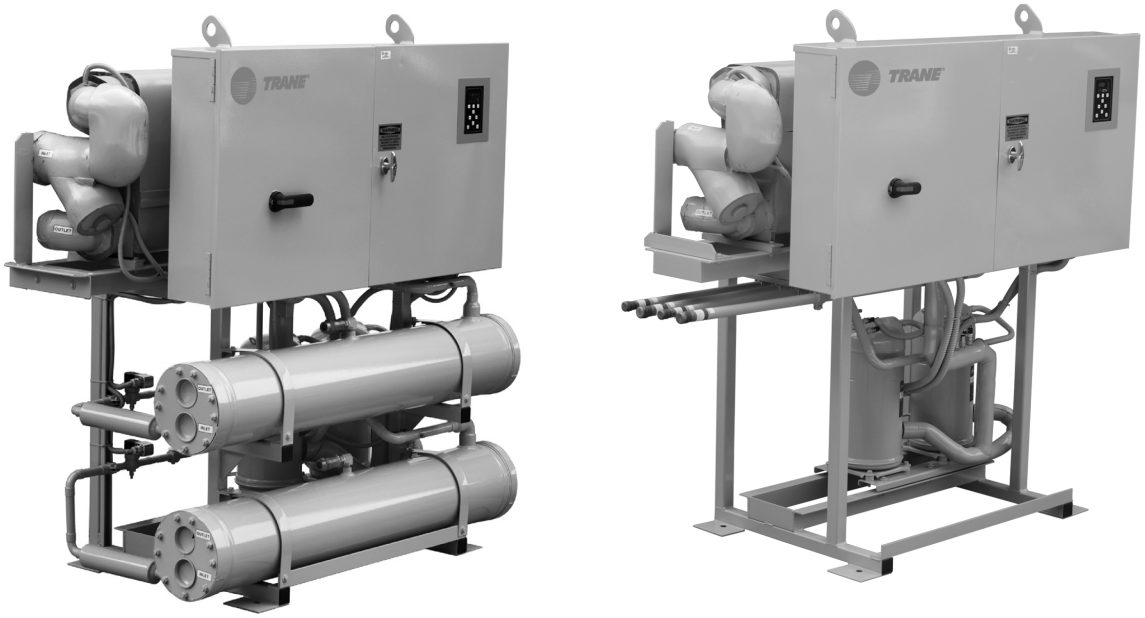
Installation, Operation, and Maintenance

Cold Generator™ Scroll Liquid Chillers
Model CGWQ and CCAQ
20 to 70 Tons (60 Hz)
Water-Cooled and Compressor Chillers



⚠ 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.

February 2016 **CGWQ-SVX01C-EN**

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

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

The three types of advisories are defined as follows:

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

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

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

Important Environmental Concerns

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

Important Responsible Refrigerant Practices

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

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

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

⚠WARNING

Refrigerant under High Pressure!

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

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Trademarks

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Revision History

CGWQ-SVX01C-EN (12 Feb 2016)

- Added ambient limitations for CCAQ/CAUJ combination to general data chapter.
- Clarified fan and low ambient damper control requirements in Electrical Wiring chapter.

Table of Contents

Model Number Descriptions

Scroll Liquid Chillers

Digit 1, 2, 3, 4 — Unit Type

CGWQ=Water-Cooled Chiller
CCAQ= Compressor Chiller

Digit 5, 6, 7 — Unit Nominal Tonnage

020 = 20 Nominal Tons
026 = 26 Nominal Tons
030 = 30 Nominal Tons
040 = 40 Nominal Tons
052 = 52 Nominal Tons
060 = 60 Nominal Tons
070 = 70 Nominal Tons

Digit 8 — Unit Voltage

A = 208V/60/3
B = 230V/60/3
F = 460V/60/3
G = 575V/60/3

Digit 9, 10 — Design Sequence

A0 = Factory Assigned

Digit 11 — Agency Listing

N = None
E = ETL/ETL-C Listed to meet U.S. and Canadian Safety Standards

Digit 12 — Water Regulating Valve

0 = None
1 = With

Digit 13 — Evaporator Temp Range

0 = Standard Cooling 42°F–60°F (4.4°C–5.5°C)
1 = Standard Cooling/Ice Making 20°F–60°F (-6.7°C–15.6°C)

Digit 14 — Power Connection

T = Terminal Block
D = Non-Fused Disconnect Switch

Digit 15 — Sound Attenuator

0 = No Sound Attenuation
3 = Compressor Sound Blanket(s)
9 = Factory Sound Enclosure Cabinet(s)

Digit 16 — Remote Interface (Digital Comm)

0 = None
2 = LonTalk®
4 = BACnet® Ms/TP
5 = BACnet IP
6 = MODBUS®
8 = Johnson N2

Digit 17 — Power Monitor

0 = None
1 = With

Digit 18 — Neoprene Isolator Pads

0 = None
1 = With

Digit 19 — Flow Switch

0 = None
1 = With

Digit 20 — Evaporator Fluid Type

0 = Water
2 = Ethylene Glycol
3 = Propylene Glycol
4 = Methanol

Digit 21 — Condenser Fluid Type

0 = Water
2 = Ethylene Glycol
3 = Propylene Glycol
9 = Air-Cooled Condenser

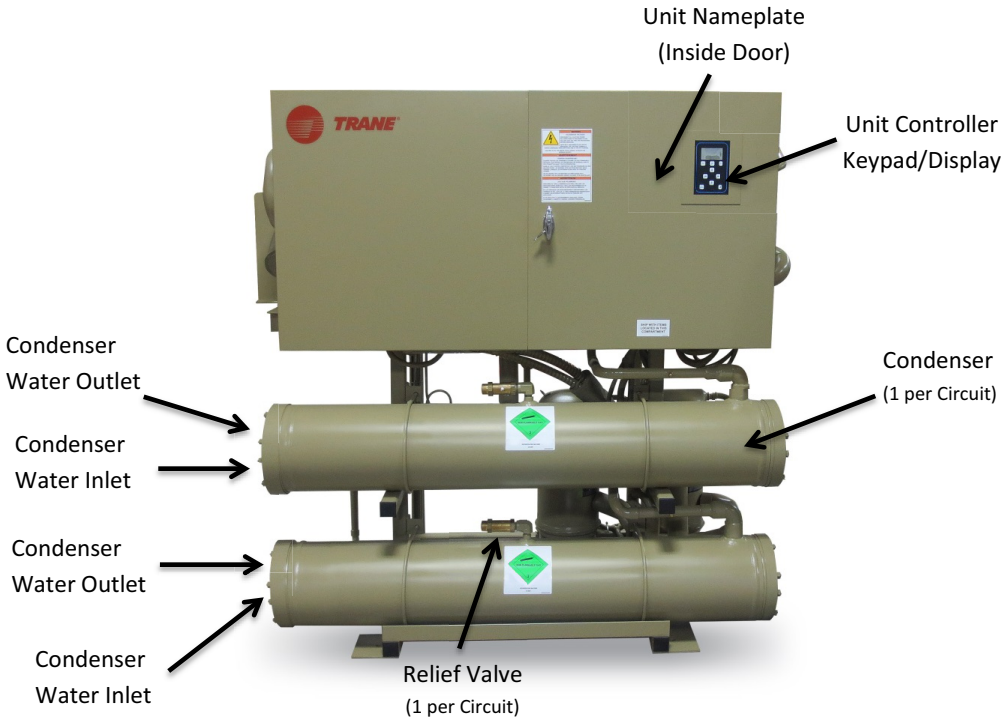
Digit 22 — Special Options

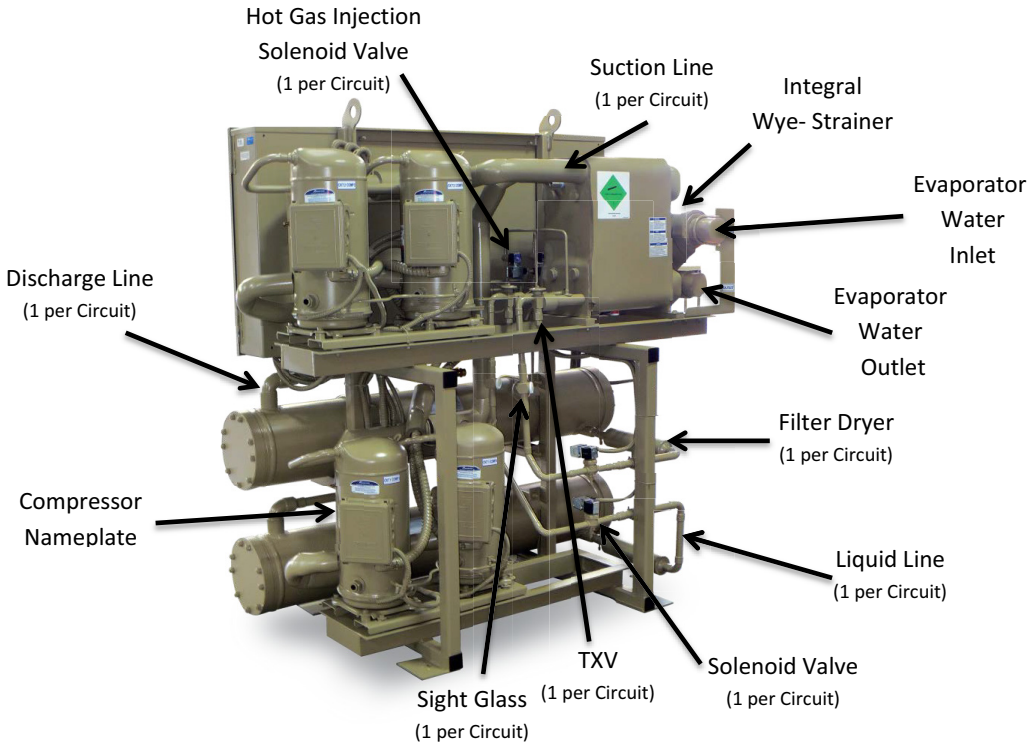
0 = None
1 = With

Digit 23 — Base Rail Forklifting

0 = None
1 = With

Unit Components





General Data

Table 1. General data for CGWQ water-cooled chillers[a]

Unit Size	20	26	30	40	52	60	70
Compressor							
Quantity	2	2	2	2,2	2,2	2,2	2,2
Nominal Tons[b] (tons)	10/10	13/13	15/15	10/10,10/10	13/13,13/13	15/15,15/15	15/20,15/20
Steps of Unloading (%)	100-50	100-50	100-50	100-75-50-25	100-75-50-25	100-75-50-25	100-71-43-21
Uncertified "A" Weighted Sound (dBA)	77	81	81	78	81	82	83
Uncertified "A" Weighted Sound w/Sound Attenuation Cabinet (dBA)	70	73	73	70	72.5	74	TBD
Evaporator							
Water Storage (gal)	1.8	2.4	2.8	3.9	5.0	5.6	7.7
Minimum Flow (gpm)	35	45	45	64	78	90	102
Maximum Flow (gpm)	71	85	104	138	168	197	236
Condenser (each)							
Water Storage (each) (gal)	3.1	3.6	4.4	3.1	3.6	4.4	4.4
Minimum Flow (each) (gpm)	20	40	48	20	40	48	48
Maximum Flow (each) (gpm)	70	135	164	70	135	164	164
General Unit							
Refrigerant	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A
Number of Independent Refrigerant Circuits	1	1	1	2	2	2	2
Refrigerant Charge per Circuit (approx.) (lb)	40	52	52	40,40	52,52	52,52	62,62
Oil Type	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE
Oil Charge each Compressor (oz)	110/110	110/110	110/110	110/110, 110/110	110/110, 110/110	110/110, 110/110	110/148, 110/148

(a) Data containing information on two circuits formatted as follows: Circuit 1, Circuit 2
(b) Nominal compressor sizes based on 60 Hz.

Table 2. General data for CCAQ compressor chillers[a]

Unit Size	20	26	30	40	52	60	70
Compressor							
Quantity	2	2	2	2,2	2,2	2,2	2,2
Nominal Tons[b] (tons)	10/10	13/13	15/15	10/10,10/10	13/13,13/13	15/15,15/15	15/20,15/20
Steps of Unloading (%)	100-50	100-50	100-50	100-75-50-25	100-75-50-25	100-75-50-25	100-71-43-21
Uncertified "A" Weighted Sound (dBA)	77	81	81	78	81	82	83
Uncertified "A" Weighted Sound w/Sound Attenuation Cabinet (dBA)	70	73	73	70	72.5	74	TBD
Evaporator							
Water Storage (gal)	1.8	2.4	2.8	3.9	5.0	5.6	7.7
Minimum Flow (gpm)	35	45	45	64	78	90	102
Maximum Flow (gpm)	71	85	104	138	168	197	236
General Unit							
Refrigerant	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A
Number of Independent Refrigerant Circuits	1	1	1	2	2	2	2
Refrigerant Charge per Circuit (approx.)[c] (lb)	6	6	7	6,6	6,6	7,7	8,8
Oil Type	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE
Oil Charge each Compressor (oz)	110/110	110/110	110/110	110/110, 110/110	110/110, 110/110	110/110, 110/110	110/148, 110/148

(a) Data containing information on two circuits formatted as follows: Circuit 1, Circuit 2
(b) Nominal compressor sizes based on 60 Hz.
(c) Charge amounts shown are only amounts in CCAQ. Additional amount to be calculated based upon piping size, length and component capacity.

Ambient Limits — CCAQ/CAUJ Combination

Minimum Ambient Temperature Limit

The minimum outdoor ambient temperature for operation of a CCAQ compressor chiller in combination with a CAUJ air cooled condenser is 40°F. This minimum is driven by compressor chiller starting considerations and not by effectiveness of condenser ambient controls once the system is up and running. Fan cycling and optional low ambient dampers do *not* mitigate the low ambient starting problem. On a cold day with outdoor ambient temperature below 40°F the liquid line pressure at the expansion valve inlet is extremely low. On start, the suction pressure immediately plunges into the freezing range causing a nuisance fault.

Maximum Ambient Temperature Limit

The maximum ambient temperature limit for the CCAQ/CAUJ operation is 110°F.

Inspection Check List and Unit Identification

To protect against loss due to damage incurred in transit, complete the following checklist upon receipt of the unit.

- Inspect the individual pieces of the shipment before accepting the unit. Check for obvious damage to the unit or packing material.
- Inspect the unit for concealed damage as soon as possible after delivery and before it is stored. Concealed damage must be reported within 15 days.
- If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the carrier's terminal of the damage immediately, by phone and by mail. Request an immediate, joint inspection of the damage with the carrier and the consignee.
- Notify the Trane sales representative and arrange for repair. Do not repair the unit, however, until damage is inspected by the carrier's representative.

After completing the inspection checklist, identify the unit with the unit nameplate, packing list and ordering information. The unit nameplate is mounted inside the control box.

Refer to "Model Number Descriptions," p. 6 for additional data that can be found on the nameplate.

Check all items against the shipping list. Verify that it is the correct unit and that it is properly equipped. If optional neoprene or spring isolators (or other ship-loose items) are ordered, they are secured in place on the shipping skid or inside the unit control box.

The *Installation and Maintenance* manual can also be found in the unit control box. Be sure to read all of this literature *before* installing and operating the unit.

Unit Description

Trane CGWQ water-cooled chillers and CCAQ compressor chillers (condenserless chillers) are designed for installation on a prepared surface in a suitable, weatherproof location above freezing (32°F). Each unit consists of a manifolded scroll compressor set(s) piped in parallel, a brazed plate evaporator, shell-and-tube condenser(s) (on CGWQ only) and control box with integral control panel—all mounted on a common frame.

Each unit is a completely assembled, hermetic package that is factory-piped, wired, leak-tested, dehydrated, charged and run-tested for proper control operation before shipment. Water inlet and outlet openings are covered before shipment. The CGWQ units contain an operating refrigerant charge. The CCAQ units contain a dry nitrogen charge and are charged with refrigerant by others after field assembly. All units are factory charged with the proper amount of refrigerant oil.

Electrical Data

Table 3. Electrical data for CGWQ water-cooled chillers and CCAQ compressor chillers

	Unit Wiring Data				Compressor Nominal Tons					Control kW
Unit Size	Rated Voltage	Minimum Circuit Ampacity	Maximum Fuse Size	Recommended Dual Element Fuse Size	Qty	# Refrig. Circuits	Nominal Tons	RLA, each	LRA, each	kW
20	200-230/3/60	75	100	90	2	1	10/10	33	239	0.16
	460/3/60	41	50	45				18	125	0.16
	575/3/60	29	40	35				13	80	0.16
26	200-230/3/60	116	150	125	2	1	13/13	51	300	0.16
	460/3/60	52	70	60				23	150	0.16
	575/3/60	45	60	50				20	109	0.16
30	200-230/3/60	126	175	150	2	1	15/15	56	340	0.16
	460/3/60	61	80	70				27	173	0.16
	575/3/60	54	70	60				24	132	0.16
40	200-230/3/60	142	150	150	4	2	10/10, 10/10	33	239	0.24
	460/3/60	77	90	80				18	125	0.24
	575/3/60	55	60	60				13	80	0.24
52	200-230/3/60	218	250	225	4	2	13/13, 13/13	51	300	0.24
	460/3/60	99	110	100				23	150	0.24
	575/3/60	85	100	90				20	109	0.24
60	200-230/3/60	238	250	250	4	2	15/15, 15/15	56	340	0.24
	460/3/60	115	125	125				27	173	0.24
	575/3/60	102	110	110				24	132	0.24
70	208-230/3/60	279	350	300	4	2	15/20, 15/20	56/74	340/505	0.24
	460/3/60	123	150	125				27/30	173/225	0.24
	575/3/60	104	125	110				24/25	132/180	0.24

Notes:
1. Use copper conductors only.
2. Local codes may take precedence.
3. Voltage Utilization Range:

Rated Voltage	Utilization Range
200-230/3/60	180-253
208-230/3/60	187-253
460/3/60	414-506
575/3/60	518-632

Dimensions and Weights

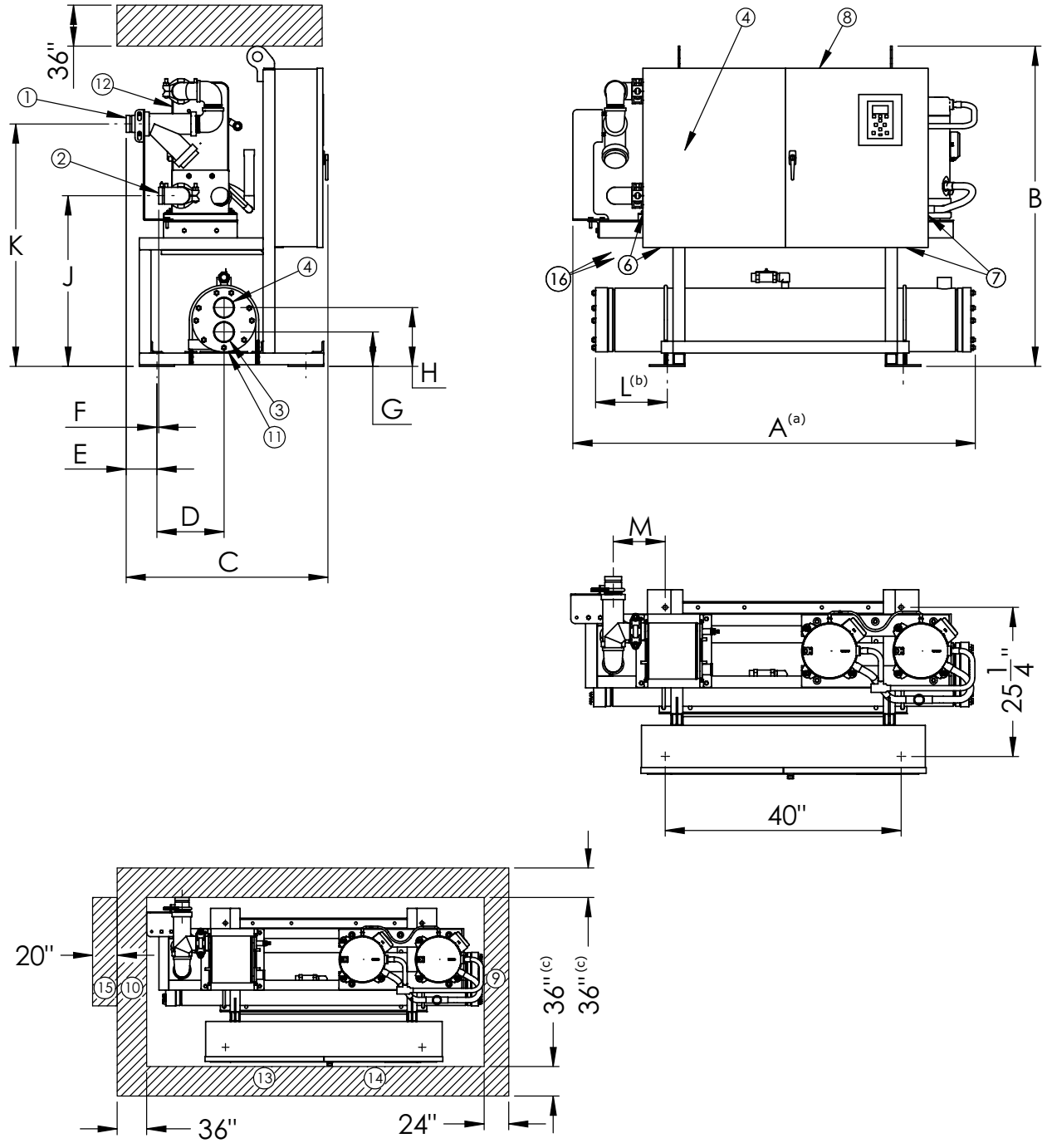
Dimensions

The Trane application manual and/or project submittals contain dimensional data, application data, and electrical data as required.

Refer to name plate on control box door (inside) for specific unit electrical data.

These documents can be forwarded for specific jobs as part of a job submittal package upon request.

Figure 1. CGWQ/CCAQ 20–30 ton mechanical drawing



(a) For units with water regulating valve option, add 16 inches (407 mm) maximum to the overall unit length, "A"
(b) For units with water regulating valve option, add 15.5 inches (394 mm) inches to the condenser water outlet dimension, "L"
(c) 42-inch (1067-mm) clearance required to other ground parts, two units with panels facing each other or other live parts require a clearance of 48 inches (1220 mm)

Table 4. CGWQ/CCAQ 20–30 ton mechanical drawing dimensions

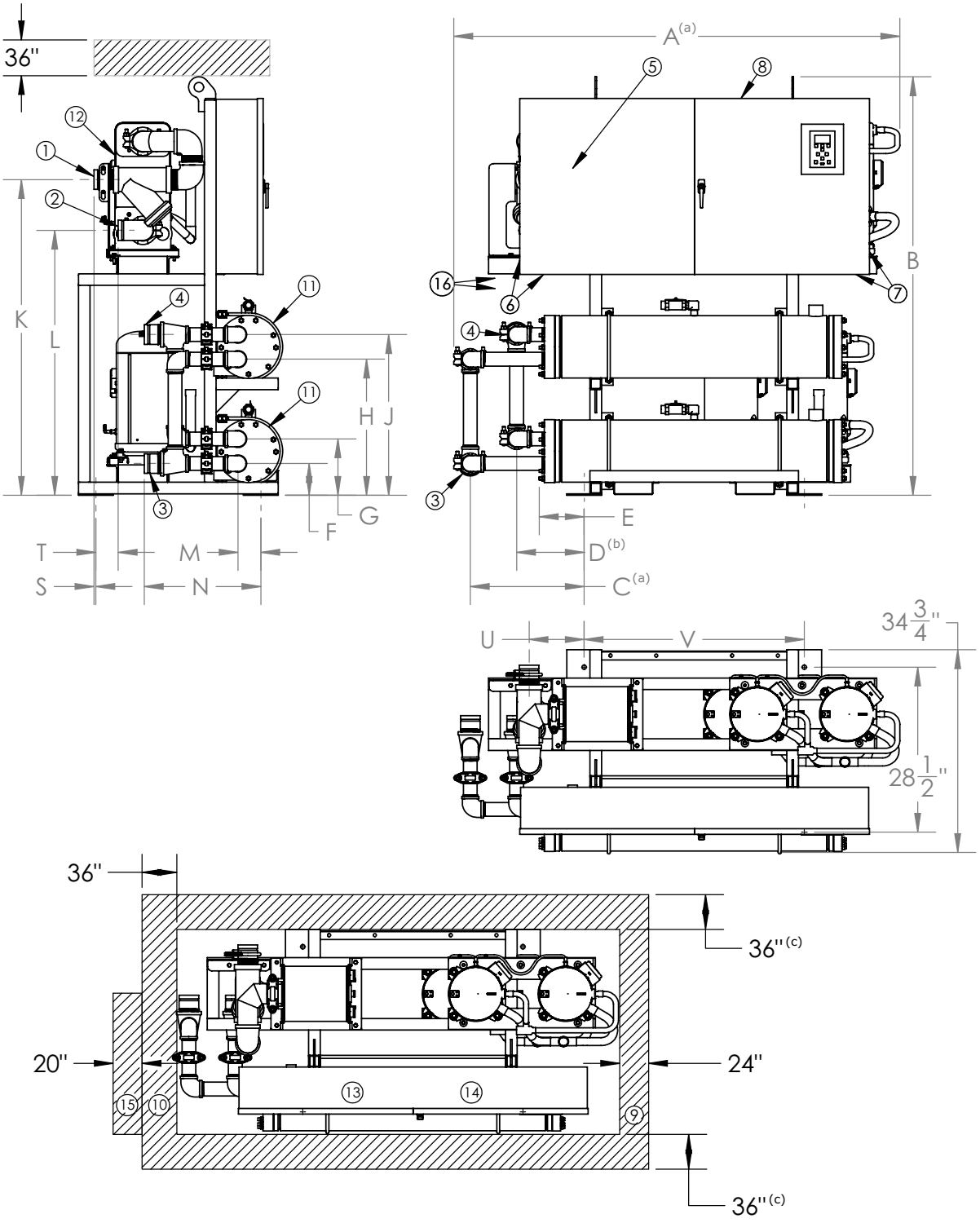
	CGWQ 20 inch (mm)	CGWQ26 inch (mm)	CGWQ30 inch (mm)	CCAQ 20 inch (mm)	CCAQ26 inch (mm)	CCAQ30 inch (mm)
A[(a)]	64 (1626)(a)	65.4 (1661)(a)	68.5 (1740)(a)	64 (1626)	65.4 (1661)	68.5 (1740)
B	54.2 (1378)	54.2 (1378)	54.2 (1378)	54.2 (1378)	54.2 (1378)	54.2 (1378)
C	32.8 (836)	32.8 (836)	34.2 (869)	32.8 (836)	32.8 (836)	34.2 (869)
D	9.6 (243)	11.4 (289)	11.4 (289)	N/A	N/A	N/A
E	3.8 (99)	3.8 (99)	5.2 (132)	3.8 (99)	3.8 (99)	5.2 (132)
F	0.8 (19)	0.8 (19)	0.4 (8)	0.8 (19)	0.8 (19)	0.4 (8)
G	5.8 (148)	5.8 (148)	5.8 (148)	N/A	N/A	N/A
H	10 (254)	10 (254)	10 (254)	N/A	N/A	N/A
J	28.8 (731)	28.8 (731)	28.8 (734)	28.8 (731)	28.8 (731)	28.8 (734)
K	41.1 (1046)	41.1 (1046)	41.1 (1046)	41.1 (1046)	41.1 (1046)	41.1 (1046)
L[(b)]	5.9 (150)(b)	12.1 (308)(b)	12.1 (308)(b)	N/A	N/A	N/A
M	4.1 (103)	5.8 (144)	8.8 (224)	4.1 (103)	5.8 (144)	8.8 (224)
1	2.5 (64) VIC	2.5 (64) VIC	2.5 (64) VIC	2.5 (64) VIC	2.5 (64) VIC	2.5 (64) VIC
2	2 (51) VIC	2 (51) VIC	2.5 (64) VIC	2 (51) VIC	2 (51) VIC	2.5 (64) VIC
3	2 (51) FPT	3 (76) FPT	3 (76) FPT	N/A	N/A	N/A
4	2 (51) FPT	3 (76) FPT	3 (76) FPT	N/A	N/A	N/A

(a) For units with water regulating valve option, add 16 inches (407 mm) maximum to the overall unit length, “A”
(b) For units with water regulating valve option, add 15.5 inches (394 mm) inches to the condenser water outlet dimension, “L”

Table 5. Reference numbers (see Figure 1, p. 12)

Item	Description
1	Evaporator Water Inlet
2	Evaporator Water Outlet
3	Condenser Water Inlet (CGWQ only)
4	Condenser Water Outlet (CGWQ only)
5	Power Disconnect (Optional)
6	Power Wire
7	Control Wire
8	Control Panel
9	Condenser Return Waterbox End (CGWQ only)—minimum clearance (for maintenance)
10	Condenser Supply Waterbox End (CGWQ only)—minimum clearance (for maintenance)
11	Condenser (CGWQ only)
12	Evaporator
13	Panel Power Section—door swing 31.3 inch (796.9 mm)
14	Panel Control Section—door swing 31.3 inch (796.9 mm)
15	Additional minimum clearance needed for units with water regulating valve option
16	1-1/8 inch Liquid Line and 1-3/8 inch Discharge Line (CCAQ only)

Figure 2. CGWQ/CCAQ 40–70 ton mechanical drawing



(a) For units with water regulating valve option, add 14 inches (356 mm) maximum to the condenser water inlet dimension, "C" and the overall unit length, "A"
(b) For units with water regulating valve option, add 15 inches (381 mm) to the condenser water outlet dimension, "D"
(c) 42-inch (1067-mm) clearance required to other ground parts, two units with panels facing each other or other live parts require a clearance of 48 inches (1220 mm)

Table 6. CGWQ/CCAQ 40–70 ton mechanical drawing dimensions

	CGWQ 40 inch (mm)	CGWQ 52 inch (mm)	CGWQ 60 inch (mm)	CGWQ 70 inch (mm)	CCAQ 40 inch (mm)	CCAQ 52 inch (mm)	CCAQ60 inch (mm)	CCAQ 70 inch (mm)
A[a]	76.2 (1937)(a)	87.6 (2226)(a)	87.6 (2226)(a)	93.5 (2375)(a)	70.8 (1800)	74 (1878)	75.8 (1924)	80.8 (2054)
B	72.2 (1835)	72.2 (1835)	72.2 (1835)	72.2 (1835)	72.2 (1835)	72.2 (1835)	72.2 (1835)	72.2 (1835)
C(a)	19.6 (499)(a)	29.8 (757)(a)	29.8 (757)(a)	29.8 (757)(a)	N/A	N/A	N/A	N/A
D[b]	11.6 (296)(b)	19.8 (503)(b)	19.8 (503)(b)	19.8 (503)(b)	N/A	N/A	N/A	N/A
E	6.9 (175)	13.1 (333)	13.1 (333)	13.1 (333)	N/A	N/A	N/A	N/A
F	5.5 (139)	5.6 (141)	5.6 (141)	5.6 (141)	N/A	N/A	N/A	N/A
G	9.8 (247)	9.8 (246)	9.8 (246)	9.8 (246)	N/A	N/A	N/A	N/A
H	23.5 (597)	23.6 (598)	23.6 (598)	23.6 (598)	N/A	N/A	N/A	N/A
J	27.8 (705)	27.8 (703)	27.8 (703)	27.8 (703)	N/A	N/A	N/A	N/A
K	54.5 (1384)	54.5 (1384)	54.5 (1384)	62.8 (1594)	54.5 (1384)	54.5 (1384)	54.5 (1384)	62.8 (1594)
L	45.8 (1162)	45.8 (1162)	45.8 (1162)	46.1 (1172)	45.8 (1162)	45.8 (1162)	45.8 (1162)	46.1 (1172)
M	4.0 (100)	2.1 (54)	2.1 (54)	2.1 (54)	N/A	N/A	N/A	N/A
N	20.1 (511)	20.8 (527)	20.8 (527)	20.8 (527)	N/A	N/A	N/A	N/A
S	0.4 (8)	0.4(8)	0.4 (8)	1.4 (34)	0.4 (8)	0.4 (8)	0.4 (8)	1.4 (34)
T	3.8 (98)	3.8 (98)	3.8 (98)	2.8 (73)	3.8 (98)	3.8 (98)	3.8 (98)	2.8 (73)
U	9.5 (241)	12.5 (318)	14.4 (364)	13 (330)	9.5 (241)	12.5 (318)	14.4 (364)	9 (229)
V	38 (965)	38 (965)	38 (965)	38 (965)	42 (1067)	42 (1067)	42 (1067)	42 (1067)
1	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC
2	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC	3 (76) VIC
3	3 (76) VIC	4 (102) VIC	4 (102) VIC	4 (102) VIC	N/A	N/A	N/A	N/A
4	3 (76) VIC	4 (102) VIC	4 (102) VIC	4 (102) VIC	N/A	N/A	N/A	N/A

(a) For units with water regulating valve option, add 14 inches (356 mm) maximum to the condenser water inlet dimension, “C” and the overall unit length, “A”
(b) For units with water regulating valve option, add 15 inches (381 mm) to the condenser water outlet dimension, “D”

Table 7. Reference numbers (see Figure 2, p. 14)

Item	Description
1	Evaporator Water Inlet
2	Evaporator Water Outlet
3	Condenser Water Inlet (CGWQ only)
4	Condenser Water Outlet (CGWQ only)
5	Power Disconnect (Optional)
6	Power Wire
7	Control Wire
8	Control Panel
9	Condenser Return Waterbox End (CGWQ only)—minimum clearance (for maintenance)
10	Condenser Supply Waterbox End (CGWQ only)—minimum clearance (for maintenance)
11	Condenser (CGWQ only)
12	Evaporator
13	Panel Power Section—door swing 31.3 inch (796.9 mm)
14	Panel Control Section—door swing 31.3 inch (796.9 mm)
15	Additional minimum clearance needed for units with water regulating valve option
16	1-1/8 inch Liquid Line and 1-3/8 inch Discharge Line (CCAQ only)

Weights

Table 8. CGWQ and CCAQ weights

Unit	Size	Shipping		Operating	
		lb	kg	lb	kg
CGWQ	20	1310	594	1200	544
	26	1430	649	1330	603
	30	1490	676	1400	635
	40	2170	984	2100	953
	52	2350	1066	2300	1043
	60	2690	1220	2655	1204
	70	2990	1356	2972	1348
CCAQ	20	1010	458	875	397
	26	1275	578	1145	519
	30	1410	640	1285	583
	40	1510	685	1390	631
	52	1570	712	1460	662
	60	1850	839	1745	792
	70	2125	964	2035	923

Installation

General Installation Information

- Where specified, supply and install valves in the water piping upstream and downstream of the evaporator and condenser water boxes, to isolate the heat exchangers for maintenance and to balance/trim the system.
- Supply and install condenser water control valve(s). Refer also to Trane publication RLC-PRB021-EN available from Trane Sales Offices for additional technical assistance. Provisions must be made for the control of condenser water that results in stable Saturated Discharge Pressure between 80°F and 128°F through all steady state, part load and transient operating conditions. Trane recommends optional factory installed integral Water Regulating Valve operated by onboard Trane controller.
- Trane offers an optional, factory-installed proportional, electronic valve on CGWQ 20–30 ton models, and dual valves on CGWQ 40–70 ton models that are completely factory installed and setup.
- Supply and install flow switch or equivalent flow proving device in the chilled water piping. Interlock this switch with the controller to ensure that the unit can only operate when water flow is established. See wiring diagram for connection point. A switch may be ordered with the unit if desired. It will be shipped loose for field installation.
- Supply and install drain valves and vent cocks on each water box as appropriate.
- Where specified, supply and install strainers ahead of all pumps and automatic modulating valves.

Note: *Trane CGWQ models are supplied with a cleanable, factory-selected Y-strainer, already installed prior to shipment.*

- Supply and install suitable refrigerant pressure relief piping from the pressure relief to the atmosphere if required. Follow ANSI/ASHRAE 15-2007 guidelines, relief manufacturer's guidelines, and industry standards when working with relief piping.
- If necessary, supply enough refrigerant and dry nitrogen (150 psig) for pressure testing (CCAQ).
- Start the unit under supervision of a qualified service technician.
- Where specified, supply and insulate the chilled water piping as required, to prevent sweating under normal operating conditions. Trane provides factory insulation on evaporator and related components.

Storage

NOTICE:

Store Units Above Freezing!

Store these units in a protected area above freezing (32°F) only. Do not store outdoors with a protective covering such as a plastic shroud. This can result in excessive water condensation that could damage controls and other components.

These units are designed for indoor installation above freezing (32°F) only. Store the unit in a suitable weatherproof location above 32°F, vibration free, and secure area. Periodically check the pressure in each refrigerant circuit to verify that the refrigerant charge is intact. If it is not, contact a qualified service organization and the appropriate sales office. If the unit is still under factory warranty, you must follow warranty procedure prior to calling for service.

Noise Considerations

Locate the unit away from sound-sensitive areas. If necessary, install the optional isolators under the unit and/or the optional factory sound attenuation cabinet. Install vibration isolators in all piping and use flexible electrical conduit. Consult an acoustical engineer for critical applications.

Foundation

A base or foundation is recommended for most installations. Provide a level surface strong enough to support the unit. Refer to "Dimensions and Weights," p. 12 for dimensions and weights. A flexible (isolated) concrete foundation or footings at each loading point will reduce transmission of vibration. Install anchor bolts in the concrete to secure the unit. If the floor is warped, uneven or in poor condition, make necessary repairs before positioning the unit. Once the unit is in place, it should be level, within 1/4 inch over its entire length and width.

Clearances

Provide enough space around the unit to allow the installation and maintenance personnel unrestricted access to all service points. Unit dimensions are given in "Dimensions and Weights," p. 12. There should be adequate clearance for condenser and compressor servicing. A minimum of three feet is recommended for effective compressor service. A minimum clearance of 3 ft.-6 inches is required to open the control panel doors.

Important: *In all cases, local codes will take precedence over these recommendations.*

Ventilation

Provisions must be made to remove heat generated by unit operation from the equipment room. Ventilation must be adequate to maintain an ambient temperature lower than 125°F.

The condenser relief valve on these units must be vented in accordance with *all local and national codes*.

Drainage

Locate the unit near a large capacity drain for condenser drain-down during shutdown or repair.

Handling

⚠WARNING

Heavy Objects!

Failure to follow instructions below or properly lift unit could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage. Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift.

CCAQ and CGWQ units are shipped stretch-wrapped and bolted to a shipping skid (unless other than standard shipping is selected).

The skidded unit can be moved by using a fork truck of suitable capacity. Refer to "Dimensions and Weights," p. 12 for unit weights.

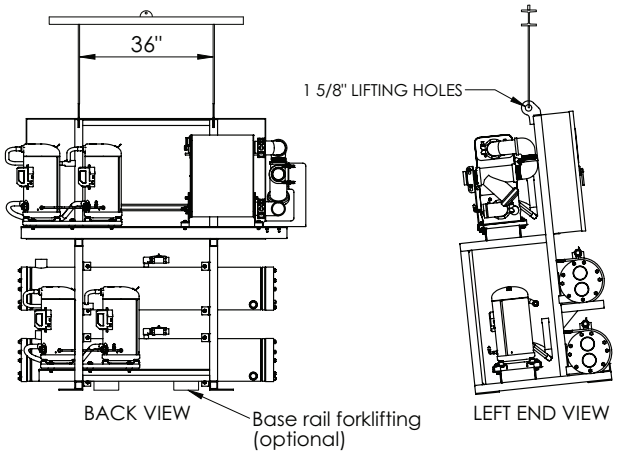
When moving the unit, the lifting forks must be positioned under the shipping skid as wide as possible where labeled. Lift the unit and move it to the desired location.

Once the unit is at the installation location, remove the stretch wrap. Inspect the unit for damage and report if damage is found.

The optional unit isolators (if ordered) are secured to the shipping skid or in the unit control panel. Other optional "ship loose" items may be attached to the skid or shipped separately depending on options selected.

Rigging

Two lifting eyes are provided on these models for rigging as integral components to the structural skid.



Lifting Procedure

⚠WARNING

Heavy Objects!

Failure to follow instructions below or properly lift unit could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage. Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift.

1. Remove the stretch wrap from the unit as described above, leaving the unit mounted to the skid.
2. Install clevis connectors or equivalent in the 1-5/8 inch lifting holes provided on each of the lifting lugs
3. Attach certified lifting chains (cables) to these points. Each chain (cable) alone must be strong enough to lift the unit.
4. Attach chains (or cables) to a lifting beam. Position the chains (cables) so that they do not contact the unit piping or the unit control panel. Use a suitable spreader bar to insure proper weight distribution.

NOTICE:

Equipment Damage!

To prevent damage to the unit, position the lifting beam and chains (cables) so that they do not contact the unit piping or the unit control panel.

5. Remove the bolts that secure the unit to the shipping skid.

6. Raise the unit just off the skid to make sure that the unit is level when lifted. Adjust chain (cable) lengths as required.
7. Lift the unit off of the skid and place in the installation location.
8. The Model CGWQ/CCAQ chiller should be moved by lifting, as outlined in Step 1 through Step 7, unless the unit is ordered with the "Base rail forklifting" option. Refer to the unit model number, digit 23, for more details.

Access Restrictions

All CCAQ/CGWQ units are designed to pass through a standard 36-inch doorway. Refer to outline drawings for other important dimensions.

Direct Mounting

The unit can be installed directly on an isolated, rigid mounting surface as long as the surface is level and will support the weight of the unit. A mounting hole is provided at each of the unit mounting locations. Provide a means of securely anchoring the unit to the mounting surface. Level the unit carefully.

Isolator Mounting (Optional)

Install the optional mounting isolators at each mounting location. Refer to manufacturer recommendations for isolator selection, placement and loading information. Isolators are identified by color and by the isolator part number. Bolt the isolator to the mounting surface. Do not fully tighten the mount bolts. Mount the unit on the isolators and install a 1/2-inch (13-mm) nut on each isolator positioning pin or bolt. Maximum isolator deflection should be 1/4 inch. Level the unit carefully. Now fully tighten isolator mounting bolts. Refer also to "Unit Leveling," p. 19.

Compressor Mounting

All compressors are rigidly bolted with compressor isolation mounts to the same compressor mounting frame (rails). No additional isolation or leveling is required. Inspect prior to start up to insure bolts are present and tight, and that no shipping damage has occurred.

Unit Leveling

Before tightening the mounting bolts, level the unit. Check unit level end-to-end by using a level, or by placing a level on the top surface of the unit frame. Unit should be level within 1/4 inch over the length. Place the level on the unit frame and check front to back level. Adjust to within 1/4 inch of level front-to-back. Use shims as required to properly level the unit.

Compressor Nameplate

The nameplate for the hermetic scroll compressor is mounted on the compressor housing, near the motor terminal junction box.

Evaporator Nameplate

The evaporator nameplate is mounted on evaporator under the insulation. To view the evaporator nameplate, remove the insulation over the area if covered and spread the insulation. The serial number information is also on record at the factory.

Condenser Nameplate

The condenser ASME nameplate is mounted on the side of the condenser.

Unit Piping

Evaporator Water Pressure

NOTICE:

Vessel Damage!

To prevent pressure vessel damage, do not exceed nameplate water side pressures.

Provide shutoff valves in the line(s) to the gauge(s) to isolate the gauges when not in use if field installed gauges are used. Use pipe with unions, flanges or groove lock type fittings to simplify disassembly for system service. Use vibration eliminators to prevent transmitting vibrations through the water lines. Install thermometers in the lines to monitor evaporator entering and leaving water temperatures. Install a balancing cock in the leaving water line. It may be used to establish a balanced water flow. Both the entering and leaving water lines should have shutoff valves installed to isolate the evaporator for service.

Flow Sensing Devices

NOTICE:

Unexpected Chiller Start!

Failure to follow instructions could cause the chiller to start unexpectedly which could result in equipment or property damage. An external source (EMS, time clock or any other means) should not be allowed to bring on a pump that would trigger the flow switch to start the chiller. The flow switch is meant to act as a safety switch and not a start/stop mechanism.

Chilled water flow switch, or other factory approved flow proving device is mandatory; field installation by contractor is required. Flow switch is to be installed and maintained per manufacturer's recommendations and interconnected to the Trane electrical control panel as described on the electrical diagram. To provide additional chiller protection, install and wire the flow switch in series with chilled water pump interlock for the chilled water circuits (refer to "Chilled Water Flow Switch," p. 29). Specific connection and schematic wiring diagrams shipped with the unit.

General Water Piping Recommendations

Make water piping connections to the evaporator and condenser. Isolate and support piping to prevent stress on the unit. Use unions, flanges or grooved lock type fittings to facilitate service procedures. Construct piping according to local and national codes. Insulate and flush the piping before connecting the unit. Chilled water piping must rise above the chiller to insure the evaporator is full of water and void of air at all times.

NOTICE:

Equipment Damage!

To prevent equipment damage, you MUST follow instructions below:

- **Bypass unit if using a flushing agent.**
- **Chilled water piping must rise above the chiller to insure the evaporator is full of water and void of air at all times.**
- **Do not overtighten connections.**

Use a pipe sealant such as Teflon® tape on all threaded water connections. Minimize heat gain and prevent condensation by insulating all chilled water piping.

Water Flow Rates

Establish balanced water flow through both the evaporator and condenser. Flow rates should fall between the minimum and maximum values given in tables. Flow rates above or below these values can cause equipment damage or improper unit operation. Refer to submittal engineering data for minimum and maximum flow ranges. Measure the evaporator water pressure drop at the pressure gauge(s) on the system water piping. Readings should approximate those shown by the pressure drop charts.

Note: *Evaporator pressure drop is an approximation and is to be used as a tool to estimate flow rate and as an aid to waterside system piping design. If an accurate measurement of flow rate is required, an accurate flow meter must be installed in the system.*

Chilled Water System Volume

Trane requires minimum system volumes as indicated on the chart below. Special applications may deviate from these numbers as directed by Trane engineering. Operation below these volumes will cause unacceptable system control problems and the potential for evaporator failure.

CGWQ/CCAQ 20—144 gallons

CGWQ/CCAQ 26—188 gallons

CGWQ/CCAQ 30—216 gallons

CGWQ/CCAQ 40—288 gallons

CGWQ/CCAQ 52—375 gallons

CGWQ/CCAQ 60—432 gallons

CGWQ/CCAQ 70—504 gallons

NOTICE:

Waterborne Debris!

To prevent evaporator or condenser damage, pipe strainers must be installed in the water supplies to protect components from water born debris. Removal of the factory installed Y-strainer or screen will void the warranty on the brazed plate evaporator.

Condenser Water Piping (CGWQ only)

Condenser water inlet and outlet types, sizes and locations are provided in Table 4, p. 13 and Table 6, p. 15. Condenser piping components and layout vary depending on the water source and connection locations, however a means of maintaining stable discharge pressure through full-, part-load, and transient conditions is required. Saturated discharge temperature must be maintained between 80°F and 128°F. Trane offers an optional factory installed water regulating valve that is controlled by unit controller. Minimum inlet condenser water temperature is 65°F. The optional water regulating valve maintains condensing pressure and temperature by throttling water flow leaving the condenser in response to compressor discharge pressure. Field supplied water regulating valves must be adjusted for proper operation during start-up. Under full load "standard AHRI conditions" the water temperature rise should be 10° F, producing a flow rate in the range of 3 gpm per ton. Minimum inlet condenser water temperature is 65°F. Condenser piping must be in accordance with all local and national codes. Condenser piping components generally function identically to those in the evaporator piping system. In addition, cooling tower systems may include a manual or automatic bypass valve that can alter water flow rate to maintain condensing pressure. Well (city) water condensing systems should include a pressure reducing valve and water regulating valve. A pressure reducing valve should be installed to reduce water pressure entering the condenser. This is required only if water pressure exceeds nameplate maximums. This is also necessary to prevent damage to the disc and seat of the water regulating valve that can be caused by excessive pressure drop through the valve.

Installing Header Instructions (CGWQ Dual Circuits Only)

To properly install the headers, see figure below and follow these steps:

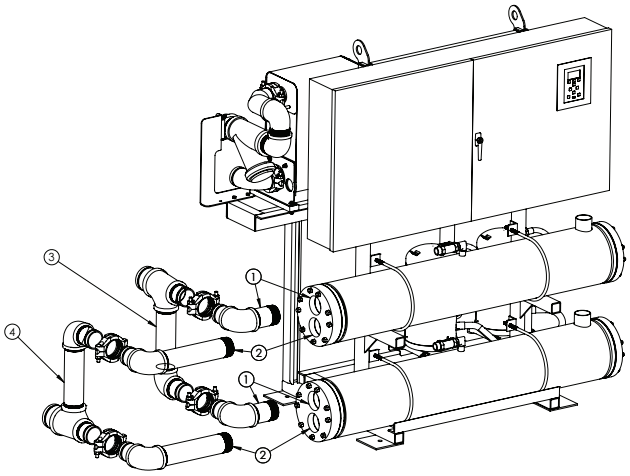
1. Install the short threaded pipes to the top and bottom condenser outlets.

Note: *These pipes will be installed on the water regulating valves if option was selected.*

2. Install the longer threaded pipes to the top and bottom condenser inlets.
3. Connect the top and bottom condenser outlets using two Victaulic clamps and Tee assembly.
4. Connect the top and bottom condenser inlets using two Victaulic clamps and Tee assembly such that the inlet tee is positioned either above or below the outlet tee (not at the same level).

Important: *Headers must be supported.*

Figure 3. Header installation



Brazed Plate Evaporator

Trane CGWQ/CCAQ chillers are equipped with brazed plate evaporators made of stamped stainless steel plates, furnace brazed together with copper based joints. Because of the small complex geometry of the flow passages, it is imperative customers take all precautions to insure these evaporators are not fouled by large particles or mineral deposits. Chillers are equipped with an integral factory installed evaporator inlet wye strainer. Screen may be removed for cleaning. Operation of chiller without screen in place will void warranty. Chemical treatment of the chilled water loop is required and must be performed by a qualified water treatment specialist.

Figure 4. Evaporator piping drawing reflecting brazed plate

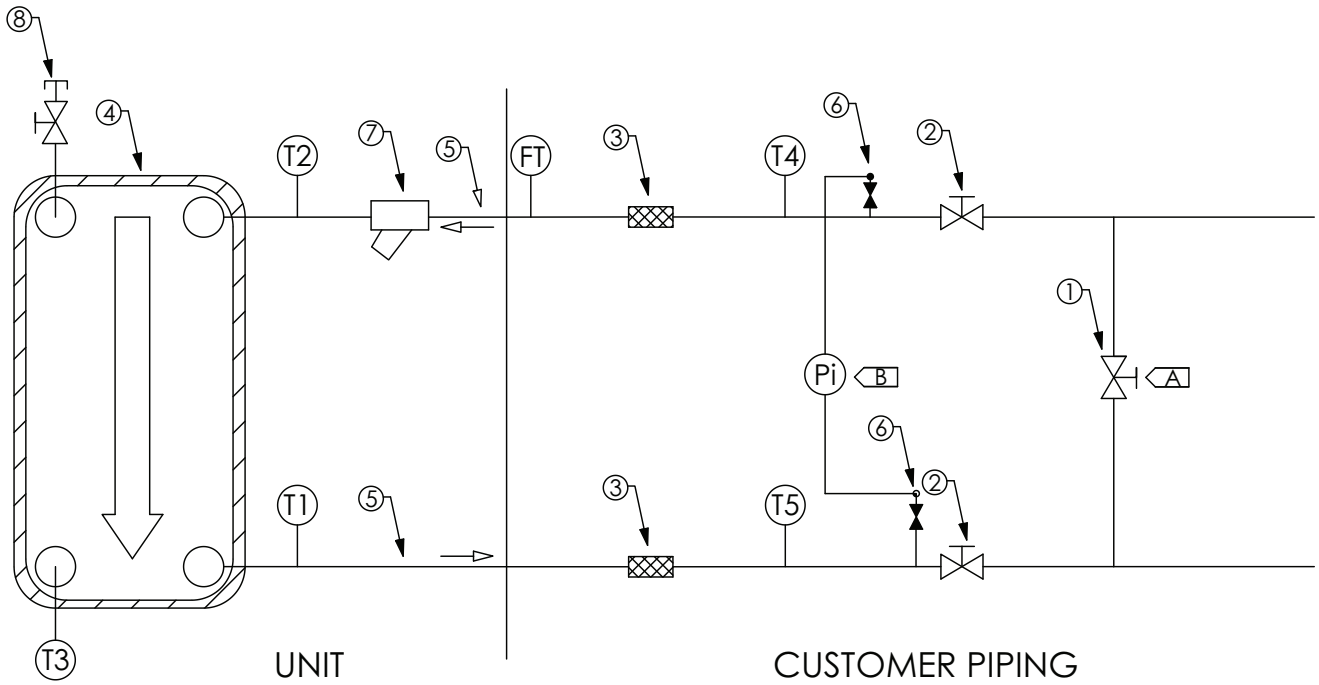


Table 9. Reference numbers (see Figure 4)

Item	Description
1	Bypass Valve
2	Isolation Valves
3	Vibration Eliminators
4	Evaporator Heat Exchangers
5	Inlet and Outlet Chilled Water Lines
6	Valves for Pressure Measurement
7	Strainer with 20 mesh screen
8	Evaporator Manual Air Vent Valve w/Plug
A	Isolator Unit for initial water loop cleaning
B[(a)]	Arrangement for Measuring Differential Pressure
FT[(b)]	Water Flow Switch
Pi	Pressure Gauge
T1	Evaporator outlet temperature sensor
T2	Evaporator inlet temperature sensor
T3	Evaporator core temperature sensor
T4	Chiller inlet temperature gauge
T5	Chiller outlet temperature gauge

(a) Must account for water head difference when calculating total unit pressure differential.
(b) Chilled water flow-proving device is required.

Water Pressure Drop Curves

Figure 5. Evaporator water pressure drop

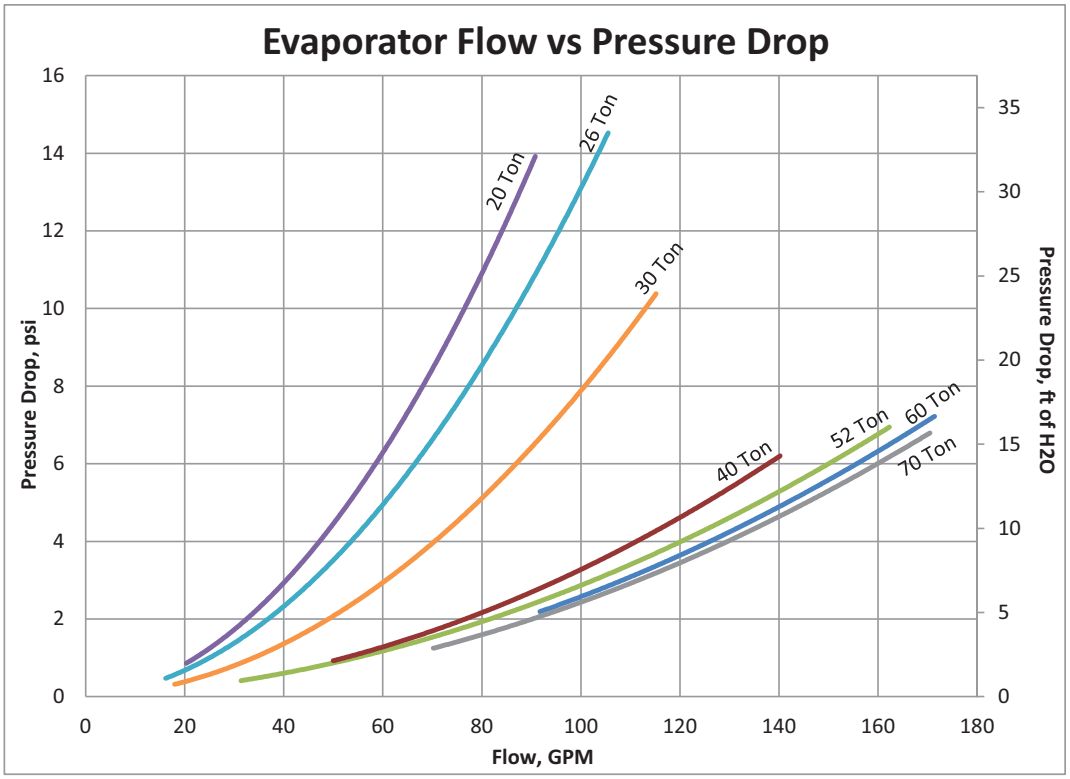
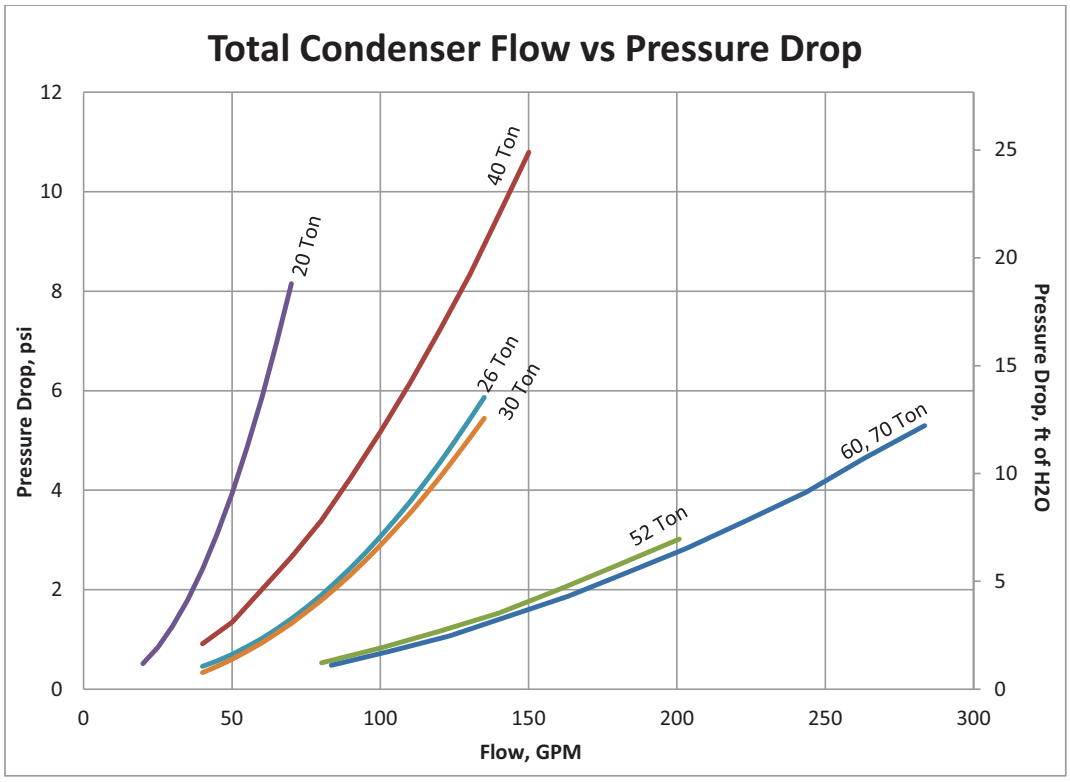


Figure 6. Condenser water pressure drop



Low Suction Temperature and Pressure Cutouts/Percent Glycol Recommendations

Table 10 shows the low suction temperature and pressure cutouts for different glycol levels.

Additional glycol beyond the recommendations will adversely affect unit performance. The unit efficiency will be reduced and the saturated evaporator temperature will be reduced.

For some operating conditions this effect can be significant.

If additional glycol is used, then use the actual percent glycol to establish the Low and Unsafe refrigerant suction pressure cutout set points.

Table 10. Minimum recommended setpoints

Ethylene Glycol / Water					Propylene Glycol / Water				
Glycol % (By Mass)	Solution Freeze Point (°F)	LOW SUCTION[a] (psig)	UNSAFE SUCT[b] (psig)	FREEZE[c][d] (°F) CORE FREEZE[e] (°F)	Glycol % (By Mass)	Solution Freeze Point (°F)	LOW SUCTION[a] (psig)	UNSAFE SUCT[b] (psig)	FREEZE[c][d] (°F) CORE FREEZE[e] (°F)
0	32.0	101.12	71.58	38.0	0	32.0	101.12	71.58	38.0
2	30.9	98.87	69.79	36.9	2	30.9	98.87	69.79	36.9
4	29.9	96.86	68.18	35.9	4	29.7	96.46	67.86	35.7
5	29.4	95.86	67.39	35.4	5	29.1	95.26	66.91	35.1
6	28.8	94.67	66.44	34.8	6	28.5	94.08	65.97	34.5
8	27.5	92.13	64.42	33.5	8	27.3	91.75	64.12	33.3
10	26.2	89.64	62.44	32.2	10	26.1	89.45	62.29	32.1
12	24.6	86.63	60.06	30.6	12	24.8	87.00	60.35	30.8
14	23.0	83.69	57.73	29.0	14	23.6	84.78	58.60	29.6
15	22.2	82.24	56.59	28.2	15	22.9	83.51	57.59	28.9
16	21.3	80.63	55.32	27.3	16	22.1	82.06	56.45	28.1
18	19.6	77.65	52.98	25.6	18	20.7	79.57	54.49	26.7
20	17.9	74.75	50.69	23.9	20	19.2	76.96	52.43	25.2
22	15.9	71.42	48.08	21.9	22	17.5	74.07	50.16	23.5
24	13.7	67.86	45.30	19.7	24	15.6	70.92	47.69	21.6
25	12.7	66.28	44.07	18.7	25	14.6	69.30	46.42	20.6
26	11.4	64.27	42.50	17.4	26	13.7	67.86	45.30	19.7
28	9.2	60.95	39.91	15.2	28	11.5	64.42	42.62	17.5
30	6.7	60.65	39.68	15.0	30	9.2	60.95	39.91	15.2
32	4.2	60.65	39.68	15.0	32	6.6	60.65	39.68	15.0
34	1.4	60.65	39.68	15.0	34	3.9	60.65	39.68	15.0
35	-0.2	60.65	39.68	15.0	35	2.5	60.65	39.68	15.0
36	-1.5	60.65	39.68	15.0	36	0.8	60.65	39.68	15.0
38	-4.6	60.65	39.68	15.0	38	-2.5	60.65	39.68	15.0
40	-8.1	60.65	39.68	15.0	40	-6.0	60.65	39.68	15.0
42	-11.7	60.65	39.68	15.0	42	-9.8	60.65	39.68	15.0
44	-15.5	60.65	39.68	15.0	44	-14.0	60.65	39.68	15.0
45	-17.6	60.65	39.68	15.0	45	-16.1	60.65	39.68	15.0
46	-19.7	60.65	39.68	15.0	46	-18.3	60.65	39.68	15.0
48	-24.0	60.65	39.68	15.0	48	-23.1	60.65	39.68	15.0
50	-28.9	60.65	39.68	15.0	50	-28.3	60.65	39.68	15.0

(a) "LOW SUCTION" refers to the low suction pressure cutout.
(b) "UNSAFE SUCT" refers to the unsafe suction pressure cutout.
(c) "FREEZE" refers to the low leaving fluid temperature cutout.
(d) The minimum leaving fluid temperature set point, "CW OUT TRGT," should not be less than 5°F above the low fluid temperature cutout, "FREEZE," and the core fluid temperature cutout, "CORE FREEZE."
(e) "CORE FREEZE" refers to the evaporator core fluid temperature cutout.

Water Treatment

NOTICE:

Proper Water Treatment Required

The use of untreated or improperly treated water in this unit could result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

Using untreated or improperly treated water in these units may result in inefficient operation and possible tube damage. Consult a qualified water treatment specialist to determine if treatment is needed.

Refrigerant Piping (CCAQ only)

NOTICE:

Excessive Water Pressure!

To prevent condenser or regulating valve damage, do not exceed nameplate condenser water pressure.

Refer to the industry standards for refrigerant piping selection information; contact the factory if you do not have access to this data. Refrigerant pipe size selected must be within the velocity and pressure drop limitations required for proper system operation. It is essential that refrigerant piping be properly sized and applied since these factors have a significant effect on performance.

Note: *Use Type K refrigerant-grade copper tubing only. The use of a lower grade tubing can cause operating problems.*

General Guidelines

Keep these general guidelines in mind as you review the recommendations specific to field piping refrigerant lines:

- Limit overall line length. Enough sub-cooling may be lost as refrigerant travels up the liquid riser to cause flashing. Review any questionable applications with the factory.
- Pipe sizing software such as Trane Engineering Toolbox can help to quickly determine proper sizes for refrigerant lines based on current engineering data.

Liquid Line

Sufficient sub-cooling must be maintained at the expansion valve. To provide proper operation throughout the range of operating conditions, the liquid-line pressure drop should not exceed the unit's minimum sub-cooling value less 5°F. To achieve this objective, keep these liquid-line considerations in mind:

1. Select the smallest, practical line size for the application. Limiting the refrigerant charge improves compressor reliability.
2. When designing the liquid line for a typical air-conditioning application (i.e., one with an operating range of 40°F to 115°F), remember that every 10 feet of vertical rise will reduce sub-cooling by 2.8°F, while every 10 feet of vertical drop will add 1.1°F of sub-cooling.
3. Provide a 1-inch pitch toward the evaporator for every 10 feet of run.
4. If the liquid line must be routed through an area warmer than outdoor air temperature, insulate the line to prevent the refrigerant from flashing.
5. A replaceable core liquid line filter drier must be installed as close as possible to the compressor chiller. The core should be changed whenever the system is opened for service. Trane compressor chillers do not include a filter-drier as standard, but one may be ordered if the installing contractor desires a factory type.
6. A moisture-indicating sight glass permits a visual check of the liquid column for bubbles. Sight glasses are included on the Trane compressor-chiller. However, never use the sight glass to determine whether the system is properly charged! Instead, either charge the system based on the required sub-cooling or calculate the amount of refrigerant needed and add it based on weight.

Discharge (Hot Gas) Line

Limit the pressure drop in the discharge line to 6 psid whenever possible to minimize the adverse effect on unit capacity and efficiency. While a pressure drop of as much as 10 psid is usually permissible, note that a 6-psid pressure drop reduces unit capacity by 0.9 percent and efficiency by 3 percent.

Pitch discharge lines in the direction of hot gas flow at the rate of 1/2-inch per each 10 feet of horizontal run. Discharge line sizing is based on required velocity to provide good oil movement. Basic discharge line parameters are:

Max allowable pressure drop 6 psig (1F)
Maximum Velocity 3500 fpm
Minimum Velocity (at minimum load)
Horizontal lines 500 fpm
Vertical lines (up flow) 1000 fpm

To design the discharge line properly, follow the recommended guidelines:

- Choose the shortest route from the compressor to the condenser.
- Use different pipe sizes for horizontal and vertical lines to make it easier to match line pressure drop and refrigerant velocity to discharge-line requirements.

- To assure proper oil entrainment and avoid annoying sound levels, size the discharge line so refrigerant velocity equals or exceeds the minimum velocity in Table 11 and remains below 3,500 fpm.
- Prevent oil and condensed refrigerant from flowing back into the compressor during "off" cycles by:
  a. pitching the discharge line toward the condenser, and
  b. routing the discharge line so that it rises to the top of the condenser, then drops to the level of the condenser inlet, creating an inverted trap.
- Double risers are generally unnecessary. The scroll compressors in Trane units unload to the extent that a single, properly sized riser can transport oil at any load condition.

Table 11. Minimum discharge-line velocities for oil entrainment

	Refrigerant Velocity, fpm	
Nom. Pipe Size, in.	Riser	Horizontal
7/8	375	285
1-1/8	430	325
1-3/8	480	360
1-5/8	520	390
2-1/8	600	450

- Riser traps are also unnecessary. Avoid using riser traps. If the discharge riser is sized to maintain the proper refrigerant velocity, adding a trap will only increase the pressure drop.

Reliability determines the success of a split air-conditioning system. Interconnecting refrigerant lines play an instrumental role in that success. It's up to us to ensure that our system design practices evolve with equipment technologies.

This can be summarized as five fundamental "rules":

1. Choose the right system (i.e., don't specify split-system equipment when a packaged chiller is best suited for the job).
2. Size the interconnecting lines to avoid the use of traps and double risers.
3. Slope the liquid lines toward the evaporator.
4. Minimize the length of the interconnecting tubing.
5. Keep the system clean.

Initial Leak Test

As shipped, Trane compressor-chillers contain a holding charge of nitrogen only. Before connecting refrigerant piping, momentarily crack open a Schraeder valve on the liquid line to insure that the unit is still pressurized. If no gas escapes thru the valve, leak test the unit to determine the source of the refrigerant leak prior to installation and repair any leaks located.

Refrigerant Piping Sizes

Refer to the Trane guide TRG-TRC006-EN and/or ASHRAE publications to determine piping selection information. Refrigerant pipe sizes selected must be within the velocity and pressure drop limitations required for proper system operations. It is essential that refrigerant piping be properly sized and applied since these factors have a significant effect on system performance and reliability.

Final Leak Test

⚠WARNING

Hazard of Explosion!

Failure to follow instructions below could result in death or serious injury or equipment or property-only damage. Use only dry nitrogen with a pressure regulator for pressurizing unit. Do not use acetylene, oxygen or compressed air or mixtures containing them for pressure testing. Do not use mixtures of a hydrogen containing refrigerant and air above atmospheric pressure for pressure testing as they may become flammable and could result in an explosion. Refrigerant, when used as a trace gas should only be mixed with dry nitrogen for pressurizing units.

Once refrigerant piping is completed, thoroughly test the system for leaks.

System Evacuation

⚠WARNING

Risk of Internal Arc Flash!

Failure to follow instructions could result in death, serious injury and compressor damage. Do not use a megohmmeter or apply power to compressor windings under vacuum as it could result in an arc flash inside the compressor.

For field evacuation after leak checking, use a vacuum pump capable of pulling a vacuum of 100 microns or less. Follow the pump manufacturer's instructions for proper use of the pump. Insure that all sections of the system are properly evacuated before proceeding.

Refrigerant Charging

NOTICE:

Equipment Damage!

To prevent damage to the evaporator and condenser, never charge liquid refrigerant into either of these vessels without adequate flow to prevent the temperature/pressure relationship to fall below 35°F.

Once the system is properly installed, leak tested and evacuated, refrigerant charging can begin. Liquid

refrigerant must be charged into each circuit through the liquid line access with the compressor(s) off.

Charge refrigerant into the system by weight. Use an accurate scale or charging cylinder to determine the exact charge entering the system. Failure to charge the system accurately can lead to under or over-charging and result in unreliable operation.

If system pressure equalize before the full charge enters the system, close the charging port and proceed to start-up procedure.

Electrical Wiring

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

General Recommendations

⚠WARNING

Hazardous Service Procedures!

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

NOTICE:

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as unit terminals are not designed to accept other types of conductors.

The wiring procedures, as described in this portion of the manual, must be accomplished to obtain proper operation of the unit.

All wiring must comply with National Electrical Code (NEC) and state and local requirements. Outside the United States, the national and/or local electrical requirements of other countries shall apply. The installer must provide properly sized system interconnecting and power supply wiring with appropriate fused disconnect switches. Type and locations of disconnects must comply with all applicable codes.

Minimum circuit ampacities, recommended fuse sizes and other unit electrical data are provided on the unit nameplate.

Power and Control Wiring

Unit Power Wiring

The installing contractor must connect appropriate power wiring (with fused disconnects) to the terminal block or non-fused, unit-mounted disconnect in the power section of the unit control panel. Electrical schematics and component location drawings are also mounted on the inside of the control panel door.

The unit power fused disconnect switch should be located in the general area of the unit, to comply with NEC or local codes. Some codes require line-of-sight disconnect locations. The optional unit unfused disconnect can be used as an emergency shutdown device.

Unit Control Wiring

Refer to "Unit Controller," p. 30 for additional details on field connections for controller and options.

Scroll Compressor Electrical Phasing

General

⚠WARNING

Hazardous Voltage!

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

NOTICE:

Compressor Damage!

Operating compressors in reverse rotation will cause damage or failure of the compressor.

It is critical that proper rotation of the scroll compressors be established before the machine 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 inlet power supply phased "ABC" or "L1, L2, L3".

The order in which the three voltages of a three-phase system succeed one another is called phase sequence or phase rotation. When rotation is clockwise, phase sequence is usually called "ABC" and 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.

Setting Proper Electrical Phase Sequence

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

1. Verify that all operating controls for the unit are in the "Off" position.
2. Disconnect power to the power distribution block in the unit control panel
3. Connect the phase sequence indicator leads to the power distribution block as follows:

Phase Seq. Lead	Terminal ID
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 displayed on the indicator. The "ABC" LED on the face of the phase indicator will glow if phase sequence is ABC.
6. If the "CBA" indicator glows instead, open the unit main power disconnect and switch two line leads on the power distribution block in the unit control panel. Close the main power disconnect and recheck phasing.
7. Open the unit disconnect and remove the phase indicator.

Unit Voltage

Electrical power to the unit must meet stringent requirements for the unit to operate properly. Total voltage supply and voltage imbalance between phases should be within the tolerances discussed below.

Voltage Supply

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

Measure each leg of supply voltage at the line voltage disconnect switches. Readings must fall within the range of 187-254 volts for units with a nameplate voltage of 208/230 volt and 414-508 volts for units with a nameplate voltage of 460 volts. If voltage on any leg does not fall within tolerance, notify the power company and request correction of this situation before operating the unit.

Inadequate voltage to the unit will shorten the life of relay contacts and compressor motors.

Voltage Imbalance

Excessive voltage imbalance between phases in a three-phase system will cause motors to overheat and eventually fail. Maximum allowable imbalance is 2 percent. Voltage imbalance is defined as 100 times the maximum deviation of the three voltages (three phases) subtracted from the average (without regard to sign), divided by the average voltage.

Example:

If the three voltages measured at the line voltage fused disconnect are 221 volts, 230 volts and 227 volts, the average would be:

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

The percentage of imbalance is then:

$$\frac{100\ (226-221)}{226} = 2.2\%$$

In the preceding example, 221 is used because it is the farthest from the average. The 2.2 percent imbalance that exists exceeds maximum allowable imbalance by 0.2 percent. This much imbalance between phases can equal as much as 20 percent current imbalance with a resulting increase in winding temperature that will decrease compressor motor life.

Control Power Supply

A fused, panel-mounted control power transformer is standard on all units. Replacement fuses are listed on the "Fuse Schedule" decal located adjacent to the transformer inside the control box.

External Contacts

Modules Connections for Interconnecting

Trane chiller units can be interconnected; however, controller software may need to be updated to allow this type of operation. Please contact the factory for more information.

Chilled Water Flow Switch

The unit controller has an input that accepts a contact closure from a proof-of-flow device such as a flow switch or other factory approved flow proving device. When this input does not prove flow within a fixed time relative to transition from enabled to run modes of the chiller, or if the flow is lost while the chiller is in the running mode of operation, the chiller will be prohibited from running. The installer must provide and install this flow proving device. See also wiring diagrams attached to the inside of the control panel door. Failure to provide this flow proving device voids unit warranty.

NOTICE:

Unexpected Chiller Start!

Failure to follow instructions could cause the chiller to start unexpectedly which could result in equipment or property damage. An external source (EMS, time clock or any other means) should not be allowed to bring on a pump that would trigger the flow switch to start the chiller. The flow switch is meant to act as a safety switch and not a start/stop mechanism.

Condenser Water Loss of Flow Protection

The controller logic will sense a loss of flow through the condenser. No flow switches are necessary with the standard unit controller configuration.

Condenser Fan Staging or VFD Control

The CCAQ compressor chiller unit controller has the ability to control fan staging, fan VFDs and damper control in order to improve the stability of discharge pressure at various ambient conditions.

Unit controller capability single circuit compressor chillers (CCAQ 20,26, and 30) have three dry contact relays to cycle condenser fan motors to control discharge pressure, as well as one 0 to 10 Vdc analog output to control a VFD or fan damper. Dual circuit compressor chillers (CCAQ 40, 52, 60, and 70) have eight dry contact relays to cycle condenser fan motors to control discharge pressure, as well as two 0 to 10 Vdc analog output to control a FVD or fan damper.

CCAQ unit controller must control condenser ambient control devices such as fan cycling and optional low ambient dampers. As a result the interconnecting field wiring must be done *by others*. For pairing CCAQ compressor chiller with CAUJ air cooled condenser, the following field wiring is to be done by others.

- **Fan cycling control**
  - One control wire for each condenser fan plus a common must be run between CCAQ compressor chiller and CAUJ condenser.
  - Required fan control wiring for CCAQ compressor chillers matched with CAUJ condensers utilizing fan control are covered by instructions on Figure 18, p. 49 and associated footnotes.
- **Low Ambient Dampers (when applicable)**
  - One shielded par for each condenser must be run between CCAQ compressor chiller and CAUJ air cooled condenser.
  - Required fan control wiring for CCAQ compressor chillers matched with CAUJ condensers utilizing low ambient control damper assembly are covered by instructions on Figure 20, p. 51 and associated footnotes.

Condenser Control

For single circuit CCAQ units, the controller has three dry contact relays to enable condenser fan motors on a rise in head pressure. These chillers also have one 0 to 10 Vdc analog output to control a VFD or fan damper. Dual circuit CCAQ have up to eight dry contact relays (one for each fan) plus two 0 to 10 Vdc analog outputs.

Single circuit CGWQ units have one dry contact relay to start a condenser pump. These chillers also have one 0 to 10 Vdc analog output to control a head pressure control valve. Dual circuit CGWQ units have one dry contact relay to start a condenser pump. These chillers have two 0 to 10 Vdc analog outputs (one for each circuit) to control head pressure control valves.

Consult wiring diagram located inside the control box door for connection point(s).

Equipment Grounds

NOTICE:

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as unit terminals are not designed to accept other types of conductors.

Provide proper grounding at the connection point provided in the unit control panel.

Unit Controller

The unit controller is a rugged microprocessor based controller designed for the hostile environment of the HVAC/R industry. It is designed to be the primary manager of the CCAQ/CGWQ product.

The unit controller provides flexibility with setpoints and control options that can be selected prior to commissioning a system or when the unit is live and functioning. Displays, pressures, temps, alarms and other interfaces are accomplished in a clear and simple language that informs the user as to the status of the controller. Refer also to the wiring diagram attached to the inside of the control panel door.

A password is required to access MCS setpoints. Use password code 2112 to access many of these features. A factory code may be required to allow access to critical areas, and can only be entered by a factory representative.

A RS-485 port is provided for communication with other manufacturers' systems. Additionally, a built-in RS-485 to RS-232 converter allows communication over the RS-485 port via the RS-232 port. Other features include the integration of BACnet®, Johnson N2, and MODBUS® into the unit controller. Also available is a card that allows communication via LonWorks®, and this should be ordered with the chiller if required. An ethernet connection is also provided on each unit. While field changes can be

made, please insure that the unit is ordered set up for required communications to insure that factory testing includes end user configuration.

A complete software support package is available for your PC allowing for system configuration, dynamic on-line display screens, remote communication, graphing and more. Downloads for the MCS-Connect software are available at www.mcscontrols.com at no charge. All information needed to run the unit is available from the unit display; however, a laptop computer is invaluable for ease of use of diagnosing or changing the unit setpoints.

Note: *Not all setpoints can be changed with MCS-Connect; some require a configuration change.*

A serial cable is included in each shipment for the convenience of the field tech. If you do not have a laptop with a serial port, you will require a converter such as a Black Box item number #IC199A-R3 serial-to-USB adaptor.

The standard configuration allows for unit to start at lowest stage possible (hot gas bypass if included as a capacity step), then add compressors as needed to meet demand.

Important: *All configuration changes need to be done by factory representatives to ensure proper operation of the unit within design parameters. Refer to MCS unit controller manual for sequence of operation and additional details.*

Unit Startup Procedures

Prior to calling for start-up services or commissioning, CCAQ-ADF001*-EN (*CCAQ Installation Completion Check List and Request for Trane Service*) or CGWQ-ADF001*-EN (*CGWQ Installation Completion Check List and Request for Trane Service*), as appropriate, must be completed and submitted. Once CCAQ-ADF001*-EN or CGWQ-ADF001*-EN has been submitted, CGWQ-ADF002*-EN (*Start-up Check List for CGWQ and CCAQ Chillers*) must be followed and submitted.

Pre-Start Up Procedures Check List

Complete each step in the "Pre-Start Up Procedures" check list included in CGWQ-ADF002A*-EN (*Start-up Check List for CGWQ and CCAQ Chillers*) and check off each step as completed.

⚠WARNING

Hazardous Voltage!

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

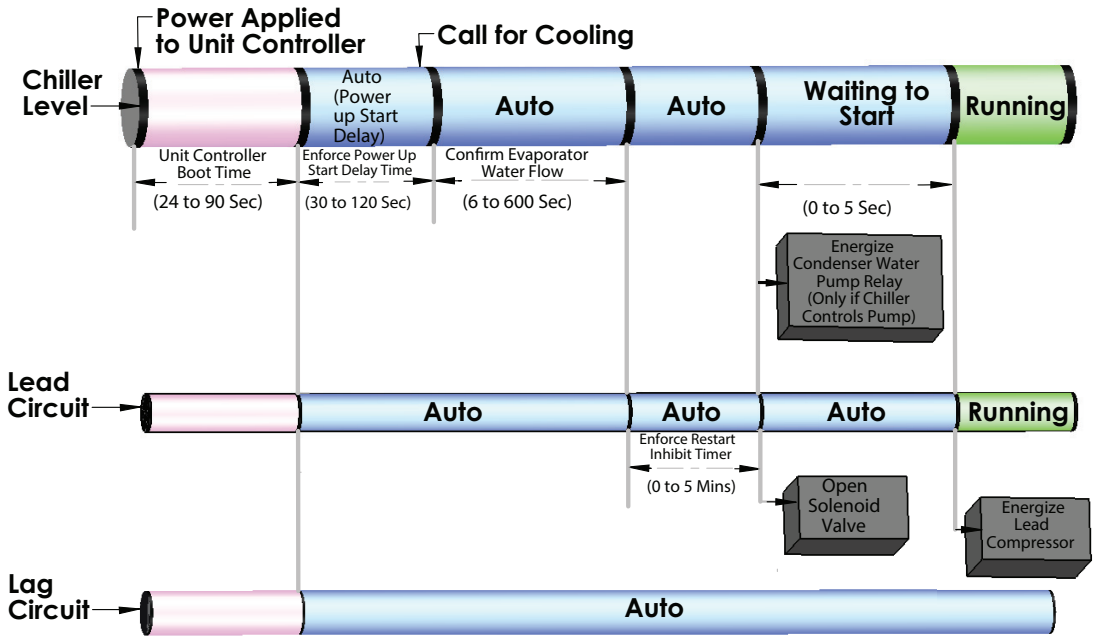
NOTICE:

Equipment Damage!

- **To prevent overheating at connections and under-voltage conditions at the compressor motor, check tightness of all connections in the compressor power circuit.**
- **To prevent compressor damage, do not operate the unit with discharge or liquid line service valves closed.**
- **The use of untreated or improperly treated water in a Chiller may result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged 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, or saline or brackish water.**
- **To prevent evaporator or condenser damage, pipe strainers must be installed in the water supplies to protect components from water born debris. Trane is not responsible for equipment damage caused by water born debris.**

Sequence of Operation

Unit Power Up



Checking Operating Conditions

NOTICE:

Evaporator/Condenser Damage!

Water (fluid) flow must be established in evaporator and condenser before adding refrigerate, removing refrigerate, or pulling vacuum, to protect heat exchangers from freezing.

NOTICE:

Compressor Damage!

Do not allow liquid refrigerant to enter the suction line as excessive liquid accumulation in the liquid lines could result in compressor damage.

To prevent compressor damage and ensure full cooling capacity, use refrigerants specified on the unit nameplate only.

- **If operating conditions indicate an overcharge, slowly (to minimize oil loss) remove refrigerant at the liquid line Schrader fitting. Do not discharge refrigerant into the atmosphere.**
- **If the remote condenser (CCAQ) is equipped with low ambient dampers, check for proper actuator and blade travel in relation to condensing pressure.**
- **Once proper unit operation is confirmed, inspect for debris, misplaced tools., etc. Secure control panel doors in place.**

Once the unit has been operating for about 10 minutes and the system has stabilized, check operating conditions and complete the checkout procedures that follow.

- Recheck evaporator water and condenser (CGWQ) water flows and pressure drops. These readings should be stable at proper levels.
- Check suction pressure and discharge pressure of the unit.

Discharge pressures—take at Schrader fitting provided on the discharge line. Normal discharge pressures are:

CCAQ units: 315 psig to 500 psig

CGWQ units: 275 psig to 430 psig

Suction pressures— take at Schrader fitting provided on the suction line. Normal suction pressures are:

42°F–60°F LWT: 104–155 psig

15°F–39°F LWT: 60–103 psig

- Check compressor oil levels. At full load, oil level should be visible in the oil level sight glass on the compressor. If it is not, add or remove oil as required.
- Check the liquid line sight glasses. Refrigerant flow past the sight glasses should be clear. Bubbles in the liquid line indicate either low refrigerant charge or excessive pressure drop in the liquid line. Such a restriction can often be identified by a noticeable temperature differential on either side of the restricted area. Frost often forms on the outside of the liquid line at this point also.

The system may not be properly charged although the sight glass is clear. Also consider superheat, sub-cooling and operating pressure.

- Once oil level, amp draw and operating pressures have stabilized, measure system suction superheat.
- Measure system liquid line sub-cooling.
- If operating pressure, sight glass, superheat and sub-cooling readings indicate refrigerant shortage, charge refrigerant into each circuit. Refrigerant shortage is indicated if operating pressures are low and sub-cooling is also low.

If suction and discharge pressures are low but sub-cooling is normal, no refrigerant shortage exists. Adding refrigerant, will result in overcharging.

Add refrigerant with the unit running by metering liquid refrigerant through the Schrader valve between the expansion valve and the evaporator refrigerant inlet until operating conditions are normal.

System Superheat

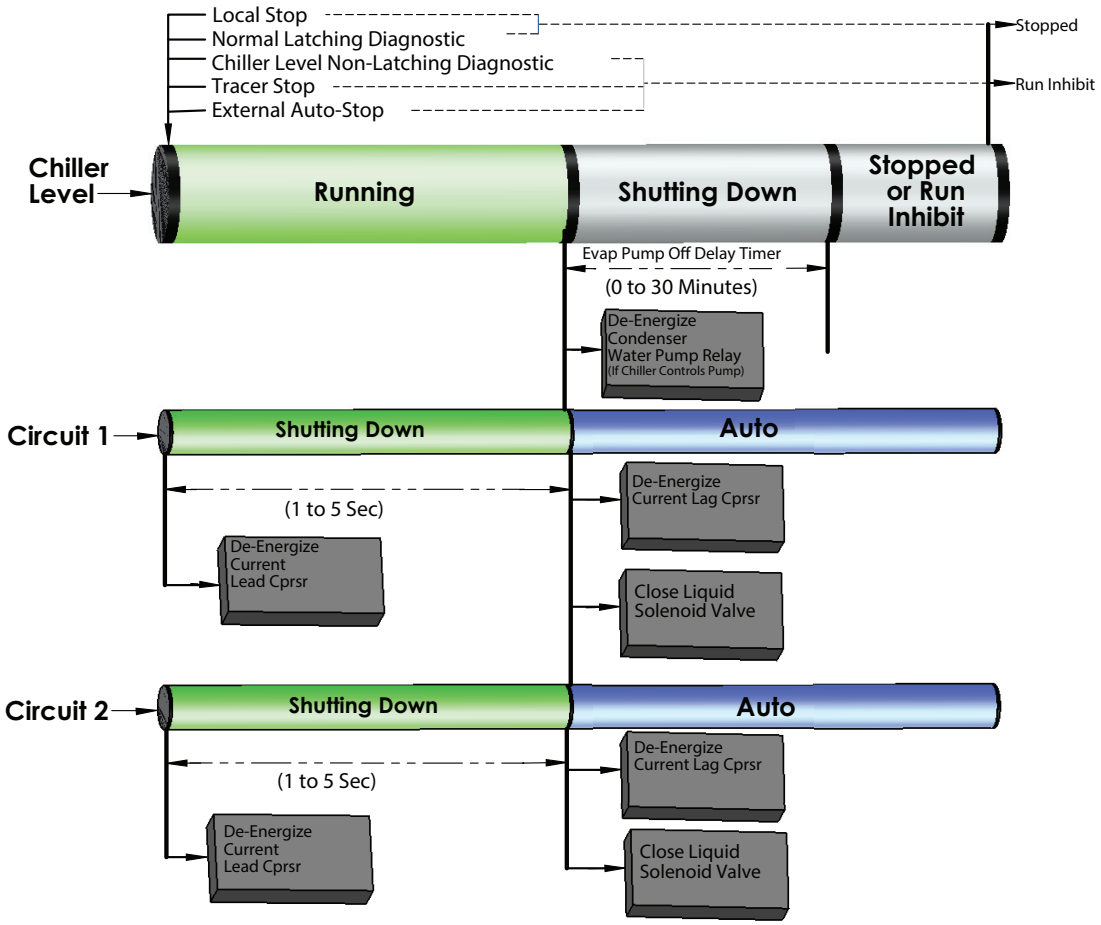
Normal superheat for each circuit is 10°F–16°F at full load. If superheat is not within this range, adjust expansion valve superheat setting. Allow 5–10 minutes between adjustments for the expansion valve to stabilize on each new setting.

System Sub-cooling

Normal sub-cooling for each circuit is 5°F to 10°F at full load where saturated discharge pressure and liquid line temperature are measured at chiller liquid line.

Unit Shutdown

Normal Unit Shutdown



Extended Shutdown Procedure

If the system is taken out of operation for long periods of time, use this procedure to prepare the system for shutdown.

1. Test condenser and high side piping for refrigerant leakage.
2. Open electrical disconnect switches for evaporator water pump. Lock the disconnect in an open position.
3. Open the unit main electrical disconnect and unit-mounted disconnect (if used) and lock in open position.

Unit Restart

Unit Restart After Extended Shutdown

Use this procedure to prepare the system for restart after an extended shutdown.

NOTICE:

Compressor Failure!

To protect compressors from premature failure the unit must be powered and crankcase heaters energized at least 24 hours BEFORE compressors are started.

NOTICE:

Compressor Damage!

To prevent compressor damage, be certain that all refrigerant valves are open before starting the unit.

1. Close the unit main disconnect(s) and the unit-mounted disconnect (if used).
2. Check compressor crankcase oil levels. Oil should be visible in the compressor oil level sight glass.
3. Fill the chilled water circuit(s) if drained during shutdown. Vent the system while filling it.
4. Close the fused disconnect switch(es) for the water pumps.
5. Start the water pump(s). With water pumps running, inspect all piping connections for leakage. Make any necessary repairs.
6. With water pump(s) running, adjust chilled water flow and check water pressure drop through the evaporator.
7. Check the flow switch on the evaporator outlet piping for proper operation.
8. Stop the water pump(s).
9. Complete each step in Trane literature CGWQ-ADF002*-EN (*Start-up Check List for CGWQ and CCAQ Chillers*).
10. Energize Crankcase Heaters (Must be energized 24 hours before startup).

Maintenance

⚠WARNING

Hazardous Service Procedures!

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

Because scroll compressors are a uniquely different design from traditional reciprocating compressors, their operating characteristics and requirements are a departure from the reciprocating compressor technology.

Compressor Oil

The R-410A scroll compressor uses POE oil as required by the manufacturer of the compressor. Refer to compressor manufacturer for exact type and amount of oil in the specific model in question.

Oil Level. While the compressor is running, the oil level may be below the sight glass *but still visible through the sight glass.* The oil level should NEVER be above the sight glass!

Oil Appearance. *If the oil is dark and smells burnt*, it was overheated because of compressor operation at extremely high condensing temperatures, a compressor mechanical failure, or occurrence of a motor burnout. *If the oil is black and contains metal flakes*, a mechanical failure has occurred. This symptom is often accompanied by a high amperage draw at the compressor motor.

Notes:

- *If a motor burnout is suspected, use an acid test kit to check the condition of the oil. If a burnout has occurred, test results will indicate an acid level exceeding 0.05 mg KOH/g.*
- *The use of commercially available oil additives is not recommended. Liability for any detrimental effects that the use of non-approved products may have on equipment performance or longevity must be assumed by the equipment owner, equipment servicer, or the oil additive manufacturer.*

Scroll Compressor Functional Test

Since the scroll compressor does not use discharge or suction valves, it is not necessary to perform a pump-down capability test, i.e. a test where the liquid line valve is closed and the compressor is pumped in a vacuum to see if it will pump-down and hold. If fact, this kind of test may actually damage the scroll compressor!

NOTICE:

Compressor Damage!

Do not pump the scroll compressor into a vacuum. Scroll compressors can pull internal low vacuums when the suction side is closed or restricted. This, in turn, may cause the internal Fusite® terminal to arc, resulting in compressor damage or failure. It may also trip the circuit breakers, blow fuses, or trip the discharge thermostat.

The proper procedure for checking scroll compressor operation is outlined below:

1. Verify that the compressor is receiving supply power of the proper voltage.
2. With the compressor running, measure the suction and discharge pressures to determine whether or not they fall within the normal operating ranges for the unit.

Normal operating pressures for the unit with a scroll compressor are the same as for a unit with a reciprocating compressor.

Compressor Operational Noises

Because the scroll compressor is designed to accommodate liquids (both oil and refrigerant) and solid particles without causing compressor damage, there are some characteristic sounds that differentiate it from those typically associated with a reciprocating compressor. These sounds, which are described below, are normal and do not indicate that the compressor is defective.

At low ambient startup: When the compressor starts up under low ambient conditions, the initial flow rate of the compressor is low. Under these conditions, it is not unusual to hear the compressor rattle until the suction pressure climbs and the flow rate increases. These sounds are *normal* and do NOT affect the operation or reliability of the compressor.

Excessive Amp Draw

Excessive Amp Draw occurs either because the compressor is operating at an abnormally high condensing temperature OR because of low voltage at the compressor motor.

Motor amp draw may also be excessive if the compressor has internal mechanical damage. In this situation, vibration and discolored oil can also be observed.

Low Suctions

Continuous low suction pressures are most likely caused by low evaporator load coupled with a system anomaly. Symptoms that may accompany low suctions include a rattling sound emitted from the compressor or an open motor winding thermostat or discharge thermostat.

Note: *Operation of the chiller with saturated suction temperatures below freezing will cause damage to the evaporator. If this occurs immediately stop the machine, diagnose and correct the problem.*

Periodic Maintenance

Perform all of the indicated maintenance procedures at the intervals scheduled. This will prolong the life of the unit and reduce the possibility of costly equipment failure.

Monthly Maintenance

Once the unit has been operating for about 10 minutes and the system has stabilized, check operating conditions and complete the checkout procedures that follow.

- Check compressor oil levels. Oil should be visible in the sight glass when the compressor is running. Operate the compressors for a minimum of three to four hours when checking the oil level, and check level every 30 minutes. If oil is not at proper level after this period, have a qualified service representative add or remove oil as required.
- Check refrigerant superheat at the compressor suction line. Superheat should be in the range of 10°F–20°F.

  Note: *A superheat calculated value is incorporated into the unit controller.*
- Check the liquid line sight glasses.
- If operating pressures and sight glass conditions seem to indicate refrigerant shortage, measure system superheat and system sub-cooling.
- If operating conditions indicate an overcharge, slowly (to minimize oil loss) remove refrigerant at the liquid line service valve.
- Inspect remote condenser coils for cleanliness (CCAQ only) and clean if required. Refer to the condenser manufacturer's recommendations.
- Inspect the entire system for unusual conditions. Use the operating log in this section to record a weekly operating conditions history for the unit. A complete operating log is a valuable diagnostic tool for service personnel.

Annually

Perform all weekly and monthly maintenance procedures.

- Have a qualified service technician check the setting and function of each control and inspect the condition of and replace compressor and control contacts if needed.
- If chiller is not piped to drain facilities, make sure drain is clear to carry away system water.
- Drain water from condenser (CGWQ only) and evaporator and associated piping systems. Inspect al piping components for leakage, damage, etc. Clean out integral evaporator strainer.
- Inspect condenser tubes and clean, if needed.
- Clean and repaint any corroded surface.
- Clean remote condenser coils (CCAQ only). Refer to the condenser manufacturer's recommendations.

Weekly Maintenance

Once the unit has been operating for about 10 minutes and the system has stabilized, check operating conditions and complete the checkout procedures that follow.

- Check compressor oil levels. Oil should be visible in the sight glass when the compressor is running. Operate the compressors for a minimum of three to four hours when checking oil level, and check level every 30 minutes. If oil is not at proper level after this period, have a qualified service representative add or remove oil as required.
- Check suction pressure and discharge pressure.
- Check the liquid line sight glasses.
- If operating pressures and sight glass conditions seem to indicate refrigerant shortage, measure system superheat and system sub-cooling.
- If operating conditions indicate an overcharge, slowly (to minimize oil loss) remove refrigerant at the liquid line service valve.
- Inspect remote condenser coils for cleanliness (CCAF only) and clean if required. Refer to the condenser manufacturer's recommendations.

Inspect the entire system for unusual conditions. Use the operating log in this section to record a weekly operating conditions history for the unit. A complete operating log is a valuable diagnostic tool for service personnel.

Electrical Schematics

CGWQ Water-Cooled Chillers

Refer to name plate on control box door (inside) for electrical data and wiring diagram.

Figure 7. Power/control wiring schematic for 20–30 ton, R-410A CGWQ water-cooled chillers

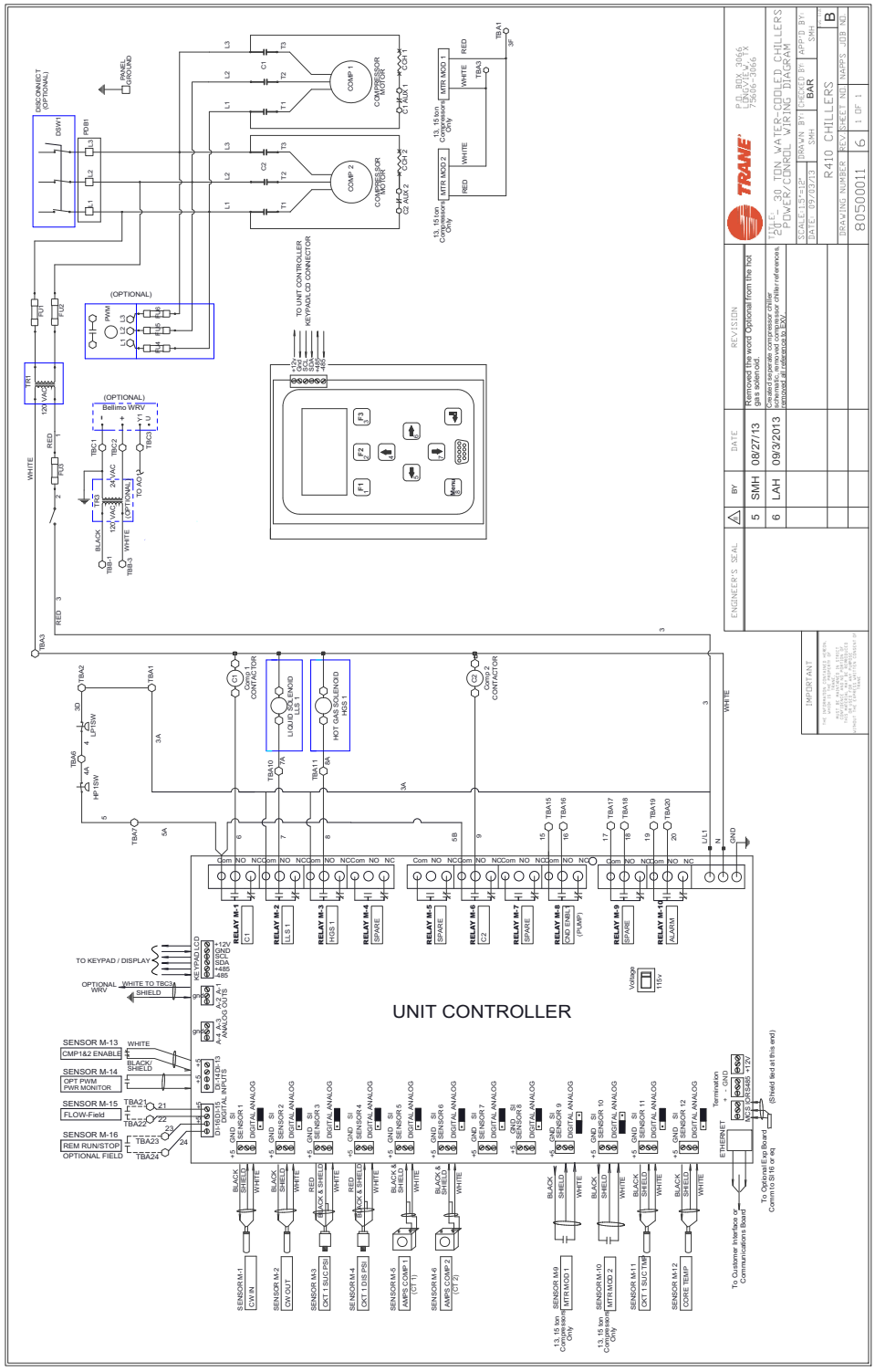


Figure 8. Power/control wiring schematic for 40–70 ton, R-410A CGWQ water-cooled chillers

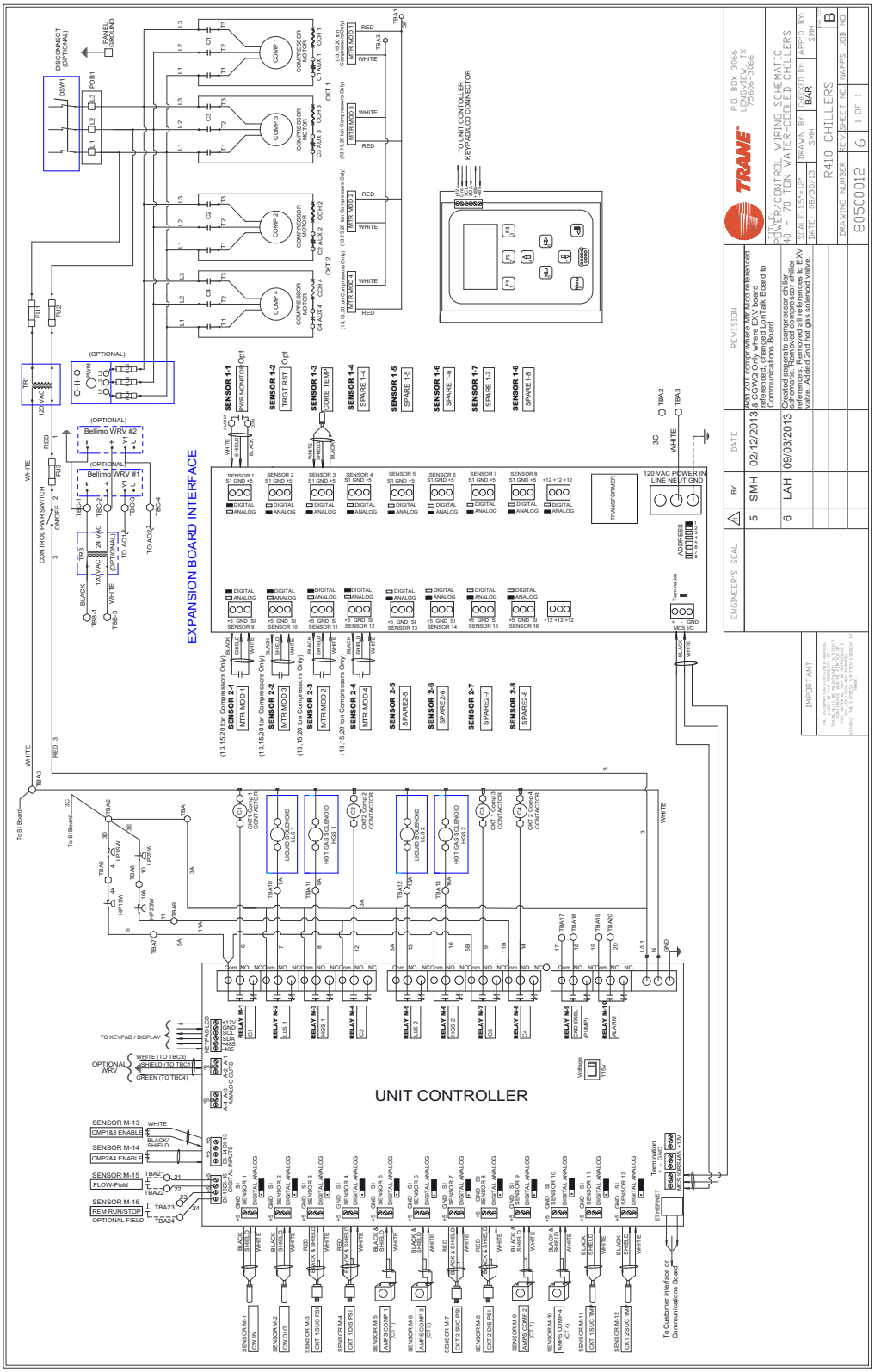


Figure 9. Control panel layout for 20–30 ton, 208V, R-410A CGWQ water-cooled scroll chillers

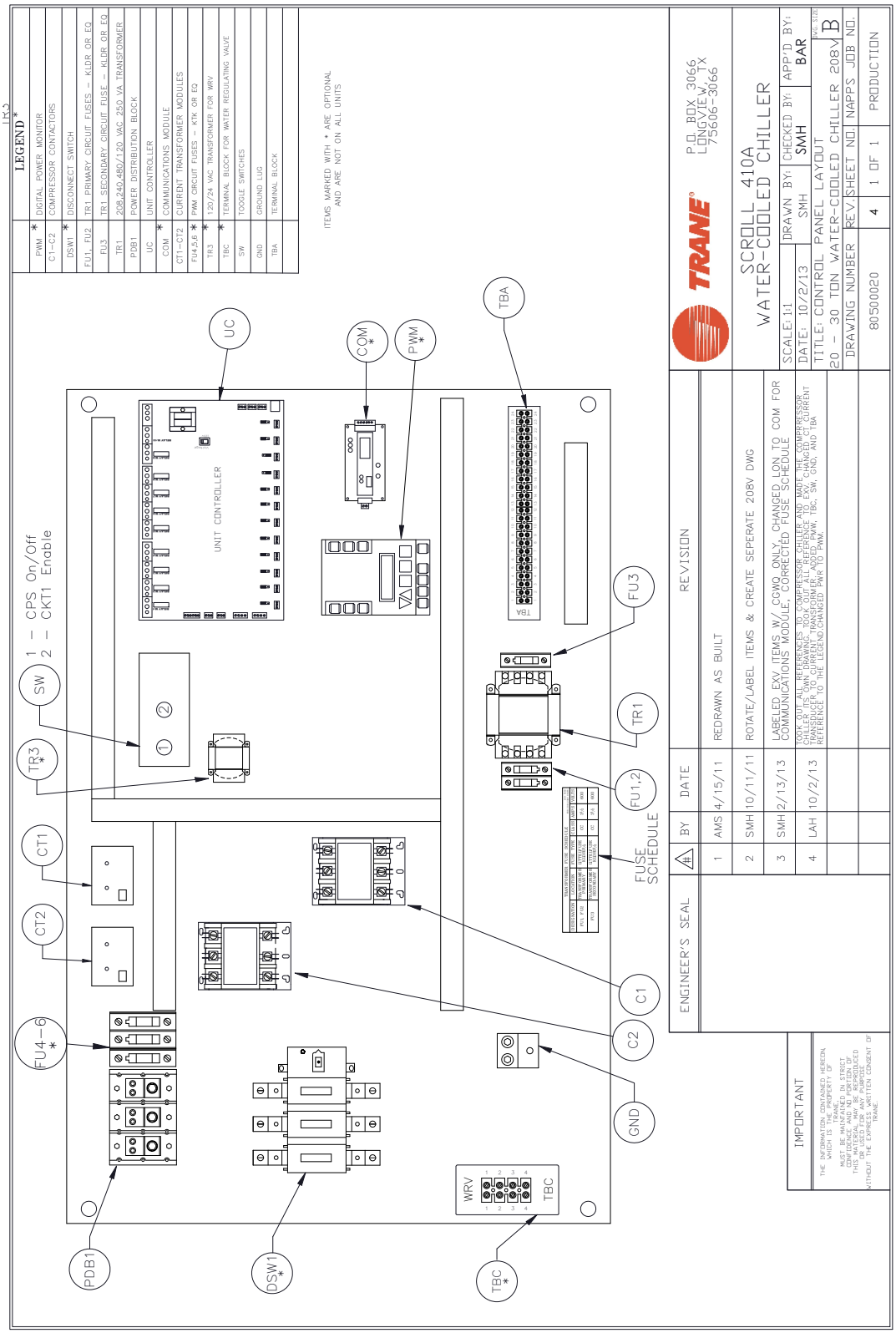


Figure 10. Control panel layout for 20–30 ton, 460V, R-410A CGWQ water-cooled scroll chillers

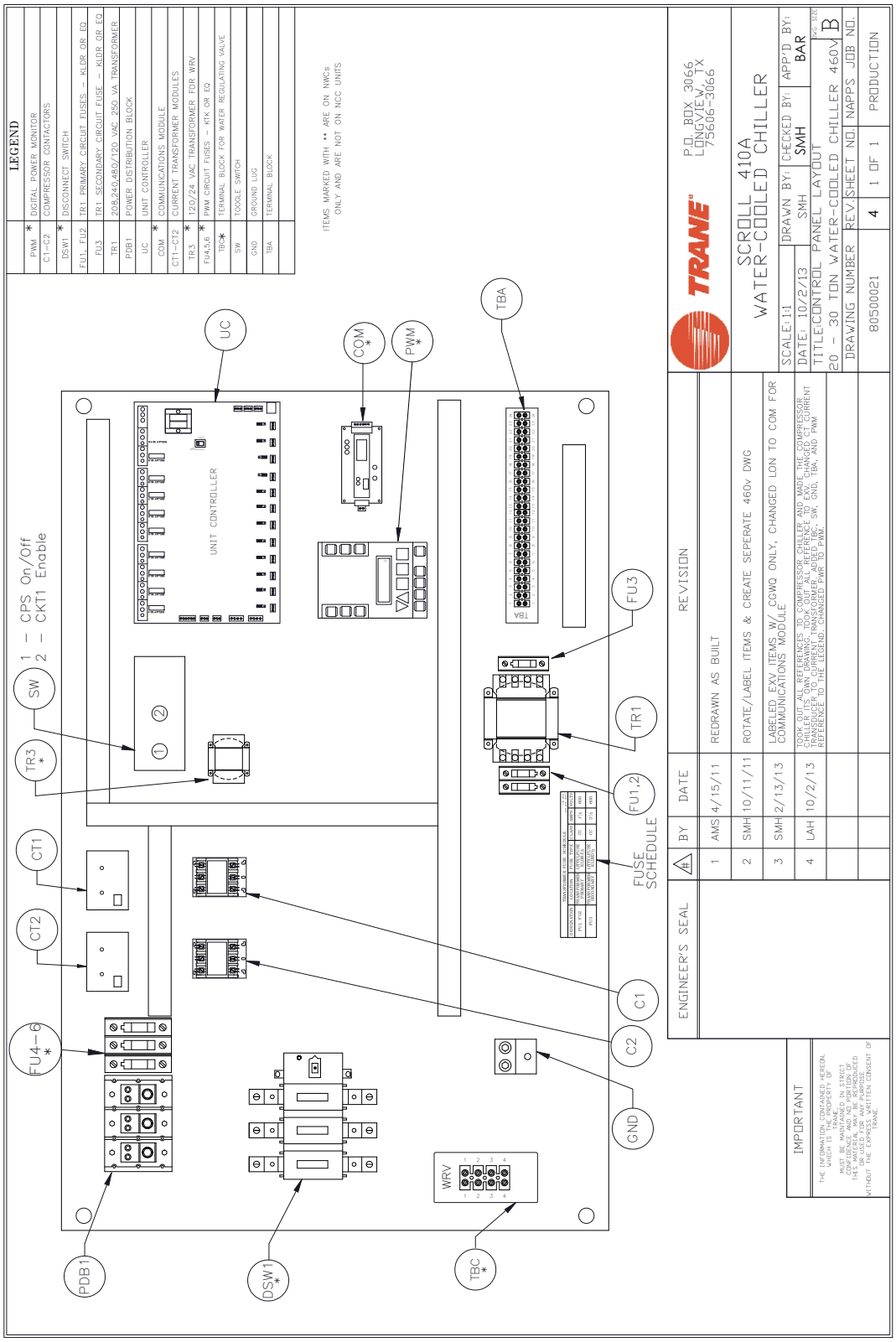


Figure 11. Control panel layout for 20–30 ton, 575V, R-410A CGWQ water-cooled scroll chillers

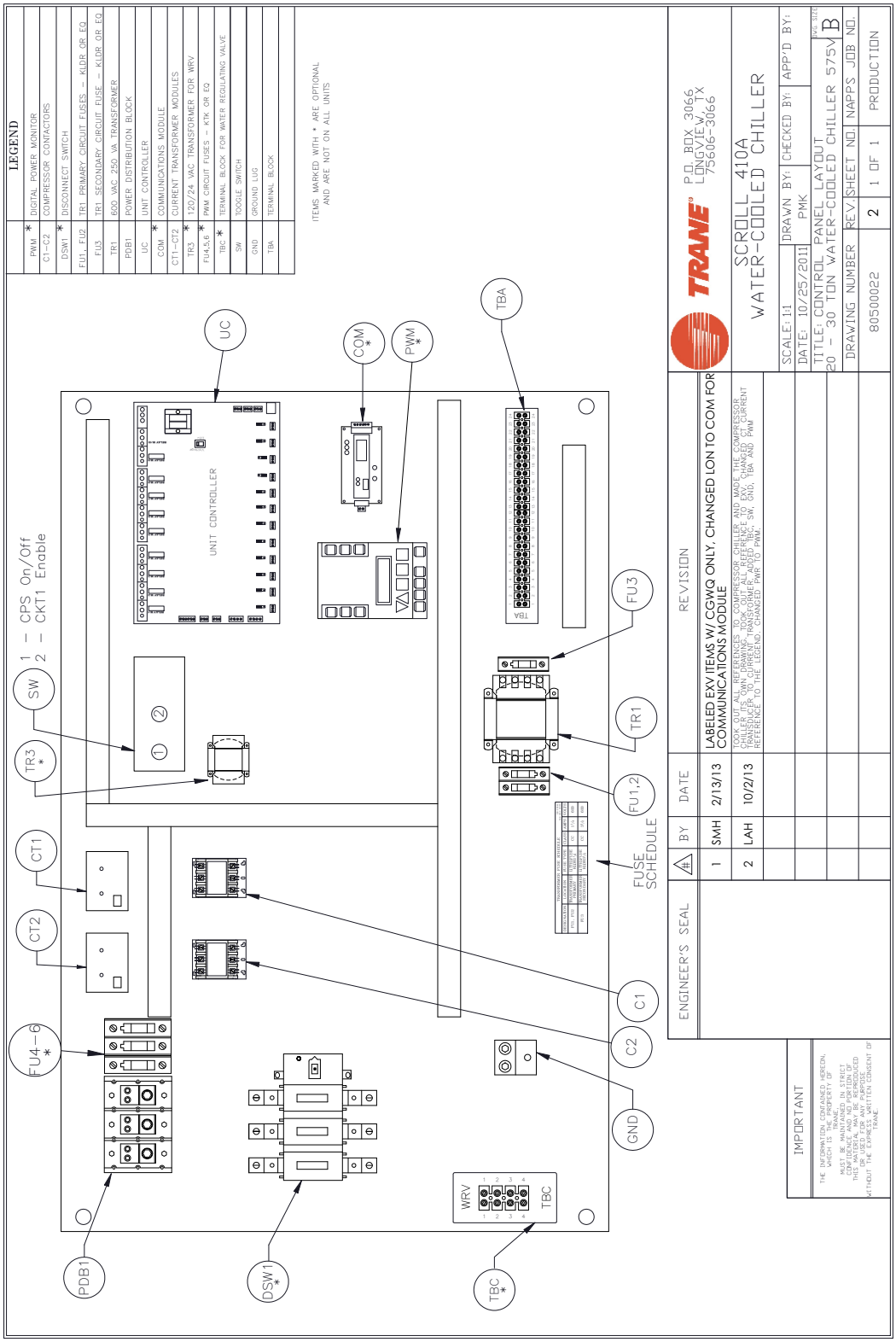


Figure 12. Control panel layout for 40–70 ton, 208V, R-410A CGWQ water-cooled scroll chillers

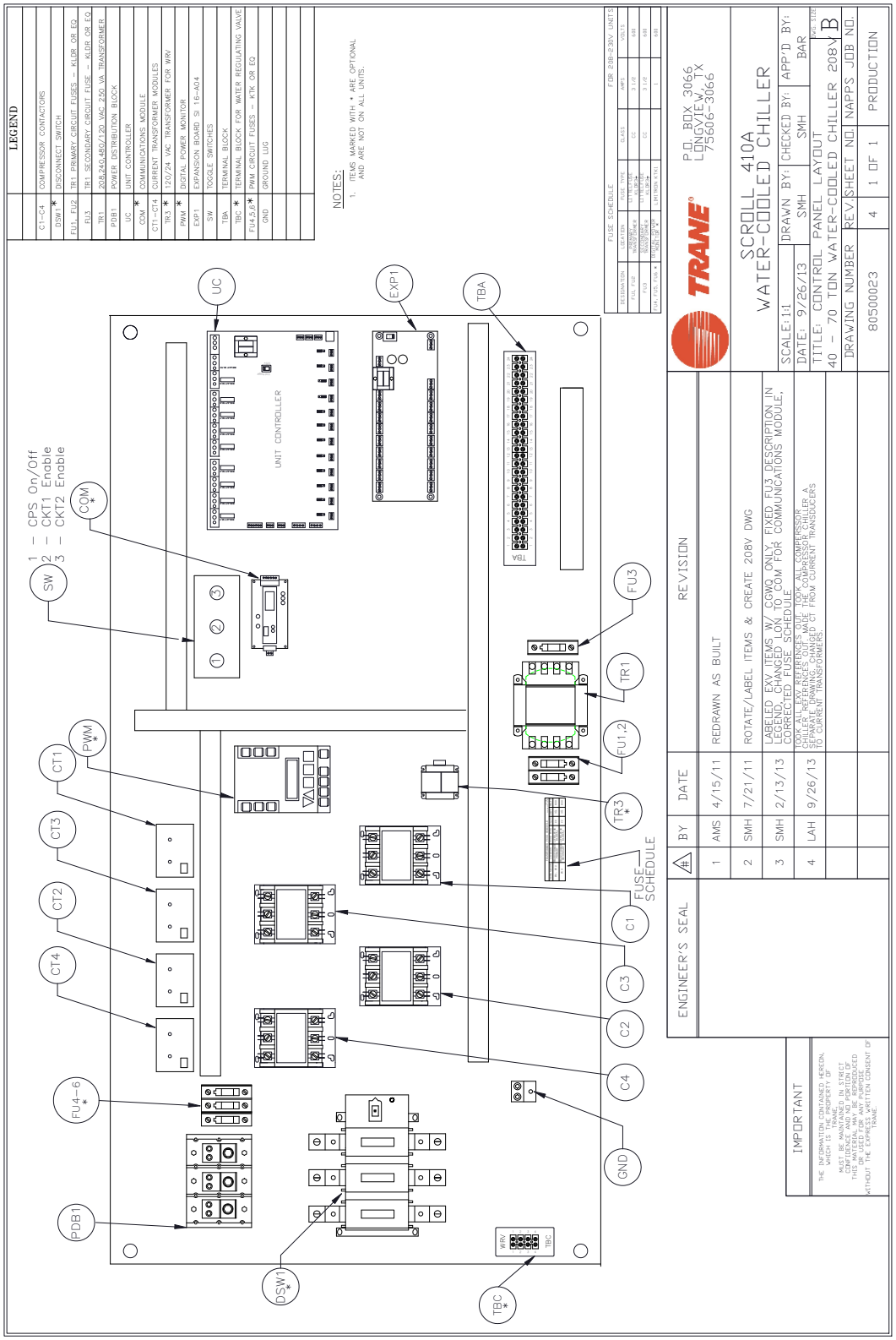


Figure 13. Control panel layout for 40–70 ton, 460V, R-410A CGWQ water-cooled scroll chillers

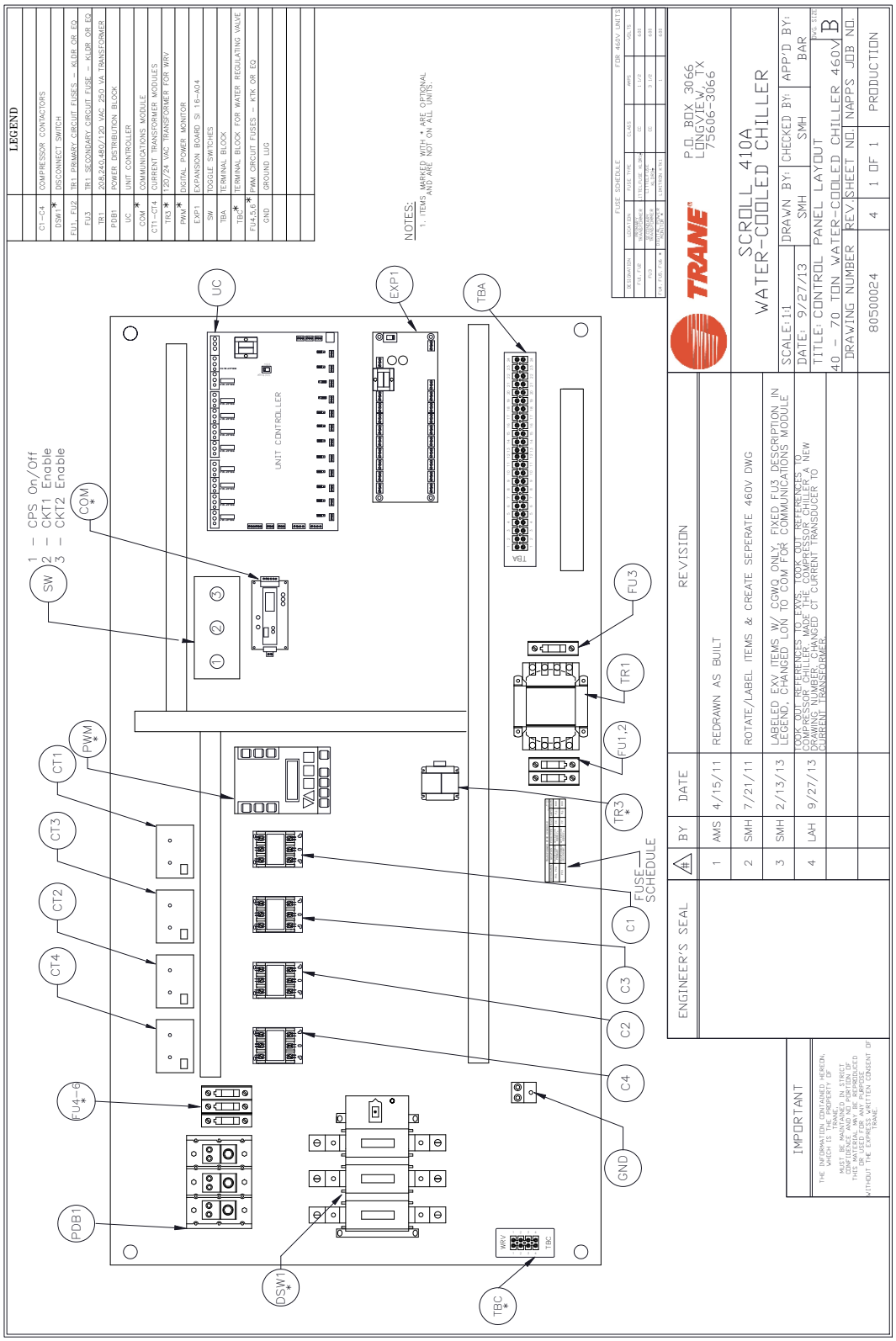
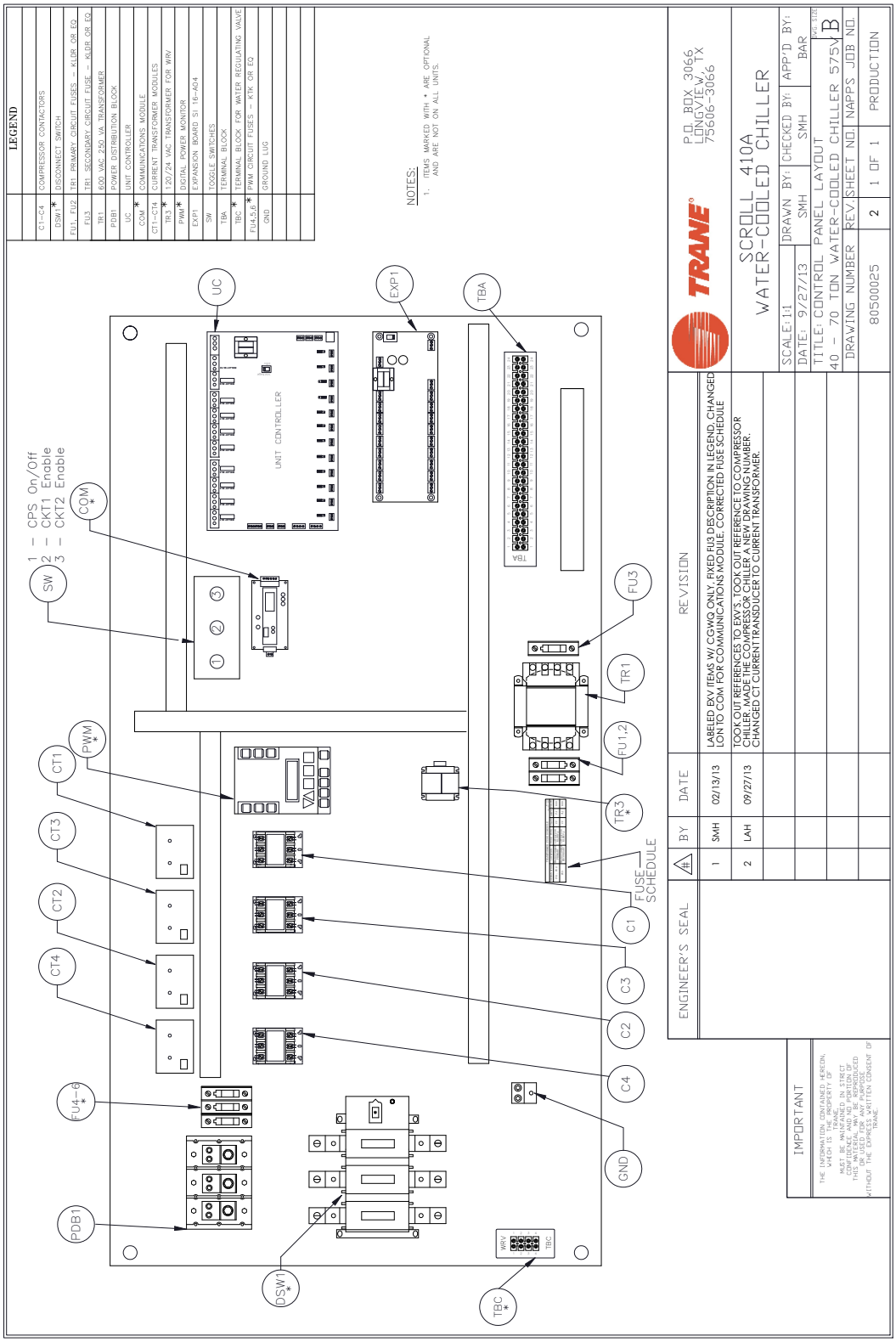


Figure 14. Control panel layout for 40–70 ton, 575V, R-410A CGWQ water-cooled scroll chillers



CCAQ Water-Cooled Chillers

Refer to name plate on control box door (inside) for electrical data and wiring diagram.

Figure 15. Power/control wiring schematic for 20–30 ton, R-410A CCAQ compressor chillers

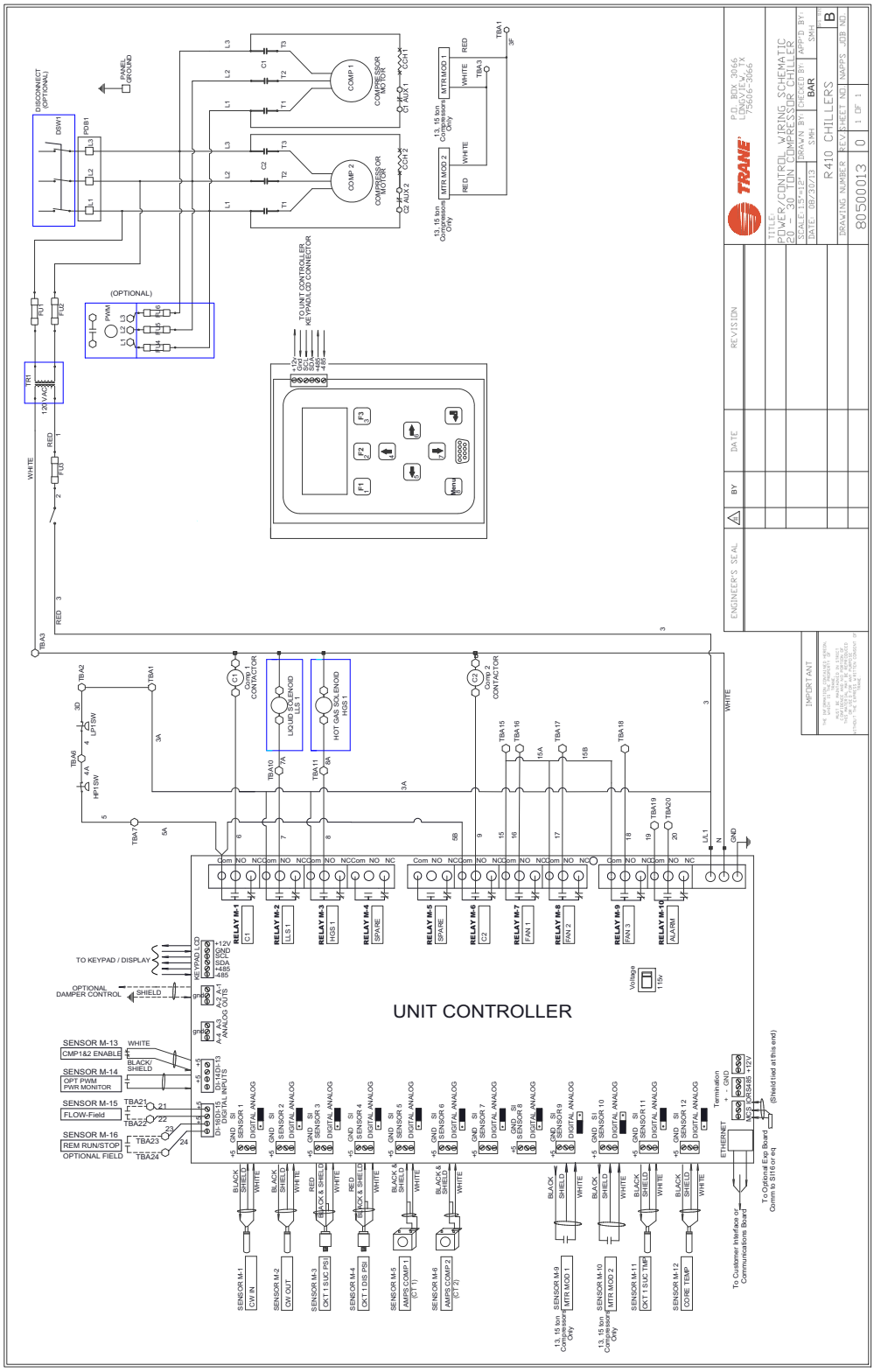


Figure 16. Power/control wiring schematic for 40–70 ton, R-410A CCAQ compressor chillers

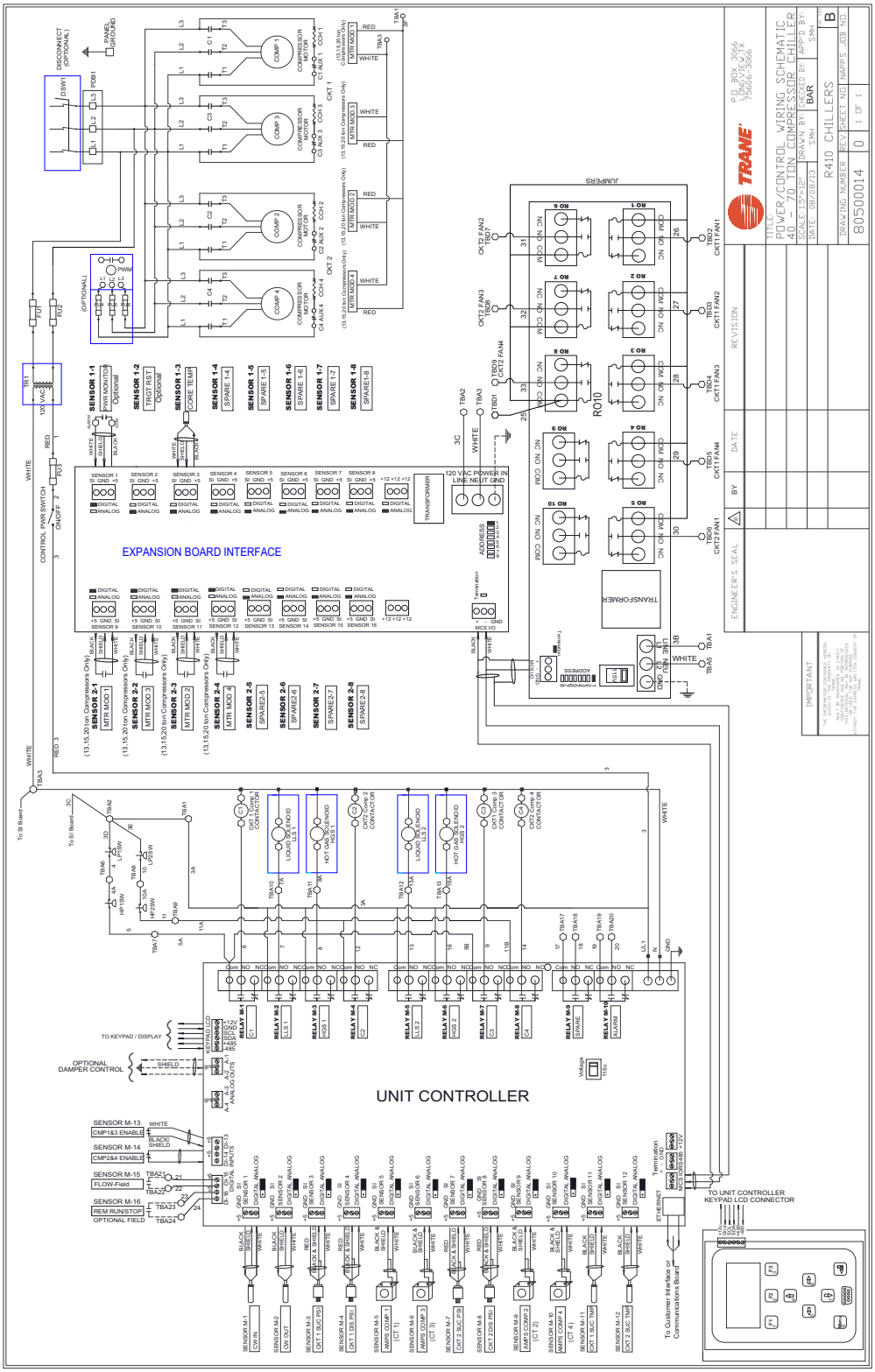


Figure 17. Power schematic, 20–60 ton, line voltage 200-230-460-575V/60Hz/3Ph CA air-cooled CAUJ condenser

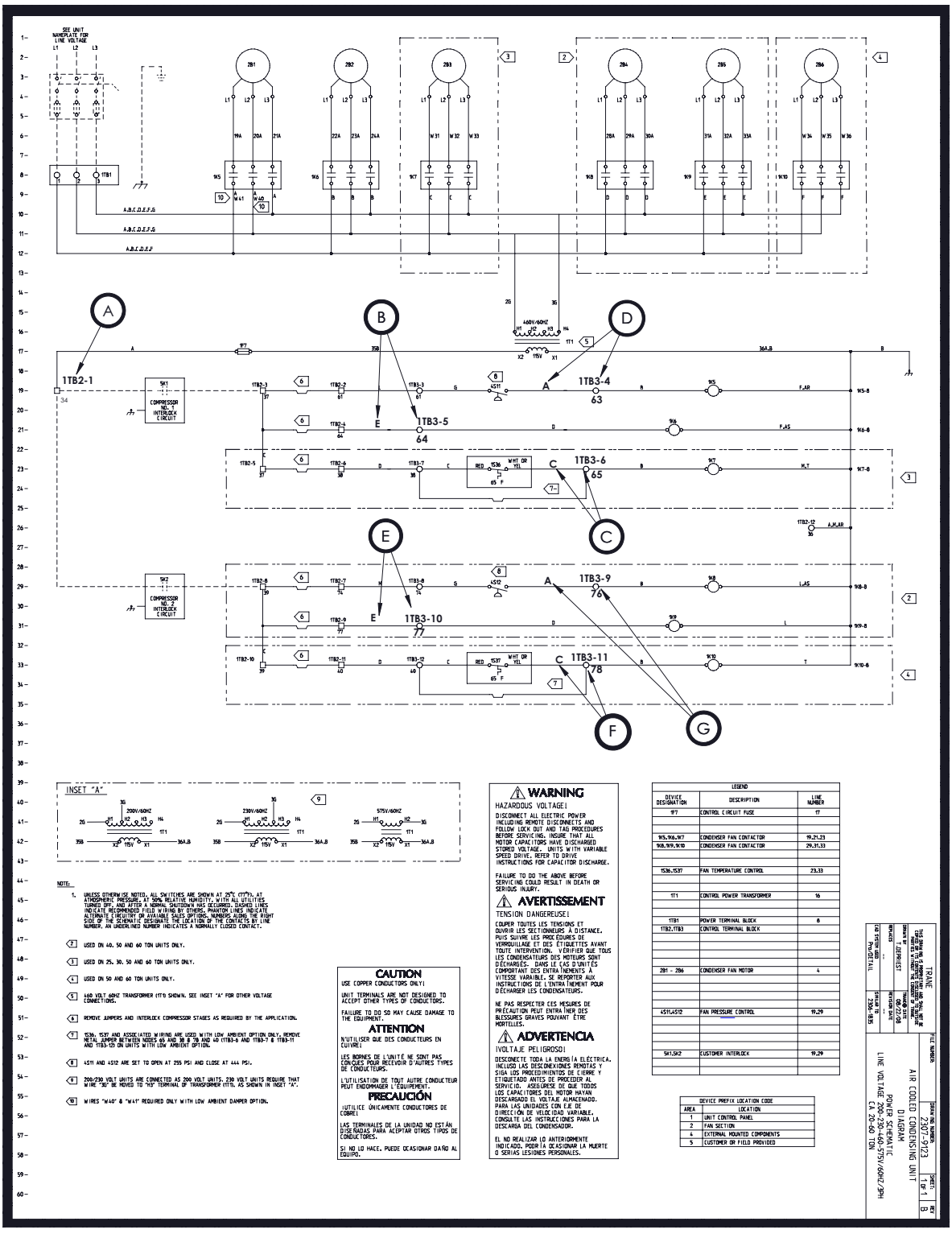


Figure 18. CAUJ condenser control circuit modification: fan cycling control by CCAQ compressor chillers

Trane CAUJ Condenser Control Circuit Modification
Fan Cycling Control by Trane CCAQ Compressor Chiller

FOR CONTROL OF 2 FAN CONDENSER:

Step	Reference Circle	Instructions	COMPLETE Initial/Date
1	A	Connect 1TB2-1 to TBA 15 at Trane Chiller.	
2	B	Remove wire 64E. Connect 1TB3-5 to TBA 16 at Trane Chiller. This is the first fan on and last fan off.	
3	D	Remove wire 63A. Connect 1TB3-4 to TBA 17 at Trane Chiller. This is the second fan on and first fan off. The installed pressure switch will not be used.	

FOR CONTROL OF 3 FAN CONDENSER:

Step	Reference Circle	Instructions	COMPLETE Initial/Date
1	A	Connect 1TB2-1 to TBA 15 at Trane Chiller.	
2	B	Remove wire 64E. Connect 1TB3-5 to TBA 16 at Trane Chiller. This is the first fan on and last fan off.	
3	C	Remove wire 65C and/or the jumper installed. Connect 1TB3-6 to TBA 17 at Trane Chiller. Ambient t-stat will not be used. This is the second fan on and second fan off.	
4	D	Remove wire 63A. Connect 1TB3-4 to TBA 18 at Trane Chiller. This is the last fan on and first fan off. The installed pressure switch will not be used.	

FOR CONTROL OF 4 FAN CONDENSER:

Step	Reference Circle	Instructions	COMPLETE Initial/Date
1	A	Connect 1TB2-1 to TBD 1 at Trane Chiller.	
2	B	Remove wire 64E. Connect 1TB3-5 to TBD 2 at Trane Chiller. This is the first fan on and last fan off.	
3	D	Remove wire 63A. Connect 1TB3-4 to TBD 3 at Trane Chiller. This is the last fan on and first fan off. The installed pressure switch will not be used.	
4	E	Remove wire 77E. Connect 1TB3-10 to TBD 6 at Trane Chiller.This is the first fan on and last fan off.	
5	G	Remove wire 76A. Connect 1TB3-9 to TBD 7 at Trane Chiller. This is the last fan on and first fan off. The installed pressure switch will not be used.	

FOR CONTROL OF 6 FAN CONDENSER:

Step	Reference Circle	Instructions	COMPLETE Initial/Date
1	A	Connect 1TB2-1 to TBD 1 at Trane Chiller.	
2	B	Remove wire 64E. Connect 1TB3-5 to TBD 2 at Trane Chiller. This is the first fan on and last fan off.	
3	C	Remove wire 65C and/or the jumper installed. Connect 1TB3-6 to TBD 3 at Trane Chiller. Ambient t-stat will not be used. This is the second fan on and second fan off.	
4	D	Remove wire 63A. Connect 1TB3-4 to TBD 4 at Trane Chiller. This is the last fan on and first fan off. The installed pressure switch will not be used.	
5	E	Remove wire 77E. Connect 1TB3-10 to TBD 6 at Trane Chiller. This is the first fan on and last fan off.	
6	F	Remove wire 78C and/or the jumper installed. Connect 1TB3-11 to TBD 7 at Trane Chiller. Ambient t-stat will not be used. This is the second fan on and second fan off.	
7	G	Remove wire 76A. Connect 1TB3-9 to TBD 8 at Trane Chiller. This is the last fan on and first fan off. The installed pressure switch will not be used.	

NOTES: All CCAQ/CAUJ applications require that the CCAQ Compressor Chiller control the condenser fan cycling.
For Fan Cycling Control - One control wire for each condenser fan plus a common must be run from the CCAQ Compressor Chiller to the CAUJ condenser.
CCAQ units are designed for operation down to a minimum of 40°F ambient.

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	LAH	09/19/13
CHECKED	SMH	09/19/13
ENG APPR.	EGN	09/19/13
MFG APPR.	BAR	09/19/13
Q.A.		

COMMENTS:

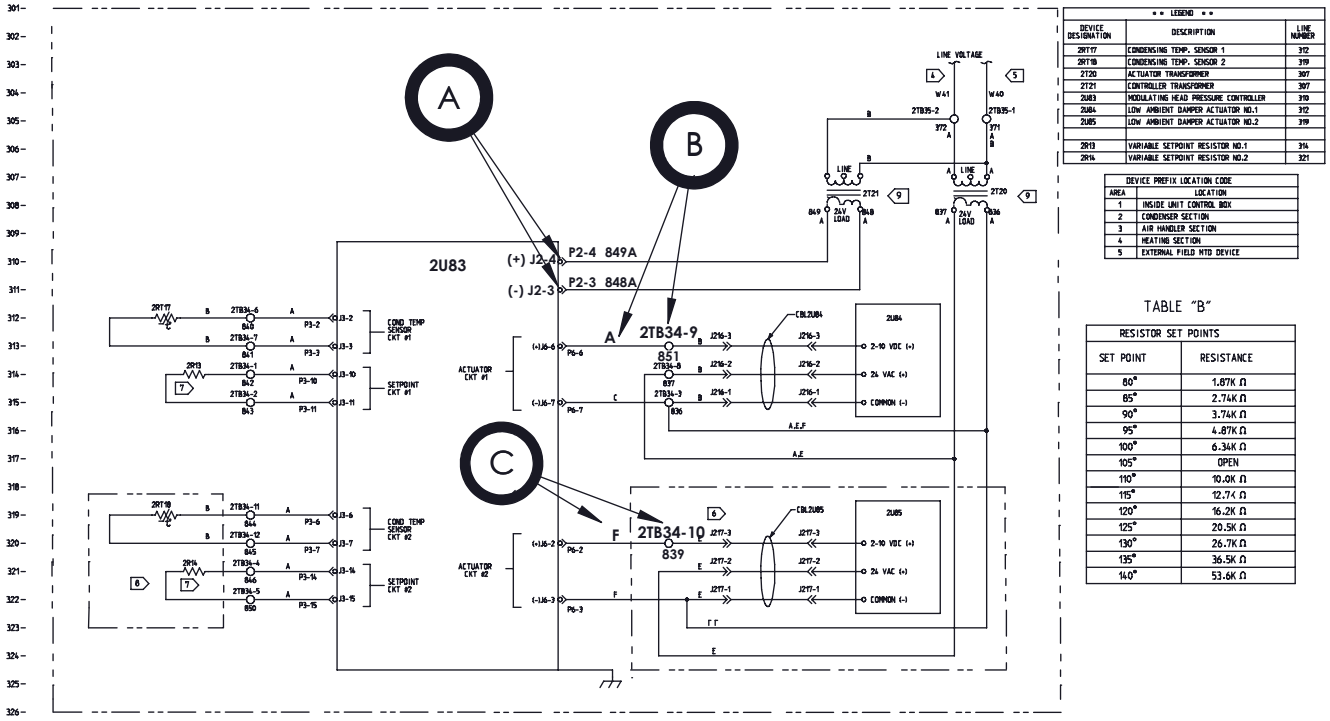
TRANE
P.O. BOX 3066
LONGVIEW, TX
75606-3066

Trane CAUJ Condenser Control Circuit Modification:
Fan Cycling Control by Trane CCAQ Compressor Chiller

SIZE	DWG. NO.	REV.
A	80500015B	
SCALE:1:1	JOB #:	SHEET 1 OF 1

Figure 19. Low ambient damper schematic wiring and connections diagrams (CCAQ)

Low Ambient Schematic Wiring Diagram



Low Ambient Connections Diagram

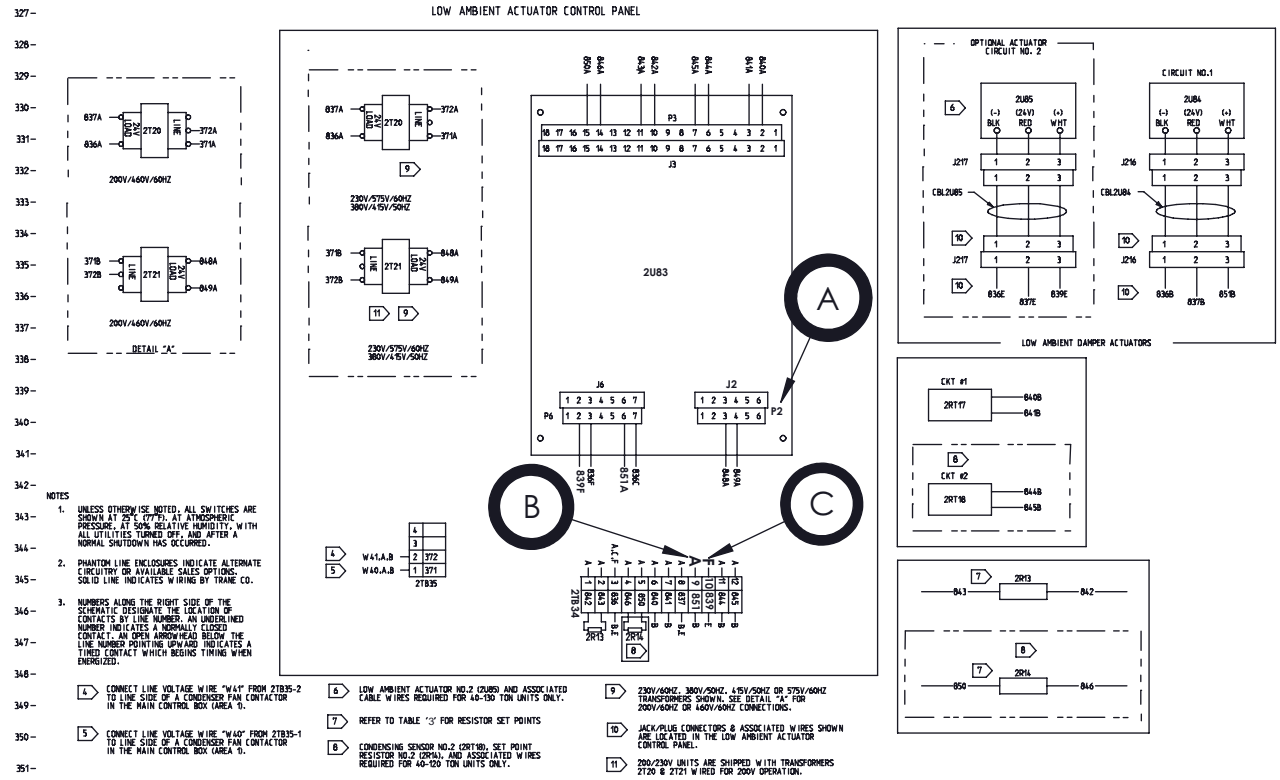


Figure 20. CAUJ condenser control circuit modification: low ambient damper control by CCAQ compressor chillers

Trane CAUJ Condenser Control Circuit Modification
Ambient Damper Control by Trane CCAQ Compressor Chiller

FOR ONE DAMPER ASSEMBLY:

Step	Reference Circle	Instructions	COMPLETE Initial/Date
1	A	Disconnect plug 2U83P2 from the existing damper control board. (Leave the remaining plugs connected to the board for grounding.)	
2	B	Disconnect and tape wire 851A from 2TB34-9. Connect 0-10VDC signal from Trane chiller main board Analog Out (A-1) to 2TB34-9.	

FOR TWO DAMPER ASSEMBLIES:

Step	Reference Circle	Instructions	COMPLETE Initial/Date
1	A	Disconnect plug 2U83P2 from the damper control box. (Leave the remaining plugs connected to the board for grounding.)	
2	B	Disconnect and tape wire 851A from 2TB34-9. Connect 0-10VDC signal from Trane chiller main board Analog Out (A-1) to 2TB34-9.	
3	C	Disconnect and tape wire 839F at 2TB34-10. Connect 0-10VDC signal from Trane chiller main board Analog Out (A-2) to 2TB34-10	

NOTES: All CCAQ/CAUJ applications require that the CCAQ Compressor Chiller control the condenser ambient dampers (when applicable).
For Ambient Control Dampers when applicable - One shielded pair for each condenser must be run from the CCAQ Compressor Chiller to the CAUJ condenser.
CCAQ units are designed for operation down to a minimum of 40°F ambient.

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
MATERIAL
FINISH
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	LAH	09/19/13
CHECKED	SMH	09/19/13
ENG APPR.	EGN	09/19/13
MFG APPR.	BAR	09/19/13
Q.A.		
COMMENTS:		

TRANE
P.O. BOX 3066
LONGVIEW, TX
75606-3066

Trane CAUJ Condenser Control Circuit Modification:
Ambient Damper Control by Trane CCAQ Compressor Chiller

SIZE	DWG. NO.	REV.
A	80500016B	
SCALE:1:1	JOB #:	SHEET 1 OF 1

Figure 21. Control panel layout for 20–30 ton, 208V, R-410A CCAQ compressor scroll chillers

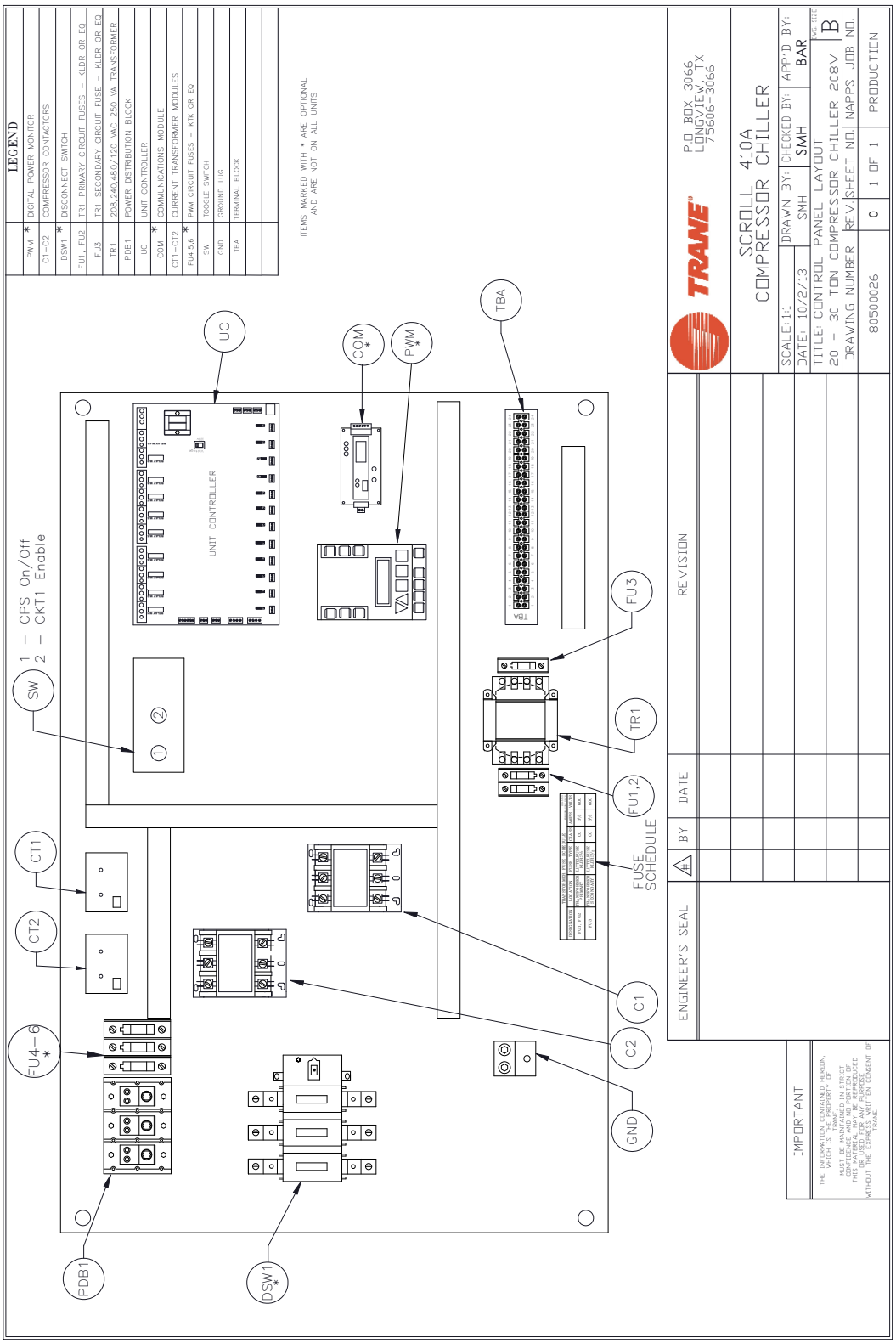


Figure 22. Control panel layout for 20–30 ton, 460V, R-410A CCAQ compressor scroll chillers

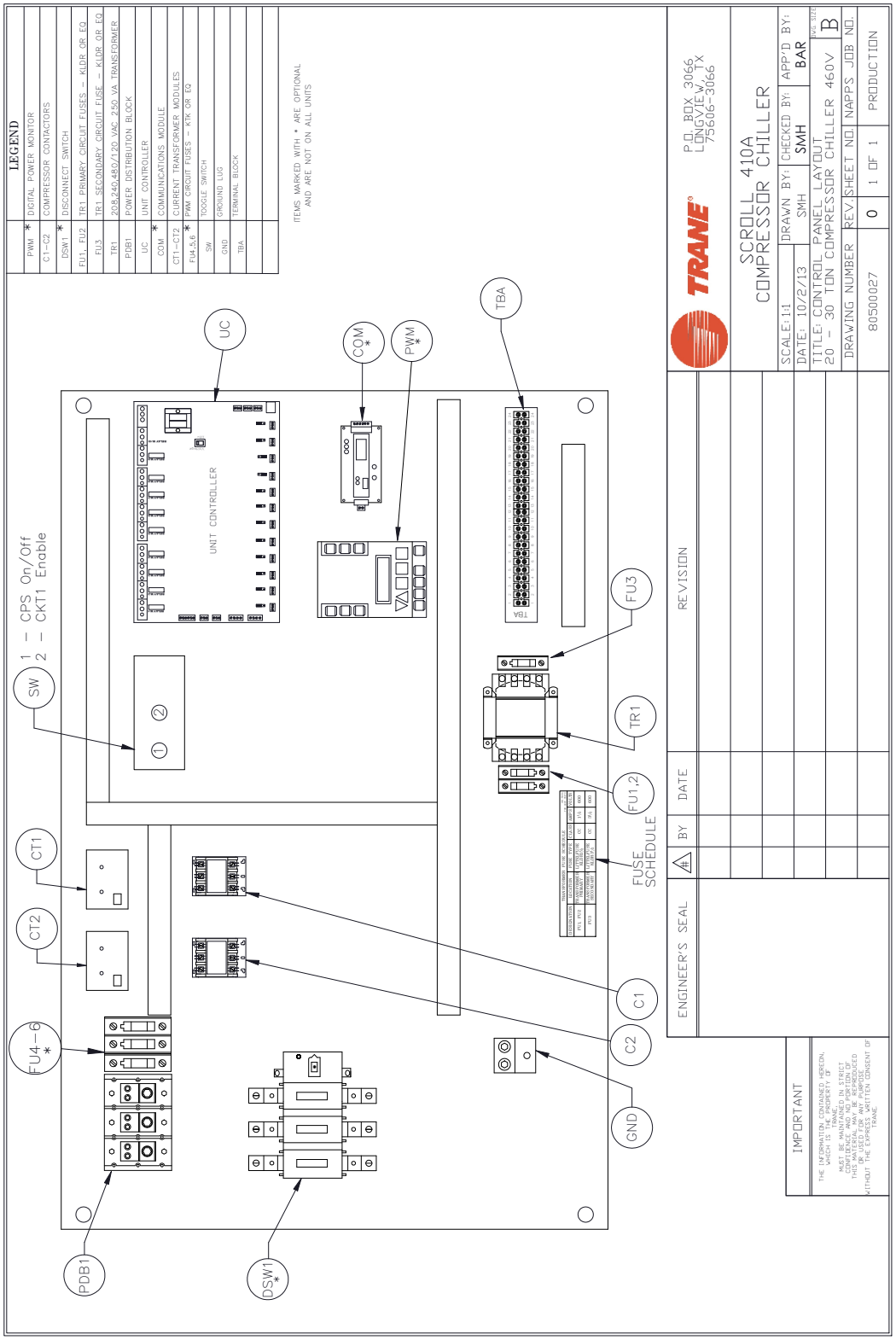


Figure 23. Control panel layout for 20–30 ton, 575V, R-410A CCAQ compressor scroll chillers

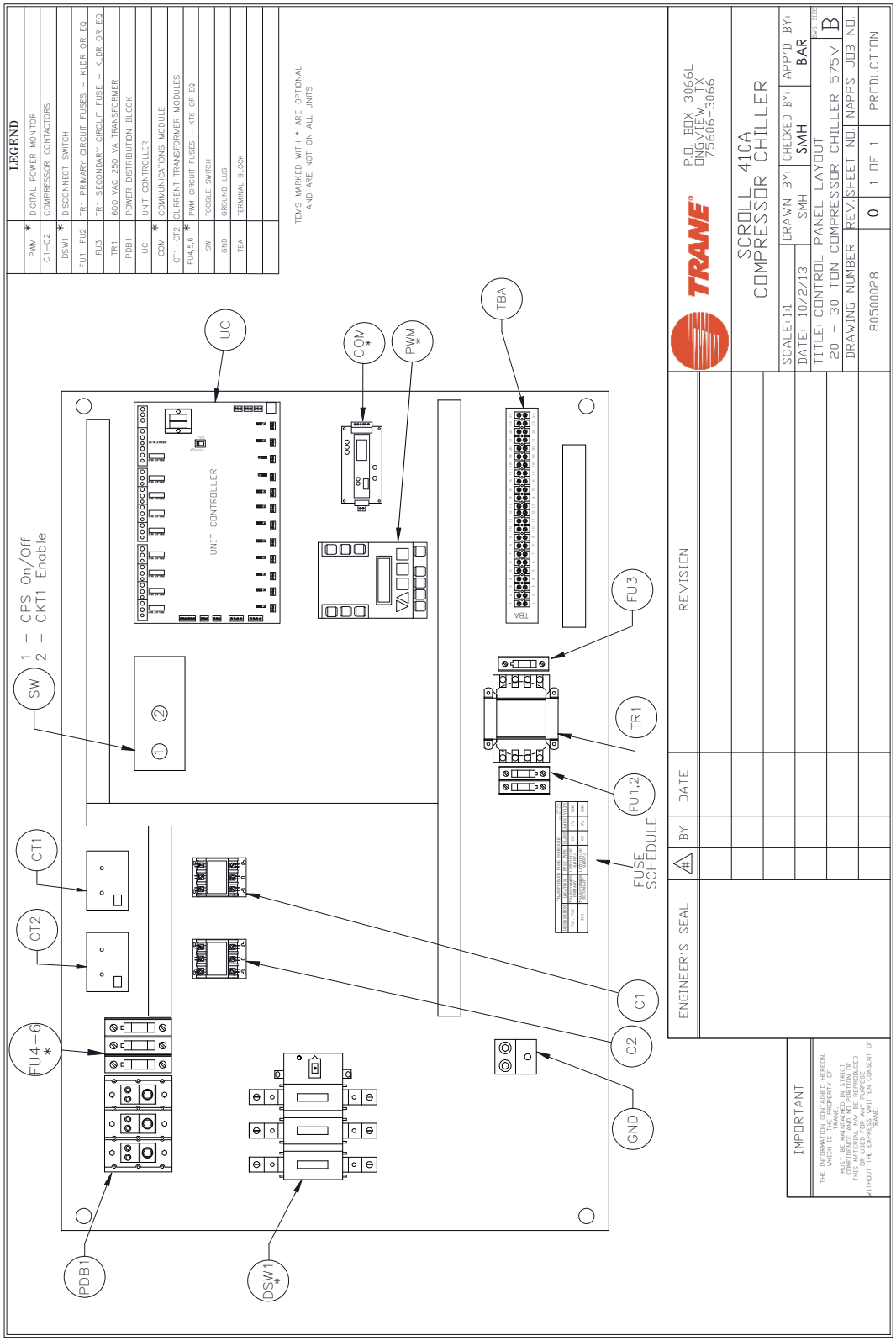


Figure 24. Control panel layout for 40–70 ton, 208V, R-410A CCAQ compressor scroll chillers

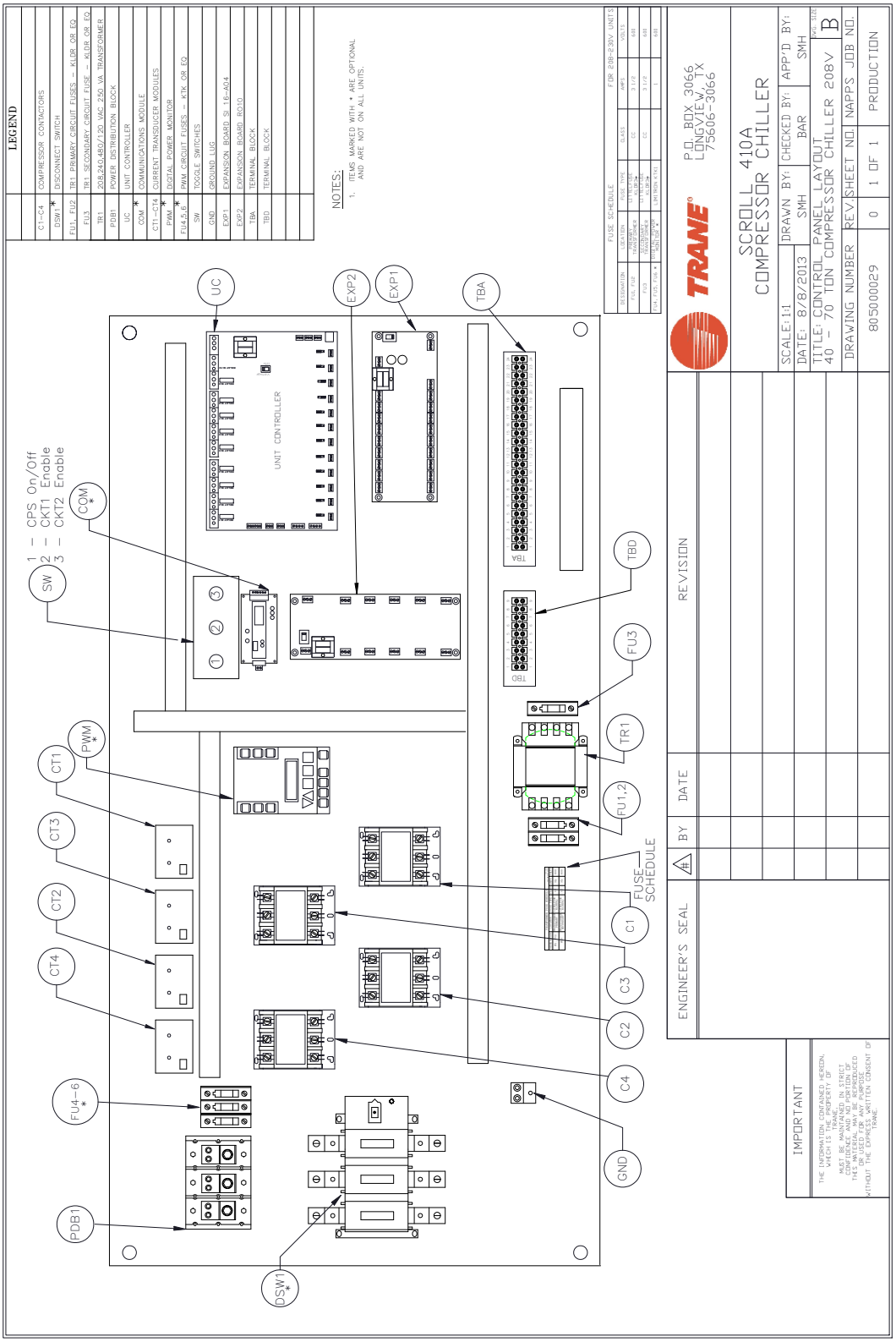


Figure 25. Control panel layout for 40–70 ton, 460V, R-410A CCAQ compressor scroll chillers

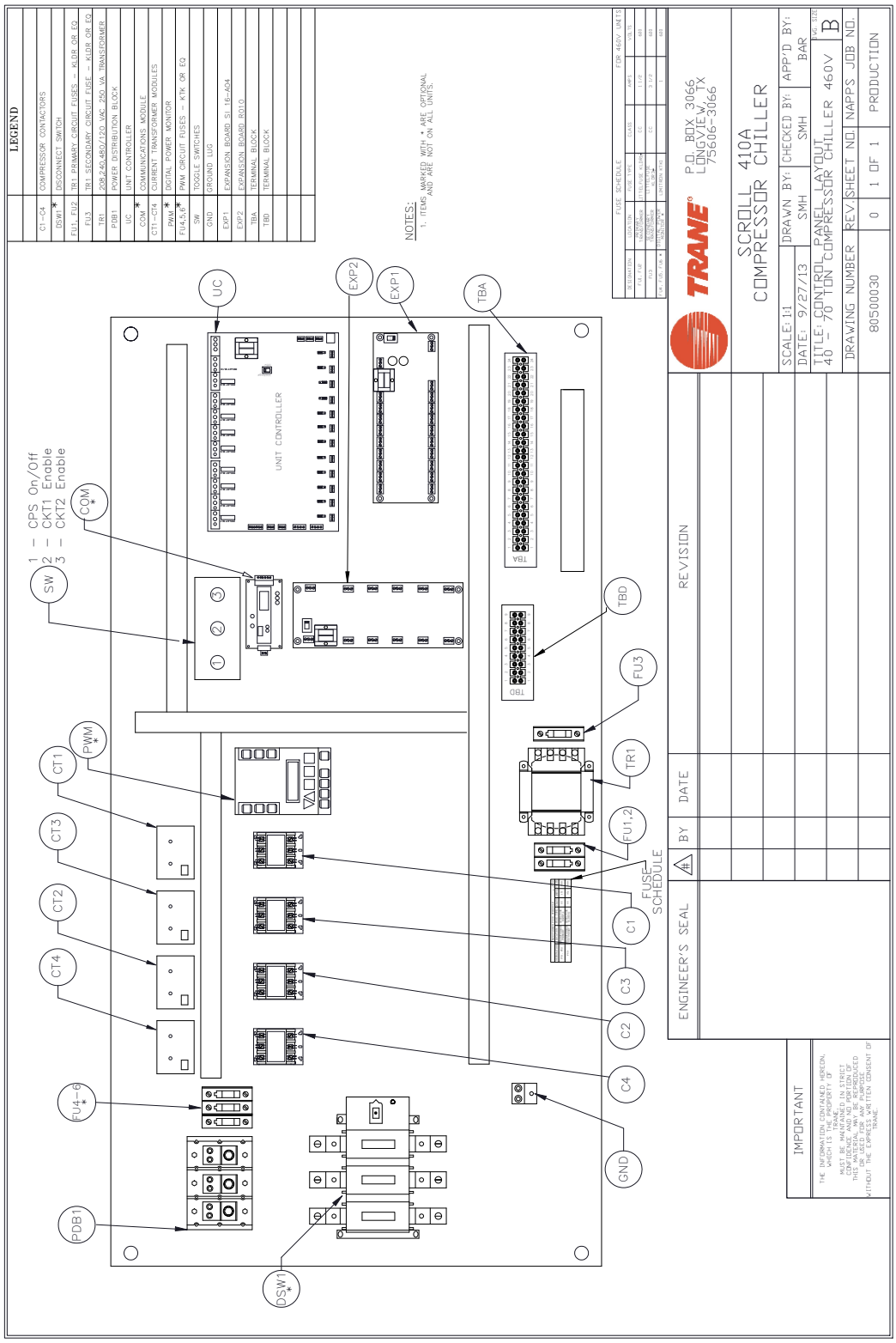
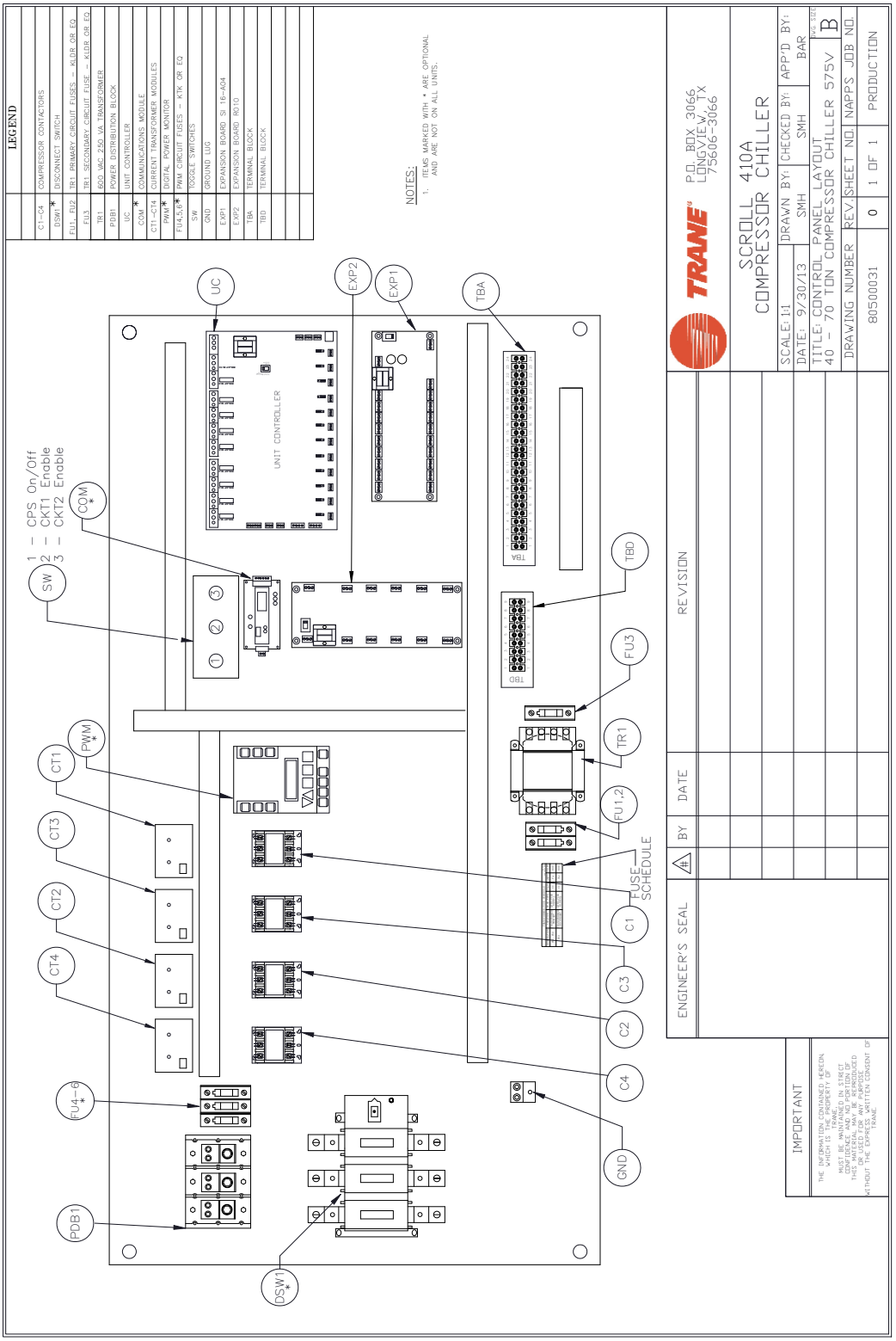


Figure 26. Control panel layout for 40–70 ton, 575V, R-410A CCAQ compressor scroll chillers



Unit Controller—Software Installation and Setup

Downloading and Installing Unit Controller (MCS-Connect) Software

Go to www.mcscontrols.com. Go to the software page and select **MCS-CONNECT**. Select **SAVE**. After downloading, open and select **RUN**. Follow prompts and software will be installed on your computer.

If your computer does not have a serial port, you will need to purchase a USB to Serial adapter. (Computer stores should have this.) Install the software for the adapter. If your computer has a serial port, you will not need an adapter.

You will need to know which Port your computer uses as the **COM PORT**. In Microsoft® Vista, go to the **CONTROL PANEL** and select **DEVICE MANAGER**. Look for **PORTS (COM & LPT)**, expand and you should see a **COM PORT** number. Windows® 7 is similar.

Start the MCS-CONNECT software. Select **SETUP>COMMUNICATIONS** and then change **LOCAL COM PORT** to match your computer. Select **SAVE** and then **OK**.

Connecting to the Chiller

Connect the supplied NULL MODEM cable between your USB adapter or serial port to the chiller. A standard serial cable will not work. Start the MCS-CONNECT software and select **LOCAL SERIAL**. You will see the site info page. The software should scan and find the chiller. (If you see a Failed to open comm port error, or it scans and does not find the chiller, your comm port settings are not correct.) Click the **1-CCAQ/CGWQ** tab. The screen shows real time data.

Set Point Changes

Click the **VIEW ONLY** button. Enter the password code **2112**. Select **OK**. Button should say **SERVICE**. Go to set points and double-click on a value. Change and select **OK**.

Viewing and Troubleshooting ALARMS

The unit controller will record and store 30-second sensor input data prior to and up to any LOCKOUT ALARM. Select the **ALARM** tab, then **INFO** next to the alarm you want to analyze. This will pop up a screen that shows operating conditions just prior to the trip. You can easily determine if the fault was caused by a sudden or gradual change. For instance, a sudden increase in discharge pressure might suggest a condenser pump or fan failure etc. (This data can also be viewed from the chiller **LCD** screen. Select **LOCKOUT ALARMS**.)

Downloading and Viewing Graphs

The unit controller continuously records and stores sensor input and relay/analog output data. This data is collected in 10-second (default) intervals. The controller stores 1008 packets of data replacing the oldest with the newest. With the time interval set at 10 seconds, you can download graph data with a time span of 168 minutes. The time interval is adjustable.

In the MCS-CONNECT software, select **GRAPH**. Data will be downloaded and then a graph setup page will appear. Select the input and output data you want to look at. Type in Y-axis parameters and select **OK**. Use the scroll bar at the bottom of the graph to view. You can go back to the setup page at any time to change selections. You may save the graph to view later. You don't have to be connected to view a saved graph file. Your saved graph will be located in a folder called **GRAPH** inside another folder called MCS on your **C:** drive.

To change the default 10-second interval, make changes and select **SAVE** and then **OK** on the setup page. The controller will now record data at this new interval.

To view a saved graph, select **LOAD A GRAPH FILE**. These files can be e-mailed to us for analysis if needed.

Updating Chiller Software and Configuration Files

Trane chillers are programmed, set up, and tested prior to shipment. Sometimes after a unit arrives at the jobsite, the customer may want to enable an option such as 0–5 Vdc target reset or chilled water pump control etc. These options require a configuration change. We will either have you download the configuration file from the chiller and e-mail it to us where we will modify it and return it to you, or we will modify a default configuration file we have here at the factory and send it to you. Modifying a configuration file you send us will save any setpoint changes that have been made on site. Otherwise, the controller will be set back to default factory settings.

To e-mail us a copy of your chiller's configuration file, in the MCS-CONNECT software, establish communication with the chiller and select **RECEIVE CFG**. Name it something and e-mail it to engineering@nappsac.com.

To load a configuration file, turn off circuit enable switches and select **TRANSMIT CFG**. Locate the new file and press **OPEN**. The file will be uploaded to the controller. The controller will reboot itself.

Routine software (HEX FILE) updates are NOT necessary. However, if we think a software update is necessary to resolve an operating issue you may be having, we will e-mail the hex file in a zipped folder. Save the zipped folder to your desktop. Right click folder and select **EXTRACT ALL**. This will create another folder by the same name on your desktop. Inside this folder you'll find the hex file. It should be about 2300 KB large.

In the MCS-CONNECT software, select **TRANSMIT SW**. Locate the *extracted* hex file and select **Transmit**. Watch the chiller LCD screen. After the file is uploaded, the Trane MCS Digital Controller will verify that it's a valid file and then erase the flash memory. Next, it will write the new hex to memory. When completed, the controller will reboot itself. This process may take 15 or 20 minutes. After the reboot is completed, close and restart the MCS-CONNECT software to reestablish communication with the chiller.

Appendix

Vendor Data Sheet

MSC-CT300 Current Transducer Data Sheet

MICRO CONTROL SYSTEMS

5877 Enterprise Parkway, Fort Myers, FL 33905
Office: 239-694-0089 Fax: 239-694-0031
www.mcscontrols.com

The MCS-CT300 Specifications & Description

Physical Characteristics

Dimensions:
- Height .....4.00"
- Width.....2.38"
- Depth .....1.56"
- Wire Hole.....1.00"

Amperage Rating .....0-300A ±2% FS
Sensor Output Voltage.....0-5vdc
Supply Voltage .....Induced

Operating Temperature.....-40°F to +158°F (-40°C to +70°C)
Storage Temperature.....-40°F to +158°F (-40°C to +70°C)

Part # MCS-CT300

Product Description

The MCS-CT300 current sensor monitors current flowing to electrical equipment. The magnitude of the current is converted to a linear (0-5vdc) output signal which can be read as a standard analog input signal. The signal is used by MCS micro controllers for the following:

1. For slide valve positioning on screw machines
2. For high amp motor overload protection
3. For verification of device on / off

The MCS-CT300 is a solid-core version, where the conductor runs through the sensor. No cutting, taping or rerouting is required. It is accurate, reliable, easy to install and requires no service.

The MCS-CT300 has an accuracy of ±2% over the range 10% to full scale in the frequency range from 50-60Hz. The sensor outputs a 0-5vdc signal. The sensor power is induced from the current being monitored.

On the printed circuit board a resistor is mounted across the CT terminals which eliminates danger from induced current. A removable three-position terminal block is provided for easy wiring.

Two-conductor shielded cable must be used. The shield must be cut at the MCS-CT300 end and tied to ground at the MCS micro controller terminal block.

Volts dc	Amps
0.08	5
0.17	10
0.33	20
0.50	30
0.67	40
0.83	50
1.00	60
1.17	70
1.33	80
1.50	90
1.67	100
1.83	110
2.00	120
2.16	130
2.33	140
2.50	150

Volts dc	Amps
2.66	160
2.83	170
3.00	180
3.16	190
3.33	200
3.50	210
3.66	220
3.83	230
4.00	240
4.16	250
4.33	260
4.50	270
4.66	280
4.83	290
5.00	300

MSC-667F Pressure Transducer Data Sheet

MICRO CONTROL SYSTEMS
5580 Enterprise Parkway, Fort Myers, FL 33905
Office: 239-694-0089 Fax: 239-694-0031
www.mcscontrols.com

The MCS-667F-T-xx Specifications & Description

Product Specifications

Pressure Range .....0 to 667 psi (Gauge)
Accuracy.....± 0.25% of span
Housing .....Stainless steel
Operating Temperature...-40ºF to +221ºF
(-40°C to +105°C)
Proof Pressure .....2 x FS
Burst Pressure.....20 x FS
Random Vibration .....40 G p-p
Input Voltage 5vdc
Output Voltage .....0.5 to 4.5vdc
Connection .....1/4" SAE female flare

Cable:
Connector .....Packard with Neoprene seal
Length.....20', 40' or 60' feet.
Type.....3-conductor, 20 awg stranded
Shield.....Foil shield with 25% overlap
Drain .....Stranded tinned copper drain
Part number description when ordering (MCS-667F-T-xx)
xx .....20' 40' or 60' wire length

Part # **MCS-667F-T-xx**

Product Description

The MCS-667F-T-xx pressure transducer is a proven performer at a low cost. Its design is ideal for demanding HVAC and refrigeration applications where long-term reliability is a requirement. Internal components are packaged in a stainless steel housing with a 1/4" SAE female flare fitting.
The following table provides a cross reference between psi and vdc at a sensor input pin (SI) of the MCS micro controller.

PSI to VDC Chart

PSI	SI (vdc)	PSI	SI (vdc)	PSI	SI (vdc)	PSI	SI (vdc)	PSI	SI (vdc)	PSI	SI (vdc)	PSI	SI (vdc)
0	0.50	100	1.10	200	1.70	300	2.30	400	2.90	500	3.50	600	4.10
10	0.56	110	1.16	210	1.76	310	2.36	410	2.96	510	3.56	610	4.16
20	0.62	120	1.22	220	1.82	320	2.42	420	3.02	520	3.62	620	4.22
30	0.68	130	1.28	230	1.88	330	2.48	430	3.08	530	3.68	630	4.28
40	0.74	140	1.34	240	1.94	340	2.54	440	3.14	540	3.74	640	4.34
50	0.80	150	1.40	250	2.00	350	2.60	450	3.20	550	3.80	650	4.40
60	0.86	160	1.46	260	2.06	360	2.66	460	3.26	560	3.86	660	4.46
70	0.92	170	1.52	270	2.12	370	2.72	470	3.32	570	3.92	667	4.50
80	0.98	180	1.58	280	2.18	380	2.78	480	3.38	580	3.98		
90	1.04	190	1.64	290	2.24	390	2.84	490	3.44	590	4.04		

The cable is available in either 20', 40' or 60' lengths, with a removable Packard connector to provide easy serviceability. The wire is sealed and crimped to the Packard connector providing a liquid tight environment and strain relief. Media compatibility: Refrigerants (freons) and ammonia.

Revised 2012-10-12

The MCS-T100 Specifications and Description

Micro Control Systems
5877 Enterprise Parkway, Fort Myers, FL 33905
Office: 239-694-0089 Fax: 239-694-0031
www.mcscontrols.com

The MCS-T100 Specifications & Description

Physical Characteristics

Standard Temperature Range ..... +32°F to +158°F (0°C to +70°C)
Standard Temperature Accuracy .... ±0.36° F (±0.2°C)
Extended Temperature Range..... -25°F to +230° F (-30°C to 110°C)
Extended Temperature Accuracy.... ±1.5°F (±0.8°C)
Resistance Range ..... 2 Meg to 286 ohms
Response Time (32 to 212°F)..... 22 sec (in liquid)
Response Time (212 to 32°F)..... 30 sec (in liquid)
Input Voltage 5vdc
Sensor Resistance..... 100,000 ohms @ 77°F (25°C)
Housing Specifications:
- Dimensions..... 0.187"OD x 1.5"L
- Material..... Stainless Steel
- Environmental rating ..... Waterproof to IP68
- Testing..... 10,000 freeze/thaw thermal cycles

Cable:
- Length ..... 20', 40' or 60'
- Wire..... 2 conductor 22 awg stranded
- Shield ..... Foil shield with 25% overlap
- Drain..... Stranded tinned copper drain

Part number description when ordering (MCS-T100-xx)
- xx..... 20', 40' or 60' wire length

Part # MCS-T100

Product Description

The MCS-T100 is an extremely fast acting temperature sensor built for demanding environments. It is ideal for high moisture locations with continuous freeze and thaw cycles. The sensor is potted with a thermally conductive adhesive to guarantee durability and response. Its high accuracy allows for interchangeability in the field.

The large resistance range allows the use of over 1000' of cable with no noticeable effect. By placing a 100,000 ohm resistor between signal and ground the sensor may be used in a three wire input mode. The table below provides a cross reference between °F, ohms and vdc at a sensor input pin (S1) of a MCS micro controller.

Product Specifications

Temp (°F)	Resist (ohms)	S1 (vdc)	Temp (°F)	Resist (ohms)	S1 (vdc)	Temp (°F)	Resist (ohms)	S1 (vdc)	Temp (°F)	Resist (ohms)	S1 (vdc)	Temp (°F)	Resist (ohms)	S1 (vdc)
21	491,039	0.846	37	302,535	1.242	53	191,021	1.718	69	123,406	2.238	85	81,454	2.756
22	476,042	0.868	38	293,758	1.270	54	185,753	1.750	70	120,169	2.271	86	79,420	2.787
23	461,550	0.890	39	285,263	1.298	55	180,647	1.782	71	117,027	2.304	87	77,444	2.818
24	447,544	0.913	40	277,040	1.326	56	175,696	1.814	72	113,977	2.337	88	75,522	2.849
25	434,007	0.936	41	269,080	1.355	57	170,897	1.846	73	111,015	2.369	89	73,654	2.879
26	420,922	0.960	42	261,373	1.384	58	166,243	1.878	74	108,139	2.402	90	71,838	2.910
27	408,271	0.984	43	253,910	1.413	59	161,730	1.910	75	105,347	2.435	91	70,072	2.940
28	396,041	1.008	44	246,684	1.442	60	157,353	1.943	76	102,634	2.467	92	68,355	2.970
29	384,214	1.033	45	239,686	1.472	61	153,109	1.975	77	100,000	2.500	93	66,685	3.000
30	372,778	1.058	46	232,908	1.502	62	148,991	2.008	78	97,441	2.532	94	65,060	3.029
31	361,718	1.083	47	226,342	1.532	63	144,997	2.041	79	94,955	2.565	95	63,480	3.058
32	351,020	1.109	48	219,982	1.563	64	141,123	2.074	80	92,541	2.597	96	61,943	3.088
33	340,672	1.135	49	213,820	1.593	65	137,363	2.106	81	90,194	2.629	97	60,448	3.116
34	330,661	1.161	50	207,850	1.624	66	133,715	2.139	82	87,915	2.661	98	58,993	3.145
35	320,976	1.188	51	202,063	1.655	67	130,175	2.172	83	85,699	2.693	99	57,577	3.173
36	311,604	1.215	52	196,456	1.687	68	126,740	2.205	84	83,546	2.724	100	56,200	3.201

Revised 2009-10-01

Copeland Compressors—Refrigeration Oils

Copeland 17-1248

17-1248

Application Engineering Bulletin

AE-1248-R7 **Revised January, 2000**

REFRIGERATION OILS

As a result of the changes taking place in our industry due to the CFC issue, Copeland has evaluated numerous compressor lubricants to ensure compatibility with new HFC refrigerants and HCFC interim blends offered by several chemical producers. In addition to compatibility with these new refrigerants, it is also desirable that any new lubricant be compatible with the traditional refrigerants such as R-12, R-22 or R-502. However, this has not been achieved in all cases.

The following table summarizes which oils/lubricants are approved for use in Copeland compressors with the various refrigerants:

Use this data for Trane CxxQ Copeland-equipped products.

COPELAND APPROVED LUBRICANTS

	Lubricant Type	Traditional Refrigerants R-12	Traditional Refrigerants R-22, R-502	Interims R-401A, R-401B, R-402A, R-408A, R-409A (MP-39, MP-66, HP-80, FX-10, FX-56)	HFC's R-134a, R-404A, R-507 R-407C, R-410A
POE's	Copeland Ultra 22CC		A	A	P
	Copeland 3MA		A	A	P (1,3)
	Mobil EAL ARCTIC 22CC	NOT ACCEPTABLE	A	A	P
	ICI (Virginia KMP) Emkarate RL 32CF		A	A	P
	Thermal Zone 22CC		A	A	P
MINERAL OILS	Witco Suniso 3GS	P	P	PM	NOT ACCEPTABLE
	Texaco Capella WF32	P	P	PM	
	Calumet RO15	P	P	PM	
	Witco (2,3) LP-200	P	P		
	Penreco (2,3) Sontex 200-LT Shrltene	P	P		
AB	Copeland Ultra 200	A	A	PM	NOT ACCEPTABLE
	Shreve Zerol 200 TD	A	A	PM	
	Soltex AB200A	A	A	PM	
	Thermal Zone 200	A	A	PM	
AB MO MIX	Shell 22-12	A	A	P	NOT ACCEPTABLE
	Witco R-195-0	A	A	P	

Legend:
P = Preferred Lubricant Choice
A= Acceptable Alternative
M= Mixture of Mineral Oil and Alkyl Benzene (AB) with minimum 50% AB

(1) ZP Scroll A/C applications
(2) BR, QR and Scroll A/C applications
(3) Not available in field

Copeland Compressors—Refrigeration Oils (continued)

Copeland 17-1248

Napthenic Mineral Oils

The BR, QR, and Scroll compressors used in HCFC R-22 applications use Witco LP-200 or Sontex 200-LT, both "white oils". Since these oils are not available through normal refrigeration wholesalers, for field "top-off" the use of any approved mineral oil (MO) or alkyl benzene (AB) is permissible.

Suniso 3GS, Capella WF32 and Calumet RO15 (pale yellow oils) are available through refrigeration wholesalers. These oils are compatible if mixed and can be used on both high and low temperature systems.

Polyol Ester Lubricants

Copeland has tested and approved the following polyol ester lubricants for use in our compressors:

Copeland Ultra 22CC

Mobil EAL Arctic 22CC

ICI Emkarate RL 32CF

Thermal Zone 22CC

These lubricants have been specifically formulated to meet our stringent demands and have been found to be equivalent in performance. These POE's **must** be used if HFC refrigerants are used in the system. They are also acceptable for use with any of the traditional refrigerants or interim blends and are compatible with mineral oils. They can therefore be mixed with mineral oils when used in systems with CFC or HCFC refrigerants. These lubricants are compatible with one another and can be mixed.

The ZP scroll compressors used in HFC R-410A applications use a POE oil not available through wholesalers. Any of the POE oils listed above may be used to replace up to 50% of the original oil if necessary.

One caution the users of POE's must be aware of is the hygroscopic nature of these lubricants. Care must be taken to avoid moisture absorption during handling.

Alkyl Benzene's

Copeland Ultra 200, Zerol 200TD, Soltex AB 200A and Thermal Zone 200 are alkyl benzene (AB) lubricants. Copeland recommends these lubricants for use as mixtures with mineral oil (MO) when using the Interim Blends such as R-401A, R-401B, R-402A, R-408A, and R-409A (MP-39, MP-66, HP80, FX-10 and FX-56). A minimum of 50% AB is required with these mixtures to assure proper oil return to the compressor.

Shell 22-12 and Witco R-195-0 are mixtures of AB/MO. If these lubricants are used in a retrofit situation, virtually all of the existing MO must be drained prior to re-filling with these products to assure a minimum 50% AB content.

Additional Literature

Additional information regarding HFC's and retrofits can be obtained from the following Copeland literature:

AE Bulletin 4-1295	HFC 134a Refrigerant Guidelines
Form 93-11	Copeland Accepted Refrigerants/Lubricants
Form 93-02	R-12 to R-401A Refrigerant Changeover Guidelines
Form 93-03	R-12 to R-401B Refrigerant Changeover Guidelines
Form 93-04	R-12 to R-134a Refrigerant Changeover Guidelines
Form 93-05	R-502 to R-402A or R-408A Refrigerant Changeover Guidelines
Form 94-15	R-502 to R-404A or R-507 Refrigerant Changeover Guidelines
Form 95-14	R-22 to R-407C Refrigerant Changeover Guidelines

Copeland Corporation
Sidney, OH 45365-0669

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Warranty

I. Limited Product Warranty & Service Policy

Napps Technology, Inc. (NAPPS) warrants for a period of twelve (12) months from date of original shipment that all products, manufactured by NAPPS, with the exception of packaged refrigeration products, are free from defects of material and workmanship when used within the service, range, and purpose for which they were manufactured. Packaged refrigeration products shall be so warranted for a period of twelve (12) months from date of start-up or eighteen (18) months from date of original shipment, whichever may first occur. Service Parts shall be so warranted for a period of ninety (90) days from date of installation, or twelve (12) months from date of original shipment, whichever may first occur.

In case material is rejected on inspection by the buyer as defective, NAPPS shall be notified in writing within ten (10) days from receipt of said material. NAPPS will then have the option of re-inspection at the buyer's plant or its own plant before allowing or rejecting the buyer's claim. Expenses incurred in connection with claims for which NAPPS is not liable may be charged back to the buyer. No claim for correction will be allowed for work done in the field except with the written consent of NAPPS. Defects that do not impair service shall not be cause for rejection. NAPPS assumes no liability in any event for consequential damages. No claim will be allowed for material damaged by the buyer or in transit. Defective equipment or parts shall be returned to NAPPS freight prepaid.

NAPPS will, at its option, repair, replace or refund the purchase price of products found by NAPPS to be defective in material or workmanship provided that written notice of such defect requesting instruction for repair, replacement or refund is received by NAPPS within ten (10) days of determination of said defect, but not more than one (1) year after the date of shipment, and provided that any instructions given thereafter by NAPPS are complied with.

Any products covered by this order found to NAPPS' satisfaction to be defective upon examination at NAPPS' factory will, at NAPPS' option, be repaired or replaced and returned to Buyer via lowest cost common carrier, or NAPPS may, at its option, grant Buyer a credit for the purchase price of the defective article.

Without limitation of the foregoing, this warranty shall not apply to (i) deterioration by corrosion or erosion of material or any cause or failure other than defect of material or workmanship; (ii) the performance of any system of which NAPPS' products are a component part; or (iii) any of NAPPS' products or parts thereof which have been subjected to alteration or repair by anyone other than NAPPS or someone authorized by NAPPS, or subjected to misuse, neglect, free chemicals in system, corrosive atmosphere, abuse or improper use or misapplication such as breakage by negligence, accident, vandalism, the elements, shock, vibration or exposure to any other service, range or environment of greater severity than that for which the products were designed, or if operation is contrary to NAPPS' or manufacturer's recommendation, or if the serial number has been altered, defaced or removed.

Hermetic motor/compressors furnished by NAPPS are subject to the standard warranty terms set forth above, except that the hermetic motor/compressor replacements or exchanges shall be made through the nearest authorized wholesaler of the hermetic motor/compressor manufacturer (not NAPPS' factory) and no freight shall be allowed for transportation of the hermetic motor/compressor to and from the wholesaler. For TRANE hermetic motor/compressors, the nearest wholesaler referred to herein shall be the nearest TRANE PARTS CENTER. The replacement hermetic motor/compressor shall be identical to the model of the hermetic motor/compressor being replaced. Additional charges, which may be incurred through the substitution of other than identical replacements, are not covered by this warranty. Evaporator failure due to fluid freezing that is the result of low fluid flow or inadequate fluid freeze protection, for applications with leaving fluid temperatures below 40°F, is not covered by this warranty.

The Warranty provided above is the only Warranty made by NAPPS with respect to its products or any parts therefore and is made expressly in lieu of any other Warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied Warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed that this Warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. NAPPS shall not incur any other, obligations or liabilities or be liable to buyer or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and NAPPS does not authorize any person to assume for NAPPS any other liability in connection with the products or parts therefore. NAPPS shall not be responsible for the loss or replacement of or the addition of compressor oil, or refrigerant.This Warranty cannot be extended, altered or varied except by a written instrument signed by NAPPS and buyer.

II. Limitation Of Liability

NAPPS shall not be liable, in contract or in tort, for any special, indirect, incidental or consequential damages, such as, but not limited to, loss of profits, or injury or damage caused to property, products, or persons by reason of the installation, modification, use, repair, maintenance or mechanical failure of any NAPPS product.

Trane optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, Trane offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts. For more information, visit www.Trane.com.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

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We are committed to using environmentally conscious print practices that reduce waste.