-freezing heater should be power off and latched, toavoid the heater damage due to higher temperature.

Seasonal Unit Startup Procedure

Follow the Start Up to start the unit, Only after pass through the procedure of Check Procedure, steps 1 to 15.

Periodic Maintenance

Perform all maintenance procedures and inspections at the recommended intervals. This will prolong the life of the chiller and minimize the possibility of costly failures.

Use an “Operator’s Log”, such as that shown at the end of the section, to record an operating history for the unit. The log serves as a valuable diagnostic tool for service personnel. By observing trends in operating conditions, an operator can anticipate and prevent problem situations before they occur. If the unit does not operate properly during maintenance inspections, refer to “Diagnostics and Troubleshooting”.

After the unit has been operating for approximately 30 minutes and the system has stabilized, check the operating conditions and complete the procedures below:

Weekly Maintenance

While unit is running in stable conditions.

1. Check MP pressure for evaporator, condenser and intermediate oil.
2. Observe liquid line sight glass on EXV.
3. If liquid line sight glass has bubbles or approach temperature of evaporator is greater than 8°F,the unit may has leakage. Please check the leakage source and repair it.
4. Inspect the entire system for unusual conditions and inspect the condenser coils for dirt and debris. If the coils are dirty, refer to coil cleaning.

Monthly Maintenance

1. Perform all weekly maintenance procedures.
2. Record the system subcooling.
3. Make any repairs necessary.

Annual Maintenance

1. Perform all weekly and monthly procedures.
2. Check oil sump oil level while unit is off.

NOTE: *Routine changing of the oil is not required. Use an oil analysis to determine the condition of the oil.*

3. Have a qualified laboratory perform a compressor oil analysis to determine system moisture content and acid level. This analysis is a valuable diagnostic tool.
4. Contact a qualified service organization to leak test the chiller, to check operating and safety controls, and to inspect electrical components for deficiencies.
5. Inspect all piping components for leakage and damage. Clean out any inline strainers.
6. Clean and repaint any areas that show signs of corrosion.
7. Clean the condenser coils.

⚠CAUTION

Use cleaning agent correctly!

Follow the cleaning agent manufacturer’s instructions, to avoid coil damage, personal injury or environmental pollution.

⚠WARNING

Hazardous Voltage w/Capacitors!

Disconnect all electric power, including remote dis-con-nects before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other en-ergy storing components provided by Trane or others, refer to the appropriate manufacturer’s literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

8. Check and tighten all electrical connections as necessary.

Table 62. RTAG Start-up Test Log

RTAG Start-up Test Log					
Job Name			Job Location		
Model #					
CRC #			Serial # :		
Sales Order #	Ship Date:		Job Elevation (ft. above sea level) |		
Starter Data:			**Start-up Only**		
Manufacturer			Chiller Appearance on arrival:		
Type: (wye-delta or x-line)			Machine gauge pressure:		ckt1/ckt2
Vendor ID #/ Model #:			Machine Symbio800 pressure		ckt1/ckt2
Volts	Amps	Hz	Unit R-134a/R1234ze Charge:		lbs
Compressor Data:			Unit oil charge (SOL120/220):		gal
Compressor 1A:			**Pressure Test (if required)**		
	Model #:		Vacuum after leak test=		mm
	Serial #		Standing Vacuum test=	mm rise in	hrs
	RLA		**Current Transformers**		
	kW		Part number (“X” code and 2-digit extension)		
	Volts		X		
	Hz		X		
Compressor 1B:			X		
	Model #:		X		
	Serial #		X		
	RLA		X		
	kW		**Summary of Options Installed**		
	Volts		Tracer Communications Interface	Y N	
	Hz		Ice Making	Y N	
Compressor 2A:			Other	Y N	
	Model #:		Other	Y N	
	Serial #		Other	Y N	
	RLA		**Evap Design Conditions**		
	kW		GPM	PSID	
	Volts		Entering Water:	Leaving Water:	
	Hz		% Glycol:		
Compressor 2B:			Type of Glycol:		
	Model #:				
	Serial #		**Evap Actual Conditions**		
	RLA		GPM	PSID	
	kW		Entering Water:	Leaving Water:	
	Volts		% Glycol:		
	Hz		Type of Glycol:		

Owner Witness Signature:

Table 63. RTAG Unit Configuration

RTAG Unit Configuration			
Job Name		Job Location	
Model #			
Serial #		CRC#	
Sales Order #	Ship Date	Job Elevation (ft. above see level)	
Setpoint View *			
Front Panel Degree Units			°C / °F
Front Panel Chilled Water Setpoint			
Front Panel Current Limit(%RLA)			
Differential to Stop			
Differential to Start			
Leaving Water Temperature Cutout			
Low Refrigerant Temperature Cutout			
Condenser Limit			
Low Ambient Lockout Setpoint			
Low Ambient Lockout (circuit 1)			Enable or Disable
Under/Over Voltage Protection			Enable or Disable
Local Atmospheric Pressure			psi
Design Delta T			°F or °C
Reset Type (circuit 1)			None Outdoor Air Temp Constant Return
Return Reset Ratio			%
Return Start Reset			
Return Max Reset			
Outdoor Reset Ratio %			
Outdoor Start Reset			
Outdoor Max Reset			
Chilled Water Pump Delay Time			minutes
Chilled Water Setpoint Filtering Settling Time			sec
Compressor Staging Deadband			
Compressor Service View **			
Unit Status:			
Circuit 1 Control			
	Front Panel Circuit Lockout		Locked or Unlocked
	Electronic Expansion Valve		Open or Auto
Circuit 2 Control			
	Front Panel Circuit Lockout		Locked or Unlocked
	Electronic Expansion Valve		Open or Auto
Configuration ***			
Nameplate			
	Model #		
	Confirm Code		
	Serial Number		

Note:

* Using Tracer TU , click on “View “ and then click “Setpoint View “ Log accordingly.

** Using Tracer TU , click on “View “ and then click “Compressor Service View “ Log accordingly.

*** Using Tracer TU , click on “View “ and then click “Configuration” (Nameplate Tab) Log accordingly

Table 64. RTAG Chiller Log

RTAG Chiller Log							
Job Name				Job Location			
Model #				Serial #			
Status View: *							
Chiller Tab:		15 min	30 min	45 min	15 min	30 min	45 min
Operating Mode							
Outdoor Air Temperature	*°F or °C*						
Active Chill Water Setpoint	*°F or °C*						
Active Current Limit Setpoint	*°F or °C*						
Evaporator Entering Water Temp.	*°F or °C*						
Evaporator Leaving Water Temp.	*°F or °C*						
		Circuit 1 Tab			**Circuit 2 Tab**		
External Hardwired Lockout		Not Locked out/ Locked out			Not Locked out/ Locked out		
Front Panel Lockout		Not Locked out/ Locked out			Not Locked out/ Locked out		
		15 min	30 min	45 min	15 min	30 min	45 min
AirFlow %							
Inverter Speed %							
Condenser Refrigerant Pressure	*psig/kPa*						
Saturated Condenser Rfgt. Temp.	*°F or °C*						
Differential Refrigerant Pressure	*psid/kPa*						
Evaporator Refrigerant Pressure	*psig/kPa*						
Saturated Evaporator Rfgt.Temp.	*°F or °C*						
EXV Position %							
Evaporator Rfgt Liquid Level	*inches/mm*						
Thermosiphon Heating Valve		open / closed	open / closed	open / closed	open / closed	open / closed	open / closed
Purge Valve		open / closed	open / closed	open / closed	open / closed	open / closed	open / closed
		Compressor 1A Tab			**Compressor 2A Tab**		
Operating Mode							
Hours				Hrs/mins			Hrs/mins
Starts							
		15 min	30 min	45 min	15 min	30 min	45 min
Phase A - B Voltage	*volts*						
Average Line Current	*%RLA*						
Line 1 current	*amps*						
Line 2 current	*amps*						
Line 3 current	*amps*						
Line 1 current	*%RLA*						
Line 2 current	*%RLA*						
Line 3 current	*%RLA*						
Evaporator Oil Return Solenoid		open / closed	open / closed	open / closed	open / closed	open / closed	open / closed
Supply Oil Temperature	*°F or °C*						
Intermediate Oil Pressure	*psig/kPa*						
Female Step solenoid		load / unload	load / unload	load / unload	load / unload	load / unload	load / unload
High Pressure Cutout switch		Good / Tripped	Good / Tripped	Good / Tripped	Good / Tripped	Good / Tripped	Good / Tripped
Comments:							

RTAG Chiller Log (continue)							
		Compressor 2A Tab			Compressor 2B Tab		
Operating Mode							
Hours				Hrs/mins			Hrs/mins
Starts							
		15 min	30 min	45 min	15 min	30 min	45 min
Phase A - B Voltage	*volts*						
Average Line Current	*%RLA*						
Line 1 current	*amps*						
Line 2 current	*amps*						
Line 3 current	*amps*						
Line 1 current	*%RLA*						
Line 2 current	*%RLA*						
Line 3 current	*%RLA*						
Evaporator Oil Return Solenoid		open / closed	open / closed	open / closed	open / closed	open / closed	open / closed
Supply Oil Temperature	*°F or °C*						
Intermediate Oil Pressure	*psig/kPa*						
Female Step solenoid		load / unload	load / unload	load / unload	load / unload	load / unload	load / unload
High Pressure Cutout switch		Good / Tripped	Good / Tripped	Good / Tripped	Good / Tripped	Good / Tripped	Good / Tripped
Comments:							

Maintenance Procedures

Refrigerant and Oil Charge Management

Proper oil and refrigerant charge is essential for proper unit operation, unit performance, and environmental protection. Only trained and licensed service personnal should service the chiller.

Some symptoms of a refrigerant under-charged unit:

- Low subcooling
- Higher than normal discharge superheat
- Bubbles in EXV sight glass
- Low liquid level diagnostic
- Larger than normal evaporator approach temperatures (leaving water temperature - saturated evaporator temperature)
- Low evaporator refrigerant temperature limit
- Low refrigerant temperature cutout diagnostic
- Fully open expansion valve
- Possible whistling sound coming from liquid line (due to high vapor velocity)
- High condenser + subcooler pressure drop

Some symptoms of a refrigerant over-charged unit:

- Lower discharge superheat
- Larger than normal condenser approach temperatures (entering condenser saturated temperature – entering air temperature)
- Condenser pressure limit
- High pressure cutout diagnostic
- Higher than normal compressor power

Some symptoms of an oil over-charged unit:

- Larger than normal evaporator approach temperatures (leaving water temperature - saturated evaporator temperature)
- Low evaporator refrigerant temperature limit
- Low unit capacity
- Low discharge superheat (especially at high loads)
- High oil sump level after normal shut down

Some symptoms of an oil under-charged unit:

- Compressor rattle or grinding sound
- Oil loss diagnostic
- Seized or welded compressor
- Low oil sump level after normal shut down

R134a/R1234ze Field Charging Procedure

Be certain that the electrical power to the unit is disconnected before performing this procedure.

⚠WARNING

Hazardous Voltage with Capacitors!

Disconnect all electric power, including remote disconnects 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 an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Vacuum Procedure

If there is no refrigerant in the unit, it is necessary to pump the vacuum first and then refill it. The steps are as follows:

1. The electronic expansion valve should be in the open position.
2. Confirm that all power supply of the unit is disconnected and locked.
3. The unit shall complete leak detection first, no leakage is confirmed.
4. Connecting the vacuum hose to service valve on the evaporator and/or liquid line, open the service valve.
5. Start the vacuum pump. Close the service valve and Stop vacuum pump successively when the vacuum gauge is lower than 67Pa.
6. The unit should be left to rest for at least 1 hour after vacuuming, and the pressure rise should not exceed 20 Pa. If the pressure rise exceeds 20Pa, there is still a leak or some moisture in the system, repeat steps 3 to 6 above.
7. Remove the vacuum hose.

Factory (initial) Refrigerant Charging Procedure

The initial charging procedure should be followed the first time the unit is charged in the factory, as well as for charging any time after the charge has been completely removed from the entire system in the event of repair.

1. The unit shall first complete Vacuuming Procedure.
2. Connect charging hose to the service valve on eva-po-rator or liquid line (filter contain a port). discharge the air in the hose. Charge liquid refrigerant in liquid line and vapor refrigerant on the evaporator.
3. Charge unit through the housing port per nameplate. Respect refrigerant type on the nameplate and do not mix R134a with R1234ze.
4. When charging is complete, shut off service valve and disconnect charging hoses.

⚠CAUTION

Evaporator Damage!

Water must be flowing through the evaporator during the entire charging process to avoid freezing and rup-turing of the evaporator tubes. Charge first with vapor to avoid freezing tubes.

Adding charge

This procedure should be followed when adding charge to an undercharged unit.

1. Attach charging hose to evaporator service valve.
2. Open the valve of charge bottle, discharge the air in charge hose.
3. Open the service valve, charge 10 pounds refrigerant gas.
4. Run unit at least 30 minutes, measure the evaporator approach.
5. If the evaporator approach is higher than value in Table 61, return to step 3
6. Close the service valve and disconnect the charging hose.

Note: *Proper evaporator approach can be determined from run log history, service experience, or by con-tacting Trane technical service.*

Refrigerant Recovery

If refrigerant recover is needed, it should use special re-cov-ery equipment to recover refrigerant, and store in a special container. It is forbidden to discharge the refrigerant into the atmosphere directly, or collect the refrigerant into the con-tainer by using the compressor of the unit to pump.

The recovery of refrigerant can be carried out through the service valve on the liquid line tube or evaporator. Attention notes are as follows:

- Operations must be performed by qualified operator with personal protective equipment.
- The workplace should be well ventilated, away from flammable and explosive objects, rain proof, and avoid to moisture.
- When the recovery equipment is working, the unit or loop recovered shouldn't run.
- The refrigerant recovery container must be dedicated to R134a or R1234ze and can be refilled repeatedly. Recov-ered refrigerants should be weighed to ensure that the total refrigerant does not exceed 80% of the container capacity.

Refrigerant Filter Replacement Procedure

A dirty filter is indicated by a temperature gradient across the filter, corresponding to a pressure drop. If the temperature downstream of the filter is 8°F (4.4°C) lower than the up-stream temperature, the filter should be replaced.

1. With the unit off, verify that the EXV is closed.
2. Close liquid line isolation valve. On units with oil cooling circuits, close ball valve on oil cooler liquid line.
3. Attach hose to service port on liquid line filter flange.
4. Evacuate refrigerant from liquid line and store, then remove hose.
5. Depress schrader valve to equalize pressure in liquid line with atmospheric pressure.

⚠CAUTION

If the electronic expansion valve cannot be closed, please carry out "refrigerant recovery", then continue the following steps.

6. Remove bolts that retain filter flange.
7. Remove old filter element.
8. Inspect replacement filter element and lubricate o-ring with Trane OIL.

⚠CAUTION

Do not use mineral oil, otherwise it will contaminate the system.

9. Install new filter element in filter housing.
10. Inspect flange gasket and replace if damaged.
11. nstall flange and torque bolts to 14-16 lb-ft (19-22 n-m).
12. 1Attach vacuum hose and evacuate liquid line.
13. Remove vacuum hose from liquid line and attach charging hose.
14. Replace stored charge in liquid line.
15. Remove charging hose.

16. Open liquid line isolation valve. On units with remote evaporators or oil cooler

Compressor Oil

⚠CAUTION

Equipment Damage!

Use only Trane OIL (specified on the unit nameplate), in the RTAG units to avoid any catastrophic damage to the compressor or unit.

R134a/R1234ze requires the use of specific POE oils as designated on the unit nameplate and listed on below table.

Refrigerant	Trane OIL
R134a/R513A	TRANE OIL 00317
R1234ze	TRANE OIL 0067E

And the general conditions of the oil should meet the requirements of following table.

Index	Acceptable Level
Moisture Content	Moisture content less than 300ppm
Acidity	Acidity less than 0.5TAN (mg KOH/g)

Oil Separator Oil Level Check

⚠CAUTION

Oil Loss!

Never allow the compressor to operate with opened service valves connecting the sight glass during oil level check, or severe oil loss will occur. Close the valves after the check.

See Figure 73. Oil Level Measure of Oil Separator, follow these procedures:

1. Run the unit under full load for more than 30 minutes.
2. Shut off the compressor.

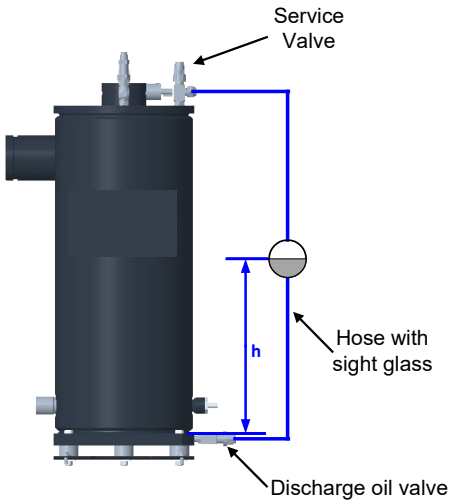


Figure 72. Oil Level Measure of Oil Separator

3. Attach a charging hose with an integrated sight glass to the service valve (1/4” port) and oil drain valve (1/4” port) of the oil separator.

Note: *Alternatively, high pressure resistance lucid hose with appropriate fittings can be used for measurement.*

4. Open both valves, move the sight glass up and down along the oil separator to confirm the height of oil level. The height of oil level (indicated as “h” in the figure) should be between 50mm and 150mm from the bottom.
5. If the oil level is too high, the additional oil may reside in other parts of the system and result in lower efficiency. Some oil can be removed till the level falls within reasonable range.
6. If the oil level is too low, it possibly indicates oil migration to evaporator or a system leak.

Note: *If the oil accumulates in the evaporator, it need to check whether the oil return solenoid valve is open, and whether the filter on oil return pipeline requires replacement. If a system leak is detected, repair the leakage before replenishing the oil.*

7. Close the service valves and remove the hose (with sight glass) after measurement.

Compressor Oil Charging

NOTICE

Oil Loss Alarm!

The diagnostic of “low oil flow” will appear if oil lines are not fully charged during compressor start-up.

The diagnostic of “oil loss” will appear if the oil level sensor at the bottom of oil separator does not detect oil during compressor start-up.

Whether should charge oil depends on the actual operation status of unit. Oil level check and compressor oil charging are required if any of the following happens:

1. Oil leak during maintenance: oil sampling, element replacement of compressor internal filter, pipe replacement of water-side heat exchanger.
2. Component replacement: replacement of compressor or coils.
3. Leakage in system, or oil loss caused by recovering refrigerant. These must be handled immediately.

In general, there are two methods to charge compressor oil:

- Maintain vacuum in the unit with a vacuum pump, and draw the oil into the system.

Note: *Require to recover the refrigerant in unit system before vacuuming*

- Pump the oil into oil pipeline with an oil pump after the unit has stopped with unchanged pressure.

Note: *oil pump and hose need to have enough pressure resistance*

Compressor oil charging procedure (after unit stops)

1. Loosely connect the oil hose to the 1/4” angle valve of compressor oil line as Figure 73.
2. Pour with the oil tank or run the oil pump. Once the oil has emptied the air in the hose, tighten the connector of hose.
3. Open the angle valve of compressor oil line to charge the required amount of oil.

Note: *adding the oil at the oil charging port of compressor angle valve can ensure the oil filter cavity and oil pipe following the oil separator are filled with oil, and an internal check valve can prevent oil from entering compressor rotors cavity.*

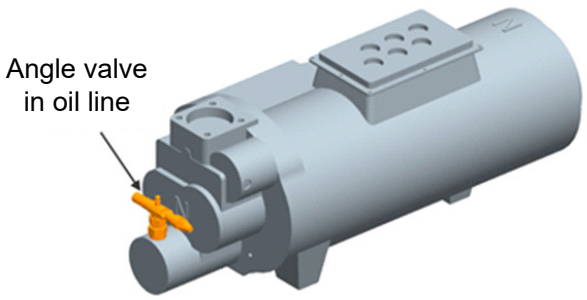


Figure 73. Oil Charge of Compressor

Draining Compressor oil

NOTICE

POE Oil!

Due to high hygroscopic properties of POE oil, all oil must be stored in metal containers, not a plastic container.

Compressor oil draining can only begin after the compressor has run 30 min and stopped 10 mins. Procedure as following:

1. Attach the pipe to the bottom drain valve of oil separator.
2. Open the valve to discharge and weight the oil.
3. Close the valve after draining a certain amount of oil.

Oil Loss Troubleshooting

When the unit has an Oil Loss diagnostic, follow these procedures:

1. Conduct “Oil Separator Level Check” after the unit has stopped.
2. Once low oil level is confirmed, 2kg of oil need be added into the oil separator in unit stopped mode. Then, start the unit and keep running for 2 hours. After stopping the unit again, drain 2kg of oil mixture from the oil separator by following “Draining Compressor Oil”.
3. If oil level is normal, check whether the oil level sensor and its wiring are correct.
4. If oil level is normal and the oil level sensor and its connection are right, the issue is possibly caused by too much liquid refrigerant in the oil separator. Then, the unit should be prohibited to run and the heaters of compressor and oil separator should be powered on for more than 12 hours, then conduct “Oil Separator Level Check” again.

NOTICE

Bypassing the protection of oil level sensor is prohibited!

When Oil Loss diagnostic appears, check the oil level of oil separator first. In order to avoid compressor damage, DO NOT bypass the protection of oil level sensor.

Internal Oil Filter Replacement

Under normal operating conditions, compressor internal filter element should be replaced after the first year of operation and as needed thereafter. The filter must be replaced if the operating pressure meets the replacement condition shown in “Figure 75. Oil Filter Replacement“ , or “Low Oil Flow” diagnostic frequently occurs, or the oil quality cannot meet requirements. Follow these procedures:

1. With the unit off, disconnect and lock all power supplies.
2. Recover the refrigerant in unit and release the system pressure.
3. Close the maintenance valves on compressor oil return pipeline.
4. Open the release plug on the cover plate of oil filter to ensure the pressure in internal filter has been released before next step.
5. Prepare container to collect and weight the leaked oil from replacing the filter.
6. Unscrew the bolts on the cover plate of oil filter, and remove the plate to take out the filter.
7. Replace with a new filter.
8. Replace the seal ring and lubricate it with a small amount of compressor oil.
9. Install the cover plate, screw and tighten the bolts, then open the maintenance valves of compressor oil lines.

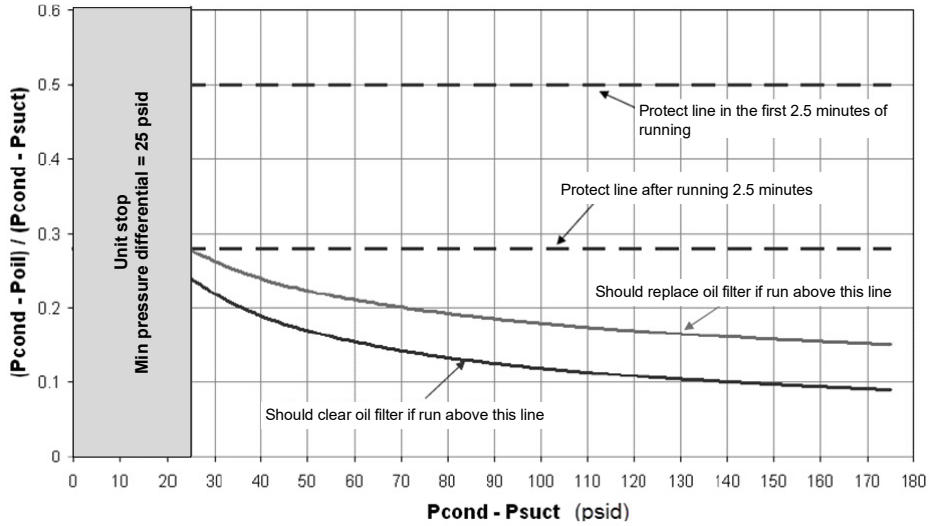


Figure 75. Oil Filter Replacement

10. Perform leak test with pressurized Nitrogen, then vacuum.
11. Charge an equal amount of new compressor oil com-paring to the leaked oil, in the method referring to the “Compressor Oil Charging”.
12. Charge a rated amount of refrigerant

Evaporator Oil Return Pipe Filter Re-place-ment

When the temperature difference is obvious between the upstream and downstream of the filter, suggest to replace it as following procedures:

1. Close both ball valve and solenoid valve at two ends of the filter.
2. Discharge the oil and refrigerant inside the filter pipe with the pin valves on the top of ball valves.
3. Replace with a new oil filter.
4. Perform leak test with pressurized Nitrogen, then vacu-um.
5. Open both ball valves and let the pipe be filled with liquid.

Coil Cleaning

Outdoor coils should be cleaned at least annually. If the unit presents in a relatively dirty environment, the cleaning fre-quency should be increased to ensure the unit operating per-formance. The suggestion is the chemical cleaning method.

⚠CAUTION

Use Cleaning Agent Correctly!

Follow manufacturer’s guidance for cleaning agent when cleaning coil to avoid the coil damage, personal injury and environmental pollution.

Water-side Heat Exchanger Main-tenance

NOTICE

Treat Water Properly!

The use of untreated or improperly treated water may result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist is required to determine what water treatment, if any, is required. The TRANE Company assumes no responsibility for equipment failures which result from untreated or improperly treated water, sa-line or brackish water.

Water-side heat exchanger is maintained based on following requirements:

- Nondestructive testing for the tubes of the heat ex-chang-er at least once every 3 years.

Note: *design a reasonable frequency for testing accord-ing to the actual conditions of unit*

- Water-side heat exchanger is a closed circulation and does not generate obvious fouling ordinarily. When unit is regarded as comforting air conditioner, if the approaching temperature difference (temperature difference between cooling outlet water and saturated evaporation) is above 5.6 °C, then the tubes of water-side heat exchanger re-

quire cleaning. Generally, chemical cleaning is performed first, followed by mechanical cleaning.

Chemical Cleaning of Water-side Heat Exchanger

Consult qualified experts in water treatment to confirm the appropriate chemical cleaning method to avoid unit damage. Figure 74 shows a typical case of chemical cleaning of reverse external circulation. All of the materials used in the external circulation system, the quantity of the solution, the duration of the cleaning period, and any required safety precautions should be approved by the company furnishing the materials or performing the cleaning. Mechanical cleaning shall be performed after completing the chemical cleaning.

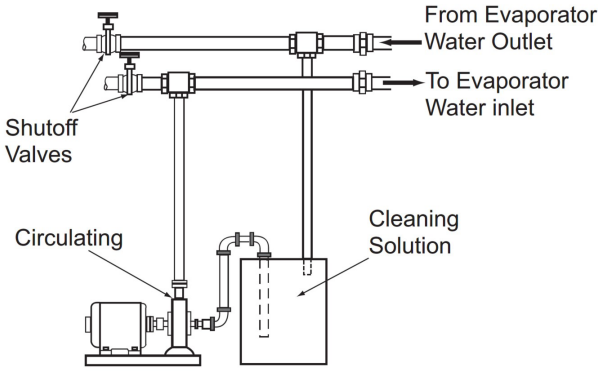


Figure 74. Chemical Cleaning

Mechanical Cleaning of Water-side Heat Exchanger

The method of mechanical cleaning is adopted for cleaning sludge or fouling of tubes. The cleaning steps are shown as following:

1. Disconnect and uninstall the water pipes connecting to water box (may be supported with lifts).

Note: *Avoid damaging the temperature sensors and insulation.*

2. Uninstall and remove watet box.

⚠WARNING

Heavy Objects!

Must pay full attention when uninstalling the water box, in order to prevent death or serious injury from falling heavy objects

3. Heat exchanger tubes cleaning. After removing the water box, use the specialized round nylon brush (1 inch size) to clean the inner surface of heat exchanger tubes. It is forbidden to use steel wire brush to avoid tube damage. Thoroughly flush the water tubes with clean water.
4. Water box reinstallation. Before installation, check whether sealing rings and gaskets of water box connections are intact; if damaged, it should be replaced with a new one after thorough washing of the sealing surface. Then tighten the bolts of water box.

Note: *Tighten bolts in a star pattern.*

5. Reinstall and reconnect the outside water pipes.
6. Perform water pipes leak test and repair the damaged insulation.

Note: *the pressure of leak test should refer to the nameplate of heat exchanger.*

Tubes Replacement of Water-side Heat Exchanger

If the tubes of water-side heat exchanger requires replace-ment, following these steps:

1. With the unit off, disconnect and lock unit power supplies.
2. Recover the refrigerant and confirm the pressure inside heat exchanger has already been released before next step.
3. Remove the side water boxes of heat exchanger.
4. Refer to Figure 15, pull and replace the heat exchange tubes in the correct pulling direction.
5. Leak Test of refrigerant side.
6. Reinstall the water box, connect external water pipes, and perform leak test of water side

NOTICE

Heat Exchanger Tubes Damage!

The heat exchanger tubes have protections at both ends and in the center. When replacing tubes, pay attention to ensure that the tubes are at the right locations, in order to prevent damage to the tubes or affecting system performance.

Compressor Replacement

If a compressor needs to be replaced follow the procedures listed below.

1. Disconnect power to the chiller. Remove the electrical junction box cover and disconnect the wires and high pressure switch etc. component.

⚠WARNING

Voltage Hazards!

Disconnect all electric power sources, including remote breakers connecting the unit before maintenance. Follow proper lockout / tag out (LOTO) procedures to ensure the power cannot be accidentally connected. Failure to do so can result in death or serious injury.

2. Recover the refrigent
3. Disassemble the vertical pillar and slanted channel on the compressor side, and use vertical pillar as temporary supporting if necessary.
4. After confirming the internal pressure of compressor has been released, disassemble all parts connecting the compressor, including suction and discharge flanges, angle valves of main oil pipes. Prepare container to collect and weight the oil drained from the compressor before unscrewing the return oil pipe connector on the bottom.
5. Dismantle the terminal box on top of compressor. Remove the 3 fixing bolts at the bottom of compressor, steadily remove the compressor from the base frame with a forklift which should support the weight of the compressor
6. Take samples of the collected oil for analyses. If the oil has deteriorated, completely drain and weight the oil inside the oil separator and oil pipes.
7. Install the new compressor. Reinstall all pipelines, connections, wires, and screws/bolts. Open the main-tenance (service) valves.
8. Reassemble the vertical pillar.
9. Vacuum and recharge the oil and refrigerant after performing the leak tests.

Note: *the weight of oil charged = the weight of oil have drained + 0.8kg.*

10. Power on for trial running. Check the suction and discharge pressure of compressor whether within the range of Table 61 after the compressor has stabilized its operation.

⚠WARNING

Compressor Damage!

Incorrect wiring will result in the compressor rotating in reverse and damaging the compressor.

Fan Replacement

Fan replacement should follow the procedures listed below:

1. Disconnect and lock power supplies.
2. Disconnect wiring in the terminal box of malfunctioned fan.
3. Remove the fixing bolts of the guard and orifice of malfunctioned fan.
4. Dismantle the components of the malfunction fan and replace with a new set, tighten the surrounding fixing bolts of the guard.
5. Reconnect the electrical wirings. Ensure the line marks are correct and the seal ring should cover on the electrical wirings without wrinkle. The wirings should be fixed on the guard with cable ties.

Note: *The water-proof nuts of fan terminal box should be tightened to prevent short circuit from moisture.*

6. Confirm the fan blades can freely rotate before power on for trial running.
7. Confirm the correct fan rotation after running

Coil Assembly or Single Coil Replacement

Coil replacement should follow the procedures:

1. Disconnect and lock power supplies.
2. Recover the refrigerant.
3. After the pressure in system has been completely released, disconnect the gas and liquid connection pipe of the coil.
4. Open the control panel, disconnect the fan power cable from the contactor, and remove the fan assembly on the coil to be replaced.

Note *1: For single coil replacement, may not need this step.*

Note *2: Record the connection position before disconnect.*

5. Fix the coil to the lift through lifting holes on the top metal plate of coil. The lifting capacity of each rope must exceed the published weight of coil.
6. Remove the malfunction coil stably and replace with a new one.

⚠WARNING

Heavy Objects!

Be aware to use proper lifting methods. Incorrect handling may result in equipment damage, personal injury or death from failing heavy objects.

7. Weld the connecting pipes of new coil, and implement pressure leakage test, then reinstall the metal plates.

⚠WARNING

Brazing Required!

- **Only qualified personnel is allowed to undertake the work.**
- **Maintain good ventilation in the jobsite.**
- **Do not perform electric or flame welding to weld re-frigerant pipelines and cooling components, unless the unit is free of any gaseous or liquid refrigerant/mixture. The refrigerant will product toxic fume once contact with flame.**
- **Must prepare proper protection measures corresponding to the unit. Ensure fire extinguishers are available if a fire has started.**
- **Nitrogen purge is required during the brazing.**

8. Vacuum and recharge the refrigerant.
9. Power on for trial running. Check the evaporator approach and condenser approach whether within the range of Table 61 after the compressor run stably.

Water side heat exchanger replacement

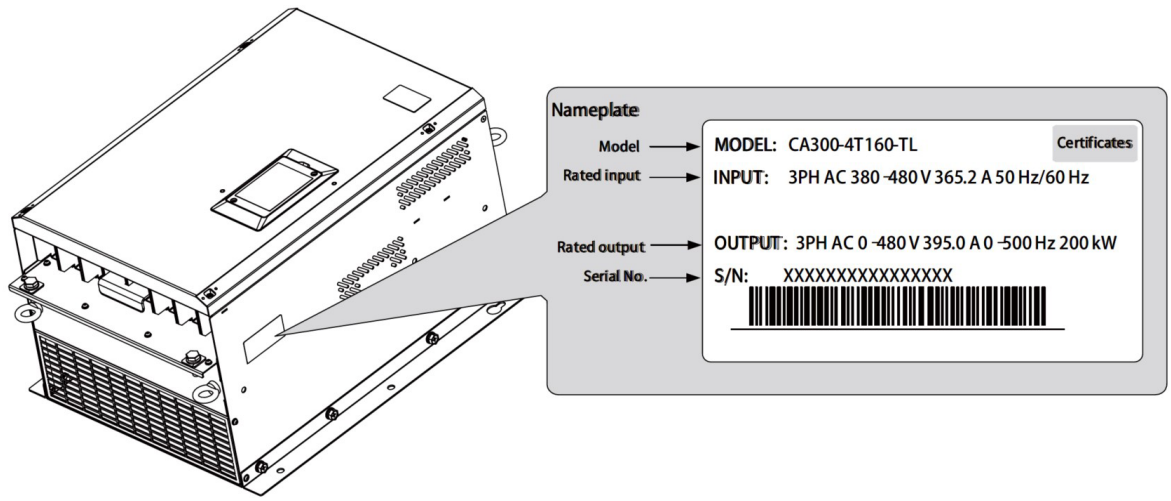
For water side heat exchanger replacement, please follow the following steps:

1. Follow steps 1~6 of the “Coil Assembly or Single Coil Replacement” , remove the coil group smoothly.
2. Close the cut-off valve in water loop, drain the water out of the heat exchanger, and dismantle the water loop connection from inlet and outlet flange of water port on heat exchanger.
3. Remove the power cable of the electrical heater in the water chamber and heat exchanger shell. Disconnect the temperature sensor from the bus.
4. Break the pipes connection with refrigeration system in two circuits, include: suction pipes, refrigerant inlet pipes, oil return pipes, etc.
5. Use the spars to lift and move the water side heat exchanger smoothly.
6. Hoist the new water-side heat exchanger into the unit and fix it.
7. Connect all the pipes to refrigeration system (may need welding), related connection fittings. And connect all the electrical or sensor cable.
8. Check or replace the filter element of the drying filter according to the method of “Refrigerant Filter Replacement Procedure”.
9. Leak detection, vacuum extraction and filling of the refrigerant side.
10. Connect water loop pipes and check leaks.
11. After passing steps 1~15 of “Pre-Start Checkout”, the unit can be started by follow the Unit Start UP Procedure.

Drive

CA300 Series Drive Overview

Nameplate And Model Description



CA300 - 4T 160 - TL

TL	Trane
-	Default

Mark	75	90	…	220
Application Motor (kW)	75	90	…	220

Voltage Class	Three phase 380 to 480V

AC Drive Series

Description of Parts

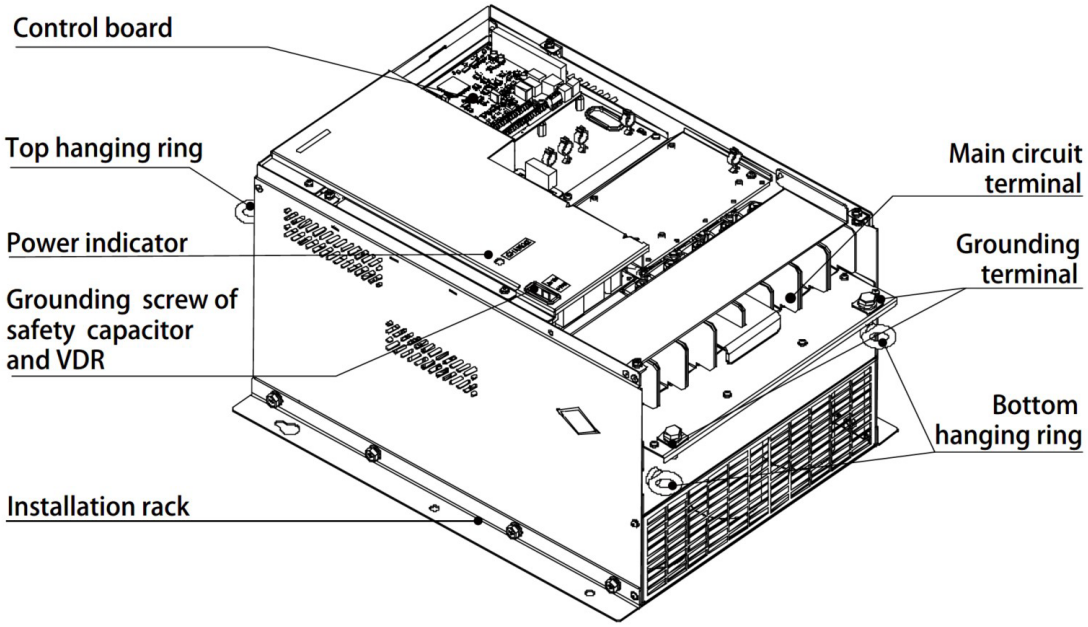


Figure 76. AC drive components (75 to 160kW)

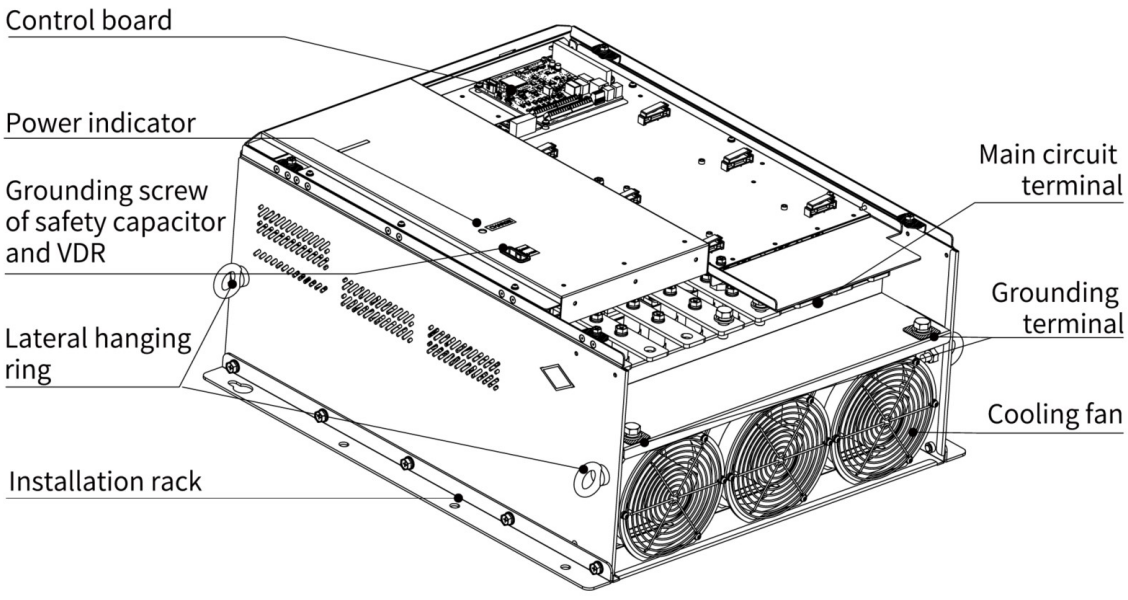


Figure 77. AC drive components (200 to 220kW)

Technical Specifications

Table 65. Product models and electrical parameters

Model	Power Capacity	Input Current	Output Current	Motor
	(kVA)	(A)	(A)	(kW)
CA300-4T75	131	136	150	75
CA300-4T90	153	162	177	90
CA300-4T110	181	194	212	110
CA300-4T132	219	238	260	132
CA300-4T160	270	291	315	160
CA300-4T200	328	365	395	200
CA300-4T220	375	394	426	220

Table 66. Technical specifications

	Item	Description
Standard functions	Output frequency	0 Hz to 500 Hz
	Carrier frequency	2 kHz to 8 kHz, automatically adjusted with the load
	Input frequency resolution	• Digital setting: 0.01 Hz • Analog setting: Maximum frequency x 0.025%
	Control mode	• SVC • V/F
	Overload capability	110% of rated current for 60s
	Torque boost	• Auto boost • Customized boost 0.1 % to 30.0 %
	V/F curve	• Straight-line V/F curve • Multi-point V/F curve • Square V/F curve • Complete V/F separation • Half V/F separation
	Ramp mode	• Straight-line ramp • S-curve ramp • Four separate acceleration/deceleration time settings in the range of 0.0s to 6500.0s
	Jog running	Frequency range of jog running: 0.00 Hz to 50.00 Hz Acceleration/Deceleration time of jog running: 0.0s to 6500.0s
	Onboard multiple preset speeds	The system implements up to eight speeds by using controlterminals.
	Onboard PID	The system implements the proportional-integral-derivative (PID) function in the closed-loop control.
	Automatic voltage regulation (AVR)	The system maintains a constant output voltage automatically when the grid voltage changes through the permissible range.
	Overvoltage and overcurrent stall control	The system limits the output current and voltage automatically during operation to prevent frequent or excessive trips.
	Overcurrent fast prevention	The system minimizes overcurrent faults to ensure normal drive operation.
	Power dip ride-through	Load feedback energy compensates for any voltage reduction, allowing the drive to continue to operate for a short time during power dips. The RUN indicator on the operating panel blinks after power dip ride-through is enabled.
	Overcurrent fast prevention	This function helps to avoid frequent overcurrent faults.
	Timing control	Time range: 0.0 minutes to 6500.0 minutes
	Communication bus	Modbus is supported.
Keypad & display(format)	LED display	ws parameters.
	Key locking and function selection	Keys on the control panel can be locked or partially locked electronically to prevent accidental operation. The range of some functions can be limited to a permitted range to prevent incorrect settings.
Protection	-	Motor short-circuit detection upon power-on, input/output phase loss protection, overcurrent protection, overvoltage protection, undervoltage protection, overheat protection, and overload protection.

	Item	Description
Running	Command source	Allows different methods of switching between command sources: • Operating panel (keypad & display) • Terminal I/O control • Serial communication
	Main frequency reference setting channel	Supports up to 10 frequency reference setting channels and allows different methods of switching between frequency reference setting channels: • Digital setting • Analog voltage reference • Analog current reference • Pulse reference • Communication reference
	Auxiliary frequency reference	Supports up to 10 auxiliary frequency sources, and allows fine tuning of the auxiliary frequency and main & auxiliary calculation.
	Input terminals	• Seven DI terminals with 100 Hz maximum input frequency • Three AI terminals that support 0 V to 10 V/0 mA to 20 mA • input and PT100 input
	Output terminals	• Four DO terminals • Three relay output terminals, one of which has NO and NC • contacts and the other two have NO terminals • Three AO terminals that support 0 mA to 20 mA current • output or 0 V to 10 V voltage output
	Communication terminal	One RS485 communication terminal
Environment	Altitude	• Below 1500 m • The AC drive runs properly when the altitude is below 1500 m. If the altitude exceeds 1500 m, de-rate the AC drive by 1% with increase of every 100 m. • Max. 3000 m for LVD directive requirement.
	Operation temperature	• -20°C to +55°C • If the ambient temperature exceeds 40°C, de-rate the drive by 1% with increase of every 1°C.
	Humidity	Less than 95% RH non-condensing.
	Vibration	2 g for boards, conformance to transport standards.
	Storage temperature	-25°C to +70°C
	IP rating	IP20/IP22
Mains	Applicable mains	TN or TT

Outline Dimensions

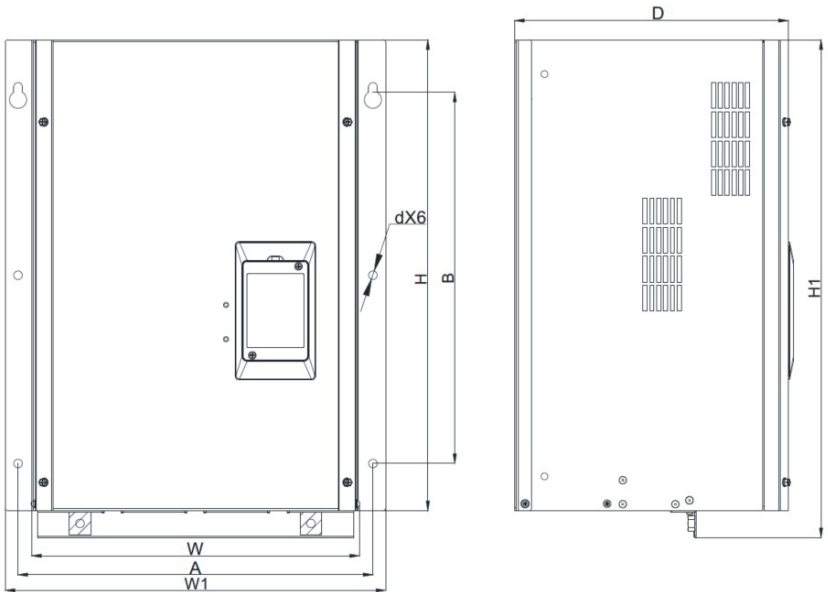


Figure 78. Outline dimensions (75 to 160kW)

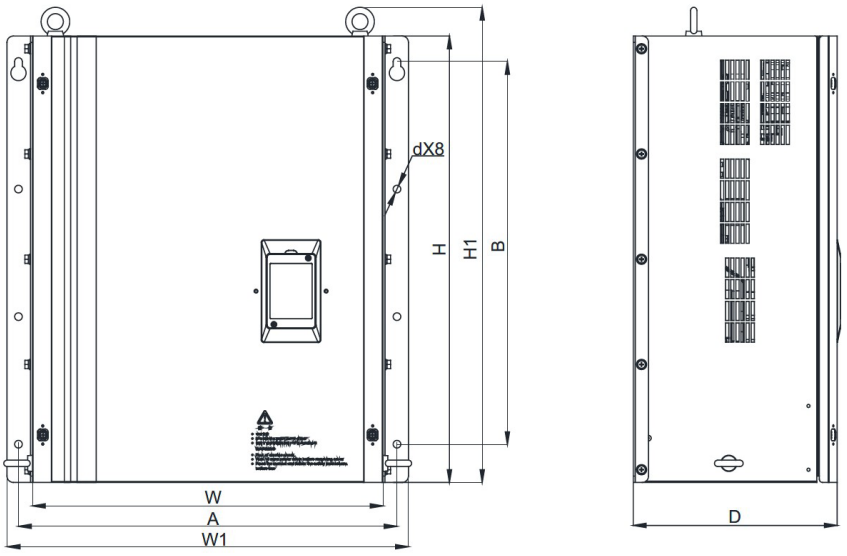
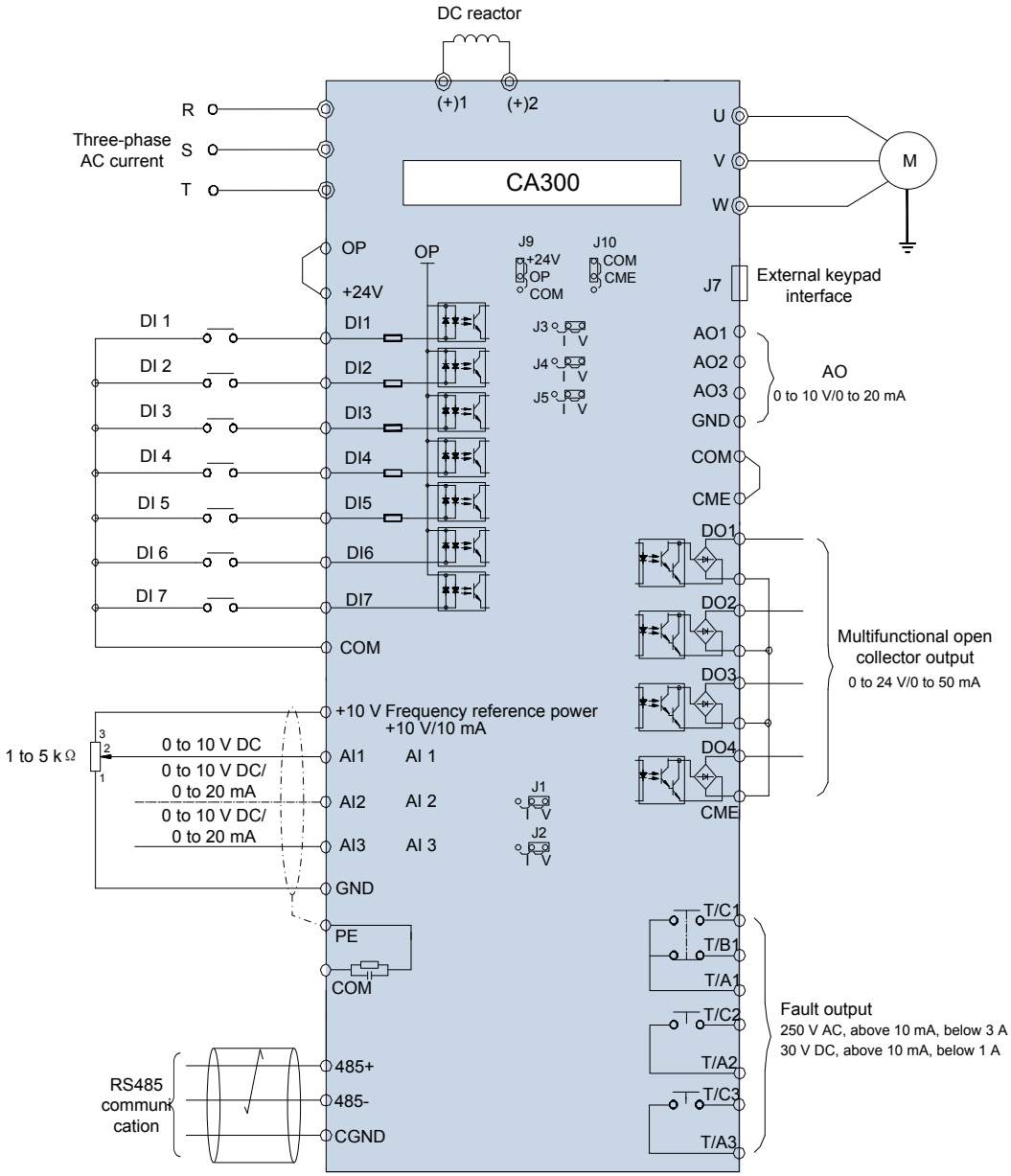


Figure 79. Outline dimensions (200 to 220kW)

Model	Mounting Hole (mm)		Dimensions (mm)					Mounting Diameter d	Weight (kg)
	A	B	W	W1	H	H1	D	(mm)	
CA300-4T75 CA300-4T90 CA300-4T110 CA300-4T132 CA300-4T160	415	433.6	383	445	550	581.5	320	10	42
CA300-4T200 CA300-4T220	594	600	550	630	700	745	320	12	89

Wiring

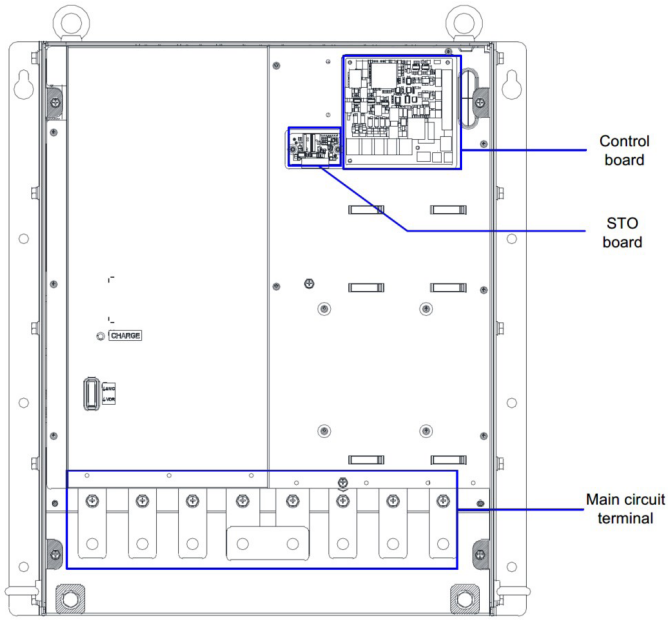
Standard Wiring



⚠CAUTION

- **To avoid accidental operation resulting from noise interference, separate the signal cable and power cable by more than 10 cm, and configure the input and output of the main circuit separately.**
- **Do not drop any cable cuttings into the AC drive during the wiring process. Failure to comply may result in errors, faults, and accidental operation.**
- **Keep the AC drive clean. Prevent cuttings and dust from entering the AC drive when drilling mounting holes on the control cabinet and other devices.**

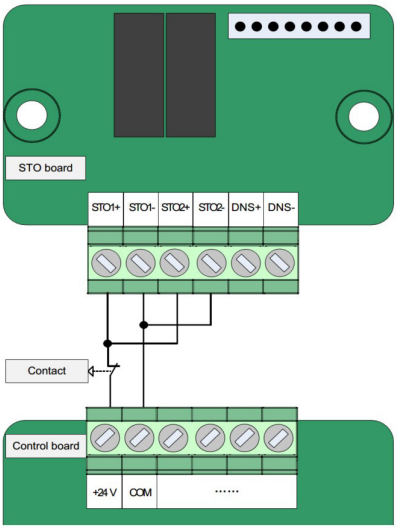
Main Circuit Terminals



Type	Mark	Name	Function
Main Circuit	R, S, and T	Three-phase power input	Connected to the mains supply
	U, V, and W	AC drive output	Connected to the motor
	(+1) and (+2)	AC reactor connection	Connected to the DC reactor
	⏚	Grounding terminal	Grounding

Control Circuit Terminals

- **Internal power supply for the STO board**



STO1+ and STO2+ are connected by NC contacts to the positive pole of the 24 V power supply. STO1- and STO2- are directly connected to the negative pole. When contacts are closed, the AC drive runs properly with 24 V input. When contacts are open, the AC drive executes an emergency stop.

Panel Operation

Introduction

Using the operating panel, you can set and modify parameters, monitor working status, and perform running control (start/stop) of the AC drive. You can also equip an external panel using the option LED operating panel (MD32NKE1) or LCD operating panel (MDKE9).

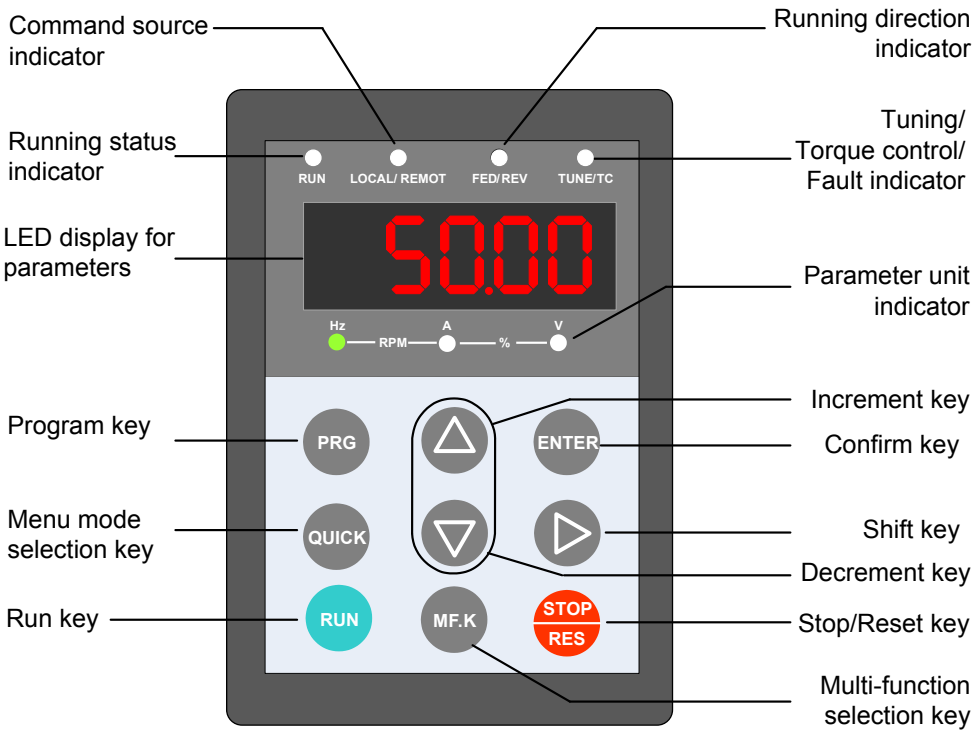


Figure 80. Details of the operating panel

Keys on LED operating Panel

Function of keys on the LED operating panel

Key	Key Name	Function
PRG	Programming	Used to enter or exit the level-1 menu.
ENTER	Confirm	Used to enter the menu interfaces level by level, and confirm the parameter setting.
△	Increment	Used to increase the displayed data or parameter number.
▽	Decrement	Used to decrease the displayed data or parameter number.
▷	Shift	Used to select the displayed parameters in turn in the stop or running state and select the digit to be modified during parameter modification.
RUN	RUN	Used to start the AC drive in the operating panel control mode.
STOP RES	Stop/Reset	Used to stop the AC drive when it is in the running status or reset the AC drive when it is in the faulty status.
MF.K	Multifunction	Used to switch over between functions.
QUICK	Menu mode selection	Used to switch over between menu modes as defined by the setting of FP-03 (Selection of individualized parameter display). By default, one menu mode is set.

Function Indicators

Indicates the light turns on, indicate the light turns off, and indicate the lignt flashes.

Table 67. Indicators on the operating panel

Indicator Status		Description
RUN Running status indicator	RUN	OFF: STOP status
	RUN	ON : RUNNING status
LOCAL/ REMOT Command source indicator	LOCAL/ REMOT	OFF: under operating panel control
	LOCAL/ REMOT	ON : under terminal control
	LOCAL/ REMOT	FLASHING : under serial communication control
TUNE/TC Tuning/ Torque control/ Fault indicator	TUNE/TC	OFF: normal running
	TUNE/TC	ON: torque control mode
	TUNE/TC	FLASHING SLOWLY: indicates auto-tuning status (once a second)
	TUNE/TC	FLASHING QUICKLY: indicates a fault condition (four times a second)
FWD/REV Running direction indicator	FED/REV	OFF : forward motor rotation
	FED/REV	ON : reverse motor rotation
Hz RPM A % V		Frequency unit : Hz
Hz RPM A % V		Current unit : A
Hz RPM A % V		Voltage unit : V
Hz RPM A % V		Speed unit : RPM
Hz RPM A % V		Percentage %

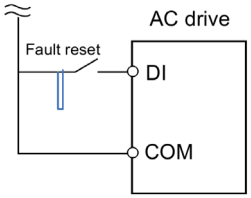
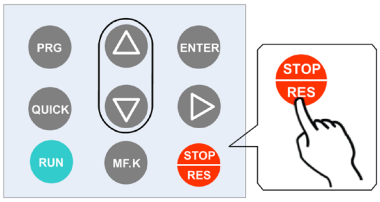
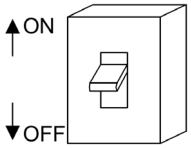
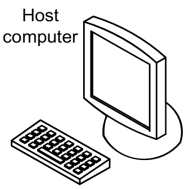
Trouble Shooting

Fault Display and Reset

Faults are handled prior to alarms.

- Example of fault code displayed: 
- Example of alarm code displayed: 

When a fault occurs during running, the AC drive stops output immediately, the fault indicator TUNE/TC flashes, and contact of the faulty relay acts. The following table lists faults and solutions for reference. Perform troubleshooting according to the descriptions and do not repair or modify the AC drive randomly. If the fault cannot be rectified, contact us or the agent.

Stage	Solution	Remarks
After the fault occurs	Check operating panel for detailed information of recent three faults, such as fault type and frequency, current, bus voltage, DI/DO state, accumulative power-on time and accumulative running time, IGBT temperature, and fault subcode at occurrence of the faults.	View this information via F9-14 to F9-46. 
Before the fault is reset	Find and remove cause of the fault. Then follow steps below to reset the fault.	Troubleshoot the fault according to section "Symptoms and Diagnostics".
Fault resetting method	Fault resetting through a DI terminal Allocate a DI terminal with function 9 "Fault reset (RESET)" by setting any of F4-00 to F4-04 to 9.	
	Fault resetting via operating panel Press the STOP key on operating panel.	
	Automatic resetting Disconnect the power supply. Until the fault code disappears, connect the power supply again.	
	Fault resetting via host computer Confirm that F0-02 = 2 and write "7" (fault reset) to communication address 2000H.	

Symptoms And Diagnostics

You may come across the following symptoms during the use of the AC drive. Refer to the following table for simple analysis.

Table 68. Symptoms and diagnostics

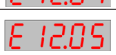
No.	Fault Description	Cause	Possible Solution
1	There is no display while power-on. 	The mains voltage is not input or too low.	Check the power supply.
		The switching power supply on drive board of the AC drive is faulty.	Check bus voltage.
		Control board or operating panel is faulty.	Contact us or the agent.
		Rectifier module is damaged.	
2	“HC” is displayed while power-on. 	Related components on control board are damaged.	Contact us or the agent
		The motor or motor cable is short circuited to ground.	
		The hall is damaged.	
		The mains voltage is too low.	
3	“E23.00” is displayed at power-on. 	Motor or motor output cable is short circuited to ground.	Use a megger to measure insulation resistance of motor and motor cable.
		The AC drive is damaged.	Contact us or the agent
4	The display is normal while power-on. But after running, “HC” is displayed and the drive stops immediately. 	The cooling fan is damaged or locked-rotor occurs.	Replace the fan.
		Short circuit exists in wiring of control terminals.	Eliminate short circuit fault in control circuit wiring.
5	E14.00 (IGBT overheat) is detected frequently. 	The setting of carrier frequency is too high.	Reduce carrier frequency (F0-15).
		The cooling fan is damaged, or ventilation is clogged.	Replace the fan or clean the ventilation.
		Components inside the AC drive are damaged (thermistor or others).	Contact us or the agent
6	The motor does not rotate after the AC drive runs.	It is motor or motor cable problem.	Check that wiring between AC drive and motor is normal.
		Related AC drive and motor parameters are set improperly.	Restore the factory parameters and re-set the following parameters properly: Motor ratings, such as rated motor frequency and rated motor speed Motor 1 control mode (F0-01) and command source selection (F0-02) F3-01 (torque boost) in V/F control under heavy-load start.
		The drive board is faulty.	Contact us or the agent
7	DI terminals are disabled.	Related parameters are set incorrectly.	Check and set parameters in group F4 again.
		External signals are incorrect.	Re-connect external signal cables.
		Jumper across OP and +24 V becomes loose.	Re-confirm the jumper bar across OP and +24 V.
		The control board is faulty.	Contact us or the agent
8	The AC drive detects overcurrent and overvoltage frequently.	Motor parameters are set improperly.	Set motor parameters or perform motor auto-tuning again.
		Acceleration/Deceleration time is improper.	Set proper acceleration/deceleration time.
		Load fluctuates.	Contact us or the agent
9	The motor coasts to stop or braking is disabled during deceleration or deceleration to stop.	Voltage limit is enabled.	If braking resistance is configured, disable voltage limit (F3-23 = 0).

Faults And Diagnostics

Table 69. Faults and diagnostics

Fault Name	Operating Panel Display	Cause	Possible Solution
Hardware fault	E01.01	The AC drive has abnormal current sampling.	Check whether the main circuit is powered on. Check whether the hall sensor or current sampling circuit is damaged. If yes, contact us or the agent.
	E01.02	The contactor is faulty.	Check the contactor.
	E01.03	The braking resistor is short- circuited.	Check that the braking resistor is normal and its model matches the AC drive model.
Overcurrent during acceleration	E02.00	Ground fault or short circuit exists in the output circuit.	Check whether short circuit occurs on the motor, motor cable or contactor.
		Control mode is SVC but motor auto-tuning is not performed.	Set motor parameters according to motor nameplate and perform motor auto-tuning.
		Acceleration time is too short.	Increase acceleration time.
		The overcurrent stall prevention parameters are set improperly.	Ensure that current limit is enabled (F3-19 = 1). The setting of current limit level (F3-18) is too large. Adjust it between 110% and 140%. The setting of current limit gain (F3-20) is too small. Adjust it between 5 and 20.
		Customized torque boost or V/F curve is not appropriate.	Adjust the customized torque boost or V/F curve.
		The spinning motor is started.	Enable the catching a spinning motor function or start the motor after it stops.
		The AC drive suffers external interference.	View historical fault records. If the current value is far from the overcurrent level, find interference source. If external interference does not exist, it is the drive board or hall device problem.
Overcurrent during deceleration	E03.00	Ground fault or short circuit exists in the output circuit.	Check whether short circuit occurs on the motor, motor cable or contactor.
		Control mode is SVC but motor auto-tuning is not performed.	Set motor parameters according to motor nameplate and perform motor auto-tuning.
		Deceleration time is too short.	Increase deceleration time.
		The overcurrent stall prevention parameters are set improperly.	Ensure that current limit is enabled (F3-19 = 1). The setting of current limit level (F3-18) is too large. Adjust it between 110% and 140%. The setting of current limit gain (F3-20) is too small. Adjust it between 5 and 20.
		Braking unit and braking resistor are not installed.	Install braking unit and braking resistor.
		The AC drive suffers external interference.	View historical fault records. If the current value is far from the overcurrent level, find interference source. If external interference does not exist, it is the drive board or hall device problem.
Overcurrent at constant speed	E04.00	Ground fault or short circuit exists in the output circuit.	Check whether short circuit occurs on the motor, motor cable or contactor.
		Control mode is SVC but motor auto-tuning is not performed.	Set motor parameters according to motor nameplate and perform motor auto-tuning.
		The overcurrent stall prevention parameters are set improperly.	Ensure that current limit is enabled (F3-19 = 1). The setting of current limit level (F3-18) is too large. Adjust it between 110% and 140%. The setting of current limit gain (F3-20) is too small. Adjust it between 5 and 20.
		The AC drive power class is small.	If output current exceeds rated motor current or rated output current of the AC drive during stable running, replace a drive of larger power class.
		The AC drive suffers external interference.	View historical fault records. If the current value is far from the overcurrent level, find interference source. If external interference does not exist, it is the drive board or hall device problem.

Drive

Fault Name	Operating Panel Display	Cause	Possible Solution
Overvoltage during acceleration		Input voltage is too high.	Adjust input voltage to normal range.
		An external force drives motor during acceleration.	Cancel the external force or install a braking resistor.
			The setting of frequency rise threshold during voltage limit (F3-26) is too small. Adjust it between 5 Hz and 15 Hz.
		The overvoltage stall prevention parameters are set improperly.	Ensure that the voltage limit function is enabled (F3-23 = 1). The setting of voltage limit (F3-22) is too large. Adjust it between 700 V and 770 V. The setting of frequency gain for voltage limit (F324) is too small. Adjust it between 30 and 50.
		Braking unit and braking resistor are not installed.	Install braking unit and braking resistor.
		Acceleration time is too short.	Increase acceleration time.
Overvoltage during deceleration		The overvoltage stall prevention parameters are set improperly.	Ensure that the voltage limit function is enabled (F3-23 = 1). The setting of voltage limit (F3-22) is too large. Adjust it between 700 V and 770 V. The setting of frequency gain for voltage limit (F324) is too small. Adjust it between 30 and 50.
		An external force drives motor during deceleration.	Cancel the external force or install a braking resistor. The setting of frequency rise threshold during voltage limit (F3-26) is too small. Adjust it between 5 Hz and 15 Hz.
		Deceleration time is too short.	Increase deceleration time.
		Braking unit and braking resistor are not installed.	Install braking unit and braking resistor.
Overvoltage at constant speed		The overvoltage stall prevention parameters are set improperly.	Ensure that the voltage limit function is enabled (F3-23 = 1). The setting of voltage limit (F3-22) is too large. Adjust it between 700 V and 770 V. The setting of frequency gain for voltage limit (F3-24) is too small. Adjust it between 30 and 50.
		An external force drives motor during running.	Cancel the external force or install a braking resistor. The setting of frequency rise threshold during voltage limit (F3-26) is too small. Adjust it between 5 Hz and 15 Hz.
Pre-charge resistor overload		Input voltage is not within the permissible range, causing frequent ON/OFF of contactor.	Adjust the voltage to normal range to ensure that bus voltage fluctuation does not cause frequent contactor ON/OFF.
Undervoltage		Instantaneous power failure occurs.	Enable the power dip ride through function (F9-59 ≠ 0).
		The AC drive's input voltage is not within the permissible range.	Adjust the voltage to normal range.
		The bus voltage is abnormal.	Contact us or the agent.
		The rectifier bridge, the inverter drive board or the inverter control board is abnormal.	Contact us or the agent.
AC drive overload		Load is too heavy or locked-rotor occurs on motor.	Reduce load or check motor and mechanical conditions.
		The AC drive power class is small.	Replace a drive of larger power class.
		Control mode is SVC but motor auto-tuning is not performed.	Set motor parameters according to motor nameplate and perform motor auto-tuning.
		The control mode is V/F.	Reduce the setting of F3-01 (torque boost) by 1.0% gradually, or set it to 0 (auto torque boost).
Pulse-by-pulse current limit fault		Load is too heavy or locked-rotor occurs on motor.	Reduce load or check motor and mechanical conditions. Replace a drive of larger power class.
		The AC drive power class is small.	
Motor overload		F9-01 (Motor overload protection gain) is set improperly.	Set F9-01 correctly.
		Load is too heavy or locked-rotor occurs on motor.	Reduce load or check motor and mechanical conditions.
Input voltage fault		R phase is lost.	Check whether input phase loss occurs. Check whether input cable is broken. Check that DI terminals are properly connected. Check the hardware voltage detection circuit.
		S phase is lost.	
		T phase is lost.	
		Overvoltage occurs on input phase.	Adjust the voltage to normal range.
		Voltage imbalance occurs on input phase.	Check whether input phase loss occurs. Check the hardware voltage detection circuit.

Fault Name	Operating Panel Display	Cause	Possible Solution
Output phase loss	E 13.00	Motor winding is damaged.	Check resistance between motor wires. Replace motor if winding is damaged.
		The cable connecting the AC drive and the motor is abnormal.	Check for wiring errors and ensure the output cable is connected properly. Correct wiring.
		The AC drive's three-phase outputs are unbalanced when the motor is running.	Check whether the motor three-phase winding is normal.
		The drive board or the IGBT is abnormal.	Contact us or the agent.
IGBT overheat	E 14.00	The ambient temperature is too high.	Lower the ambient temperature.
		The ventilation is clogged.	Clean the ventilation.
		The cooling fan is damaged.	Replace the fan.
		Thermally sensitive resistor of IGBT is damaged.	Contact us or the agent.
		IGBT is damaged.	
External fault	E 15.01	External fault signal is input via NO DI.	Confirm that the mechanical condition allows restart (F8-18) and reset the operation.
	E 15.02	External fault signal is input via NC DI.	Confirm that the mechanical condition allows restart (F8-18) and reset the operation.
Communication fault	E 16.01	Modbus communication timeout	Check whether the RS485 cable is correctly connected. Check whether the setting of Fd-04 and PLC communication cycle are proper.
Motor auto-tuning fault	E 19.02	Auto-tuning of pole position angle of synchronous motor is faulty.	It is possible the motor is not connected, or output phase loss occurs.
	E 19.04		
	E 19.05	Auto-tuning of initial pole position angle of synchronous motor is faulty.	Increase the setting of F2-29 (initial position angle test current of synchronous motor).
	E 19.06	Stator resistance auto-tuning is faulty.	Check whether the motor is not connected. Ensure that rated motor current (F1-03) is set according to motor nameplate.
	E 19.07		
	E 19.08		
	E 19.09	Auto-tuning of instantaneous leakage inductance of asynchronous motor is faulty.	Check whether the motor is not connected or output phase loss occurs. Ensure that the motor is connected.
	E 19.10		
	E 19.11	Inertia auto-tuning is faulty.	Ensure that rated motor current (F1-03) is set according to motor nameplate. Increase the setting of inertia auto-tuning and dynamic speed reference (F2-43).
	E 19.12	Auto-tuning times out.	Check whether the motor is not connected or output phase loss occurs. Ensure that the motor is disconnected from load.
	E 19.13		
	E 19.14		
	E 19.15		
	E 19.16		
	E 19.17		
	E 19.19		
	E 19.20	Auto-tuning of installation angle of no-load synchronous motor times out.	Check the Z feedback signal.
	E 19.22		
	E 19.23	Auto-tuning of pole position of synchronous motor is faulty.	Ensure that rated motor current (F1-03) is set according to motor nameplate. Decrease the setting of F2-29 (initial position angle test current of synchronous motor).
	E 19.24	Auto-tuning of instantaneous leakage inductance of asynchronous motor is incorrect.	Check whether the AC drive power class is small,and replace an AC drive of proper power class based on motor power.
EEPROM read and write fault	E2 1.01	EEPROM read and write is abnormal.	For parameters written to EEPROM, check RAM addresses and address mapping. For details, see the address expression rules in the Appendix. If the EEPROM chip is damaged, replace the main control board.
	E2 1.02		
	E2 1.03		
	E2 1.04		

Drive

Fault Name	Operating Panel Display	Cause	Possible Solution
Abnormal motor auto-tuning result	E22.00	Stator resistance is not within the permissible range.	Check whether rated motor voltage and current are incorrectly set, and set F1-02 and F1-03 according to motor nameplate. Check that auto-tuning is performed after the motor stops.
	E22.01	Asynchronous motor rotor resistance is not within the permissible range.	
	E22.02	No-load current and mutual inductive reactance of asynchronous motor are not within the permissible range. If such an alarm is generated, the AC drive calculates no-load current and mutual inductive reactance based on known parameters. The calculated values may be different from optimal values.	Set motor parameters in group F1 according to motor nameplate. Before auto-tuning, ensure that the motor has no load.
	E22.03	Synchronous motor back EMF is not within the permissible range.	Ensure that rated motor voltage (F1-02) is set according to motor nameplate. Before auto-tuning, ensure that the motor has no load.
	E22.04	Inertia auto-tuning is faulty.	Ensure that rated motor current (F1-03) is set according to motor nameplate.
Short circuit to ground	E23.00	Motor is short circuited to the ground.	Replace cable or motor.
Motor phase-to-phase short circuit	E24.00	Phase-to-phase short circuit occurs on motor.	Check whether two-phase short circuit occurs in three-phase (U, V, W) output.
Accumulative running time reached	E26.00	Accumulative running time reaches the setting value.	Clear the record through parameter initialization.
Accumulative power-on time reached	E29.00	Accumulative power-on time reaches the setting value.	Clear the record through parameter initialization.
Load loss	E30.00	The output current of AC drive is smaller than F9-64 (load loss detection level).	Check whether load is disconnected or the setting of F9-64 and F9-65 (load lost detection time) satisfies actual running condition.
PID feedback lost during running	E31.00	PID feedback is smaller than the setting value of FA-26 (detection level of PID feedback loss).	Check PID feedback or set FA-26 properly.
Speed feedback lost error	E42.00	Motor auto-tuning is not performed.	Perform motor auto-tuning.
		F9-69 (detection level of speed error) and F9-70 (detection time of speed error) are set incorrectly.	Set F9-69 and F9-70 correctly based on actual condition.
Motor over-speed	E43.00	Encoder parameters are set improperly.	Set encoder parameters properly.
		Motor auto-tuning is not performed.	Perform motor auto-tuning.
		F9-67 (Over-speed detection level) and F9-68 (Over-speed detection time) are set incorrectly.	Set F9-67 and F9-68 correctly based on actual condition.
Motor overheat	E45.00	Cable connection of temperature sensor becomes loose.	Check cable connection of temperature sensor.
		The motor temperature is too high.	Decrease carrier frequency or take other measures to cool the motor.
		The setting of F9-57 (motor overheat protection threshold) is too small.	Increase the setting of F9-57 (90° C to 100° C for common motor).
Synchronous control parameter setting fault	E46.01	More than two slave types are set.	Check whether the slave option is selected for A8-10, A8-50, and A8-70.
STO fault	E47.00	The STO card is faulty.	Check STO wiring.

Maintenance

Rountine Maintenance

Check the following items daily to ensure normal running and prevent damage to the AC drive. Copy this checklist and sign the “Checked” column after each inspection.

Inspection Item	Inspection Points	Solutions	Checked
Motor	Inspect whether the abnormal sounds and vibration occur on the motor.	• Check whether the mechanical connection is normal. • Check whether output phase loss occurs on the motor. • Check whether retaining screws of the motor are tightened.	
Fan	Inspect whether the cooling fan of the AC drive and motor work abnormally.	• Check running of the cooling fan of the AC drive. • Check whether the cooling fan of the motor is normal. • Check whether the ventilation is clogged. • Check whether the ambient temperature is within the permissible range.	
Installation environment	Inspect whether the cabinet and cable duct are abnormal.	• Check input and output cables for damaged insulation. • Check for vibration of the hanging bracket. • Check whether ground bars and terminals become loose or get corroded.	
Load	Inspect whether the running currentof the AC drive exceeds the rated current of the AC drive and motor for a certain period.	• Check whether motor parameters are set properly. • Check whether the motor is overloaded. • Check whether the mechanical vibration is severe (allowed range: < 1 g).	
Input Voltage	Inspect whether the power voltage ofthe main and control circuits is within the allowed range.	• Check that the input voltage is within the allowed range. • Check whether start of heavy load exists.	

Service Life of Wear Parts

The service life of fans and electrolytic DC bus capacitors is related to the operating environment and maintenance status. The general service life is listed as follows.

Components	Service Lift [1]
Fan	> 5 years
Electrolytic capacitor	> 5 years

[1] You can determine when to replace these parts according to the actual operating time.
- Ambient temperature : 40 °C
- Load rate : 80%

Replacing Cooling Fans

1. Possible damage causes: bearing worn and blade aging
2. Judging criteria: whether there is crack on the blade; whether there is abnormal vibration noise upon startup; whether the blade runs abnormally
3. Replacement method:

Removing the Fans

①. Disconnect the fan power cables (marked by blue circles in the following figure).
②. Remove the M4 screws (marked by red circles in the following figure) from the fan cover.
③. Remove the fan and fan cover.

Installing the Fans

①. Install the fan in a reverse procedure to removal. Pay attention to the direction of the fan.
②. After the replacement is completed, check that the air flow direction is upright.

Function Code

Table 70. Function code

Cir 1			Cir 2		
Para. No.	**Para. Value**	**Description**	**Para. No.**	**Para. Value**	**Description**
F0-01	2	V/F control	F0-01	2	V/F control
F0-02	2	Serial comms.	F0-02	2	Serial comms.
F0-03	9	Communication setting	F0-03	9	Communication setting
F0-10	50	Max. frequency	F0-10	50	Max. frequency
F0-12	50	Frequency upper limit	F0-12	50	Frequency upper limit
F0-14	30	Frequency lower limit	F0-14	30	Frequency lower limit
F0-15	2	Carrier frequency	F0-15	2	Carrier frequency
F0-17	6	Acceleration time	F0-17	6	Acceleration time
F0-18	20	Deceleration time	F0-18	20	Deceleration time
F1-01	Power	Parameters on the motor nameplate	F1-01	Power	Parameters on the motor nameplate
F1-02	Voltage		F1-02	Voltage	
F1-03	Current		F1-03	Current	
F1-04	Frequency		F1-04	Frequency	
F1-05	Speed		F1-05	Speed	
A4-00	1	DC power calculation enabled	A4-00	1	DC power calculation enabled
A4-01	97.3	Power correction coefficient	A4-01	97.3	Power correction coefficient
F4-01	0	DI2 filter overtemperature protection. 1) If the overtemperature protection contact of the filter is connected between DI2 and COM, set F4-01 to 52. In this case, Err62 is reported when no signal is connected. 2) Set to 0 by default.	F4-01	0	DI2 filter overtemperature protection. 1) If the overtemperature protection contact of the filter is connected between DI2 and COM, set F4-01 to 52. In this case, Err62 is reported when no signal is connected. 2) Set to 0 by default.
F5-02	1	TA/TC running status output	F5-02	1	TA/TC running status output
F5-03	0	PA/PC filter control signal. 1) Control filter capacitance; set to 52; PA/PC connected for filter control in serial 2) Set to 0 by default.	F5-03	0	PA/PC filter control signal. 1) Control filter capacitance; set to 52; PA/PC connected for filter control in serial 2) Set to 0 by default.
Fd-00	9	Baud rate: 115200 bps	Fd-00	9	Baud rate: 115200 bps
FD-01	1	Modbus data format: 8-E-1	FD-01	1	Modbus data format: 8-E-1
FD-02	1	Local address	FD-02	2	Local address
F8-54	1	Set to 1 by default to enable the STO function.	F8-54	1	Set to 1 by default to enable the STO function.

Schematic Diagram List

Typical field connection diagram, electrical schematics drawing list for the RTAG units are shown in this section.

Unit Nominal Tonnage	Unit Type	Schematic EC Fan	Schematic AC Fan	Field Wiring Diagram
RTAG 100-230	PSE	23114568	--	23114578
RTAG 100-225	H/X	--	23114594	
RTAG 255-440	PSE	23115927	--	
RTAG 255-500	H/X	--	23115016	

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

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

RTAG-SVX002C-EN Dec 2022