Installation, Operation and Maintenance

RTAG Air-Cooled Helical Rotary Liquid Chillers

Models: RTAG

225-500 ton units (60Hz)

572598690001

SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

Feb. 2022

RTAG-SVX001H-EN

TRANE TECHNOLOGIES

Warnings, Cautions and Notices

Warnings, Cautions and Notices Note that warnings, cautions and notices appear at appropriate intervals throughout this manual. Warnings are provide 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.

Read this manual thoroughly before operating or servicing this unit.

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

Important Environmental Concerns!

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

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. 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 hook on base at name plate 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.

Literature History

1. RTAG-SVX001H-EN (March 2022)
   New manual.

Notice

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

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Unit Model Number

An example of a typical unit model number is:

RTAG	190	C	C	A	0	P	0	C	S	N	D	X	F	N	L	2	S	T	X	X	X	C	X	0	X	F	R	V	0	D	1	N	N	I	X	N
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

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 Screw Chiller

Digit 5~7 – Unit Nominal Tons
225 = 225 Nominal Tons
230 = 230 Nominal Tons
285 = 285 Nominal Tons
310 = 310 Nominal Tons
340 = 340 Nominal Tons
375 = 375 Nominal Tons
400 = 400 Nominal Tons
440 = 440 Nominal Tons
460 = 460 Nominal Tons
500 = 500 Nominal Tons

Digit 8 - Unit Power Supply
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 - Efficiency
H = High 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°F~114.8°F(-10°C~46°C)
H = High Ambient 14°F~125°F(-10°C~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(4°C~20°C)

Digit 21- Evaporator Water Pressure
L = 150psi

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

Digit 23-Thermal Insulation
S = Standard Thermal Insulation

Digit 24-Condenser Options
B = Copper tube/Al Fin Coil, with Black Coated
C = Copper tube/Copper Fin Coil

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-NoUPS
A = External Set Points & Capacity Outputs
B = Rpd rst-NoUPS, Ext.Set Pts & Cap.Output

Digit 32 – Refrigerant Charge
F = Full Charge (R134a)
N = Nitrogen (R134a)
P = 12kg Charge (R134a)

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
D = Mech Disconnect Switch
C = Circuit Breaker

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

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

Main options implementation scheme:

Medium low noise option of Sound Treatment use sound wrap depends compressor configuration: N5, N6 use tube sound wrap, N6E2 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 implement with both sound wrap and variable speed fan, adjust fan speed.

For Unit Application, High Ambient option is added with oil cooler base on Standard ambient configuration. 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
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)
065 = 065 kW (M1/50Hz)
058 = 058 kW (L2/50Hz)
048 = 048 kW (L1/50Hz)
041 = 041 kW (K2/50Hz)
036 = 036 kW (K1/50Hz)

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

CHHW Compressor Model Number

Digits 1-4
CHHW = GP2.5 Compressor Family

Digit 5
0 = All compressors

Digit 6 Frame Size
N = N Frame

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

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

Digit 9 Internal Relief
K = 450 psid

Digits 10-11 Design Sequence
** = Factory assigned

Digit 12 Capacity Limit
N = Standard capacity

Digits 13-15 Motor kW Rating
093 = N5 50Hz
112 = N5 60Hz
112 = N6 50Hz
134 = N6 60Hz

Digit 16 Volume Ratio
A = HighVolume 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 models: premium seasonal efficiency 225, 230, 285, 310, 340, 375, 400, 440 and 460; high efficiency 400 and 500. All models have dual refrigerant cycle, which shares one water loop 460 Ton PSE unit is two 230 Ton PSE units put together.

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 UC800 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 1000meter; temperature should be within the range of -18ºC ~ +52ºC; 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 -20ºC 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 nameplate, 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

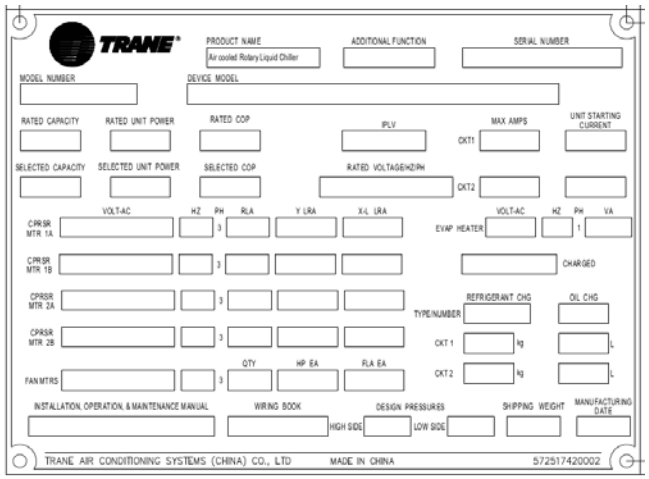


Figure 1. Unit Nameplate

Compressor nameplate

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

General Data

Table 1. General data — 225 - 460 Ton 380 Volt -60Hz premium seasonal efficiency (variable speed fan)

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	2
Min load	%	18%	18%	12%	12%	12%	9%	9%	9%	9%
Must hold current(1A/1B)	A	253/-	253/-	212/243	253/243	253/243	212/243	253/243	253/243	253/253
Must hold current(2A/2B)	A	253/-	253/-	253/-	253/-	253/-	212/243	253/243	253/243	253/253
Evaporator										
Type						Shell & Tube (CHIL)				
Rating flow	gpm	511	524	664	735	764	864	926	1012	1047.6
Rating WPD	psid	4.7	4.2	5.4	5.3	5.7	5.7	5.4	4.3	4.2
Min flow	gpm	256	262	332	367	382	432	463	506	524
Max flow	gpm	767	786	995	1102	1146	1295	1390	1518	1571
Water storage	lb	263	289	265	301	301	332	369	455	578
tube size	inch			6"				8"		6"
Fan type						Axial flow				
Quantity		12	14	14	16	16	18	18	20	28
power		1,5		1.65						1,5
Fan speed	RPM	910/200		970/200						910/200
Single fan Airflow	CFM	10036		11772						10036
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	534.1	541,7	496.9	540.2	540.2	496.9	530.8	535.5	541.7
Control panel 2	A	-	-	269	269	269	496.9	530.8	535.5	541.7
Unit start up amps										
Control panel 1	A	534.1	541.7	677.9	721.2	721.2	677.9	711.8	716.5	541.7
Control panel 2	A	-	-	269	269	269	677.9	711.8	716.5	541.7
Refrigerant charge										
ckt 1	Lb	216	229	309	348	384	326	326	403	458
ckt 2	Lb	216	229	152	165	165	326	326	403	458
Oil charge (the oil type show on unit nameplate)										
ckt 1	gal	2.1	2.1	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	gal	2.1	2.1	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension										
Length	inch	296	344	364	410	410	456	456	467,5	698
width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
height	inch	98,5	98.5	98,5	98,5	98,5	98.5	98,5	98,5	98,5
Shipping weight	lb	12642	14134	16956	18470	18506	21080	21410	22922	28268
Operation weight	lb	12904	14423	17221	18772	18808	21413	21779	23376	28846

Note: 1. Date Containing: Temperature of Inlet/outlet: 54/44°F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft² °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 selected according unit voltage, but the current value in table is base on 380V/60HZ/3Ph.

Table 2. General data — 225 - 460 Ton 460 Volt -60Hz premium seasonal efficiency (variable speed fan)

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	2
Min load	%	18%	18%	12%	12%	12%	9%	9%	9%	9%
Must hold current(1A/1B)	A	253/-	253/-	212/201	253/201	253/201	212/201	253/201	253/201	253/253
Must hold current(2A/2B)	A	253/-	253/-	253/-	253/-	253/-	212/201	253/201	253/201	253/253
Evaporator										
Type						Shell & Tube (CHIL)				
Rating flow	gpm	511	524	664	735	764	864	926	1012	1047.6
Rating WPD	psid	4.7	4.2	5.4	5.3	5.7	5.7	5.4	4.3	4.2
Min flow	gpm	256	262	332	367	382	432	463	506	524
Max flow	gpm	767	786	995	1102	1146	1295	1390	1518	1571
Water storage	lb	263	289	265	301	301	332	369	455	578
tube size	inch			6"				8"		6"
Fan type						Axial flow				
Quantity		12	14	14	16	16	18	18	20	28
power		1,5		1.65						1,5
Fan speed	RPM	910/200		970/200						910/200
Single fan Airflow	CFM	10036		11772						10036
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	Lb	216	229	309	348	384	326	326	403	458
ckt 2	Lb	216	229	152	165	165	326	326	403	458
Oil charge (the oil type show on unit nameplate)										
ckt 1	gal	2.1	2.1	4.2	4.2	4.2	4.2	4.2	4.2	4.2
ckt 2	gal	2.1	2.1	2.1	2.1	2.1	4.2	4.2	4.2	4.2
Dimension										
Length	inch	296	344	364	410	410	456	456	467,5	698
width	inch	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4	88.4
height	inch	98,5	98.5	98,5	98,5	98,5	98.5	98,5	98,5	98,5
Shipping weight	lb	12642	14134	16956	18470	18506	21080	21410	22922	28268
Operation weight	lb	12904	14423	17221	18772	18808	21413	21779	23376	28846

Note: 1. Date Containing: Temperature of Inlet/outlet: 54/44°F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft² °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 selected according unit voltage, but the current value in table is base on 460V/60HZ/3Ph.

Table 3. General data — 400 - 500 Ton 380 Volt -60Hz high efficiency (fixed speed fan)

Model	RTAG	400	500
Refrigerant	R134a	R134a	R134a
Compressor			
Model		CHHW (N5+N5, N5+N5)	CHHW (N6E+N6E;N6E+N6E)
Type		Horizontal semienclosed screw compressor	
Starter		YDEL	YDEL
Circuits		2	2
Min load	%	7,50%	7,50%
Must hold current(1A/1B)	A	243/243	318/318
Must hold current(2A/2B)	A	243/243	318/318
Evaporator			
Type		Shell & Tube (CHIL)	Shell & Tube (CHIL)
Rating flow	gpm	1154	944
Rating WPD	psid	5,6	5,6
Min flow	gpm	577	472
Max flow	gpm	1730	1416
Water storage	lb	369	455
tube size	inch	8"	8"
Air side heat exchanger			
Fan type		Axial flow	Axial flow
Quantity		18	20
Power	kW/per	2	2
Fan speed	RPM	860	860
Single fan Airflow	CFM	11478	11478
Fan current	A	4,7	4,7
Unit Max RLA(Max Compr+Fan+Control)			
Control panel 1	A	530,8	685,5
Control panel 2	A	530,8	685,5
Unit start up amps			
Control panel 1	A	711,8	791,5
Control panel 2	A	711,8	791,5
Refrigerant charge			
ckt 1	Lb	326,3	406,0
ckt 2	Lb	326,3	406,0
Oil charge (the oil type show on unit nameplate)			
ckt 1	gal	4,2	4,2
ckt 2	gal	4,2	4,2
Dimension			
Length	inch	456	467,5
Width	inch	88,4	88,4
Height	inch	97,6	97,6
Shipping weight	lb	20640	22481
Operation weight	lb	21008	22935

Note: 1. Date Containing: Temperature of Inlet/outlet: 54/44°F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft² °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 selected according unit voltage, but the current value in table is base on 380V/60Hz/3Ph.

Overview

Table 4. General data — 400 - 500 Ton 400 Volt -60Hz high efficiency (fixed speed fan)

Model	RTAG	400	500
Refrigerant	R134a	R134a	R134a
Compressor			
Model		CHHW (N5+N5, N5+N5)	CHHW (N6E+N6E;N6E+N6E)
Type		Horizontal semienclosed screw compressor	
Starter		YDEL	YDEL
Circuits		2	2
Min load	%	7,50%	7,50%
Must hold current(1A/1B)	A	231/231	302/302
Must hold current(2A/2B)	A	231/231	302/302
Evaporator			
Type		Shell & Tube (CHIL)	Shell & Tube (CHIL)
Rating flow	gpm	1154	944
Rating WPD	psid	5,6	5,6
Min flow	gpm	577	472
Max flow	gpm	1730	1416
Water storage	lb	369	455
tube size	inch	8"	8"
Air side heat exchanger			
Fan type		Axial flow	Axial flow
Quantity		18	20
Power	kW/per	2	2
Fan speed	RPM	860	860
Single fan Airflow	CFM	11478	11478
Fan current	A	4,7	4,7
Unit Max RLA(Max Compr+Fan+Control)			
Control panel 1	A	504	651
Control panel 2	A	504	651
Unit start up amps			
Control panel 1	A	676	752
Control panel 2	A	676	752
Refrigerant charge			
ckt 1	Lb	326,3	406,0
ckt 2	Lb	326,3	406,0
Oil charge (the oil type show on unit nameplate)			
ckt 1	gal	4,2	4,2
ckt 2	gal	4,2	4,2
Dimension			
Length	inch	456	467,5
Width	inch	88,4	88,4
Height	inch	97,6	97,6
Shipping weight	lb	20640	22481
Operation weight	lb	21008	22935

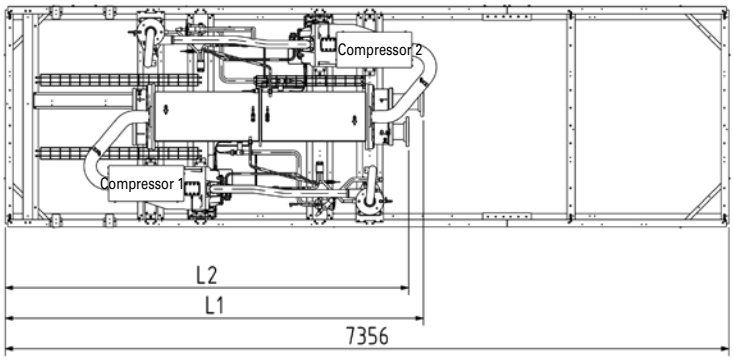
Note: 1. Date Containing: Temperature of Inlet/outlet: 54/44°F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft² °F h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could selected according unit voltage, but the current value in table is base on 400V/60HZ/3Ph.

Table 5. General data — 400 - 500 Ton 460 Volt -60Hz high efficiency (fixed speed fan)

Model	RTAG	400	500
Refrigerant	R134a	R134a	R134a
Compressor			
Model		CHHW (N5+N5, N5+N5)	CHHW (N6E+N6E;N6E+N6E)
Type		Horizontal semienclosed screw compressor	
Starter		YDEL	YDEL
Circuits		2	2
Min load	%	7,50%	7,50%
Must hold current(1A/1B)	A	201/201	263/263
Must hold current(2A/2B)	A	201/201	263/263
Evaporator			
Type		Shell & Tube (CHIL)	Shell & Tube (CHIL)
Rating flow	gpm	1154	944
Rating WPD	psid	5,6	5,6
Min flow	gpm	577	472
Max flow	gpm	1730	1416
Water storage	lb	369	455
tube size	inch	8"	8"
Air side heat exchanger			
Fan type		Axial flow	Axial flow
Quantity		18	20
Power	kW/per	2	2
Fan speed	RPM	860	860
Single fan Airflow	CFM	11478	11478
Fan current	A	4,7	4,7
Unit Max RLA(Max Compr+Fan+Control)			
Control panel 1	A	438	566
Control panel 2	A	438	566
Unit start up amps			
Control panel 1	A	588	654
Control panel 2	A	588	654
Refrigerant charge			
ckt 1	Lb	326,3	406,0
ckt 2	Lb	326,3	406,0
Oil charge (the oil type show on unit nameplate)			
ckt 1	gal	4,2	4,2
ckt 2	gal	4,2	4,2
Dimension			
Length	inch	456	467,5
Width	inch	88,4	88,4
Height	inch	97,6	97,6
Shipping weight	lb	20640	22481
Operation weight	lb	21008	22935

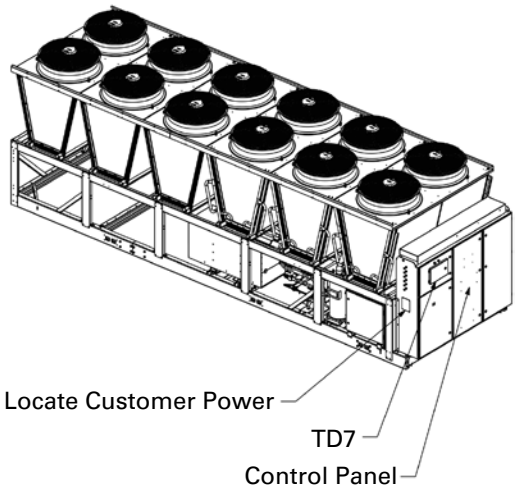
Note: 1. Date Containing: Temperature of Inlet/outlet: 54/44°F, Ambient Temperature: 95°F, Scaling factor: 0.001 ft² °F h/Btu.
2. Minimum start-up / operating ambient based on a 5 mph wind across the condenser.
3. Detail components structure / location please see Dimension sector.
4. Electric type could selected according unit voltage, but the current value in table is base on 460V/60HZ/3Ph.
5. 400Ton HE unit with 460V/60Hz/3Ph is not available now in Trane Select Assist (TSA).

Dimension

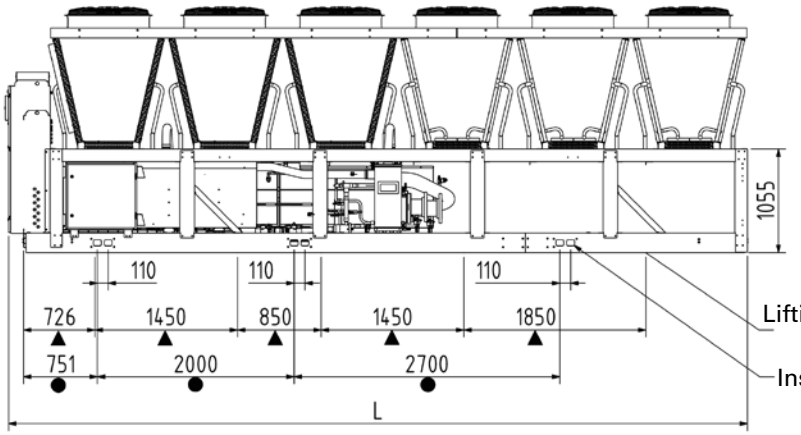


Top View

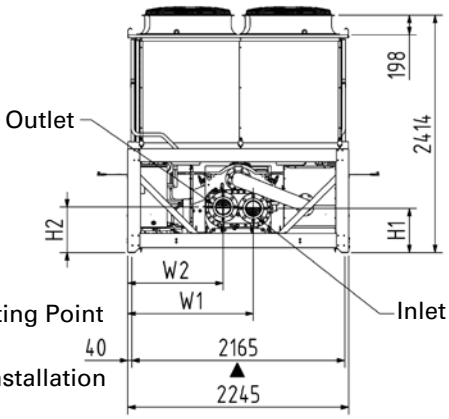
(With fan/coil removed)



ISO View



Side View



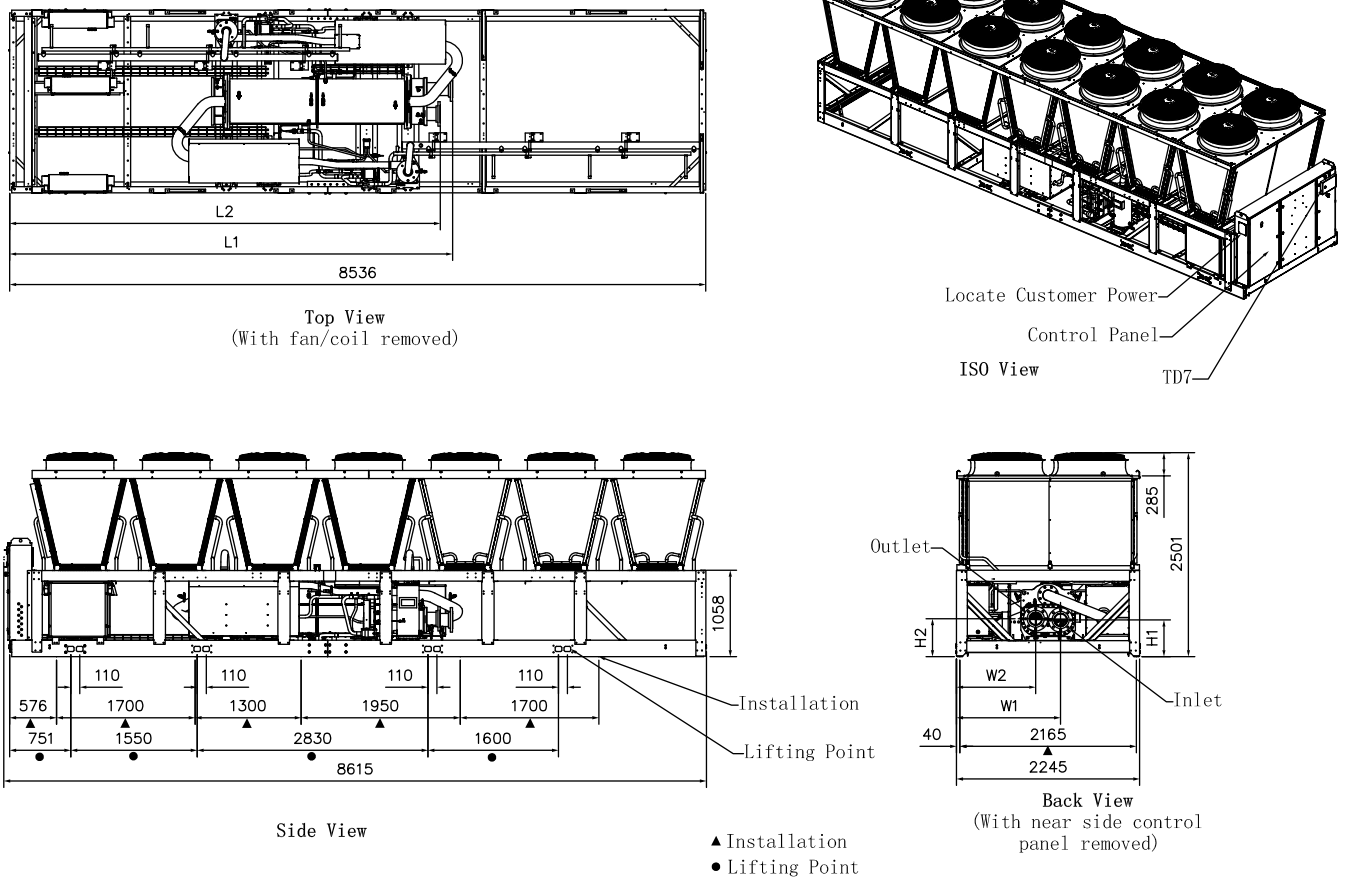
▲ Installation Point

● Lifting Point

Back View

Unit	Water Box	H1 (mm)	H2 (mm)	W1 (mm)	W2 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High eff) (Extra eff) (mm)	L (Premium Seasonal eff) (mm)
RTAG225P	150psi	450	465	1275	970	3938	3938	6"	7380	7510

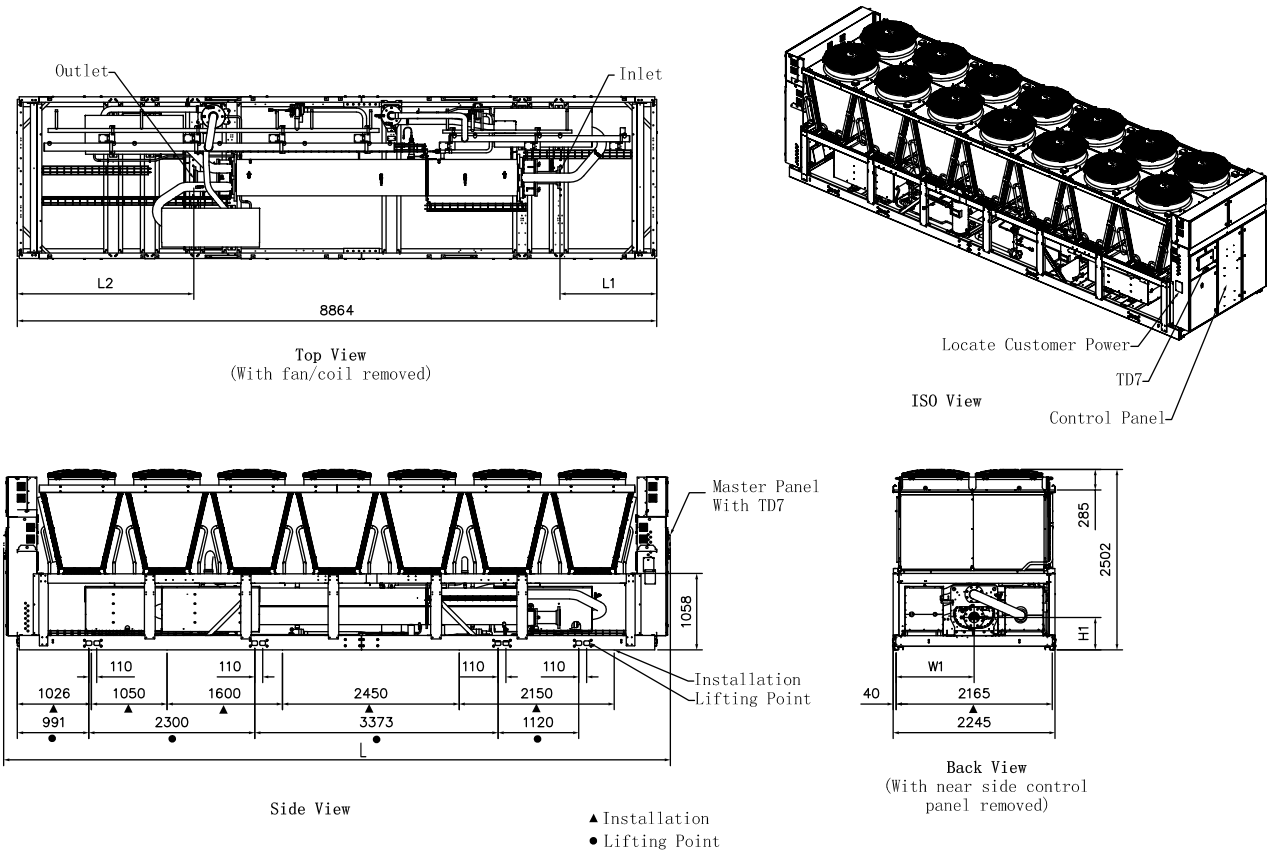
Figure 2. Dimension - RTAG 225 Premium efficiency unit



Unit	Water Box	H1 (mm)	H2 (mm)	W1 (mm)	W2 (mm)	L1 (mm)	L2 (mm)	L (mm)	Water pipe
RTAG 230P	150psi	450	465	1275	970	5118	5118	8732	6"

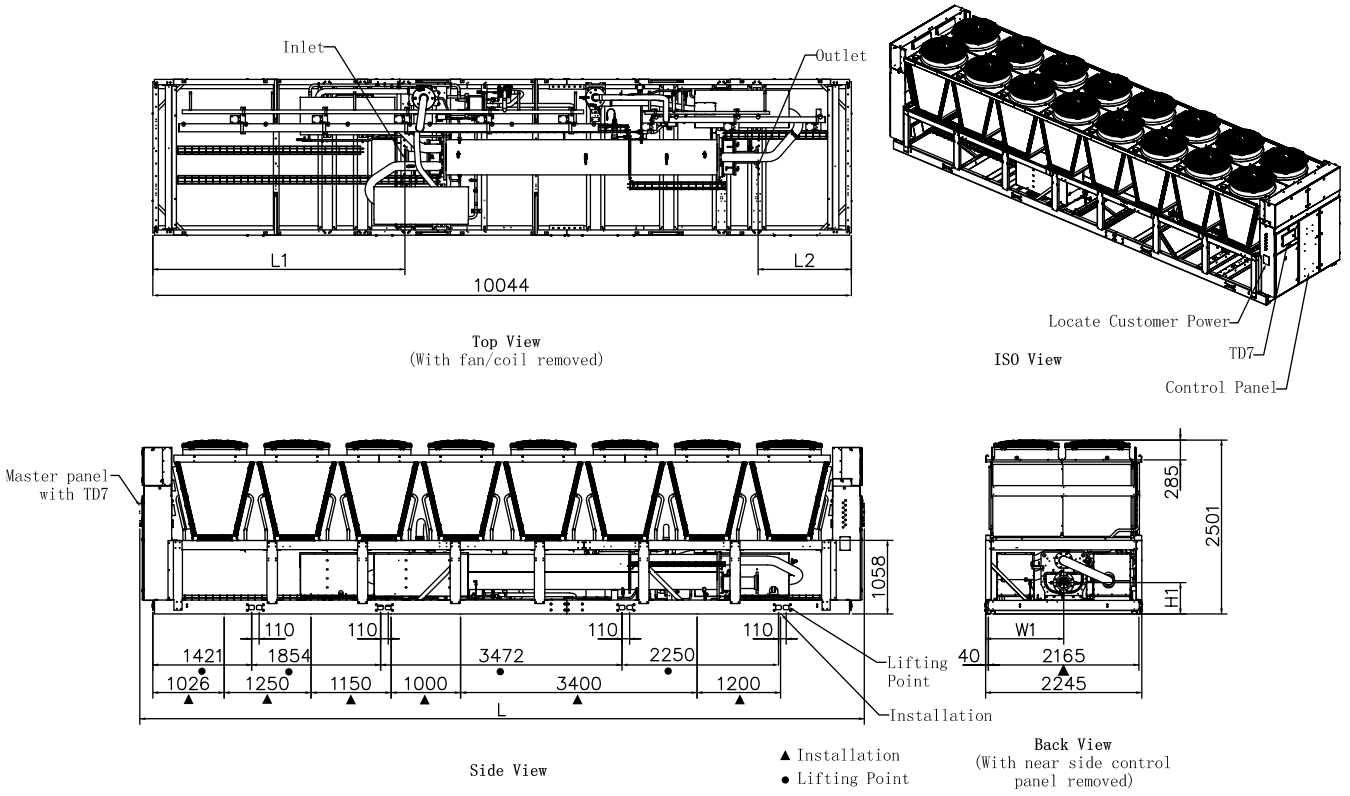
Figure 3. Dimension - RTAG 230 Premium efficiency unit

Dimension



Unit	Water Box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High eff) (mm)	L (Premium Seasonal eff) (mm)
285P	150psi	450	1120	2698	1593	6"	---	9246

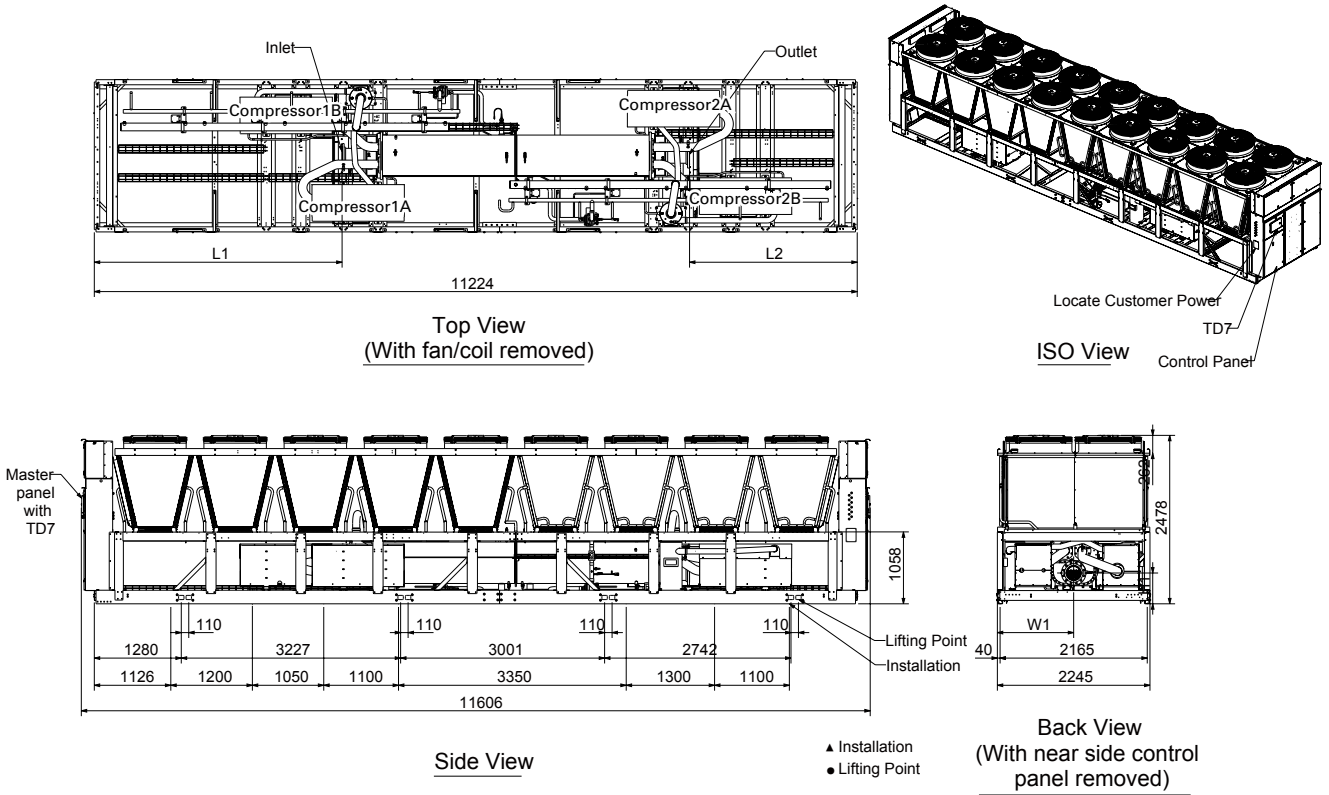
Figure 4. Dimension - RTAG 285 Premium efficiency unit



Unit	Water Box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High eff) (Extra eff) (mm)	L (Premium Seasonal eff) (mm)
310P	150psi	450	1120	3877	1593	6"	---	10418
340P	150psi	450	1120	3877	1593	6"	---	10418

Figure 5. Dimension - RTAG 310/340 Premium efficiency unit

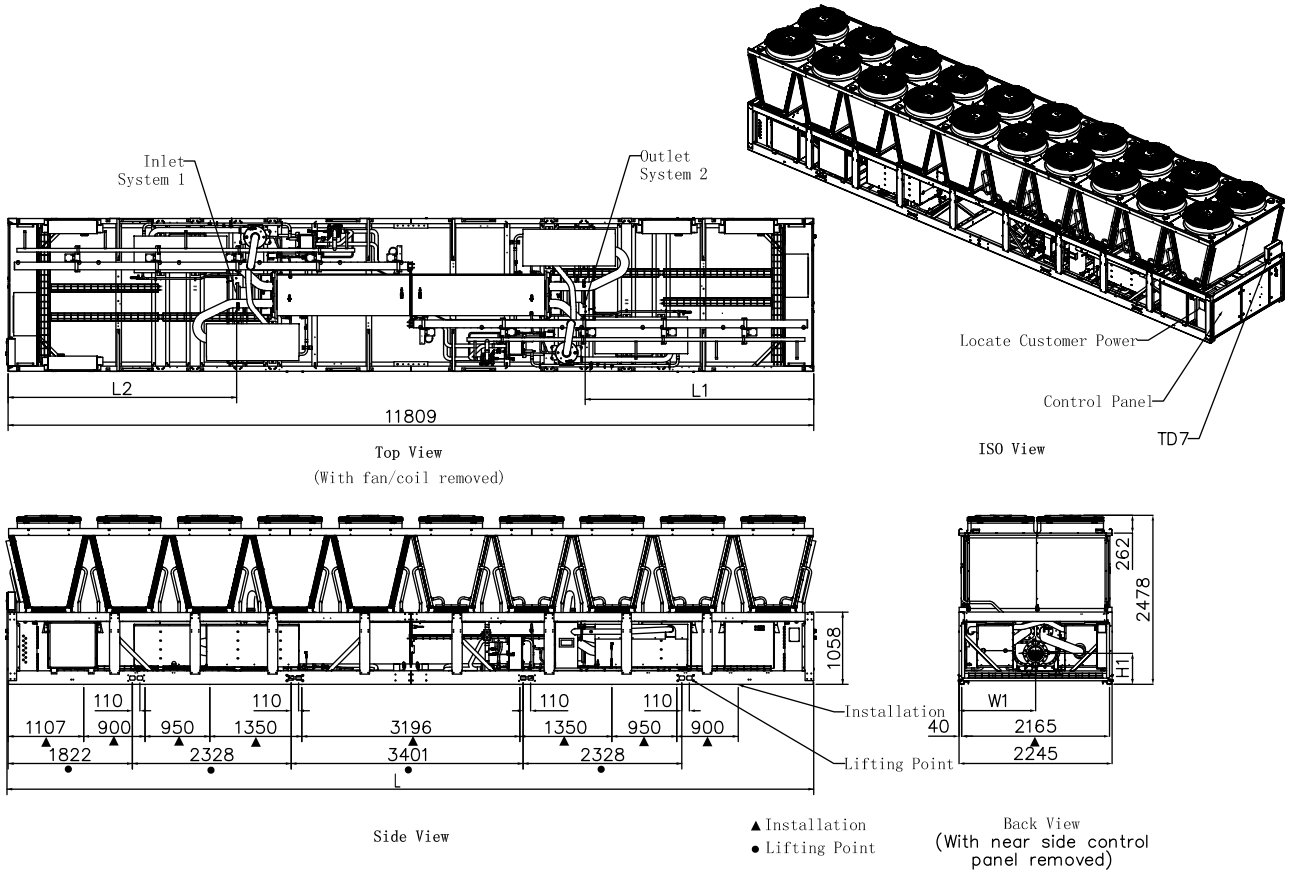
Dimension



Unit	Water Box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High eff) (mm)	L (Premium Seasonal eff) (mm)
400H	150psi	453	1120	3882	2703	8″	---	11580
375P	150psi	453	1120	3882	2703	8″	---	11580
400P	150psi	453	1120	3882	2703	8″	---	11580

Figure 6. Dimension - RTAG 375/400 High/ Premium efficiency unit

Dimension



Unit	Water Box	H1 (mm)	W1 (mm)	L1 (mm)	L2 (mm)	Water pipe	L (High eff) (mm)	L (Premium Seasonal eff) (mm)
440P 500H	150psi	453	1120	3582	3582	8"	11875	11875

Figure 7. Dimension - RTAG 440/500 High/ Premium efficiency unit

Installation - Mechanical

Installation Responsibilities

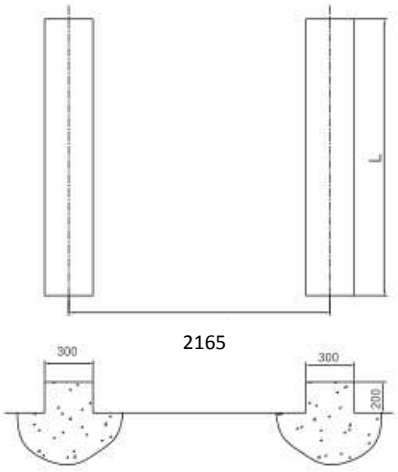
Table 6. Installation Responsibilities

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 8 , 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 UC800.
- 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)
225	Premium	7550
230	Premium	8772
285	Premium	9240
310; 340	Premium	10420
375; 400	High	11350
	Premium	11600
440	Premium	11850
500	High	11850

Figura 8. Installation clearance

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 qual ified 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.

Clearances

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 9 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.

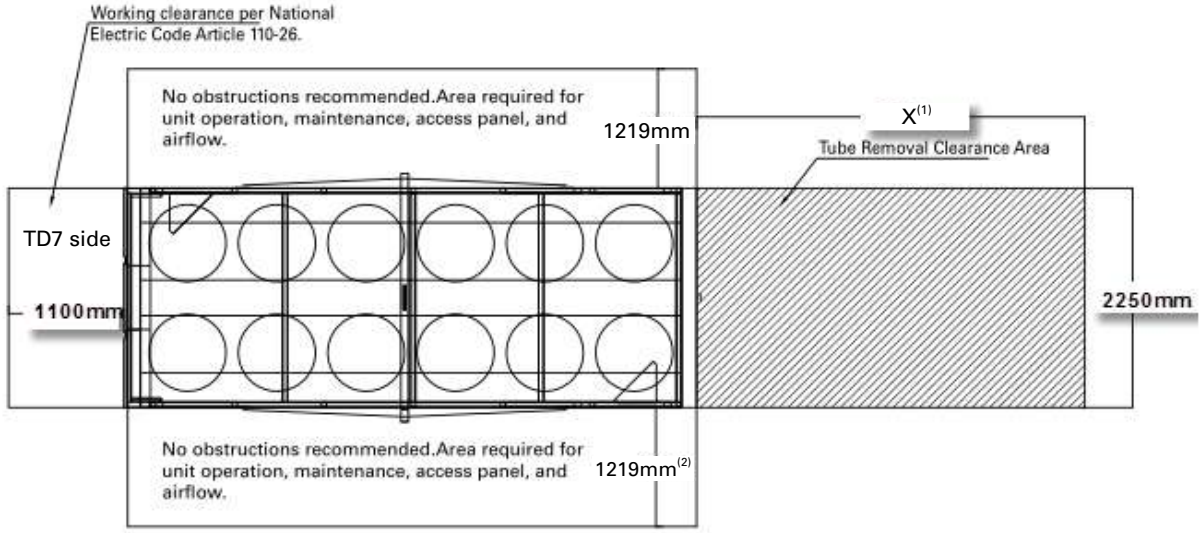
Warm air recirculation occurs when discharge air from the condenser fans is recycled back to the condenser coil inlet. Coil starvation occurs when free airflow to (or from) the condenser is restricted.

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

Debris, trash, supplies etc. should not be allowed to accumulate 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.

Figura 9. Installation clearance

NOTICE

No block above unit vent and no ventilating duct. Make sure there isn't any heat source within 5 meter distance of the unit, such as air compressor exhaust 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 minimum 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 Dangerous!

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 10 ~ Figure 12.
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 10, Figure 11, Figure 12 and Table 9.
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.

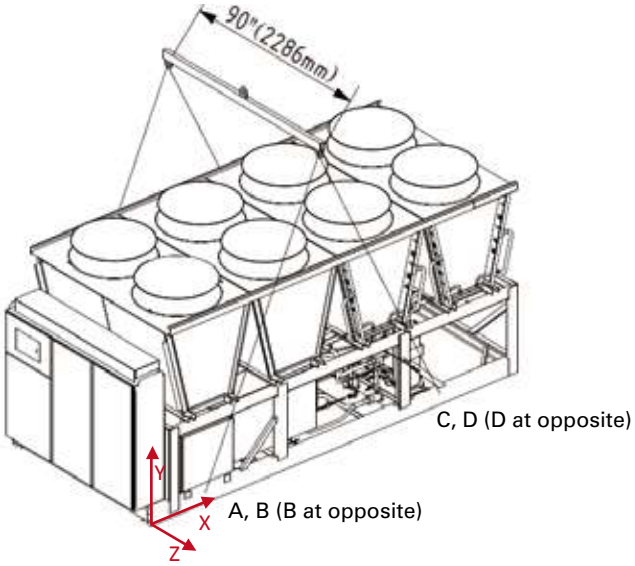


Figura 10. Unit lifting schematic (4 points)

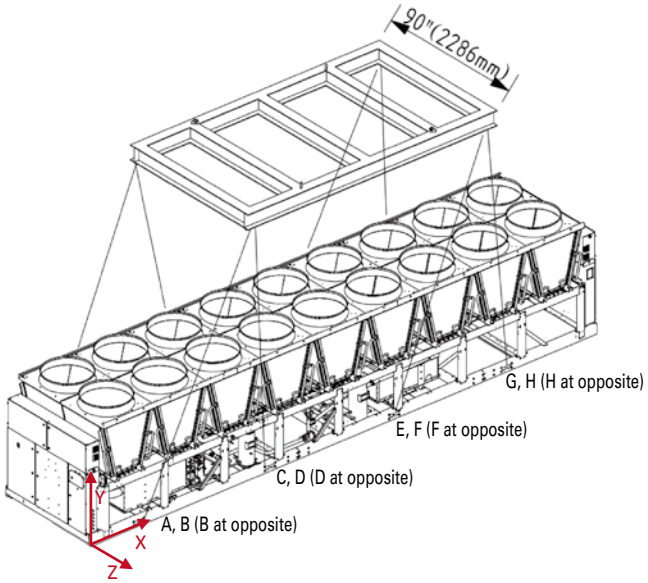


Figura 12. Unit lifting schematic (8 points)

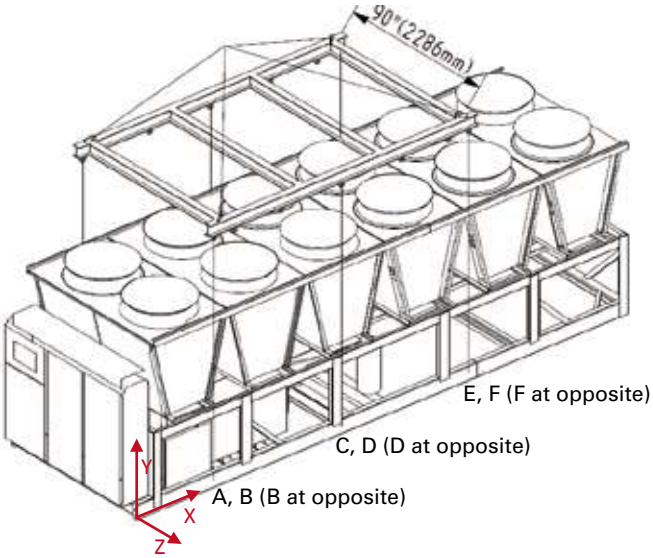


Figura 11. Unit lifting schematic (6 points)

Table 7. Lifting Weights and CG Dimensions

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)
400	High	934	1178	1449	1344	1018	1205	1255	980	9362	5885	933	-1126
500	High	1205	1530	1330	1140	1159	1306	1507	1219	10397	5893	964	-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

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. According Figure 13 location to install the isolator.
2. Secure the isolators to the mounting surface using the mounting slots in the isolator base plate. 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.

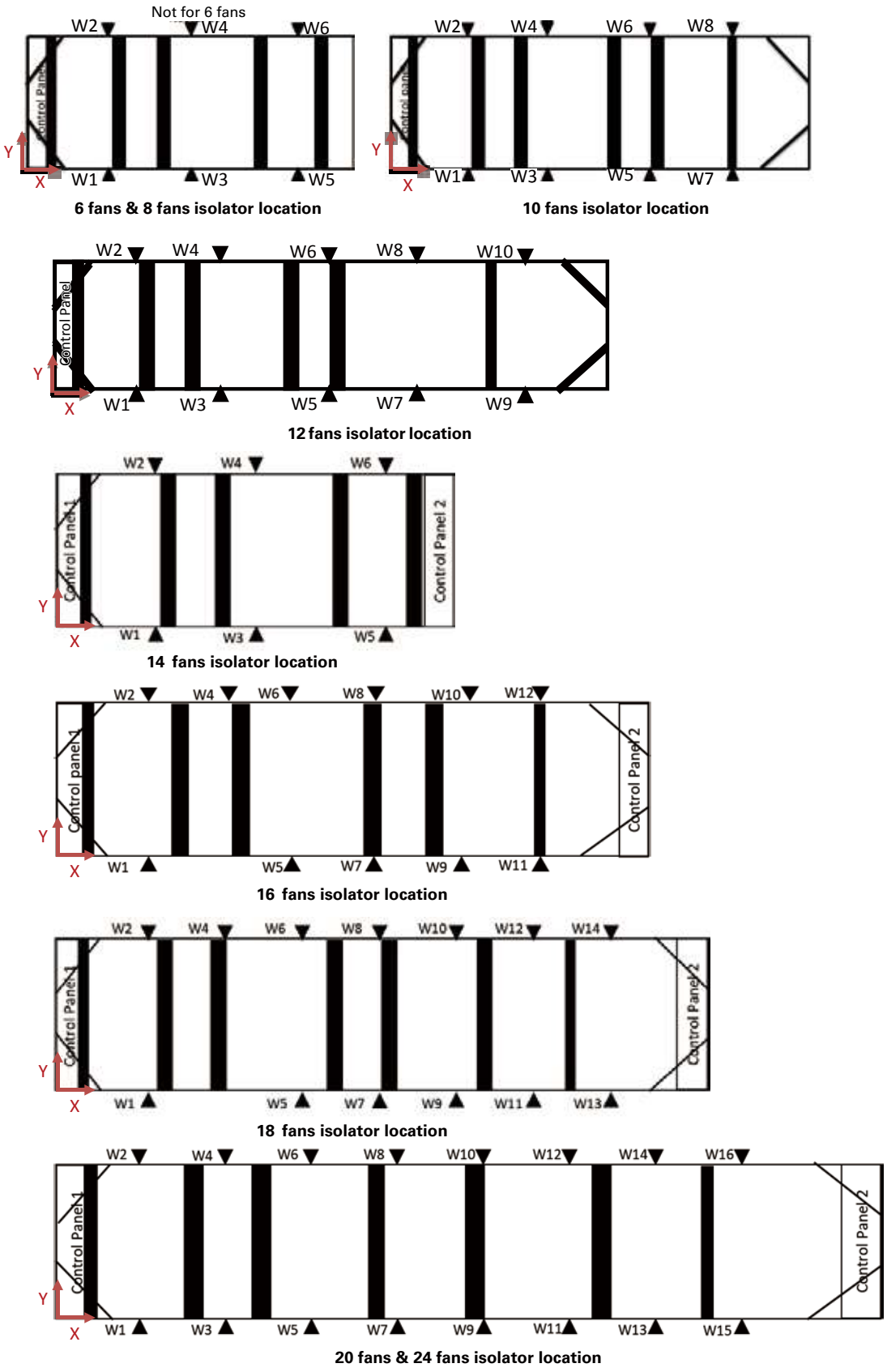


Figura 13. Isolator location

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
X10140305630	76.2	12.7	127.0	14.2	9.7	69.9	158.8	40.6±6.35	117.6	Lime
X10140305620	76.2	12.7	127.0	14.2	9.7	69.9	158.8	40.6±6.35	117.6	Brick Red
X10140305610	76.2	12.7	127.0	14.2	9.7	69.9	158.8	40.6±6.35	117.6	Brown

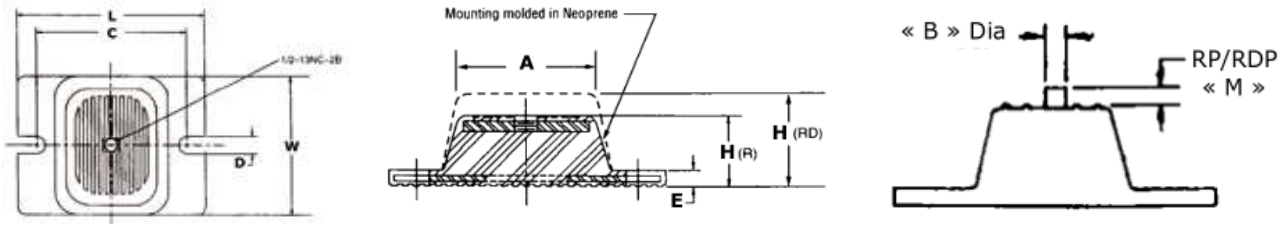


Figura 14. Rubber isolator dimension

Table 8. 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	
225P	12	700	2150	3000	4450	6300	--	--	--	10
230P	14	550	2250	3550	5500	7200	--	--	--	10
285P	14	1000	2050	3650	6100	8250	--	--	--	10
310P; 340P	16	1000	2250	3400	4400	7800	9000	--	--	11
375P; 400H 400P	18	1100	2300	3350	4450	7800	9100	10200	--	13
440P	20	1100	2000	2950	4300	7496	8846	9796	10696	14
500H	20	1100	2000	2950	4300	7496	8846	9796	10696	14

Table 9. Unit Isolators Part Extension Number

Unit Type	Isolator color at each location																Isolator Quantity
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	
225P	Brick red	Brick red	Brick red	Brown	Brown	Brick red	Brown	Brown	Brown	Brown	-	-	-	-	-	-	10
230P	Brown	Brown	Brick red	Brown	Brick red	Brick red	Brick red	Brick red	Brown	Brown	-	-	-	-	-	-	10
285P	Brown	Brick red	Brick red	Brick red	Brown	Brown	Brick red	Brick red	Brick red	Brick red	-	-	-	-	-	-	10
310P; 340P	Brick red	Brown	--	Brown	Brick red	Brown	Brick red	Brick red	Brick red	Brick red	Brick red	Brick red	-	-	-	-	11
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
440P	Brown	Brown	--	Brown	Brick red	Brick red	Brick red	Brick red	Brick red	Brick red	Brick red	Brick red	Brown	--	Brown	Brown	14
500H	Brown	Brown	--	Brown	Brick red	Brick red	Brick red	Brick red	Brick red	Brick red	Brick red	Brick red	Brown	--	Brown	Brown	14

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 waterbox 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 typical piping connection schematic, Figure 15:

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 gage, 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 meshes.
5. install balance valve on outlet water pipe to adjust water flow rate, and install service valve to switch off water flow during maintenance.
6. Install flow switch on inlet water pipe to avoid low flow rate. See installation notes in Water Flow Switch
7. Install vent valve on water box top to discharge air in water loop; install purge valve on bottom of water box, the purge piping arranged in site.***Evaporator the drain valve is open when it leaves the factory. Please make sure to close the drain valve before starting at first time.***
8. install automatic 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.

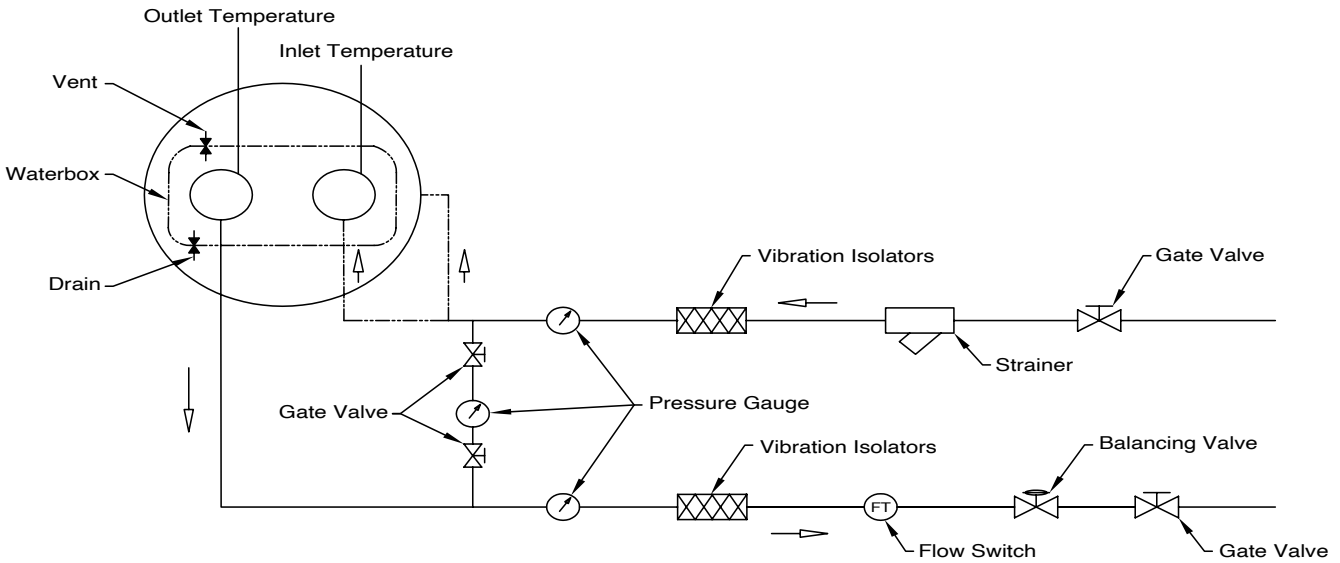


Figure 15. Water side heat exchanger typical piping connection schematic

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

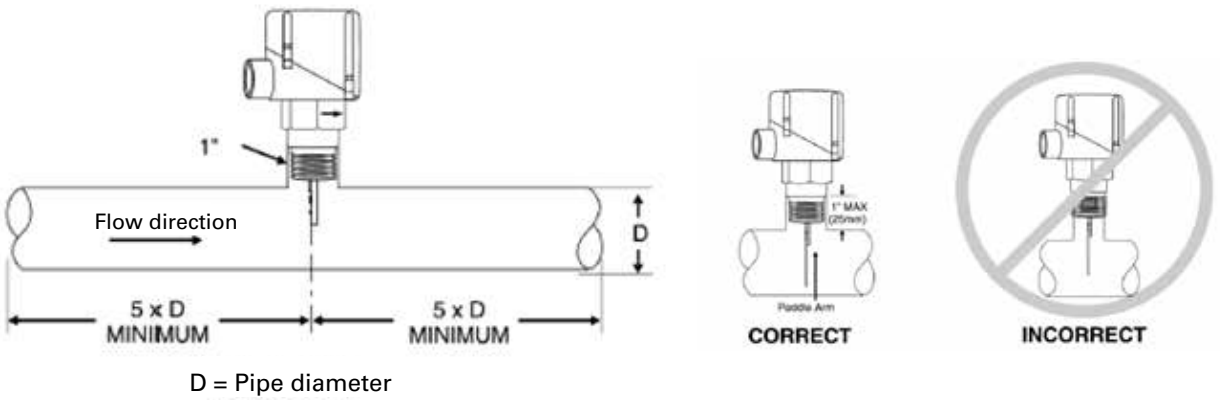
Water loop systems minimum volume, include chiller, water piping and indoor unit, all these water flow should not less than 9L/kW, in order to keep the unit steady operation and accurate controlled water temperature. If the volume is lower than this minimum value, should install a water tank with similar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

Water Flow Switch

To protect the unit, water loop must be installed flow switch and interlocked with water pump. To interlock the water pump, please refer to Field Wiring Diagram (line 194 and 346). once the the water flow of heat exchanger was below Table 1 required minimum flow, water flow switch can stop the compressor operation.Water flow switch is accessories, its general installation requirements outlined below, see Figure 16:

- 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 Table 10. Target slice length before usage.
- Water bypass cannot be installed between water flow switch and evaporator, Otherwise, switch can't protect evaporator and evaporator may be freeze if the evaporator inlet water flow is too small.
- 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 Figure 17.
- Water flow switch should be interlocked with water pump control.

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.

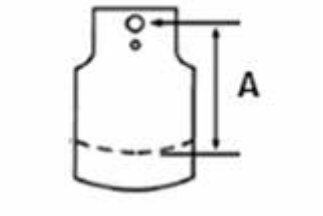


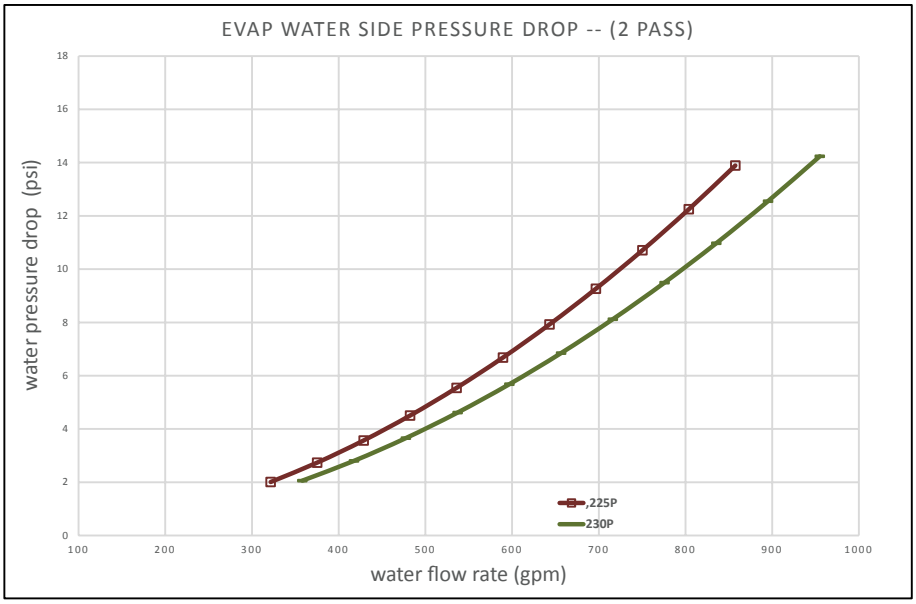
D = Pipe diameter

Figure 16. Water flow switch installation schematic

Table 10. Target slice length

UNIT	Water pipe	Slice length A (mm)
225; 230	6″	31
285 310; 340	6″	30
375	8″	46
400		40
440		34
500		34





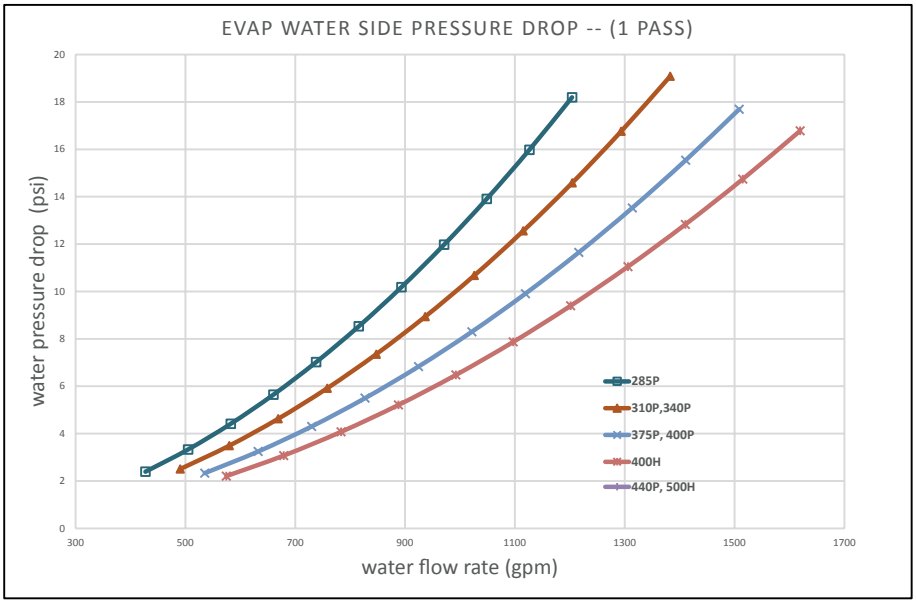


Figure 17. Water flow switch installation schematic

NOTICE

Water flow protection!

TRANE chiller UC800 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.

Water Treatment

Water side heat exchanger must apply with treated and filted water, water property quality should within the range Table 11 water quality requirements, to avoid the damage of unit. Detail method please consulting experts in water treatment.

Table 11. Water quality requirements

Water property	requirements
NH_3	<2 ppm
NH^{4+}	<2 ppm
Cl_2	<1 ppm
Cl-	< 300 ppm
H_2S*	<0.05 ppm
$SO4^{2-}$	< 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 damage!

Using improper handling or untreated water may cause unit on fouling, wear, corrosion, moss and damage. TRANE company is not responsible for the equipment 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 panel 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.
- 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 damage!

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

NOTICE

Water side heater damage!

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

Installation - Electrical

General Recommendations

All wiring must comply with local codes. Typical field wiring diagrams are included at the end of the manual. Minimum current ampacities and other unit electrical data are on the unit nameplate and Table 12 & Table 13. 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 the loss of related guarantee rights without the authorization or approval from Trane Company.

Important!

Do not allow conduit to interfere with other components, 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.

Table 12. 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
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
400	460/60/3	2	4	168,168/168,168	1065,1065/1065,1065	346,346/346,346	9/9	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

Table 13. 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
225	380/60/3	1	2	203/203	1306/1306	424/424	6/6	1.5	3.8
225	460/60/3	1	2	168/168	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	460/60/3	1	2	168/168	1065/1065	346/346	7/7	1.5	3.8
285	380/60/3	2	4	170,203/203	1306,1306/1306	424,424/424	9/5	1.65	4.7
285	460/60/3	2	4	141,168/168	1065,1065/1065	346,346/346	9/5	1.65	4.7
310	380/60/3	2	4	203,203/203	1306,1306/1306	424,424/424	11/5	1.65	4.7
310	460/60/3	2	4	168,168/168	1065,1065/1065	346,346/346	11/5	1.65	4.7
340	380/60/3	2	4	203,203/203	1306,1306/1306	424,424/424	11/5	1.65	4.7
340	460/60/3	2	4	168,168/168	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	460/60/3	2	4	141,168/141,168	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	460/60/3	2	4	168,168/168,168	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	460/60/3	2	4	168,168/168,168	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	460/60/3	2	4	168,168/168,168	1065,1065/1065,1065	346,346/346,346	14/14	1.65	4.7

Notes:
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/1 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.

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.

⚠ WARNING

Hazardous Voltage!

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

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.

⚠ 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.

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 18 & Figure 19.

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).

115/230 VAC 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 115/230 VAC power supply to the unit. Green lugs are provided for 115/230 VAC customer wiring.

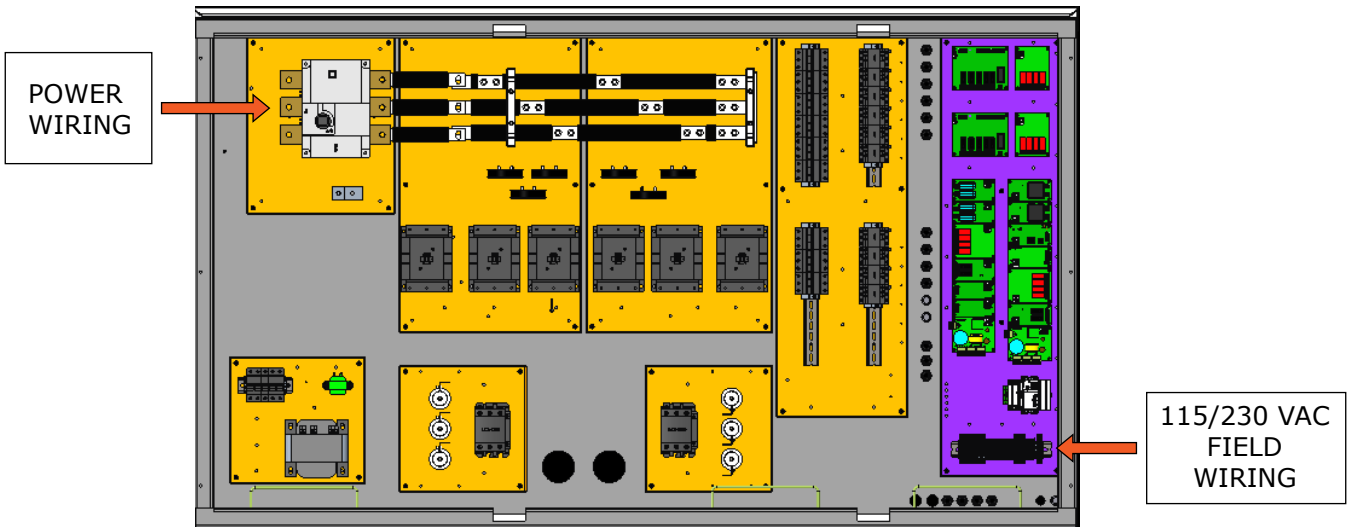


Figure 18. Power Entrance of fixed panel

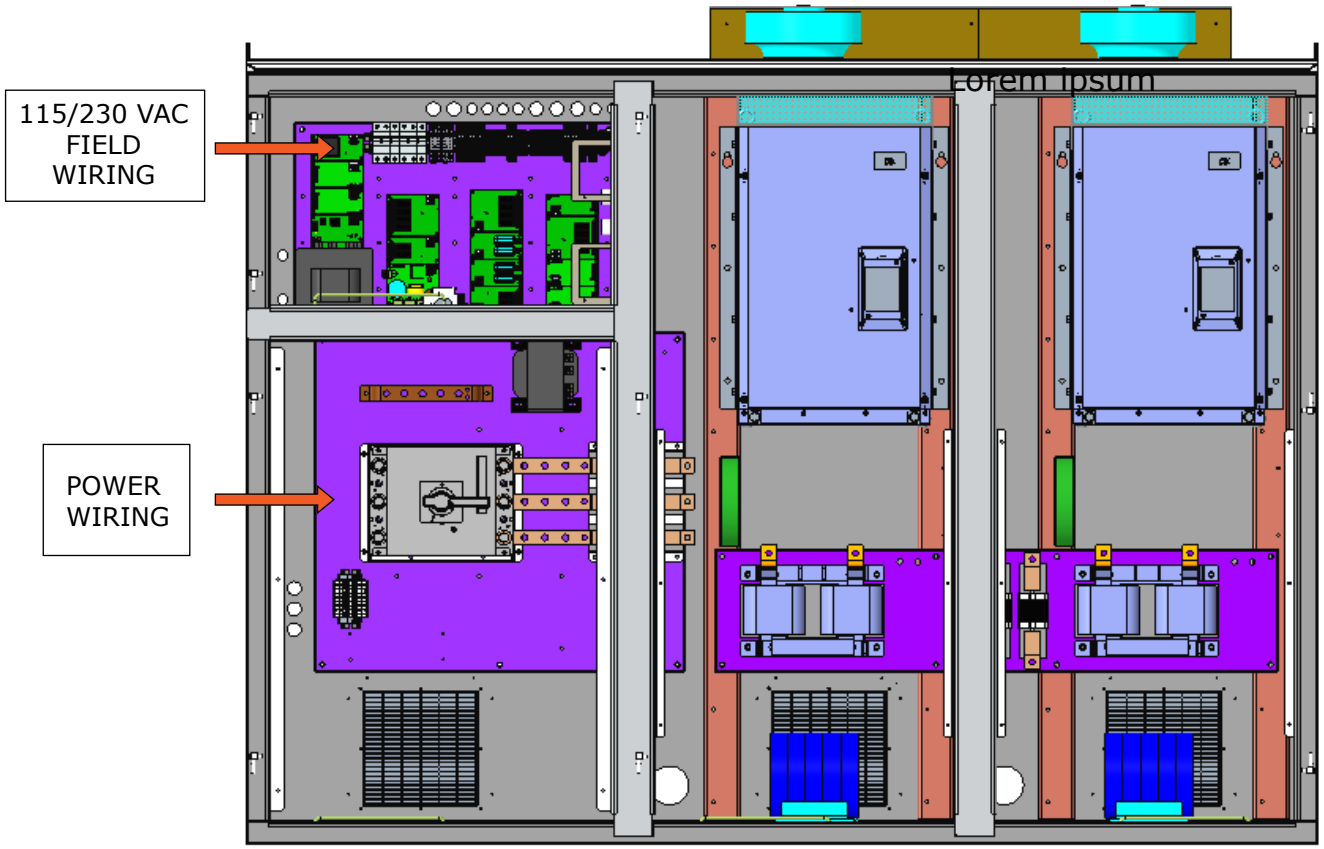


Figure 19. Power Entrance of AFD panel

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

Heater Power Supply

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

It is required to provide an independent power source (230V 60Hz -15amp) ,with a fused-disconnect.

⚠ CAUTION

Heater Tape!

Control panel main controller UC800 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 115/230 VAC control circuit. The EWP relay operates in different modes depending on UC800 or Tracer commands, if available. Normally, the EWP relay follows the AUTO mode of the chiller. Whenever the chiller has no diagnostics and is in 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 14. Pump Relay 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 UC800 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 LLID) as part of the Alarm Relay Output Option. 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 programmable relays can be found in Table 15. The relay will be energized when the event/state occurs.

Table 15. 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

UC800 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 16. 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 applicable 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

UC800 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 UC800 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 UC800 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 UC800	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 UC800 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 UC800	%=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 UC800 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.

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.

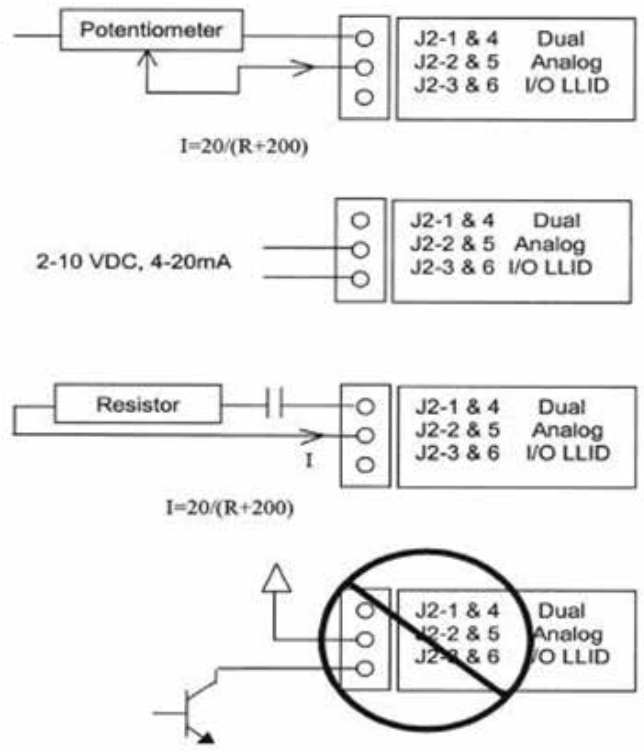


Figure 20. Wiring Examples for ECLS and ECWS

Chilled Water Reset (CWR)

UC800 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 30F)	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

Optional Tracer Communications Interface

This option allows the Tracer UC800 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 UC800 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 wiring!

All field -installed wiring must be completed by qualified-personnel. All field-installed wiring must comply with NEC and applicable 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 17. 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)

UC800 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

Table 18. 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

BACnet Communications Interface for Chillers (BCI-C)

The RTAG controller UC800 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 UC800 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 3.8)
- BACnet protocol: data link layers, device address binding, networking options, and character sets
- Object data points and configurations

BACnet Protocol Implementation Conformance 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)	

Interoperability Building Blocks (Annex K)

Data Sharing Description	Supported BIBB
Data Sharing-COV-B (DS-COV-B)	
Data Sharing-ReadProperty-A (DS-RP-A)	√
Data Sharing-ReadProperty-B (DS-RP-B)	√
Data Sharing-ReadPropertyMultiple-B (DS-RPM-B)	√
Data Sharing-WriteProperty-A (DS-WP-A)	√
Data Sharing-WriteProperty-B (DS-WP-B)	√
Data Sharing-WritePropertyMultiple-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-ES-UM-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 Types

Table 19. Descriptions and configurations

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

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

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

(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	

Object Data Points and Diagnostic Data Points with Corresponding Chiller Models

For quick reference, the following tables are listed two different ways. Table 20. through Table 25. are listed by input/output type and sorted by object identifier. These tables provide the user with the units type for each object type. Not all points are available to the user. The available data points are defined during self-configuration and are dependent on the type of equipment.

Note: *The last four columns in each table identify which chiller model corresponds with each object name.*

Table 20. Analog Output

Object Identifier	Object Name	Description	Units	Valid Range	Default
Analog Output 1	Chilled Water Setpoint	Desired leaving water temperature if chiller is in cooling mode.	°F	0°F to 75°F	44°F
Analog Output 2	Current Limit Setpoint	Sets the maximum capacity that the chiller can use	%	0% to 120%	100%

Table 21. Analog Input

Object Identifier	Object Name	Description	Units
Analog Input 1	Active Cool Setpoint Temperature	Active chiller water setpoint	°F
Analog Input 2	Active Current Limit Setpoint	Active capacity current limit setpoint.	%
Analog Input 5	Actual Running Capacity	Level of capacity that the chiller is currently running at	%
Analog Input 7	Suction Pressure- Ckt 1	Circuit 1 suction pressure.	PSI
Analog Input 12	Evaporator Saturated Refrigerant Temperature- Ckt 1	Circuit 1 evaporator refrigerant temperature.	°F
Analog Input 16	Condenser Refrigerant Pressure- Ckt 1	Circuit 1 condenser refrigerant pressure	PSI
Analog Input 20	Condenser Saturated Refrigerant Temperature- Ckt 1	Circuit 1 . Condenser refrigerant temperature.	°F
Analog Input 25	Local Atmosphere pressure	Local Atmosphere pressure	PSI
Analog Input 26	Starter-compressor-1A	Number of starts for compressor-1A	None
Analog Input 27	Starter-compressor-1B	Number of starts for compressor-1B	None
Analog Input 34	Run Time –Compressor 1A	Total run time of compressor 1A	Hours
Analog Input 35	Run Time –Compressor 1B	Total run time of compressor 1B	Hours
Analog Input 44	Evaporator Entering Water Temp	Temperature of the water entering the evaporator	°F
Analog Input 45	Evaporator Leaving Water Temp	Temperature of the water leaving the evaporator	°F
Analog Input 46	Condenser Entering Water Temp	Temperature of the water entering the condenser	°F
Analog Input 47	Condenser Leaving Water Temp	Temperature of the water leaving the condenser	°F
Analog Input 48	High Side Oil Pressure-Compressor 1A	Pressure of the oil at the high side of the compressor 1A	PSI
Analog Input 49	High Side Oil Pressure-Compressor 1B	Pressure of the oil at the high side of the compressor 1B	PSI
Analog Input 56	Discharge Temp-Compressor 1A	Discharge temperature of compressor 1A	°F
Analog Input 58	Condenser Control Output	Percentage of condenser water flow being requested by the chiller	%
Analog Input 59	Phase AB Voltage-Compressor 1A	Phase AB voltage compressor 1A	volts
Analog Input 71	Line 1 Current (in Amps)-Compressor 1A	Line 1 Current (in Amps)-Compressor 1A	Amps
Analog Input 72	Line 2 Current (in Amps)-Compressor 1A	Line 2 Current (in Amps)-Compressor 1A	Amps
Analog Input 73	Line 3 Current (in Amps)-Compressor 1A	Line 3 Current (in Amps)-Compressor 1A	Amps
Analog Input 74	Line 1 Current (in Amps)-Compressor 1B	Line 1 Current (in Amps)-Compressor 1B	Amps
Analog Input 75	Line 2 Current (in Amps)-Compressor 1B	Line 2 Current (in Amps)-Compressor 1B	Amps
Analog Input 76	Line 3 Current (in Amps)-Compressor 1B	Line 3 Current (in Amps)-Compressor 1B	Amps
Analog Input 83	Line 1 Current (%RLA)-Compressor 1A	Line 1 Current (%RLA)-Compressor 1A	%
Analog Input 84	Line 2 Current (%RLA)-Compressor 1A	Line 1 Current (%RLA)-Compressor 1A	%
Analog Input 85	Line 3 Current (%RLA)-Compressor 1A	Line 2 Current (%RLA)-Compressor 1A	%
Analog Input 86	Line 1 Current (%RLA)-Compressor 1B	Line 1 Current (%RLA)-Compressor 1B	%
Analog Input 87	Line 2 Current (%RLA)-Compressor 1B	Line 1 Current (%RLA)-Compressor 1B	%
Analog Input 88	Line 3 Current (%RLA)-Compressor 1B	Line 2 Current (%RLA)-Compressor 1B	%
Analog Input 95	Number of Circuits	Number of Circuits	None
Analog Input 96	Number of Compressors Ckt 1	Number of Compressors, Ckt 1	None

Table 22. Multistate Output

Object Identifier	Object Name	Description	Relinquish Default	Object States
Multi-StateOutput 1	Chiller Mode Command	Mode of operation of the chiller	1=cooling	1=HVAC_Heat 4=Not Used

Table 23. Multistate Input

BCI-C Object Identifier	Object Name	Description	Object States
Multi-State Input 1	Running Mode	Indicates the primary running mode of the chiller	1=Chiller Off 2=Chiller in Start Mode 3=Chiller in Run Mode 4=Chiller in Pre-shutdown Mode 5=Chiller in Service Mode
Multi-State Input 2	Operation Mode	Indicates the primary operation mode of the chiller	1=HVAC_Heat 2=HVAC_Cool 3=HVAC_Ice 4=Not Used
Multi-State Input 3	MP Communication Status	Communication status	1=R-22 2= Communication 3= Communication Lost 4= Failed to Established 5= Waiting to Establish
Multi-State Input 4	Refrigerant Type	Refrigerant Type	1=R-11 2=R-12 3=R-22 4=R-123 5=R-134a 6=R-407C 7=R-410A
Multi-State Input 5	Model Information	Indicates the model type of the chiller	1=RTA 2=CVH 3=CVG 4=CVR 5=CDH 6=RTH 7=CGW 8=CGA 9=CCA 10=RTW 11=RTX 12=RTU 13=CCU 14=CXA 15=CGC 16=RAU
Multi-State Input 6	Cooling Type	Cooling type of the condenser	1=Water Cooled 2=Air Cooled
Multi-State Input 7	Manufacturing Location	Location where chiller was manufacture	1=Field Applied 2=La Crosse 3=Pueblo 4=Charmes 5=Rushville 6=Macon 7=Waco 8=Lexington 9=Forsyth 10=Clarksville 11=Ft.Smith 12=Penang 13=Colchester 14=Curitiba 15=Taicang 16=Taiwan 17=Epinal 18=Golbey

Table 24. Binary Output

Object Identifier	Object Name	Description	Relinquish Default	Object States
Binary Output 1	Chiller Auto Stop Command	Allows the chiller to run if conditions for running are met.	True	Inactive = Stop Active = Auto
Binary Output 2	Remote Diagnostic Reset Command	Resets remotely diagnostics that can be reset.	False	Inactive = No Reset Request Active = Reset Request
Binary Output 4	Noise Reduction Request	Request chiller enter mode to reduce noise.	False	Inactive = Normal Active = Reduced Noise

Table 25. Binary Input

Object Identifier	Object Name	Description	Object States
Binary Input 1	Run Enabled	Indicates if the chiller is available to run or is currently running.	Inactive = Stop Active = Auto
Binary Input 2	Local Setpoint Control	Indicates if the chiller is being controlled by local setpoints instead of BAS setpoints.	Inactive = Remote Control Active = Local Control
Binary Input 3	Capacity Limited	Indicates if conditions may exist that prevent the chiller from reaching setpoint.	Inactive = Not Limited Active = Limited
Binary Input 4	Chiller Running State	Indicates if the chiller is running or stopped	Inactive = Off Active = On
Binary Input 5	Condenser Water Flow Status	Condenser water flow status (not used in RTAG)	Inactive = Normal Active = Reduced Noise
Binary Input 6	Chiller Auto Stop Command	Allows the chiller to run if conditions for running are met.	Inactive = No Flow Active = Flow
Binary Input 7	Head Relief Request	Indicates if the chiller is asking an outside system to provide more heat rejection from the condenser water loop	Inactive = Off Active = On
Binary Input 9	Compressor 1A Running	Indicates if compressor 1A is running	Inactive = Off Active = Running
Binary Input 10	Compressor 1B Running	Indicates if compressor 1B is running	Inactive = Off Active = Running
Binary Input 17	Evaporator Water Pump Request	Indicates a request form the chiller to turn on the evaporator water pump	Inactive = Off Active = On
Binary Input 19	Condenser Water Pump Request	Indicates a request form the chiller to turn on the condenser water pump	Inactive = Off Active = On
Binary Input 23	Alarm Present	Indicates if an alarm is active	Inactive = No Alarm Active = Alarm
Binary Input 24	Shutdown Alarm Present	Indicates if a shutdown alarm is active	Inactive = No Alarm Active = None
Binary Input 25	Last Diagnostic	Indicates last diagnostic for the chiller	Inactive = Off Active = On

Controls

Overview

RTAG chillers utilize the following control/ interface components:

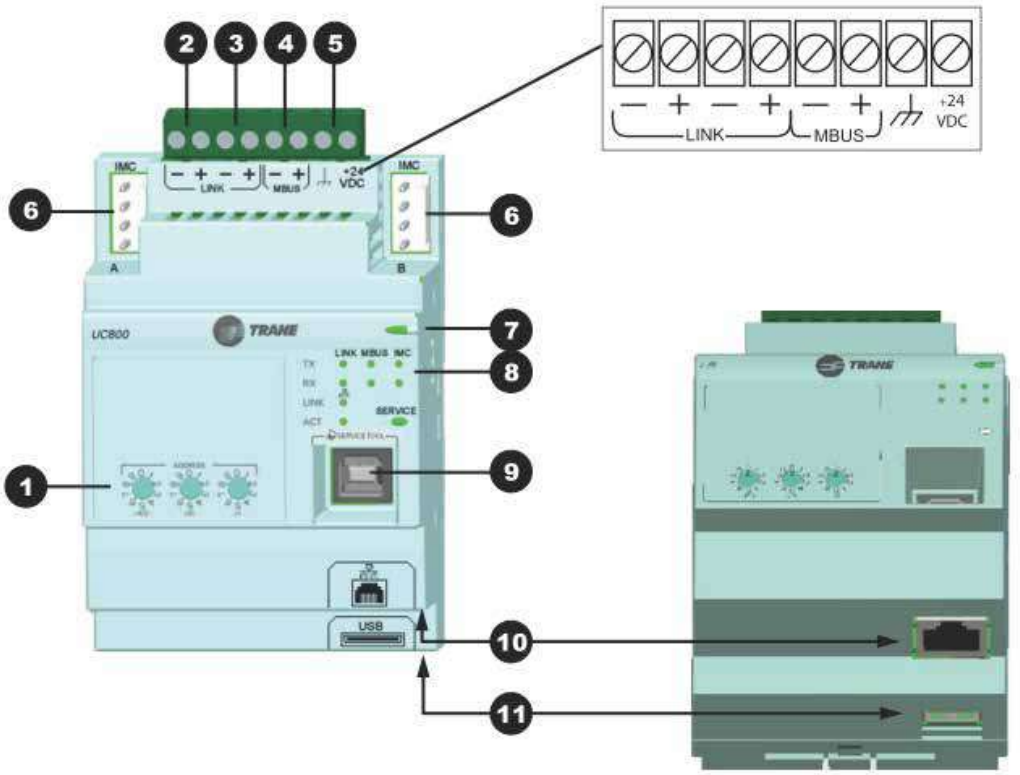
- Tracer™ UC800 Controller
- Tracer AdaptiView™ TD7 Operator Interface

UC800 Specifications

This section covers information pertaining to the UC800 controller hardware.

Wiring and Port Descriptions

Figure 21 illustrates the UC800 controller ports, LEDs, rotary switches, and wiring terminals. The numbered list following Figure 21 corresponds to the numbered call-outs in the illustration.



Front view **Bottom View**

1. Rotary Switches for setting BACnet® MAC address or MODBUS ID.
2. LINK for BACnet MS/TP, or MODBUS Slave (two terminals, ±). Field wired if used.
3. LINK for BACnet MS/TP, or MODBUS Slave (two terminals, ±). Field wired if used.
4. Machine bus for existing machine LLIDs (IPC3 Tracer bus 19.200 baud). IPC3 Bus: used for Comm4 using TCI or LonTalk® using LCI-C.
5. Power (210 mA at 24 Vdc) and ground terminations (same bus as item 4). Factory wired.
6. IMC for MODBUS Master (two terminals, ±). Field wired if used.
7. Marquee LED power and UC800 Status indicator (Table 26, P 55.).
8. Status LEDs for the BAS link, MBus link, and IMC link.
9. USB device type B connection for the service tool (Tracer TU).
10. The Ethernet connection can only be used with the Tracer AdaptiView display.
11. USB Host (not used).

Figure 21. Wiring locations and connection ports

Communication Interfaces

There are four connections on the UC800 that support the communication interfaces listed. See Figure 17 for the locations of each of these ports.

- BACnet® MS/TP
- MODBUS™ Slave
- LonTalk™ using LCI-C (from the IPC3 bus)
- Comm 4 using TCI (from the IPC3 bus)

Rotary Switches

There are three rotary switches on the front of the UC800 controller. Use these switches to define a three-digit address when the UC800 is installed in a BACnet or MODBUS system (e.g., 107, 127, etc.).

Note: *Valid addresses are 001 to 127 for BACnet and 001 to 247 for MODBUS.*

LED Description and Operation

There are 10 LEDs on the front of the UC800. Figure 22 shows the locations of each LED and Table 26 describes their behavior in specific instances.

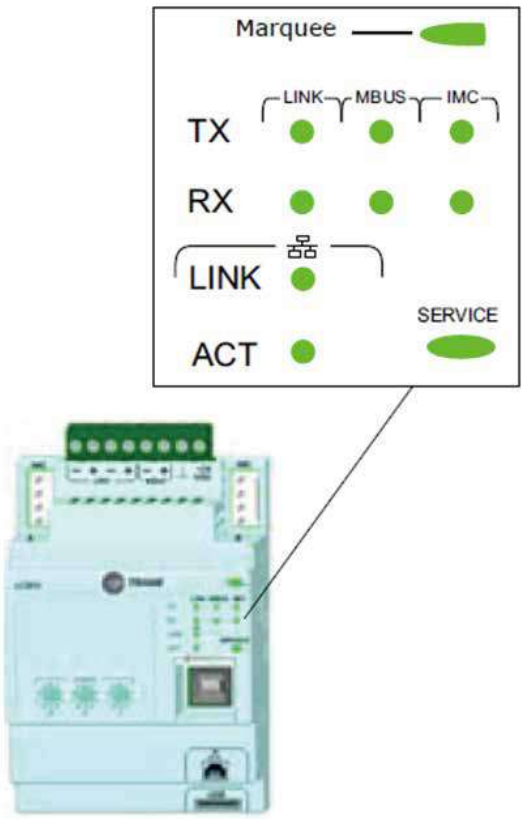


Figure 22. Wiring locations and connection ports

Table 26. LED behavior

LED	UC800 Status
Marquee LED	Powered. If the Marquee LED is green solid, the UC800 is powered and no problems exist.
	Low power or malfunction. If the Marquee LED is red solid, the UC800 is powered, but there are problems present.
	Alarm. The Marquee LED blinks Red when an alarm exists.
LINK, MBUS, IMC	The TX LED blinks green at the data transfer rate when the UC800 transfers data to other devices on the link.
	The Rx LED blinks yellow at the data transfer rate when the UC800 receives data from other devices on the link.
Ethernet Link	The LINK LED is solid green if the Ethernet link is connected and communicating.
	The ACT LED blinks yellow at the data transfer rate when data flow is active on the link.
Service	The Service LED is solid green when pressed. For qualified service technicians only. Do not use.

Important: *Maintain at least 6 inches between low- voltage (<30V) and high voltage circuits. Failure to do so could result in electrical noise that could distort the signals carried by the low-voltage wiring, including IPC.*

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.

Figure 23. TD7 screens

Home Screen

The home screen (Figure 24) 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 24. TD7 screens

Table 27. 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

Viewing 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 25. Chiller operating modes

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

Table 28. 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 29. 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.**
Running - Limit	**The circuit, and compressor are 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**
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.
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 30. 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 submode. 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 26. 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 26. 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 23) to view the Reports screen. The Reports screen contains the following buttons:

- Custom Report1
- Custom Report2
- Custom Report3
- Evaporator
- Condenser
- Compressor
- Motor About
- Operating Modes
- Log Sheet
- ASHRAE Chiller Log

Each button links to the report named on the button.

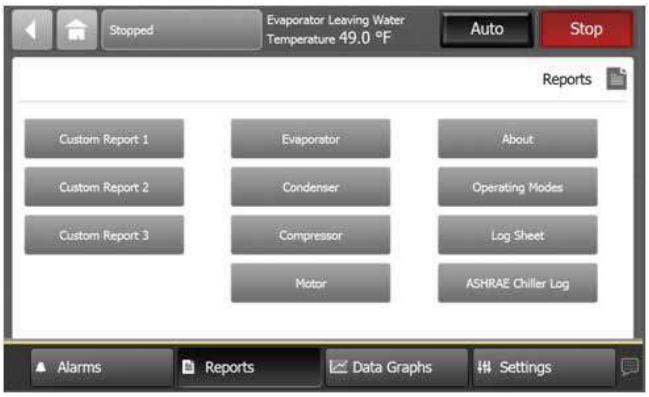


Figure 27. Report screen

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.

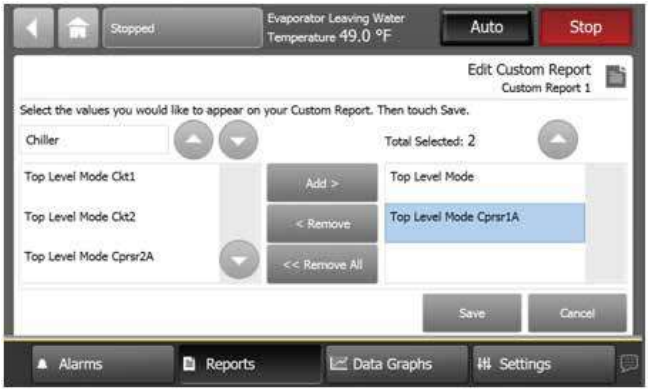


Figure 28. Edit custom report screen

Figure 29. Report evaporator screen

Lorem ipsum

Table 31. 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	%

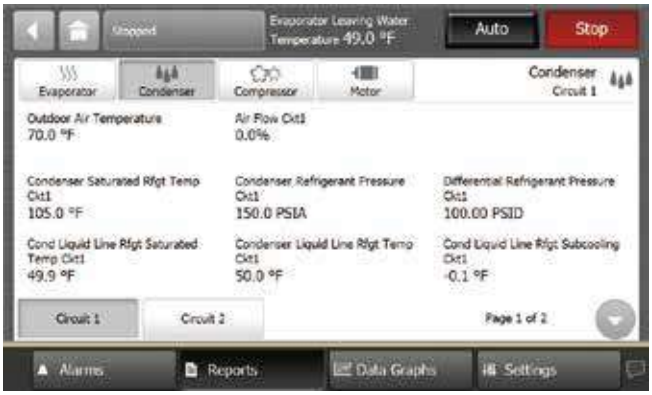


Figure 30. Report condenser screen

Table 32. 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 31. Report compressor screen

Table 33. 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 32. Report motor screen

Table 34. 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 33). 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.

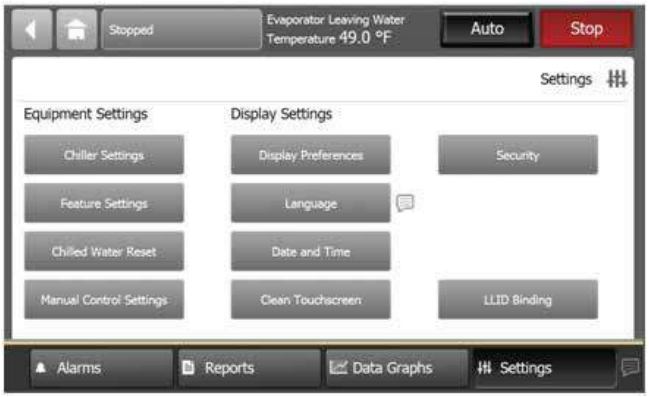


Figure 33. Setting screen

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 33). 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 34.*

Figure 34. Equipment setting screen (Chiller setting shown)

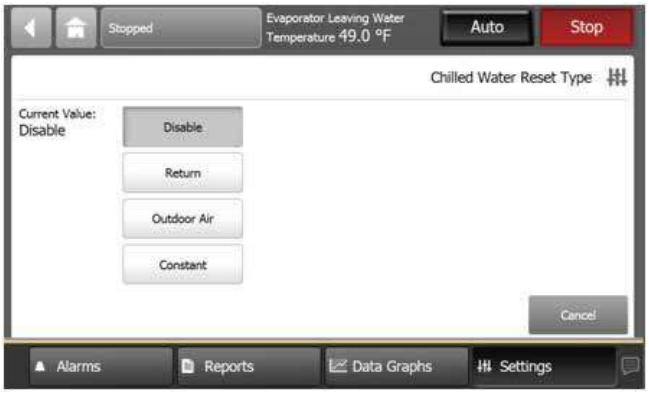


Figure 35. Chilled water reset type screen

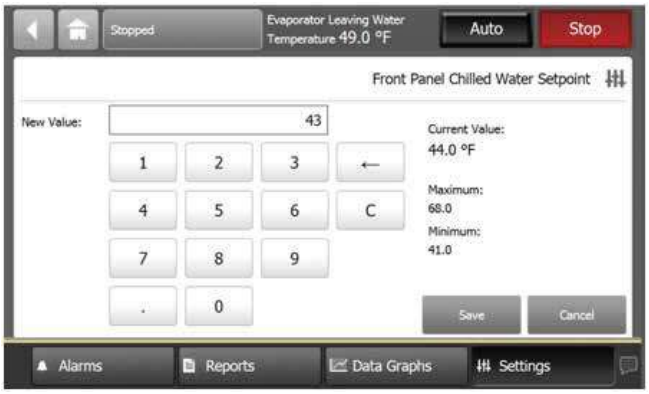


Figure 36. Changed chilled water setpoint screen

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 34), 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 35), 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 UC800 controller. The screen you were previously viewing appears.

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 35. 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.

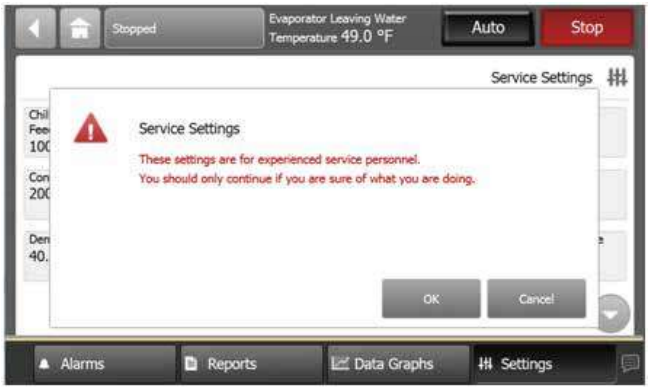


Figure 37. Warning message

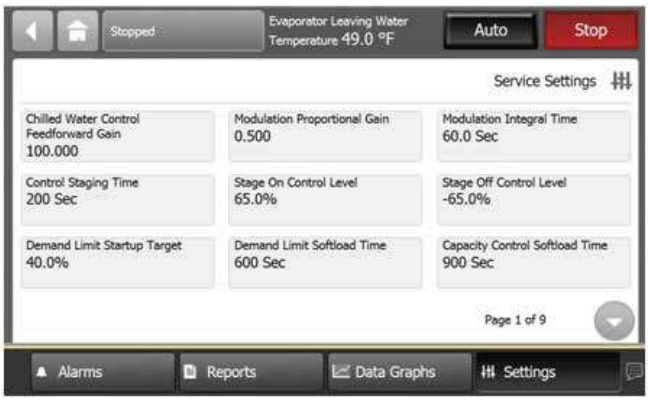


Figure 38. Service settings screen

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 39). 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 (see Figure 39):

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

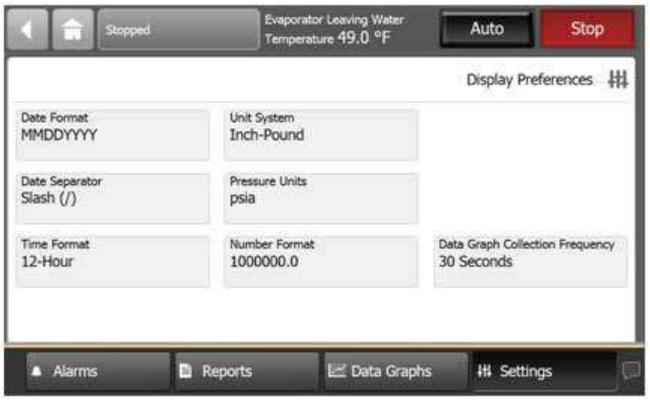


Figure 39. Display preference screen

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 40. 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

Figure 41. 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 41as 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.

Figure 42. 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 43. Countdown screen

Security Settings

If security if 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 45).

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 45).
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 44. Security screen - disable

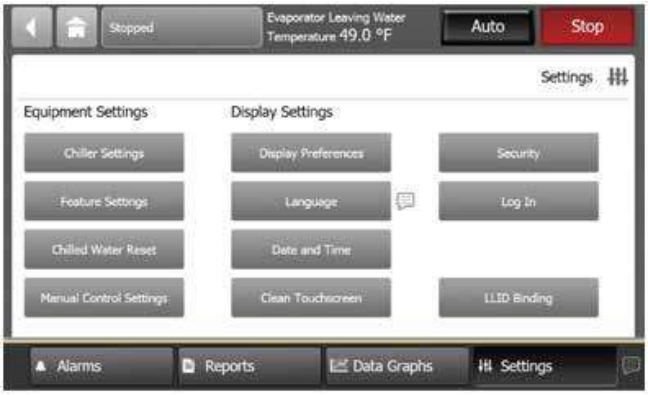


Figure 45. Security settings screen

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 46).
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 46. Log in screen

Logging Out

To log out:

1. Touch the Log out button. A confirmation screen appears (Figure 47).
2. Touch Yes to confirm that you want to log out. The Settings screen appears with a Log in button on it.

Figure 47. Log out confirmation screen

Tracer TU

The AdaptiView™ TD7 operator interface allows for daily operational tasks and setpoint changes. However, to adequately service RTAG 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

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.

Figure 48. Tracer TU

Sequence of Operation

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 49 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 Tracer™ 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

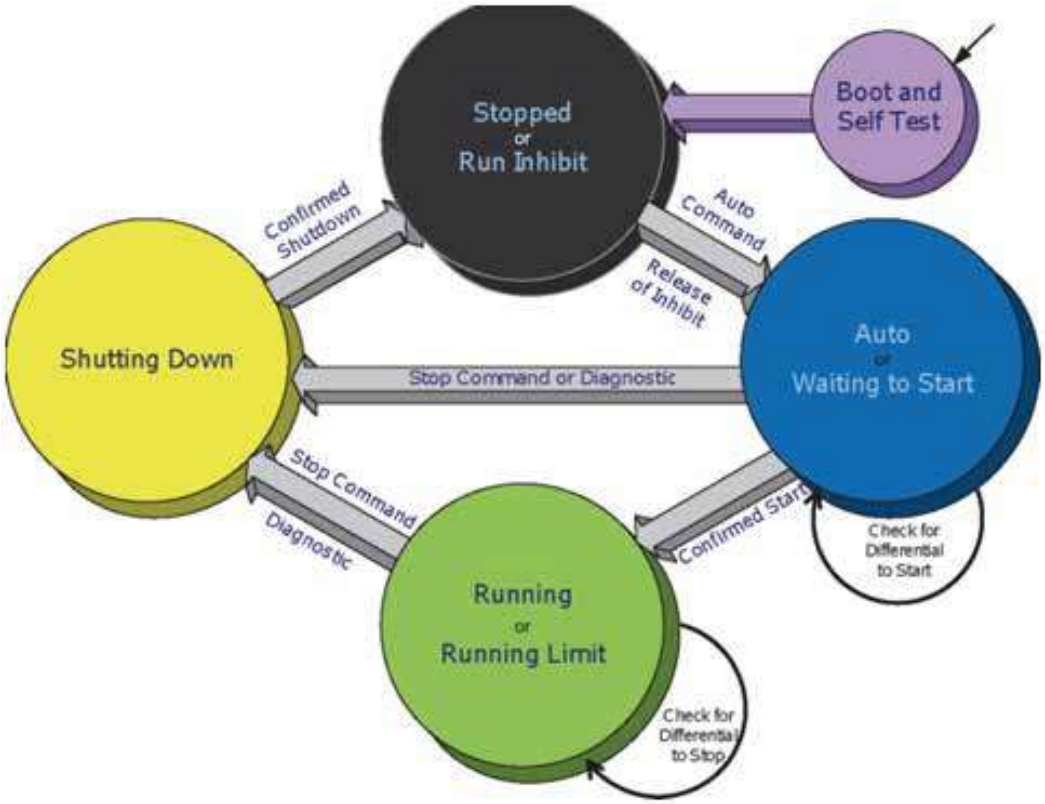


Figure 49. Software operation overview

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 50 shows the respective TD-7 AdaptiView screens during a power up of the UC800 and display. This process takes 25 seconds for the UC800 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.

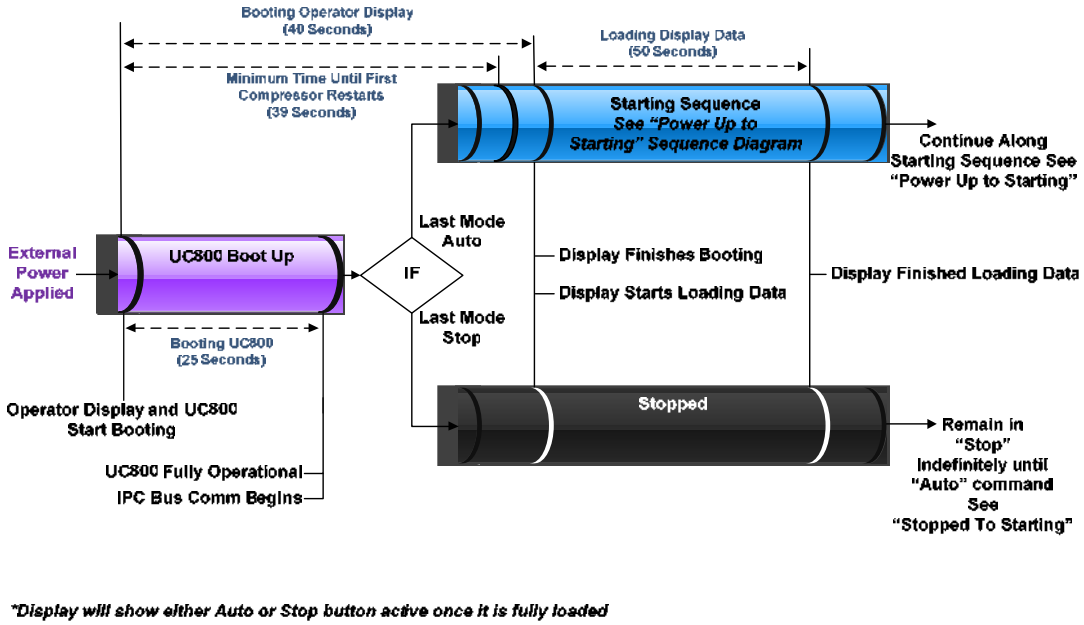


Figure 50. Sequence of operation: power up diagram

Power Up to Starting

Figure 51, 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.

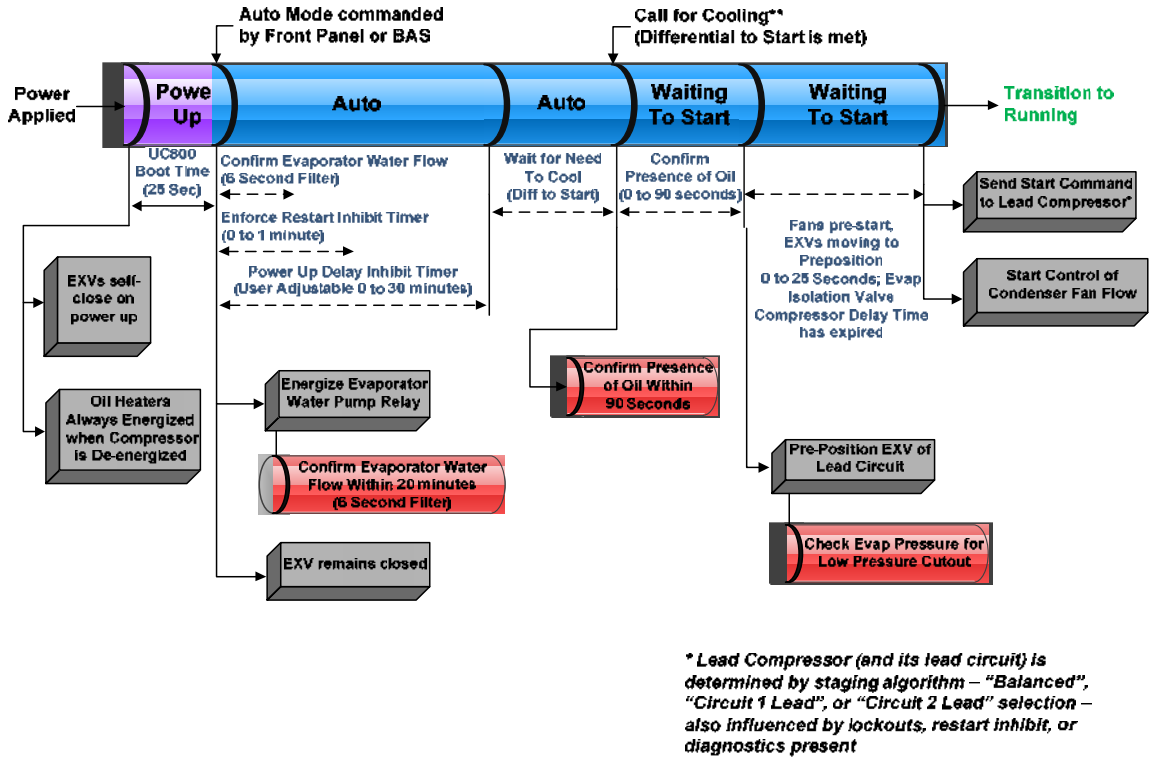


Figure 51. Sequence of events: power up to starting

Stopped to Starting

Figure 52 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.

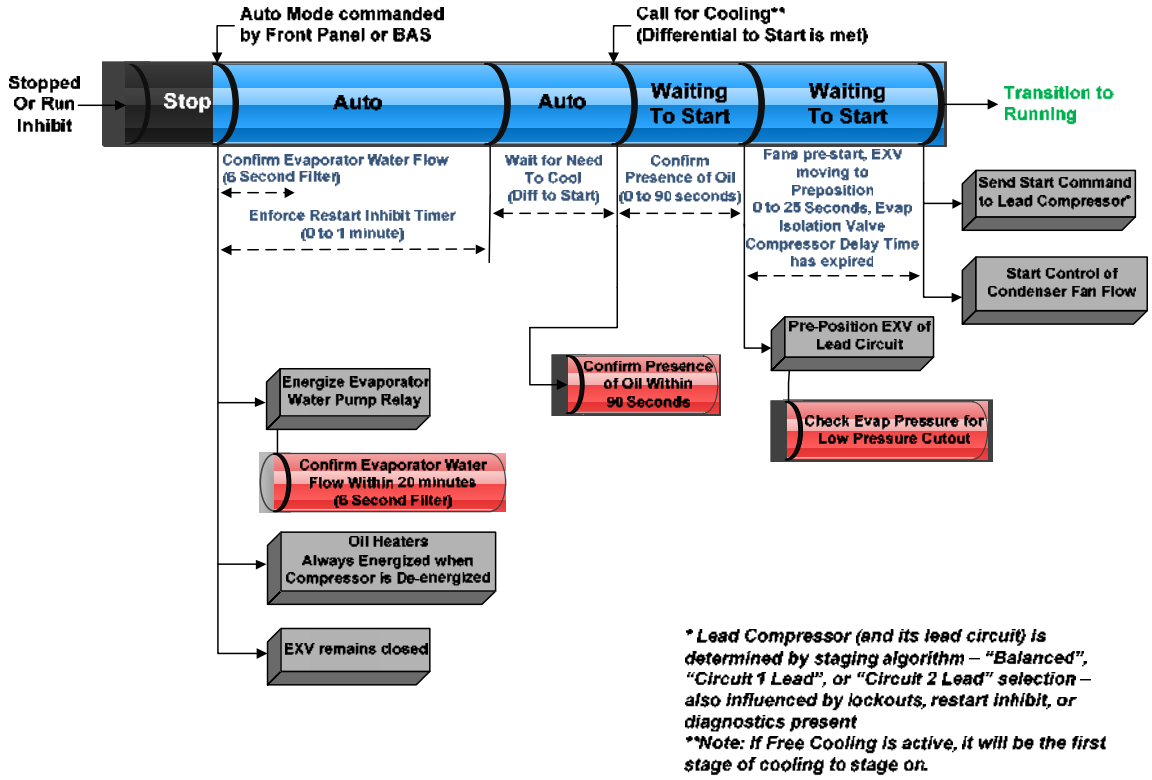


Figure 52. Sequence of events: stopped to starting

Running (Lead Compressor/Circuit Start and Run)

Figure 53 shows a typical start and run sequence for the lead compressor and its circuit.

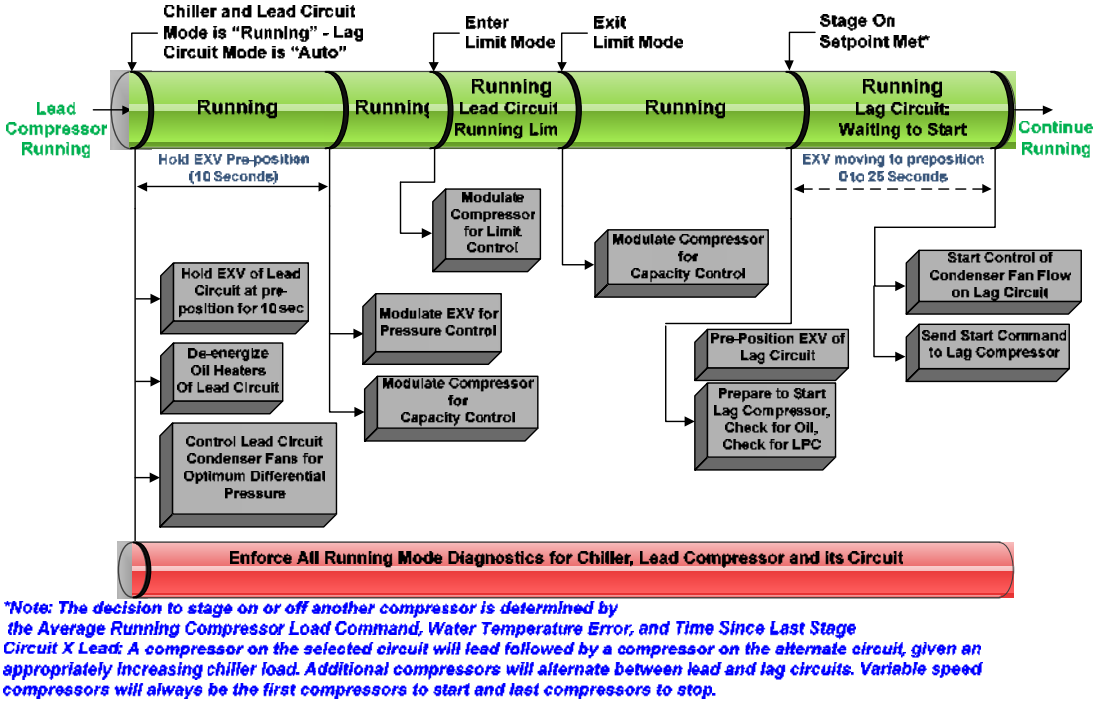
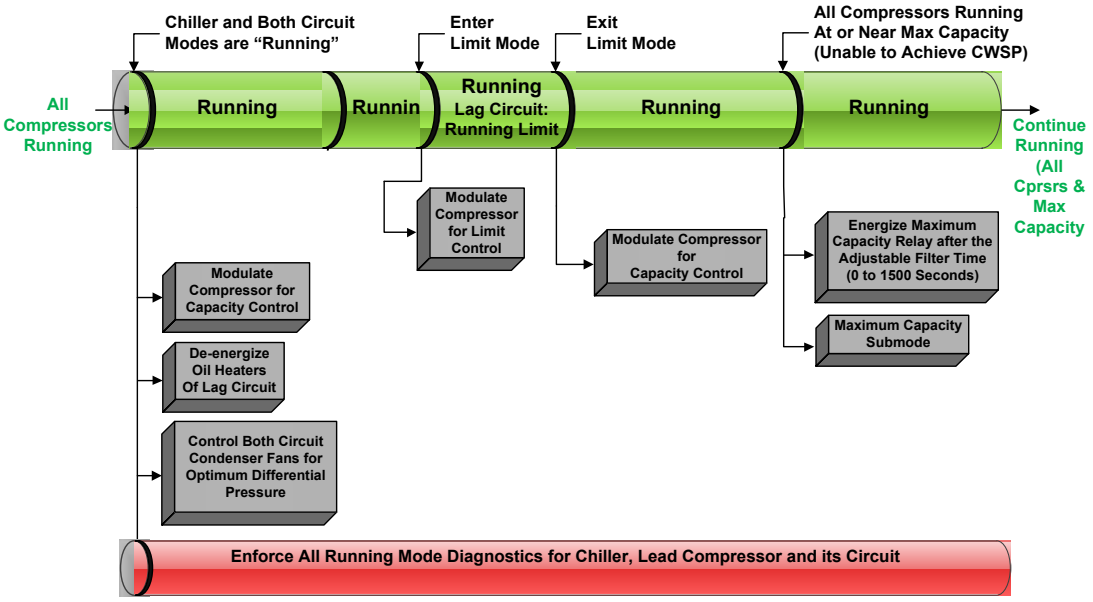


Figure 53. Sequence of operation: running (lead compressor/circuit start and run)

Running (Lag Compressor/Circuit Start and Run)

Figure 54 shows a typical start and run sequence for the lag compressor and its circuit.

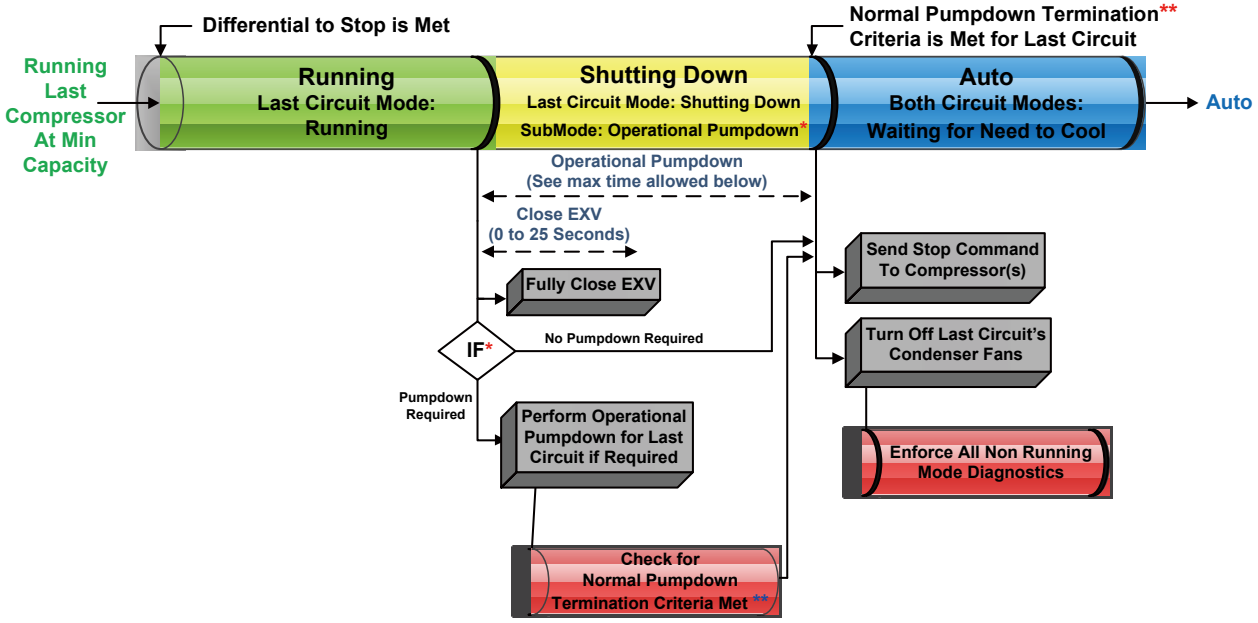


*Note: The decision to stage on or off another compressor is determined by the Average Running Compressor Load Command, Water Temperature Error, and Time Since Last Stage

Figure 54. Sequence of operation: running (lag compressor/circuit start and run)

Satisfied Setpoint

Figure 55 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.

Figure 55. Sequence of events: satisfied setpoint

Unloading Unstaging

Figure 56 shows the normal transition from full load to minimum load while the chiller is running.

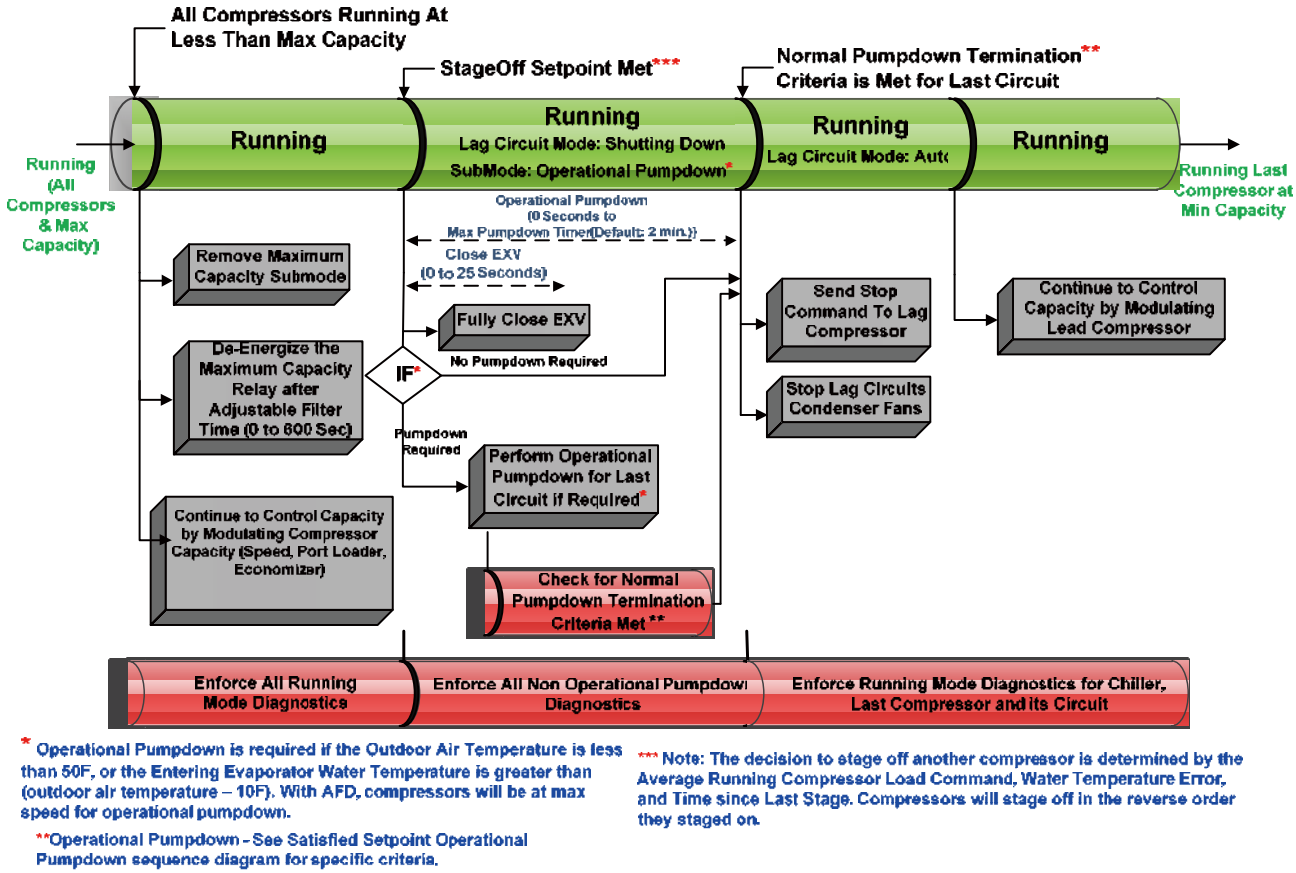


Figure 56. Sequence of events: Unloading unstaging

Normal Shutdown to Stopped or Run Inhibit

Figure 57 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.

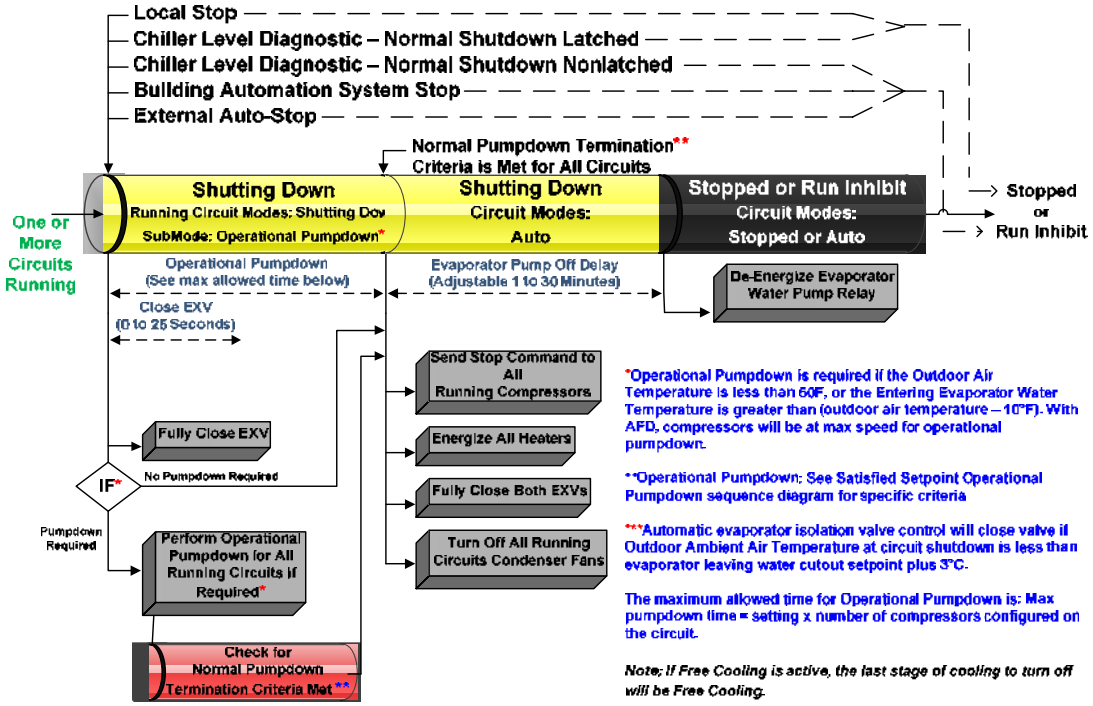


Figure 57. Sequence of events: normal shutdown to stopped or run inhibit

Immediate Shutdown to Stopped or Run Inhibit

Figure 58 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.

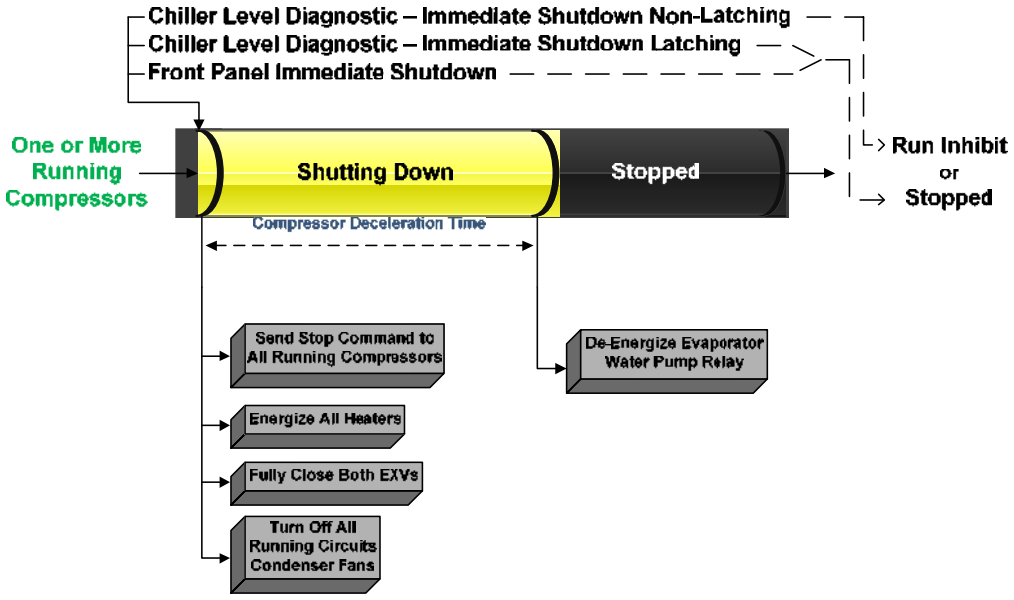


Figure 58. Sequence of events: immediate shutdown to stopped or run inhibit

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 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 36. 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 37. 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

Diagnostic Name and Source	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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
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 38. 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

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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
Low Refrigerant Temperature	Circuit	Immediate	Latch	All Ckt Running Modes	The warmer of either the either the 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 Prestart [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 Function specification 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

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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
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
Restart Inhibit Invoked - xy	Cprsr	Warning	NonLatch	All	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
BAS Failed to Establish Communication	Chiller	Warning and Special Action	NonLatch	At power-up	The BAS was setup as "installed" and the BAS did not communicate with the Lontalk LCIC within 15 minutes after chiller controls power-up. Refer to Section on Setpoint Arbitration to determine how setpoints and operating modes may be affected. 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
BAS Communication Lost	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

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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 < 2F. 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
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]	This diagnostic can be triggered in two ways: 1) 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. The trip criteria is not evaluated (and time above the threshold is not counted) until the ignore time passes. 2) If the absolute value of the Actual Evap Pool Temp Correction CktX is greater than the 'Evap Pool Temp Diagnostic Threshold CktX' AND the absolute value of the Pool Temp Error is greater than the 'Evap Pool Temp Diagnostic Threshold CktX', the diagnostic will occur. There is an ignore time of 2 minutes following circuit startup. Pool Temp Sensor may have failed due to incorrect installation, improper insulation, or an offset pool temperature measurement typically caused by moisture intrusion.	Local

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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
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

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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
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.	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.	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.	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.	Local

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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.	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.	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.	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
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

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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 105F (65.55C), range 80F (26.67C)-150F(65.55C) 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 Cut-out - 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 UC800 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
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

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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 39. 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
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 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: 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

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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: 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
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

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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
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

Diagnostic Name	Affects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
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 chapter 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 duplex system. RTAG085 and RTAG100 are single circuit, with one rotary screw compressor; while others are two circuits with one or two compressors per circuit, and one chilled water loop . The system schematic of two circuits is shown in Figure 59 System Schematic.

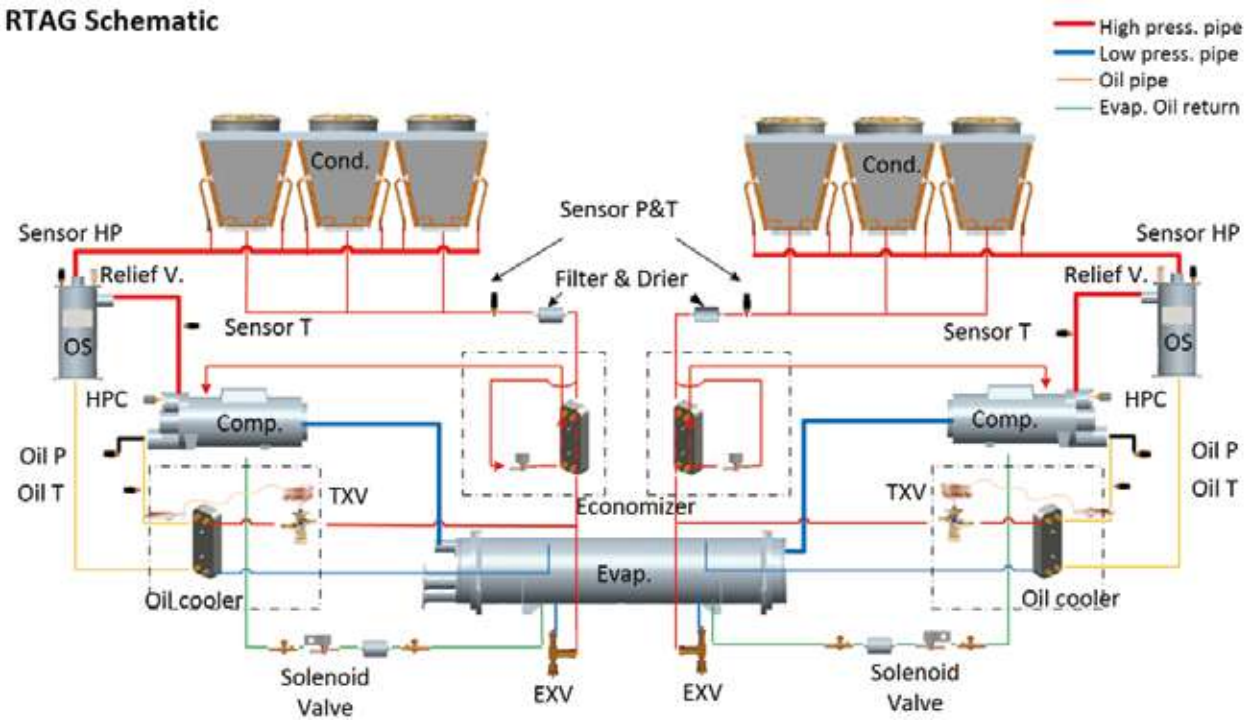


Figure 59. System Schematic

Refrigerant Cycle

The refrigerant cycle of unit without economizer is represented in the pressure enthalpy diagram in Figure 60. 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 99.5% 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 in the 7mm tube (states 2b to 3b). Refrigerant flow throughthe system is balanced by an electronic expansion valve (states 3b to 4).

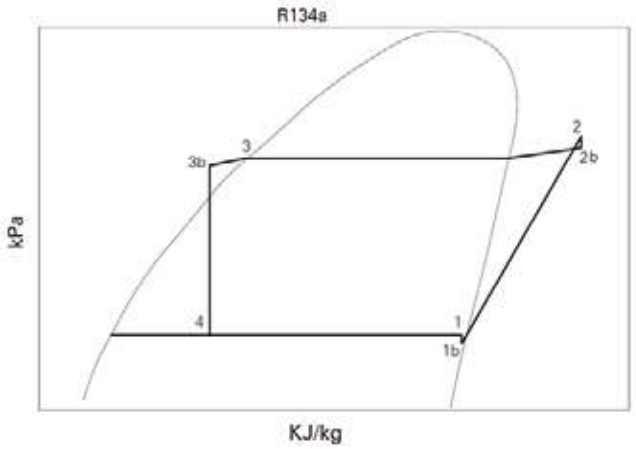


Figure 60. Pressure Enthalpy (P-h) diagram of RTAG

Figure 61 show the refrigerant cycle of pressure enthalpy diagram of RTAG with economizer unit. Comparing to figure57, 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).

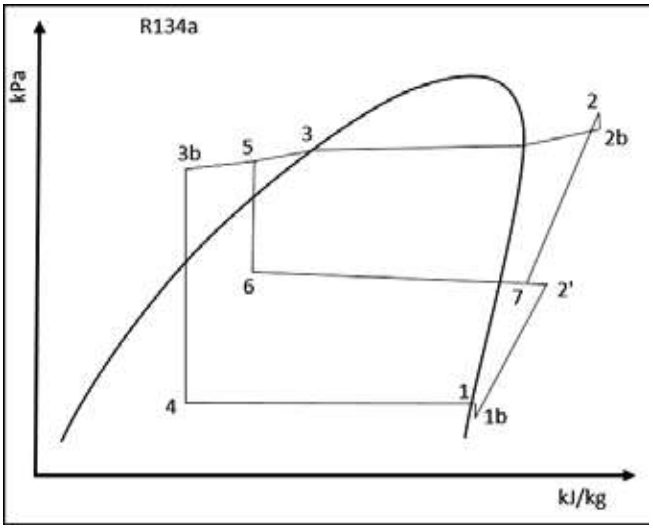


Figure 61. Pressure Enthalpy (P-h) diagram of RTAG with Economizer

R134a 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 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 requires the use of specific POE oils as designated on the unit nameplate. To avoid compressor damage and insure the performance requirement, use only R134a.

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 62, 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.

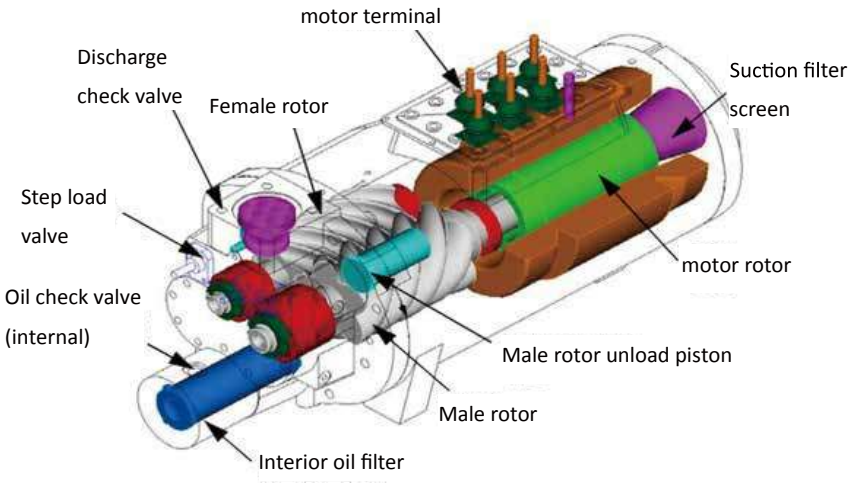


Figure 62. Compressor inner configuration

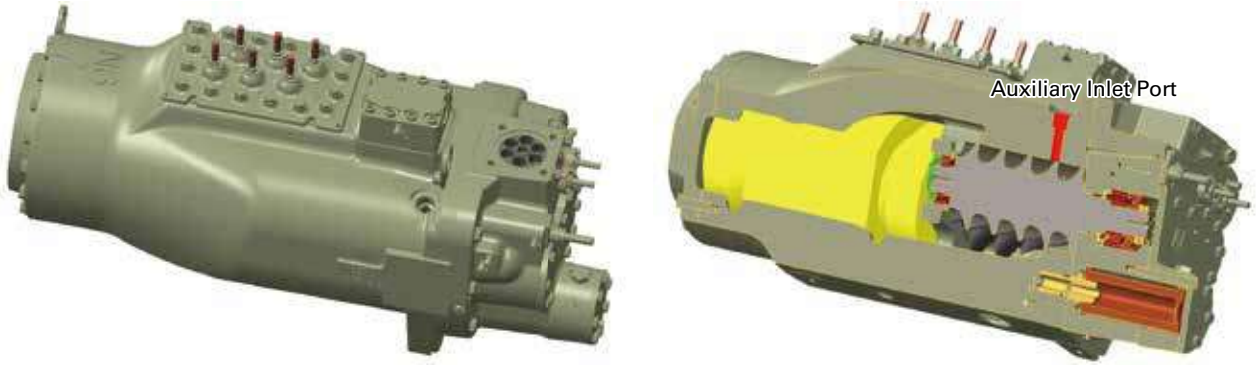


Figure 63. Compressor with Auxiliary Inlet Port

Condenser and 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, mean while 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 continue flow to high oil concentration area and go on evaporating, oil concentration further increase, and finally go back to compressor. 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 cop-

per tubes, mechanically expanded into the tube sheets. Tubes are cleanable with dismountable water boxes. Tubes exterior diameter is 19mm. 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 one kind: 1.03MPa (150psig). 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 59 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, is returned through a line that is connected to the compressor.

An internal, pilot operated shutoff valve is provided to prevent oil flow into the compressor when the compressor is not running.

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 41. RTAG Start-up Test Log" P. 106 . 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 Procedure

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 liquid, and oil return lines, open 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 counterclockwise is open. Operation of ball valve in oil return line status see Figure 64.

Open

Close

Figure 63. Compressor with Auxiliary Inlet Port

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 meet the range of "General data tables P.13. and check the water pressure drop through the evaporator according to "Figure 11. Water flow- pressure drop curve" P. 27.
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 UC800 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:

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

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

Vx = 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/UC800.
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 connection should 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 dis¬connect). 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.

NOTICE

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 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 15. Water side heat exchanger typical piping connection schematic" P. 33 , 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 "General data tables P.13."

Unit Start Up and Shut Off Procedures

Start Up

If the present checkout, as discussed above chapter, 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 the Table 43.
3. Close the fused-disconnect switch for the chilled water pump. Energize the pump(s) to start water circulation.
4. Check all the service valves are open for each circuit, for example, valve on liquid line, oil line etc.
5. Make sure evaporator heater is energized right. Please confirm that the drainage valve on the evaporator water box is closed.
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 10, when compressor in full load.
   b. Measure the system discharge superheat.

Table 40. Unit Running Status

Evaporator Approach		Condenser Approach	
Range (ºC)	Calculation Method	Range (ºC)	Calculation Method
2~4	Leaving water temperature−saturated suction temperature	12~20	Leaving water temperature−saturated suction temperature

NOTICE

Compressor Damage!

Catastrophic damage to the compressor will occur if the oil line shut off valve or the angle 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 charge before first start, else for nitrogen charging options or 12 kg filling options, filling unit must strictly follow Table 1 ~ Table 3 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 Re-start

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 unit-mounted disconnect (if installed) and lock in the “OPEN” position.
3. Disconnect the evaporator 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, to avoid the heater damage due to higher temperature.

Seasonal Unit Startup Procedure

Follow the 3.1 Start Up to start the unit, Only after pass through the procedure of 2.2 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 8F, 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, clean the coil.

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 coils at least once a year. If the unit is in a dirty environment, increasing cleaning frequency. Chemical cleaning is recommended.

⚠ 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 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.

8. Check and tighten all electrical connections as necessary.

Table 41. 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 UC800 pressure			ckt1/ckt2
Volts	Amps	Hz	Unit R-134a Charge			lbs
Compressor Data:			Unit oil charge (SOL120)			gal
Compressor A:			**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 B:			X			
	Model #:		X			
	Serial #		X			
	RLA		X			
	KW		**Summary of Options Installed**			
	Volts		Y N	Tracer Communications Interface		
	HZ		Y N	Ice Making		
Compressor C:			Y N	Other		
	Model #:		Y N	Other		
	Serial #		Y N	Other		
	RLA		**Evap Design Conditions**			
	KW		GPM	PSID		
	Volts		Entering Water:	Leaving Water:		
	HZ		% Glycol:			
Compressor D:			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 42. RTAG Unit Configuration

RTAG Unit Configuration			
Job Name		Job Location	
Model #			
Serial #		CRC#	
Sales Order #	Ship Date	Job Elevation (ft. above sea level)	
Setpoint View *			
Front Panel Degree Units (circle one)			F or C
Front Panel Chilled Water Setpoint			
Front Panel Current Limit			
Differential to Stop			
Differential to Start			
Leaving Water Temperature Cutout			
Low Refrigerant Temperature Cutout			
Condenser Limit			
Low Ambient Lockout Setpoint			
Low Ambient Lockout (circle one)			Enable or Disable
Under/Over Voltage Protection			Enable or Disable
Local Atmospheric Pressure			psi
Design Delta T			F or C
Reset Type (circle one)			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 Techview , click on "View " and then click "Setpoint View " Log accordingly.

** Using Techview , click on "View " and then click "Compressor Service View " Log accordingly.

*** Using Techview , click on "View " and then click "Configuration" (Nameplate Tab) Log accordingly.

Table 43. 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							
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*						
		Compressor 1A Tab			*Compressor 1B 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:							

	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
VFD	**Circuit 1 Tab**			**Circuit 2 Tab**		
AFD Output Power						
Frequency Command						
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 personal should service the chiller.

Some symptoms of a refrigerant under-charged unit:

- Low subcooling
- Higher than normal discharge superheat
- Bubbles in EXV sight glass
- Larger than normal evaporator approach temperatures (leaving water temperature - saturated evaporator temperature)
- Lower suction pressure, low refrigerant temperature limit or 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 Field Charging Procedure

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

⚠ WARNING

Hazardous Voltage w/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 evaporator 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 filter housing port per nameplate.
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 rupturing 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 40, 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 contacting Trane technical service.*

Refrigerant recovery

If refrigerant recover is needed, it should use special recovery 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 container 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 and can be refilled repeatedly. Recovered 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 upstream 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 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.
5. Remove hose.
6. 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.

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

⚠ CAUTION

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

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

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.

Use only TRANE OIL 00317 in the RTAG units, 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 65. 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.
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*

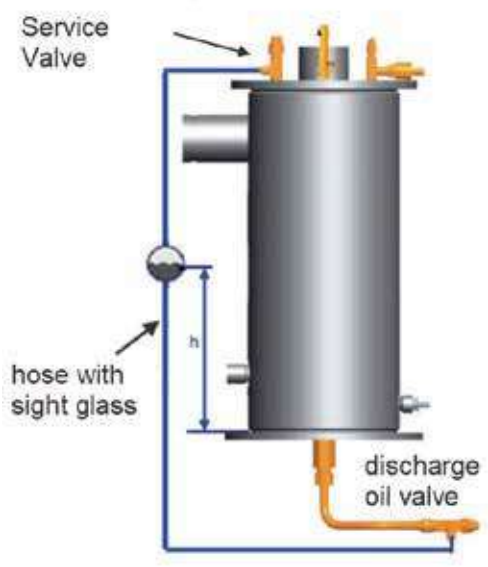


Figure 65. Oil Level Measure of Oil Separator

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 66. Oil Charge of Compressor.
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.*

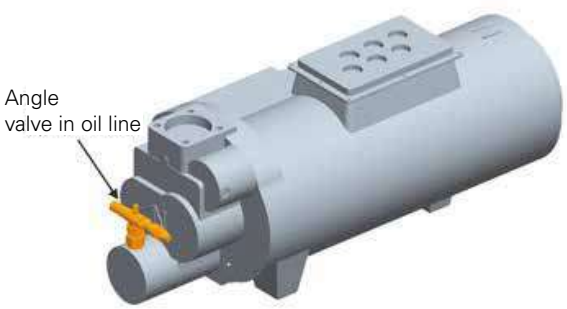


Figure 66. Oil Charge of Compressor

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 needs 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

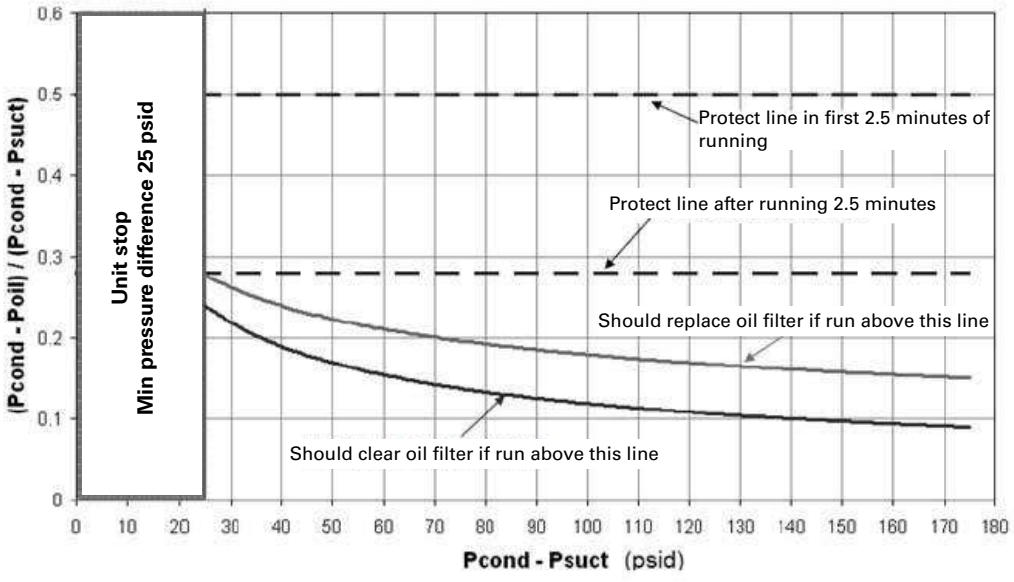


Figure 67. Oil Charge of Compressor

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 60. 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.
10. Perform leak test with pressurized Nitrogen, then vacuum.
11. Charge an equal amount of new compressor oil comparing 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 Replacement

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 vacuum.
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 frequency should be increased to ensure the unit operating performance. 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 Maintenance

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, saline or brackish water.

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

- Nondestructive testing for the tubes of the heat exchanger at least once every 3 years.

Note: *design a reasonable frequency for testing according 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 require 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 68. Chemical Cleaning" 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.

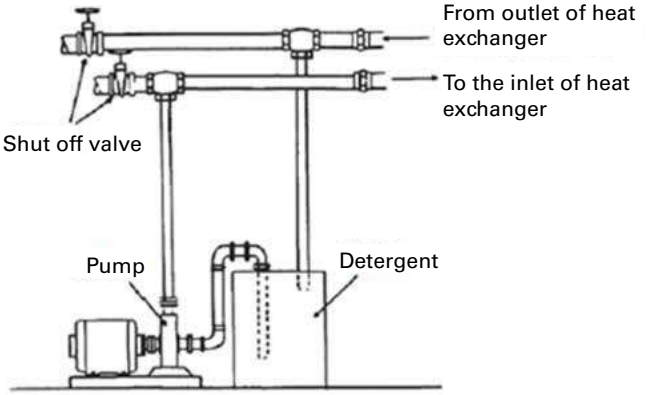


Figure 68. Chemical Cleaning

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 water 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 replacement, 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 and locked. 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 refrigerant.
3. Disassemble the vertical pillar on the compressor side, and move it to the position of dotted line as support, which is shown in “Figure 40. Compressor Replacement”.
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 compres-

sor, 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 maintenance (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 10 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 refrigerant 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 39 after the compressor run stably.

Water side heat exchanger replacement

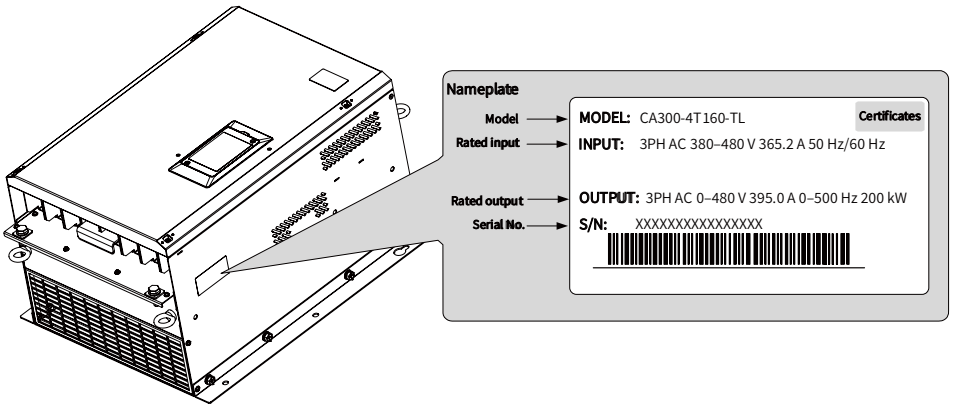
For water side heat exchanger replacement, please follow the following steps:

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

Code	Product Series
CA300	Central air conditioner

Code	Voltage Class
4T	Three phase 380–480 V

Code	Description
TL	Trane

Code	Applicable Motor(kW)
160	160
200	200

Description of Parts

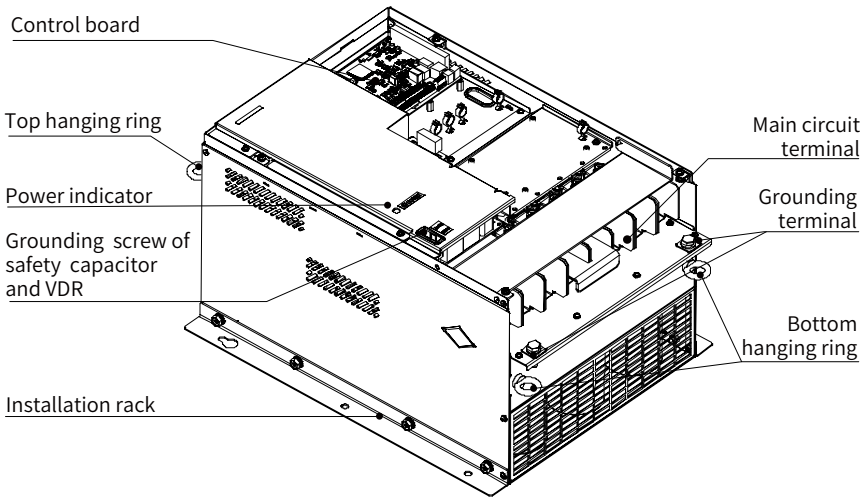


Figure 75. AC drive components (132/160 kW)

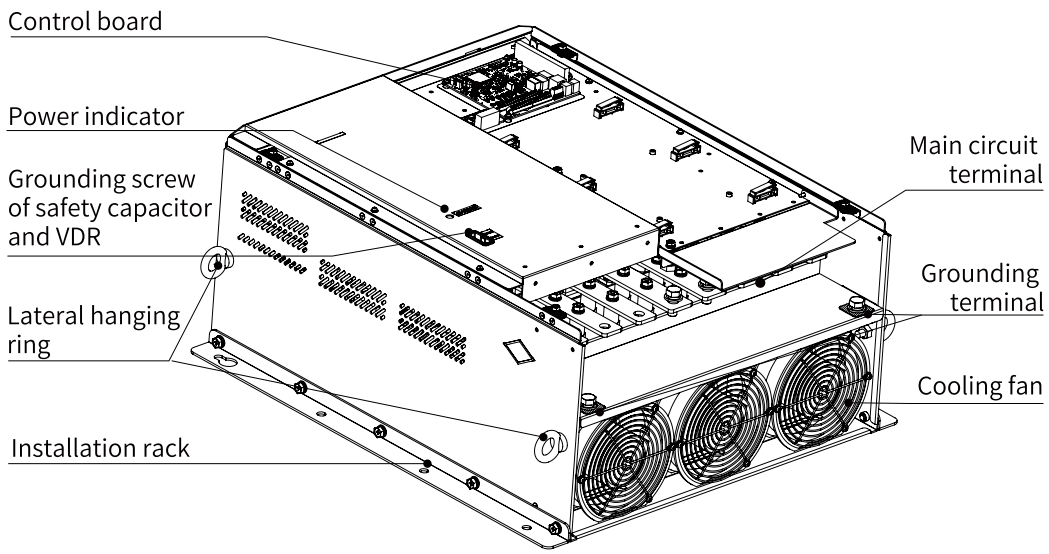


Figure 76. AC drive components (200 kW)

Technical Specifications

Table 48. Product models and electrical parameters

Model	Power Capacity (kVA)	Input Current (A)	Output Current (A)	Motor (kW)
CA300-4T132-TL	219	238	260	132
CA300-4T160-TL	270	291	315	160
CA300-4T200-TL	328	365	395	200

Table 49. 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
	Multiple preset speeds	The system implements up to eight speeds by using control terminals.
	Built-in 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 and display	LED display	ws parameters.
	Key locking and function selection	All or some keys can be locked to prevent accidental operation. The range of some key 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.
Environment	Command source	Allows different methods of switching between command sources: • Operating panel (keypad & display) • Terminal I/O control • Serial communication

Drive

	Item	Description
Running	Main frequency reference	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	RS485 communication terminal
Environment	Altitude	• 1500 m to 3000 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.

Outline Dimensions

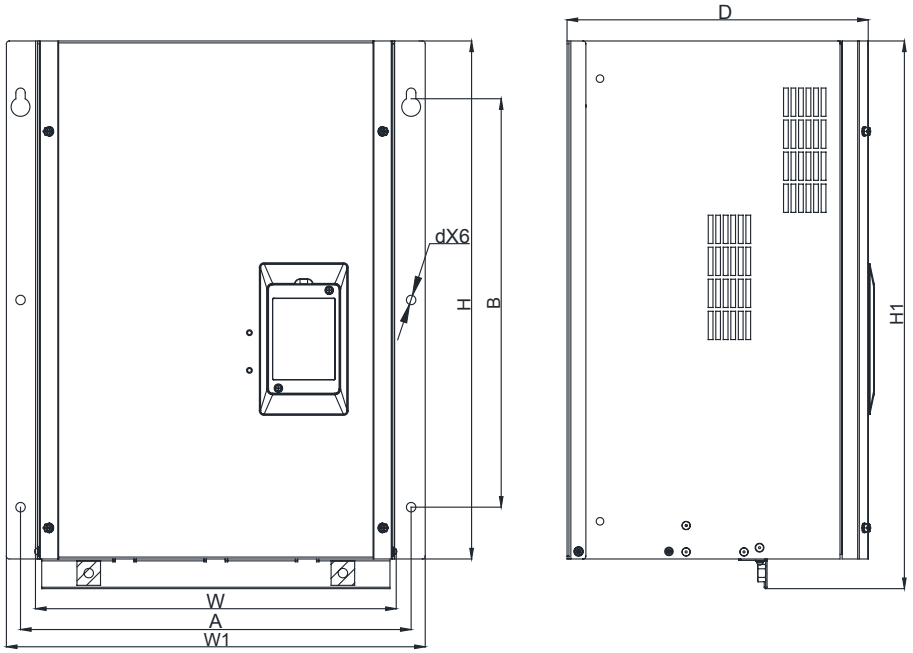


Figure 77. Outline dimensions (160 kW)

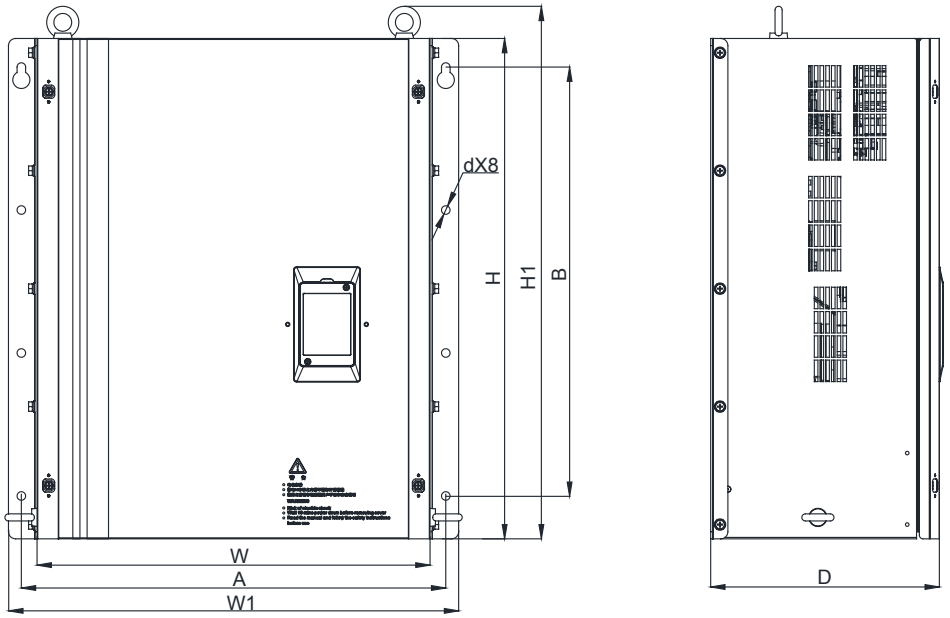


Figure 78. Outline dimensions (200 kW)

Model	Mounting Hole (mm)		Dimensions (mm)					Mounting Diameter d (mm)	Weight (kg)
	A	B	W	W1	H	H1	D		
CA300-4T160-TL	415	440	375	445	550	580	320	$10	42
CA300-4T200-TL	594	600	550	630	700	745	320	$12	89

Wiring

Standard Wiring

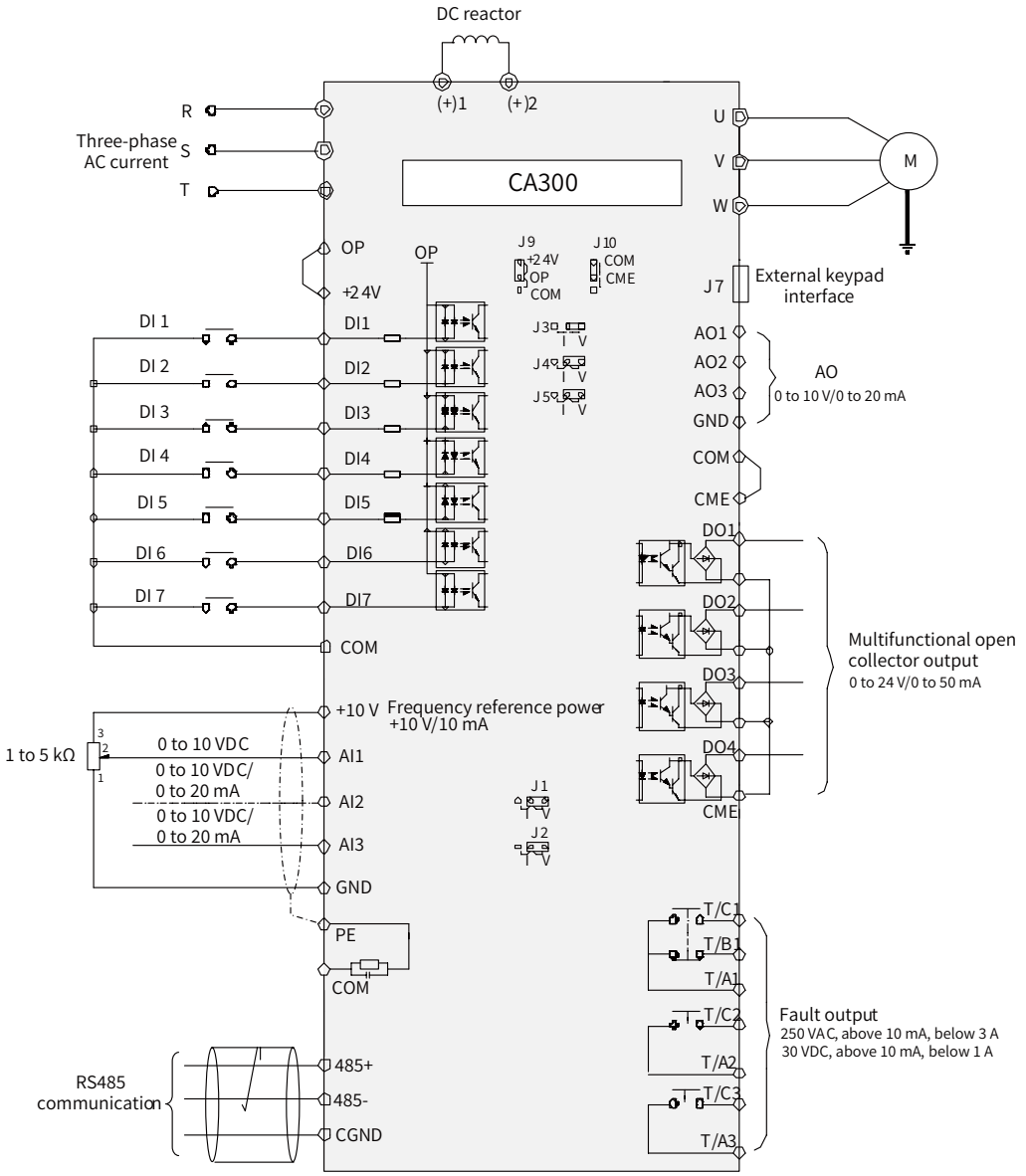
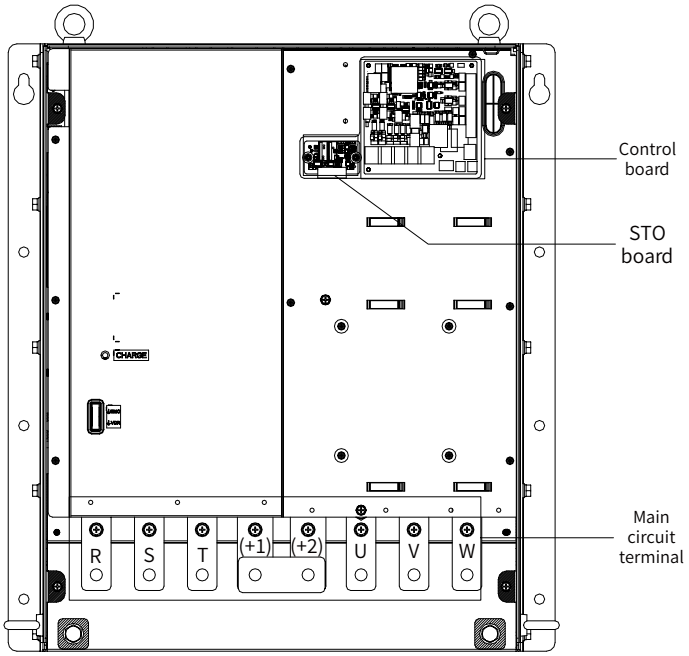


Figure 79. Standard electrical wiring

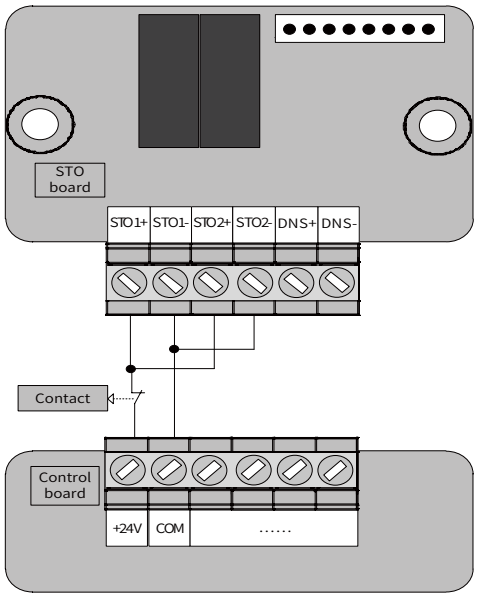
Main Circuit Terminals

AC drive terminal arrangement



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

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).

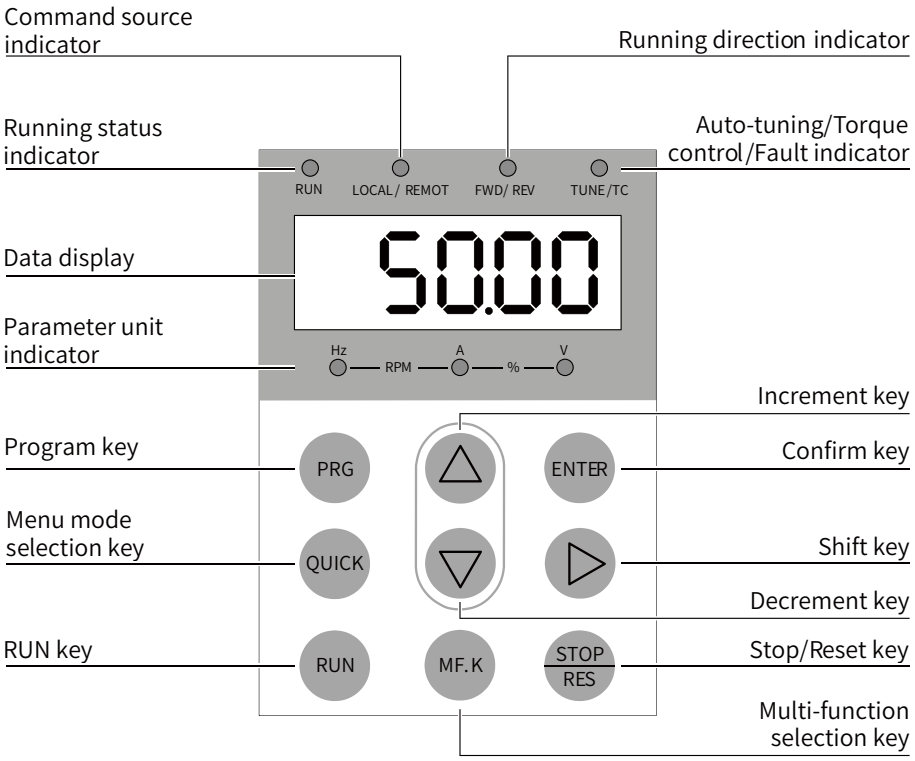


Figure 80. Details of the operating panel

Keys on LED Operating Panel

Function of keys on the LED operating panel

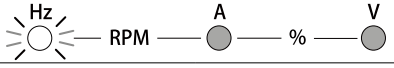
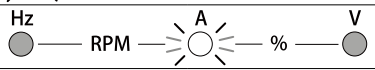
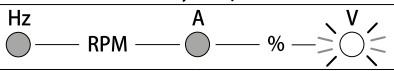
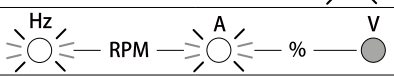
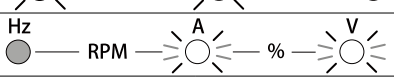
Key	Key Name	Function
PRG	Programming	Used to enter or exit the level-1 menu.
ENTER	Confirm	Used to enter the menu interfaces level by level, and confirm the parameter setting.
△	Increment	Used to increase the displayed data or parameter number.
▽	Decrement	Used to decrease the displayed data or parameter 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.

Key	Key Name	Function
MF.K	Multifunction	Used to switch over between functions.
PRG	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,  indicates the light turns off, and  indicates the light flashes.

Table 50. 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	lashing: under serial communication control
FWD/REV Running direction indicator	 FWD/ REV	Off: forward motor rotation
	 FWD/ REV	On: reverse motor rotation
TUNE/TC Auto-tuning/ Torque control/Fault indicator	 TUNE/ TC	Off: normal running
	 TUNE/ TC	On: torque control mode
	 TUNE/ TC	Flashing slowly: auto-tuning status (once per second)
	 TUNE/ TC	Flashing quickly: fault status (four times per second)
		Frequency unit: Hz
		Current unit: A
		Voltage unit: V
		Speed unit: RPM
		Percentage (%)

Troubleshooting

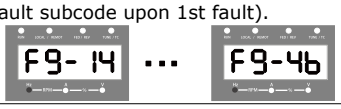
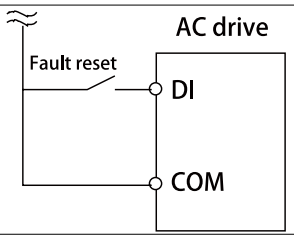
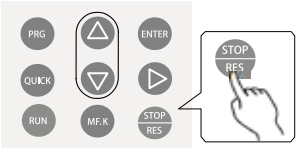
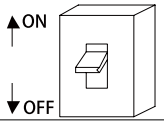
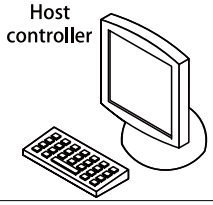
Fault Display and Reset

Faults are handled prior to alarms.

1. Example of fault code displayed: “E02.00”
2. Example of alarm code displayed: “A16.13”

When a fault occurs during running, the AC drive stops output immediately, the fault indicator 

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 the 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 using F9-14 (1st fault type) to F9-46 (Fault subcode upon 1st fault). 
Before the fault is reset	Locate the fault cause and rectify the fault. Then follow the steps below to reset the fault.	
Fault resetting method	a. Fault resetting through a DI terminal Allocate a DI terminal with function 9 “Fault reset (RESET)” by setting any of F4- 00 (DI1 function selection) to F4-04 (DI5 function selection) to 9 (Fault reset).	
	b. Fault resetting using the operating panel Press the STOP key on the operating panel.	
	c. Automatic resetting Disconnect the power supply. Wait until the fault code disappears, and connect the power supply again.	
	d. Fault resetting through communication Confirm that F0-02 (Command source selection) is set to 2 (Serial comms.) and write “7” (fault reset) to communication address 2000H using a host computer.	

Faults and Diagnostics

Fault Code	Fault Name	Cause	Possible Solution
E01.01	Hardware fault	The AC drive is abnormal in 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.
E02.00	Overcurrent during acceleration	A ground fault or short circuit exists in the output circuit of the AC drive.	Check whether short circuit occurs on the motor, motor cable, or contactor.
		The control mode is SVC but motor auto-tuning is not performed.	Set motor parameters according to the 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 F3-18 (V/F current limit level) is too large. Adjust it between 110% and 140%. The setting of F3-20 (V/F current limit gain) 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 flying start 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, locate the interference source. If external interference does not exist, the driver board or hall device may be faulty.
E03.00	Overcurrent during deceleration	A ground fault or short circuit exists in the output circuit of the AC drive.	Check whether short circuit occurs on the motor, motor cable, or contactor.
		The control mode is SVC but motor auto-tuning is not performed.	Set motor parameters according to the 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 F3-18 (V/F current limit level) is too large. Adjust it between 110% and 140%. The setting of F3-20 (V/F current limit gain) is too small. Adjust it between 5 and 20.
		The braking unit and braking resistor are not installed.	Install the 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, locate the interference source. If external interference does not exist, the driver board or hall device may be faulty.
E04.00	Overcurrent at constant speed	A ground fault or short circuit exists in the output circuit of the AC drive.	Check whether short circuit occurs on the motor, motor cable, or contactor.
		The control mode is SVC but motor auto-tuning is not performed.	Set motor parameters according to the 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 F3-18 (V/F current limit level) is too large. Adjust it between 110% and 140%. The setting of F3-20 (V/F current limit gain) 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, locate the interference source. If external interference does not exist, the driver board or hall device may be faulty.
E05.00	Overvoltage during acceleration	Input voltage is too high.	Adjust input voltage to normal range.
		An external force drives the motor during acceleration.	Remove the external force or install a braking resistor. The setting of F3-26 (Frequency rise threshold during voltage limit) 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 F3-22 (V/F voltage limit) is too large. Adjust it between 700 V and 770 V. The setting of F3-24 (Frequency gain for V/F voltage limit) is too small. Adjust it between 30 and 50.
		The braking unit and braking resistor are not installed.	Install the braking unit and braking resistor.
		Acceleration time is too short.	Increase acceleration time.

Fault Code	Fault Name	Cause	Possible Solution
E06.00	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 F3-22 (V/F voltage limit) is too large. Adjust it between 700 V and 770 V. The setting of F3-24 (Frequency gain for V/F voltage limit) is too small. Adjust it between 30 and 50.
		An external force drives motor during deceleration.	Remove the external force or install a braking resistor. The setting of F3-26 (Frequency rise threshold during voltage limit) is too small. Adjust it between 5 Hz and 15 Hz.
		Deceleration time is too short.	Increase deceleration time.
		The braking unit and braking resistor are not installed.	Install the braking unit and braking resistor.
E07.00	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 ofF3-22 (V/F voltage limit) is too large. Adjust it between 700 V and 770 V. The setting of F3-24 (Frequency gain for V/F voltage limit) is too small. Adjust it between 30 and 50.
		An external force drives the motor during running.	Remove the external force or install a braking resistor. The setting of F3-26 (Frequency rise threshold during voltage limit) is too small. Adjust it between 5 Hz and 15 Hz.
E08.00	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.
E09.00	Undervoltage	Instantaneous power failure occurs.	Enable the power dip ride through function by setting F9-59 (Power dip ride-through function selection) to a non-zero value.
		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 driver board, or the inverter control board is abnormal.	Contact us or the agent.
E10.00	AC drive overload	The load is too heavy or locked-rotor occurs on the motor.	Reduce load or check motor and mechanical conditions.
		The AC drive power class is small.	Replace a drive of larger power class.
		The control mode is SVC but motor auto-tuning is not performed.	Set motor parameters according to the motor nameplate and perform motor auto-tuning.
		The V/F control mode is used.	Reduce the setting of F3-01 (Torque boost) by 1.0% gradually, or set it to 0 (auto torque boost).
E10.01	Pulse-by-pulse current limit fault	The load is too heavy or locked-rotor occurs on the motor.	Reduce load or check motor and mechanical conditions. Replace a drive of larger power class.
		The AC drive power class is small.	
E11.00	Motor overload	F9-01 (Motor overload protection gain) is set improperly.	Set F9-01 properly.
		The load is too heavy or locked-rotor occurs on the motor.	Reduce load or check motor and mechanical conditions.
E12.01	Input voltage fault	R phase is lost.	Check whether input phase loss occurs. Check whether the input cable is broken. Check that DI terminals are properly connected. Check the hardware voltage detection circuit.
E12.02		S phase is lost.	
E12.03		T phase is lost.	
E12.04		Overvoltage occurs on input phase.	Adjust the voltage to normal range.
E12.05		Voltage imbalance occurs on input phase.	Check whether input phase loss occurs. Check the hardware voltage detection circuit.
E13.00	Output phase loss	The motor is faulty.	Check whether open circuit occurs on the motor.
		The cable connecting the AC drive and the motor is abnormal.	Rectify external faults.
		The AC drive's three-phase outputs are unbalanced when the motor is running.	Check whether the motor three-phase winding is normal.
		The driver board or the IGBT is abnormal.	Contact us or the agent.
E14.00	IGBT overheat	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.
		The thermally sensitive resistor of The IGBT is damaged.	Contact us or the agent.
		The IGBT is damaged.	
E15.01	External fault	An external fault signal is input through an NO DI.	Confirm that the mechanical condition allows restart (F8-18, Startup protection selection) and reset the operation.
E15.02		An external fault signal is input through an NC DI.	Confirm that the mechanical condition allows restart (F8-18, Startup protection selection) and reset the operation.

Fault Code	Fault Name	Cause	Possible Solution
E16.01	Communication fault	Modbus communication timeout	Check whether the RS485 cable is correctly connected. Check whether the settings of Fd-04 (Modbus communication timeout) and PLC communication cycle are proper.
E19.02	Motor autotuning fault	Auto-tuning of pole position angle of the synchronous motor is faulty.	The motor may be disconnected, or output phase loss may occur.
E19.04			
E19.05		Auto-tuning of initial pole position angle of the synchronous motor is faulty.	Increase the setting of F2-29 (Initial position angle test current for synchronous motor).
E19.06		Stator resistance autotuning is faulty.	Check whether the motor is connected. Ensure that F1-03 (Rated motor current) is set according to the motor nameplate.
E19.07			
E19.08			
E19.09		Auto-tuning of instantaneous leakage inductance of the asynchronous motor is faulty.	Check whether the motor is connected or output phase loss occurs. Ensure that the motor is connected.
E19.10			
E19.11		Inertia auto-tuning is faulty.	Ensure that F1-03 (Rated motor current) is set according to the motor nameplate. Increase the setting of F2-43 (Inertia autotuning and dynamic speed reference).
E19.12		Auto-tuning times out.	Check whether the motor is connected or output phase loss occurs. Ensure that the motor is disconnected from load.
E19.13			
E19.14			
E19.15			
E19.16			
E19.17			
E19.19			
E19.20		Auto-tuning of zero position angle of the no-load synchronous motor times out.	Check the Z feedback signal.
E19.22			
E19.23		Auto-tuning of pole position of the synchronous motor is faulty.	Ensure that F1-03 (Rated motor current) is set according to the motor nameplate. Decrease the setting of F2-29 (Initial position angle test current for synchronous motor).
E19.24		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.
E21.01	EEPROM read and write fault	EEPROM read and write is abnormal.	For parameters written to EEPROM, check RAM addresses and address mapping. If the EEPROM chip is damaged, require vendor to replace the main control board.
E21.02			
E21.03			
E21.04			
E22.00	Abnormal motor auto-tuning result	Stator resistance is not within the permissible range.	Check whether rated motor voltage and current are incorrectly set, and set F1-02 (Rated motor voltage) and F1-03 (Rated motor current) according to the 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 the 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 the motor nameplate. Before auto-tuning, ensure that the motor has no load.
E22.03		Synchronous motor back EMF is not within the permissible range after auto-tuning.	Ensure that F1-02 (Rated motor voltage) is set according to the motor nameplate. Before auto-tuning, ensure that the motor has no load.
E22.04		Inertia auto-tuning is faulty.	Ensure that F1-03 (Rated motor current) is set according to the motor nameplate.
E23.00	Short circuit to ground	The motor is short circuited to the ground.	Replace the faulty cable or motor.
E24.00	Motor phase-to-phase short circuit	Phase-to-phase short circuit occurs on the motor.	Check whether two-phase short circuit occurs in three-phase (U, V, W) output.
E26.00	Accumulative running time reached	Accumulative running time reaches the setting value.	Clear the record through parameter initialization.
E29.00	Accumulative power-on time reached	Accumulative power-on time reaches the setting value.	Clear the record through parameter initialization.
E30.00	Load loss	The output current of the AC drive is smaller than F9-64 (Load lost detection level).	Check whether the load is disconnected or the setting of F9-64 and F9-65 (Load lost detection time) satisfies actual running conditions.
E31.00	PID feedback lost during running	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.

Fault Code	Fault Name	Cause	Possible Solution
E42.00	Excessive speed deviation	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 improperly.	Set F9-69 and F9-70 properly based on actual conditions.
E43.00	Motor overspeed	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 improperly.	Set F9-67 and F9-68 properly based on actual conditions.
E45.00	Motor overheat	Cable connection of the temperature sensor is loose.	Check cable connection of the temperature sensor.
		The motor temperature is too high.	Increase 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 motors).
E46.01	Synchronous control parameter setting fault	More than two slave types are set.	Check whether the slave option is selected for A8-10, A8-50, and A8-70.
E47.00	STO fault	The STO card is faulty.	Check STO wiring.

Symptoms and Diagnostics

No.	Fault Description	Cause	Possible Solution
1	There is no display at power-on.	The mains voltage is not input or is too low.	Check the power supply.
		The switching power supply on the driver board of the AC drive is faulty.	Check bus voltage.
		The control board or operating panel is faulty.	Contact us or the agent.
		The rectifier module is damaged.	
2	"HC" is displayed at power-on.	Related components on the control board are damaged.	Contact us or the agent.
		The motor or motor cable is short circuited to ground.	
		The hall sensor is damaged.	
		The mains voltage is too low.	
3	"E23.00" is displayed at power-on.	The motor or motor output cable is short circuited to ground.	Use a megger to measure the insulation resistance of the motor and motor cable.
		The AC drive is damaged.	Contact us or the agent.
4	The display is normal at power-on. But after running, "HC" is displayed and the AC 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 faults in control circuit wiring.
5	E14.00 (IGBT overheat) is detected frequently.	The setting of carrier frequency is too high.	Reduce F0-15 (Carrier frequency).
		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.	The motor or motor cable is faulty.	Check that wiring between the AC drive and motor is normal.
		Motor parameters are set improperly on the AC drive.	Restore the factory parameters and reset the following parameters properly: • Motor ratings, such as rated motor frequency and rated motor speed • F0-01 (Motor 1 control mode) and F0-02 (Command source selection) • F3-01 (Torque boost) in V/F control under heavy-load start.
		The driver board is faulty.	Contact us or the agent.
7	DI terminals are disabled.	Related parameters are set improperly.	Check and set parameters in group F4 again.
		External signals are incorrect.	Re-connect external signal cables.
		The jumper across OP and +24 V is 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 set improperly.	Set proper acceleration/deceleration time.
		Load fluctuates.	Contact us or the agent.
9	The braking torque is insufficient when the motor is decelerating or decelerates to stop.	Voltage limit is enabled.	If a braking resistance is configured, set F3-23 (V/F voltage limit selection) to 0 (Disabled) to disable voltage limit.

Maintenance

Routine 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 current of 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 of the 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.

Component	Service Life [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

Unit 1			Unit 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 name-plate	F1-01	Power	Parameters on the motor name-plate
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 outpu	F5-02	1	TA/TC running status outpu
F5-03	0	PA/PC filter control signal 1) Contol filter capacitance; set to 52; PA/PC conected for filter control in serial 2) Set to 0 by default.	F5-03	0	PA/PC filter control signal 1) Contol filter capacitance; set to 52; PA/PC conected 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.

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