TRANE

Installation CVHE-IN-8

Library	Service Literature
Product Section	Refrigeration
Product	Centrifugal Liq. Chiller, Water-Cooled
Model	60 HZ CVHE, CVHF(Cooling-Only & Heat Recovery)
Literature Type	Installation
Sequence	8
Date	September 1993
File No.	SV-RF-CTV-CVHE-IN-8-9/93
Supersedes	

Water-Cooled, Hermetic CenTraVac®

50 and 60 HZ Models CVHE and CVHF

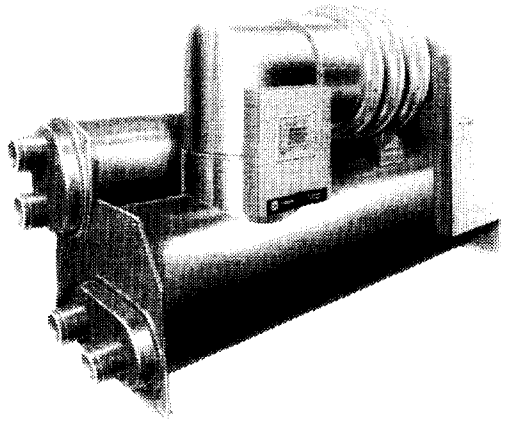
Cooling-Only and Heat-Recovery, Direct-Drive CenTraVacs with UCP2 Control Panels

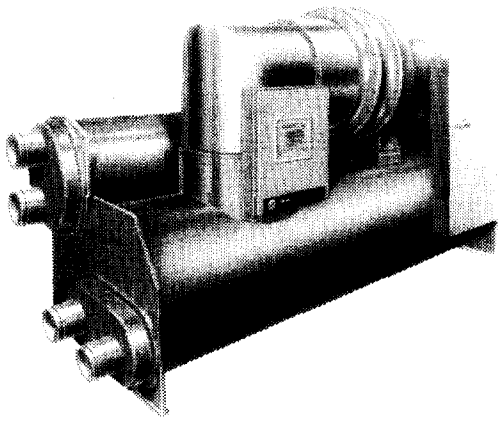
CVHE 230 thru CVHE-890, 1120, 1250

"1A through 1W" Design Sequences

CVHF 650, 770, 910 1060, 1280

"E0" Design Sequence





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Since the Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified, experienced technicians.

Table of Contents

Fold-out figures in the back of the manual are as follows:

Figure 22
800-Ton Heat Recovery Unit

Figure 27
Typical CVHE/CVHF UCP2 Field Wiring Layout for Adjustable Frequency Drive

Figure 28
Typical UCP2 Schemetic Wiring CVHE, CVHF Unit-Mounted Wye-Delta Starter

Figure 29
Typical UCP2 Schemetic Wiring CVHE, CVHF Remote-Mounted Wye-Delta Starter

Figure 29a
Typical UPC2 Schematic Wiring CVHE, CVHF Human Interface, Stepper and Circuit Module

Figure 29b
Typical UCP2 Schematic Wiring CVHE, CVHF Chiller and Options Module

Figure 29c
Typical UCP2 Schematic Wiring CVHE, CVHF Purge Module

Figure 29d
Typical UCP2 Schematic Wiring CVHE, CVHF TCI 4 and I.O Modules

Figure 29e
Typical UCP2 Field Connection Wiring CVHE, CVHF

Figure 29f
Typical UPC2 Wiring Layout CVHE, CVHF

Figure 37
Locations of UCP2 Temperature Sensors

Notice

The Trane Company urges that all HVAC servicers working on Trane equipment, or any manufacturer's products, make every effort to eliminate, if possible, or vigorously reduce the emission of CFC, HCFC, and HFC refrigerants to the atmosphere resulting from installation, operation, routine maintenance, or major service on this equipment. Always act in a responsible manner to conserve refrigerants for continued use even when acceptable alternatives are available.

Conservation and emission-reduction can be accomplished by following recommended Trane service and safety procedures published in Trane general service manuals "CTV-SB-81", "CTV-SB-82" and CFC-Guide 2. Copies of these manuals may be obtained by contacting your local Trane commercial product representative.

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General Information

Literature Change History

CVHE-IN-8 (September 1993)

Original issue of manual describes proper installation of CVHE units of "1A through 1U" and CVHF "EO" design sequences with UCP2 microcomputer-based control systems.

About this Manual

This booklet describes proper installation of Model CVHE/CVHF CenTraVac 50 or 60 Hz chillers equipped with microcomputer-based control systems, whether standard cooling only or heat-recovery. A careful review of this information along with the submittal package provided for the unit — will assure that the chiller is installed correctly.

Product Description Block

Trane 60 Hz. Model CVHE hermetic CenTraVac units and 50 Hz. units are defined by the product definition and selection system (PDS). Each unit is defined by the product description block which appears on the unit nameplate. An explanation of the PDS product code is provided in the unit operation and maintenance literature.

Commonly Used Acronyms

AFD = Adjustable Frequency Drive
ASME = American Society of Mechanical Engineers
ASHRAE = American Society of Heating, Refrigerating and Air Conditioning Engineers

BAS = Building Automation System
LBU = La Crosse Business Unit
CABS = Auxiliary Condenser Tube-Bundle Size
CDBS = Condenser Bundle Size
CDSZ = Condenser Shell Size
CWR = Chilled Water Reset

DTFL = Delta-T at Full Load (i.e., the difference between entering and leaving chilled water temperatures at design load)
EVBS = Evaporator Size
EVSZ = Evaporator Shell Size

FC = Free Cooling
GPM = Gallons-per-Minute
HGBP = Hot Gas Bypass

HVAC = Heating, Ventilating, and Air Conditioning
IE = Intemally Enhanced Tubes
IPC = Interprocessor Communication

PFCC = Power Factor Correction Capacitor
PSID = Pounds-per-Square-Inch (differential pressure)
PSIG = Pounds-per-Square-Inch (gauge pressure)

UCP2 =Chiller Control Panel for CenTraVacs

Warnings and Cartons

Notice that WARNINGS and CAUTIONS appear at appropriate intervals throughout this manual. WARNINGS are provided to alert installing contractors to potential hazards that could result in personal injury or death, while CAUTIONS are designed to alert personnel to conditions that could result in equipment damage.

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

Unit Nameplate

The CVHE/CVHF unit nameplate is located on the left side of the unit control panel (UCP). A typical unit nameplate is illustrated in Figure 1. The following information is provided on the CVHE/CVHF unit nameplate.

- Unit model and size descriptor
- Unit serial number
- Identifies unit electrical requirements
- List correct operating charge and type of refrigerant.
- Lists unit test pressures and maximum operating pressures
- Identifies unit Installation and Operation and Maintenance manuals
- Product description block (identifies all unit components and unit "design sequence" used to order literature and make other inquiries about the unit).
- Lists drawing numbers for unit wiring diagrams.

Adjustable Frequency Drive (Option)

For receiving, storage and mounting information see literature shipped with the adjustable frequency drive.

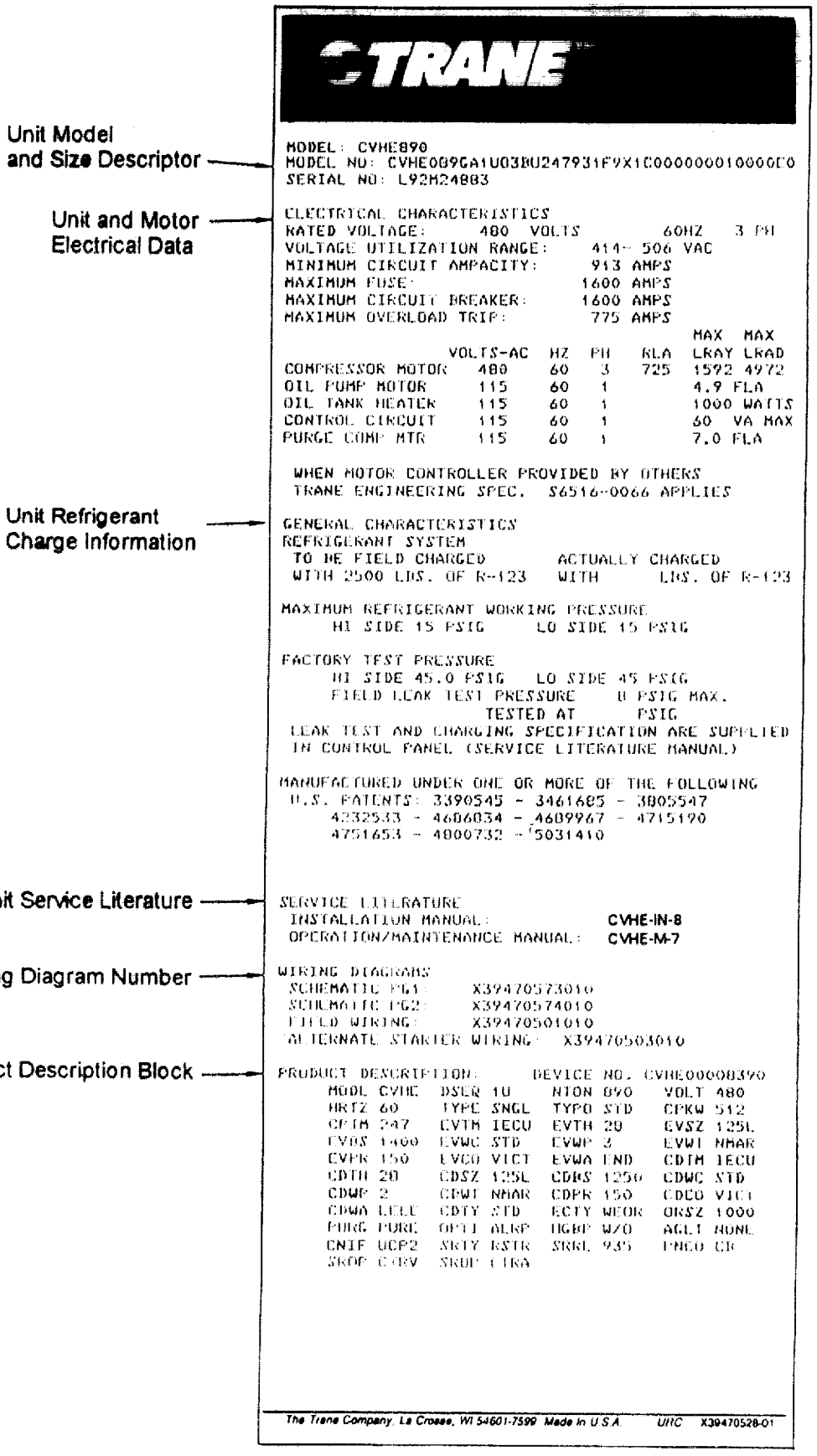
For power and interconnecting wiring, see Electrical Wiring section and Figure 27 in this manual.

Metric Conversion

For tables and charts in this manual, the following conversions apply:

In. x 2.54 = cm.
Ft. x 30.48 = cm.
Lbs. x .453 = kg.

Figure 1
Typical CVHE/CVHF
Unit Nameplate



Responsibilities of Installing Contractor(s)

For your convenience, a summary of the contractor responsibilities typically associated with the CVHE/CVHF chiller installation process is provided below. Table 1 further categorizes these responsibilities by differentiating between Trane-supplied and field-supplied materials, and factory-supplied and field-installed components.

Refer to the Installation section of this manual for more detailed instructions.

[ ] Locate and maintain the loose parts, i.e. isolators, bulb wells, temperature sensors, flow sensors or other factory-ordered field installed options, for installation as required. Loose parts are located in the starter panel on units with factory-installed unit-mounted starters or in the motor terminal box for units with remote-mounted starters.

[ ] Install unit on a foundation with flat support surfaces level within 1/16", and of sufficient strength to support concentrated loading.

Place manufacturer-supplied isolation pad assemblies under unit. (Use spring isolators for upper floor installations).

[ ] Install unit per applicable Trane installation manual.

[ ] Complete all water piping and electrical connections.

Note: Field-piping must be arranged and supported to avoid stress on the equipment. It is strongly recommended that the piping contractor refrain from piping closer than 3'-0" minimum to the equipment. This will allow for proper fit-up upon arrival of the unit at the job-site. Any adjustment that is necessary can be made to the piping at that time.

[ ] Where specified, supply and install valves in water piping upstream and downstream of evaporator and condenser water boxes to isolate shells for maintenance, and to balance/trim system.

[ ] Supply and install flow switches (or equivalent devices) in both chilled water and condenser water piping. Interlock each switch with proper pump starter to ensure unit can only operate when water flow is established.

[ ] Supply and install taps for thermometers and pressure gauges in water piping adjacent to inlet and outlet connections of both evaporator and condenser.

[ ] Supply and install drain valves to each water box.

[ ] Supply and install vent cocks on each water box.

[ ] Where specified, supply and install strainers ahead of all pumps and automatic modulating valves.

[ ] Supply and install pressure-relief piping from pressure-relief rupture disc to atmosphere.

[ ] If necessary, supply sufficient Refrigerant-HCFC-22 (maximum of 1 lb. per machine) and dry nitrogen (8 psig per machine) for pressure testing under manufacturer's supervision.

[ ] Start unit under supervision of a qualified service technician.

[ ] Where specified, supply and insulate evaporator and any other portions of machine as required to prevent sweating under normal operating conditions.

[ ] Unit-Mounted Starters Only. Remove top of starter panel and cut access area for line-side wiring; front left quadrant of top provides recommended access to starter lugs.

[ ] Supply and install wire terminal lugs to starter.

[ ] Unit-Mounted Starters Only. Supply and install field wiring to line-side lugs of starter.

[ ] Supply and install a Refrigerant Monitor per ASHRAE 15 specifications. Refer to "Model CVHE/CVHF CenTraVac Checksheet and Request for Serviceman" for additional information.

Table 1 - CVHE/CVHF Installation Requirements

Type of Requirement	Trane-Supplied Trane-Installed	Trane-Supplied Field-Installed	Field-Supplied Field-Installed
Rigging			a. Safety chains b. Clevis connectors c. Lifting beam
Isolation		a. Isolation pads or spring isolators	a. Isolation pads or spring isolators
Electrical	a. Circuit breakers or fusible disconnects (optional) b. Unit-mounted starter (optional) c. PFCCs (optional)	a. Jumper bars b. Temperature sensor (optional outdoor air) c. Flow switches (may be field supplied)	a. Circuit breakers or fusible disconnects (optional) b. Remote-mounted starter, AFD (optional) c. PFCCs (remote-mounted starter option only) d. Terminal lugs e. Ground connection(s) f. Jumper bars g. BAS wiring (optional) h. IPC wiring (AFD and remote-mounted starters only) i. Control voltage wiring (AFD and remote-mounted starters only) j. Oil pump interlock wiring (AFD and remote-mounted starters only) K. High condenser pressure interlock wiring (AFD and remote-mounted starters only). L. Chilled water pump contactor and wiring. m. Condenser water pump contactor and wiring. n. Optional relays and wiring (See Table 16)
Water Piping		a. Flow switches (May be field supplied)	a. Thermometers b. Water flow pressure gauges c. Isolation and balancing valves water piping d. Vents and drain valves (1 each per pass) e. Pressure-relief valves (for water boxes as required
Rupture Disc	a. Rupture disc assembly		a. Vent line and flexible connector
Insulation	a. insulation (optional)		a. Insulation

Unit Shipment

Each CVHE/CVHF chiller ships from the factory as a hermetically-assembled package; it is factory-piped, wired and tested. All openings are covered or plugged to prevent contamination during shipment and handling.

See Figure 2 for an illustration of a typical CVHE/CVHF unit and its components. As soon as the unit arrives at the job site, inspect it thoroughly for damage and material shortages. In addition:

- Verify that the chiller is dehydrated by checking the evaporator pressure gauge for an indication of holding charge pressure.

- To prevent damaging moisture from entering the unit and causing corrosion, each chiller is pressurized with dry air before shipment.

Note: The holding charge should register approximately 8 psig on the gauge. If the charge has escaped, contact your local Trane sales office for instructions.

- Check the oil sump sight glasses to verify that the sump was factory-charged with 7 gallons of oil.

If no oil level is visible, contact your local Trane sales office.

- Compare the unit nameplate data (including electrical characteristics) with the corresponding ordering and shipping information to verify that the correct unit was shipped to the job site.

If a thorough inspection of the chiller reveals damage or material shortages, be sure to file these claims with the carrier immediately. Specify the extent and type of damage found, and notify the appropriate Trane sales representative. Do not install a damaged unit without the sales representative's approval!

Storage

If the chiller will be stored at the job site for an extended period of time before it is installed, exercise these precautionary measures to protect the unit from damage:

1. Do not remove the protective coverings factory-installed on the control panel and compressor inlet vane actuator for shipment.

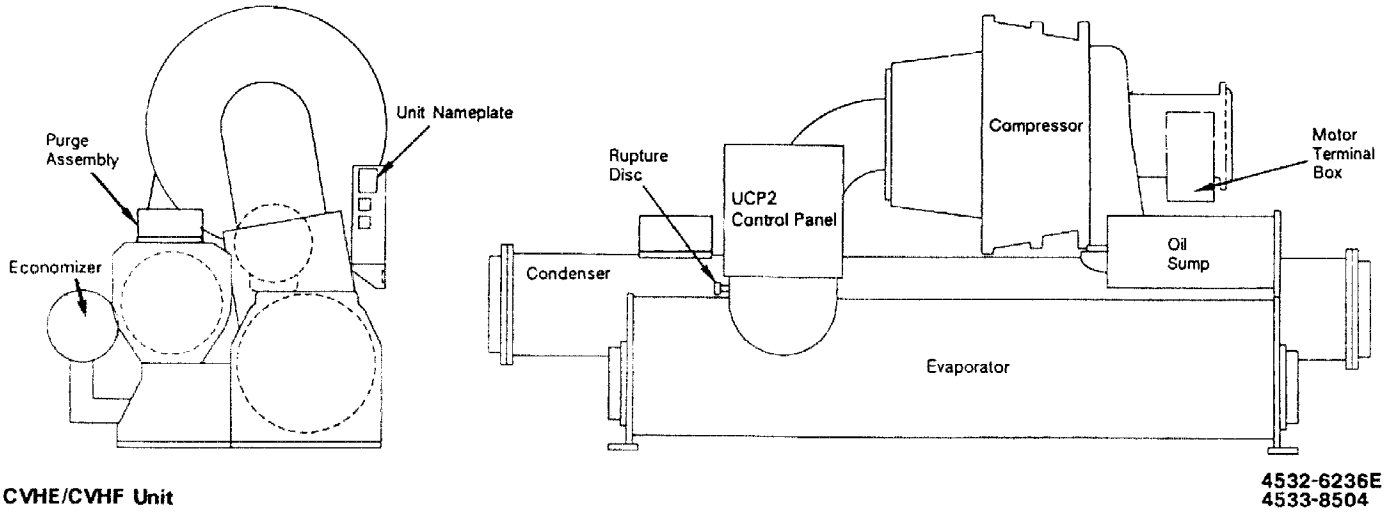
2. Store the chiller in a dry, vibration free and secure area. If factory insulated, protect chiller from prolonged exposure to sunlight.

CAUTION: To prevent damage to the factory-installed insula- tion, do not allow excessive exposure to sunlight.

3. Periodically check the condenser and evaporator pressure gauges to verify that the 8 psig dry air @ 72 °F ambient holding charge is still in the chiller. If this charge escapes, contact a qualified service organization and the Trane sales engineer that handled the order.

Note: The storage range for the microcomputer-based devices in the unit control panel is -40°F (-40 C) to 158° F (70 C).

Figure 2
Typical CVHE/CVHF Chillers



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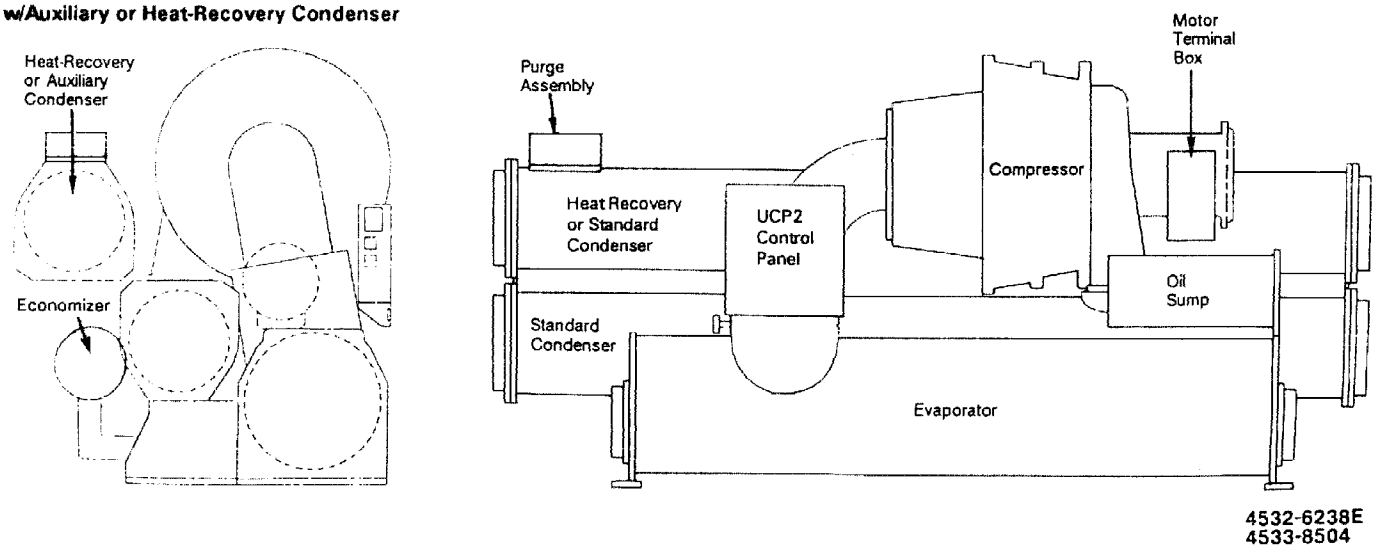
4533-8504

CVHE/CVHF Unit
w/Auxiliary or Heat-Recovery Condenser



4532-6238E
4533-8504

Recommended Unit Clearances

Adequate clearance around and above the chiller is required to allow sufficient access for service and maintenance operations.

Figures 3, 3a, 4, 5 and 5a illustrate the recommended clearances for CVHE/CVHF units with and without options.

Notice that, in each instance, the minimum vertical clearance above the chiller is 3-feet.

In addition, be sure to provide at least 3-feet of working space in front of the unit control panel to satisfy Article 110-16 of the National Electric Code.

Important! Do not install piping or conduit above the compressor motor assembly or behind the suction elbow!

(Specific unit clearance requirements are also indicated in the submittal package provided for your unit.)

Operating Environment

Besides assuring that the site selected for chiller installation provides the necessary clearances, consider the equipment's operating environment.

To assure that electrical components operate properly, do not locate the chiller in an area exposed to dust, dirt, corrosive fumes, or excessive heat and humidity. Note that the maximum ambient temperature range for chiller operation is 95 to 100 ° F (35 to 38 c).

CAUTION: CVHE/CVHF operation at ambient temperatures exceeding 100 °F (38 C) can fatigue the unit's rupture disc, causing it to break at a reduced refrigerant pressure (i.e., <15 psig). Starter component damage can also occur because of the panel's inability to dissipate heat adequately.

If any of these adverse operating conditions are present, take whatever action is necessary to improve the equipment room environment.

Foundation Requirements

Provide rigid, non-warping mounting pads or a concrete foundation as a mounting surface for the chiller. Ensure that the base is of sufficient strength and mass to properly support the chiller at its full operating weight (i.e., including completed piping, and full operating charges of refrigerant, oil and water.

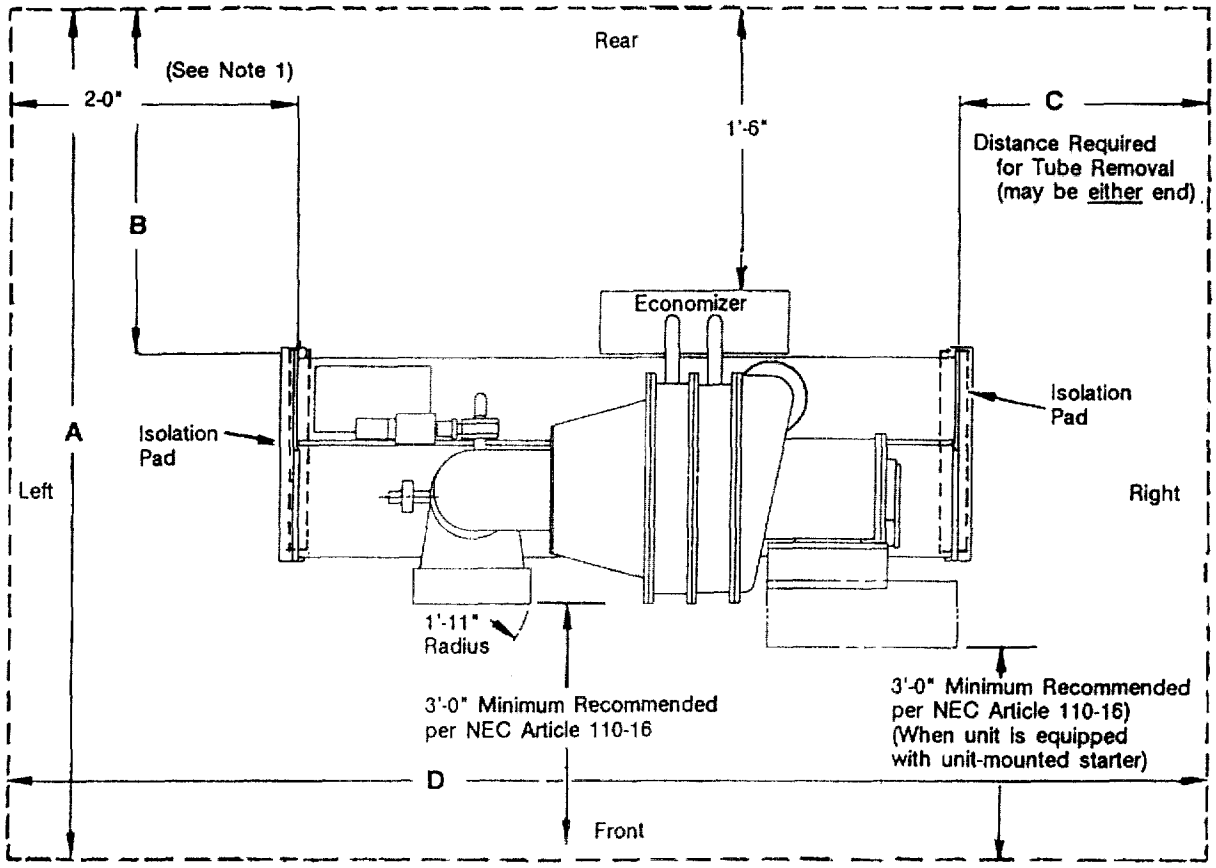
For your convenience, a summary of standard unit shipping and operating weights is provided in Table 2 and 2a. Table 3 indicates the weights of various chiller options.

Notice that the floor loading for all sizes of CVHE and CVHF chillers is 62 pounds per square inch.

To assure proper unit operation, the chiller must be level within 1/16" over its length and width when set into place on the mounting surface.

The Trane Company will not assume responsibility for equipment problems resulting from an improperly designed or constructed foundation.

Figure 3
Clearance Requirements for Standard CVHE



Top View

Notes:
1. Does not include water box.
2. Minimum vertical clearance over chiller is 3 feet.

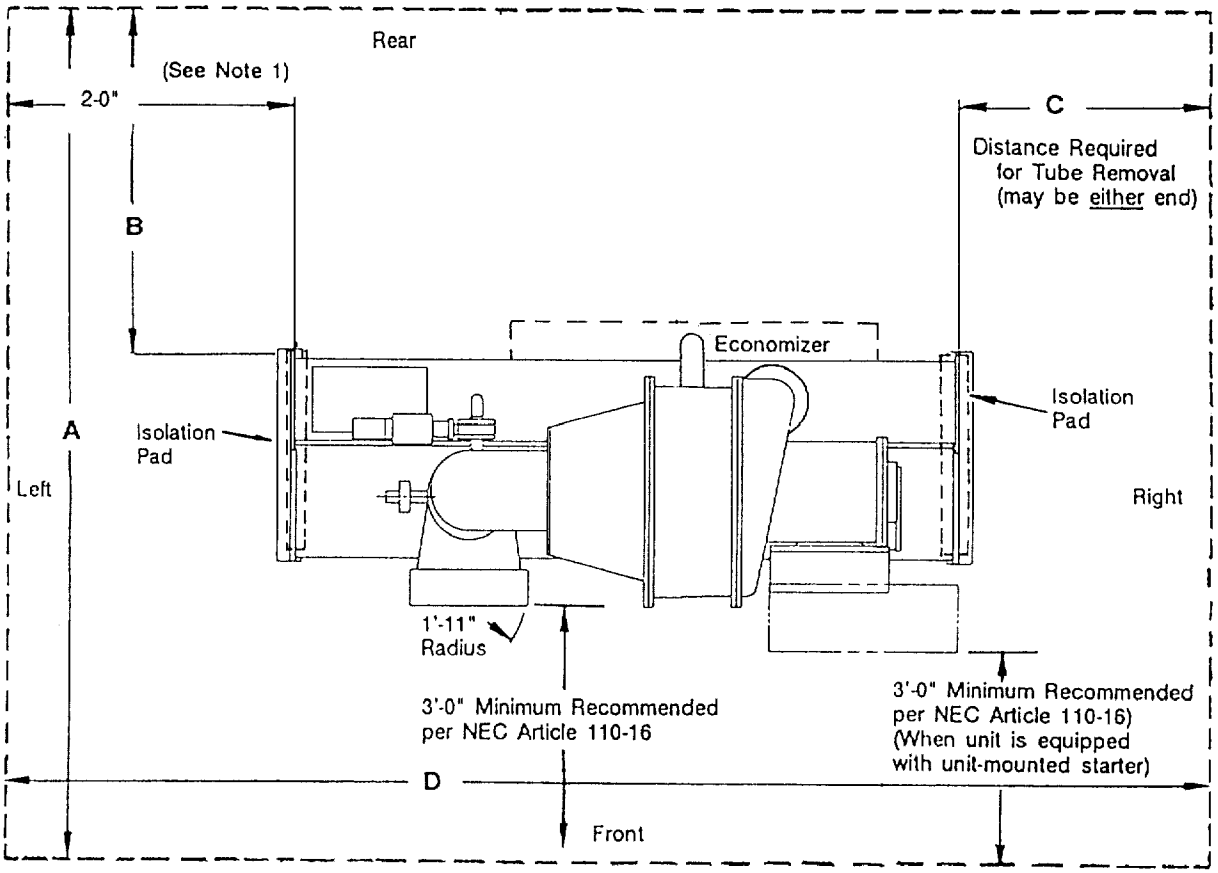
Do not install piping or conduit above compressor motor assembly or behind suction elbow!

Dim.	Shell Comb.	(EVSZ 0320S/L)	(EVSZ 050S/L)	(EVSZ 080S/L)	(EVSZ 125L)	(EVSZ 140E)
A	All	10' -3-3/16"	11-1-11/16"	12' -5-1/4"	14' -7/8"	14' -5-11/16"
B	All	2' -6-5/8"	2' -10-1/8"	2' -6-7/16"	2' -10-13/16"	3' 3-5/8"
C_2	S/S	11' -9"	11' -9"	11' -9"	n/a	n/a
	All Others	15' -6"	15' -6"	15' -6"	15' -6"	17' -5"
D_3	S/S	25' -0"	25'-0"	25' -0"	n/a	n/a
	All Others	32'-6-1/4"	32'-6-1/4"	32' -6-1/4"	32'-6-1/4"	36'-3-3/4"

Notes:

1. EVSZ = Evaporator Size, L = Long Shell; S = Short Shell; E = Extended Shell, M = Medium Shell
2. Clearance requirement to evaporator tube removal does not include water box. Add water box dimension to this figure.
3. Does not include water box. Add water box dimension to this figure.

Figure 3a
Clearance Requirements for Standard CVHFs



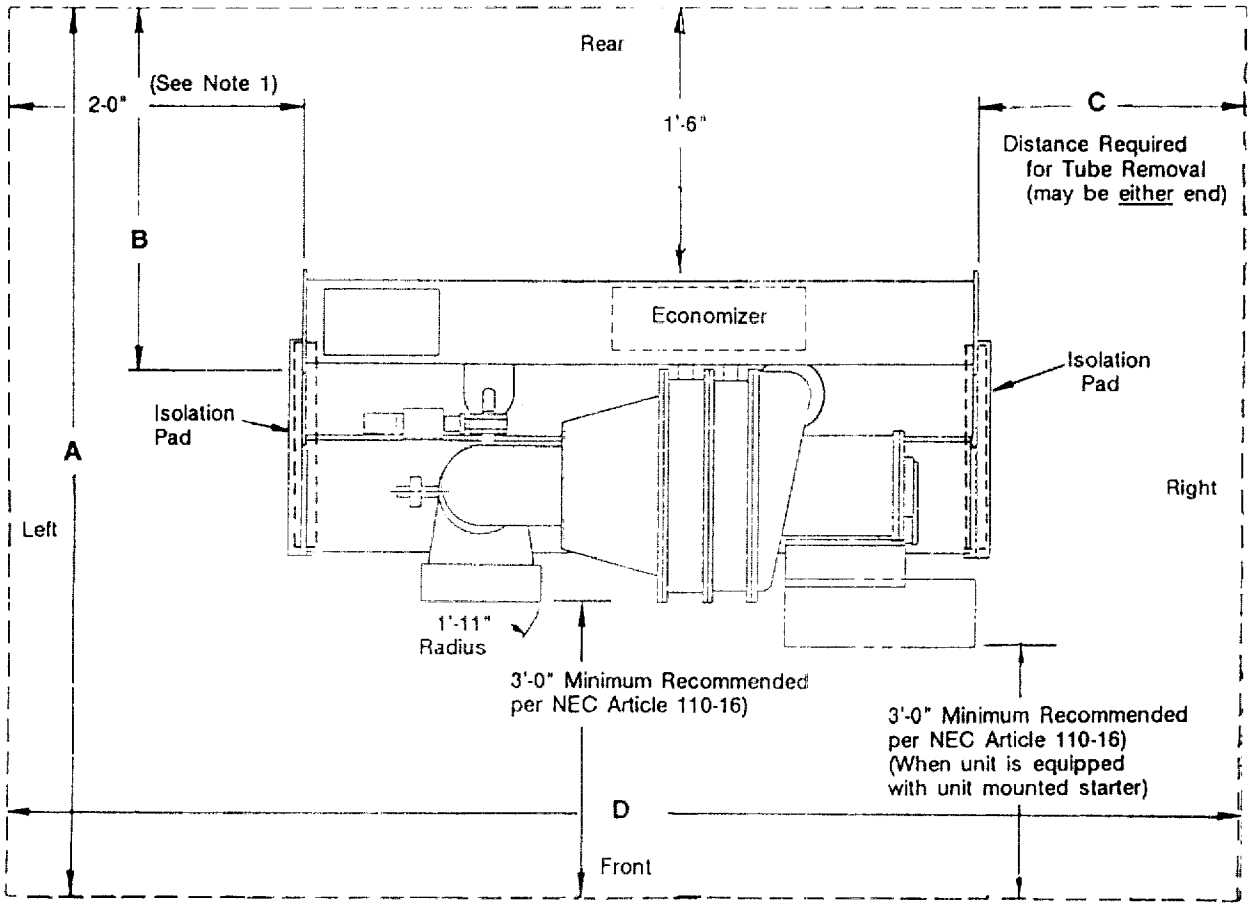
Top View

Dim.	Shell Comb.	(EVSZ 080S/L)	(EVSZ 0142 M/L)	(EVSZ 210M/L)
A	All	12' -7-1/2"	14' -9-5/8"	15' -3-11/16"
B	All	2' -6-7/16"	2' -11-7/16"	3' -6-1/16"
C_2	S/S	11' -9"	N/A	N/A
	M/S	N/A	13' -10"	13' -10"
	All Others	15' -6"	15' -6"	15' -6"
D_3	S/S	25' -0"	N/A	N/A
	M/S	N/A	29'-2"	29' -2"
	All Others	32' -6-1/4"	32' -6-1/4"	32' -6-1/4"

Notes:

1. EVSZ = Evaporator Size, L = Long Shell; M = Medium Shell, S = Short Shell;
2. Clearance requirement for evaporator tube removal, does not include water box. Add water box dimension to this figure.
3. Does not include water box. Add water box dimension to this figure.

Figure 4
Clearance Requirements for
Standard CVHEs w/Heat Recovery Condenser



Top View

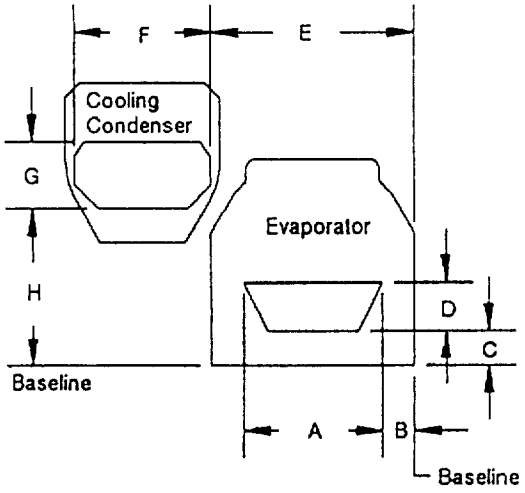
Notes:
1. Does not include water box.
2. Minimum vertical clearance over chiller is 3 feet.

Do not install piping or conduit above compressor motor assembly or behind suction elbow!

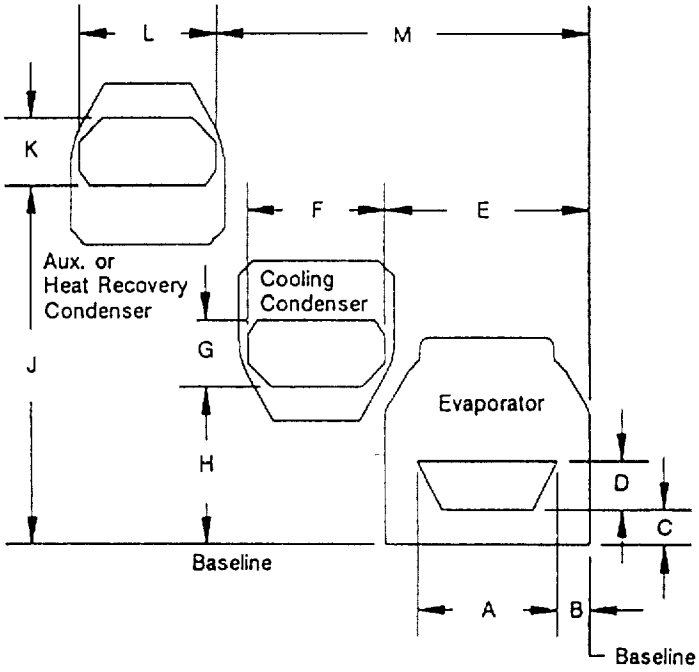
Dim.	Shell Comb.	(EVSZ 032S/L)	(EVSZ 050S/L)	(EVSZ 080S/L)	(EVSZ 125L)	(EVSZ 140E)
A	All	10' -6-9/16"	11' -2-11/16"	12' -5-3/8"	14' -7/8"	14' -5-11/16"
B	All	2' -10"	2' -11-1/8"	2' -6-9/16"	2' -11-7/8"	3' -3-5/8"
C_2	S/S	11' -9"	11' -9"	11' -9"	n/a	n/a
	All Others	15' -6"	15' -6"	15' -6"	15' -6"	17' -5"
D_3	All	2' -0"	2' -0"	2' -0"	2'	2'
	S/S	25' -0"	25' -0"	25' -0"	25'-0	n/a
	All Others	32' -6-1/4"	32' -6-1/4"	32' -6-1/4"	32' -6-1/4"	36' -3-3/4"

Notes:
1. EVSZ = Evaporator Size, L = Long Shell; S = Short Shell; E = Extended Shell;
2. Clearance requirement to evaporator tube removal does not include water box. Add water box dimension to this figure.
3. Does not include water box. Add water box dimension to this figure.

Figure 5
Tube Bundle Locations
for Model CVHE 50/60 Hz Units



Cooling Only Units

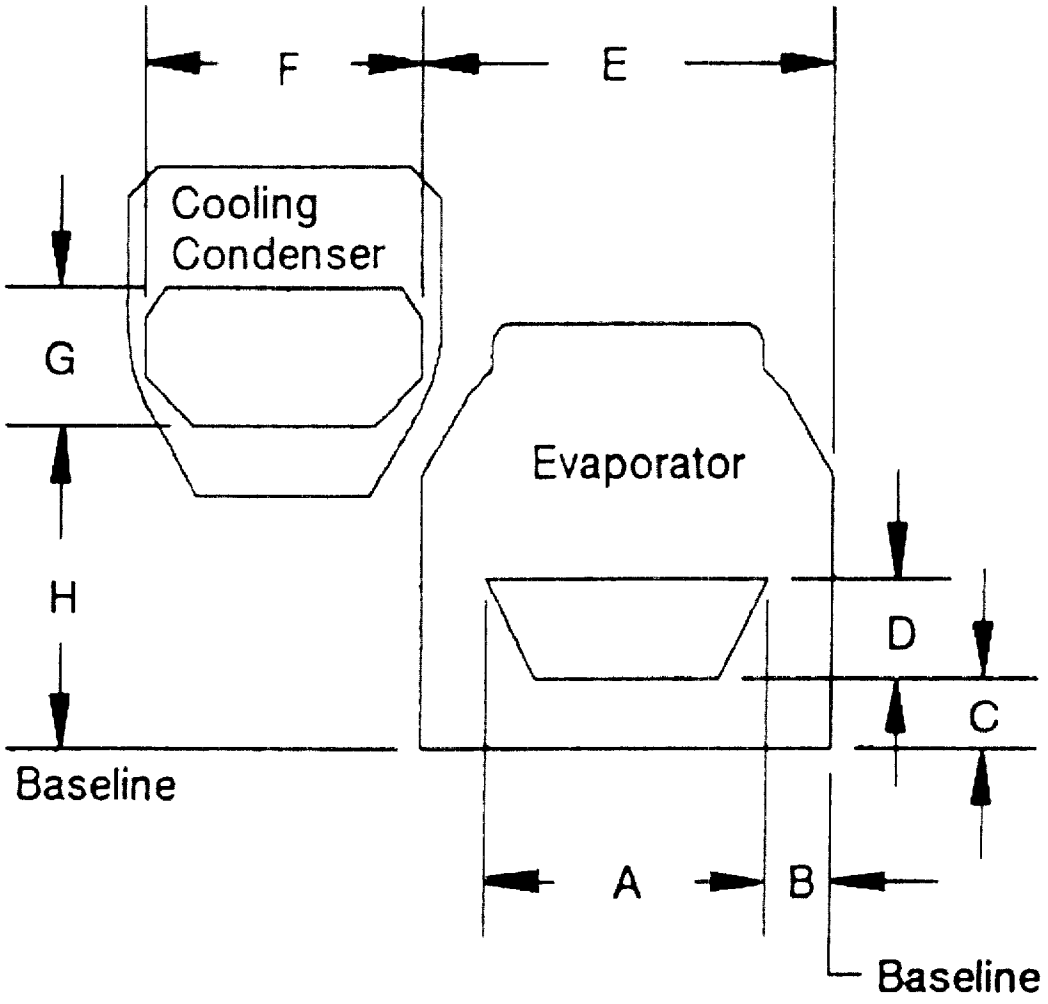


Heat Recovery & Auxiliary Condenser Units

EVSZ	CDSZ	All Units							
		A	B	C	D	E	F	G	H
032S/L	032S/L	2'-0-1/4"	2-7/8"	5"-1/8"	7-1/4"	2'-8-1/4"	1'-5-58"	0'-10-1/4"	1-8-7/8"
050S/L	050S/L	2'-6-3/4"	2-7/8"	6"	8-7/8"	3'-1-1/8"	1'-10-3/8"	1'-1-1/2"	2'-1-1/8"
080S/L	080S/L	3'-5-1/8"	4-1/4"	6-1/4"	11-3/8"	3'-7-3/8"	2'-4-7/8"	1'-6-3/8"	3'-7-7/8"
125L	125L	3'-10-3/4"	3-3/4"	6-3/4"	1'-2-5/8"	4'-1-5/8"	3'-0-1/2"	1'-11-1/4"	3'-8-1/2"
140L	140L	3'-10-3/4"	3-3/4"	6-3/4"	1'-2-5/8"	4'-4-3/8"	3'-2-1/2"	2'-0-7/8"	3'-8-3/8"

EVZS	CDSZ	Heat Recovery				Auxiliary Condenser			
		J	K	L	M	J	K	L	M
032S/L	All	4' -0-1/2"	0' -10-1/4"	1' -5-5/8"	4' -0-1/2"	4' -2-7/8"	5-'3/8"	1' -1-7/8"	4' -0-1/4"
050S/L	All	4' -11"	1' -1-1/2"	1' -10-3/8"	4' -6-1/8"	4' -11-1/2"	5' -3/8"	1' -1-7/8"	4' -8-7/8"
080S/L	All	7' -3-1/4"	1' -6-3/8"	2' -4-7/8"	4' -8-3/8"	7' -0-5/8"	5' -3/8"	1' -1-7/8"	5' -8-7/8"
125L	125L	7' -11"	1' -11-1/4"	3' -0-1/2"	5' -6-7/8"	7' -11-1/2"	5' -3/8"	1' -1-7/8"	6' -11-1/8"
140L	140L	Contact CASBU Marketing							

Figure 5a
Tube Bundle Locations for Model CVHF 60 HZ Units



Cooling Only & Free Cooling Units

EVSZ	CDSZ	A	B	C	D	E	F	G	H
080S/L	080S/L	3' -5-1/8"	4' -1/4"	6' -1/4"	11' -3/8"	3' -7-3/8"	2'-4-3/8"	1' -6-3/8"	3' -7-7/8"
142M/L	142S/L	3' -10-3/4"	3' -3/4"	6' -3/4"	1' -2-5/8"	4'- 4-3/8"	3' -2-1/2"	2' -0-7/8"	3' -8-3/8"
210M/L	210S/L	4' -5-7/16"	5' -3/8"	7' -9/16"	1' -4-1/4"	5' -0-1/8"	3' -5-1/4"	2' -5"	3' -10-3/16"

Table 2
Typical Shipping and Operating Weights (Lbs.) for Standard CVHE Units
See Note (1)

Shell Length Designators		Maximum Weights (Lbs.)	
EVSZ [5]	CDSZ [6]	Shipping	Operating [2]
032S	032S	11,437	12,927
032S	032L	11,862	13,482
032L	032L	12,437	14,352
050S	050S	14,821	17,600
050S	050L	15,451	18,013
050L	050L	16, 281	19,284
080S	080S	21,597	25,091
080S	080L	22,627	26,453
080L	080L	23,992	28,451
125L	125L	34,356	41,703
140E	140L	38,000	46,000

Notes:
1. Weights shown above are accurate within ± 3%, and are calculated with non-marine 150 psig water boxes. Marine-style water boxes may add considerably more weight; contact LBU Marketing for details.
2. Operating weights include refrigerant, oil and water charges.
3. For more specific data on weights and isolator loading, refer to the unit submittal package.
4. See Table 3 for additional weights associated with various chiller options.
5. EVSZ = Evaporator Shell Size: S = Short Shell; L = Long Shell; E = Extended Length.
6. CDSZ = Condenser Shell Size: S = Short; L = Long Shell.

Table 2a
Typical Shipping and Operating Weights
(Lbs.) for Standard CVHF Units (See Note 1)

Shell Length Designators		Maximum Weights (Lbs.)	
EVSZ [5]	CDSZ [6]	Shipping	Operating [2]
080S	080S	22,690	25,910
080S	080L	23,740	27,230
080L	080L	25,090	29,300
142M	142S	31,180	36,450
142M	142L	32,640	38,370
142L	142L	33,360	39,470
210M	210S	38,300	45,670
210M	210L	40,330	48,360

Notes:
1. Weights shown above are accurate within ± 3%, 150 psig waterboxes. Marine-style water boxes may add considerably more weight: Contact La Crosse Business Unit Marketing for details.
2. Operating weights include refrigerant and oil charges and water volume.
3. For more specific data on weights and isolator loading, refer to the unit submittal package.
4. See Table 3 for additional weights associated with various chiller options.
5. EVSZ = Evaporator Shell Size: S = Short Shell; M = Medium Shell; L = Long Shell.
6. CDSZ = Condenser Shell Size: S = Short Shell; L = Long Shell.

Table 3
Weights (LBS) for Typical CVHE Options (See Note 1)

Cond. Size (CDSZ)	Aux. Cond. Size 80		Aux. Cond. Size 130		"S" - Heat Rec. Cond.		"L" - Heat Rec. Cond.		Free Cooling	
	Ship	Oper	Ship	Oper	Ship	Oper	Ship	Oper	Ship	Oper
032S/L	1,049	1,250	1,163	1,423	1,801	2,378	2,226	2,933	500	800
050S/L	1,049	1,250	1,163	1,423	2,657	3,499	3,187	4,437	750	1,310
080S/L	1,049	1,250	1,163	1,423	4,415	5,898	5,445	7,260	760	1,430
125L	1,049	1,250	1,163	1,423	n/a	n/a	9,569	12,407	1200	2,150
140L	1,049	1,250	1,163	1,423	n/a	n/a	Design Special		Design Special	

Notes:
1. Unit-Mounted Starter option = 525 lbs. (shipping and operating).
2. Weights shown are accurate within ± 3%.
3. For more specific information on unit weights and isolator loading, refer to unit submittals.

Note: Immediately report any unit damage incurred during handling or installation at the job site to the Trane sales office.

Rigging

Lifting is the recommended method for moving CVHE/CVHF chillers. Suggested lifting arrangements for standard and heat-recovery units are illustrated in Figure 6.

Note that each of the cables used to lift the unit must be capable of supporting the entire weight of the chiller. (See Tables 2, 2a and 3 for unit shipping and operating weights.) Notice that the lifting beam used to right the unit must be at least 12 feet long.

WARNING: To avoid serious injury and possible equipment damage, lift the chiller horizontally; use the lifting arrangement and rigging shown in Figure 6.

To lift the chiller properly, insert clevis connections at the points indicated in Figure 6; a 2"-diameter lifting hole is provided at each of these points. Next, attach the lifting cables or slings.

Once the lifting cables are in place, attach a safety cable or sling between the first-stage casting of the compressor and the lifting beam. To do this, remove a retaining bolt from the compressor first-stage casting and replace it with an eyebolt.

Note: There should not be tension on this safety cable; it is used only to prevent the unit from rolling during the lift.

When the lift is complete, detach the clevis connections and safety chain, then remove the eyebolt that was used to secure the safety chain to the compressor, and reinstall the retaining bolt in its place.

If the chiller cannot be moved using the conventional rigging method just described, consider these points.

1. If job site conditions require rigging of the chiller at an angle greater than 45° from horizontal (end-to-end), dowel-pin the compressor and remove it from the unit. Be sure to contact a qualified service organization for specific rigging instructions.

CAUTION: To prevent tube-sheet or tube damage during lifting procedures, do not tilt the unit more than 45 ° from horizontal (level); end-to-end. Raising the unit to a vertical or near-vertical position places excessive strain on shell components. If job site conditions require special lifting procedures, contact your local Trane Sales Office for approval or instructions.

CAUTION: To prevent oil migration out of the oil tank during lifting procedures, remove the oil from the oil tank if the unit will be lifted at any angle greater than 15 ° from horizontal end-to-end.

If oil is allowed to run out of the oil tank into other areas of the chiller, it will be extremely difficult to return the oil to the oil tank even during operation.

2. When lifting the chiller is either impractical or undesirable, attach cables or chains to the jacking slots shown in Figure 6; then push or pull the unit across a smooth surface. Should the chiller be on a shipping skid, it is not necessary to remove the shipping skid from the chiller before sliding it into place.

CAUTION:
Chiller shipping skids are not designed to support the entire weight of the unit at any single point. Improperly supporting the chiller-and-skid assembly may result in equipment damage.

CAUTION: To prevent possible equipment damage, do not use a fork lift to move the chiller!

3. If removal of the compressor or economizer assembly is necessary to move the chiller into its operating location, contact The Trane Company, for special instructions, concerning chiller disassembly and reassembly procedures.

CAUTION: Do not remove these components without first consulting The Trane Company. Lifting the compressor/motor assembly from the shells without factory-installed doweling in the compressor casting flanges may result in misalignment of the compressor castings.

Shipping Skid Removal

To detach the skid from the unit once the chiller is set into place:

1. Remove the carriage bolts that fasten the steel straps to the skids. (Carriage bolt locations are shown in Figure 7).

2. Place jacks in the slots provided at each end of the chiller. Figure 6.

3. Using the jacks installed in Step 2, elevate one end of the chiller at a time; work from end to end in small increments to ensure stability. (The skid will remain on the floor).

Caution: Shipping skids are not designed to support the entire weight of the unit at any single point. Improperly supporting the chiller-and-skid assembly may result in equipment damage.

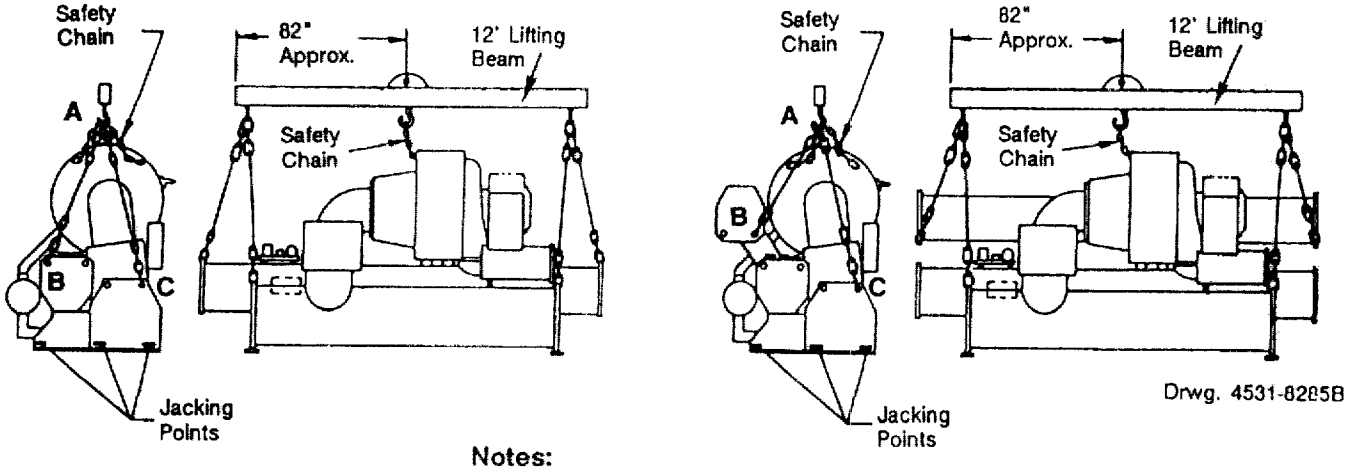
4. Once the chiller is elevated sufficiently, disassemble and remove the skid.

WARNING: Shipping skids are very heavy, and may cause injury if dropped.

5. Position isolator pads (or spring isolators) beneath the chiller feet; see "Unit Isolation" for instructions.

6. Once the isolators are in place, lower the chiller; again, work from end to end in small increments to maintain stability.

Figure 6
Recommended Lifting Arrangements - CVHE/CVHF

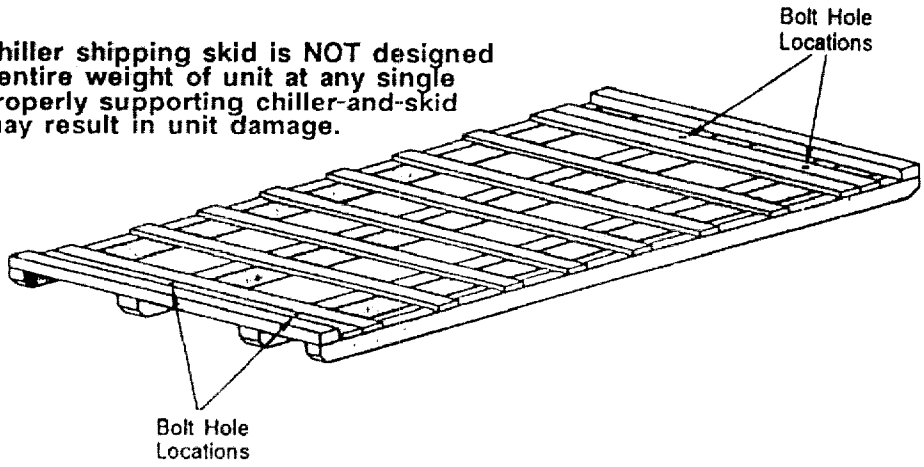


Notes:
1. Lifting chains (or cables) may or may not be the same length between Points A and B, or between Points A and C. Adjust as necessary for an even lift.
2. Lifting holes provided on chiller to attach chains are 2" in diameter.
3. Attach safety chain (or cable) as shown, and without tension. The safety chain is not used for lifting, but is there to prevent the unit from rolling.
4. Do not forklift the unit!

WARNING: Do not use chains or cables other than as shown. Alternative lifting arrangements may result in serious personal injury and equipment damage.

Figure 7
Shipping Skid

Caution: Chiller shipping skid is NOT designed to support entire weight of unit at any single point. Improperly supporting chiller-and-skid assembly may result in unit damage.



Unit Isolation

To minimize sound and vibration transmission through the building structure — and to assure proper weight distribution over the mounting surface, always install isolation pads or spring isolators under the chiller feet.

Note: Isolation pads (Figure 8) are provided with each chiller unless spring isolators are specified on the sales order.

Specific isolator loading data is provided in the unit submittal package. If necessary, contact your local Trane sales office for further information.

Important! When determining placement of isolation pads or spring isolators, remember that the control panel side of the unit is always designated as the unit front.

Isolation Pads

When the unit is ready for final placement, position isolation pads under the chiller feet as shown in Figure 9 and 9a.

Remember that the chiller must be level within 1/16" over its length and width after it is lowered onto the isolation pads. In addition, all piping connected to the chiller must be properly isolated and supported so that it does not place any stress on the unit.

Spring Isolators

Spring isolators should be considered whenever chiller installation is planned for an upper story location. Base isolator selection and placement on the information presented in Figure 10 and Figure 10a. (Notice that 3 types of spring isolators—each with its own maximum loading characteristics are used with CVHE/CVHF chillers.)

Spring isolators typically ship assembled and ready for installation. To install and adjust the isolators properly, follow the instructions given.

Note: Do not adjust the isolators until the chiller is piped and charged with refrigerant and water.

1. Position the spring isolators under the chiller as shown in Figures 10, 10a and 11. Make sure that each isolator is centered in relation to the tube sheet.

Note: Spring isolators shipped with the chiller are not identical! Be sure to compare the data provided in the unit submittal package and Figures 9 through 11 to determine proper isolator placement.

2. Set the isolators on the subbase; shim or grout as necessary to provide a flat, level surface at the same elevation for all mountings. Be sure to support the full underside of the isolator base plate; do not straddle gaps or small shims.

Figure 8
Isolation Pad

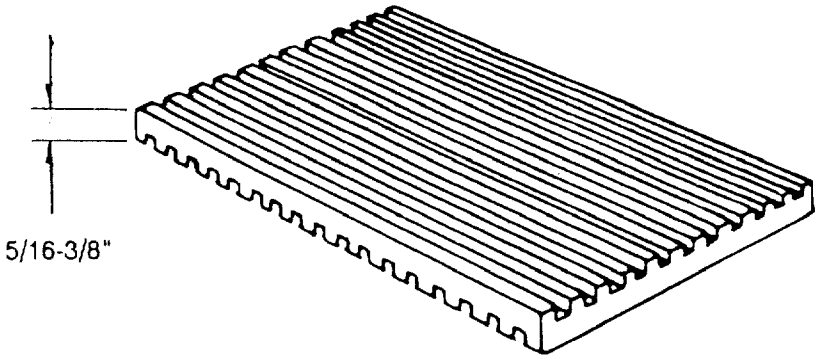
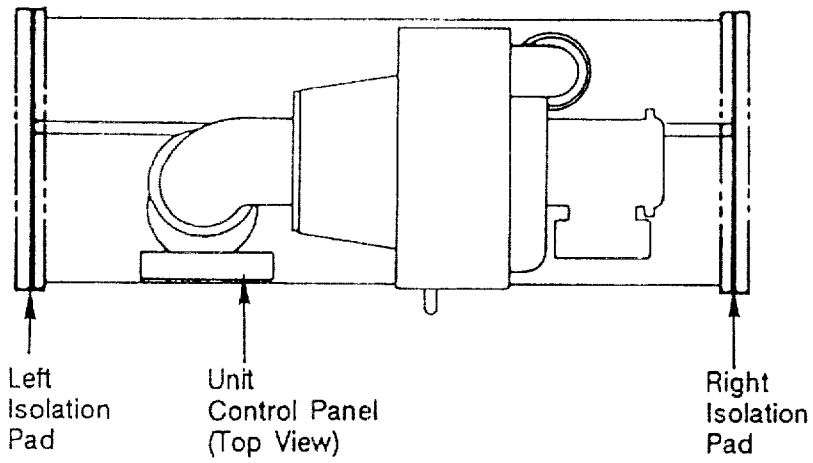


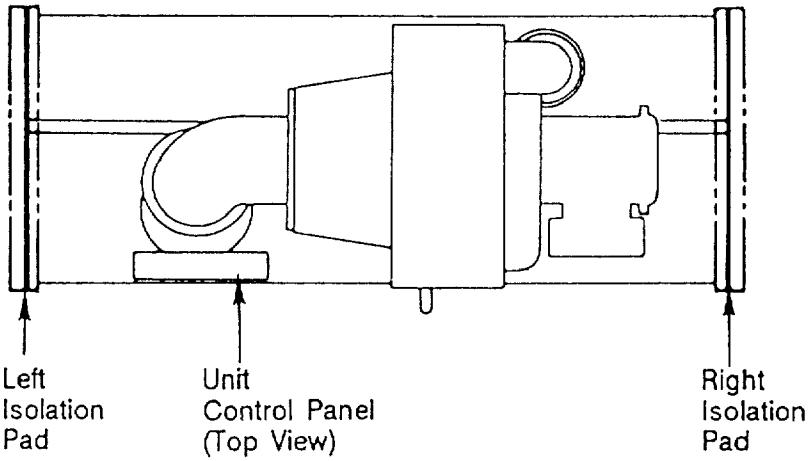
Figure 9
Isolation Pad Placement - CVHE



Shell Length Designators		Isolator Loading (Lbs.)	
EVSZ	CDSZ	Left Pad	Right Pad
032S	032S	5,305	7,622
032S	032L	5,851	7,631
032L	032L	6,065	8,286
050S	050S	7,472	9,604
050S	050L	8,349	9,664
050L	050L	8,578	10,706
080S	080S	10,737	14,354
080S	080L	12,085	14,367
080L	080L	12,603	15,848
125L	125L	18,777	22,926
140E	140L	20,500	25,500

Notes:
1. "Isolator loading" values shown are based on the total maximum operating weight values listed in Table 2. Operating weights include refrigerant, oil and water charges. For more specific information on unit weights and isolator loading, refer to the unit submittal package.
2. Weights shown above are accurate within ±3%, and are calculated with non-marine, 150 psig water boxes. Marine style water boxes may add considerably more weight; contact Trane LBU Marketing for details.
3. See Table 3 for additional weights associated with various chiller options.
4. EVSZ = Evaporator Shell Size; S = Short Shell; L = Long Shell; E = Ext. Shell.
5. CDSZ = Condenser Shell Size; S = Short Shell; L = Long Shell

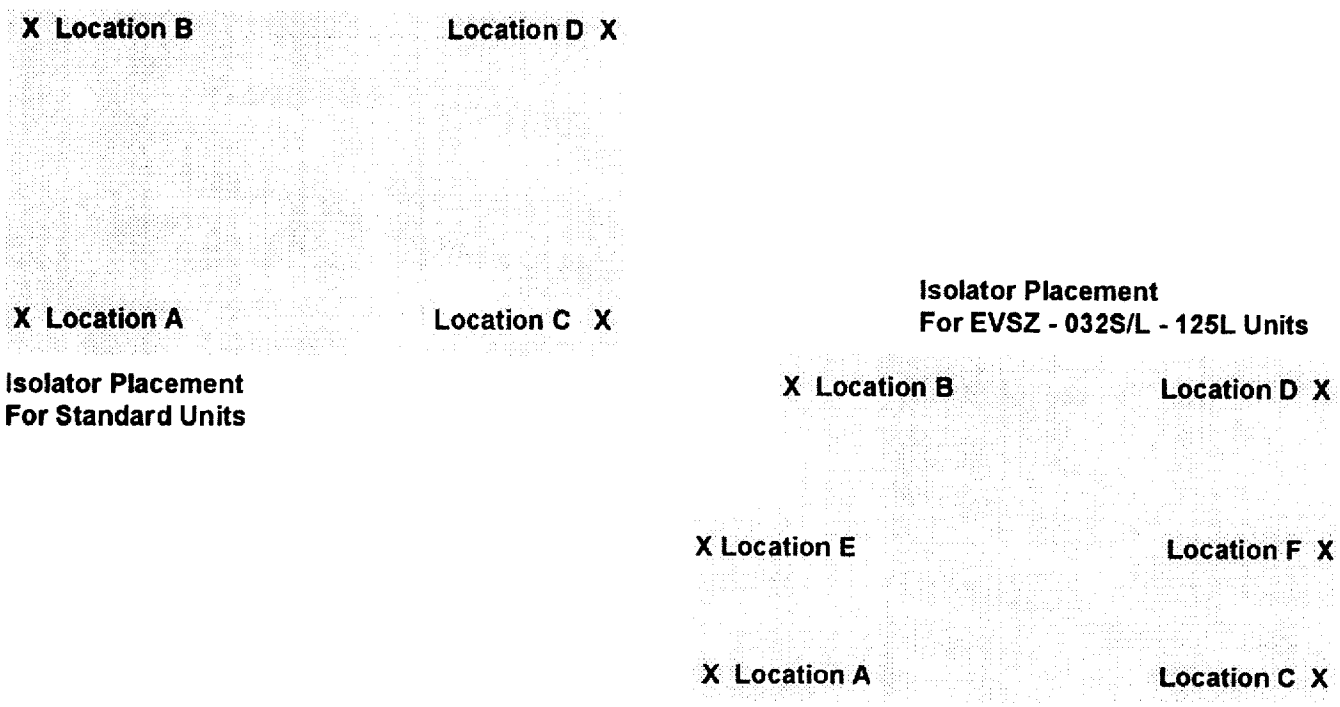
Figure 9a
Isolation Pad Placement - CVHF



Shell Length Designators		Isolator Loading (Lbs.)	
EVSZ	CDSZ	Left Pad	Right Pad
080S	080S	11,830	14,080
080S	080L	13,000	14,230 .
080L	080L	13,230	16,070
142M	142S	16,450	19,990
142M	142L	17,470	20,900
142L	142L	18,210	21,260
210M	210S	21,190	24,480
210M	210L	22,620	25,740
210L	210L	23,530	26,290

Notes:
1. "Isolator loading" values shown are based on the total maximum operating weight values listed in Table 2. Operating weights include refrigerant, oil and water charges. For more specific information on unit weights and isolator loading, refer to the unit submittal package.
2. Weights shown above are accurate within ±3%, and are calculated with standard 1" IECU tubes and Non-Marine 150 psig waterboeses, Marine-style water boxes may add considerably more weight; contact Trane LBU Marketing for details.
3. See Table 3 for additional weights associated with various chiller options.
4. EVSZ = Evaporator Shell Size; S = Short Shell; L = Long Shell; M =Medium Shell,
5. CDSZ = Condenser Shell Size, S = Short Shell; L = Long Shell.

Figure 10
Isolation Spring Placement - CVHE

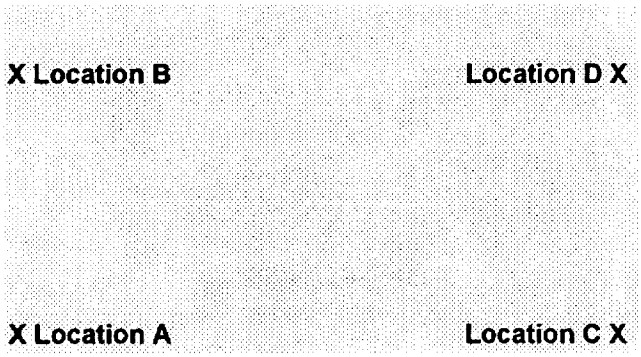


Estimated Spring Isolator Loading (Lbs.)							
EVSZ	CDSZ	Location A Left Front	Location B Left Rear	Location C Right Front	Location D Right Rear	Location E Left Mid.	Location F Right Mid.
032S	032S	3,267	2,486	4,226	3,338	n/a	n/a
032S	032L	3,431	2,810	4,147	3,466	n/a	n/a
032L	032L	3,547	2,734	4,675	3,742	n/a	n/a
050S	050S	4,124	3,775	5,158	4,770	n/a	n/a
050S	050L	4,368	4,270	5,051	4,946	n/a	n/a
050L	050L	4,530	4,160	5,778	5,363	n/a	n/a
080S	080S	6,654	5,183	7,932	6,327	n/a	n/a
080S	080L	7,059	5,949	7,786	6,622	n/a	n/a
080L	080L	7,346	5,879	8,938	7,323	n/a	n/a
125L	125L	10,149	7,972	11,866	9,515	n/a	n/a
140E	140E	6,991	6,086	8,629	7,317	6,309	7,877

Notes:

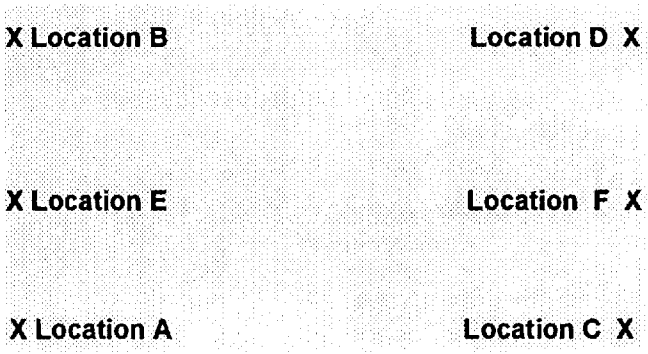
1. This table only provides an estimated range of loading at each isolator location. the values given are based on a standard unit with non-marine water boxes and without a unit-mounted starter. For specific isolator loading information, refer to the submittal package provided for the unit, or contact your local Trane sales office.
2. If the unit is equipped with a unit-mounted starter, add 525 pounds to the isolator load range for isolator location "C".
3. EVSZ = Evaporator Size, CDSZ = Condenser Size

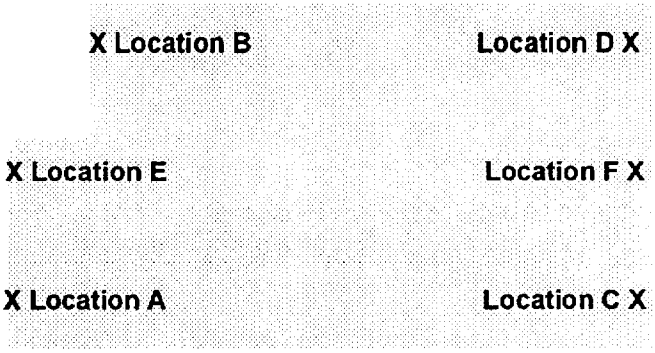
Figure 10a
Spring Isolator Placement - CVHF



Isolator Placement for all Shells 032S/L to 125L

Isolator Placement for
EVSZ 142M/L w/CDSZ 142L
EVSZ 210M/L w/CDSZ 210 L



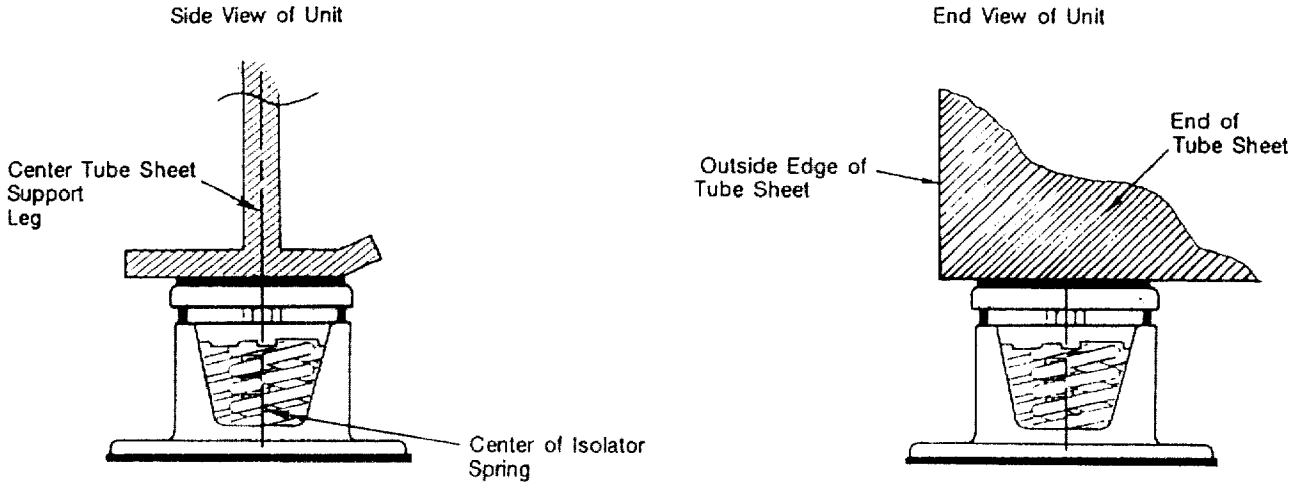


Isolator Placement for
EVSZ 140E w/CDSZ 140L
EVSZ 142M w/CDSZ 142S
EVSZ 210M w/CDSZ 210S

Estimated Spring Isolator Loading (Lbs.)							
EVSZ	CDSZ	Location A Left Front	Location B Left Rear	Location C Right Front	Location D Right Rear	Location E Left Mid.	Location F Right Mid.
080S	080S	6,641	5,187	7,831	6,253	n/a	n/a
080S	080L	7,047	5,956	7,683	6,545	n/a	n/a
080L	080L	7,340	5,889	8,831	7,243	n/a	n/a
142M	142S	6,156	5,004	7,523	5,887	5,297	6,577
142M	142L	6,198	5,512	7,402	6,570	5,761	6,927
142L	142L	6,594	5,653	7,664	6,561	5,986	7,032
210M	210S	7,372	6,903	8,587	7,791	6,919	8,100
210M	210L	7,395	7,649	8,414	8,725	7,572	8,601
210M	210L	7,861	7,829	8,785	8,745	7,839	8,761

Notes:
1. The values given are based on a standard unit with 1" IECU Tubes, Non marine 150 psig water boxes and without unit mounted starter. For specific isolator loading information, refer to the submittal package provided for the unit, or contact your local Trane sales office.
2. If the unit is equipped with a unit-mounted starter, add 525 pounds to the Isolator load at Location C.
3. EVSZ = Evaporator Size, CDSZ = Condenser Size

Figure 11
Chiller Foot/Isolator Orientation



Note: The spring isolator must be centered in relation to the lube sheet. Do not align the isolator with the flat part of the chiller foot since the tube sheet is often off-center.

Note: Place isolators near outside edge of tube sheet as shown.

3. If required, bolt the isolators to the floor through the slots provided, or cement the pads.

Note: Fastening the isolators to the floor is not necessary unless specified.

4. If the chiller must be fastened to the isolators, insert cap screws through the chiller base and into the holes tapped in the upper housing of each isolator. However, do not allow the screws to protrude below the underside of the isolator upper housing. An alternative method of fastening the chiller to the isolators is to cement the neoprene pads.

5. Set the chiller on the isolators; refer to "Rigging" for listing instructions.

The weight of the chiller will force the upper housing of each isolator down, perhaps causing it to rest on the isolator's lower housing. (Figure 12 illustrates spring isolator construction.)

6. Check the clearance (Labeled **X** in Figure 12) on each isolator. If this dimension is less than 1/4" on any isolator, use a wrench to turn the adjusting bolt one complete revolution upward.

Repeat this operation until a 1/4" clearance is obtained at one or more isolators.

Note: When the load is applied to the isolators (Step 5), the top plate of each isolator moves down to compress the springs until either; (1) The springs support the load; or (2) The top plate rests on the bottom housing of the isolator.

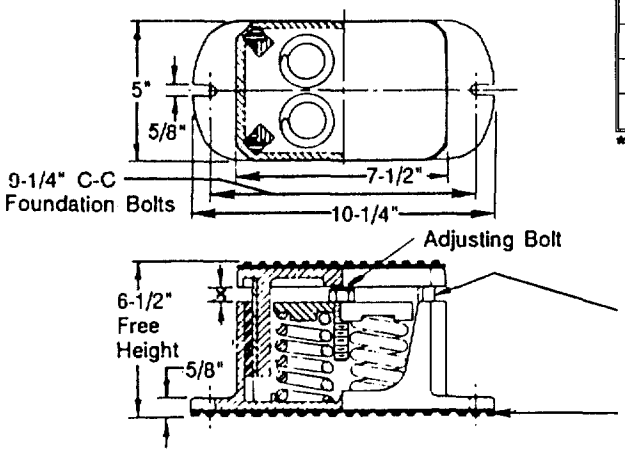
a. If the springs are supporting the load, screwing down on the adjusting bolt (Step 7) will immediately begin to raise the chiller.

7. Turn the adjusting bolt on each of the remaining isolators to obtain the required minimum clearance at **X** (Figure 12) of 1/4".

8. Once the minimum required clearance is obtained on each of the isolators, level the chiller by turning the adjusting bolt on each of the isolators on the low side of the unit. Be sure to work from one isolator to the next. Remember that the chiller must be level to within 1/16: over its length and width, and that clearance **X** of each isolator must be at least 1/4 inch.

Figure 12
Typical Spring Isolator Types and Construction

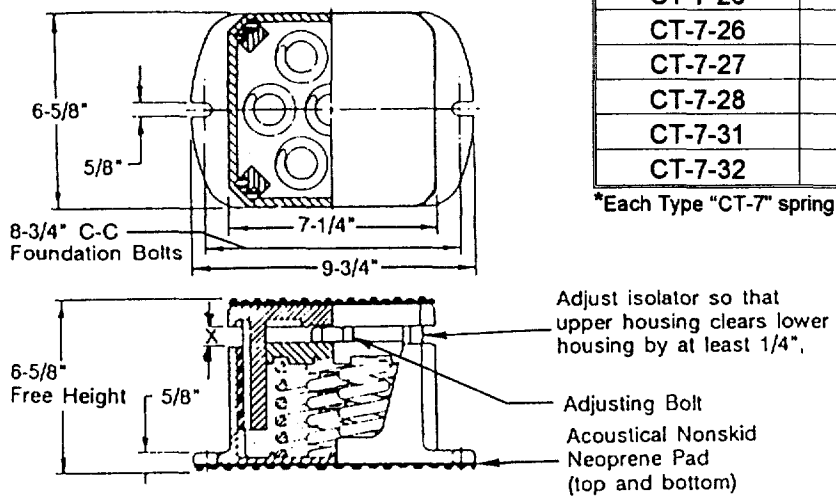
Type CT-4 Spring Isolators



Isolator Type and Size	Maximum Load (Lbs.)	Deflection (Inches)	Spring Color Coding
CT-4-25	1,800	1.22	Red
CT-4-26	2,400	1.17	Purple
CT-4-27	3,000	1.06	Orange
CT-4-28	3,600	1.02	Green
CT-4-31	4,400	0.83	Gray
CT-4-32	5,200	0.74	White

*Each Type "CT-4" spring isolator has 4 springs.

Type CT-7 Spring Isolators



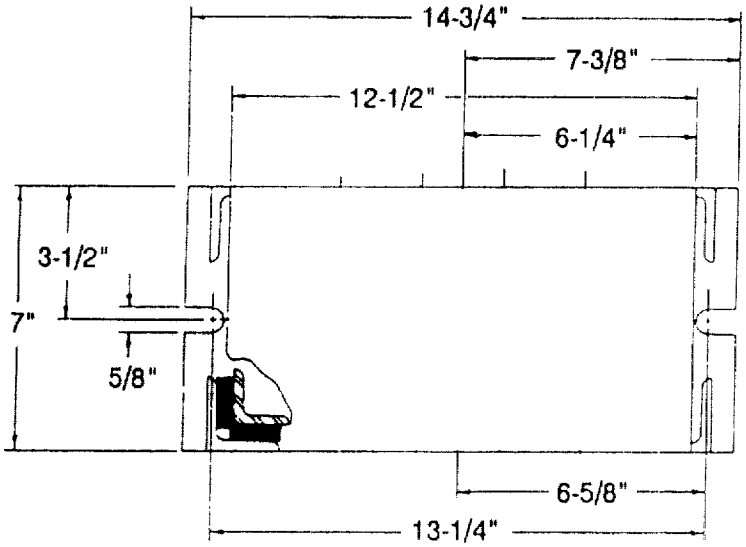
Isolator Type and Size	Maximum Load (Lbs.)	Deflection (Inches)	Spring Color Coding
CT-7-25	3,150	1.22	Red
CT-7-26	4,200	1.17	Purple
CT-7-27	5,250	1.06	Orange
CT-7-28	6,300	1.02	Green
CT-7-31	7,700	0.83	Gray
CT-7-32	9,100	0.74	White

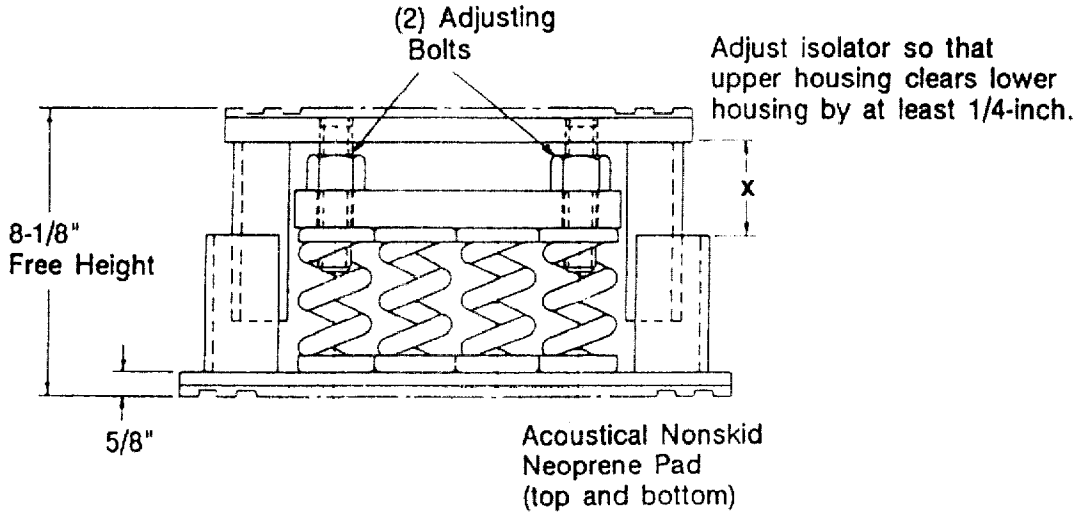
*Each Type "CT-7" spring isolator has 7 springs.

Figure 12 (Con't)
Type CT-12 Spring Isolators

Isolator Type and Size	Maximum Load (Lbs.)	Deflection (Inches)	Spring Color Coding
CT-12-25	5,400	1.22	Red
CT-12-26	7,200	1.17	Purple
CT-12-27	9,000	1.06	Orange
CT-12-28	10,800	1.02	Green
CT-12-31	13,200	0.83	Gray
CT-12-32	15,600	0.74	White

*Each Type "CT-12" spring isolator has 7 springs.





Unit Leveling

Follow the instructions outlined below and illustrated in Figure 13 to determine whether or not the chiller is set level.

1. Measure an equal distance up from each foot of the chiller (identified as **X** in Figure 13), and make a punch mark at each measured distance.

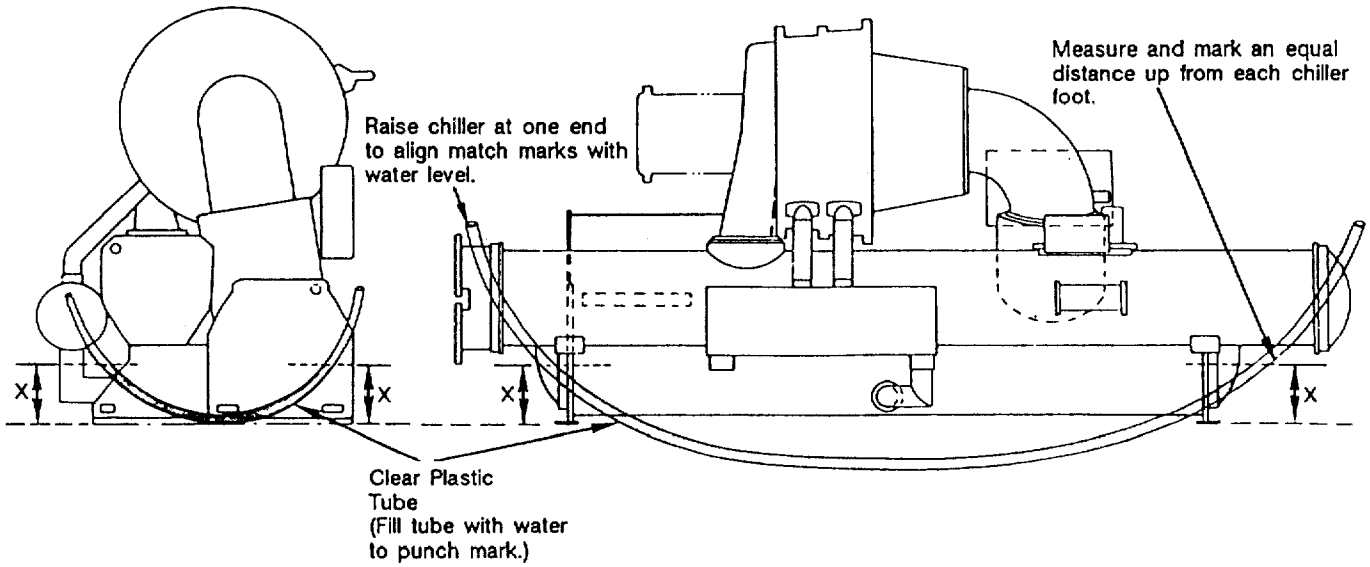
2. Suspend a clear plastic tube along the length of the chiller as shown in Figure 13.

3. Fill the tube with water until the level aligns with the punch mark at one end of the chiller; then check the water level at the opposite mark.

If the water level does not align with the punch mark, use full-length shims to raise one end of the chiller until the water level at each end of the tube aligns with the punch marks at both ends of the chiller.

4. Once the unit is level across its length, repeat Steps 1 through 3 to see if unit is level across the width. Remember that the chiller must be level within 1/16" over both its length and width.

Figure 13
Checking Unit Levelness



Water Piping

Overview

Several water piping circuits must be installed and connected to the chiller.

Note: Field piping must be arranged and supported to avoid stress on the equipment. It is strongly recommended that the piping contractor refrain from piping closer than 3'-0" minimum to the equipment. This will allow for proper fit-up upon arrival of the unit at the job site. Any adjustment that is necessary can be made to the piping at that time.

(1) Pipe the evaporator into the chilled water circuit;

(2) Pipe the condenser into the cooling tower water circuit;

(3) A heat-recovery condenser water circuit, (optional);

(4) An auxiliary condenser water circuit, (optional);

Piping suggestions for each of the four water circuits listed above are outlined later in this section. General recommendations for the installation field-supplied piping components (e.g., valves, flow switches, etc.) common to most chiller water circuits are listed below.

Water Treatment

Since the use of untreated or improperly treated water in a CenTraVac may result in inefficient operation and possible tube damage, be sure to engage the services of a qualified water treatment if needed. A label with the following disclamatory note is affixed to each CVHE/CVHF unit:

Customer Note:

"The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is advisable. The Trane Company warranty specifically excludes liability for corrosion, erosion or deterioration of Trane equipment, Trane assumes no responsibilities for the results of the use of untreated or improperly treated water, or saline or brackish water."

CAUTION: Do not use untreated or improperly treated water, or equipment damage may occur.

Pressure Gauges

Locate pressure gauge taps in a straight run of pipe. Place tap a minimum of one pipe diameter downstream of any elbow, orifice etc.. Example, for a 6" pipe, the tap would be at least 6" from any elbow, orifice, etc.

Valves

1. Install field-supplied air vents and drain valves on the water boxes. Each water box is provided with a 3/4" NPTF vent and drain connection.

Plastic plugs are factory-installed in both openings for shipment; remove and discard these plugs as you install the water box vents and drain valves.

2. If necessary for the application, install pressure-relief valves at the drain connections on the evaporator and condenser water boxes. To do so, add a tee with the relief valve attached to the drain valve.

To determine whether or not pressure-relief valves are needed for a specific application, keep in mind that:

a. Vessels with close-coupled shutoff valves may cause high, potentially damaging hydrostatic pressures as fluid temperature rises; and,

b. Relief valves are required by ASME codes when the shell waterside is ASME. Follow ASME guidelines or other applicable codes to assure proper relief valve installation.

CAUTION: Failure to install pressure-relief valves in the condenser and evaporator water circuits may result in shell damage due to hydrostatic expansion.

Strainers

Install a strainer in the entering side of each piping circuit to avoid possible tube plugging in the chiller with debris.

CAUTION: Failure to install strainers in all water piping entering the chiller can result in tube plugging conditions that damage unit components.

Flow-Sensing Devices

Use either flow switches or differential pressure switches in conjunction with the pump interlocks to verify evaporator and condenser water flows.

To assure adequate chiller protection, wire the chilled-water and condenser-water flow switches in series with the appropriate water pump interlock. Refer to the wiring diagrams that shipped with the unit for specific electrical connections.

Unless stated otherwise, all flow-sensing devices must be field-supplied. Be sure to follow the manufacturer's recommendations for device selection and installation. Also, review the general flow switch installation guidelines listed below.

1. Mount the flow switch upright in a horizontal section of pipe. Allow at least 5 pipe diameters of straight, horizontal run on each side of the switch.

Avoid locations adjacent to elbows, orifices and valves whenever possible.

2. To assure that the flow switch operates as designed, adjust the length of the flow switch paddle to compensate for the pipe diameter and the height of the coupling tee used to install the switch.

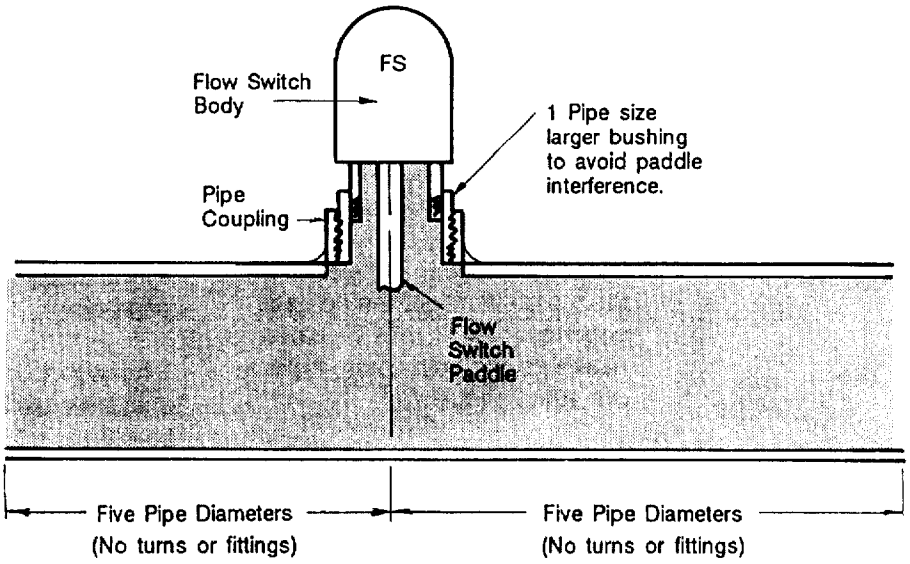
3. Install the flow switch using a coupling that is large enough to allow the insertion of a bushing one pipe diameter larger than the flow switch base (Figure 14). This will prevent interference with the flow switch paddle.

4. Verify that the direction-of-flow arrow on the switch points in the same direction as actual water flow through the piping circuit.

5. Remove all air from the piping circuit to prevent possible flow switch "fluttering".

6. Adjust the flow switch to open when water flow is less than normal.

Figure 14
Flow Switch Installation



Evaporator and Condenser Water Piping

Figures 15 and 16 illustrate the typical water piping arrangements recommended for the evaporator and condenser.

Note: It is strongly recommended that the piping contractor refrain from piping closer than 3'-0" minimum to the equipment. This will allow for proper fit-up upon arrival of the unit at the job site. Any adjustment that is necessary can be made to the piping at that time.

Water piping connection sizes are identified in Tables 4, 4a, 5 and 5a. Remember that entering and leaving evaporator water can be piped to either water box connection since the tube bundles are split vertically.

Note: To assure that the evaporator water piping is clear, check it after the chilled water pump is operated but before initial chiller start-up. If any partial blockages exist, they can be detected and removed to prevent possible tube damage resulting from evaporator freeze-up or erosion.

Note: Arrange the condenser water piping so that the water supply enters the shell at the lower connection, and exits from the top connection. Single-pass condenser shells may be piped as desired since both connections are at the same level.

For applications that include an "infinite source:" or "multiple-use", cooling condenser water supply, install a valved bypass "leg" (optional) between the supply and return pipes; see Figure 16. This valved bypass allows the operator to short-circuit water flow through the cooling condenser when the supply water temperature is too low.

CAUTION: To prevent operating problems. Condenser water supply temperature should not fall below 55° F.

Note: Whenever a CVHE/CVHF unit is equipped with an auxiliary condenser, use a bypass valve system to avoid circulating water through the auxiliary shell during unit shutdown.

Water Box Locations

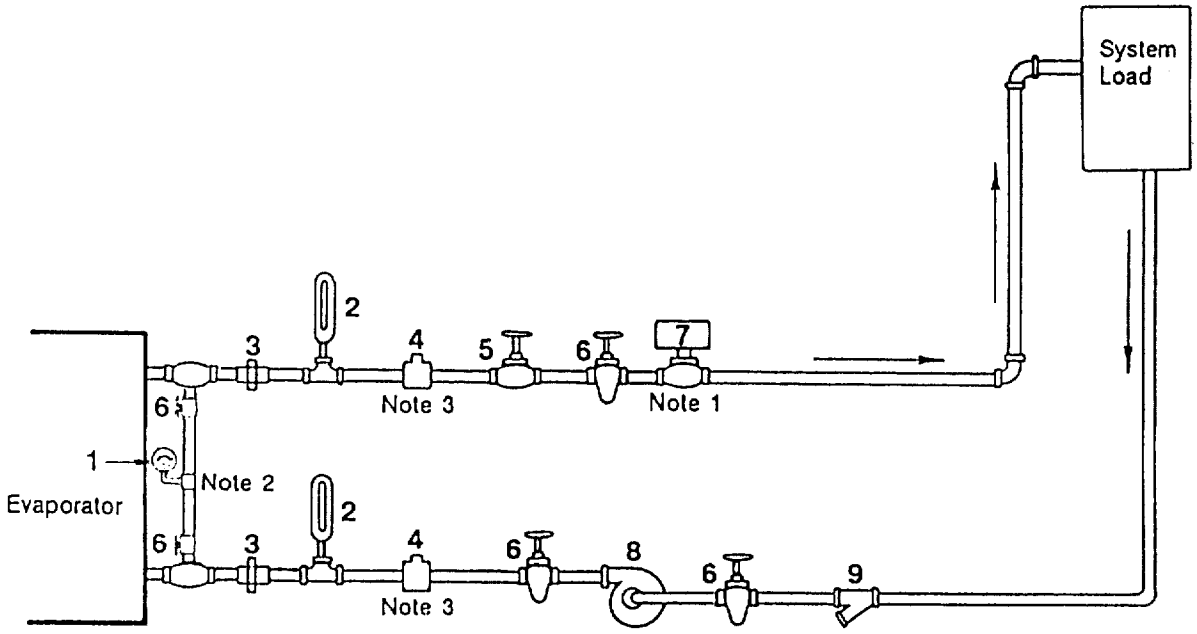
If necessary, the non-marine water boxes on each shell whether evaporator or condenser can be switched end-for-end to obtain the desired piping arrangement. Contact Trane La Crosse Business Unit Marketing for switching of marine-style boxes.

CAUTION: To prevent altering the designed water flow piping configuration in the unit; do not exchange positions of marine water boxes. This will prevent proper unit operation.

To accommodate lifting apparatus, a nut is welded to each evaporator water box to enable attachment of a 3/4" eyebolt (field-supplied). Condenser water boxes are provided with 1/2" tapped holes that allow installation of the eyebolt included in the unit's loose parts-box.

If the water boxes on any of the shells are exchanged end-for-end, be sure to reinstall them right side up to maintain the correct baffle arrangements. Use a new gasket with each water box cover.

Figure 15
Typical Evaporator Water Piping Circuit

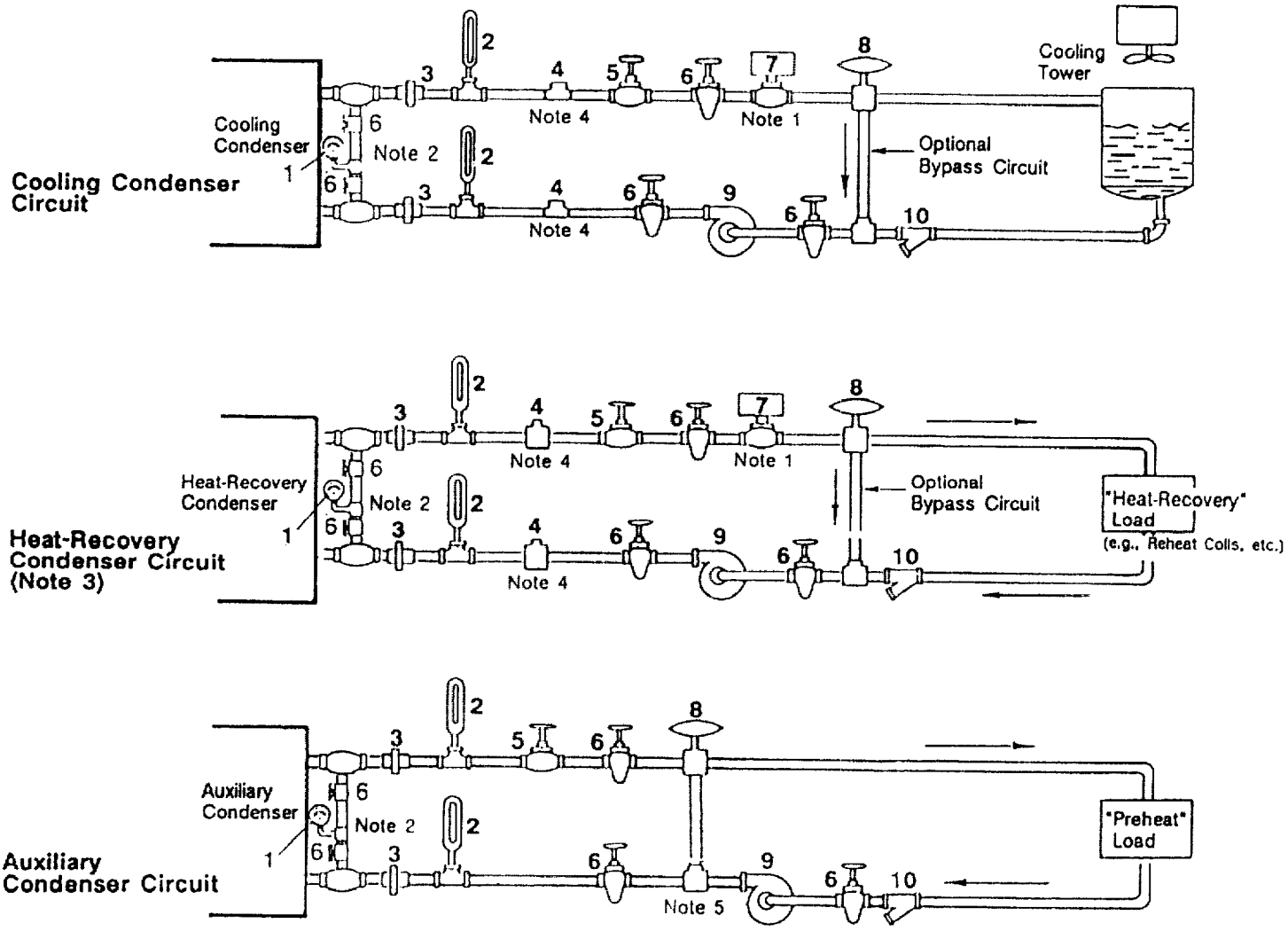


Notes:
1. Flow switch 5S1 (Item 7 in Legend of Components) may be installed in either the entering or leaving leg of the chilled water circuit.
2. It is recommended to pipe 1 gauge between entering and leaving pipes. A shutoff valve on each side of the gauge allows the operator to read either entering or leaving water pressure.

Legend (Field-Supplied/Installed Components)

1. Pressure Gauge
2. Thermometer(s) (If field supplied)
3. Union (s) or Flanged Connection(s)
4. 1/2" NPT Coupling(s)
5. Balancing Valve
6. Gate (Isolation) Valve (s) or Ball Valve(s)
7. Chilled Water Flow Switch (5S1)
8. Strainer

Figure 16
Typical Condenser Water Piping Circuits



Notes:
1. The Flow Switch 5S2 (Item 7 in Legend of Components) may be installed in either the entering or leaving leg of the chilled water circuit.
2. It is recommended to pipe 1 gauge between entering and leaving pipes.
3. Some type of field-supplied temperature control device may be required to regulate the temperature of the heat-recovery condenser water circuit. For application recommendations, see Trane Application Manual, "AM-FND-8", entitled "Heat-Recovery Engineering Seminar".
4. Install a bypass valve system to avoid circulating water through the auxiliary shell when the unit is shut down.

Legend (Field-Supplied/Installed Components)

1. Pressure Gauge
2. Thermometer(s) (If field specified)
3. Union(s) or Flanged Connection(s)
4. 1/2" NPT Coupling(s)
5. Balancing Valve
6. Gate (Isolation) Valve(s) or Ball Valves
7. Condenser Water Flow Switch
8. 3-Way Valve (Optional)
9. Condenser Water Pump
10 Strainer

Table 4
Evaporator Water Piping Connection Sizes - CVHE

CVHE Units Size Range	EVSZ (1)	Connection Size		
		1 Pass	2 Pass	3 Pass
230-320	032S/032L	8"	6"	5"
360-500	050S/050L	10"	8"	6"
560-800	080S/080L	12"	10"	8"
890-1250	125L	16"	12"	10"
890-1250	142M/142L	16"	12"	10"

Note: EVSZ = Evaporator Shell Size; S = Short Shell, L = Long Shell, E = Extended Shell

Table 4a
Evaporator Water Piping Connection Sizes - CVHF

CVHE Units Size Range	EVSZ (1)	Connection Size		
		1 Pass	2 Pass	3 Pass
650-910	080S/L	12"	10"	8"
650-1280	142M/L	16"	12"	10"
1060-1280	210M/L	16"	14"	12"

Note: EVSZ = Evaporator Shell Size; S = Short Shell, M = Medium Shell, L = Long Shell

Table 5
Condenser Water Piping Connection Sizes - CVHE

CDSZ	2-Pass Shells
032S/032L	6"
050S/050L	8"
080S/080L	10"
125L	12"
140E	12"

Note: CDSZ = Evaporator Shell Size;
E = Extended Shell,
S = Short Shell
L = Long Shell,

Table 5a
Condenser Water Piping Connection Sizes - CVHF

CDSZ	2-Pass Shell
080S/L	10"
050S/050L	12"
080S/080L	14"

Note: CDSZ = Condenser Shell Size;
S = Short Shell ,
L = Long Shell

Water Piping Connections

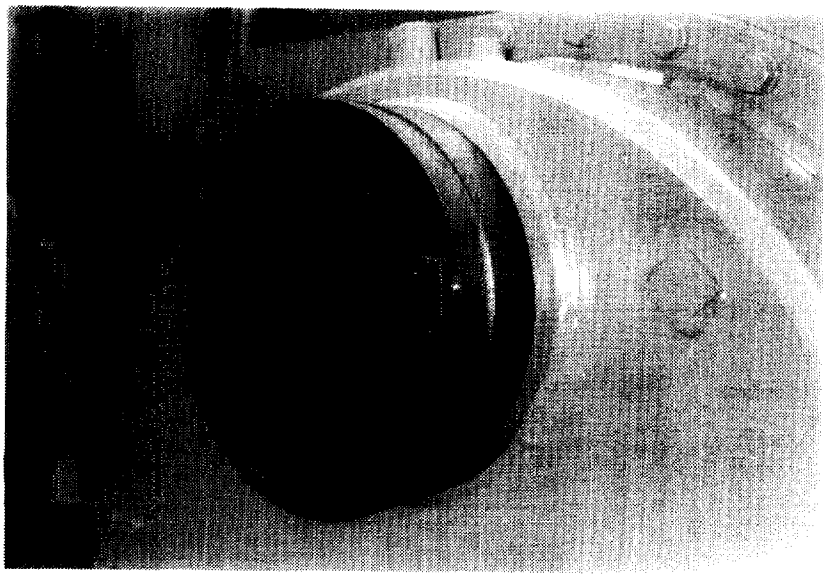
For CVHEs beginning with design sequence "1D", all units (except those with 032 through 050 condenser shells with 150 psig non-marine water boxes) use cut-groove end NSP (Victaulic®-style) pipe connections. All CVHF units, "A" and later design sequences, use grooved-pipe connections, also. See Figure 17.

Piping joined using grooved type couplings, like all types of piping systems, requires proper support to carry the weight of pipes and equipment. The support methods used must eliminate undue stresses on joints, piping and other components; allow movement where required, and provide for any other special requirements (i.e., drainage, etc.).

Table 6
Water Piping Connection Components for CenTraVacs

		Customer Piping Connection	
Unit Model	**Unit Connection Type**	**Victualic®**	**Flanged**
CVHE	Flanged (Condenser 032 - 050 150 psig non-marine only)	Trane provided Victaulic-to-flange adapter	No Adapter Required
CVHE/CVHF	Victaulic (All others)	Customer Provided Victaulic Coupling	Trane Provided Victaulic-to-Flange Adapter

Figure 17
Typical CVHE Grooved Pipe Connection



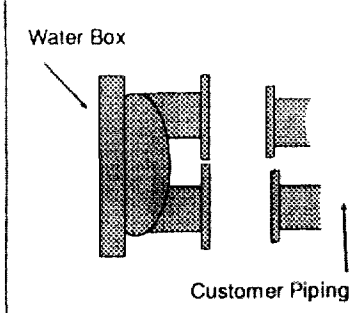
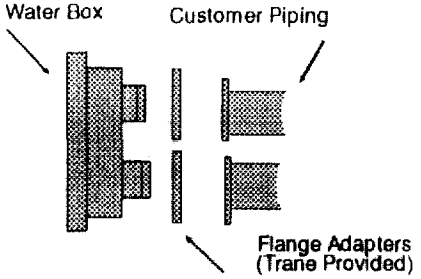
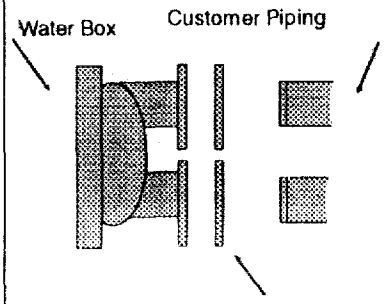
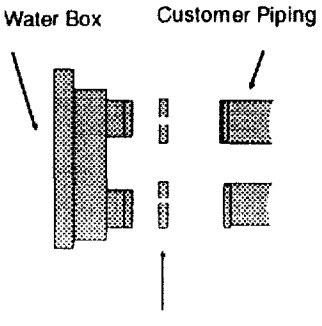
Grooved Pipe Coupling

A customer-supplied, standard flexible grooved pipe coupling (Victaulic® Style 77 or equivalent) should be used to complete the Victaulic connection for both 150 and 300 psig water boxes. See Table 6. When a flexible coupling such as this is installed at the water box connections (Figure 18), other flexible piping connectors (i.e., braided-steel, elastomeric arch, etc.) are usually not required to attenuate vibration and/or prevent stress on the connections.

Refer to the coupling manufacturer's guidelines for specific information concerning proper piping system design and construction methods for grooved water piping systems.

Note: Flexible coupling gaskets require proper lubrication before installation to provide a good seal. Refer to the coupling manufacturer's guidelines for proper lubricant type and application.

Figure 18
Customer Piping Alternatives for CVHE/CVHF Water Connections

Customer Piping Connection Type	Trane Water Box Construction	
	CVHE/CVHF w/032-050 Cond.	Fabricated (All Others)
Flanged		
Victaulic®		

Flange-Connection Adapters

When flat-face flange connections are specified, flange-to-groove adapters are provided (Victaulic® Style 741 for 150 psig systems; Style 743 for 300 psig systems). The adapters are shipped bolted to one of the chiller end-supports (Figure 19a). Adapter weights are given in Tables 7 and 8. The flange adapters provide a direct, rigid connection of flanged components to the grooved-pipe chiller water box connections.

In this case, the use of flexible type connectors (i.e., braided steel, elastomeric arch, etc.) is recommended to attenuate vibration and/or prevent stress at the water box connections. Flange adapters are not provided for CVHE/CVHF units with 300 psig water boxes that have 14-inch or 16-inch piping connections.

All flange-to-flange assembly bolts must be provided by the installer. Bolt sizes and number required are given in Tables 7 and 8. The four draw-bolts needed for the 14-inch and 16-inch Style 741 (150 psig) adapters are provided. The Style 741, 150 psig flange adapter requires a smooth, hard surface for a good seal.

Connection to other type flange faces (i.e., raised, serrated, rubber, etc.) will require the use of a flange washer between the faces. Refer to the flange adapter manufacturer's guidelines for specific information.

The Style 743, 300-psig flange adapters are designed to mate with raised-face flanges. They can be used with flat-faced flanges, however, if the raised projections on the outside face of the adapter are removed (Figure 20).

Note: The flange-adapter gasket must be placed with the color-coded lip on the pipe and the other lip facing the mating flange.

CAUTION: To provide effective seal, gasket-contact surfaces of adapter must be free of gouges, undulations or deformities.

Victaulic Gasket Installation

1. Check gasket and lubricate: Check gasket supplied to be certain it is suited for intended service. Code identifies gasket grade. Apply a thin coat of silicone lubricant to gasket tips and outside of gasket.

2. Install Gasket: Place gasket over pipe end, being sure gasket lip does not overhang pipe end. See Figure 19 for gasket configuration.

3. Join pipe ends: Align and bring two pipe ends together and slide gasket into position centered between the grooves on each pipe. No portion of the gasket should extend into the groove on either pipe.

4. Apply Vic-Flange®: Open Vic-Flange® fully and place hinged flange around the grooved pipe end with the circular key section locating into the groove.

5. Insert Bolt: Insert a standard bolt through the mating holes of the Vic-Flange® to secure the flange firmly in the groove.

6. Tighten Nuts: Tighten nuts alternately and equally until housing bolt pads are firmly together - metal-to-metal. Excessive nut tightening is not necessary. **Note:** Uneven tightening may cause gasket to pinch.

Figure 19
Typical Victaulic® Flange Gasket Configuration

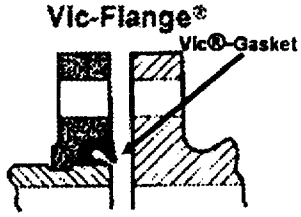


Figure 19a
Typical Shipping Location for Flange

Flange Adapters Bolted in Shipping Position

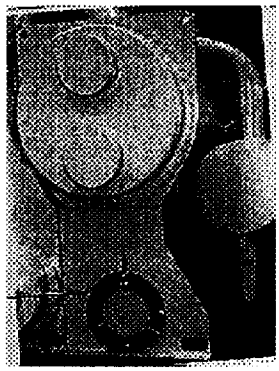


Table 7
Installation Data for CVHE/CVHF
150 PSIG Flange Adapters

Nom. Size (In./*mm*)	Ass'y Bolt Size (In.)*	No. Ass'y Bolts Req.	Bolt Pattern Dia. (In./*mm*)	Weight (Lbs./*kg*)
4/*100*	5/8 x 3	8	7.5/*191*	7.7/*3.5*
5/*125*	3/4 x 3-1/2	8	8.5/*216*	9.3/*4.2*
6/*150*	3/4 x 3-1/2	8	9.5/*241*	10.3/*4.7*
8/*200*	3/4 x 3-1/2	8	11.75/*298*	16.6/*7.5*
10/*250*	7/8 x 1/4	12	14.25/*362*	24.2/*11.0*
12/*300*	7/8 x 1/4	12	17.0/*432*	46.8/*21.2*
14/*350*	1 x 4-1/2	12	18.75/*476*	75.0/*34.0*
16/*400*	1 x 4-1/2	16	21.25/*540*	90.0/*40.8*

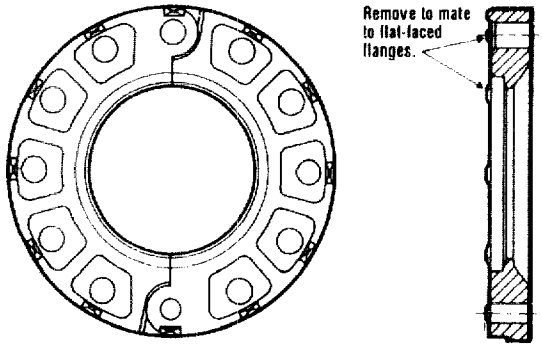
* Bolt size for conventional flange-to-flange connection. Longer bolts are required when flange washer must be used.

Table 8
Installation Data for CVHE/CVHF
300 PSIG Flange Adapters

Nom. Size (In./*mm*)	Ass'y Bolt Size (In.)*	No. Ass'y Bolts Req.	Bolt Pattern Dia. (In./*mm*)	Weight (Lbs./*kg*)
4/*100*	3/4 x 3-3/4	8	7.88/*200*	15.3/*6.9*
5/*125*	3/4 x 4	8	9.25/*235*	17.7/*8.0*
6/*150*	3/4 x 4-1/2	12	10.63/*270*	23.4/*10.6*
8/*200*	3/4 x 4-3/4	12	13.0/*330*	34.3/*15.6*
10/*250*	1 x 5-1/4	16	15.25/*387*	48.3/*21.90*
12/*300*	1-1/8 x 5-3/4	16	17.75/*451*	70.5/*32.0*

* Bolt size for conventional flange-to-flange connection. Longer bolts are required when flange washer must be used.

Figure 20
Modfying CVHE/CVHF 300 PSIG
Flange Adapters for Flat-Faced Flange Application



Bolt-Tightening Sequence for Water Piping Connections

A bolt-tightening sequence for flanges with flat gaskets or o-rings is described below and shown in Figure 21. Remember that improperly tightened flanges may leak!

Note: Before tightening any of the bolts, align the flanges. Flange bolt torque requirements are given in Table 9.

Flanges with 4, 8 or 12 Bolts. See Figure 21. Tighten all bolts to a snug tightness, following the appropriate numerical sequence for the flange. Repeat this sequence to apply the final torque to each bolt.

Flanges with 16, 20 or 24 Bolts. See Figure 21. Following the appropriate numerical sequence, tighten only the first half of the total number of bolts to a snug tightness. Next, sequentially tighten the remaining half of the bolts in the proper order.

Flanges with More than 24 Bolts. Refer to Figure 21 and sequentially tighten the first 12 bolts to a snug tightness. Tighten the next 12 consecutively numbered bolts in sequence, to the final torque.

Then, apply final torque to the first 12 bolts and the bolts not yet tightened (i.e., unnumbered bolts in Figure 21). Be sure to start with bolt "1" and move progressively around the flange in a clockwise direction.

Evaporator Water Box Covers. See Figure 21. Ensure that the water box head rests tightly against the tube sheet; then snugly tighten the 26 bolts in sequential order.

If excessive tube sheet crown prevents the head from contacting the tube sheet, tighten the bolts located where the greatest gaps occur. Be sure to use an equal number of bolt turns from side to side.

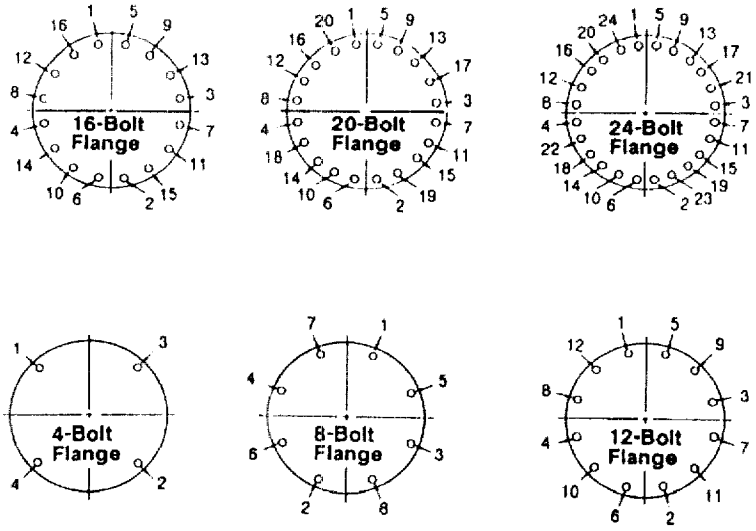
Finally, apply final torque to each bolt in sequential order. (Each bolt is identified by number in Figure 21.)

Table 9
Flange Bolt Torque Recommendations for O-Ring and Flat-Gasket Piping Connections (See Note).

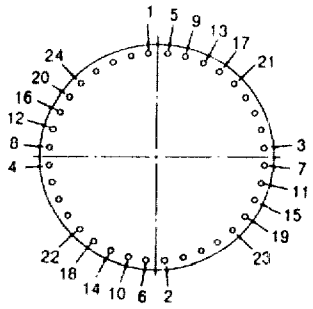
Bolt Size (In.)	Gasket Type	
	O-Ring	Flat
3/8	25 (34)	12-18 (16-24)
1/2	70 (95)	33-50 (45-68)
5/8	150 (203)	70-90 (95-122)
3/4	250 (339)	105-155 (142-210)

Note: Torques provided in ft./lbs. (Newton/metres)

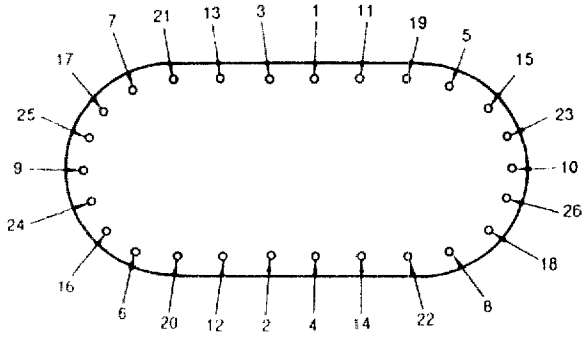
Figure 21
Bolt Tightening Sequences for Water Piping Flanges and Waterboxes



Flanges with more than 24 bolts



Evaporator Water Box Covers



Purifier Purge Requirements

Purge Installation

For certain CenTraVacs, the purge system is not mounted on the chiller when it ships. For 800-ton heat recovery chillers (see fold-out drawing of Figure 22 at end of manual) and for 1,250- and 1,400-ton chillers with auxiliary condensers, the Purifier Purge is shipped in a separate container that is secured to the chiller shipping skid. During chiller installation, the purge system must be installed on the chiller.

Install the purge system in accordance with the following instructions.

1. Remove Purifier Purge from its shipping brackets or container.

2. Disconnect purge gas and liquid lines and conduit from shipping bracket that spans purge supports on top of the heating or auxiliary condenser.

3. Remove shipping bracket and screws from purge supports and discard.

4. Locate purge on top of supports (purge base goes outside supports).

5. Secure purge to supports with four 1/4-20 x 1/2 long hex head thread rolling screws provided with unit.

6. Remove purge control panel access cover.

7. Connect 90° conduit connector to open 7/8 dia hole on side of control panel.

8. Connect conduit wires to terminal block in control panel as shown in wiring connection detail, Figure 23 (see fold-out drawing at end of manual).

9. Replace access cover on control panel.

10. Braze 1/4" FL and 5/8 ODS copper lines to purge per A.W.S. B CUP-3, (1/4" ODSW copper coupling provided with unit.

11. Open gas and liquid line ball valves before operating unit.

Refrigerant Vent-Line Piping

General Recommendations

Both the purge and rupture disc vent lines must be routed to outside atmosphere. Use only material compatible with the refrigerant in use. The use of PVC (not CPVC) piping is acceptable if the pipe joint is properly primed and if the adhesive used has been tested for refrigerant compatibility. Testing conducted in Trane laboratories has approved the use of the following materials for PVC pipe construction.

Primer - Hercules, Primer for PVC, #60-456;
Adhesive-Hercules, Clear PVC, Medium Body, Medium Set, #60-020.

Consult with the manufacturers of any field-provided components or materials added to the refrigerant-side of the machine for acceptable material compatibility.

Purge Discharge Vent Line

On CVHE and CVHF units, the purge discharge is factory-piped downstream of the rupture disc on the unit.

During vent line construction, provide a drip leg on the line that is of sufficient length to accommodate a minimum of one gallon of liquid. Provide a standard 1/4" FL x 1/4" NPT, capped refrigerant service valve to facilitate liquid removal. Accumulated liquid must be drained from the drip leg into an evacuated waste container once every six months, at a minimum; and more often if the purge operates excessively.

Rupture Disc Vent Installation

All CenTraVac chillers are equipped with carbon rupture discs. A cross-section of the rupture disc assembly appears in in Figure 24 along with an illustration indicating the location of the rupture disc on the suction elbow.

If refrigerant pressure within the evaporator exceeds 15 psig, the rupture disc breaks, shell pressure is relieved as refrigerant escapes from the chiller.

When constructing the rupture disc vent line, be sure to consult local codes for applicable guidelines and constraints.

Several general recommendations for rupture disc vent line installation are outlined below.

1. Verify that the vacuum support side of the rupture disc is positioned as shown in the cross-section view that appears in Figure 24.

Note: If the rupture disc was removed for any reason, it must be reinstalled as shown.

2. Do not apply threading torque to the outside pipe assembly when installing the connecting pipe.

CAUTION: Applying threading torque to the outside pipe may damage the rupture disc assembly.

3. Support the vent piping, use a flexible connection to avoid placing stress on the rupture disc. (Stress can alter rupture pressure and cause the disc to break prematurely.)

The flexible connector used to isolate the rupture disc from excessive vent line vibration must be compatible with the refrigerant in use. Use a flexible, steel connector such as the stainless-steel type MFP, style HNE, flexible pump connector (from Vibration Mounting and Control, Inc.) or equivalent.

See Figure 24 for a recommended relief piping arrangement.

Important! Vent pipe size must conform to ANSI/ASHRAE Standard 15-1992, which discusses vent pipe sizing. Use Table 10 and then Figure 25 to determine proper vent pipe size.

Note: To determine the total "C" value for a specific unit, add the appropriate "C" values for the evaporator, standard condenser and economizer. If the unit is equipped with any options (e.g., heat recovery, free cooling, or an auxiliary condenser), add the applicable "C" value(s) to this total. With this new sum, refer to Figure 25 to determine the vent line pipe diameter needed to handle flow.

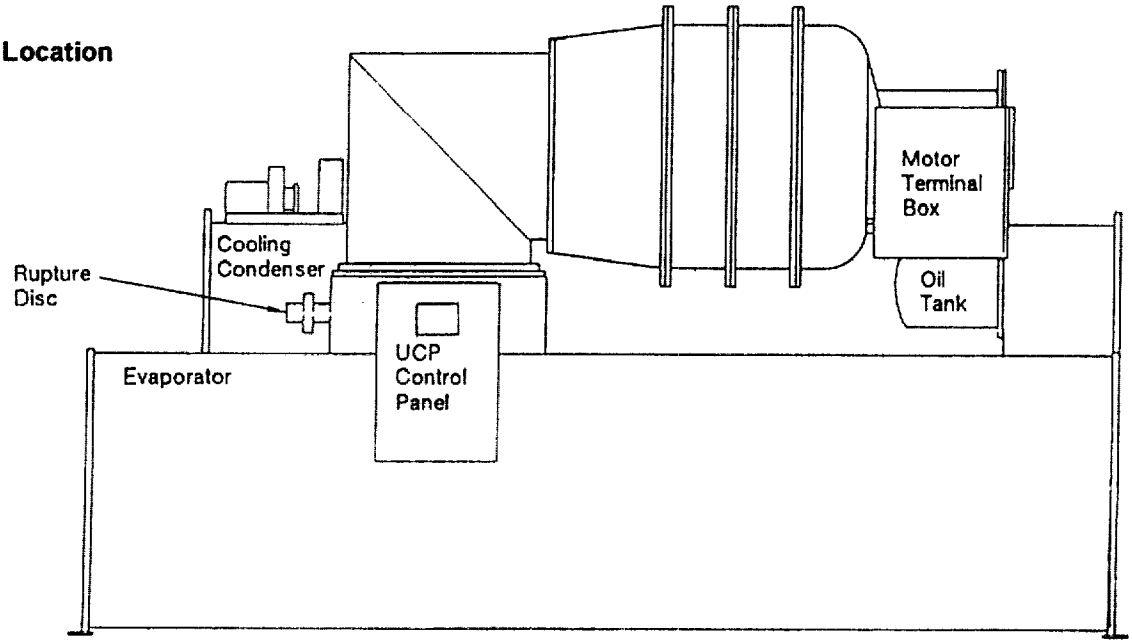
4. Normally, where multiple chillers are used, install a separate rupture disc vent line for each unit.

5. Consult local regulations for any special relief line requirements and refer to CFC-GUIDE-2 published by The Trane Co.

6. The discharge of the vent line outside should not be in the general vicinity of any fresh air intakes to the building. any gas venting from the vent line should not be allowed to re-enter the building.

Figure 24
Illustrated Rupture Disc Location, Cross Section of Rupture Disc and Recommended Rupture Disc Relief Piping

Rupture Disc Location



Cross Section of Rupture Disc

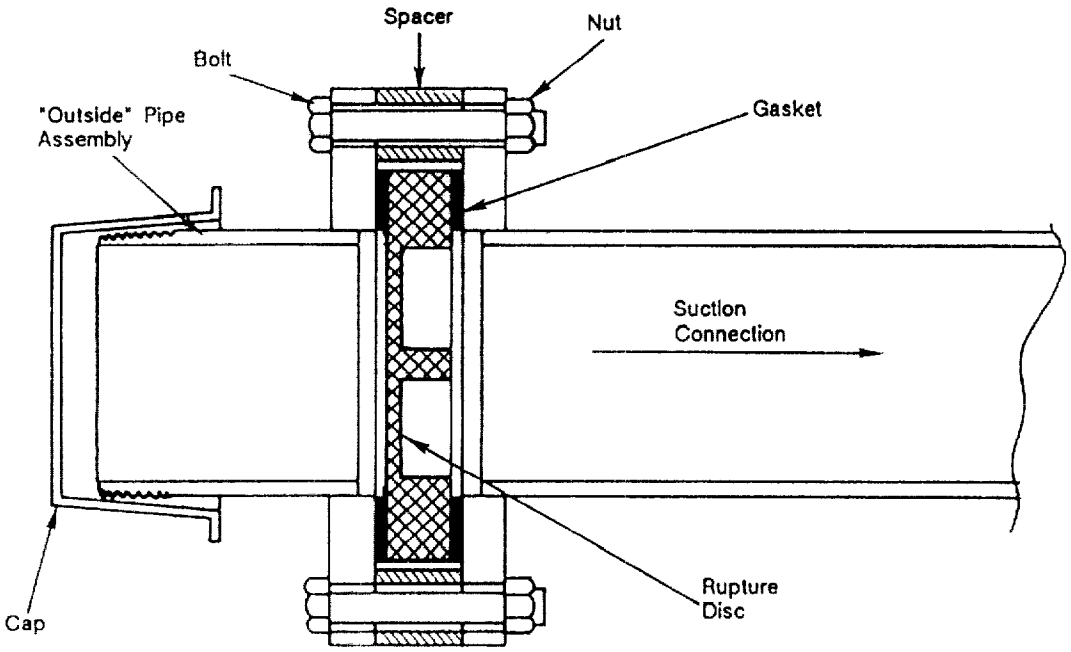


Figure 24 (Continued)

Recommended Arrangement for Rupture Disc Relief Piping

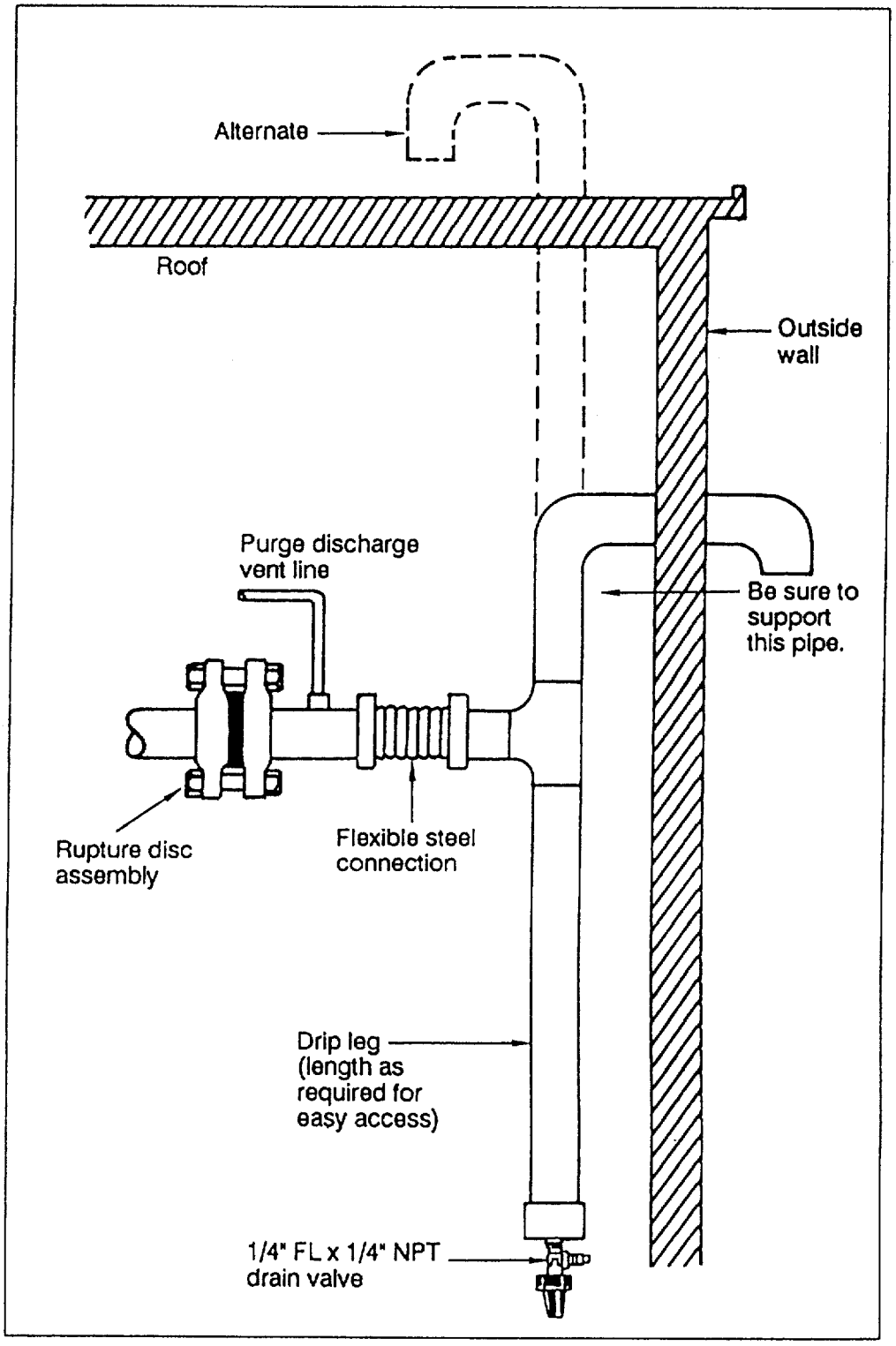


Table 10
"C" Values Used to Determine Rupture Disc Vent Line Sizes - CVHE/CVHF

Evap Size (EVSZ) (3)	Cond Size (CDSZ) (4)	"C" Values for Unit Components							
		Rupt. Disc Dia.	Evap	Std Cond	Econ	Short H.R. Cond	Long H.R. Cond	Aux. Cond.	With Free Cool
032S	032S	3"	26.25	18.87	4.85	18.87	25.19	15.28	4.16
032S	032L		26.25	25.19					
032L	032L		35.04	25.19					
050S	050S		33.05	23.56	7.44	23.56	31.45		6.16
050S	050L		33.05	31.45					
050L	050L		44.13	31.45					
080S	080S		45.59	29.06	11.63	29.06	38.80		5.87
080S	080L		45.59	38.80					
080L	080L		60.86	38.80					
125L	125L		65.86	48.50	15.80	n/a	48.50		8.10
140E	140L		74.30	50.50	17.40	n/a	Des. Spec.		Des. Spec.
142M	142S		58.07	38.32		38.32	n/a		7.10
142M	142L		58.47	50.50		n/a	50.50		
142L	142L		68.86	50.50					
210M	210S		66.81	42.54		42.54	n/a		7.10
210M	210L		66.81	56.72		n/a	56.72		
210L	210L		75.16	56.72					

Notes:

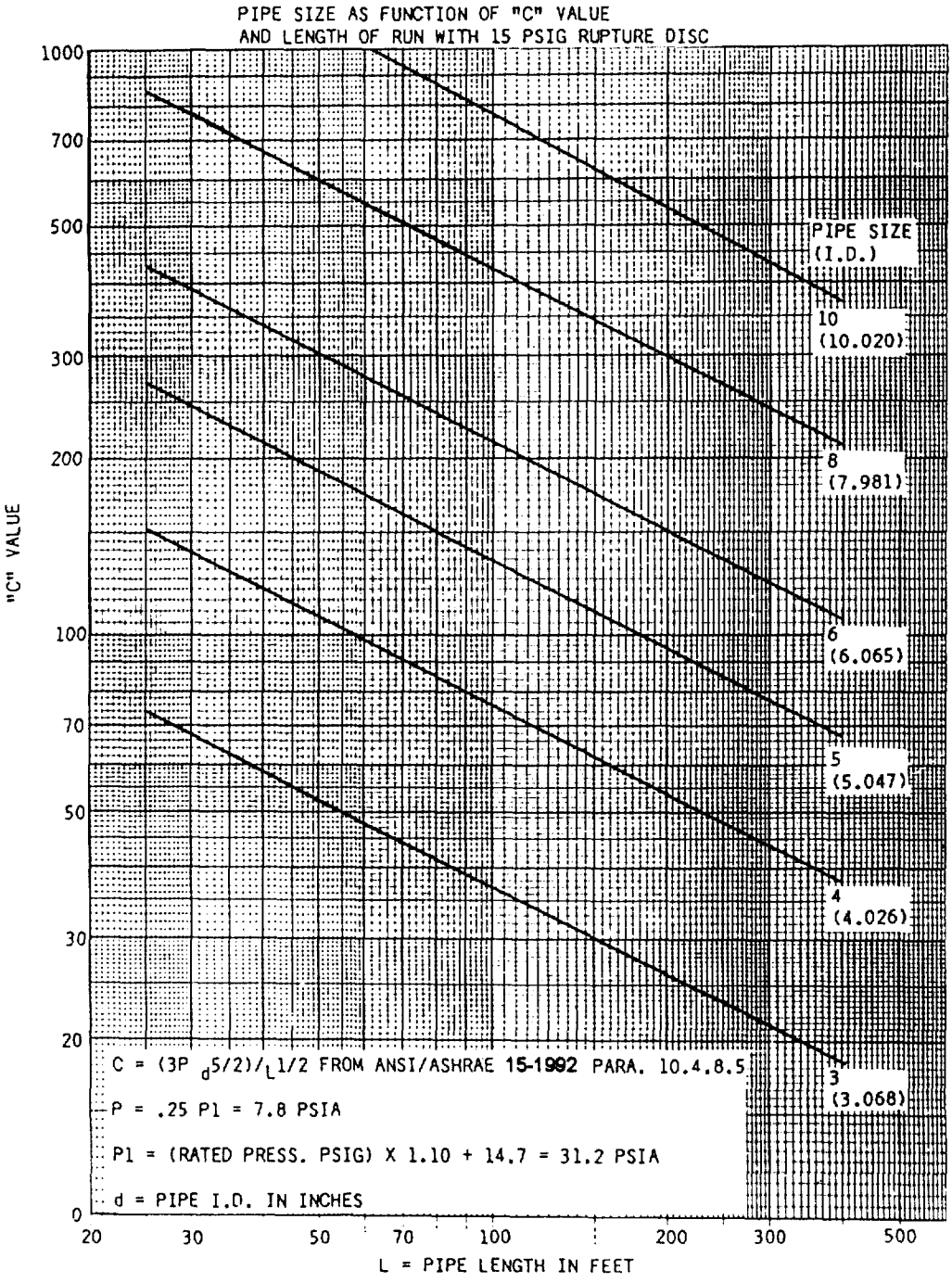
1. To determine the total "C" value for a specific unit, add the appropriate "C" values for the evaporator, standard condenser and economizer. If the unit is equipped with any options (e.g., heat recovery, free cooling, or an auxiliary condenser). add the applicable "C" values(s) to this total. With this new sum, refer to Figure 20 to determine the vent line pipe diameter needed to handle flow.

2. If piping multiple rupture discs (multiple units) to a common vent line, first determine the total "C" value for each unit, and then; add all "C" values together and apply the result to the "vent pipe sizing chart" in Figure 20.

3. EVSZ = Evaporator Shell Size;
   S =Short Shell
   L = Long Shell;
   E = Extended Shell
   M = Medium.

4. CDSZ = Condenser Shell Size;
   S =Short Shell
   L = Long Shell;
   E = Extended Shell.

Figure 25
Rupture Disc Vent Pipe Sizing



Unit Insulation Requirements

Factory-installed insulation is available as an option for all CVHE/CVHF units.

In those instances where the chiller is not factory-insulated, install insulation over the areas shaded in Figure 26. It may also be necessary to insulate the compressor suction cover and motor barrel if the unit is installed in an area subjected to high humidities.

The quantities of insulation required based on unit size and insulation thickness are listed in Table 8. Insulation thickness is determined at normal design conditions which are:

- 85° F Dry Bulb Ambient Temperature
- 75% Relative Humidity

Note: If the unit is not factory-insulated: Install insulation around the evaporator bulbwells; and, ensure that the bulbwells and connections for the water box drains and vents are still accessible after insulation is applied.

CAUTION: If the insulation will be painted in the field, use only water-based latex paints! Thinners and solvents used in other types of paints may cause seams in the insulation to open as a result of shrinkage.

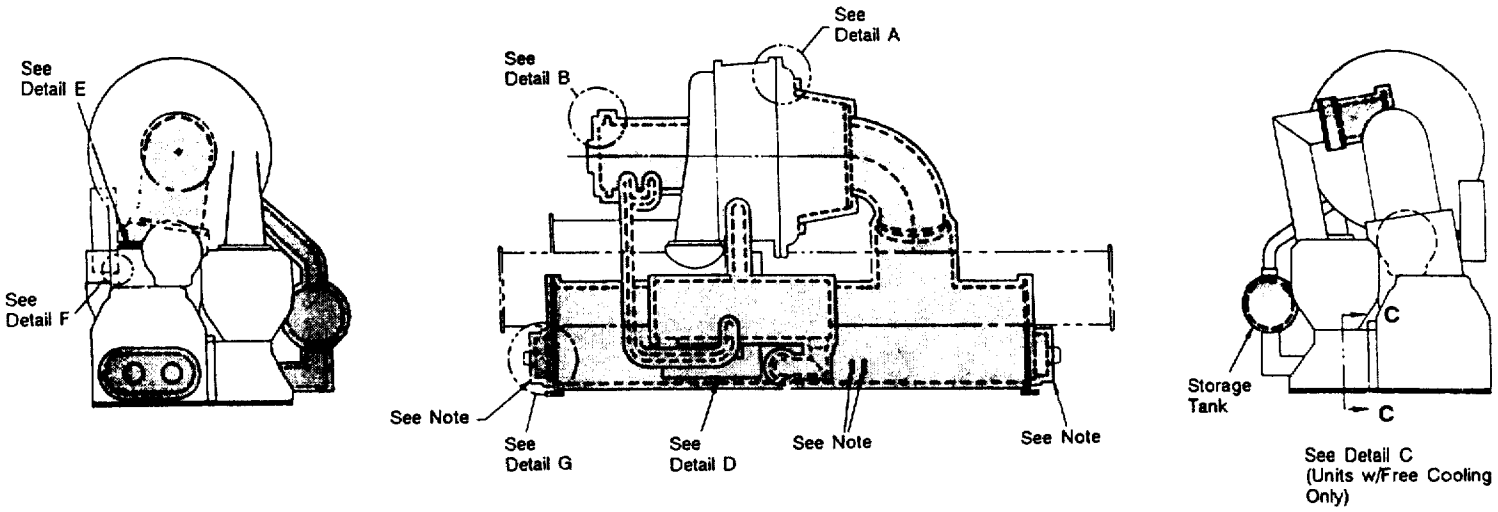
CAUTION: To prevent damage to the factory-installed insulation, do not allow excessive exposure to sunlight.

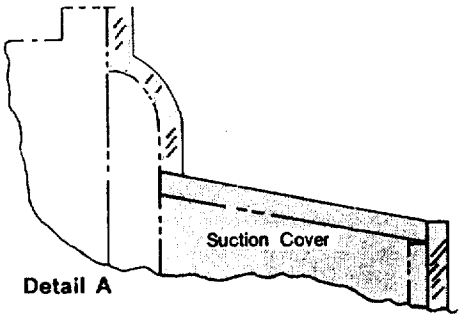
Table 11
CVHE/CVHF Evaporator Insulation Requirements

EVSZ (Note 1)	Standard Unit		Add for Free Cooling	
	3/4" Insulation (Note 2)	3/8" Insulation (Note 3)	3/4" Insulation (Note 2)	3/8" Insulation (Note 3)
032S	192 sq. ft.	24 sq. ft.	12 sq. ft.	24 sq. ft.
032L	216 sq. ft.	24 sq. ft.	12 sq. ft.	24 sq. ft.
050S	216 sq. ft.	36 sq. ft.	12 sq. ft.	24 sq. ft.
050L	252 sq. ft.	36 sq. ft.	12 sq. ft.	24 sq. ft.
080S	288 sq. ft.	48 sq. ft.	12 sq. ft.	24 sq. ft.
080L	348 sq. ft.	48 sq. ft.	12 sq. ft.	24 sq. ft.
125L	384 sq. ft.	96 sq. ft.	12 sq. ft.	36 sq. ft.
140E	460 sq. ft.	115 sq. ft.	15 sq. ft.	45 sq. ft.
142M	384 sq. ft.	115sq. ft.	n/a	n/a
142L	384 sq. ft.	115 sq. ft.	n/a	n/a
210M	518 sq. ft.	115 sq. ft.	n/a	n/a
210L	545 sq. ft.	115 sq. ft.	n/a	n/a

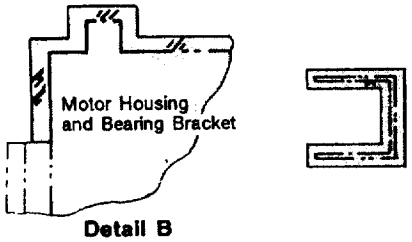
Notes:
1. EVSZ = Evaporator Shell Size, L = Long Shell, S = Short Shell.
2. 3/4" sheet insulation is installed on the evaporator, evaporator water boxes, compressor motor, suction elbow, and suction cover as indicated in Figure 21.
3. 3/8" sheet insulation is installed on all economizers. All liquid lines and other pipes require the use of 1/2"-wall pipe insulation, or 3/8" sheet insulation.

Figure 26
Recommended Areas for Unit Insulation

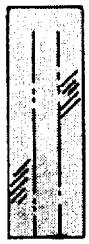




Detail A

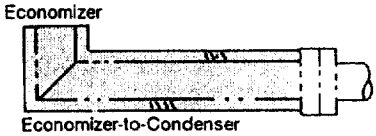


Detail B

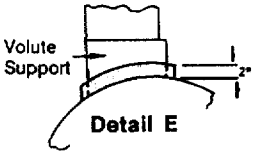


Condenser Support

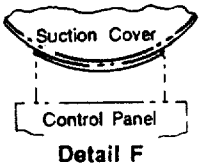
Detail C



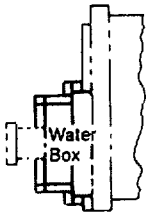
Detail D



Detail E



Detail F



Detail G

Note: Bulbwells, drain and vent connections must be accessible after insulating.

Electrical Wiring

Note: Unit-mounted starters are available as an option on CVHE/CVHF units with RLAs of 1315 amps or less, and with a nominal voltage of no more than 600 volts.

While this option eliminates most field-installed wiring requirements, the electrical contractor must still complete the electrical connection for: (1) power supply wiring to the starter, (2) other unit control options present, and (3) any field-supplied control devices.

General Recommendations

WARNING: To prevent injury or death due to electrical shock or contact with moving parts, lock supply power and chiller disconnect switches open.

As you review this manual, along with the wiring instructions presented in this section, keep in mind that:

. . .typical field connection requirements for remote-mounted starters are shown in fold-out drawings at end of manual, respectively, and summarized in Table 12.

. . .all field-installed wiring must conform to NEC guidelines, as well as to any applicable state and local codes. Be sure to satisfy any special grounding requirements that may be necessary

. . .compressor motor electrical data including motor kw, voltage utilization range, rated load amps and locked motor amps is listed in Tables 13 through 17 for your reference.

. . .all field-installed wiring should be checked for proper terminations, and for possible shorts or grounds.

Note: The typical customer connection diagrams shown (see fold-out drawings at end of manual) are representative of standard CVHE/CVHF units, and are provided only for general reference. Because these illustrations may not reflect the actual wiring of your unit always refer to the wiring diagrams that shipped with the chiller for specific electrical schematic and connection information.

Adjustable Frequency Drive Option

An overall layout of the Adjustable Frequency Drive option is shown in Figure 27 (see fold-out drawing). The following information is recommended when installing Adjustable Frequency Drive: Do not cut Adjustable Frequency Drive enclosure to provide electrical access. Removeable panels have been provided for this purpose. Modify these panels only; away from enclosure. Ref to installation information shipped with the adjustable frequency drive or submittal drawings.

WARNING: Do not cut Adjustable Frequency Drive enclosure. Debris falling inside frequency drive may cause failure of electronic components.

Table 12
CVHE/CVHF Field Wiring Requirements

Description of Wiring Power Supply Wiring	Start Panel Terminations	UCP Terminations
Standard Wiring: (To Terminal Block)		
3-Phase Power Supply	2TB2: G, L3, L2, L1	n/a
Starter/Motor Junction Box Interconnection (Remote Starter Only):	T1 thru T6 (as applicable by Starter Type)	n/a
Alternate Wiring: (To Circuit Breaker):		
3-Phase Power Supply	2CB1: G, L3, L2, L1	n/a
120 VAC Control Wiring		
Standard Circuits:		
Chilled Water Flow Proving	n/a	1TB1-10, 12 (incl. 5S1, 5K1)
Condenser Water Flow Proving	n/a	1TB1-11, 13 (incl. 5S2, 5K2)
Chilled Water Pump Relay	n/a	1U1-J12 -1,2
Condenser Water Pump Relay	n/a	1U1-J14 -1,2
UCP Ground Connection	n/a	G
120V Power Supply to UCP	2TB1-1, 2TB1-2	1TB1-1, 1TB1-2
High Pressure Cutout	2TB1-4	1TB1- 4
Oil Pump Interlock	2TB1-7 , 2TB1-8	1TB1-7 , 1TB1-8
(Remote Mounted Starters Only)		
Optional Wiring		
Compressor Running Relay	n/a	1U1-J16 -1,2,3
Alarm Relay	n/a	1U1-J18 -1,2,3
Limit Warning Relay	n/a	1U1-J20 -1,2,3
<30 VAC Control Wiring		
Optional Wiring		
External Autostop	n/a	1U1-J5 -1,2
Emergency Stop	n/a	1U1-J5 -3,4
Outdoor Air Temp Sensor	n/a	1U1-J5 -5,6
External Condensor Pressure Output	n/a	1U1-J7 -3,4
External Heat Pump Control	n/a	1U1-J7 -5,6
Options Module Wiring		
External Free Cooling Switch	n/a	1U5-J3 -5,6
External Ice Machine Control Enable	n/a	1U5-J3 -7,8
Heat Recovery Actuator Output	n/a	1U5-J7 -1,2
% RLA Output	n/a	1U5-J7 -3,4
External Current Limit Setpoint	n/a	1U5-J7 -11,12
External Chilled Water Setpoint	n/a	1U5-J9 -4,5
Ice Making Relay	n/a	1U5-J8 -1,2
Tracer Controlled Relay	n/a	1U5-J18 -1,2, 3
Head Relief Request Relay	n/a	1U5-J12 -1,2
Maximum Capacity Relay	n/a	1U5-J14 -1,2
Free Cooling Auxillary Relay	n/a	1U5-J20 -1,2

Table 13
60 HZ CVHE 230 thru 320
Compressor Motor Electrical Data

Compressor CPKW	Electrical Characteristics (Note 2)	Compressor Voltage												
		200	208	380	440	460	480	575	600	2300	2400	3300	4000	4160
142	RLA	444	434	234	200	192	185	155	150	n/a	n/a	n/a	n/a	n/a
	LRAY	1030	1071	565	408	426	447	352	367	n/a	n/a	n/a	n/a	n/a
	LRAD	3174	3314	1741	1251	1305	1369	1079	1131	n/a	n/a	n/a	n/a	n/a
	PFCC	15	15	25	15	15	15	15	15	n/a	n/a	n/a	n/a	n/a
154	RLA	483	469	255	220	210	202	168	163	n/a	n/a	n/a	n/a	n/a
	LRAY	1030	1071	565	408	426	447	352	367	n/a	n/a	n/a	n/a	n/a
	LRAD	3174	3314	1741	1251	1305	1369	1079	1131	n/a	n/a	n/a	n/a	n/a
	PFCC	15	15	25	15	15	15	15	15	n/a	n/a	n/a	n/a	n/a
171	RLA	536	282	282	243	232	223	186	179	n/a	n/a	n/a	n/a	n/a
	LRAY	1030	1071	565	408	426	447	352	367	n/a	n/a	n/a	n/a	n/a
	LRAD	3174	3314	1741	1251	1305	1369	1079	1131	n/a	n/a	n/a	n/a	n/a
	PFCC	15	15	25	15	15	15	15	15	n/a	n/a	n/a	n/a	n/a
187	RLA	590	563	307	268	257	243	205	195	n/a	n/a	n/a	n/a	n/a
	LRAY	1030	1071	565	408	426	447	352	367	n/a	n/a	n/a	n/a	n/a
	LRAD	3174	3314	1741	1251	1305	1369	1079	1131	n/a	n/a	n/a	n/a	n/a
	PFCC	15	15	25	15	15	15	15	15	n/a	n/a	n/a	n/a	n/a
204	RLA	655	720	342	294	282	272	226	217	56	54	39	n/a	31
	LRAY	1329	1380	629	504	529	554	396	414	n/a	n/a	339	32	252
	LRAD	4151	4311	1966	1575	1652	1731	1234	1293	421	436	n/a	242	n/a
	PFCC	45	45	40	30	30	30	30	30	25	25	50	n/a	25
231	RLA	741	720	387	338	32	309	256	246	63	60	44	25	35
	LRAY	1329	1380	629	504	529	554	396	414	n/a	n/a	339	242	252
	LRAD	4151	4311	1966	1575	1652	1731	1234	1293	421	436	n/a	n/a	n/a
	PFCC	45	45	40	30	30	30	30	30	25	25	50	25	25
257	RLA	826	800	438	373	360	360	287	277	70	67	49	40	39
	LRAY	1452	1520	861	677	711	746	522	548	n/a	n/a	339	242	252
	LRAD	4713	4933	2681	2105	2216	2325	1627	1709	421	436	n/a	n/a	n/a
	PFCC	60	60	75	50	50	50	40	40	25	25	50	25	25

Notes:

1. Motor furnished must have CPKW rating greater than or equal to the full load kw determined from Trane's computer selection program. Motor selections must correspond to available component cominations.
2. N/A = not available
   RLA = Rated Load Amps (Maximum values shown).
   LRAY = Locked Rotor Amps for Wye Configuration (Maximum values shown).

Table 14
60 HZ CVHE 360 thru 500 - Compressor Motor Electrical Data

Compressor CPKW	Electrical Characteristics (Note2)	Compressor Voltage												
		200	208	380	440	460	480	575	600	2300	2400	3300	4000	4160
204	RLA	658	640	349	297	288	283	228	222	56	54	39	32	31
	LRAY	1452	1520	861	677	711	746	522	548	n/a	n/a	339	242	252
	LRAD	4713	4933	2681	2105	2216	2325	1627	1709	421	436	n/a	n/a	n/a
	PFCC	60	60	75	50	50	50	40	40	25	25	50	25	25
231	RLA	740	720	394	337	324	315	257	248	63	60	44	37	35
	LRAY	1452	1520	861	677	711	746	522	548	n/a	n/a	339	242	252
	LRAD	4713	4933	2681	2105	2216	2325	1627	1709	421	436	n/a	n/a	25
	PFCC	60	60	75	50	50	50	40	40	25	25	50	25	n/a
257	RLA	826	800	438	373	360	389	287	277	70	67	55	40	39
	LRAY	1452	1520	861	677	711	746	522	548	n/a	n/a	339	242	252
	LRAD	4713	4933	2681	2105	2216	2326	1627	1709	421	436	n/a	n/a	n/a
	PFCC	60	60	75	50	50	50	40	40	25	25	50	25	25
287	RLA	925	892	488	337	403	439	321	309	78	75	55	45	43
	LRAY	1452	1520	861	677	711	929	522	548	n/a	n/a	339	242	252
	LRAD	4713	4933	2681	2105	2216	2888	1627	1709	421	436	n/a	n/a	n/a
	PFCC	60	60	75	50	50	60	40	40	25	25	25	25	25
323	RLA	1033	1003	546	468	451	488	359	346	89	86	62	51	49
	LRAY	1958	2040	1054	849	889	929	649	679	n/a	n/a	376	285	296
	LRAD	6078	6332	3281	2638	2763	2888	2020	2112	496	513	n/a	n/a	n/a
	PFCC	75	75	80	60	60	60	50	50	25	25	50	25	25
361	RLA	1150	1116	607	521	502	488	399	385	99	96	71	57	56
	LRAY	1958	2040	1054	849	889	929	649	679	n/a	n/a	452	334	347
	LRAD	6078	6332	3281	2638	2763	2888	2020	2112	581	601	n/a	n/a	n/a
	PFCC	75	75	80	50	60	60	50	50	50	50	50	50	50
403	RLA	1278	1245	683	582	561	545	445	430	111	108	79	64	63
	LRAY	3190	3329	1387	1060	1110	1160	803	839	n/a	n/a	504	391	407
	LRAD	9590	9991	4167	3185	3336	3487	2412	2521	680	704	n/a	n/a	n/a
	PFCC	75	75	100	60	60	60	50	50	50	50	50	50	50
453	RLA	1443	1406	759	649	626	607	498	481	126	122	88	72	70
	LRAY	3190	3329	1647	1283	1346	1410	1016	1063	n/a	n/a	504	391	407
	LRAD	9590	9991	4954	3668	4049	4233	3059	3197	680	704	n/a	n/a	n/a
	PFCC	75	75	0	60	60	60	50	50	50	50	50	50	50

Notes:

1. Motor funrished must have CPKW rating greater than or equal to the full load kw determined from Trane's computer selection program. Motor selections must correspond to available component cominations.

Table 15
60 HZ CVHE 560 thru 800
Compressor Motor Electrical Data

Compressor CPKW	Electrical Characteristics (Note 2)	Compressor Voltage												
		200	208	380	440	460	480	575	600	2300	2400	3300	4000	4160
323	RLA	1033	1003	546	465	449	439	353	342	89	86	62	51	49
	LRAY	1958	2040	1387	1060	1110	1160	803	839	n/a	n/a	376	285	296
	LRAD	6078	6332	4167	3185	3386	3487	2412	2512	496	513	n/a	n/a	n/a
	PFCC	75	75	100	60	60	60	50	50	25	25	50	25	25
361	RLA	1150	1116	610	517	499	487	396	382	99	96	71	57	56
	LRAY	1958	2040	1387	1060	1110	1160	803	839	n/a	n/a	452	334	347
	LRAD	6078	6332	4167	3185	3336	3487	2421	2521	581	601	n/a	n/a	n/a
	PFCC	75	75	100	60	60	60	50	50	50	50	50	50	50
403	RLA	826	1245	683	582	561	545	445	430	111	108	79	64	63
	LRAY	1452	3329	1387	1060	1110	1160	803	839	n/a	n/a	504	391	407
	LRAD	3174	9991	4167	3185	3336	3487	2421	2521	680	704	n/a	n/a	n/a
	PFCC	15	75	100	60	60	60	50	50	50	50	50	50	50
453	RLA	590	1406	759	649	626	607	498	481	126	122	88	72	70
	LRAY	1030	3329	1647	1283	1346	1410	1016	1063	n/a	n/a	504	391	407
	LRAD	3174	9991	4954	3866	4049	4233	3197	3197	680	704	n/a	n/a	n/a
	PFCC	75	75	90	60	60	60	50	50	50	50	50	50	50
512	RLA	n/a	n/a	873	750	719	694	551	551	145	139	101	84	81
	LRAY	n/a	n/a	1292	975	1022	1069	796	796	n/a	n/a	490	380	396
	LRAD	n/a	n/a	4068	3072	3219	3367	2507	2507	661	685	n/a	n/a	n/a
	PFCC	n/a	n/a	125	90	90	90	80	80	50	50	150	50	100
588	RLA	n/a	n/a	996	849	820	798	631	1091	167	160	117	96	9
	LRAY	n/a	n/a	1709	1316	1379	1443	1091	3420	n/a	n/a	559	422	43
	LRAD	n/a	n/a	5361	4130	4329	4529	3420	100	734	760	n/a	n/a	n/a
	PFCC	n/a	n/a	150	100	100	100	100	695	100	100	150	100	100
653	RLA	n/a	n/a	1101	945	911	886	695	1138	186	179	130	107	10
	LRAY	n/a	n/a	1849	1485	1556	1628	1138	679	n/a	n/a	618	509	53
	LRAD	n/a	n/a	5795	4649	4872	5097	3572	3572	885	917	n/a	n/a	n/a
	PFCC	n/a	n/a	150	100	100	100	100	100	100	100	200	100	100

Notes:

1. Motor funrished must have CPKW rating greater than or equal to the full load kw determined from Trane's computer selection program. Motor selections must correspond to available component cominations.
2. N/A = not available
   RLA = Rated Load Amps (Maximum values shown).
   LRAY = Locked Rotor Amps for Wye Configuration (Maximum values shown).
   LRAD = Locked Rotor Amps for Delta Configuration (Maximum values shown).
   PFCC = Power Factor Correction Capacitor Size (KVARs). PFCCs are slected for PFCC design voltage (Table 18). Do not exeed these

Table 16
60 Hz CVHE 890 thru 1250
Compressor Motor Electrical Data

Compressor CPKW	Electrical Characteristics (Note2)	Compressor Voltage												
		200	208	380	440	460	480	575	600	2300	2400	3300	4000	4160
512	RLA	900	750	738	730	288	283	228	222	56	54	39	32	81
	LRAY	1943	1462	1533	1604	711	746	522	548	n/a	n/a	339	242	439
	LRAD	5998	4560	4780	5001	2216	2325	1627	1709	421	436	n/a	n/a	n/a
	PFCC	200	125	125	125	50	50	40	40	25	25	50	25	100
588	RLA	1020	858	835	821	324	315	257	248	63	60	44	37	93
	LRAY	1943	1462	1533	1604	711	746	522	548	n/a	n/a	339	242	439
	LRAD	5998	4560	4780	5001	2216	2325	1627	1709	421	436	n/a	n/a	n/a
	PFCC	200	125	125	125	50	50	40	40	25	25	50	25	100
653	RLA	1101	945	911	886	360	389	287	277	70	67	55	40	103
	LRAY	1849	1485	1555	1628	711	746	522	548	n/a	n/a	339	242	530
	LRAD	5795	4649	4872	5097	2216	2326	1627	1709	421	436	n/a	n/a	n/a
	PFCC	150	100	100	100	50	50	40	40	25	25	50	25	100
745	RLA	1237	1068	1023	989	403	439	321	309	78	75	55	45	117
	LRAY	2043	1659	1739	1821	711	929	522	548	n/a	n/a	339	242	646
	LRAD	6388	5124	5370	5622	2216	2888	1627	1709	421	436	n/a	n/a	n/a
	PFCC	125	100	100	100	50	60	40	40	25	25	25	25	150
856	RLA	1426	1221	1170	1131	451	488	359	346	89	86	62	51	134
	LRAY	2648	1954	2078	2143	889	929	649	679	n/a	n/a	376	285	694
	LRAD	8193	6042	6333	6626	2763	2888	2020	2112	496	513	n/a	n/a	n/a
	PFCC	180	100	100	100	60	60	50	50	25	25	50	25	150
957	RLA	1588	1366	1307	1260	502	488	399	385	99	96	71	57	149
	LRAY	2931	2162	2266	2371	889	929	649	679	n/a	n/a	452	334	767
	LRAD	9074	6691	7014	7338	2763	2888	2020	2112	581	601	n/a	n/a	n/a
	PFCC	160	120	120	120	60	60	50	50	50	50	50	50	150

Notes:

1. Motor funrished must have CPKW rating greater than or equal to the full load kw determined from Trane's computer selection program. Motor selections must correspond to available component cominations.
2. N/A = not available
   RLA = Rated Load Amps (Maximum values shown).
   LRAY = Locked Rotor Amps for Wye Configuration (Maximum values shown).
   LRAD = Locked Rotor Amps for Delta Configuration (Maximum values shown).
   PFCC = Power Factor Correction Capacitor Size (KVARs). PFCCs are slected for PFCC design voltage (Table 18). Do not exeed these values.

Table 17
60 Hz CVHF 650 thru 1280
Compressor Motor Electrical Data

Compressor CPKW	Electrical Characteristics (Note 2)	Compressor Voltage												
		380	440	460	480	575	600	2300	2400	3300	4000	4160	4800	6600
257	RLA	434	368	355	347	282	272	69.4	66.8	48.9	39.9	38.6	34.8	26.4
	LRAY	1387	1060	1110	1160	803	839	n/a	n/a	339	244	254	290	256
	LRAD	4167	3185	3336	3487	2412	2521	421	440	n/a	n/a	n/a	n/a	n/a
	PFCC	100	60	60	60	50	50	25	25	25	25	25	55	n/a
287	RLA	485	411	397	387	315	304	77.5	74.5	54.4	44.6	43	38.4	28.9
	LRAY	1387	1060	1110	1160	803	839	n/a	n/a	339	246	256	290	256
	LRAD	4167	3185	3336	3487	2412	2521	424	442	n/a	n/a	n/a	n/a	n/a
	PFCC	100	60	60	60	50	50	25	25	25	25	25	n/a	n/a
323	RLA	546	463	446	436	354	341	88.6	85.4	62.1	51	49.3	43.1	32.2
	LRAY	1387	1060	1110	1160	803	839	n/a	n/a	375	284	296	290	256
	LRAD	4167	3185	3336	3487	2412	2521	491	512	n/a	n/a	n/a	n/a	n/a
	PFCC	100	60	60	60	50	50	25	25	25	25	25	n/a	n/a
361	RLA	610	517	499	487	396	382	99	95.8	70.2	57	55.3	47.7	35.4
	LRAY	1387	1060	1110	1160	803	839	n/a	n/a	451	333	347	290	256
	LRAD	4167	3185	3336	3487	2412	2521	575	600	n/a	n/a	n/a	n/a	n/a
	PFCC	100	60	60	60	50	50	25	50	50	25	50	50	n/a
403	RLA	683	582	561	545	445	430	111	108	78	64	62	53.6	39.3
	LRAY	1387	1060	1110	1160	803	839	n/a	n/a	502	390	405	334	256
	LRAD	4167	3185	3336	3487	2412	2521	672	702	n/a	n/a	n/a	n/a	n/a
	PFCC	100	60	60	60	50	50	50	50	50	50	50	60	n/a
453	RLA	759	649	626	607	498	481	125	121	88	72.1	69.9	60.3	44.2
	LRAY	1647	1283	1346	1410	1016	1063	n/a	n/a	502	390	405	334	256
	LRAD	4954	3866	4049	4233	3059	3197	672	702	n/a	n/a	n/a	n/a	n/a
	PFCC	90	60	60	60	50	50	50	50	50	50	50	60	n/a
512	RLA	871	750	718	692	573	550	143	137	99	82	79	68.6	49.8
	LRAY	1279	968	1015	1062	759	791	n/a	n/a	487	419	436	375	256
	LRAD	4044	3052	3185	3346	2384	2483	723	755	n/a	n/a	n/a	n/a	n/a
	PFCC	80	80	80	90	80	80	75	75	75	75	75	85	80

Notes:

1. Motor funrished must have CPKW rating greater than or equal to the full load kw determined from Trane's computer selection program. Motor selections must correspond to available component cominations.
2. N/A = not available
   RLA = Rated Load Amps (Maximum values shown).
   LRAY = Locked Rotor Amps for Wye Configuration (Maximum values shown).
   LRAD = Locked Rotor Amps for Delta Configuration (Maximum values shown).
   PFCC = Power Factor Correction Capacitor Size (KVARs). PFCCs are slected for PFCC design voltage (Table 18). Do not exeed these values.

Table 17 (Continued)
60 Hz CVHF 650 thru 1280
Compressor Motor Electrical Data

Compressor CPKW	Electrical Characteristics (Note 2)	Compressor Voltage												
		380	440	460	480	575	600	2300	2400	3300	4000	4160	4800	6600
588	RLA	993	849	818	794	650	629	163	156	114	94	90	78.5	57.1
	LRAY	1700	1247	1370	1433	1036	1089	n/a	n/a	555	419	436	375	324
	LRAD	5309	4104	4283	4502	3249	3384	723	755	n/a	n/a	n/a	n/a	n/a
	PFCC	125	80	100	100	80	100	75	75	75	75	75	90	100
653	RLA	1099	945	910	883	723	695	182	175	127	105	101	87.4	63.5
	LRAY	1836	1474	1545	1617	1080	1130	n/a	n/a	613	505	526	438	362
	LRAD	5727	4618	4816	5066	3392	3530	871	910	n/a	n/a	n/a	n/a	n/a
	PFCC	100	90	100	120	80	90	75	100	75	75	100	100	100
745	RLA	1238	1068	1024	988	817	789	206	199	144	118	115	99	72.1
	LRAY	2027	1632	1710	1789	1363	1425	n/a	n/a	795	615	640	513	362
	LRAD	6314	5095	5312	5587	4210	4381	1061	1108	n/a	n/a	n/a	n/a	n/a
	PFCC	90	90	90	100	90	100	100	100	100	100	100	100	110
856	RLA	1425	1223	1171	1131	937	900	236	227	166	136	131	114	81.9
	LRAY	2630	1940	2034	2128	1504	1574	n/a	n/a	884	661	688	608	463
	LRAD	8091	6001	6288	6581	4654	4841	1139	1190	n/a	n/a	n/a	n/a	n/a
	PFCC	120	90	100	120	100	110	100	100	100	100	100	130	110
957	RLA	1588	1368	1309	1260	1046	1003	264	253	185	152	146	127	91.1
	LRAY	2910	2153	2257	2361	1677	1754	n/a	n/a	1020	729	759	659	491
	LRAD	8959	6668	6925	7312	5192	5400	1258	1314	n/a	n/a	n/a	n/a	n/a
	PFCC	120	100	100	120	100	100	100	100	100	100	100	130	100
1062	RLA	n/a	1510	1451	1403	1155	1113	290	279	203	167	161	140	101
	LRAY	n/a	2525	2645	2766	1986	2077	n/a	n/a	1152	880	916	795	576
	LRAD	n/a	7848	8267	8598	6162	6477	1518	1585	n/a	n/a	n/a	n/a	n/a
	PFCC	n/a	100	125	150	100	125	100	100	100	100	100	100	110
1228	RLA	n/a	n/a	n/a	n/a	n/a	n/a	335	322	235	193	186	161	n/a
	LRAY	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1380	1003	1044	883	n/a
	LRAD	n/a	n/a	n/a	n/a	n/a	n/a	1730	1806	n/a	n/a	n/a	n/a	n/a
	PFCC	n/a	n/a	n/a	n/a	n/a	n/a	100	100	100	100	100	100	n/a

Notes:

1. Motor furnished must have CPKW rating greater than or equal to the full load kw determined from Trane's computer selection program. Motor selections must correspond to available component combinations.
2. N/A = not available
   RLA = Rated Load Amps (Maximum values shown).
   LRAY = Locked Rotor Amps for Wye Configuration (Maximum values shown).

Power Supply Wiring

To assure that power supply wiring to the starter panel is properly installed and connected, review and follow the guidelines outlined below.

3-Phase Power Source

1. Verify that the starter nameplate ratings are compatible with the power supply characteristics — and with the electrical data on the CVHE/CVHF nameplate.

2. If the starter enclosure must be cut to provide electrical access, exercise care to prevent debris from falling inside the enclosure.

CAUTION: Debris inside the starter panel may cause an electrical short that seriously damages the starter components.

3. Use copper wire to connect the 3-phase power supply to the remote- or unit-mounted starter panel.

CAUTION: To avoid corrosion or overheating, use only copper conductors for terminal connections.

4. Size the power supply wiring in accordance with NEC, using the RLA value stamped on the chiller nameplate and transformer load on L1 and L2.

Note: All CVHE/CVHF units are designed to comply with NEC guidelines.

5. Make sure that the incoming power wiring is properly phased; each power supply conduit run to the starter must carry the correct leads to ensure equal phase representation. See Figure 30.

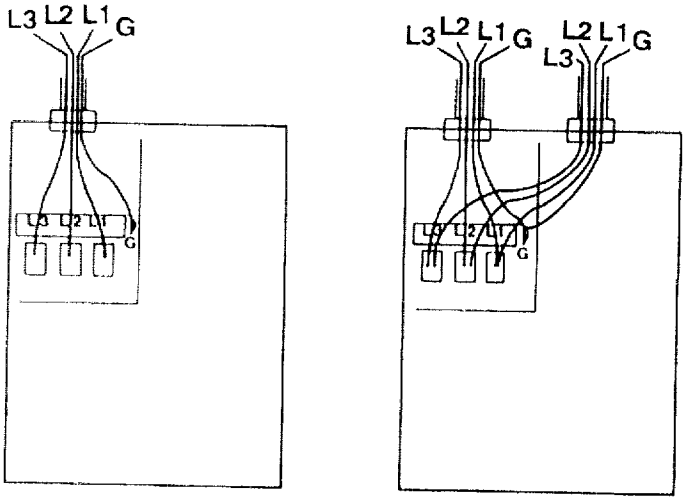
6. As you install the power supply conduit, make sure that its position does not interfere with the serviceability of any of the CVHE/CVHF components, nor with structural members and equipment. Also, assure that the conduit is long enough to simplify any servicing that may be necessary in the future (e.g., starter removal).

Note: Use flexible conduit to enhance serviceability and minimize vibration transmission.

Circuit Breakers and Fusible Disconnects

In compliance with NEC guidelines, size the circuit breaker or fused disconnect, the chiller nameplate max. fuse size or max circuit breaker size marking.

Figure 30
Proper Phasing for Starter Power Supply Wiring



Optional PFCCs

Power factor correction capacitors (PFCCs) are designed to provide power factor correction for the compressor motor. Available as an option for unit-mounted starters, and remote-mounted starter.

Note: Remember that the PFCC nameplate voltage rating must be greater than or equal to the compressor voltage rating stamped on the unit nameplate. See Table 18 to determine what size PFCC is appropriate for each compressor voltage application.

CAUTION: PFCCs must be wired into the starter correctly! Misapplication of these capacitors could result in a loss of motor overload protection and subsequently motor damage.

PFCCs are wired as shown in Figure 31 where the capacitor leads are run through the overload transformer.

Table 18
PFCC Sizing per Compressor Voltage Application

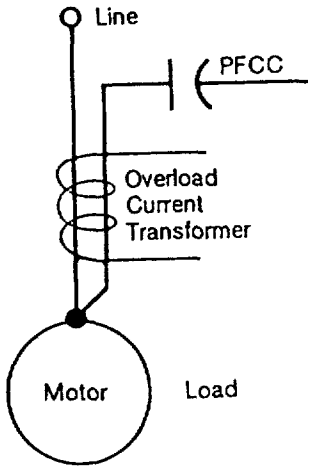
PFCC Design Voltage	Compressor Motor Voltage (See CVHE Nameplate)
240V/60 Hz	200V/60 Hz
	208V/60 Hz
480V/60 Hz	380V/60 Hz
	440V/60 Hz
	460V/60 Hz
	480V/60 Hz
600V/60 Hz	575V/60 Hz
	600V/60 Hz
2400V/60 Hz	2300V/60 Hz
	2400V/60 Hz
4160V/60 Hz	3300V/60 Hz
	4000V/60 Hz
	4160V/60 Hz

Note: See price sheets for maximum capacitor size selection at PFCC design volts above.

PFCC Rating	Compressor Motor Rating (See CVHE Nameplate)
480V/50 Hz	346V/50 Hz
	380V/50 Hz
	400V/50 Hz
	415V/50 Hz
4160V50 H	3300V/50 Hz

Note: See price sheets for maximum capacitor size selection at PFCC design volts above.

Figure 31
PFCC Leads Routed thru Overload Current Transformer

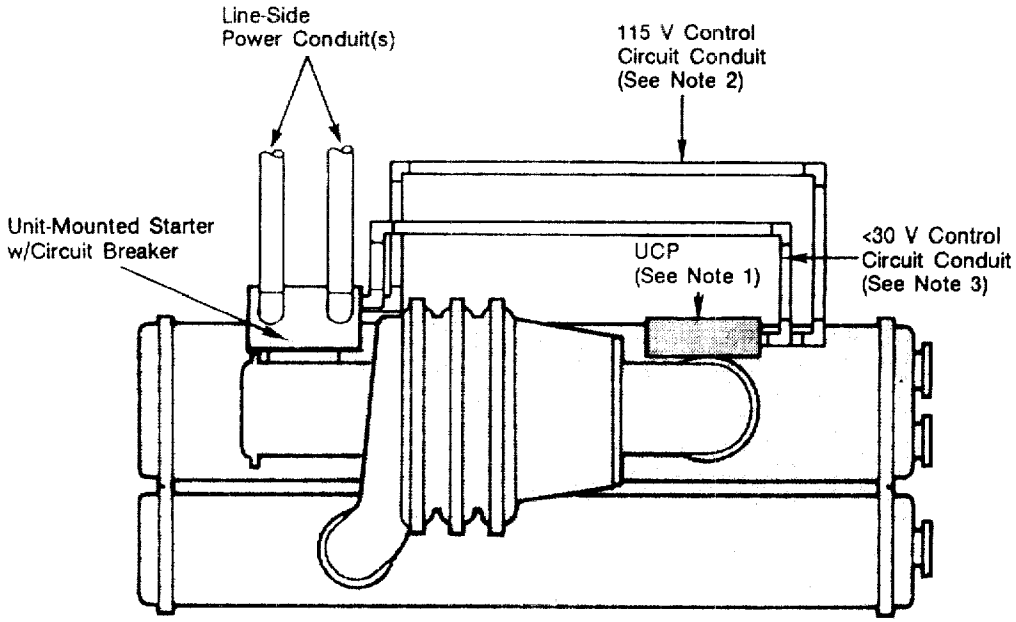


Interconnecting Wiring

Typical equipment room conduit layouts with and without unit-mounted starters and AFD are shown in Figures 32 and 33, respectively.

Keep in mind that the interconnecting wiring between the starter panel, compressor and UCP2 control panel is factory-installed with unit-mounted starters, but must be field-installed when a remote-mounted starter or AFD is used.

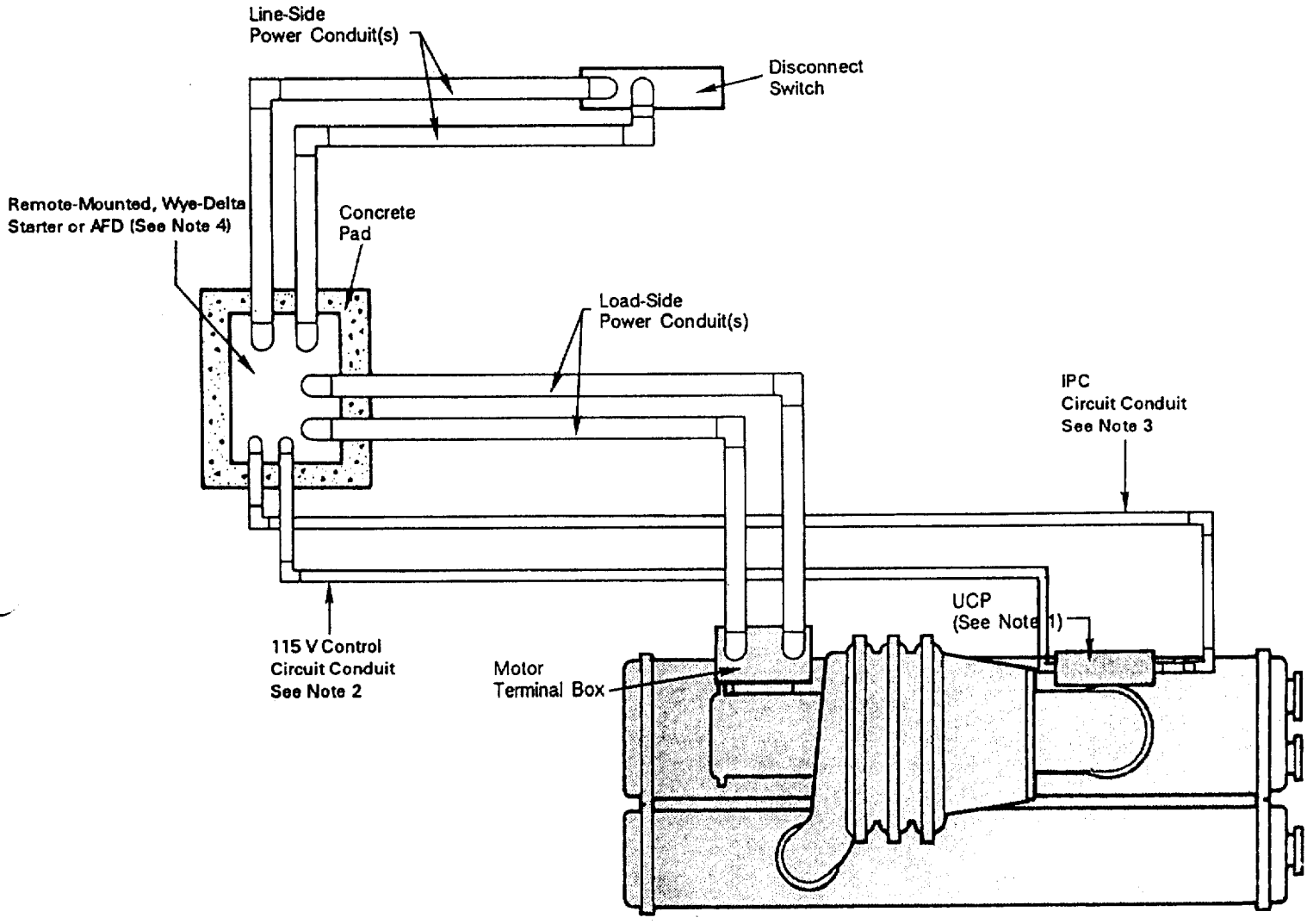
Figure 32
Typical Equipment Room Layout for CVHE/CVHF w/Unit-Mounted, Wye-Delta Starter



Notes:

1. Refer to the unit field connection diagram for approximate UCP knockout locations.
   CAUTION: To prevent damage to the UCP's components, do NOT route control circuit conduit into the top of the UCP enclosure.
2. 115-Volt conduit must enter the right back portion of the unit control panel (UCP).
3. IPC circuit conduit must enter the left back portion of the UCP.
4. See Starter Submittal Drawing for location of incoming wiring to the starter.

Figure 33
Typical Equipment Room Layout for CVHE/CVHF w/Remote-Mounted, Wye-Delta Starter



Notes:

1. Refer to the unit field connection diagram for approximate UCP knockout locations.
   CAUTION: To prevent damage to the UCP's components, do NOT route control circuit conduit into the top of the UCP enclosure.
2. 115-Volt conduit must enter the right back portion of the unit control panel (UCP).
3. IPC circuit conduit must enter the left back portion of the UCP.
4. AFD option - Use removable panel to provide access for electrical. Do not cut enclosure.

Starter to Motor (Remote-Mounted Starters Only and Adjustable Frequency Drive)

Ground Wire Terminal Lugs. Ground wire lugs are provided in the motor terminal box, and in the starter panel.

Terminal Clamps. Terminal clamps are supplied with the motor terminals to accommodate either bus bars or standard motor terminal wire lugs. Terminal clamps provide additional surface area to minimize the possibility of improper electrical connections.

Wire Terminal Lugs. Wire terminal lugs must be field-supplied.

1. Use field-provided crimp-type wire terminal lugs properly sized the application.

Note: Wire size ranges for the starter line- and load-side wire lugs are listed on the starter submittal drawings supplied by the starter manufacturer. Carefully review the submitted wire lug sizes for compatibility with the conductor sizes specified by the electrical engineer or contractor.

2. A terminal clamp with a 3/8" bolt is provided on each motor terminal stud; use the factory-supplied Belleville washers on the wire lug connections.

Figure 34 illustrates the juncture between a motor connection pad and the wire terminal lug.

3. Tighten each bolt to 24 foot-pounds.

4. Install <u>but do not connect</u> the power lead between the starter and compressor motor. (These connections will be completed under supervision of a qualified Trane service engineer after the prestart inspection).

CAUTION: Reversing the input leads with the output leads of an AFE will cause catastrophic failure of AFD transistors. Ensure the power supply wiring and output to motor wiring are connected to the proper terminals.

Bus Bars. Install bus bars between the motor terminals when a low-voltage "across-the-line", "primary reactor/resistor" or "auto transformer", or AFD starter is used.

Be sure to jumper motor Terminal T1 to T6, T2 to T4, and T3 to T5.

Bus bars and extra nuts are available as a Trane option.

Note: Bus bars are not needed in high-voltage applications since only 3 terminals are used in the motor and starter.

Starter to UCP (Remote-Mounted Starters Only and Adjustable Frequency Drive)

Electrical connections required between the remote-mounted starter and the chiller control panel (UCP) are shown in Figure 29 and outlined in Table 12. Refer to Figure 27 for AFD. A point-to-point starter-to-UCP connection schematic is shown in Figure 35.

Note: Install conduit between the right back portion when facing the front of the UCP and the starter for the 115-volt circuits; and between the left back portion of the UCP and the starter for the IPC circuit (Figure 35).

When sizing and installing the electrical conductors for these circuits, follow these guidelines.

CAUTION: Debris inside the starter panel may cause an electrical short that seriously damages the starter components.

1. If the starter enclosure must be cut to provide electrical access, exercise care to prevent debris from falling inside the enclosure. Do not cut AFD enclosure

2. Use only shielded twisted pair for the IPC circuit between the starter and the UCP on remote mounted starters. Recommended wire is Beldon Type 8760, 18 AWG for runs up to 1000 feet.

Note: The polarity of the IPC wire pair is critical for proper operation.

3. Separate low-voltage (less than 30V) wiring from the 115V wiring by running each in its own conduit.

4. As you route the IPC circuit out of the starter enclosure, making sure that it is at least 6" from all wires carrying a higher voltage.

5. For UCP2 IPC Shielded Twisted Pair wiring, the shield should be grounded on one end only at UCP2. The other end should be un-terminated and taped back on the cable sheath to prevent any contact between shield and ground.

CAUTION: To ensure that electrical noise does not distort the signals carried by the low-voltage wiring, including the IPC, maintain at least 6" between low-voltage (<30V) and 115V circuits.

Purge Control Panel to UCP (Field installed purge only)

Install wiring between the purge control panel and the UCP for 115/volt circuits and the IPC circuits as shown in Figure 36.

Figure 34
Terminal Stud, Clamp and Lug Assembly

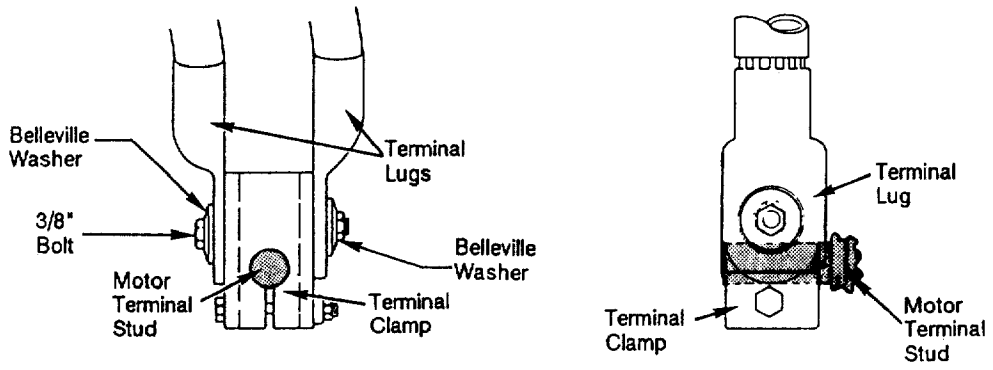


Figure 35
UCP2 Control Panel Connections

Trane Supplied
Remote Starter Connections
** Not required on X-Line Starters*

1TB1		2TB1
1	------115 VAC [H]------	1
2	------115 VAC [N]------	2
5*	------Run Relay-------	6*
9	------Start Relay-------	4
7	---Oil Pump Interlock----	8
8	---Oil Pump Interlock----	9

Trane Supplied
Adjustable Frequency Drive
Connections

1TB1		2TB1
1	----115 VAC [H]----	201
2	----115 VAC [N]----	202
5	------Shunt Trip-----	203
9	------Run Relay------	204
7	---Oil Pump Interlock----	206
8	---Oil Pump Interlock----	207

Note: See Manufacturer's Drawings for Starters by Others.

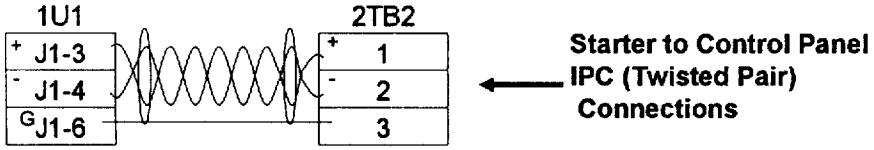
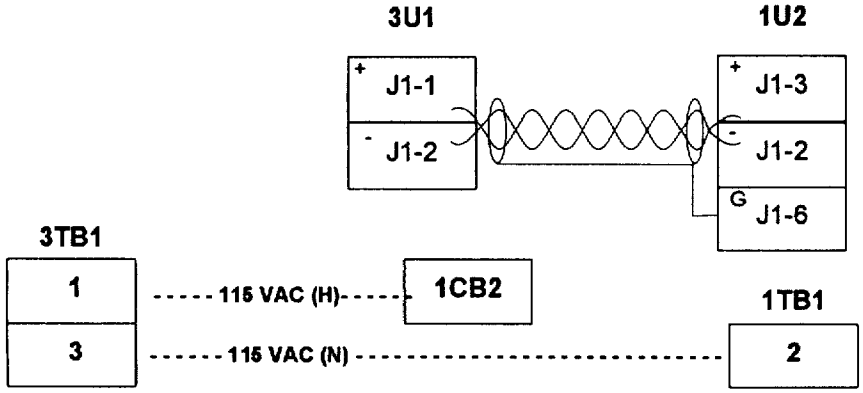


Figure 36
Field Installed Purge



Note: The polarity of the IPC wire pair is critical for proper operation.

UCP Electrical Specifications

Following is a list of constraints for the UCP2 in the control panel :

Note that the control panel is designed to receive input from the secondary of a power transformer in the starter panel.

1. Nominal Voltage: 115 VAC, with operating range of 98 to 132 VAC, inclusive.
2. Maximum vA: 1725 vA (15-amp fuse).
3. Power input wiring must be at least 6" from low-voltage less than 30V wiring.
4. All signal inputs are low-voltage, less than 30V.
5. UCP Storage Range: -40 F to 158 F (-40C to 70C) not appli-

Control Circuit Wiring

Interlock Circuits

Chilled Water Flow. Wire the evaporator water pump contactor (5K1) to a separate 120 volt single phase power supply with 14 AWG, 600 volt copper wire, then connect this circuit to 1U1-J12-1 and -2. This will allow the UCP to control the evaporator water pump, or wire the 5K1 contactor to operate remotely and independently of the UCP.

Wire the auxiliary contacts of the evaporator water pump contactor (5K1) in series with the flow switch (5S1) installed in the evaporator supply pipe. Use 14 AWG, 600-volt copper wire.

Connect this circuit to UCP Terminals 1TB1-10 and -12 as shown in Figures 28 and 29.

If installed properly, the chilled water interlock circuit will only allow compressor operation if the evaporator pump is running and providing at least the minimum water flow required.

Condenser Water Flow. Wire the condenser water pump contactor (5K2) to a separate 120-volt, single-phase power supply with 14 AWG, 600-volt copper wire; then connect this circuit to UCP Terminals 1U1-J14-1 and -2.

Next, use 14 AWG, 600-volt copper wire to connect the auxiliary contacts of the condenser water pump contactor (5K2) in series with the flow switch (5S2) installed in the condenser supply pipe.

Connect this circuit to UCP Terminals 1TB1-11 and -13. Figures 28 and 29.

If installed properly, the condenser water interlock circuit will only allow the compressor to operate if the condenser pump is running and providing at least the minimum water flow required.

Temperature Sensor Circuits

1. All temperature sensors are factory installed except the optional outdoor air temperature sensor. Mount this sensor in the fresh air intake, or on the north wall of the building out of direct sun light.

2. If the leads on the sensor do not reach all the way back to the UCP:

a. Route the sensor leads to a junction box mounted in a convenient location.

b. Splice the leads to 14-18 AWG, 600 V wires of sufficient length inside the junction box.

c. Route the added length of wire to the UCP in conduit (unless it is shielded).

3. Attach the outdoor air temperature sensor wires at 1U1-J5-5 and -6.

Note: If shielded cable is used to extend the sensor leads, be sure to tape off the shield wire at the junction box and ground it at the UCP. If the added length is run in conduit, do not run them in the same conduit with other circuits carrying 30 or more volts!

CAUTION: To prevent possible sensor malfunction due to electrical noise, never route low-voltage sensor leads with other conductors carrying 30 or more volts.

4. All of the water temperature sensors used in the UCP control system are accurate to within ± 1.0 F, and are "matched" pairs.

The term "matched sensor pair" indicates that both sensors in a given pair have the same accuracy. For example, a sensor that registers a temperature that is 0.5 degrees higher than the "actual" value is paired with another sensor that also registers 0.5 ° high.

If entering and leaving water temperature sensors are not "matched", the accuracy of the temperature readings displayed on the face of the UCP is reduced.

Optional Relay Circuits

Optional Control/Output Circuits: Install various optional wiring as detailed in Table 19 and Figure 28 and 29 as required by the owner's specifications

Table 19: UCP2 Optional Field Wiring

					Control Panel Terminations						
					Binary Outputs			Binary Inputs		Analog Outputs/ Inputs	
Feature	Class	Type	Standard Optional	Module Design	Com	NC	NO				
Compressor Running Relay	I	Form C	S	1U1	J16-3	J16-2	J16-1				
Alarm Relay	I	Form C	S	1U1	J18-3	J18-2	J18-1				
Limit Warning Relay	I	Form A	S	1U1	J20-2	n/a	J20-1				
External Auto-Stop Input	II	BI	S	1U1				J5-1	J5-2		
Emergency Stop Input	II	BI	S	1U1				J5-3	J5-4		
Condenser Pressure Output	II	AO	O	1U1						J7-3	J7-4
External Heat Pump Control	II	BI	S	1U1				J7-5	J7-6		
Ice Making Relay	I	Form A	O	1U5	J8-2	n/a	J8-1				
Tracer Temp. Senser Input	II	AI	O	1U5						J7-7	J7-8
Tracer Controlled Relay	I	Form C	O	1U5	J18-3	J18-2	J18-1				
Head Relief Request Relay	I	Form A	O	1U5	J12-2	n/a	J12-1				
Maximum Capacity Relay	I	Form A	O	1U5	J14-2	n/a	J14-1				
Free Cooling Auxillary Relay	I	Form A	O	1U5	J20-2	n/a	J20-1				
External Free Cooling Switch	II	BI	O	1U5				J3-5	J3-6		
Ice Machine Control Input	II	BI	O	1U5				J3-7	J3-8		
% RLA Output	II	AO	O	1U5						J7-3	J7-4
External Current Limit Setpoint	II	AI	O	1U5						J7-11	J7-12
External Chilled Water Setpoint	II	AI	O	1U5						J9-4	J9-5
Purge Alarm Relay	I	BO	S	3U1	J16-3	J16-2	J16-1				
Outdoor Temperature Sensor Input	II	AI	O	1U1						J5-5	J5-6
Heat Recovery Actuator Output	II	AO	O	1U5						J7-1	J7-2

Notes:
1. Contact rating of all Class I binary outputs is 2.88 Amps Pilot Duty, 7.2 Amps Resistive, and 1/3 hp all at 120 VAC.
2. For Class I Binary Inputs, Contacts must be compatible with 120 VAC, 5 mg.
   For Class II (<30 VAC) Binary Inputs, contacts must be compatible with 24 VAC, 12 mg.
3. Wire all Class I circuits to the right back of the UCP in conduit.
4. Wire all Class II circuits to the left back of the UCP in conduit separate from all Class I wiring.
5. Options indicated as "S" are standard, provided with all units, but not required for unit operation.
6. Options indicated as "O" are not standard on all units, but require an option item, i.e. options module or sensor, to be obtained to enable the use of the option.
7. All analog outputs/inputs are 2-10 VDC/4-20 ma selectable, note polarity on wiring diagrams. All Analog outputs are 2-10 VAC only.
8. Max Voltage = 240 volts

Type Abbreviations: **Form A**, SPSTNO = Single Pull Single Throw Normally Open, **Form C**, SPDT = Single Pull Double Throw, **AI** = Analog Input, **AO** = Analog Output, **BI** = Binary Input, **BO** = Binary Output

Optional Tracer Communication Interface

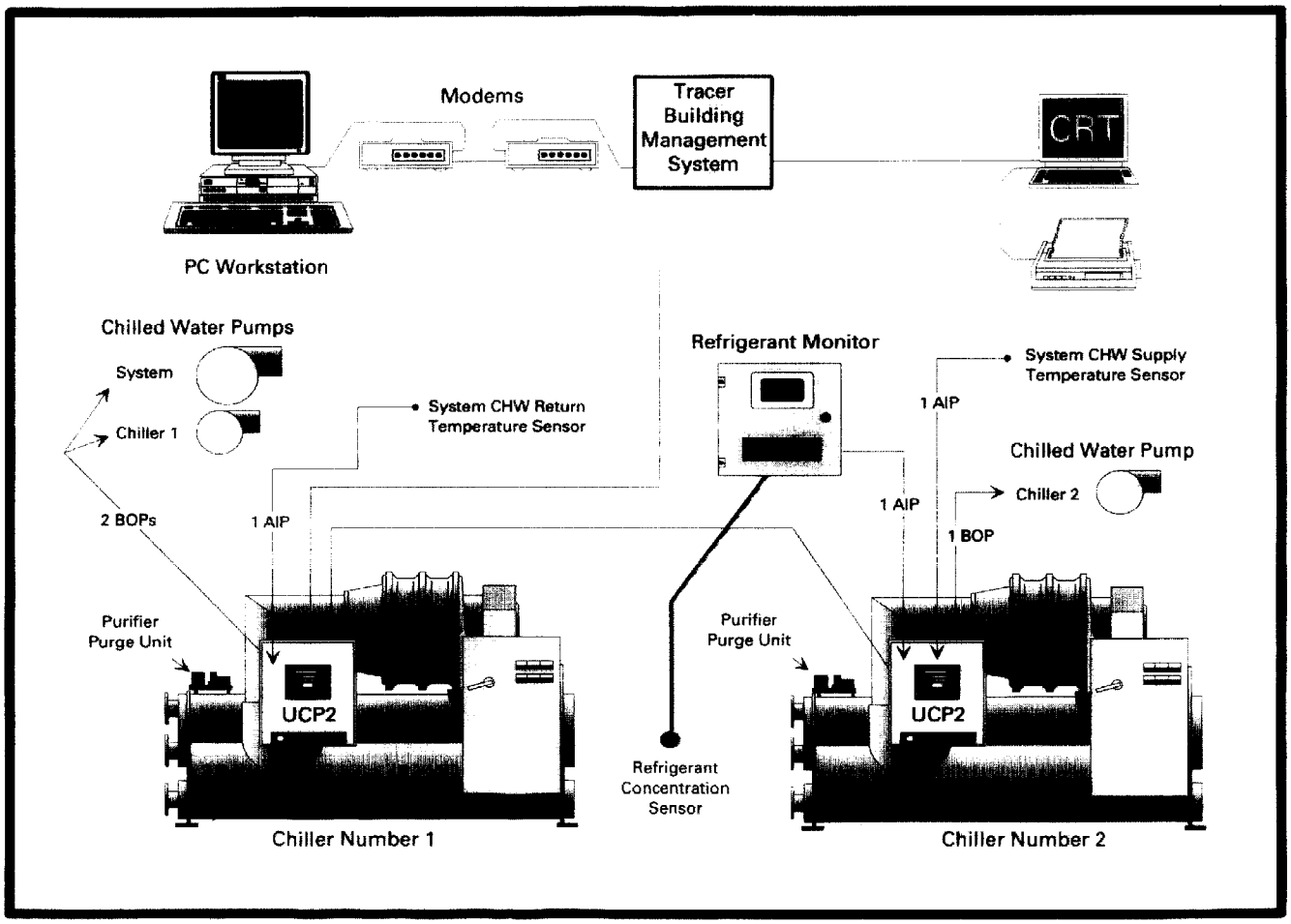
This control option allows the UCP to exchange information—such as chiller status and operating set points with a Tracer System .

Figure 37 illustrates how such a communication/control network might appear.

Note: The circuit must be run in separate conduit to prevent electrical noise interference!

Additional information about the TCI option is published in the installation manual and operator's guide that ship with the Tracer.

Figure 38
Illustrates How a Communication /Control Network to Chiller Units w/UCP2 Control Panels Might Appear



Unit Start-Up

All phases of initial unit start-up must be conducted under the supervision of a qualified local service engineer. This includes pressure testing, evacuation, electrical checks, refrigerant charging, actual start-up, and operator instruction.

Complete the "CenTraVac Check Sheet and Request for Serviceman" form found at the end of this manual, and forward it to your local Trane Service Company. Advance notification is required to assure that initial start-up is scheduled as close to the requested date as possible.

Model CVHE/CVHF CenTraVac®
Checksheet And Request For Serviceman

To: _____ Trane Service Company

Project Name: _____

The Following Items Are Being Installed And Will Be Complete By _____

1. CenTraVac:
In place and piped. Do not insulate CenTraVac or adjacent piping. The contractor is responsible for any foreign material left in the unit. ☐

2. Piping:
Chilled water piping connected to:
- CenTraVac ☐
- Air handling units ☐
- Pumps ☐

Condenser and heat recovery condenser (as applicable) piping connected to:
- CenTraVac ☐
- Pumps ☐
- Cooling tower ☐
- Heating loop ☐

Make-up water connected to cooling tower ☐
Water supply connected to filling system ☐
Systems filled ☐
Pumps run, air bled from system ☐
Strainers cleaned ☐

3. Flow Balancing Valves Installed:
Leaving chilled water ☐
Leaving condenser water ☐
Heat recovery condenser leaving water ☐

4. Wiring:
Compressor motor starter has been furnished by or approved by The Trane Company, La Crosse, WI ☐
Power available ☐
Interconnecting wiring, starter to control panel ☐
External interlock (flow switches, water pump aux., etc.) ☐
Motors connected on:
- CenTraVac* ☐
- Chilled water pump ☐

Cooling tower fan rotation checked ☐
Condenser water pump ☐
Heat recovery condenser water pump (as applicable) ☐
Power available for vacuum pump ☐
(115V AC) ☐
All controls installed and connected ☐
All magnetic starters installed and connected ☐

*NOTE: Do not make final connections to compressor motor until requested by Trane Service Representative.

5. Testing:
Dry nitrogen available for pressure testing ☐
Refrigerant-22 available for leak testing if necessary (25 lbs.) ☐

6. Refrigerant On Job Site ☐

7. Gauges, Thermometers And Air Vents
Installed on both sides of evaporator ☐
Installed on both sides of condenser and heat recovery condenser (as applicable) ☐

8. System Can Be Operated Under Load Conditions ☐

9. Electrician, Control Man And Contractor's Representative Are Available To Evacuate, Charge And Test The CenTraVac Under Serviceman's Supervision ☐

In Accordance With Your Quotation And Our Purchase Order Number _____

We Will Therefore Require Your Serviceman On The Job By** _____

This is to certify that the CenTraVac(s) has been properly and completely installed and the applicable items listed above have been completed.

**Advance notification is required to allow scheduling of the start-up as close to the requested date as possible.

Compliance To ASHRAE Standard 15R

Yes No 1. Does the equipment room have a refrigerant monitor/sensor capable of monitoring and alarming within the acceptable exposure level (AEL) of the refrigerant?

Yes No 2. Does the equipment room have an audible or visual alarm (other than the light on the monitor) which is controlled by the monitor?

Yes No 3. Does the equipment room have mechanical ventilation?†

Yes No 4. Is a self contained breathing apparatus available in close proximity of the equipment room?

Yes No 5. Are the purge discharge and the rupture disk piped to the outdoors?

†The mechanical ventilation consists of two flow requirements i.e., a two-speed fan where the high speed is sized by the formula Cfm = 100 × the square root of the pounds of refrigerant of the largest chiller, and low speed is 0.5 Cfm per square foot of the equipment room space. (This requirement is for chillers located within the building which is the most common.)

Owner Awareness Of Safe Refrigerant Handling Procedures

Yes No 1. Has the owner been fully instructed on the proper use of refrigerant 123?

Yes No 2. Was the owner given a copy of the MSDS sheet for HCFC-123?

Yes No 3. Was the owner given a copy of Trane publication "CFC-GUIDE-2, Refrigerant Handling Guidelines"?

Additional time required to complete the start-up and adjustment due to incompleteness of the installation will be invoiced at prevailing rates.

Checklist Completed By: _____

_____

_____

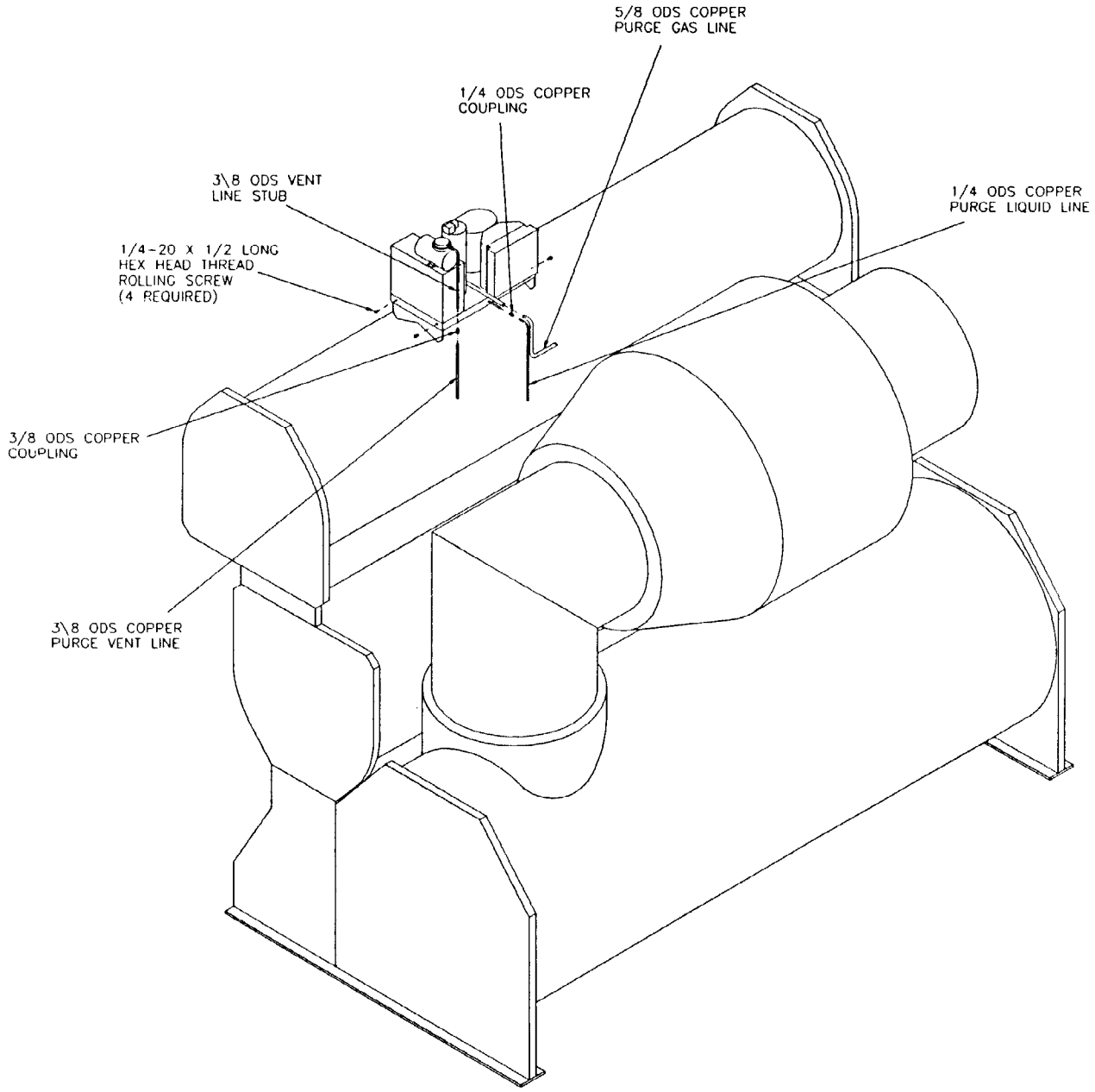
Signed: _____

Dated: _____

Notice To Trane Service Agency:
A copy of this completed form must be submitted to the CenTraVac Technical Service Department in La Crosse, WI prior to the actual start-up date.

Printed by INLAND PRINTING, Inc., La Crosse, WI

Figure 22
800-Ton Heat Recovery Unit



800 TON HEAT RECOVERY UNIT SHOWN
1250 AND 1400 TON AUXILIARY CONDENSER UNITS HAVE SIMILAR PURGE MOUNTING

EXT 0A
PRINT REQ'D FOR CUSTOMER INSTALLATION

ODS COPPER
GE LIQUID LINE

CUSTOMER NOTE:

1. REMOVE PURIFIER PURGE AND 3/8 ODS COPPER VENT LINE STUB FROM SHIPPING CONTAINER.
2. DISCONNECT PURGE GAS, LIQUID AND VENT LINES AND CONDUIT FROM SHIPPING BRACKET THAT SPANS PURGE SUPPORTS ON TOP OF THE HEATING OR AUXILIARY CONDENSER.
3. REMOVE SHIPPING BRACKET (SEE NOTE 2) AND SCREWS FROM PURGE SUPPORTS AND DISCARD.
4. LOCATE PURGE ON TOP OF SUPPORTS (PURGE BASE GOES OUTSIDE SUPPORTS).
5. SECURE PURGE TO SUPPORTS WITH FOUR 1/4-20 X 1/2 LONG HEX HEAD THREAD ROLLING SCREWS PROVIDED WITH UNIT.
6. REMOVE PURGE CONTROL PANEL ACCESS COVER.
7. CONNECT 90° CONDUIT CONNECTOR TO OPEN 7/8 DIA HOLE ON SIDE OF CONTROL PANEL.
8. CONNECT CONDUIT WIRES TO TERMINAL BLOCK IN CONTROL PANEL AS SHOWN IN WIRING CONNECTION DETAIL.
9. REPLACE ACCESS COVER ON CONTROL PANEL.
10. ATTACH 3/8 ODS COPPER VENT LINE STUB TO 3/8 FLARE CONNECTION ON PURGE PUMPOUT COMPRESSOR. VENT LINE STUB TO BE POINTED DOWN.
11. BRAZE 1/4, 3/8 AND 5/8 ODS COPPER LINES TO PURGE PER A.W.S. B CUP-3, (1/4 & 3/8 ODS COPPER COUPLINGS PROVIDED WITH UNIT).
12. OPEN GAS AND LIQUID LINE BALL VALVES BEFORE OPERATING UNIT.

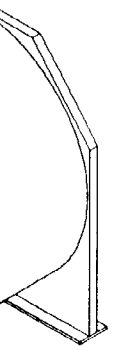
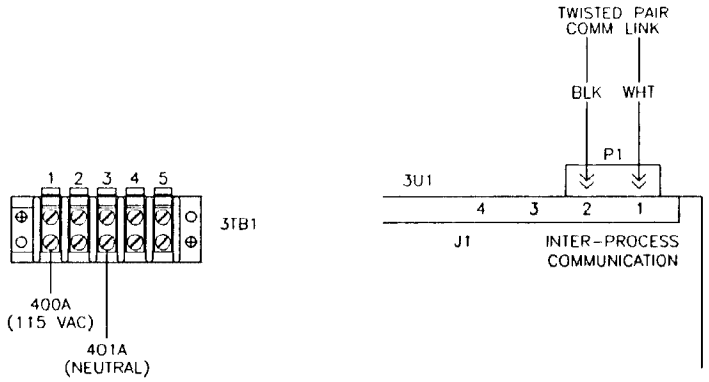


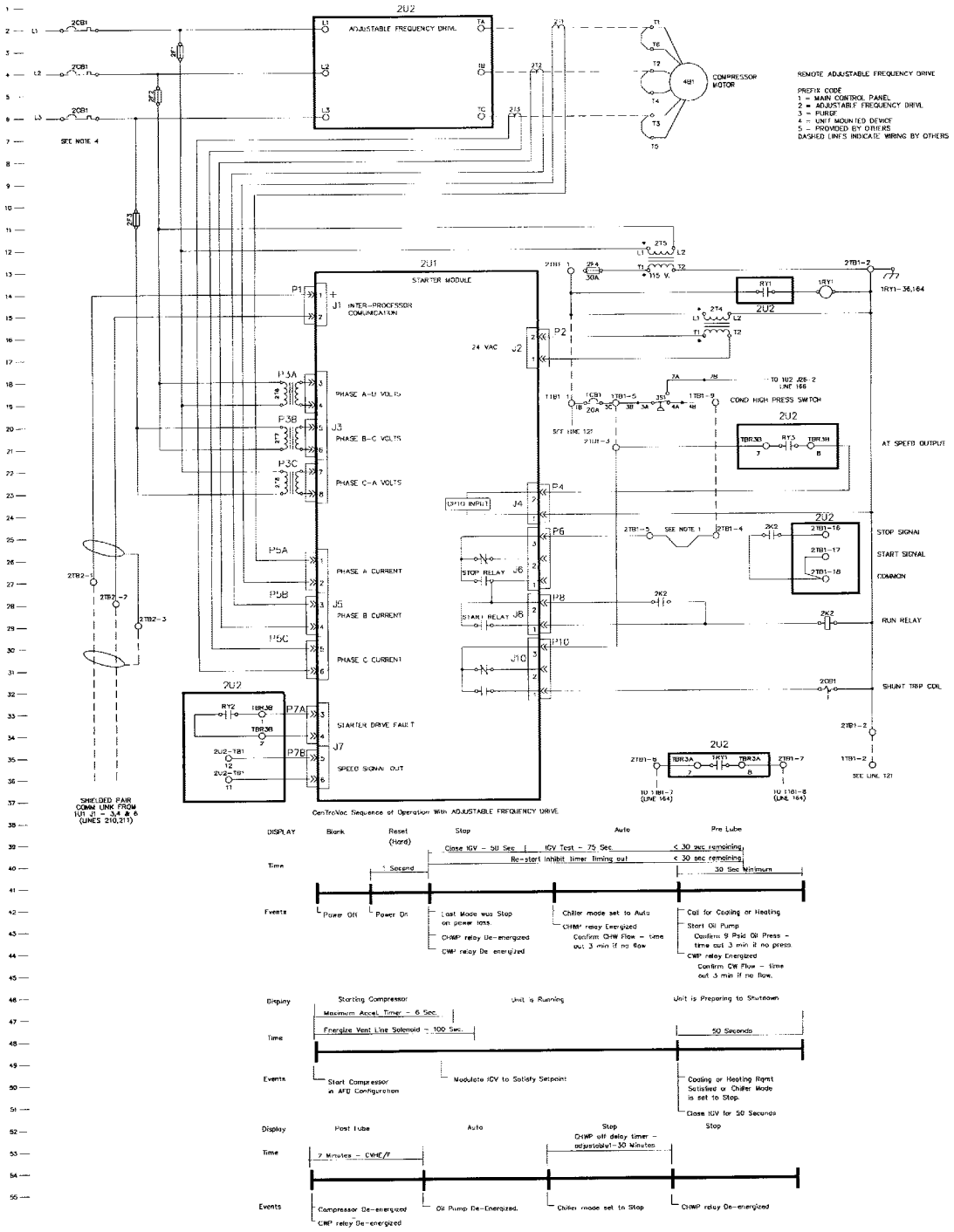
Figure 23
Wiring Connection Detail



WIRING CONNECTION DETAIL

MOUNTING

Figure 27
Typical CVHE/CVHF UCP2
Field Wiring Layout for Adjustable
Frequency Drive



THIS DRAWING IS PROPRIETARY AND SHALL NOT BE COPIED OR ITS CONTENTS DISCLOSED TO OUTSIDE PARTIES WITHOUT THE WRITTEN CONSENT OF THE TRANE COMPANY.

NOTES:
1. OPTIONAL ADJUSTABLE FREQUENCY DRIVE (AFD) INTERLOCK. SEE AFD MANUFACTURES WIRING DIAGRAM FOR SPECIFIC APPLICATION.
2. UNLESS OTHERWISE NOTED,ALL SWITCHES ARE SHOWN AT 25 C (77 F), AT ATMOSPHERIC PRESSURE, AT 50% RELITIVE HUMIDITY, WITH ALL UTILITIES TURNED OFF AND AFTER A NORMAL SHUTDOWN HAS OCCURED.
3. NUMBERS ALONG THE RIGHT SIDE OF THE SCHEMATIC DESIGNATE THE LOCATION OF THE CONTACTS BY LINE NUMBER. AN UNDERLINED NUMBER INDICATES A NORMALLY CLOSED CONTACT.
4. THRIFT PHASE POWER SUPPLY VOLTAGE–SEE UNIT NAMEPLATE
5. REMOTE WYE–DELTA AFD WIRING BETWEEN AFD AND CONTROL MODULE ARE SHOWN. SEE AFD MANUFACTURES WIRING DIAGRAM FOR SPECIFIC AFD WIRING.
6. RELAY COILS ARE NOT SHOWN. CONTACTS ARE CONTROLLED BY THE LOGIC OF THE MICRO–CONTROLLER. SEE SEQUENCE OF OPERATION.

⚠ WARNING
HAZARDOUS VOLTAGE
DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.
FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

⚠ AVERTISSEMENT
VOLTAGE HASARDEUX
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IMPORTANT
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Figure 27
Typical CVHE/CVHF UCP2
Field Wiring Layout for Adjustable
Frequency Drive

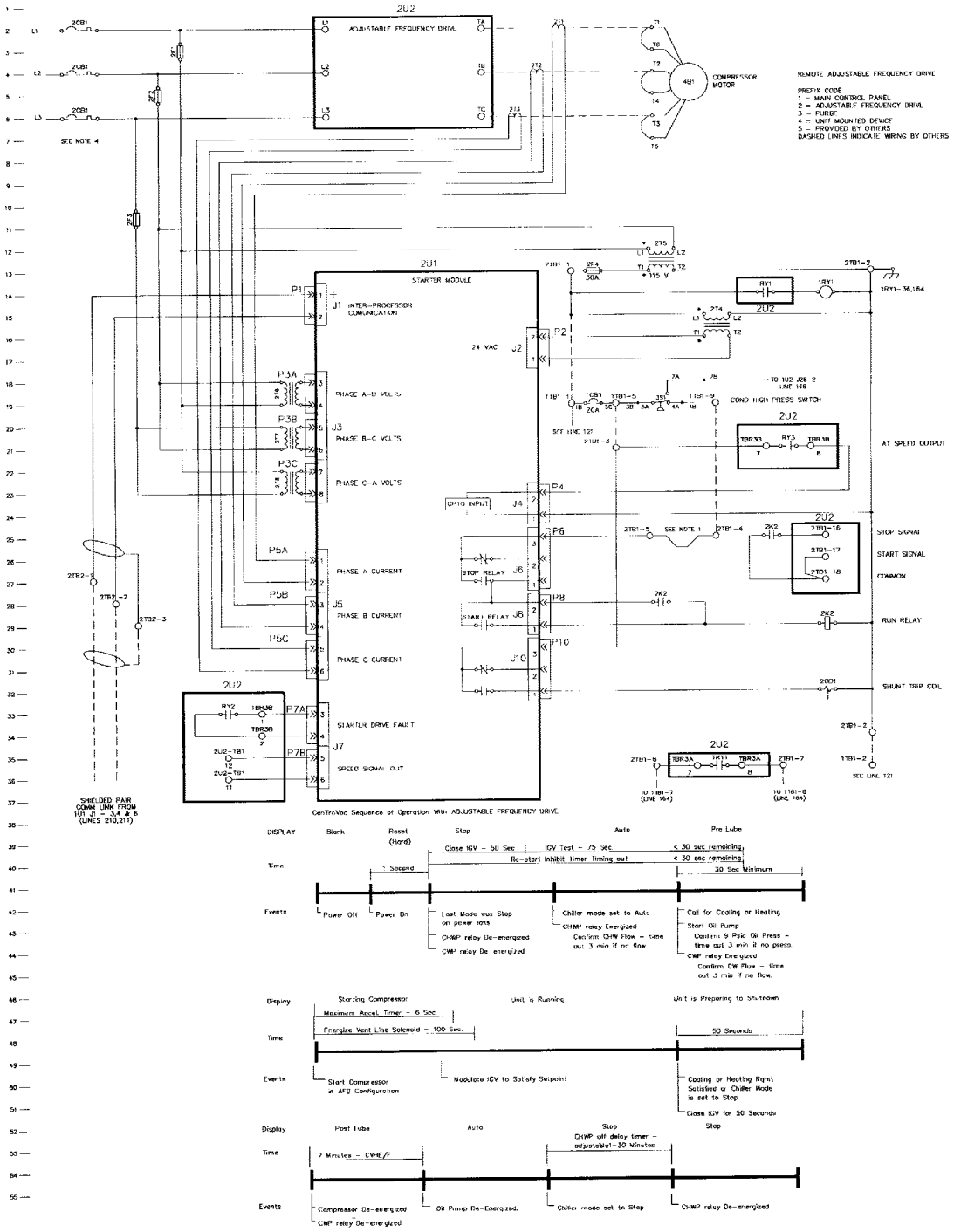

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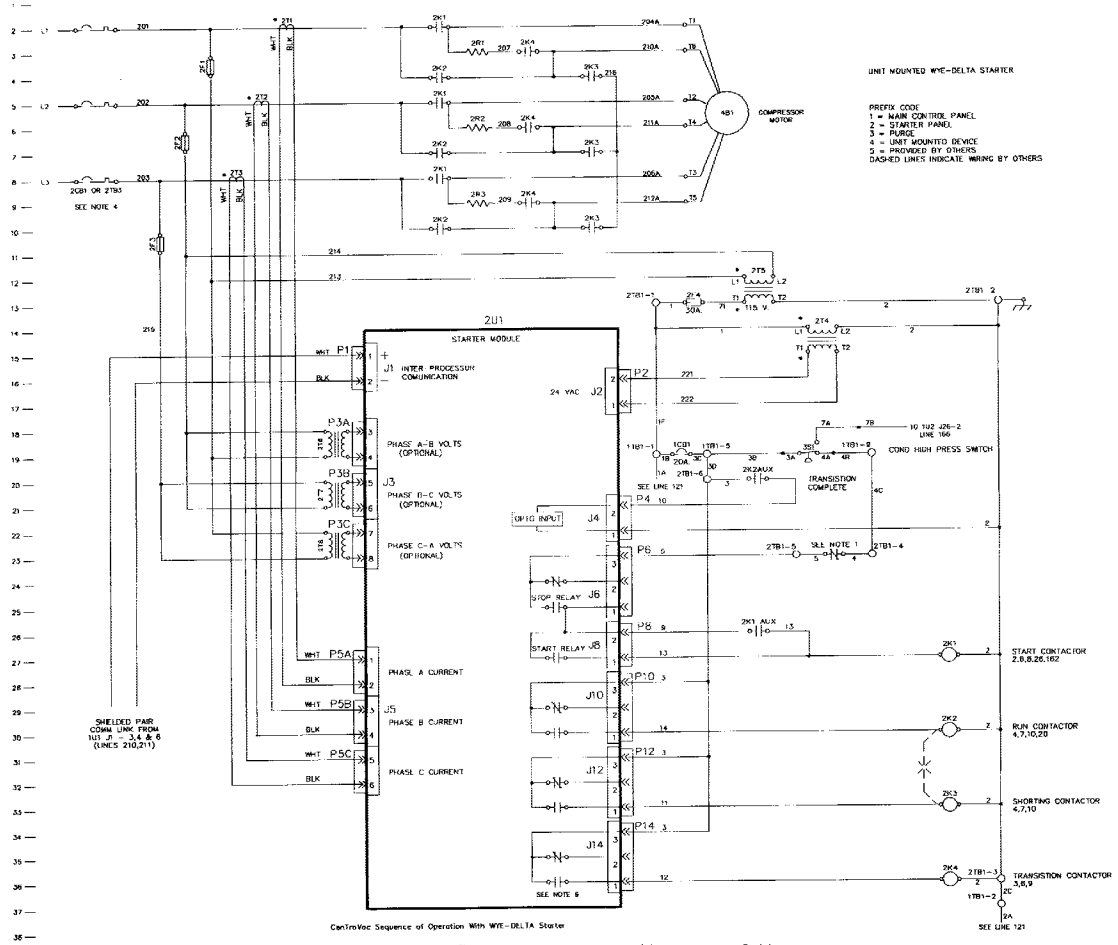
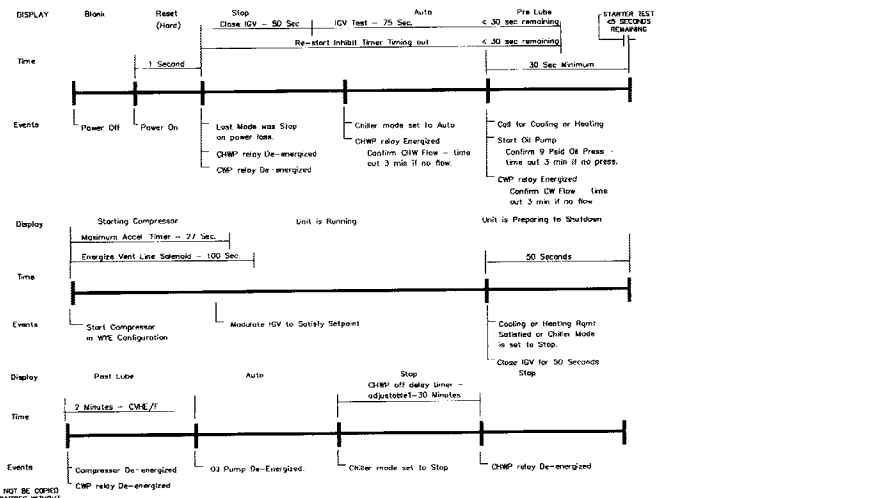
Figure 28
Typical UCP2 Schematic Wiring CVHE, CVHF
Unit-Mounted Wye-Delta Starter



ControVac Sequence of Operation With WYE-DELTA Starter



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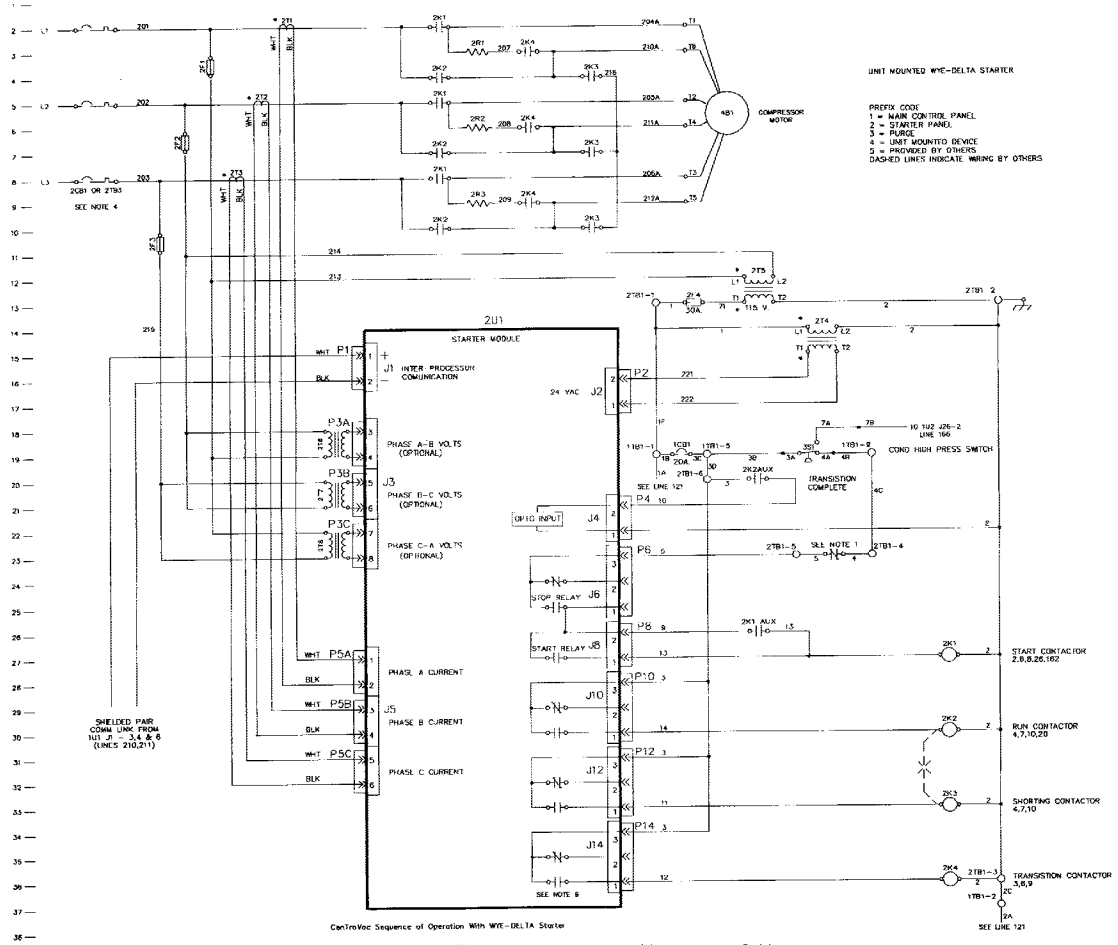

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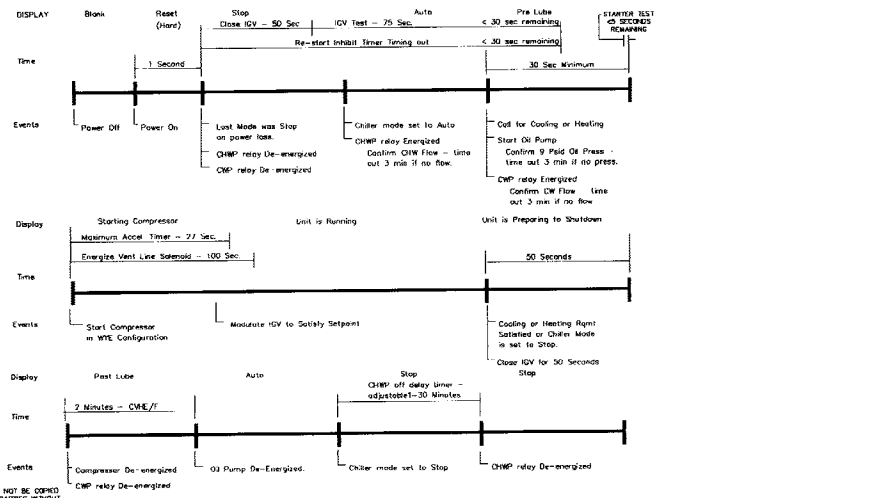

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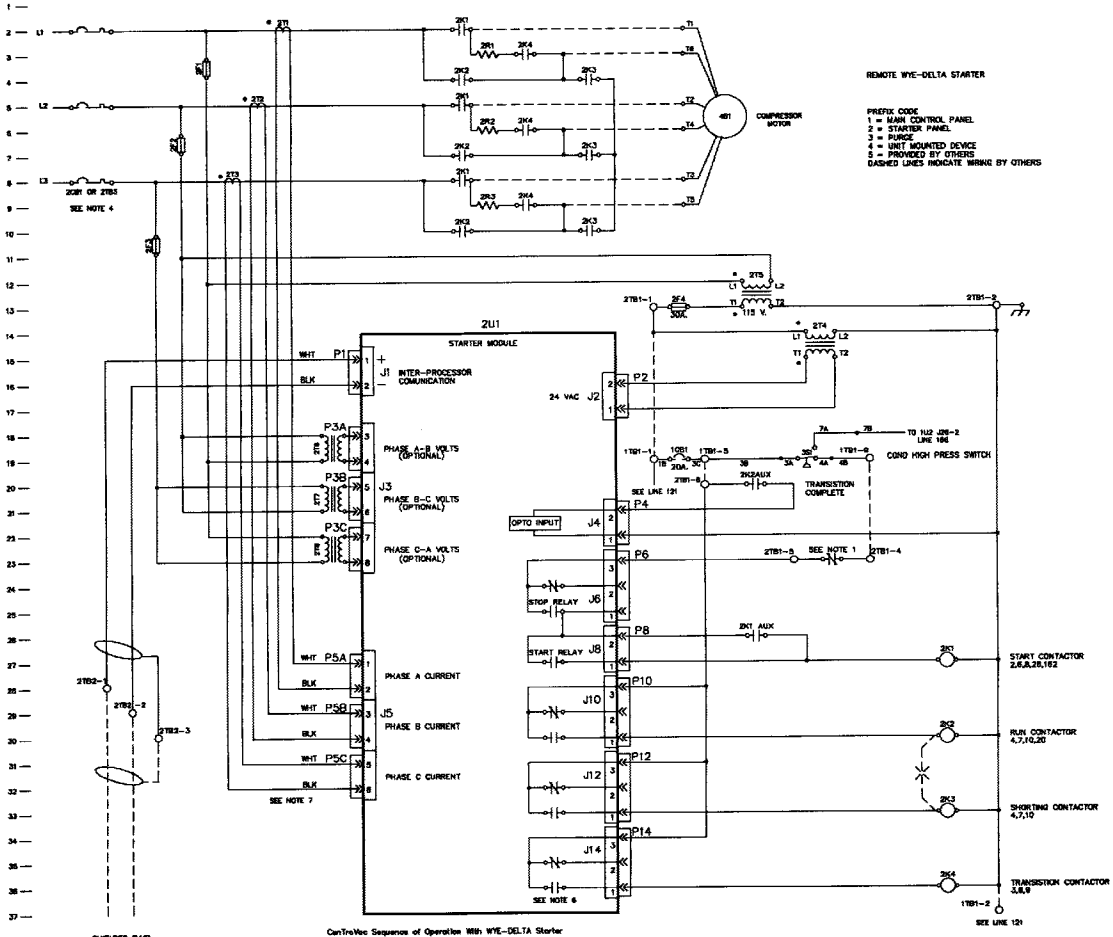
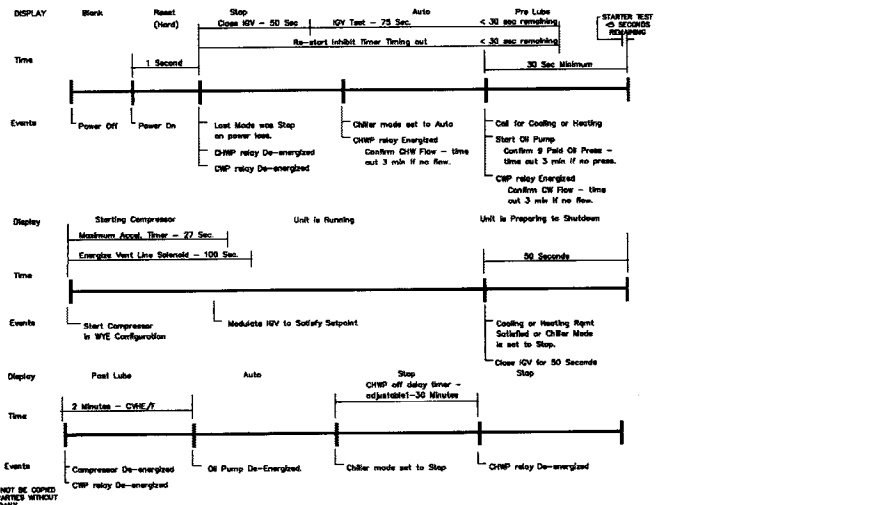
Figure 29
Typical UCP2 Schematic Wiring CVHE, CVHF
Remote Wye-Delta Starter





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7. FOR REMOTE Y–D STARTERS RATED GREATER THAN 935 RLA, SEE STARTER MANUFACTURERS WIRING DIAGRAM FOR SPECIFIC CURRENT TRANSFORMER WIRING.

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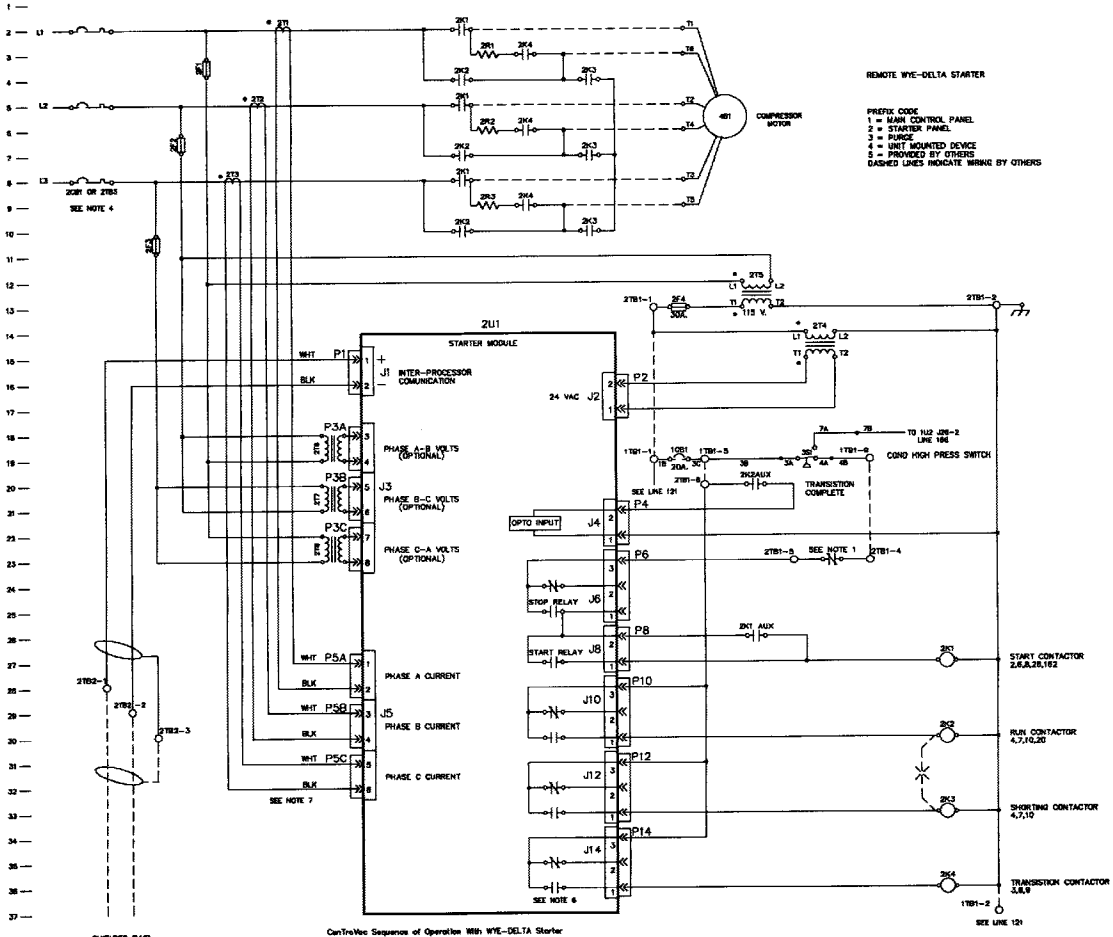
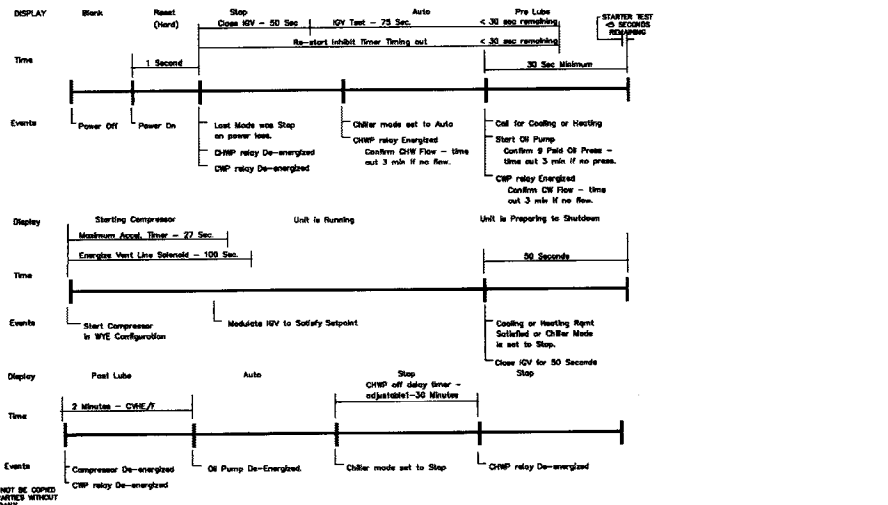
Figure 29
Typical UCP2 Schematic Wiring CVHE, CVHF
Remote Wye-Delta Starter





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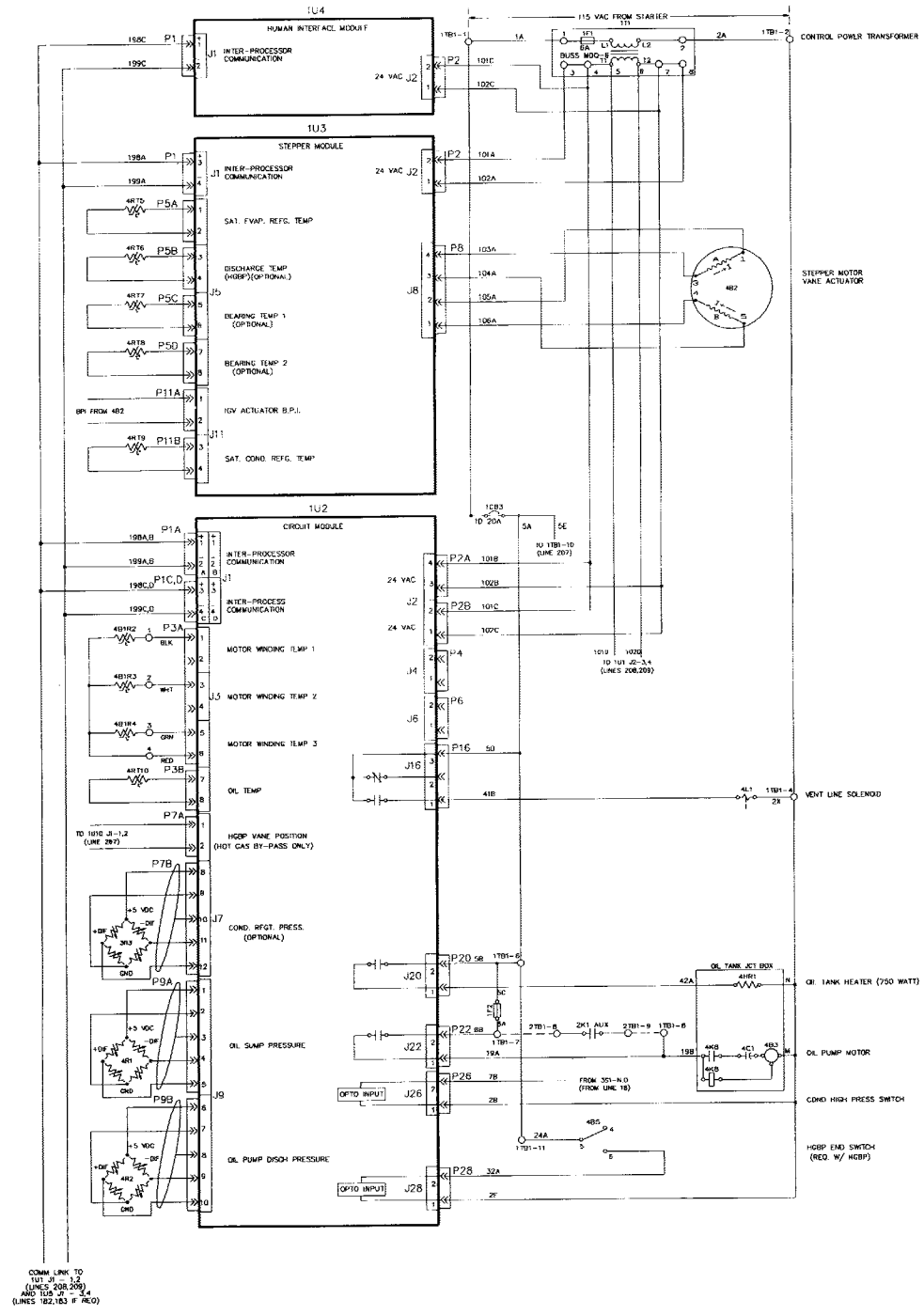
NOTES:
1. OPTIONAL STARTER INTERLOCK. SEE STARTER MANUFACTURERS WIRING DIAGRAM FOR SPECIFIC APPLICATION.
2. UNLESS OTHERWISE NOTED,ALL SWITCHES ARE SHOWN AT 25 C (77 F), AT ATMOSPHERIC PRESSURE, AT 50% RELITIVE HUMIDITY, WITH ALL UTILITIES TURNED OFF AND AFTER A NORMAL SHUTDOWN HAS OCCURED.
3. NUMBERS ALONG THE RIGHT SIDE OF THE SCHEMATIC DESIGNATE THE LOCATION OF THE CONTACTS BY LINE NUMBER. AN UNDERLINED NUMBER INDICATES A NORMALLY CLOSED CONTACT.
4. THREE PHASE POWER SUPPLY VOLTAGE–SEE UNIT NAMEPLATE
5. REMOTE WYE–DELTA STARTER WIRING BETWEEN STARTER AND CONTROL MODULE ARE SHOWN. SEE STARTER MANUFACTURERS WIRING DIAGRAM FOR SPECIFIC STARTER WIRING.
6. RELAY COILS ARE NOT SHOWN. CONTACTS ARE CONTROLLED BY THE LOGIC OF THE MICRO–CONTROLLER. SEE SEQUENCE OF OPERATION.
7. FOR REMOTE Y–D STARTERS RATED GREATER THAN 935 RLA, SEE STARTER MANUFACTURERS WIRING DIAGRAM FOR SPECIFIC CURRENT TRANSFORMER WIRING.

⚠WARNING
HAZARDOUS VOLTAGE!
DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.
FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

⚠AVERTISSEMENT
VOLTAGE HASARDEUSES!
DÉCONNECTEZ TOUTES LES SOURCES ÉLECTRIQUES INCLUANT LES DÉSCONTECTEURS SITUÉS À DISTANCE AVANT D'EFFECTUER L'ENTRETIEN.
FAUTE DE DÉCONNECTER LA SOURCE ÉLECTRIQUE AVANT D'EFFECTUER L'ENTRETIEN PEUT ENTRAÎNER DES BLESSURES CORPORELLES SÉVÈRES OU LA MORT.

IMPORTANT
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.

Figure 29a
Typical UCP2 Schematic Wiring CVHE, CVHF
Human Interface, Stepper and Circuit Module



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PREFIX CODE
1 = MAIN CONTROL PANEL
2 = STARTER PANEL
3 = PURGE
4 = UNIT MOUNTED DEVICE
5 = PROVIDED BY OTHERS
DASHED LINES INDICATE WIRING BY OTHERS

⚠ WARNING
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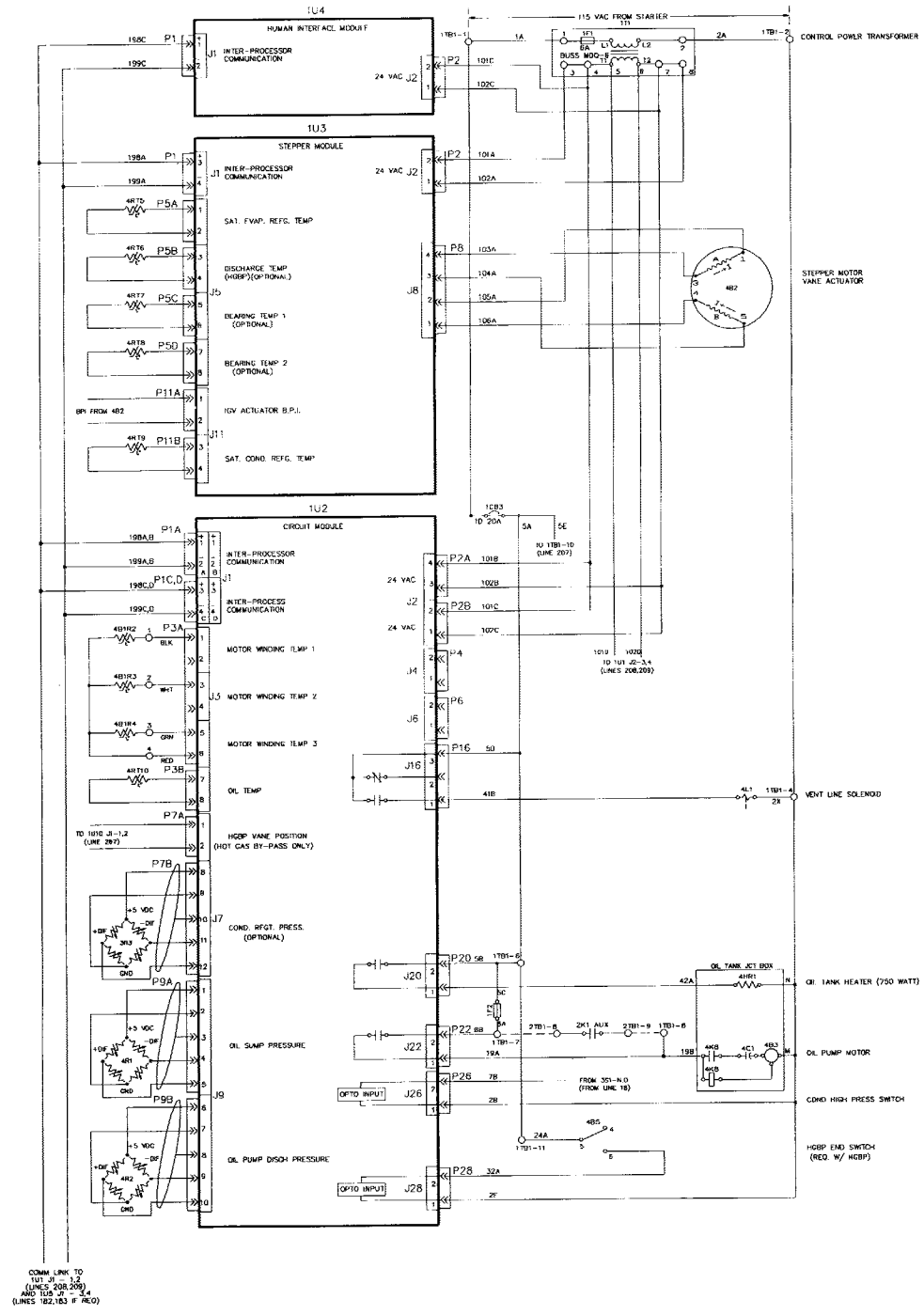

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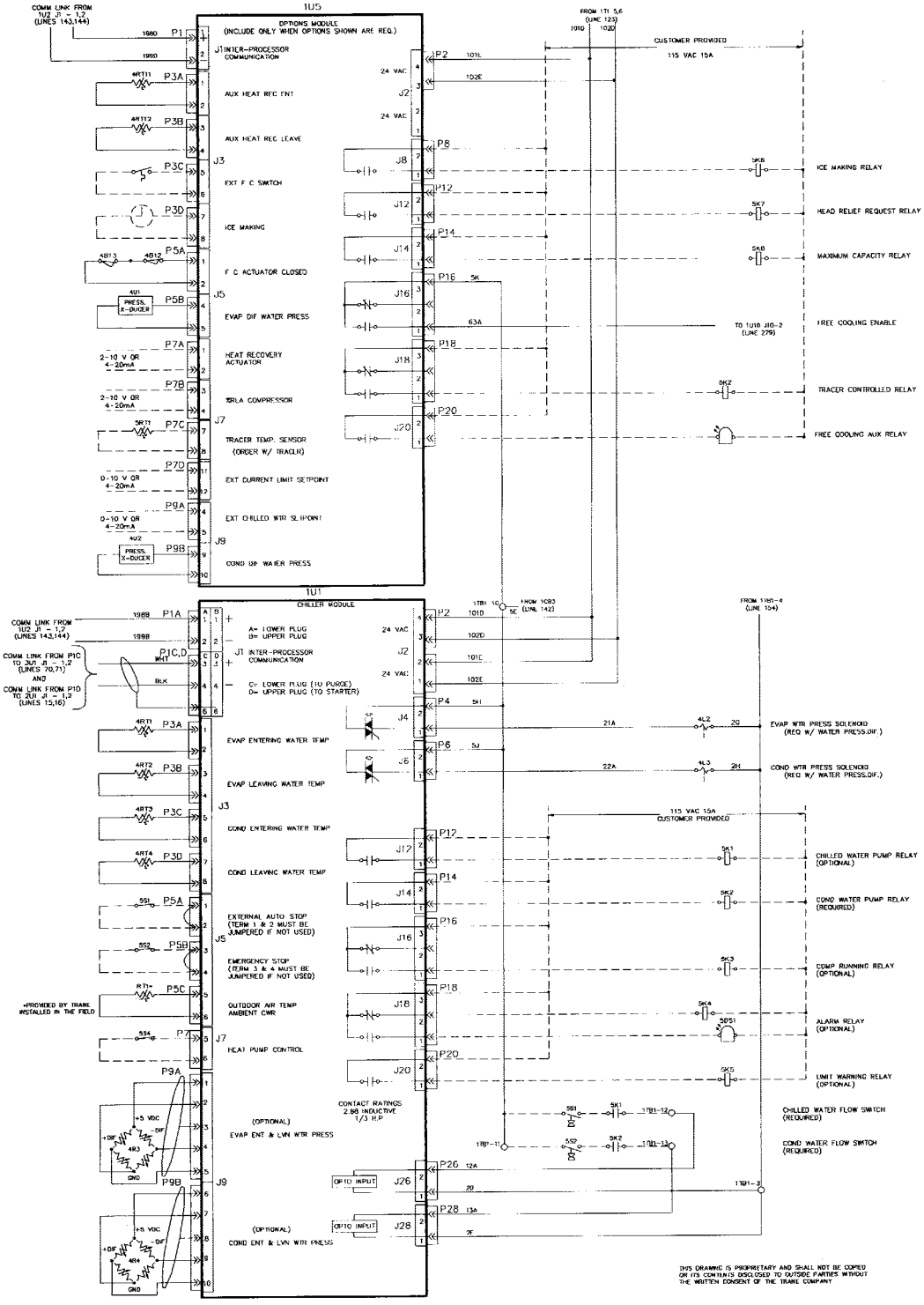
Figure 29b
Typical UCP2 Schematic Wiring CVHE, CVHF
Chiller and Options Modules



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Typical UCP2 Schematic Wiring CVHE, CVHF
Chiller and Options Modules

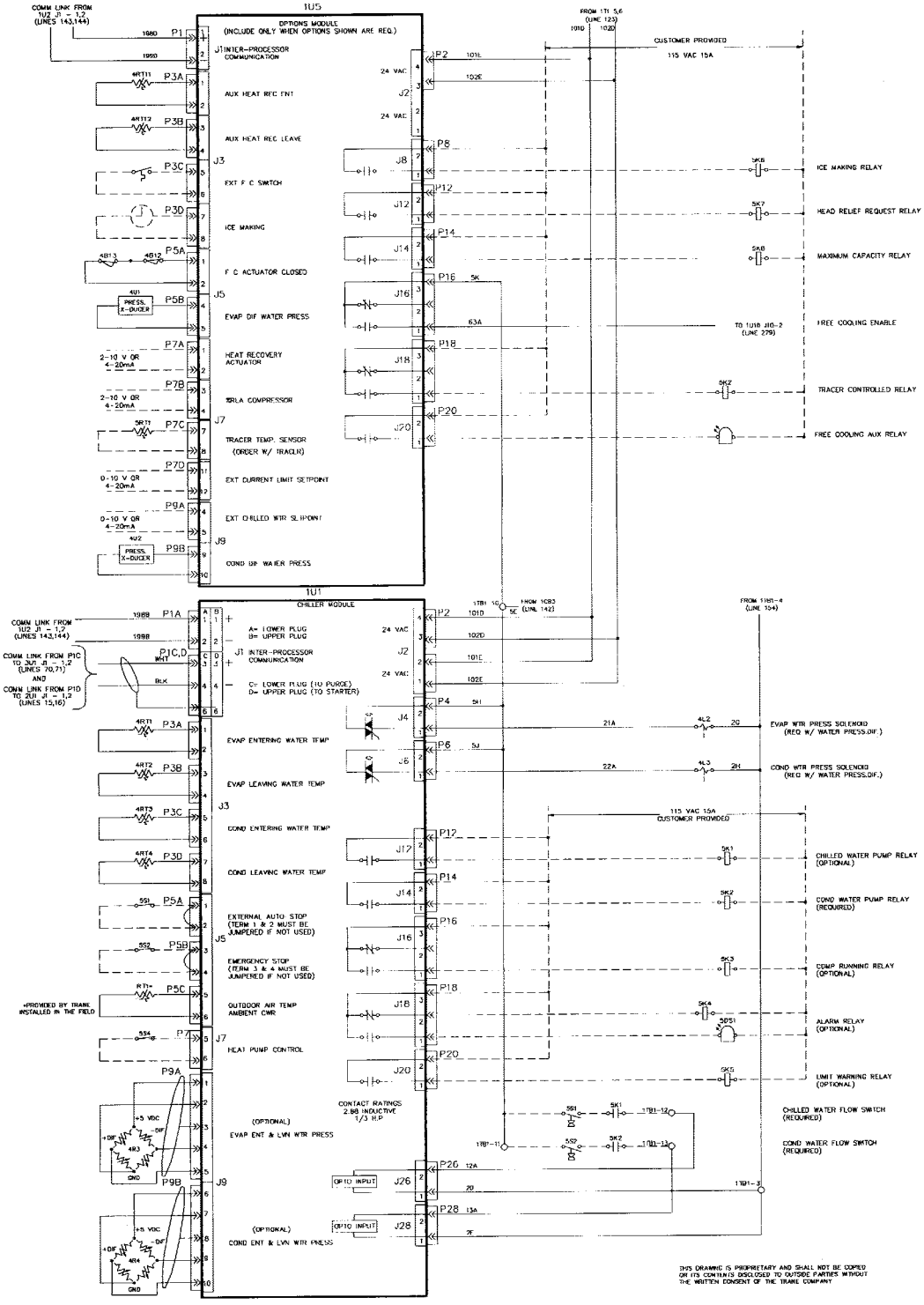

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Figure 29c
Typical UCP2 Schematic Wiring CVHE, CVHF
Purge Module

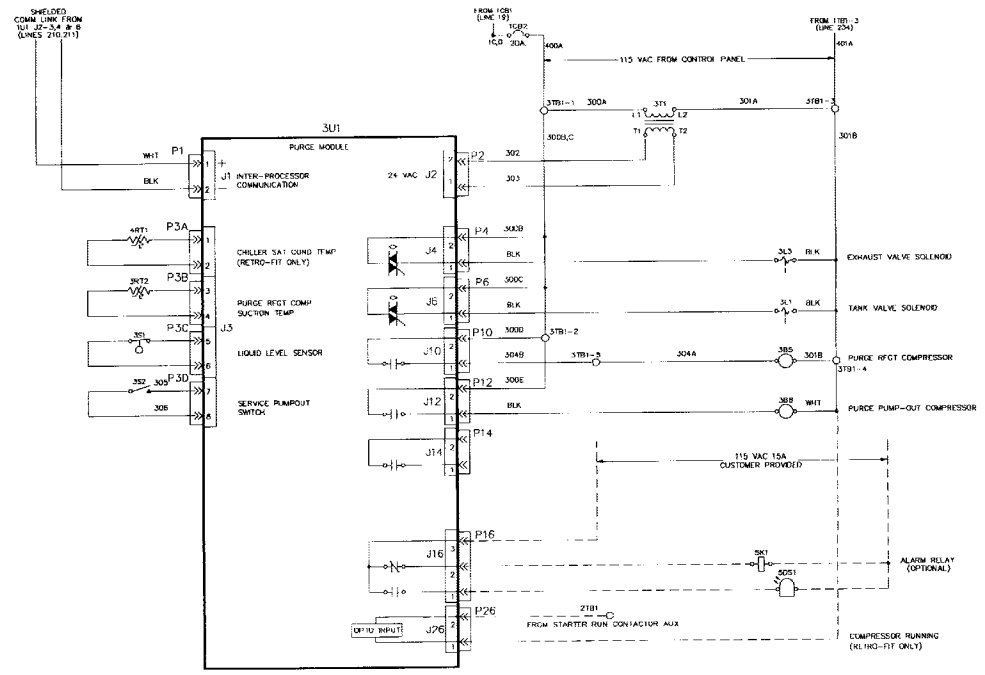

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Figure 29c
Typical UCP2 Schematic Wiring CVHE, CVHF
Purge Module

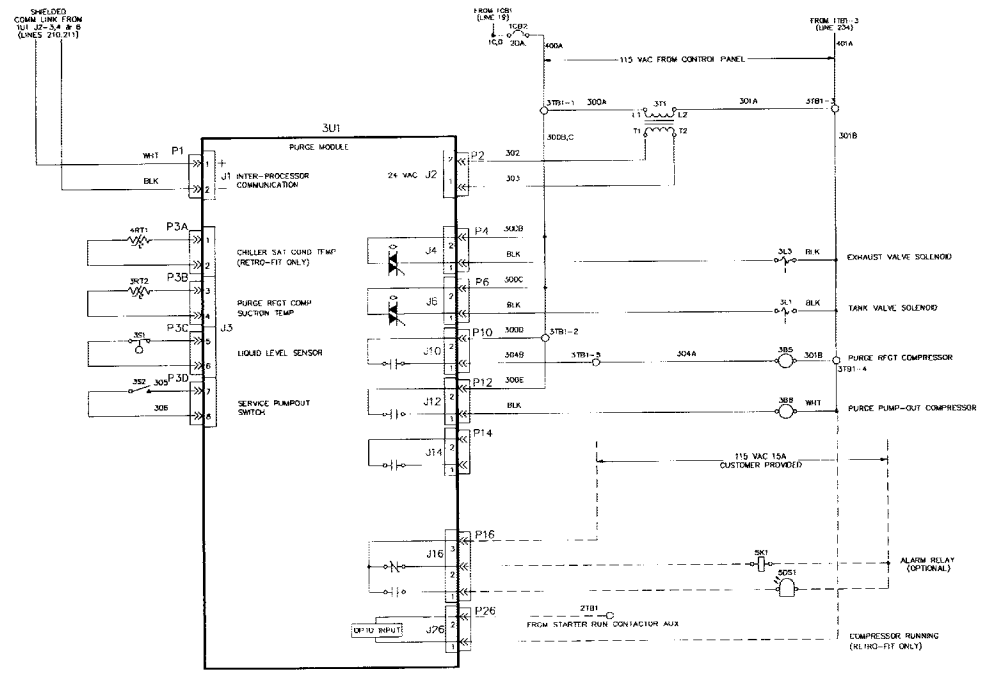

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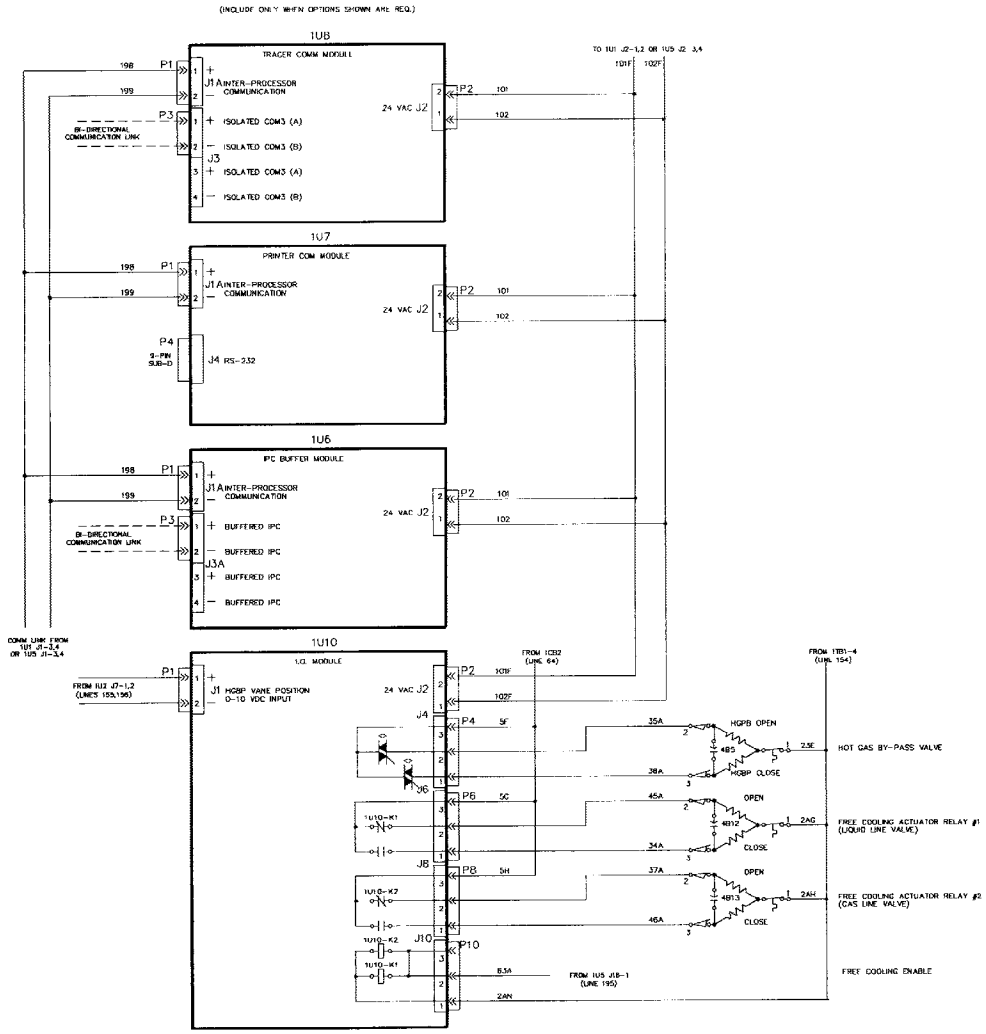
Figure 29d
Typical UCP2 Schematic Wiring CVHE, CVHF
TCI 4 and I.O. Modules



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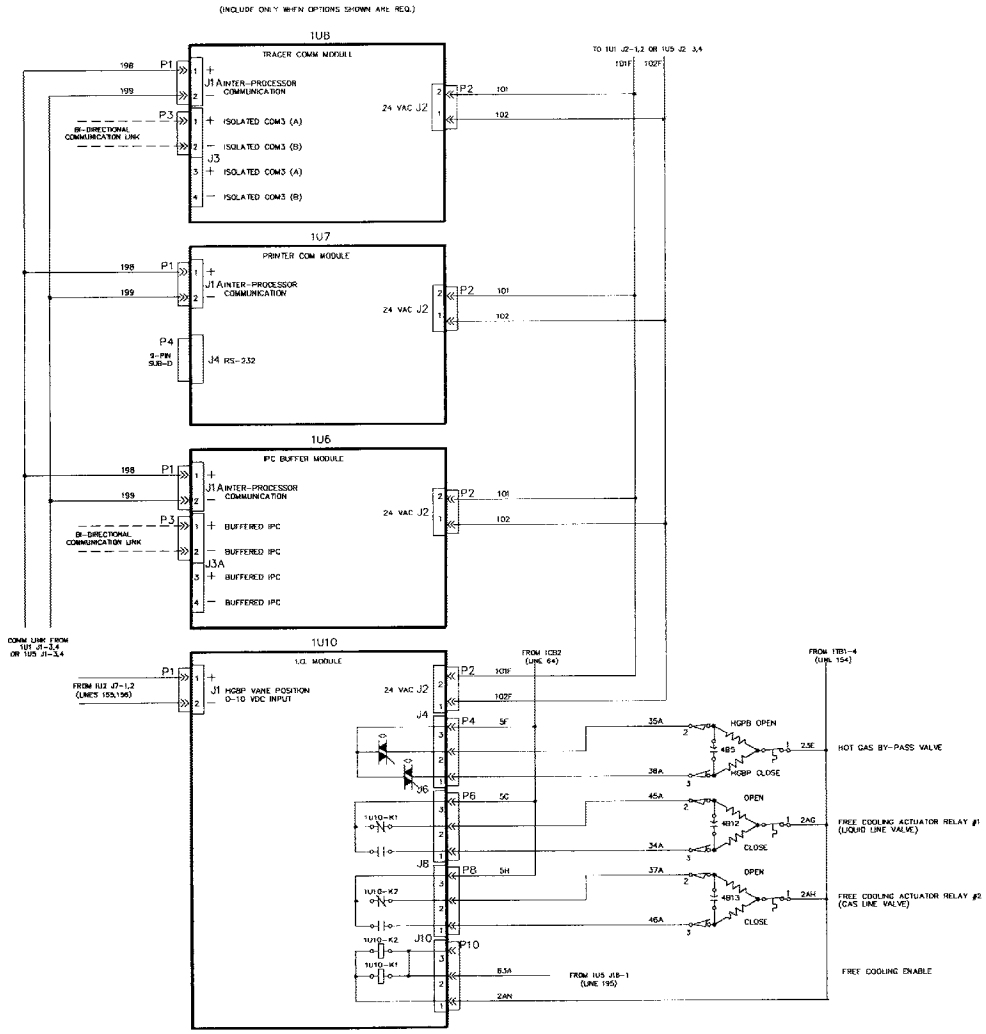

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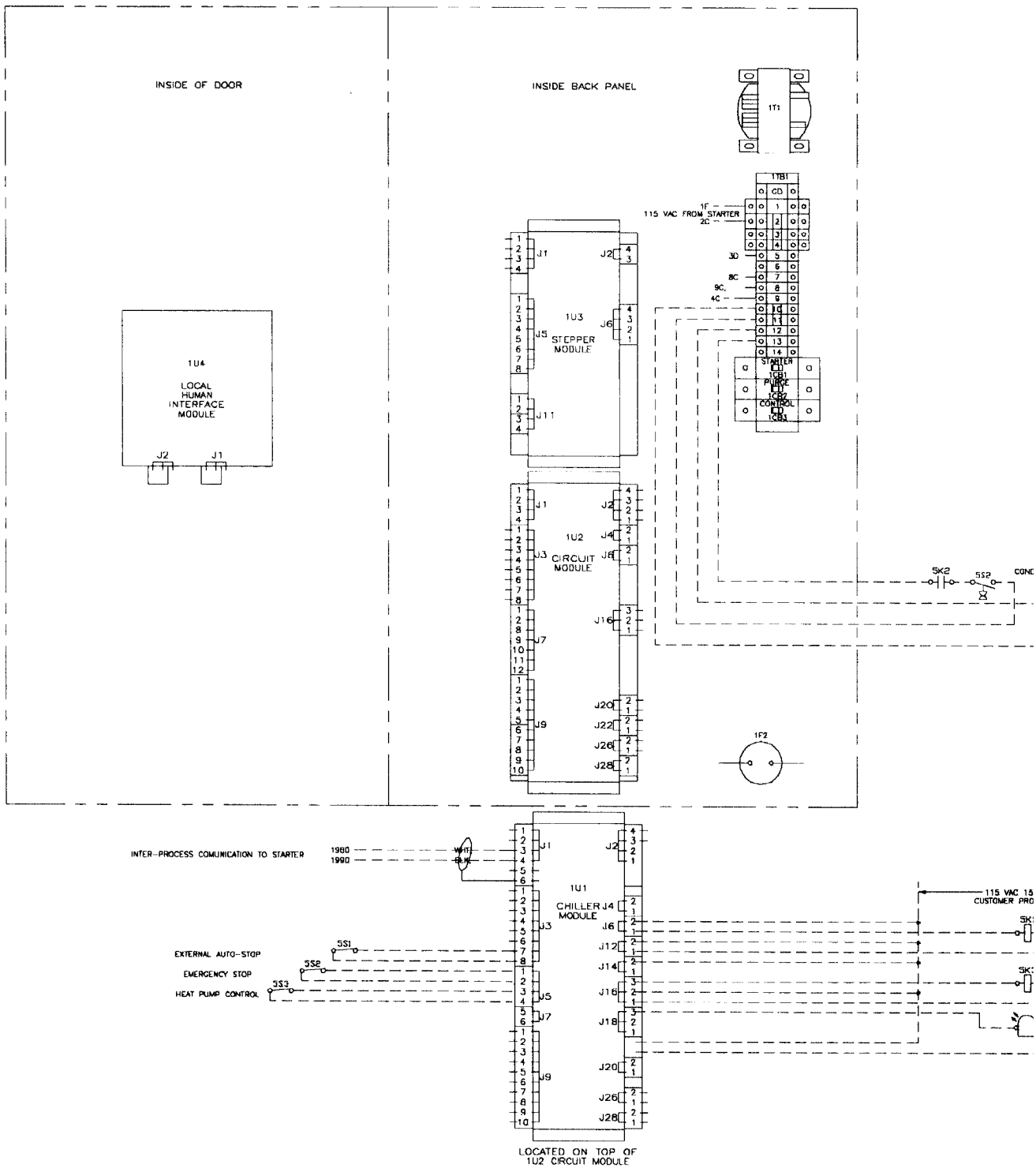
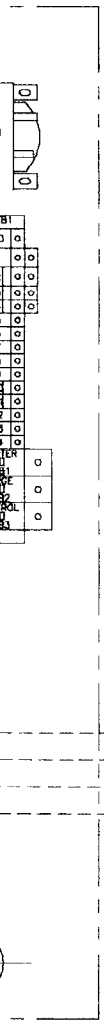
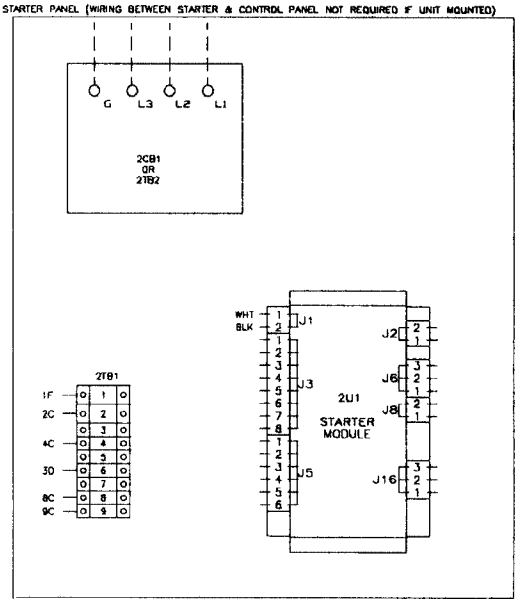
Figure 29e
Typical UCP2 Field Connection Wiring
CVHE, CVHF







⚠ WARNING

DISCONNECT ELECTRIC POWER SUPPLY BEFORE SERVICING TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK.

AVERTISSEMENT

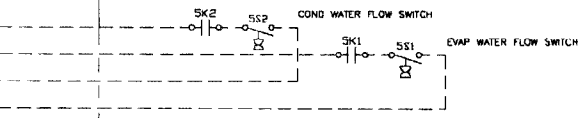
DEBRANCHER DU CIRCUIT D'ALIMENTATION ELECTRIQUE AVANT L'ENTRETIEN POUR EVITER BLESSURE OU MORT PAR ELECTROCUTION.

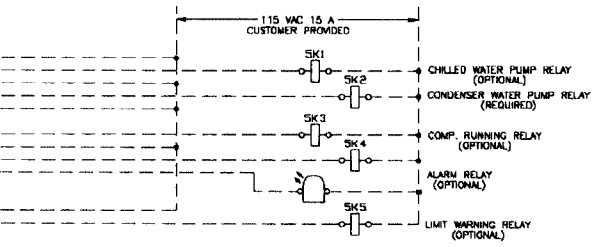
⚠ CAUTION

USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.

ATTENTION

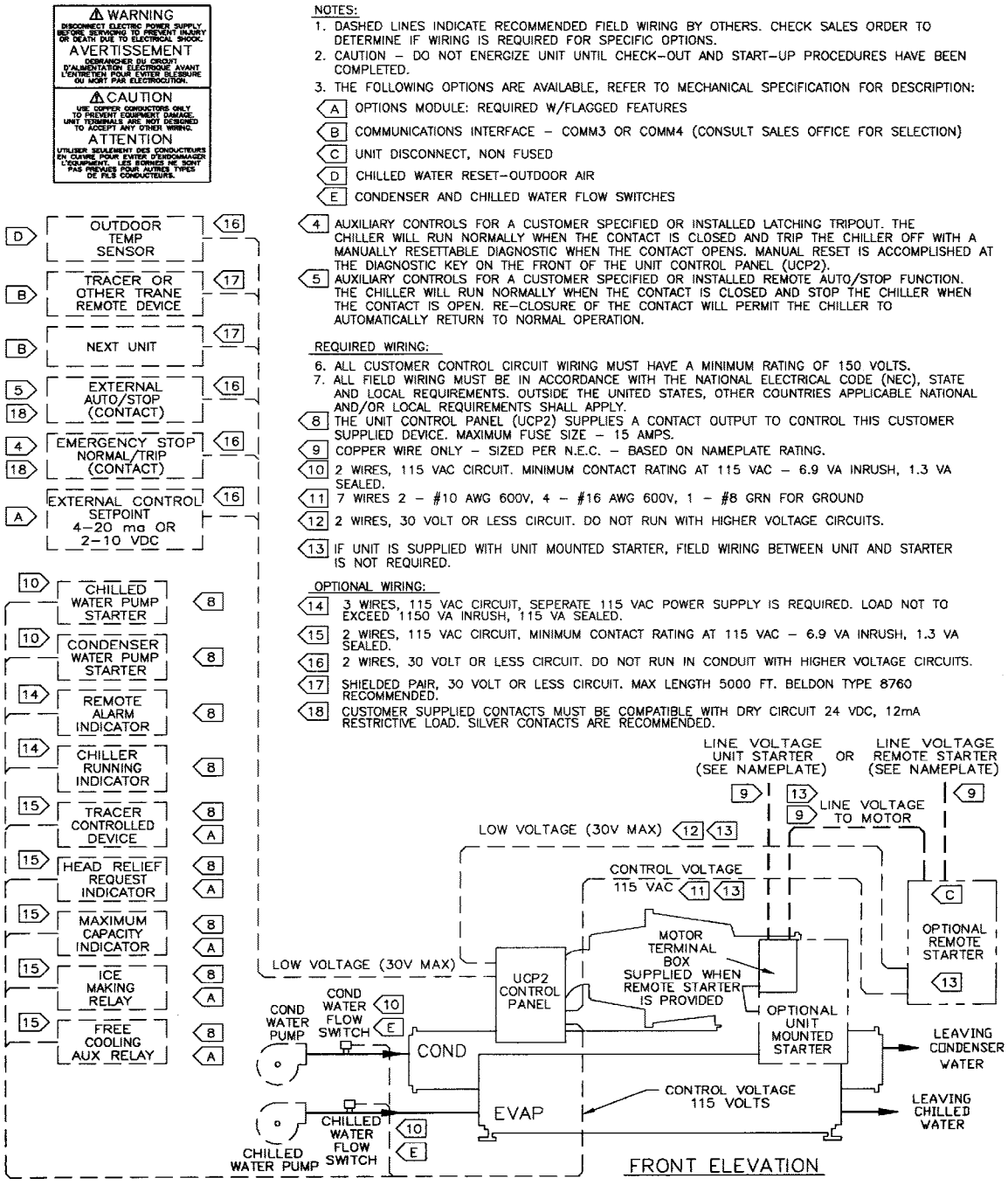
UTILISER SEULEMENT DES CONDUCTEURS EN CUIVRE POUR EVITER D'ENDOMMAGER L'EQUIPMENT. LES BORNES NE SONT PAS PREVUES POUR AUTRES TYPES DE FILS CONDUCTEURS.





NOTES:

1. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. PHANTOM LINES INDICATE ALTERNATE CIRCUITRY OR AVAILABLE SALES OPTION. CHECK SALES ORDER TO DETERMINE IF WIRING IS REQUIRED FOR SPECIFIC OPTIONS.
2. ALL THREE PHASE MOTORS SUPPLIED WITH THE UNIT ARE PROTECTED UNDER PRIMARY SINGLE PHASE FAILURE CONDITIONS.
3. CAUTION – DO NOT ENERGIZE UNIT UNTIL CHECK-OUT AND START-UP PROCEDURES HAVE BEEN COMPLETED.
4. THE FOLLOWING OPTIONS ARE AVAILABLE – THEY ARE IMPLEMENTED AND WIRED AS REQUIRED FOR A SPECIFIC SYSTEM APPLICATION.
   - ⟨A⟩ OPTIONS MODULE INCLUDES:
     EXTERNAL CHILLED WATER SETPOINT
     0–10 VDC OR 4–20 ma.
     COND. & EVAP. WATER FLOW SENSING SYSTEMS
     GREATER THAN 150 PSIG.
   - ⟨B⟩ COMMUNICATIONS INTERFACE– COM3 OR COM4
     (CONSULT SALES OFFICE FOR SELECTION)
   - ⟨H⟩ UNIT DISCONNECT, NON FUSED
   - ⟨J⟩ CHILLED WATER RESET – RETURN WATER (STANDARD FEATURE UCP2)
   - ⟨K⟩ CHILLED WATER RESET – OUTDOOR AIR
   - ⟨S⟩ CONDENSER AND CHILLED WATER FLOW SWITCHS
5. AUXILIARY CONTROLS FOR A CUSTOMER SPECIFIED OR INSTALLED LATCHING TRIPOUT. THE CHILLER WILL RUN NORMALLY WHEN THE CONTACT IS CLOSED AND TRIP THE CHILLER OFF WITH A MANUALLY RESETTABLE DIAGNOSTIC WHEN THE CONTACT OPENS. MANUAL RESET IS ACCOMPLISHED AT THE DIAGNOSTIC KEY ON THE FRONT OF THE UNIT CONTROL PANEL (UCP).
6. AUXILIARY CONTROLS FOR A CUSTOMER SPECIFIED OR INSTALLED REMOTE AUTO/STOP FUNCTION. THE CHILLER WILL RUN NORMALLY WHEN THE CONTACT IS CLOSED AND STOP THE CHILLER WHEN THE CONTACT IS OPEN. RE-CLOSURE OF THE CONTACT WILL PERMIT THE CHILLER TO AUTOMATICALLY RETURN TO NORMAL OPERATION.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⚠ CAUTION
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.
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UTILISER SEULEMENT DES CONDUCTEURS EN CUIVRE POUR EVITER D'ENDOMMAGER L'EQUIPEMENT. LES BORNES NE SONT PAS PREVUES POUR AUTRES TYPES DE FILS CONDUCTEURS.
NOTES:
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2. CAUTION – DO NOT ENERGIZE UNIT UNTIL CHECK-OUT AND START-UP PROCEDURES HAVE BEEN COMPLETED.
3. THE FOLLOWING OPTIONS ARE AVAILABLE, REFER TO MECHANICAL SPECIFICATION FOR DESCRIPTION:
A OPTIONS MODULE: REQUIRED W/FLAGGED FEATURES
B COMMUNICATIONS INTERFACE – COMM3 OR COMM4 (CONSULT SALES OFFICE FOR SELECTION)
C UNIT DISCONNECT, NON FUSED
D CHILLED WATER RESET-OUTDOOR AIR
E CONDENSER AND CHILLED WATER FLOW SWITCHES
4 AUXILIARY CONTROLS FOR A CUSTOMER SPECIFIED OR INSTALLED LATCHING TRIPOUT. THE CHILLER WILL RUN NORMALLY WHEN THE CONTACT IS CLOSED AND TRIP THE CHILLER OFF WITH A MANUALLY RESETTABLE DIAGNOSTIC WHEN THE CONTACT OPENS. MANUAL RESET IS ACCOMPLISHED AT THE DIAGNOSTIC KEY ON THE FRONT OF THE UNIT CONTROL PANEL (UCP2).
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REQUIRED WIRING:
6. ALL CUSTOMER CONTROL CIRCUIT WIRING MUST HAVE A MINIMUM RATING OF 150 VOLTS.
7. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC), STATE AND LOCAL REQUIREMENTS. OUTSIDE THE UNITED STATES, OTHER COUNTRIES APPLICABLE NATIONAL AND/OR LOCAL REQUIREMENTS SHALL APPLY.
8 THE UNIT CONTROL PANEL (UCP2) SUPPLIES A CONTACT OUTPUT TO CONTROL THIS CUSTOMER SUPPLIED DEVICE. MAXIMUM FUSE SIZE – 15 AMPS.
9 COPPER WIRE ONLY – SIZED PER N.E.C. – BASED ON NAMEPLATE RATING.
10 2 WIRES, 115 VAC CIRCUIT. MINIMUM CONTACT RATING AT 115 VAC – 6.9 VA INRUSH, 1.3 VA SEALED.
11 7 WIRES 2 – #10 AWG 600V, 4 – #16 AWG 600V, 1 – #8 GRN FOR GROUND
12 2 WIRES, 30 VOLT OR LESS CIRCUIT. DO NOT RUN WITH HIGHER VOLTAGE CIRCUITS.
13 IF UNIT IS SUPPLIED WITH UNIT MOUNTED STARTER, FIELD WIRING BETWEEN UNIT AND STARTER IS NOT REQUIRED.
OPTIONAL WIRING:
14 3 WIRES, 115 VAC CIRCUIT, SEPERATE 115 VAC POWER SUPPLY IS REQUIRED. LOAD NOT TO EXCEED 1150 VA INRUSH, 115 VA SEALED.
15 2 WIRES, 115 VAC CIRCUIT, MINIMUM CONTACT RATING AT 115 VAC – 6.9 VA INRUSH, 1.3 VA SEALED.
16 2 WIRES, 30 VOLT OR LESS CIRCUIT. DO NOT RUN IN CONDUIT WITH HIGHER VOLTAGE CIRCUITS.
17 SHIELDED PAIR, 30 VOLT OR LESS CIRCUIT. MAX LENGTH 5000 FT. BELDON TYPE 8760 RECOMMENDED.
18 CUSTOMER SUPPLIED CONTACTS MUST BE COMPATIBLE WITH DRY CIRCUIT 24 VDC, 12mA RESTRICTIVE LOAD. SILVER CONTACTS ARE RECOMMENDED.
D OUTDOOR TEMP SENSOR 16
B TRACER OR OTHER TRANE REMOTE DEVICE 17
B NEXT UNIT 17
5 18 EXTERNAL AUTO/STOP (CONTACT) 16
4 18 EMERGENCY STOP NORMAL/TRIP (CONTACT) 16
A EXTERNAL CONTROL SETPOINT 4-20 ma OR 2-10 VDC 16
10 CHILLED WATER PUMP STARTER 8
10 CONDENSER WATER PUMP STARTER 8
14 REMOTE ALARM INDICATOR 8
14 CHILLER RUNNING INDICATOR 8
15 TRACER CONTROLLED DEVICE 8 A
15 HEAD RELIEF REQUEST INDICATOR 8 A
15 MAXIMUM CAPACITY INDICATOR 8 A
15 ICE MAKING RELAY 8 A
15 FREE COOLING AUX RELAY 8 A
LINE VOLTAGE UNIT STARTER (SEE NAMEPLATE)
OR
LINE VOLTAGE REMOTE STARTER (SEE NAMEPLATE)
9 13 LINE VOLTAGE TO MOTOR 9
LOW VOLTAGE (30V MAX) 12 13
CONTROL VOLTAGE 115 VAC 11 13
C
OPTIONAL REMOTE STARTER
13
MOTOR TERMINAL BOX SUPPLIED WHEN REMOTE STARTER IS PROVIDED
LOW VOLTAGE (30V MAX)
UCP2 CONTROL PANEL
COND WATER FLOW SWITCH 10 E
COND WATER PUMP
COND
OPTIONAL UNIT MOUNTED STARTER
LEAVING CONDENSER WATER
CONTROL VOLTAGE 115 VOLTS
EVAP
LEAVING CHILLED WATER
CHILLED WATER FLOW SWITCH 10 E
CHILLED WATER PUMP
FRONT ELEVATION

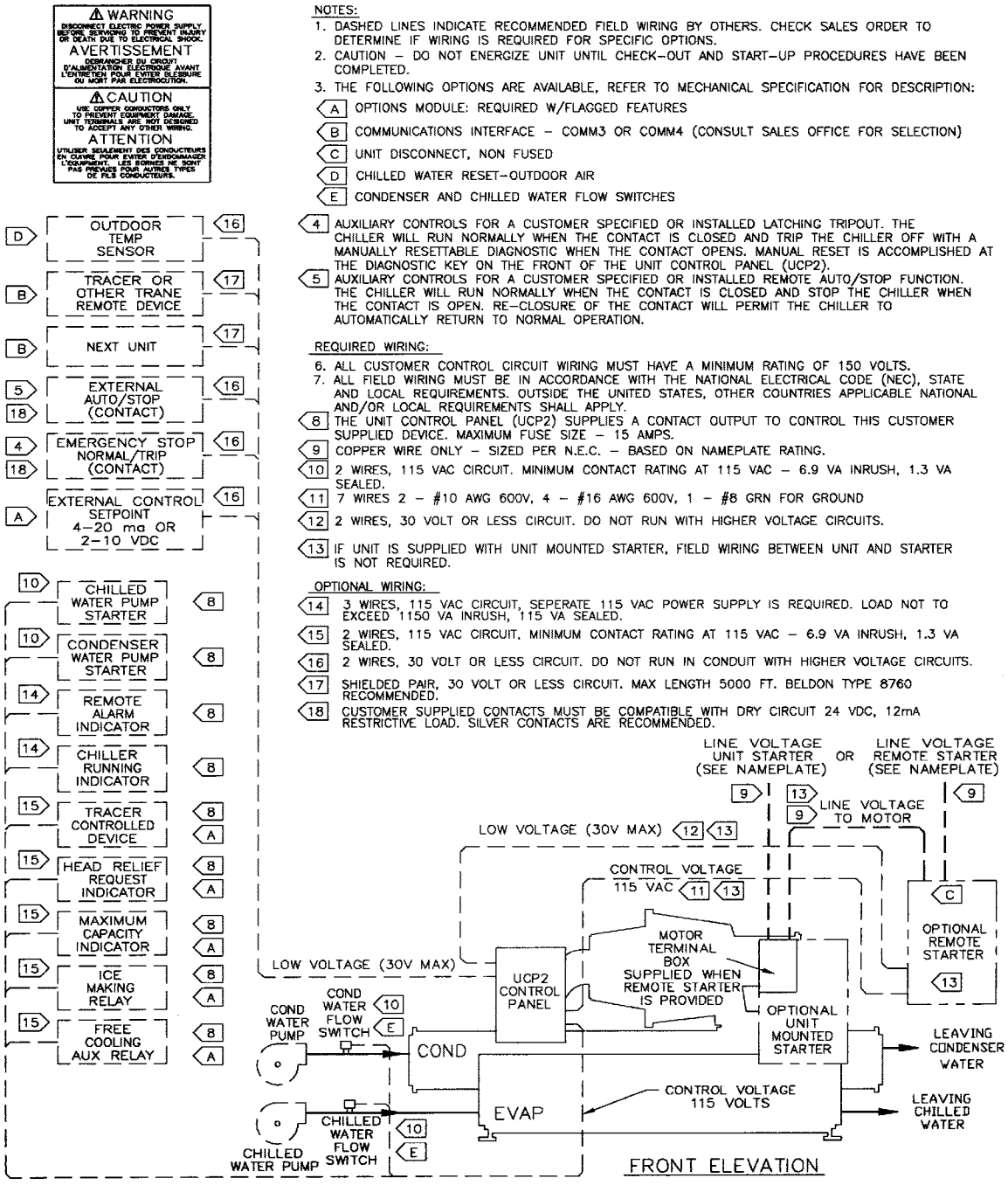
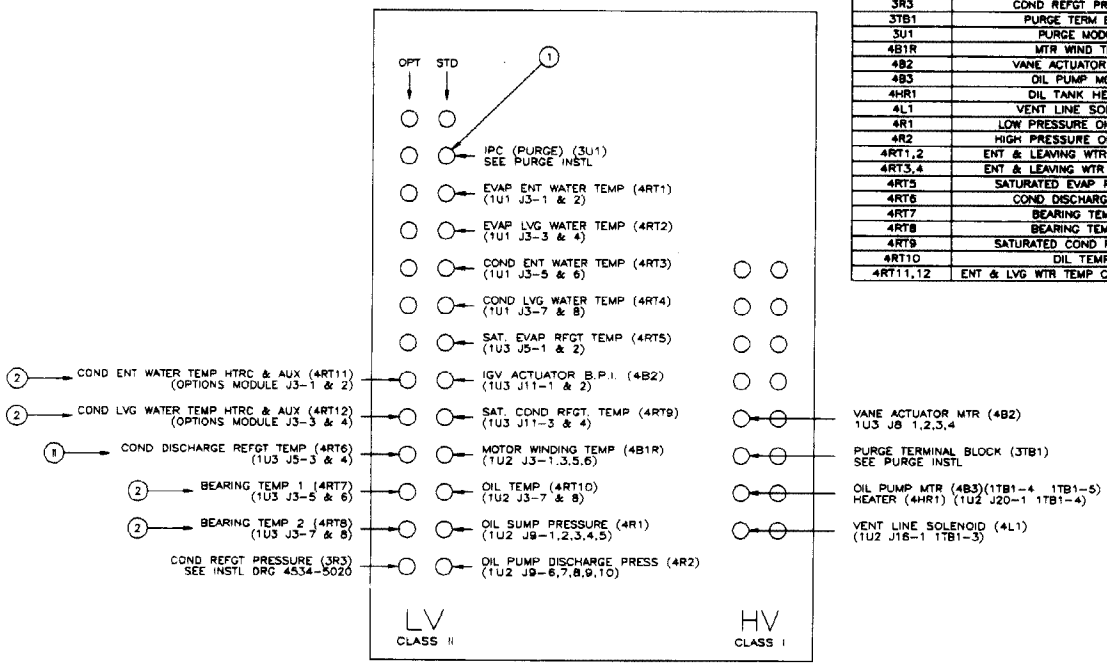
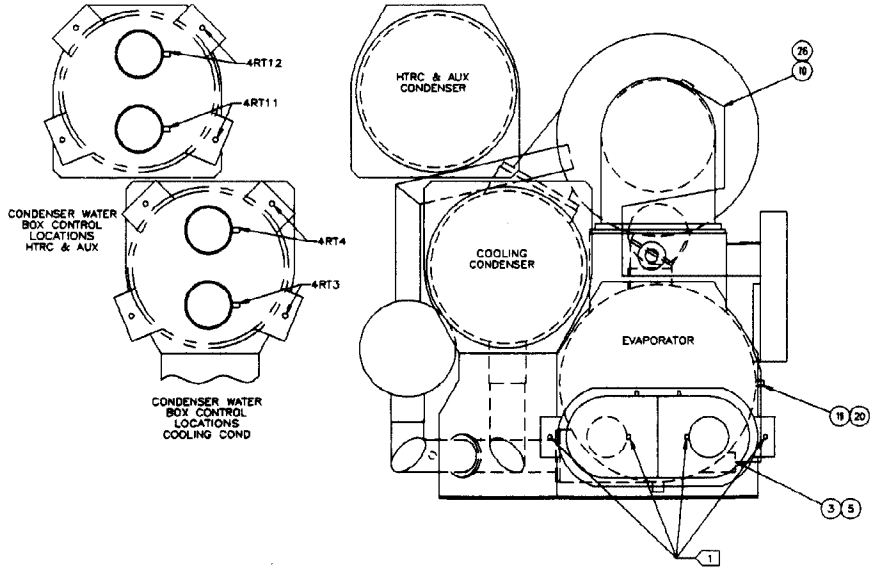

⚠ WARNING
DISCONNECT ELECTRIC POWER SUPPLY BEFORE SERVICING TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK.
AVERTISSEMENT
DEBRANCHER DU CIRCUIT D'ALIMENTATION ELECTRIQUE AVANT L'ENTRETIEN POUR EVITER BLESSURE OU MORT PAR ELECTROCUTION.
⚠ CAUTION
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.
ATTENTION
UTILISER SEULEMENT DES CONDUCTEURS EN CUIVRE POUR EVITER D'ENDOMMAGER L'EQUIPEMENT. LES BORNES NE SONT PAS PREVUES POUR AUTRES TYPES DE FILS CONDUCTEURS.
NOTES:
1. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. CHECK SALES ORDER TO DETERMINE IF WIRING IS REQUIRED FOR SPECIFIC OPTIONS.
2. CAUTION – DO NOT ENERGIZE UNIT UNTIL CHECK-OUT AND START-UP PROCEDURES HAVE BEEN COMPLETED.
3. THE FOLLOWING OPTIONS ARE AVAILABLE, REFER TO MECHANICAL SPECIFICATION FOR DESCRIPTION:
A OPTIONS MODULE: REQUIRED W/FLAGGED FEATURES
B COMMUNICATIONS INTERFACE – COMM3 OR COMM4 (CONSULT SALES OFFICE FOR SELECTION)
C UNIT DISCONNECT, NON FUSED
D CHILLED WATER RESET-OUTDOOR AIR
E CONDENSER AND CHILLED WATER FLOW SWITCHES
4 AUXILIARY CONTROLS FOR A CUSTOMER SPECIFIED OR INSTALLED LATCHING TRIPOUT. THE CHILLER WILL RUN NORMALLY WHEN THE CONTACT IS CLOSED AND TRIP THE CHILLER OFF WITH A MANUALLY RESETTABLE DIAGNOSTIC WHEN THE CONTACT OPENS. MANUAL RESET IS ACCOMPLISHED AT THE DIAGNOSTIC KEY ON THE FRONT OF THE UNIT CONTROL PANEL (UCP2).
5 AUXILIARY CONTROLS FOR A CUSTOMER SPECIFIED OR INSTALLED REMOTE AUTO/STOP FUNCTION. THE CHILLER WILL RUN NORMALLY WHEN THE CONTACT IS CLOSED AND STOP THE CHILLER WHEN THE CONTACT IS OPEN. RE-CLOSURE OF THE CONTACT WILL PERMIT THE CHILLER TO AUTOMATICALLY RETURN TO NORMAL OPERATION.
REQUIRED WIRING:
6. ALL CUSTOMER CONTROL CIRCUIT WIRING MUST HAVE A MINIMUM RATING OF 150 VOLTS.
7. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC), STATE AND LOCAL REQUIREMENTS. OUTSIDE THE UNITED STATES, OTHER COUNTRIES APPLICABLE NATIONAL AND/OR LOCAL REQUIREMENTS SHALL APPLY.
8 THE UNIT CONTROL PANEL (UCP2) SUPPLIES A CONTACT OUTPUT TO CONTROL THIS CUSTOMER SUPPLIED DEVICE. MAXIMUM FUSE SIZE – 15 AMPS.
9 COPPER WIRE ONLY – SIZED PER N.E.C. – BASED ON NAMEPLATE RATING.
10 2 WIRES, 115 VAC CIRCUIT. MINIMUM CONTACT RATING AT 115 VAC – 6.9 VA INRUSH, 1.3 VA SEALED.
11 7 WIRES 2 – #10 AWG 600V, 4 – #16 AWG 600V, 1 – #8 GRN FOR GROUND
12 2 WIRES, 30 VOLT OR LESS CIRCUIT. DO NOT RUN WITH HIGHER VOLTAGE CIRCUITS.
13 IF UNIT IS SUPPLIED WITH UNIT MOUNTED STARTER, FIELD WIRING BETWEEN UNIT AND STARTER IS NOT REQUIRED.
OPTIONAL WIRING:
14 3 WIRES, 115 VAC CIRCUIT, SEPERATE 115 VAC POWER SUPPLY IS REQUIRED. LOAD NOT TO EXCEED 1150 VA INRUSH, 115 VA SEALED.
15 2 WIRES, 115 VAC CIRCUIT, MINIMUM CONTACT RATING AT 115 VAC – 6.9 VA INRUSH, 1.3 VA SEALED.
16 2 WIRES, 30 VOLT OR LESS CIRCUIT. DO NOT RUN IN CONDUIT WITH HIGHER VOLTAGE CIRCUITS.
17 SHIELDED PAIR, 30 VOLT OR LESS CIRCUIT. MAX LENGTH 5000 FT. BELDON TYPE 8760 RECOMMENDED.
18 CUSTOMER SUPPLIED CONTACTS MUST BE COMPATIBLE WITH DRY CIRCUIT 24 VDC, 12mA RESTRICTIVE LOAD. SILVER CONTACTS ARE RECOMMENDED.
D OUTDOOR TEMP SENSOR 16
B TRACER OR OTHER TRANE REMOTE DEVICE 17
B NEXT UNIT 17
5 18 EXTERNAL AUTO/STOP (CONTACT) 16
4 18 EMERGENCY STOP NORMAL/TRIP (CONTACT) 16
A EXTERNAL CONTROL SETPOINT 4-20 ma OR 2-10 VDC 16
10 CHILLED WATER PUMP STARTER 8
10 CONDENSER WATER PUMP STARTER 8
14 REMOTE ALARM INDICATOR 8
14 CHILLER RUNNING INDICATOR 8
15 TRACER CONTROLLED DEVICE 8 A
15 HEAD RELIEF REQUEST INDICATOR 8 A
15 MAXIMUM CAPACITY INDICATOR 8 A
15 ICE MAKING RELAY 8 A
15 FREE COOLING AUX RELAY 8 A
LINE VOLTAGE UNIT STARTER (SEE NAMEPLATE)
OR
LINE VOLTAGE REMOTE STARTER (SEE NAMEPLATE)
9 13 LINE VOLTAGE TO MOTOR 9
LOW VOLTAGE (30V MAX) 12 13
CONTROL VOLTAGE 115 VAC 11 13
C
OPTIONAL REMOTE STARTER
13
MOTOR TERMINAL BOX SUPPLIED WHEN REMOTE STARTER IS PROVIDED
LOW VOLTAGE (30V MAX)
UCP2 CONTROL PANEL
COND WATER FLOW SWITCH 10 E
COND WATER PUMP
COND
OPTIONAL UNIT MOUNTED STARTER
LEAVING CONDENSER WATER
CONTROL VOLTAGE 115 VOLTS
EVAP
LEAVING CHILLED WATER
CHILLED WATER FLOW SWITCH 10 E
CHILLED WATER PUMP
FRONT ELEVATION

Figure 37
UCP2 Control and Sensor Locations

DEVICE DESIGNATION	DESCRIPTION
3R3	COND REFGT PRESSURE
3TB1	PURGE TERM BLOCK
3U1	PURGE MODULE
4B1R	MTR WIND TEMP
4B2	VANE ACTUATOR MOTOR
4B3	OIL PUMP MOTOR
4HR1	OIL TANK HEATER
4L1	VENT LINE SOLENOID
4R1	LOW PRESSURE OIL SENSOR
4R2	HIGH PRESSURE OIL SENSOR
4RT1,2	ENT & LEAVING WTR TEMP EVAP
4RT3,4	ENT & LEAVING WTR TEMP COND
4RT5	SATURATED EVAP RFGT TEMP
4RT6	COND DISCHARGE TEMP
4RT7	BEARING TEMP 1
4RT8	BEARING TEMP 2
4RT9	SATURATED COND RFGT TEMP
4RT10	OIL TEMP
4RT11,12	ENT & LVG WTR TEMP CD. HTRC & AUX



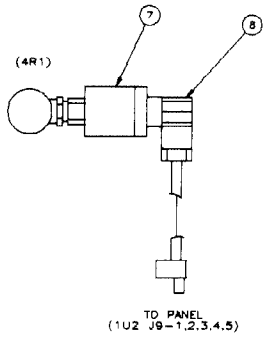


DESCRIPTION
REFGT PRESSURE
GE TERM BLOCK
URGE MODULE
R WIND TEMP
ACTUATOR MOTOR
PUMP MOTOR
TANK HEATER
LINE SOLENOID
SSURE OIL SENSOR
ESSURE OIL SENSOR
VING WTR TEMP EVAP
VING WTR TEMP COND
D EVAP RFGT TEMP
DISCHARGE TEMP
ARING TEMP 1
ARING TEMP 2
D COND RFGT TEMP
OIL TEMP
R TEMP CD. HTRC & AUX

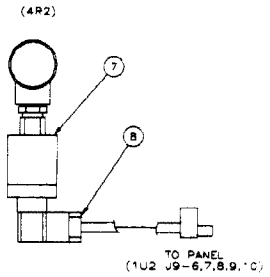
.1TB1-5)
B1-4)

NOTES:

1. EVAP ENTERING WATER MAY BE EITHER END, FRONT OR REAR. CONTACT CUSTOMER FOR CORRECT ENTERING EVAP WATER CONN



LOW PRESSURE OIL SENSOR
(OIL VENT LINE) (4R1)



HIGH PRESSURE OIL SENSOR
(OIL FEED LINE) (4R2)

DETAIL C