# AquaEdge® 23XRV
# High-Efficiency Variable Speed Screw Chiller with Greenspeed® Intelligence and PIC6 Controls
# 50/60 Hz
# R-134a

# Installation Instructions

## CONTENTS



## SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

It is important to recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices, which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

Screw liquid chillers are designed to provide safe and reliable service when operated within design specifications. When operating this equipment, use good judgment and safety precautions to avoid damage to equipment and property or injury to personnel.

**⚠ DANGER**

Failure to follow these procedures will result in severe personal injury or death.

UNIT AND ELECTRICAL CONSTRUCTION is designed for use in a non-hazardous environment (non-flammable and non-explosive). DO NOT install the chiller in a hazardous (flammable or explosive) location or environment.




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## ⚠ DANGER

Failure to follow these procedures will result in severe personal injury or death.

DO NOT VENT refrigerant relief devices within a building. Outlet from rupture disc or relief valve must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE 15 (American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers) (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.

PROVIDE adequate ventilation in accordance with ANSI/ASHRAE 15, especially for enclosed and low overhead spaces. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death. Intentional misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

DO NOT USE OXYGEN to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.

DO NOT USE air to leak test. Use only refrigerant or dry nitrogen.

NEVER EXCEED specified test pressures. VERIFY the allowable test pressure by checking the instruction literature and the design pressures on the equipment nameplate.

DO NOT VALVE OFF any safety device.

BE SURE that all pressure relief devices are properly installed and functioning before operating any machine.

RISK OF INJURY OR DEATH by electrocution. High voltage is present on motor leads even though the motor is not running when a solid state or inside-delta mechanical starter is used. Open the power supply disconnect before touching motor leads or terminals.

## ⚠ WARNING

Failure to follow these procedures may result in personal injury or death.

DO NOT USE TORCH to remove any component. System contains oil and refrigerant under pressure.

To remove a component, wear protective gloves and goggles and proceed as follows:

Shut off electrical power to unit.

Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.

Traces of vapor should be displaced with nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.

Cut component connection tubing with tubing cutter and remove component from unit. Use a pan to catch any oil that may come out of the lines and as a gauge for how much oil to add to the system.

Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

DO NOT USE eyebolts or eyebolt holes to rig heat exchangers or the entire assembly.

DO NOT work on high (or medium) voltage equipment unless you are a qualified electrician.

## ⚠ WARNING

DO NOT WORK ON electrical components, including control panels, switches, starters, or oil heater until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid-state components.

LOCK OPEN AND TAG electrical circuits during servicing. IF WORK IS INTERRUPTED, confirm that all circuits are deenergized before resuming work.

AVOID SPILLING liquid refrigerant on skin or getting it into the eyes. USE SAFETY GOGGLES. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, IMMEDIATELY FLUSH EYES with water and consult a physician.

NEVER APPLY an open flame or live steam to a refrigerant cylinder. Dangerous over pressure can result. When it is necessary to heat refrigerant, use only warm (110 F [43 C]) water.

DO NOT REUSE disposable (nonreturnable) cylinders or attempt to refill them. It is DANGEROUS AND ILLEGAL. When cylinder is emptied, evacuate remaining gas pressure, loosen the collar, and unscrew and discard the valve stem. DO NOT INCINERATE.

CHECK THE REFRIGERANT TYPE before adding refrigerant to the machine. The introduction of the wrong refrigerant can cause machine damage or malfunction.

Operation of this equipment with refrigerants other than those cited herein should comply with ANSI/ASHRAE 15 (latest edition). Contact Carrier for further information on use of this machine with other refrigerants.

DO NOT ATTEMPT TO REMOVE fittings, covers, etc., while machine is under pressure or while machine is running. Be sure pressure is at 0 psig (0 kPa) before breaking any refrigerant connection.

CAREFULLY INSPECT all relief valves, rupture discs, and other relief devices AT LEAST ONCE A YEAR. If machine operates in a corrosive atmosphere, inspect the devices at more frequent intervals.

DO NOT ATTEMPT TO REPAIR OR RECONDITION any relief valve when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism. Replace the valve.

DO NOT install relief devices in series or backwards.

USE CARE when working near or in line with a compressed spring. Sudden release of the spring can cause it and objects in its path to act as projectiles.

SOME MODELS MAY EXCEED 85 dBA. Hearing protection should be worn when working in the vicinity of such chillers.

## ⚠ CAUTION

Failure to follow these procedures may result in personal injury or damage to equipment.

DO NOT STEP on refrigerant lines. Broken lines can whip about and release refrigerant, causing personal injury.

DO NOT climb over a machine. Use platform, catwalk, or staging. Follow safe practices when using ladders.

USE MECHANICAL EQUIPMENT (crane, hoist, etc.) to lift or move inspection covers or other heavy components. Even if components are light, use mechanical equipment when there is a risk of slipping or losing your balance.

**⚠ CAUTION**

BE AWARE that certain automatic start arrangements CAN ENGAGE THE STARTER, TOWER FAN, OR PUMPS. Open the disconnect ahead of the starter, tower fan, and pumps. Shut off the machine or pump before servicing equipment.

USE only repaired or replacement parts that meet the code requirements of the original equipment.

DO NOT VENT OR DRAIN waterboxes containing industrial brines, liquid, gases, or semisolids without the permission of your process control group.

DO NOT LOOSEN waterbox cover bolts until the waterbox has been completely drained.

DOUBLE-CHECK that coupling nut wrenches, dial indicators, or other items have been removed before rotating any shafts.

DO NOT LOOSEN a packing gland nut before checking that the nut has a positive thread engagement.

PERIODICALLY INSPECT all valves, fittings, and piping for corrosion, rust, leaks, or damage.

PROVIDE A DRAIN connection in the vent line near each pressure relief device to prevent a build-up of condensate or rain water.

DO NOT re-use compressor oil or any oil that has been exposed to the atmosphere. Dispose of oil per local codes and regulations.

DO NOT leave refrigerant system open to air any longer than the actual time required to service the equipment. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed.

Chiller must be installed in an indoor environment where the ambient temperature is between 40 to 104°F (4 to 40°C) with a relative humidity (non-condensing) of 95% or less. To ensure that electrical components operate properly and to avoid equipment damage, do not locate chiller in an area exposed to dust, dirt, corrosive fumes, or excessive heat and humidity.

# INTRODUCTION

The 23XRV machine is factory assembled, wired, and leak tested. Installation (not by Carrier) consists primarily of establishing water and electrical services to the machine. The rigging, installation, field wiring, field piping, and insulation of waterbox covers are the responsibility of the contractor and/or customer. Carrier has no installation responsibilities for the equipment.

## Job Data

Necessary information consists of:

- job contract or specifications
- machine location prints
- rigging information
- piping prints and details
- field wiring drawings
- starter manufacturer's installation details
- Carrier certified print

# INSTALLATION

## Step 1 — Receive the Machine

INSPECT SHIPMENT

**⚠ CAUTION**

Do not open any valves or loosen any connections. The 23XRV machine may be shipped with a full refrigerant charge. Some machines may be shipped with a nitrogen holding charge as an option.

1. Inspect for shipping damage while machine is still on shipping conveyance. If machine appears to be damaged or has been torn loose from its anchorage, have it examined by transportation inspectors before removal. Forward claim papers directly to transportation company. *Manufacturer is not responsible for any damage incurred in transit.*
2. Check all items against shipping list. Immediately notify the nearest Carrier representative if any item is missing.
3. To prevent loss or damage, leave all parts in original packages until beginning installation. All openings are closed with covers or plugs to prevent dirt and debris from entering machine components during shipping. A full operating oil charge is placed in the oil sump before shipment.

IDENTIFY MACHINE (FIG. 1-8)

Refer to machine nameplate in Fig. 1. The machine model number, serial number, and heat exchanger sizes are stamped on the Refrigeration Machine nameplate located on the side of the VFD (variable frequency drive) enclosure. Check this information against shipping papers and job data.

***Identifying Drive by Part Number***

The VFD drive can be identified by its part number (Fig. 9). This number appears on the shipping label and on VFD nameplate.

***Drive Input Component Location***

Figure 10 identifies the control center components for the LiquiFlo 2.0 (LF-2) VFD. Figure 11 identifies the control center components for the Std Tier VFD.

***Identifying Power Module by ID Number***

Each LF-2 AC power module can be identified by its ID number. See Fig. 9. This number appears on the shipping label and on the power module's nameplate. Power ratings for LF-2 VFDs are provided in Table 1. Power ratings for Std Tier VFDs are provided in Table 2.

INSTALLATION REQUIREMENTS

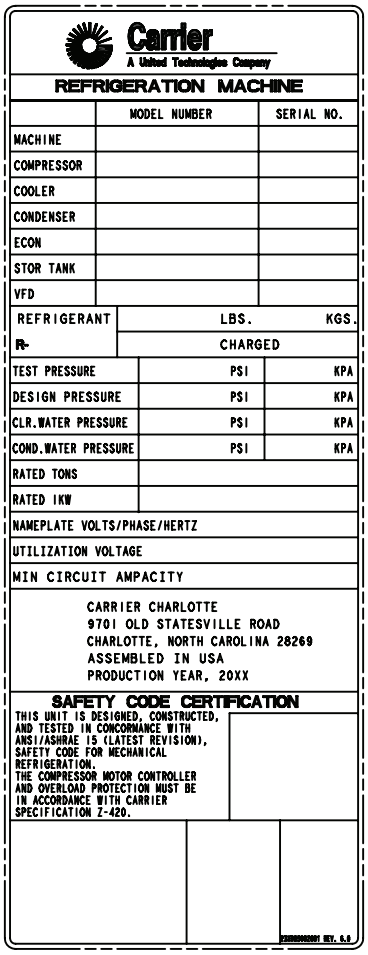
Certain installation requirements should be checked before continuing with the chiller's electrical installation. Input power wire sizes, branch circuit protection, and control wiring are all areas that need to be evaluated.

***Determining Wire Size Requirements***

Wire size should be determined based on the size of the conduit openings and applicable local, national, and international codes (e.g., NEC [National Electric Code]/CEC [California Energy Commission] regulations). General recommendations are included in the Carrier field wiring drawing.

***Conduit Entry Size***

It is important to determine the size of the conduit openings in the enclosure power entry plate so that the wire planned for a specific entry point will fit through the opening. Do NOT punch holes or drill into the top surface of the control center enclosure for field wiring. Knockouts are provided in the back of the control center for field control wiring connections.



Carrier
A United Technologies Company

**REFRIGERATION MACHINE**

| | MODEL NUMBER | SERIAL NO. |
|---|---|---|
| MACHINE | | |
| COMPRESSOR | | |
| COOLER | | |
| CONDENSER | | |
| ECON | | |
| STOR TANK | | |
| VFD | | |

| REFRIGERANT | LBS. | KGS. |
|---|---|---|
| R- | CHARGED | |

| | | |
|---|---|---|
| TEST PRESSURE | PSI | KPA |
| DESIGN PRESSURE | PSI | KPA |
| CLR.WATER PRESSURE | PSI | KPA |
| COND.WATER PRESSURE | PSI | KPA |
| RATED TONS | | |
| RATED IKW | | |
| NAMEPLATE VOLTS/PHASE/HERTZ | | |
| UTILIZATION VOLTAGE | | |
| MIN CIRCUIT AMPACITY | | |

CARRIER CHARLOTTE
9701 OLD STATESVILLE ROAD
CHARLOTTE, NORTH CAROLINA 28269
ASSEMBLED IN USA
PRODUCTION YEAR, 20XX

**SAFETY CODE CERTIFICATION**

THIS UNIT IS DESIGNED, CONSTRUCTED, AND TESTED IN CONCORMANCE WITH ANSI/ASHRAE 15 (LATEST REVISION), SAFETY CODE FOR MECHANICAL REFRIGERATION.
THE COMPRESSOR MOTOR CONTROLLER AND OVERLOAD PROTECTION MUST BE IN ACCORDANCE WITH CARRIER SPECIFICATION Z-420.

**Fig. 1 — Refrigeration Machine Nameplate**

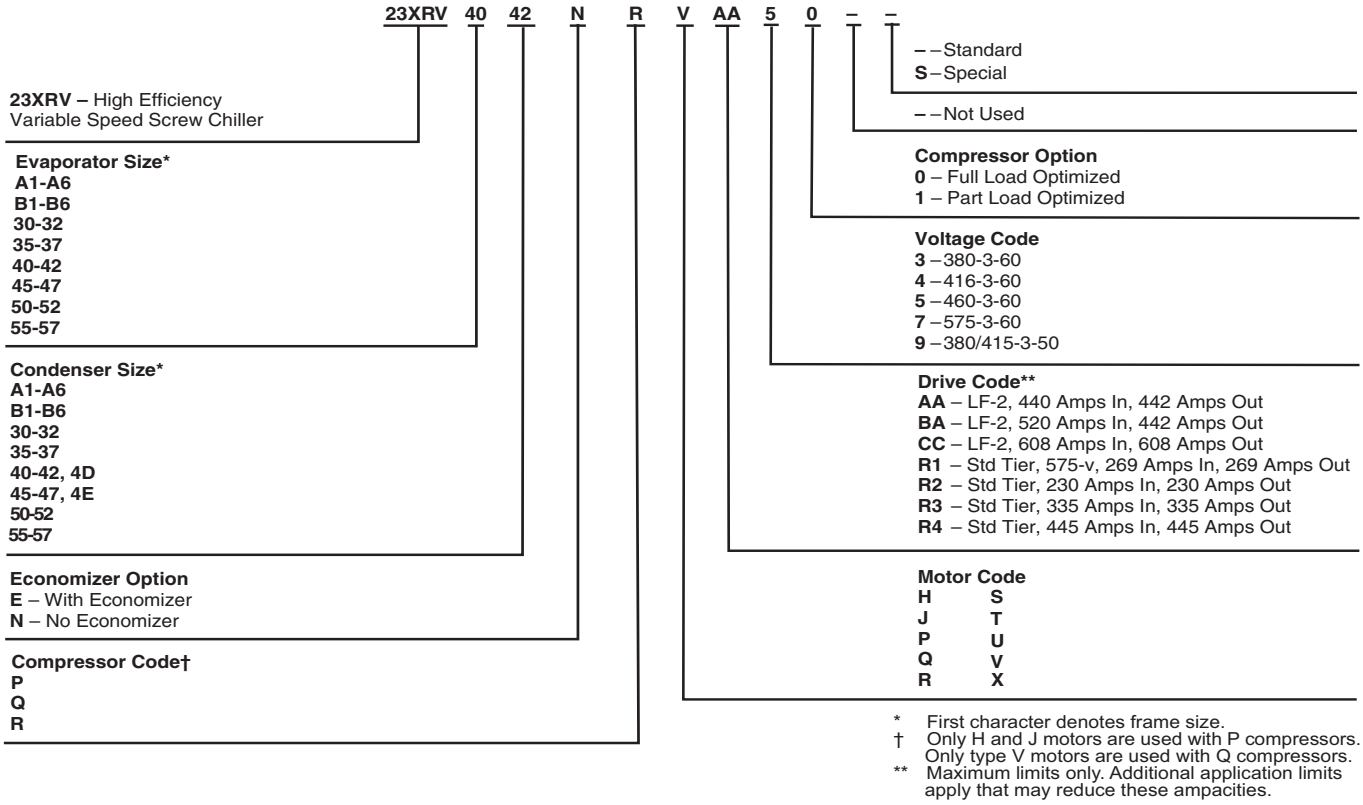
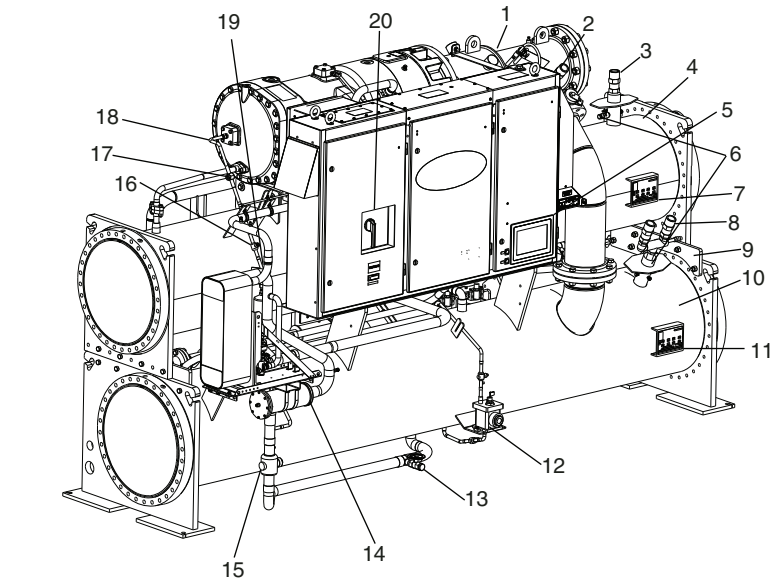
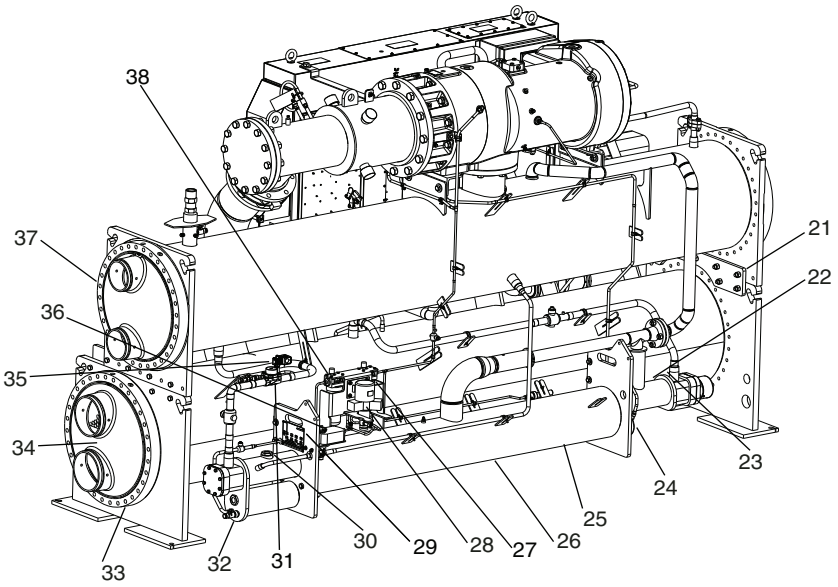


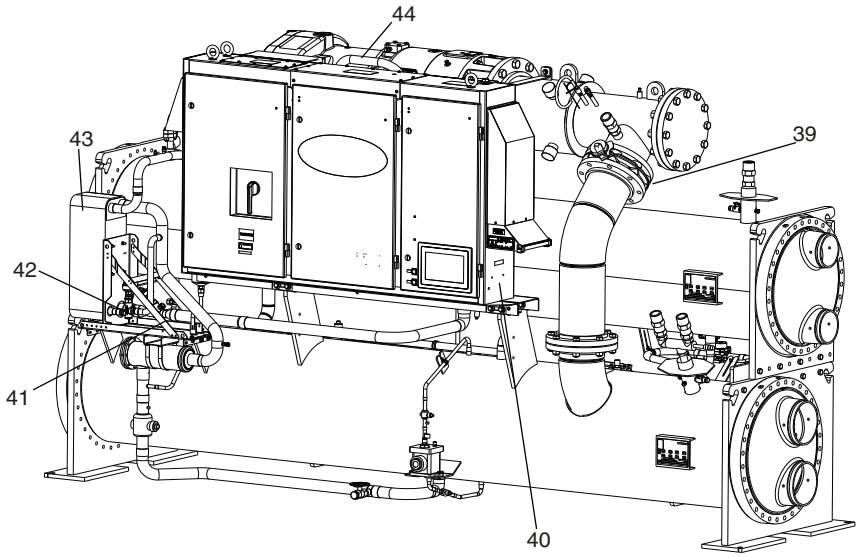

**Fig. 2 — Model Number Identification**




**1** — Discharge Pipe
**2** — Variable Frequency Drive
**3** — Cooler Relief Valve
**4** — Compressor Discharge Pipe
**5** — PIC6 Controller
**6** — Refrigerant Charging Valve
**7** — ASME Nameplate, Evaporator
**8** — Condenser Relief Valves
**9** — Tubesheet Mounting Brackets
**10** — Condenser
**11** — ASME Nameplate, Condenser
**12** — Level Sensing Chamber
**13** — Condenser Refrigerant Pumpout Valve
**14** — Refrigerant Strainer
**15** — Cooler Inlet Isolation Valve
**16** — Motor Cooling Isolation Valve
**17** — Motor Cooling Sight Glass
**18** — Motor Cooling Supply Line
**19** — Motor Cooling Line Filter Drier (Hidden)
**20** — VFD Disconnect

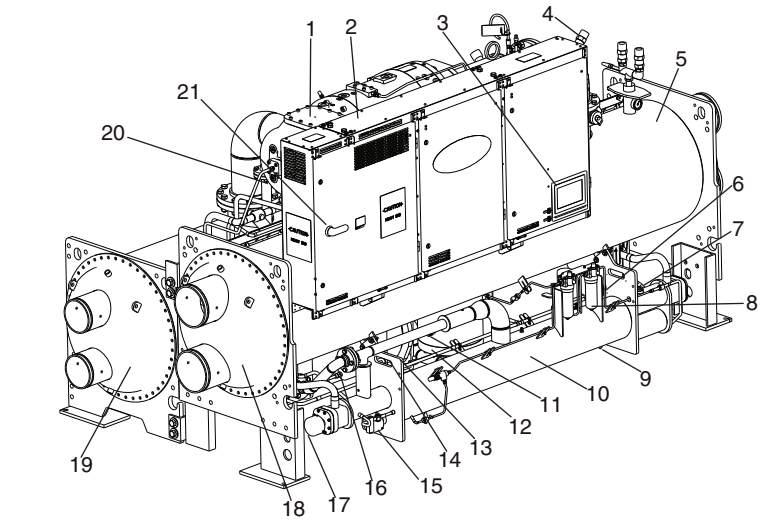



**21** — Tubesheet Mounting Brackets
**22** — Vaporizer Sight Glass
**23** — Vaporizer Drain Sight Glass (Hidden)
**24** — Oil Sump Heater (Hidden)
**25** — Oil Sump
**26** — Oil Sump Sight Glass (Hidden)
**27** — Oil Pump Outlet Filter
**28** — Oil Pump
**29** — ASME Nameplate Oil Concentrator
**30** — Vaporizer Sight Glass
**31** — Hot Gas Bypass Line
**32** — Oil Charging Drain Valve
**33** — Typical Waterbox Drain Coupling (Hidden)
**34** — Condenser Supply/Return End Waterbox
**35** — Variable Orifice
**36** — Oil Reclaim Actuator
**37** — Cooler Supply/Return End Waterbox
**38** — Oil Pump Inlet Filter

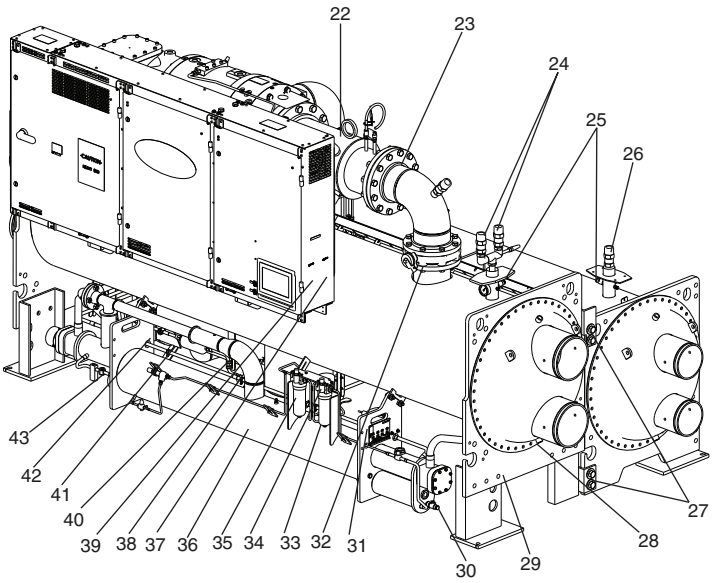



**39** — Discharge Isolation Valve Assembly (Option or Accessory)
**40** — Machine Electrical Data Nameplate
**41** — Main EXV
**42** — Economizer Gas EXV (Option)
**43** — Economizer (Option)
**44** — Economizer Muffler (Hidden)

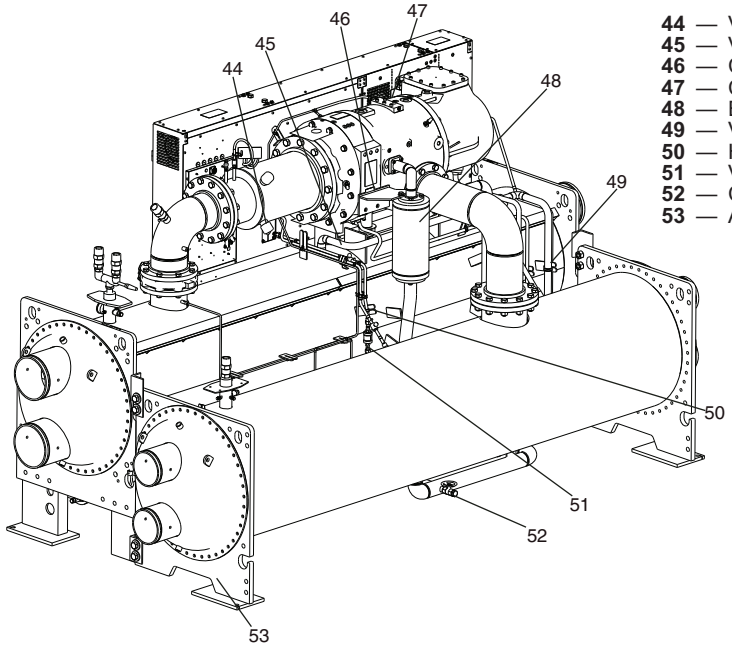
**Fig. 3 — Typical 23XRV Components (Units with P Compressor)**




**1** — Motor Terminal Cover Plate
**2** — Variable Frequency Drive
**3** — PIC6 Controller
**4** — Discharge Pipe Relief Valve
**5** — Condenser
**6** — Oil Reclaim Actuator
**7** — Vaporizer Sight Glass
**8** — Oil Filter Assembly
**9** — Oil Sump Temperature (hidden)
**10** — Oil Sump
**11** — Condenser Refrigerant Pumpout Valve
**12** — Condenser Float Chamber
**13** — Cooler Inlet Isolation Valve (Hidden)
**14** — ASME Nameplate, Economizer (Hidden)
**15** — Oil Sump Heater
**16** — Filter Drier
**17** — Vaporizer Heater
**18** — Condenser Supply/Return End Waterbox
**19** — Cooler Supply/Return End Waterbox
**20** — Motor Cooling Supply Line
**21** — VFD Disconnect

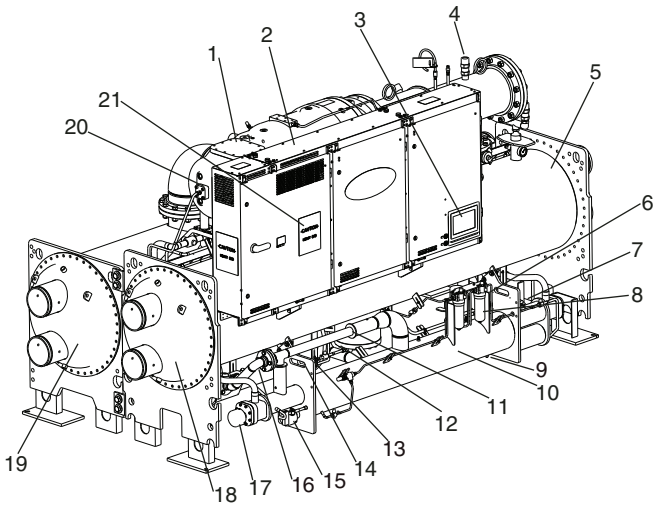



**22** — Discharge Pipe
**23** — Compressor Discharge Check Valve Access Cover
**24** — Condenser Relief Valves
**25** — Refrigerant Charging Valves
**26** — Cooler Relief Valve
**27** — Tubesheet Mounting Brackets
**28** — Typical Waterbox Drain Coupling
**29** — ASME Nameplate, Condenser
**30** — Oil Drain
**31** — ASME Nameplate Oil Concentrator
**32** — Discharge Isolation Valve (Option or Accessory)
**33** — Suction Oil Filter
**34** — Oil Pump
**35** — Discharge Oil Filter
**36** — Oil Sump Sight Glass
**37** — Refrigeration Machine Nameplate
**38** — Filter Drier Isolation Valve with Schrader Valve
**39** — Machine Electrical Data Nameplate
**40** — Economizer
**41** — Motor Cooling Sight Glass
**42** — Motor Cooling Isolation Valve
**43** — Vaporizer Drain Sight Glass

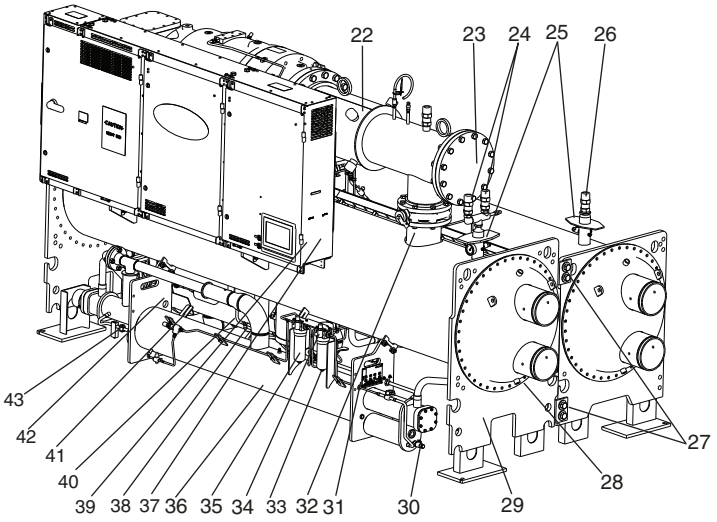



**44** — VFD Cold Plate Refrigeration Inlet Connection (Outlet Hidden)
**45** — VFD Cold Plate Orifice
**46** — Compressor Nameplate
**47** — Compressor Lubrication Block
**48** — Economizer Muffler
**49** — Vaporizer Condenser Gas Isolation Valve
**50** — Hot Gas Bypass Isolation and Trim Valve
**51** — VFD Cooling Refrigerant Strainer
**52** — Cooler Refrigerant Pumpout Valve
**53** — ASME Nameplate, Cooler

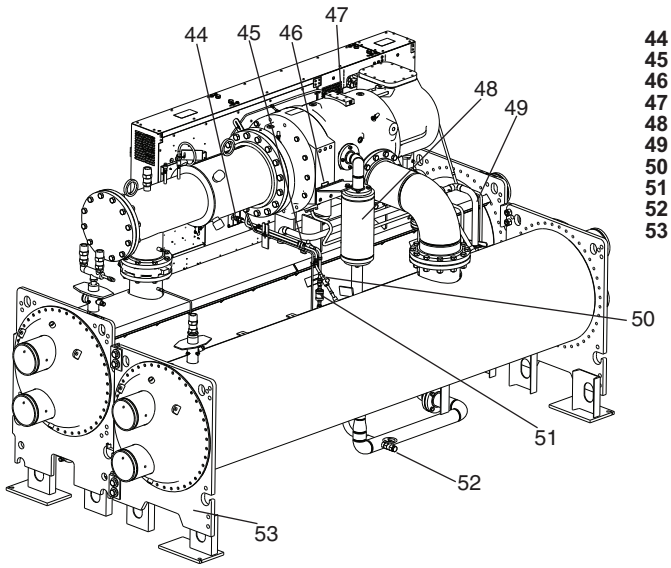
**Fig. 4 — Typical 23XRV Components (Units with Q Compressor)**




**1** — Motor Terminal Cover Plate
**2** — Variable Frequency Drive
**3** — PIC6 Controller
**4** — Discharge Pipe Relief Valve
**5** — Condenser
**6** — Oil Reclaim Actuator
**7** — Vaporizer Sight Glass
**8** — Oil Filter Assembly
**9** — Oil Sump Temperature
**10** — Oil Sump
**11** — Condenser Refrigerant Pumpout Valve
**12** — Condenser Float Chamber
**13** — Cooler Inlet Isolation Valve (Hidden)
**14** — ASME Nameplate, Economizer (Hidden)
**15** — Oil Sump Heater
**16** — Filter Drier
**17** — Vaporizer Heater
**18** — Condenser Supply/Return End Waterbox
**19** — Cooler Supply/Return End Waterbox
**20** — Motor Cooling Supply Line
**21** — VFD Disconnect

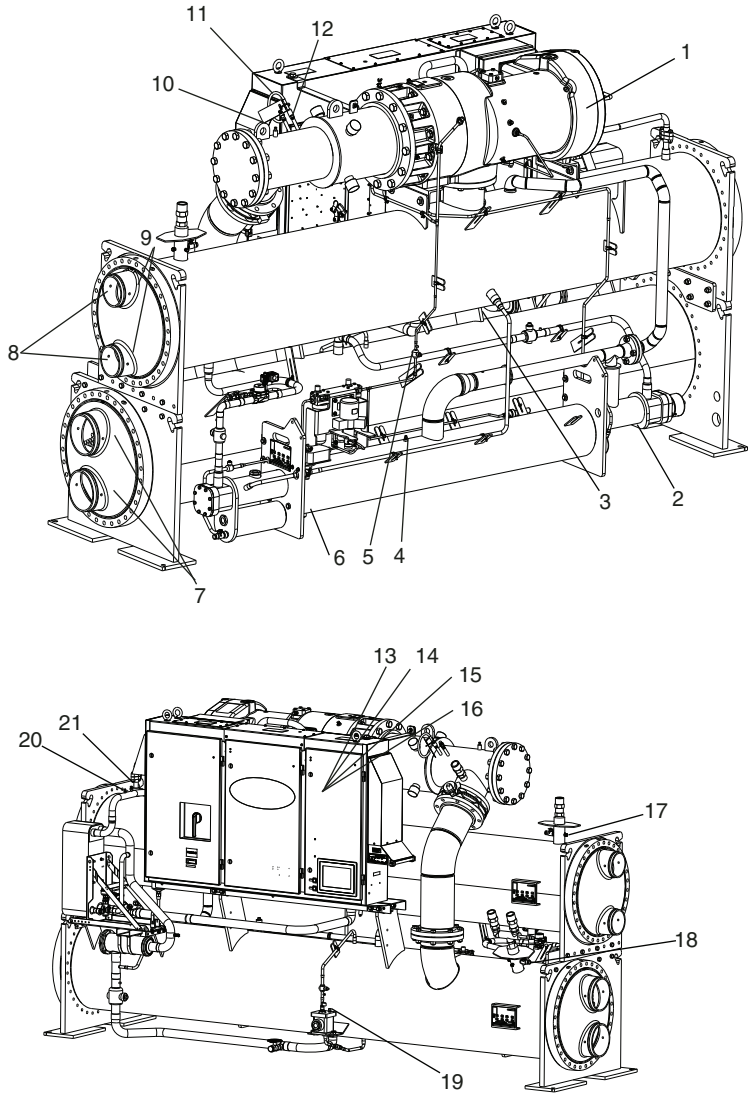



**22** — Discharge Pipe
**23** — Compressor Discharge Check Valve Access Cover
**24** — Condenser Relief Valves
**25** — Refrigerant Charging Valves
**26** — Cooler Relief Valve
**27** — Tubesheet Mounting Brackets
**28** — Typical Waterbox Drain Coupling
**29** — ASME Nameplate, Condenser
**30** — Oil Drain
**31** — ASME Nameplate Vaporizer
**32** — Discharge Isolation Valve (Option or Accessory)
**33** — Suction Oil Filter
**34** — Oil Pump
**35** — Discharge Oil Filter
**36** — Oil Sump Sight Glass
**37** — Refrigeration Machine Nameplate
**38** — Filter Drier Isolation Valve with Schrader Valve
**39** — Machine Electrical Data Nameplate
**40** — Economizer
**41** — Motor Cooling Sight Glass
**42** — Motor Cooling Isolation Valve
**43** — Vaporizer Drain Sight Glass




**44** — VFD Cold Plate Refrigeration Inlet Connection (Outlet Hidden)
**45** — VFD Cold Plate Orifice
**46** — Compressor Nameplate
**47** — Compressor Lubrication Block
**48** — Economizer Muffler
**49** — Vaporizer Condenser Gas Isolation Valve
**50** — Hot Gas Bypass Isolation and Trim Valve
**51** — VFD Cooling Refrigerant Strainer
**52** — Cooler Refrigerant Pumpout Valve
**53** — ASME Nameplate, Cooler

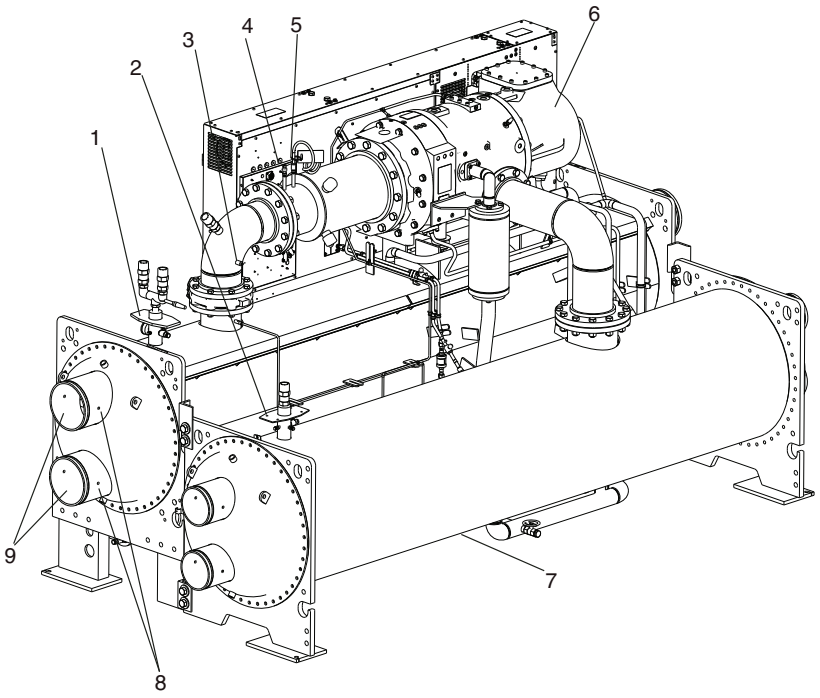
**Fig. 5 — Typical 23XRV Components (Units with R Compressor)**



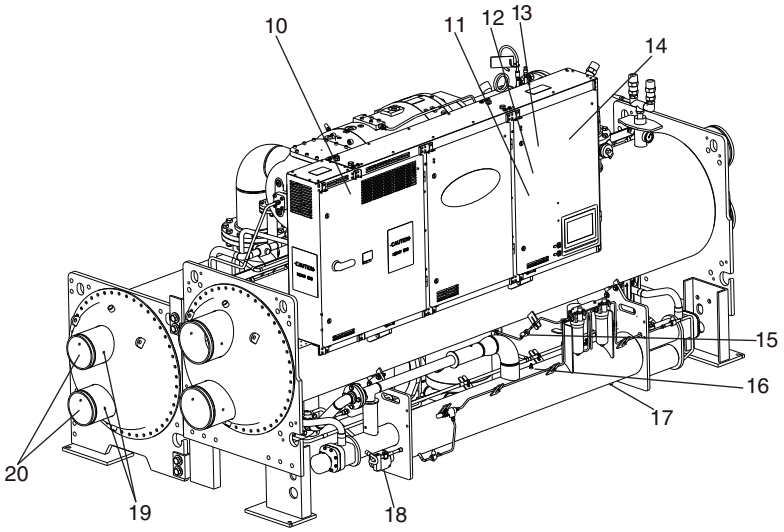

**1** — Compressor Motor Winding Temperature (Hidden)
**2** — Vaporizer Temperature
**3** — Evaporator Return Liquid Temperature (Hidden)
**4** — Oil Sump Pressure
**5** — Oil Sump Temperature
**6** — Supply Oil Pressure
**7** — Condenser Liquid Temperature (Hidden)
**8** — Evaporator Liquid Flow (Optional)
**9** — Evaporator Liquid Temperature (Hidden)
**10** — Compressor Discharge Temperature
**11** — Compressor Discharge Pressure
**12** — Compressor Discharge High Pressure Switch

**13** — Inductor Temperature Switch (Inside VFD Enclosure)
**14** — VFD Rectifier Temperature (Inside Power Module)
**15** — VFD Heat Sink Temperature (Inside VFD Enclosure)
**16** — VFD Inverter Temperature (Inside Power Module)
**17** — Evaporator Temperature
**18** — Condenser Pressure
**19** — Condenser Liquid Level Sensor
**20** — Economizer Pressure (Optional)
**21** — Economizer Temperature (Optional)

**Fig. 6 — Typical 23XRV Installation — Sensor Locations (Units with P Compressor)**

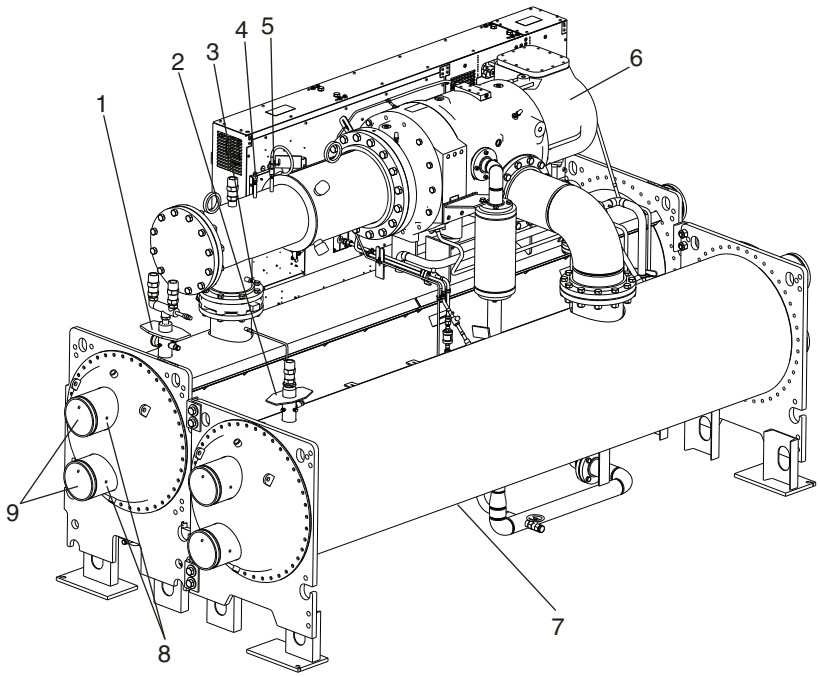



**1** — Condenser Pressure
**2** — Evaporator Pressure
**3** — Compressor Discharge Temperature
**4** — Compressor Discharge Pressure
**5** — Compressor Discharge High Pressure Switch
**6** — Compressor Motor Winding Temperature (Hidden)
**7** — Evaporator Refrigerant Liquid Temperature (Hidden)
**8** — Condenser Liquid Temperature
**9** — Condenser Liquid Flow (Optional)

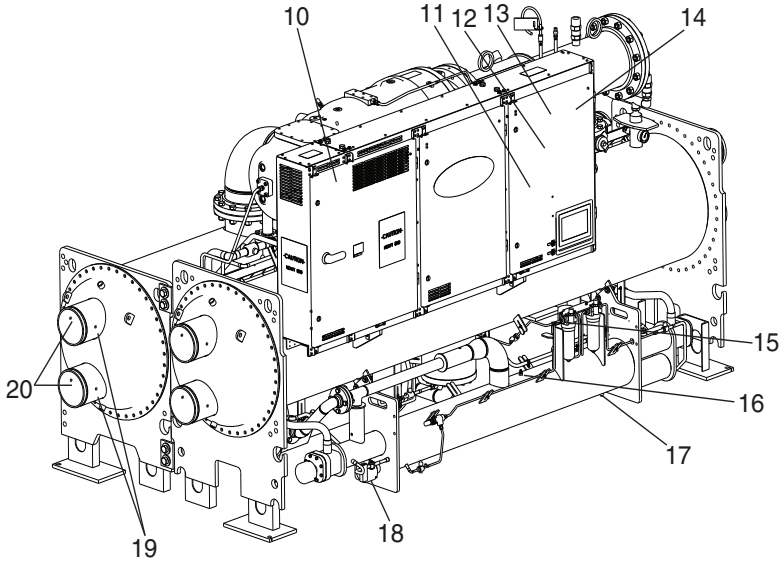



**10** — Inductor Temperature Switch (Inside VFD Enclosure)
**11** — VFD Rectifier Temperature (Inside Power Module)
**12** — VFD Cold Plate Temperature (Inside VFD Enclosure)
**13** — VFD Inverter Temperature (Inside Power Module)
**14** — Humidity Sensor (Inside LF2 VFD Enclosure)
**15** — Oil Pressure Leaving Filter (Hidden)
**16** — Oil Sump Pressure (Hidden)
**17** — Oil Sump Temperature (Hidden)
**18** — Vaporizer Temperature
**19** — Evaporator Liquid Temperature
**20** — Evaporator Liquid Flow (Optional)

**Fig. 7 — Typical 23XRV Installation — Sensor Locations (Units with Q Compressor)**




**1** — Condenser Pressure
**2** — Evaporator Pressure
**3** — Compressor Discharge Temperature
**4** — Compressor Discharge Pressure
**5** — Compressor Discharge High Pressure Switch
**6** — Compressor Motor Winding Temperature (Hidden)
**7** — Evaporator Refrigerant Liquid Temperature (Hidden)
**8** — Condenser Liquid Temperature
**9** — Condenser Liquid Flow (Optional)




**10** — Inductor Temperature Switch (Inside VFD Enclosure)
**11** — VFD Rectifier Temperature (Inside Power Module)
**12** — VFD Cold Plate Temperature (Inside VFD Enclosure)
**13** — VFD Inverter Temperature (Inside Power Module)
**14** — Humidity Sensor (Inside LF2 VFD Enclosure)
**15** — Oil Pressure Leaving Filter
**16** — Oil Sump Pressure (Hidden)
**17** — Oil Sump Temperature (Hidden)
**18** — Vaporizer Temperature
**19** — Evaporator Liquid Temperature
**20** — Evaporator Liquid Flow (Optional)

**Fig. 8 — Typical 23XRV Installation — Sensor Locations (Units with R Compressor)**

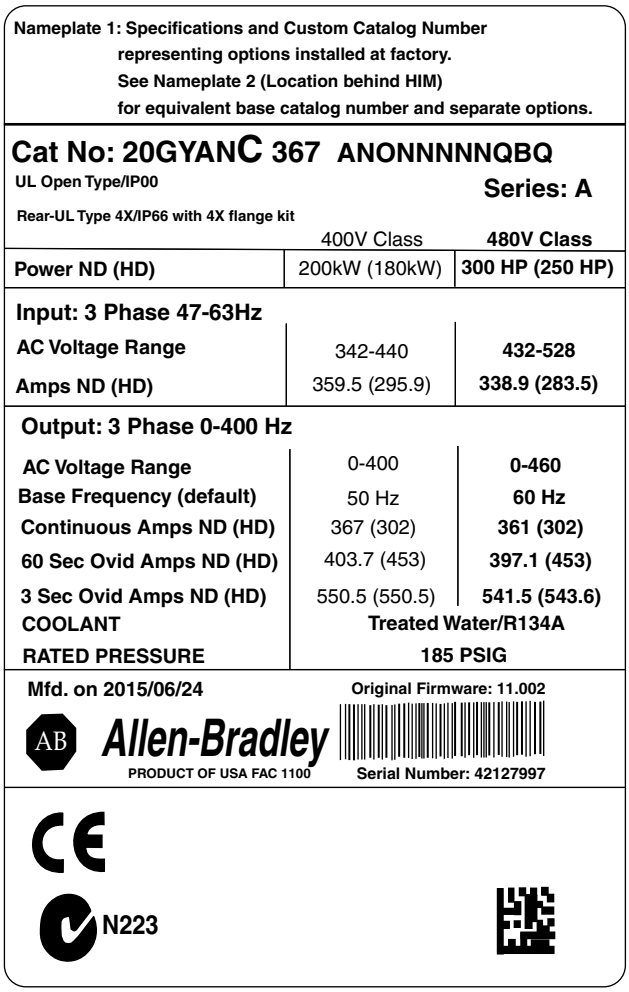



**Fig. 9 — VFD Nameplate**

### *Recommended Control and Signal Wire Sizes*

The recommended minimum size wire to connect I/O signals to the control terminal blocks is 18 AWG (American Wire Gauge). Recommended terminal tightening torque is 7 to 9 in.-lb (0.79 to 1.02 N-m).

### *Recommended Airflow Clearances*

Be sure there is adequate clearance for air circulation around the enclosure. A 6-in. (152.4 mm) minimum clearance is required wherever vents are located in the VFD enclosure.

### *Match Power Module Input and Supply Power Ratings*

It is important to verify that building power will meet the input power requirements of the Machine Electrical Data nameplate input power rating. Be sure the input power to the chiller corresponds to the chiller's nameplate voltage, current, and frequency. Refer to machine nameplate in Fig. 12. The machine electrical data nameplate is located on the right side of the control center.

## PROVIDE MACHINE PROTECTION

Protect machine and VFD enclosure from construction dirt and moisture. Keep protective shipping covers in place until machine is ready for installation.

If machine is exposed to freezing temperatures after water circuits have been installed, open waterbox drains and remove all water from cooler and condenser. Leave drains open until system is filled.

It is important to properly plan before installing a 23XRV unit to ensure that the environment and operating conditions are satisfactory. The installation must comply with all requirements in the certified prints.

Chiller should be installed in an indoor environment where the ambient temperature is between 40 and 104°F (4 and 40°C) with relative humidity of 95% or less.

**Table 1 — Drive Assembly and Power Module Ratings (LF-2 VFD)**

| CARRIER PART NUMBER | VFD FRAME SIZE | ENCLOSURE TYPE | INPUT VOLTAGE (V) RANGE | MAX INPUT CURRENT (AMPS) | MAX OUTPUT CURRENT[a] at 4 kHz (AMPS) |
|---|---|---|---|---|---|
| 23XRB2AA_ _ _ _ _ _ _ _ _ _ | Frame 2AA | NEMA 1 | 380 to 460 | 440 | 440 |
| 23XRB2BA_ _ _ _ _ _ _ _ _ _ | Frame 2BA | NEMA 1 | 380 to 460 | 520 | 440 |
| 23XRB2BB_ _ _ _ _ _ _ _ _ _ | Frame 2BB | NEMA 1 | 380 to 460 | 520 | 520 |
| 23XRB2CC_ _ _ _ _ _ _ _ _ _ | Frame 2CC | NEMA 1 | 380 to 460 | 608 | 608 |

NOTE(S):

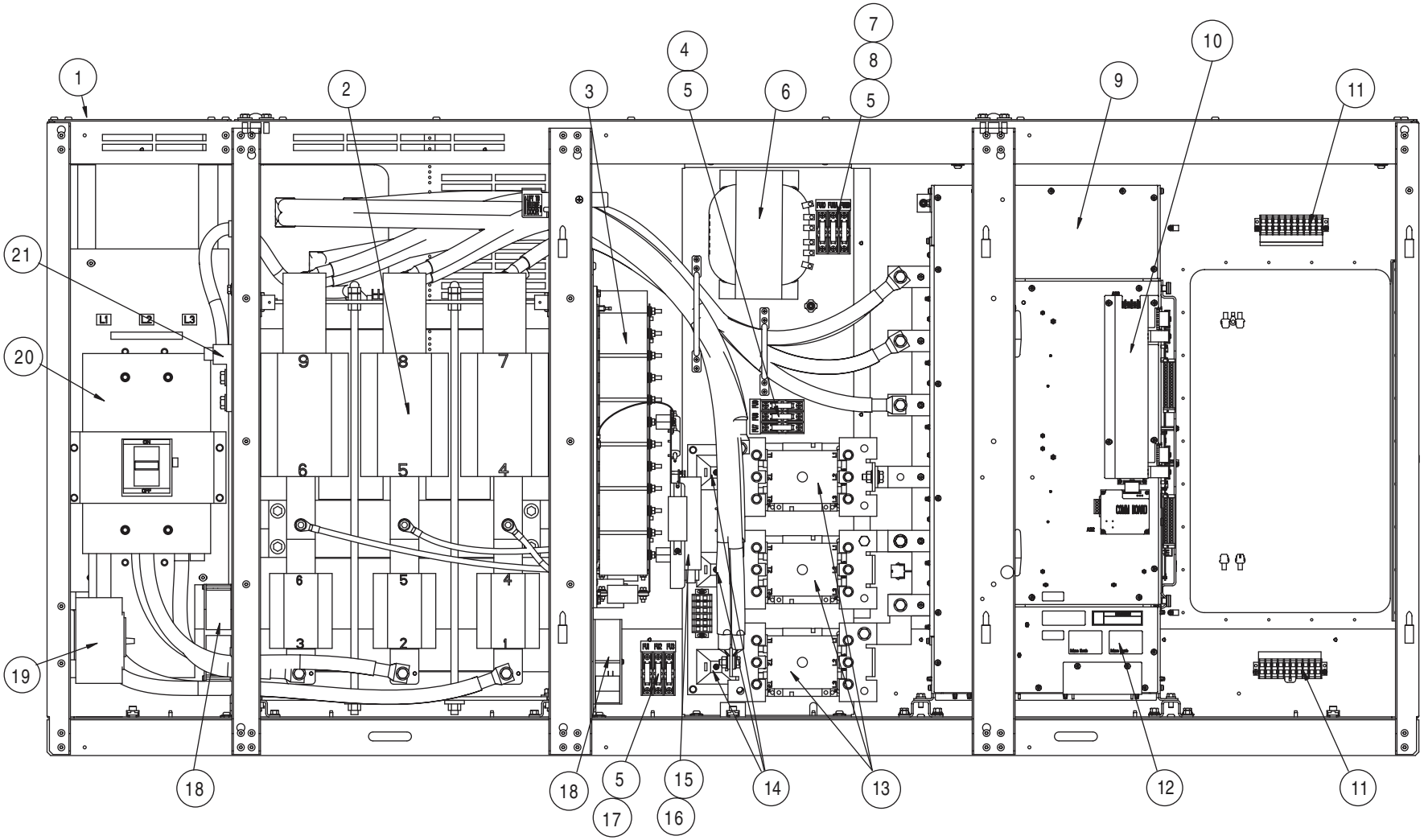
a. 110% output current capability for one minute, 150% output current for 5 seconds.

**Table 2 — Drive Assembly and Power Module Ratings (Std Tier VFD)[a]**

| CARRIER PART NUMBER | ENCLOSURE TYPE | INPUT VOLTAGE (Digit Y of part number) | | MAX INPUT CURRENT (AMPS) | MAX OUTPUT CURRENT[b] at 2 kHz (AMPS) |
|---|---|---|---|---|---|
| | | Y | Voltage/Hz | | |
| 23XS0_ _ _00Y_ _ F0[c] (Rockwell; S = Air cooled) | NEMA 1 | 3<br>4<br>5<br>7<br>9 | 380v / 60 Hz<br>416v / 60 Hz<br>460v / 60 Hz<br>575v / 60 Hz<br>400v / 50 Hz | 230<br>269<br>335<br>445 | 230<br>269<br>335<br>445 |

NOTE(S):

a. All voltage and current combinations listed may not be available for sale. Please review Carrier Marketing literature for latest offering.
b. 110% output current capability for one minute, 150% output current for 5 seconds.
c. Last character 0 indicates refrigerant-cooled; last digit A indicates air-cooled.




**1** — Input Power Wiring Panel
**2** — Input Inductor Assembly
**3** — Capacitor Bank Assembly
**4** — Fuse, Class CC, 600v, 20A (3)
**5** — Fuse Black, 30A, 600v, Class CC
**6** — Transformer, 3kVA
**7** — Fuse, Class CC, 600v, 5A (1)
**8** — Fuse, Class CC, 600v, 25A (2)
9 — Power Module Assembly
10 — Communications Interface Board
11 — Terminal Block, 10-Position (2)
**12** — Power Module Nameplate
**13** — AC Contactor (3)
**14** — Pre-Charge Resistor Assembly
**15** — Line Sync PC Board Assembly
**16** — Line Sync Board Cover
**17** — Fuse, Class CC, 600v, 1A (3)
**18** — Fan, 115v (2)
**19** — Circuit Breaker, 600v, 15A
**20** — Circuit Breaker, 600v
**21** — Lug, Ground, 2-600 MCM

**Fig. 10 — Control Center Components (LF-2 VFD)**

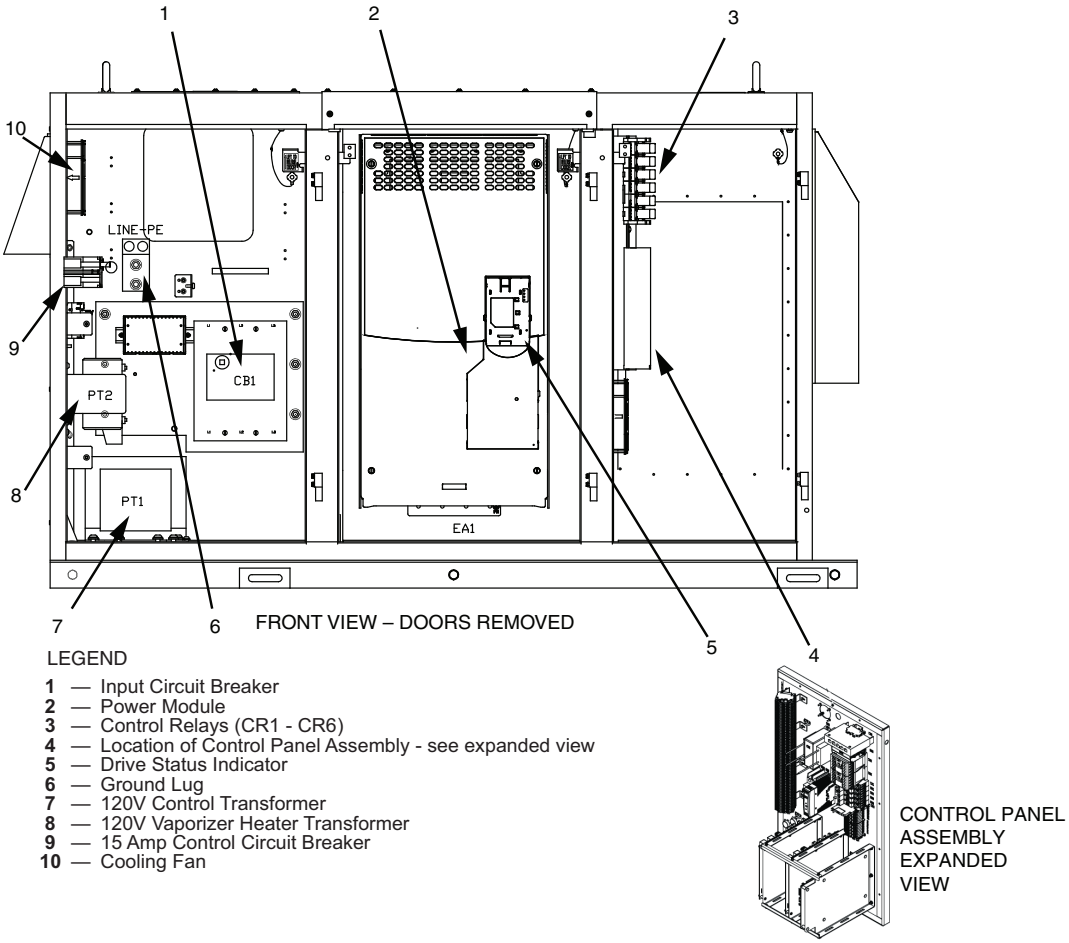
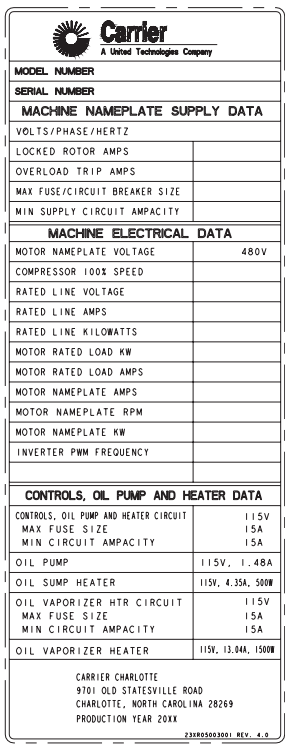



**Fig. 11 — Control Center Components (Std Tier VFD)**



Carrier
A United Technologies Company

| | |
|---|---|
| MODEL NUMBER | |
| SERIAL NUMBER | |
| **MACHINE NAMEPLATE SUPPLY DATA** | |
| VOLTS/PHASE/HERTZ | |
| LOCKED ROTOR AMPS | |
| OVERLOAD TRIP AMPS | |
| MAX FUSE/CIRCUIT BREAKER SIZE | |
| MIN SUPPLY CIRCUIT AMPACITY | |
| **MACHINE ELECTRICAL DATA** | |
| MOTOR NAMEPLATE VOLTAGE | 480V |
| COMPRESSOR 100% SPEED | |
| RATED LINE VOLTAGE | |
| RATED LINE AMPS | |
| RATED LINE KILOWATTS | |
| MOTOR RATED LOAD KW | |
| MOTOR RATED LOAD AMPS | |
| MOTOR NAMEPLATE AMPS | |
| MOTOR NAMEPLATE RPM | |
| MOTOR NAMEPLATE KW | |
| INVERTER PWM FREQUENCY | |
| | |
| **CONTROLS, OIL PUMP AND HEATER DATA** | |
| CONTROLS, OIL PUMP AND HEATER CIRCUIT<br>MAX FUSE SIZE<br>MIN CIRCUIT AMPACITY | 115V<br>15A<br>15A |
| OIL PUMP | 115V, 1.48A |
| OIL SUMP HEATER | 115V, 4.35A, 500W |
| OIL VAPORIZER HTR CIRCUIT<br>MAX FUSE SIZE<br>MIN CIRCUIT AMPACITY | 115V<br>15A<br>15A |
| OIL VAPORIZER HEATER | 115V, 13.04A, 1500W |

CARRIER CHARLOTTE
9701 OLD STATESVILLE ROAD
CHARLOTTE, NORTH CAROLINA 28269
PRODUCTION YEAR 20XX
23XR0500300I REV. 4.0

**Fig. 12 — Machine Electrical Data Nameplate**

## Step 2 — Rig the Machine

The 23XRV machine can be rigged as an entire assembly. Large interconnecting piping has flanged connections that allow the compressor, cooler, and condenser sections to be separated and rigged individually. In addition, the VFD can be removed and rigged separately.

RIG MACHINE ASSEMBLY

See rigging instructions on label attached to machine. Also refer to rigging guide (Fig. 13), physical data in Fig. 14 and 15, and Tables 3-19. *Lift machine only from the points indicated in rigging guide.* Each lifting cable or chain must be capable of supporting the entire weight of the machine.

**⚠WARNING**

Lifting machine from points other than those specified may result in serious damage to the unit and personal injury. Rigging equipment and procedures must be adequate for machine weight. See Fig. 13 for machine weights.

NOTE: These weights are broken down into component sections for use when installing the unit in sections. For the complete machine weight, add all component sections and refrigerant charge together. See Tables 8-19 for machine component weights.

Contractors are not authorized to disassemble any part of the chiller without Carrier's supervision. Any request otherwise must be in writing from the Carrier Service Manager.

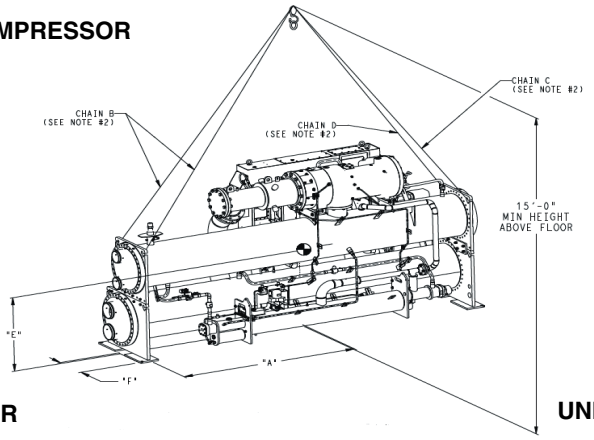
NOTE: Carrier suggests that a structural engineer be consulted if transmission of vibrations from mechanical equipment is of concern.

| COMPRESSOR TYPE* | HEAT EXCHANGER CODE | MAXIMUM WEIGHT | VESSEL LENGTH | DIM. "A" | CHAIN LENGTH | | | DIM. "E" | DIM. "F" |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | "B" | "C" | "D" | | |
| | | lb | ft | ft-in. | ft-in. | ft-in. | ft-in. | ft-in. | ft-in. |
| P | A1-A6 | 15,582 | 12' | 6' -7" | 12′- 5″ | 11′-6″ | 11′-10″ | 3′-6″ | 1′ -6″ |
| | B1-B6 | 16,391 | 14' | 7′- 5″ | 13′- 0″ | 12′-0″ | 12′- 4″ | 3′-6″ | 1′ -6″ |
| Q | 30-32 | 17,962 | 12′ | 6′-10″ | 13′- 5″ | 13′-0″ | 12′- 5″ | 3′-11″ | 3′- 8″ |
| | 35-37 | 19,501 | 14′ | 7′- 8″ | 13′-10″ | 13′-5″ | 12′-10″ | 3′-11″ | 3′- 8″ |
| | 40-42, 4D | 21,032 | 12′ | 6′-10″ | 13′- 6″ | 12′-8″ | 12′- 3″ | 4′- 1″ | 3′-11″ |
| | 45-47, 4E | 22,468 | 14′ | 7′- 8″ | 13′-11″ | 13′-2″ | 12′- 8″ | 4′- 1″ | 3′-11″ |
| | 50-52 | 23,856 | 12′ | 6′-10″ | 13′-10″ | 12′-7″ | 12′- 9″ | 4′- 0″ | 4′- 4″ |
| | 55-57 | 25,642 | 14′ | 7′- 8″ | 14′- 4″ | 13′-1″ | 13′- 1″ | 4′- 0″ | 4′- 4″ |
| R | 30-32 | 19,187 | 12′ | 6′-10″ | 13′- 5″ | 13′-0″ | 12′- 5″ | 3′-11″ | 3′- 8″ |
| | 35-37 | 20,589 | 14′ | 7′- 8″ | 13′-10″ | 13′-5″ | 12′-10″ | 3′-11″ | 3′- 8″ |
| | 40-42 | 23,928 | 12′ | 6′-10″ | 13′- 6″ | 12′-8″ | 12′- 3″ | 4′- 1″ | 3′-11″ |
| | 45-47 | 25,167 | 14′ | 7′- 8″ | 13′-11″ | 13′-2″ | 12′- 8″ | 4′- 1″ | 3′-11″ |
| | 50-52 | 26,950 | 12′ | 6′-10″ | 13′-10″ | 12′-7″ | 12′- 9″ | 4′- 0″ | 4′- 4″ |
| | 55-57 | 28,479 | 14′ | 7′- 8″ | 14′- 4″ | 13′-1″ | 13′- 1″ | 4′- 0″ | 4′- 4″ |

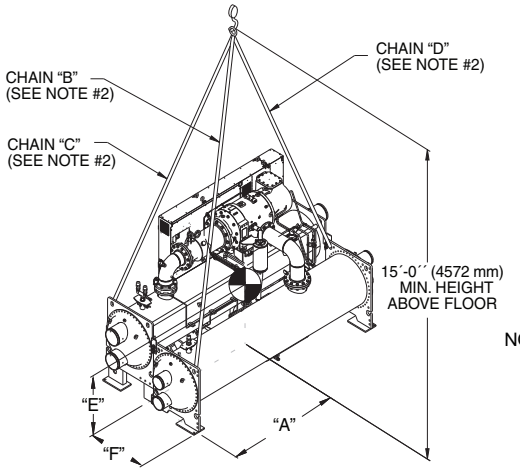
| COMPRESSOR TYPE* | HEAT EXCHANGER CODE | MAXIMUM WEIGHT | VESSEL LENGTH | DIM. "A" | CHAIN LENGTH | | | DIM. "E" | DIM. "F" |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | "B" | "C" | "D" | | |
| | | kg | mm | mm | mm | mm | mm | mm | mm |
| P | A1-A6 | 7 068 | 3658 | 2007 | 3785 | 3505 | 3607 | 1067 | 457 |
| | B1-B6 | 7 435 | 4267 | 2261 | 3962 | 3658 | 3759 | 1067 | 457 |
| Q | 30-32 | 8 147 | 3658 | 2083 | 4089 | 3962 | 3785 | 1194 | 1118 |
| | 35-37 | 8 846 | 4267 | 2337 | 4216 | 4089 | 3912 | 1194 | 1118 |
| | 40-42, 4D | 9 540 | 3658 | 2083 | 4115 | 3861 | 3734 | 1245 | 1194 |
| | 45-47, 4E | 10 191 | 4267 | 2337 | 4242 | 4013 | 3861 | 1245 | 1194 |
| | 50-52 | 10 821 | 3658 | 2083 | 4216 | 3835 | 3886 | 1219 | 1321 |
| | 55-57 | 11 631 | 4267 | 2337 | 4369 | 3988 | 3988 | 1219 | 1321 |
| R | 30-32 | 8 703 | 3658 | 2083 | 4089 | 3962 | 3785 | 1194 | 1118 |
| | 35-37 | 9 339 | 4267 | 2337 | 4216 | 4089 | 3912 | 1194 | 1118 |
| | 40-42 | 10 854 | 3658 | 2083 | 4115 | 3861 | 3734 | 1245 | 1194 |
| | 45-47 | 11 416 | 4267 | 2337 | 4242 | 4013 | 3861 | 1245 | 1194 |
| | 50-52 | 12 224 | 3658 | 2083 | 4216 | 3835 | 3886 | 1219 | 1321 |
| | 55-57 | 12 918 | 4267 | 2337 | 4369 | 3988 | 3988 | 1219 | 1321 |

*The 11th character of the chiller model number indicates the compressor type.

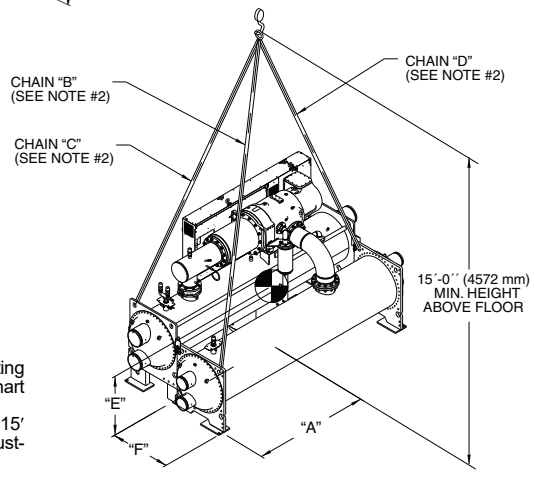
**UNITS WITH P COMPRESSOR**




**UNITS WITH Q COMPRESSOR**




**UNITS WITH R COMPRESSOR**




NOTES:

1. Each chain must be capable of supporting the entire weight of the machine. See chart for maximum weights.
2. Chain lengths shown are typical for 15′ (4572 mm) lifting height. Some minor adjustments may be required.

**Fig. 13 — Machine Rigging Guide**

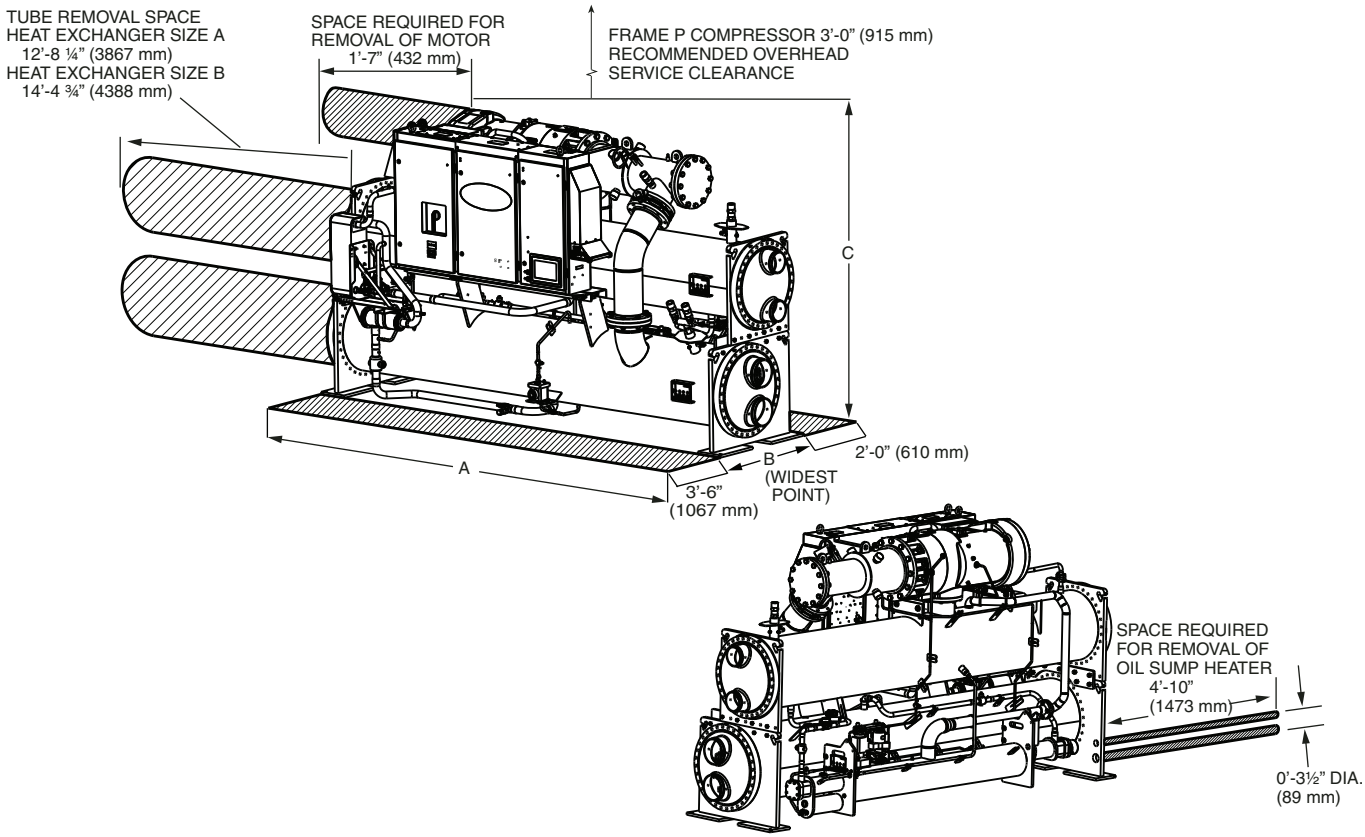



**Fig. 14 — 23XRV Heat Exchanger Sizes A,B Dimensions (Unit with P Compressor Shown)**

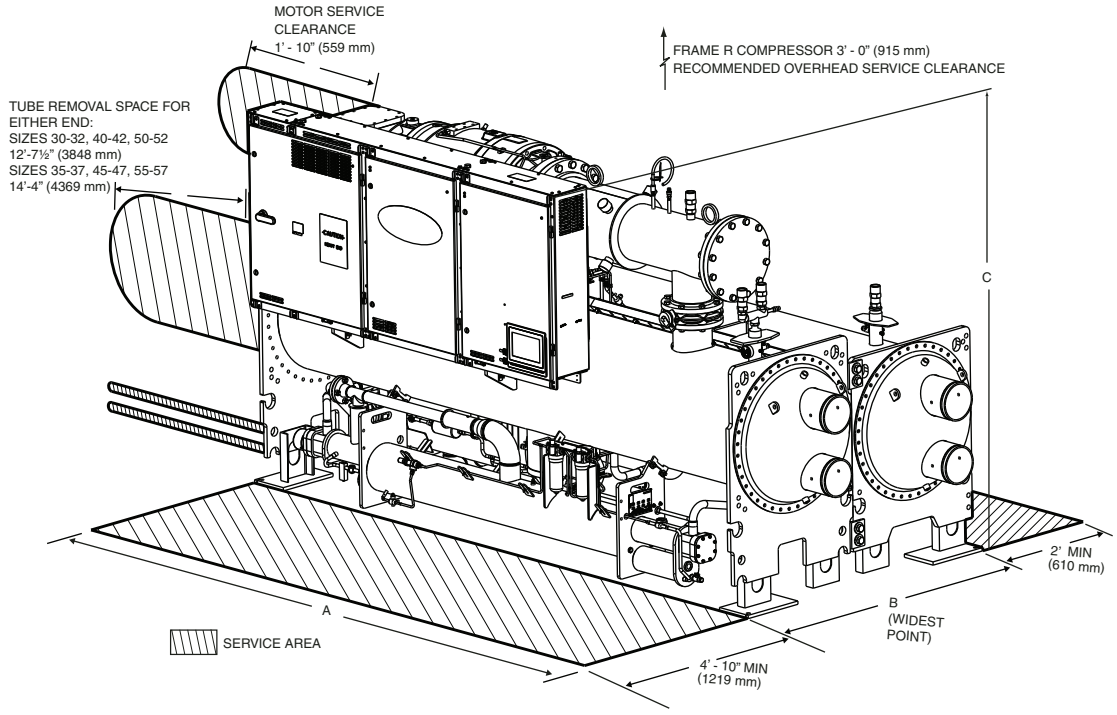



**Fig. 15 — 23XRV Heat Exchanger Sizes 30-57 Dimensions (Unit with R Compressor Shown)**

## Table 3 — 23XRV Heat Exchanger Sizes A,B Dimensions (Nozzle-in-Head Waterbox)[a,b,c,d,e,f]

| HEAT EXCHANGER SIZE | A (LENGTH)[g] | | | | | | B (WIDTH) | C (HEIGHT) |
|---|---|---|---|---|---|---|---|---|
| | 1-Pass | | 2-Pass | | 3-Pass | | | |
| | ft-in. | mm | ft-in. | mm | ft-in. | mm | | |
| A | 14- 6-3/4 | 4439 | 14- 1-1/4 | 4301 | 14- 6-3/4 | 4439 | See unit certified drawings | |
| B | 16- 3-1/4 | 4959 | 15- 9-3/4 | 4822 | 16- 3-1/4 | 4959 | | |

NOTE(S):

a. Service access should be provided per American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 15, latest edition, National Fire Protection Association (NFPA) 70, and local safety code.
b. Allow at least 3 ft (915 mm) overhead clearance for service rigging for compressor.
c. Certified drawings available upon request.
d. Marine waterboxes may add 6 in. (152 mm) to the width of the machine. See certified drawings for details.
e. 'A' length dimensions shown are for standard 150 psig (1034 kPa) design and Victaulic connections. The 300 psig (2068 kPa) design and/or flanges will add length. See certified drawings.
f. Dished head waterbox covers are available only for 2-pass design.
g. 1 or 3 pass length applies if either (or both) cooler or condenser is a 1 or 3 pass design. The 2-pass length assumes both cooler and condenser nozzles on same end of chiller.

## Table 4 — 23XRV Heat Exchanger Sizes A,B Dimensions (Marine Waterbox)[a,b,c,d,e,f]

| HEAT EXCHANGER SIZE | A (LENGTH)[g] | | | | | | B (WIDTH) | C (HEIGHT) |
|---|---|---|---|---|---|---|---|---|
| | 1-Pass | | 2-Pass | | 3-Pass | | | |
| | ft-in. | mm | ft-in. | mm | ft-in. | mm | | |
| A | 15- 9 | 4801 | 14- 6-1/2 | 4435 | 15- 5 | 4699 | See unit certified drawings | |
| B | 17- 5-1/2 | 5322 | 16- 3 | 4955 | 17- 1-1/2 | 5220 | | |

NOTE(S):

a. Service access should be provided per ASHRAE 15, latest edition, NFPA 70, and local safety code.
b. Allow at least 3 ft (915 mm) overhead clearance for service rigging for compressor.
c. Certified drawings available upon request.
d. Marine waterboxes may add 6 in. (152 mm) to the width of the machine. See certified drawings for details.
e. 'A' length dimensions shown are for standard 150 psig (1034 kPa) design and Victaulic connections. The 300 psig (2068 kPa) design and/or flanges will add length. See certified drawings.
f. Dished head waterbox covers are available only for 2-pass design.
g. 1 or 3 pass length applies if either (or both) cooler or condenser is a 1 or 3 pass design. The 2-pass length assumes both cooler and condenser nozzles on same end of chiller.

## Table 5 — 23XRV Dimensions Heat Exchanger Sizes 30-57 (Nozzle-In-Head Waterbox)[a,b,c,d,e,f]

| HEAT EXCHANGER SIZE | A (LENGTH, WITH NOZZLE-IN-HEAD WATERBOX) | | | | | | B (WIDTH) | C (HEIGHT) |
|---|---|---|---|---|---|---|---|---|
| | 1-Pass | | 2-Pass[g] | | 3-Pass | | | |
| | ft-in. | mm | ft-in. | mm | ft-in. | mm | | |
| 30 to 32 | 14- 3-1/4 | 4350 | 13- 8-1/4 | 4172 | 14- 3-1/4 | 4350 | See unit certified drawings | |
| 35 to 37 | 15-11-3/4 | 4870 | 15- 4-3/4 | 4693 | 15-11-3/4 | 4870 | | |
| 40 to 42, 4D | 14- 9 | 4496 | 14- 3-1/8 | 4347 | 14- 6 | 4420 | | |
| 45 to 47, 4E | 16- 5-1/2 | 5017 | 15-11-5/8 | 4867 | 16- 2-1/2 | 4940 | | |
| 50 to 52 | 14-10 | 4521 | 14- 4-1/2 | 4382 | 14- 6-1/2 | 4432 | | |
| 55 to 57 | 16- 6-1/2 | 5042 | 16- 1 | 4902 | 16- 3 | 4953 | | |

NOTE(S):

a. Service access should be provided per ASHRAE 15, latest edition, NFPA 70, and local safety code.
b. Allow at least 3 ft (915 mm) overhead clearance for service rigging for frame R compressor.
c. Certified drawings available upon request.
d. Marine waterboxes may add 6 in. (152 mm) to the width of the machine. See certified drawings for details.
e. 'A' length dimensions shown are for standard 150 psig (1034 kPa) design and Victaulic connections. The 300 psig (2068 kPa) design and/or flanges will add length. See certified drawings.
f. Dished head waterbox covers not available for 3 pass design.
g. Assumes both cooler and condenser nozzles on same end of chiller.

## Table 6 — 23XRV Heat Exchanger Sizes 30-57 Dimensions (Marine Waterbox)[a,b,c,d,e]

| HEAT EXCHANGER SIZE | A (LENGTH, MARINE WATERBOX) | | | | B (WIDTH) | C (HEIGHT) |
|---|---|---|---|---|---|---|
| | 2-Pass[f] | | 1 or 3-Pass[g] | | | |
| | ft-in. | mm | ft-in. | mm | | |
| 30 to 32 | 14- 9 | 4496 | 16- 4-3/4 | 4997 | See unit certified drawings | |
| 35 to 37 | 16- 5-1/2 | 5017 | 18- 1-1/4 | 5518 | | |
| 40 to 42, 4D | 15- 2-3/4 | 4642 | 16- 3-1/4 | 5086 | | |
| 45 to 47, 4E | 16-11-3/4 | 5163 | 18- 4-3/4 | 5607 | | |
| 50 to 52 | 15- 3-1/2 | 4661 | 16- 8-1/2 | 5093 | | |
| 55 to 57 | 17- 0 | 5182 | 18- 5 | 5613 | | |

NOTE(S):

a. Service access should be provided per ASHRAE 15, latest edition, NFPA 70, and local safety code.
b. Allow at least 3 ft (915 mm) overhead clearance for service rigging for frame R compressor.
c. Certified drawings available upon request.
d. Marine waterboxes may add 6 in. (152 mm) to the width of the machine. See certified drawings for details.
e. 'A' length dimensions shown are for standard 150 psig (1034 kPa) design and Victaulic connections. The 300 psig (2068 kPa) design and/or flanges will add length. See certified drawings.
f. Assumes both cooler and condenser nozzles on same end of chiller.
g. 1 or 3 pass length applies if cooler is a 1 or 3 pass design.

## Table 7 — 23XRV Waterbox Nozzle Sizes

| FRAME SIZE | NOZZLE SIZE (in.) (NOMINAL PIPE SIZE) | | | | | |
|---|---|---|---|---|---|---|
| | Cooler | | | Condenser | | |
| | 1-Pass | 2-Pass | 3-Pass | 1-Pass | 2-Pass | 3-Pass |
| A1-A3, B1-B3 NIH | 8 | 6 | 6 | 8 | 6 | 6 |
| A4-A6, B4-B6 NIH | 8 | 6 | 6 | 10 | 8 | 6 |
| A,B Marine | 8 | 6 | 6 | N/A | 6 | N/A |
| 3 | 10 | 8 | 6 | 10 | 8 | 6 |
| 4 | 10 | 8 | 6 | 10 | 8 | 6 |
| 5 | 10 | 8 | 6 | 10 | 10 | 8 |

## Table 8 — 23XRV Compressor and Motor Weights

| COMPRESSOR TYPE | MOTOR SIZE | ENGLISH | | | | SI | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Compressor Weight (lb) | Stator Weight (lb) | Rotor Weight (lb) | Motor Terminal Cover (lb) | Total Compressor Weight (kg) | Stator Weight (kg) | Rotor Weight (kg) | Motor Terminal Cover (kg) |
| P | H,J | 3036 | 110 | 167 | N/A | 1377 | 50 | 76 | N/A |
| Q | V | 4090 | 370 | 193 | 39 | 1855 | 168 | 88 | 18 |
| R | P,Q,R,S,T,U,V,X | 4866 | 441 | 229 | 46 | 2207 | 200 | 104 | 21 |

## Table 9 — 23XRV Maximum Component Weights[a,b]

| COMPONENT | | FRAME 3 HEAT EXCHANGER | | FRAME 4 HEAT EXCHANGER | | FRAME 5 HEAT EXCHANGER | | FRAME A HEAT EXCHANGER | | FRAME B HEAT EXCHANGER | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb | kg | lb | kg | lb | kg | lb | kg | lb | kg |
| Isolation Valves | | 70 | 32 | 70 | 32 | 115 | 52 | 70 | 32 | 70 | 32 |
| Suction Elbow | P Compressor | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Q Compressor | 159 | 72 | 187 | 85 | 184 | 83 | N/A | N/A | N/A | N/A |
| | R Compressor | 179 | 81 | 237 | 108 | 232 | 105 | N/A | N/A | N/A | N/A |
| Discharge Elbow/ Muffler | P Compressor | N/A | N/A | N/A | N/A | N/A | N/A | 584 | 265 | 584 | 265 |
| | Q Compressor | 597 | 271 | 597 | 271 | 597 | 271 | N/A | N/A | N/A | N/A |
| | R Compressor | 747 | 339 | 747 | 339 | 747 | 339 | N/A | N/A | N/A | N/A |
| Vaporizer and Oil Sump | | 830 | 376 | 830 | 376 | 830 | 376 | 830 | 376 | 830 | 376 |
| Economizer | | 542 | 246 | 542 | 246 | 542 | 246 | 174 | 79 | 174 | 79 |

NOTE(S):

a. To determine compressor frame size, refer to Fig. 2.
b. Weights for the items in the above table must be added to obtain the total chiller weight.

LEGEND

**VFD** — Variable Frequency Drive

## Table 10 — VFD (Variable Frequency Drive) Weight Table

| DRIVE TYPE | COMPRESSOR | VOLTAGE/Hz | AMPERAGE (A) | WEIGHT (lb) |
|---|---|---|---|---|
| Std. Tier | P | 380/400/415/50 and 480/60 | 230 | 998 |
| | | | 335, 445 | 1200 |
| | | 575/60 | 269 | 1200 |
| | Q/R | 380/400/415/50 and 480/60 | 230 | 998 |
| | | | 335, 445 | 1200 |
| LF2 | Q/R | 380-415 50/60 | 440 | 1400 |
| | | | 520, 608 | 1800 |
| | | 440-480 50/60 | 440 | 1500 |
| | | | 520, 608 | 1800 |

## Table 11 — 23XRV Cooler Frame Size A1-A6, B1-B6 Heat Exchanger Weights

| FRAME SIZE | ENGLISH | | | | | | | METRIC (SI) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Steel Wt (lb) | Copper Wt (lb) | Dry Rigging Wt[a] (lb) | Refrig. Wt (lb) | Ship Wt (lb) | Water Vol (Gal.) | Oper. Wt (lb) | Steel Wt (kg) | Copper Wt (kg) | Dry Rigging Wt[a] (kg) | Refrig. Wt (kg) | Ship Wt (kg) | Water Vol (L) | Oper. Wt (kg) |
| A1 | 2506 | 734 | 3240 | 270 | 3510 | 47 | 3904 | 1137 | 333 | 1470 | 122 | 1592 | 178 | 1771 |
| A2 | 2506 | 789 | 3295 | 290 | 3585 | 51 | 4009 | 1137 | 358 | 1495 | 132 | 1627 | 193 | 1819 |
| A3 | 2506 | 889 | 3395 | 310 | 3705 | 57 | 4182 | 1137 | 403 | 1540 | 141 | 1681 | 216 | 1897 |
| A4 | 2506 | 962 | 3468 | 330 | 3798 | 62 | 4315 | 1137 | 436 | 1573 | 150 | 1723 | 235 | 1958 |
| A5 | 2506 | 1076 | 3582 | 360 | 3942 | 69 | 4520 | 1137 | 488 | 1625 | 163 | 1788 | 261 | 2050 |
| A6 | 2506 | 1190 | 3696 | 390 | 4086 | 77 | 4725 | 1137 | 540 | 1677 | 177 | 1854 | 291 | 2144 |
| B1 | 2642 | 839 | 3481 | 305 | 3786 | 54 | 4236 | 1198 | 381 | 1579 | 138 | 1717 | 204 | 1921 |
| B2 | 2642 | 901 | 3543 | 325 | 3868 | 58 | 4352 | 1198 | 409 | 1607 | 147 | 1754 | 220 | 1974 |
| B3 | 2642 | 1016 | 3658 | 355 | 4013 | 65 | 4558 | 1198 | 461 | 1659 | 161 | 1820 | 246 | 2067 |
| B4 | 2642 | 1099 | 3741 | 375 | 4116 | 71 | 4706 | 1198 | 498 | 1696 | 170 | 1866 | 269 | 2134 |
| B5 | 2642 | 1229 | 3871 | 415 | 4286 | 79 | 4946 | 1198 | 557 | 1755 | 188 | 1943 | 299 | 2242 |
| B6 | 2642 | 1360 | 4002 | 445 | 4447 | 87 | 5177 | 1198 | 617 | 1815 | 202 | 2017 | 329 | 2348 |

NOTE(S):

a. Dry rigging weight = Steel weight + Copper weight.

## Table 12 — 23XRV Condenser Frame Size A1-A6, B1-B6 Heat Exchanger Weights

| FRAME SIZE | ENGLISH | | | | | | | METRIC (SI) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Steel Wt (lb) | Copper Wt (lb) | Dry Rigging Wt[a] (lb) | Refrig. Wt (lb) | Ship Wt (lb) | Water Vol (Gal.) | Oper. Wt (lb) | Steel Wt (kg) | Copper Wt (kg) | Dry Rigging Wt[a] (kg) | Refrig. Wt (kg) | Ship Wt (kg) | Water Vol (L) | Oper. Wt (kg) |
| A1 | 3390 | 734 | 4124 | 550 | 4674 | 47 | 5068 | 1538 | 333 | 1871 | 249 | 2120 | 178 | 2299 |
| A2 | 3390 | 844 | 4234 | 550 | 4784 | 54 | 5237 | 1538 | 383 | 1921 | 249 | 2170 | 204 | 2375 |
| A3 | 3390 | 944 | 4334 | 550 | 4884 | 61 | 5391 | 1538 | 428 | 1966 | 249 | 2215 | 231 | 2445 |
| A4 | 3390 | 1049 | 4439 | 550 | 4989 | 67 | 5552 | 1538 | 476 | 2014 | 249 | 2263 | 254 | 2518 |
| A5 | 3390 | 1190 | 4580 | 550 | 5130 | 77 | 5769 | 1538 | 540 | 2078 | 249 | 2327 | 291 | 2617 |
| A6 | 3390 | 1345 | 4735 | 550 | 5285 | 87 | 6007 | 1538 | 610 | 2148 | 249 | 2397 | 329 | 2724 |
| B1 | 3571 | 839 | 4410 | 625 | 5035 | 54 | 5485 | 1620 | 381 | 2001 | 283 | 2284 | 204 | 2488 |
| B2 | 3571 | 964 | 4535 | 625 | 5160 | 62 | 5677 | 1620 | 437 | 2057 | 283 | 2340 | 235 | 2575 |
| B3 | 3571 | 1078 | 4649 | 625 | 5274 | 69 | 5853 | 1620 | 489 | 2109 | 283 | 2392 | 261 | 2655 |
| B4 | 3571 | 1198 | 4769 | 625 | 5394 | 77 | 6037 | 1620 | 543 | 2163 | 283 | 2446 | 291 | 2738 |
| B5 | 3571 | 1360 | 4931 | 625 | 5556 | 87 | 6286 | 1620 | 617 | 2237 | 283 | 2520 | 329 | 2851 |
| B6 | 3571 | 1537 | 5108 | 625 | 5733 | 99 | 6558 | 1620 | 697 | 2317 | 283 | 2600 | 375 | 2974 |

NOTE(S):

a. Dry rigging weight = Steel weight + Copper weight.

## Table 13 — 23XRV Code 30-57 Heat Exchanger Weights[a,b,c,d,e]

| CODE | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dry Rigging Weight (lb)[f] | | Machine Charge | | | | Dry Rigging Weight (kg)[f] | | Machine Charge | | | |
| | Cooler Only | Condenser Only | Refrigerant Weight (lb) | | Liquid Volume (Gal.) | | Cooler Only | Condenser Only | Refrigerant Weight (kg) | | Liquid Volume (L) | |
| | | | Economizer | No Economizer | Cooler | Condenser | | | Economizer | No Economizer | Cooler | Condenser |
| 30 | 4148 | 3617 | 800 | 650 | 56 | 56 | 1882 | 1641 | 363 | 295 | 212 | 212 |
| 31 | 4330 | 3818 | 800 | 650 | 64 | 65 | 1964 | 1732 | 363 | 295 | 242 | 246 |
| 32 | 4522 | 4023 | 800 | 650 | 72 | 74 | 2051 | 1825 | 363 | 295 | 273 | 280 |
| 35 | 4419 | 4529 | 910 | 760 | 61 | 61 | 2004 | 2054 | 413 | 345 | 231 | 231 |
| 36 | 4627 | 4758 | 910 | 760 | 70 | 72 | 2099 | 2158 | 413 | 345 | 265 | 273 |
| 37 | 4845 | 4992 | 910 | 760 | 80 | 83 | 2198 | 2264 | 413 | 345 | 303 | 314 |
| 40 | 5008 | 4962 | 900 | 750 | 103 | 110 | 2272 | 2251 | 408 | 340 | 390 | 416 |
| 41 | 5178 | 5155 | 900 | 750 | 111 | 119 | 2349 | 2338 | 408 | 340 | 420 | 451 |
| 42 | 5326 | 5347 | 900 | 750 | 119 | 129 | 2416 | 2425 | 408 | 340 | 450 | 488 |
| 4D | 5326 | 5347 | 900 | 750 | 119 | 129 | 2416 | 2425 | 408 | 340 | 450 | 488 |
| 45 | 5463 | 5525 | 1015 | 865 | 112 | 120 | 2478 | 2506 | 460 | 392 | 424 | 454 |
| 46 | 5659 | 5747 | 1015 | 865 | 122 | 130 | 2567 | 2607 | 460 | 392 | 462 | 492 |
| 47 | 5830 | 5967 | 1015 | 865 | 130 | 141 | 2644 | 2707 | 460 | 392 | 492 | 534 |
| 4E | 5830 | 5967 | 1015 | 865 | 130 | 141 | 2644 | 2707 | 460 | 392 | 492 | 534 |
| 50 | 5827 | 6013 | 1250 | 1100 | 132 | 147 | 2643 | 2727 | 567 | 499 | 500 | 557 |
| 51 | 6053 | 6206 | 1250 | 1100 | 143 | 156 | 2746 | 2815 | 567 | 499 | 541 | 591 |
| 52 | 6196 | 6387 | 1250 | 1100 | 150 | 165 | 2810 | 2897 | 567 | 499 | 568 | 625 |
| 55 | 6370 | 6708 | 1430 | 1280 | 144 | 160 | 2889 | 3043 | 649 | 581 | 545 | 606 |
| 56 | 6631 | 6930 | 1430 | 1280 | 156 | 171 | 3008 | 3143 | 649 | 581 | 591 | 647 |
| 57 | 6795 | 7138 | 1430 | 1280 | 164 | 181 | 3082 | 3238 | 649 | 581 | 621 | 685 |

NOTE(S):

a. Cooler includes the suction elbow and 1/2 the distribution piping weight.
b. Condenser includes float valve and sump, discharge stub-out, and 1/2 the distribution piping weight.
c. For special tubes refer to the 23XRV Computer Selection Program.
d. All weights for standard 2-pass NIH (nozzle-in-head) design with Victaulic grooves.
e. 42D and 42E heat exchanges are for the condenser only.
f. Rigging weights are for standard tubes of standard wall thickness (Turbo-B3 and Spikefin 2, 0.025-in. [0.635 mm] wall).

## Table 14 — 23XRV Additional Data for Cooler Marine Waterboxes[a,b,c]

| HEAT EXCHANGER FRAME, PASS | ENGLISH | | SI | |
|---|---|---|---|---|
| | Rigging Weight (lb) (See Note 2) | Water Volume (Gal.) | Rigging Weight (kg) (See Note 2) | Water Volume (L) |
| **Frame A,B, 1 Pass, 150 psig (1034 kPa)** | 760 | 64 | 345 | 242 |
| **Frame A,B, 2 Pass, 150 psig (1034 kPa)** | 400 | 29 | 181 | 110 |
| **Frame A,B, 3 Pass, 150 psig (1034 kPa)** | 752 | 55 | 341 | 208 |
| **Frame 3, 1 and 3 Pass, 150 psig (1034 kPa)** | 730 | 84 | 331 | 318 |
| **Frame 3, 2 Pass, 150 psig (1034 kPa)** | 365 | 42 | 166 | 159 |
| **Frame 4, 1 and 3 Pass, 150 psig (1034 kPa)** | 1888 | 109 | 856 | 413 |
| **Frame 4, 2 Pass, 150 psig (1034 kPa)** | 944 | 54 | 428 | 204 |
| **Frame 5, 1 and 3 Pass, 150 psig (1034 kPa)** | 2445 | 122 | 1109 | 462 |
| **Frame 5, 2 Pass, 150 psig (1034 kPa)** | 1223 | 61 | 555 | 231 |
| **Frame A,B, 1 Pass, 300 psig (2068 kPa)** | 812 | 64 | 368 | 242 |
| **Frame A,B, 2 Pass, 300 psig (2068 kPa)** | 436 | 29 | 198 | 110 |
| **Frame A,B, 3 Pass, 300 psig (2068 kPa)** | 788 | 55 | 357 | 208 |
| **Frame 3, 1 and 3 Pass, 300 psig (2068 kPa)** | 860 | 84 | 390 | 318 |
| **Frame 3, 2 Pass, 300 psig (2068 kPa)** | 430 | 42 | 195 | 159 |
| **Frame 4, 1 and 3 Pass, 300 psig (2068 kPa)** | 2162 | 109 | 981 | 413 |
| **Frame 4, 2 Pass, 300 psig (2068 kPa)** | 1552 | 47 | 704 | 178 |
| **Frame 5, 1 and 3 Pass, 300 psig (2068 kPa)** | 2655 | 122 | 1204 | 462 |
| **Frame 5, 2 Pass, 300 psig (2068 kPa)** | 1965 | 53 | 891 | 201 |

NOTE(S):

a. Add to heat exchanger data for total weights or volumes.
b. Weight adder shown is the same for cooler and condenser of equal frame size.
c. For the total weight of a vessel with a marine waterbox, add these values to the heat exchanger weights (or volume).

## Table 15 — 23XRV Additional Data for Condenser Marine Waterboxes[a,b,c]

| HEAT EXCHANGER FRAME, PASS | ENGLISH | | SI | |
|---|---|---|---|---|
| | Rigging Weight (lb) (see Note 2) | Water Volume (gal) | Rigging Weight (kg) (see Note 2) | Water Volume (L) |
| **Frame A,B, 1 Pass, 150 psig (1034 kPa)** | N/A | N/A | N/A | N/A |
| **Frame A,B, 2 Pass, 150 psig (1034 kPa)** | 454 | 32 | 206 | 121 |
| **Frame A,B, 3 Pass, 150 psig (1034 kPa)** | N/A | N/A | N/A | N/A |
| **Frame 3, 1 and 3 Pass, 150 psig (1034 kPa)** | N/A | N/A | N/A | N/A |
| **Frame 3, 2 Pass, 150 psig (1034 kPa)** | 365 | 42 | 166 | 159 |
| **Frame 4, 1 and 3 Pass, 150 psig (1034 kPa)** | N/A | N/A | N/A | N/A |
| **Frame 4, 2 Pass, 150 psig (1034 kPa)** | 989 | 54 | 449 | 204 |
| **Frame 5, 1 and 3 Pass, 150 psig (1034 kPa)** | N/A | N/A | N/A | N/A |
| **Frame 5, 2 Pass, 150 psig (1034 kPa)** | 1195 | 60 | 542 | 227 |
| **Frame A,B, 1 Pass, 300 psig (2068 kPa)** | N/A | N/A | N/A | N/A |
| **Frame A,B, 2 Pass, 300 psig (2068 kPa)** | 491 | 42 | 223 | 159 |
| **Frame A,B, 3 Pass, 300 psig (2068 kPa)** | N/A | N/A | N/A | N/A |
| **Frame 3, 1 and 3 Pass, 300 psig (2068 kPa)** | N/A | N/A | N/A | N/A |
| **Frame 3, 2 Pass, 300 psig (2068 kPa)** | 430 | 42 | 195 | 159 |
| **Frame 4, 1 and 3 Pass, 300 psig (2068 kPa)** | N/A | N/A | N/A | N/A |
| **Frame 4, 2 Pass, 300 psig (2068 kPa)** | 1641 | 47 | 744 | 178 |
| **Frame 5, 1 and 3 Pass, 300 psig (2068 kPa)** | N/A | N/A | N/A | N/A |
| **Frame 5, 2 Pass, 300 psig (2068 kPa)** | 1909 | 50 | 866 | 189 |

NOTE(S):

a. Add to heat exchanger data for total weights or volumes.
b. Weight adder shown is the same for cooler and condenser of equal frame size.
c. For the total weight of a vessel with a marine waterbox, add these values to the heat exchanger weights (or volume).

## Table 16 — 23XRV Waterbox Cover Weights, Frames 3,4,5 — English (lb)[a,b,c]

| WATERBOX DESCRIPTION | COOLER | | | | | | CONDENSER | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Frame 3 | | Frame 4 | | Frame 5 | | Frame 3 | | Frame 4 | | Frame 5 | |
| | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged |
| **NIH 1 Pass Cover, 150 psig** | 282 | 318 | 148 | 185 | 168 | 229 | 282 | 318 | 148 | 185 | 168 | 229 |
| **NIH 2 Pass Cover, 150 psig** | 287 | 340 | 202 | 256 | 222 | 276 | 287 | 340 | 191 | 245 | 224 | 298 |
| **NIH 3 Pass Cover, 150 psig** | 294 | 310 | 472 | 488 | 617 | 634 | 294 | 310 | 503 | 519 | 628 | 655 |
| **NIH Plain End, 150 psig** | 243 | 243 | 138 | 138 | 154 | 154 | 225 | 225 | 138 | 138 | 154 | 154 |
| **MWB End Cover, 150 psig** | 243/315 | 243/315 | 138/314 | 138/314 | 154/390 | 154/390 | 225/234 | 225/234 | 138/314 | 138/314 | 154/390 | 154/390 |
| **NIH 1 Pass Cover, 300 psig** | 411 | 486 | 633 | 709 | 764 | 840 | 411 | 486 | 633 | 709 | 764 | 840 |
| **NIH 2 Pass Cover, 300 psig** | 411 | 518 | 626 | 733 | 760 | 867 | 411 | 578 | 622 | 729 | 727 | 878 |
| **NIH 3 Pass Cover, 300 psig** | 433 | 468 | 660 | 694 | 795 | 830 | 433 | 468 | 655 | 689 | 785 | 838 |
| **NIH Plain End, 300 psig** | 291 | 291 | 522 | 522 | 658 | 658 | 270 | 270 | 522 | 522 | 658 | 658 |
| **MWB End Cover, 300 psig** | 445/619 | 445/619 | 522/522 | 522/522 | 658/658 | 658/658 | 359/474 | 359/474 | 522/522 | 522/522 | 658/658 | 658/658 |

NOTE(S):

a. Add to heat exchanger data for total weights or volumes.
b. Weight adder shown is the same for cooler and condenser of equal frame size.
c. For the total weight of a vessel with a marine waterbox, add these values to the heat exchanger weights (or volume).

LEGEND

**MWB** —Marine Waterbox
**NIH** —Nozzle-in-Head

## Table 17 — 23XRV Waterbox Cover Weights, Frames 3,4,5 — SI (kg)[a,b,c]

| WATERBOX DESCRIPTION | COOLER | | | | | | CONDENSER | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Frame 3 | | Frame 4 | | Frame 5 | | Frame 3 | | Frame 4 | | Frame 5 | |
| | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged |
| **NIH 1 Pass Cover, 1034 kPa** | 128 | 144 | 67 | 84 | 76 | 104 | 128 | 144 | 67 | 84 | 76 | 104 |
| **NIH 2 Pass Cover, 1034 kPa** | 130 | 154 | 92 | 116 | 101 | 125 | 130 | 154 | 87 | 111 | 102 | 135 |
| **NIH 3 Pass Cover, 1034 kPa** | 133 | 141 | 214 | 221 | 280 | 288 | 133 | 141 | 228 | 235 | 285 | 297 |
| **NIH Plain End, 1034 kPa** | 110 | 110 | 63 | 63 | 70 | 70 | 102 | 102 | 63 | 63 | 70 | 70 |
| **MWB End Cover 1034 kPa** | 110/143 | 110/143 | 63/142 | 63/142 | 70/177 | 70/177 | 102/106 | 102/106 | 63/142 | 63/142 | 70/177 | 70/177 |
| **NIH 1 Pass Cover, 2068 kPa** | 186 | 220 | 287 | 322 | 347 | 381 | 186 | 220 | 287 | 322 | 346 | 381 |
| **NIH 2 Pass Cover, 2068 kPa** | 186 | 235 | 284 | 332 | 344 | 393 | 186 | 235 | 282 | 331 | 330 | 398 |
| **NIH 3 Pass Cover, 2068 kPa** | 196 | 212 | 299 | 315 | 361 | 376 | 196 | 212 | 297 | 313 | 356 | 380 |
| **NIH Plain End 2068 kPa** | 132 | 132 | 237 | 237 | 298 | 298 | 122 | 122 | 237 | 237 | 298 | 298 |
| **MWB End Cover 2068 kPa** | 202/281 | 202/281 | 237/237 | 237/237 | 298/298 | 298/298 | 163/215 | 163/215 | 237/237 | 237/237 | 298/298 | 298/298 |

NOTE(S):

a. Add to heat exchanger data for total weights or volumes.
b. Weight adder shown is the same for cooler and condenser of equal frame size.
c. For the total weight of a vessel with a marine waterbox, add these values to the heat exchanger weights (or volume).

LEGEND

**MWB** —Marine Waterbox
**NIH** —Nozzle-in-Head

**Table 18 — 23XRV Waterbox Cover Weights, Frames A/B — English (lb)[a,b,c]**

| WATERBOX DESCRIPTION | COOLER FRAMES A AND B | | CONDENSER FRAMES A AND B | |
|---|---|---|---|---|
| | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged |
| **NIH,1-Pass Cover 150 psig** | 217 | 244 | 242 | 274 |
| **NIH,2-Pass Cover 150 psig** | 172 | 265 | 191 | 298 |
| **NIH,3-Pass Cover 150 psig** | 228 | 245 | 261 | 277 |
| **NIH/Marine Plain End, 150 psig** | 157 | 157 | 173 | 173 |
| **MWB Cover, 150 psig** | 296 | 296 | 332 | 332 |
| **NIH,1-Pass Cover 300 psig** | 217 | 271 | 242 | 312 |
| **NIH,2-Pass Cover 300 psig** | 172 | 301 | 191 | 334 |
| **NIH,3-Pass Cover 300 psig** | 228 | 263 | 261 | 295 |
| **NIH/Marine Plain End, 300 psig** | 157 | 157 | 173 | 173 |
| **MWB Cover, 300 psig** | 296 | 296 | 332 | 332 |

NOTE(S):

a. Add to heat exchanger data for total weights or volumes.
b. Weight adder shown is the same for cooler and condenser of equal frame size.
c. For the total weight of a vessel with a marine waterbox, add these values to the heat exchanger weights (or volume).

LEGEND

**MWB** —Marine Waterbox
**NIH** —Nozzle-in-Head

**Table 19 — 23XRV Waterbox Cover Weights, Frames A/B — SI (kg)[a,b,c]**

| WATERBOX DESCRIPTION | COOLER FRAMES A AND B | | CONDENSER FRAMES A AND B | |
|---|---|---|---|---|
| | Victaulic Nozzles | Flanged | Victaulic Nozzles | Flanged |
| **NIH,1-Pass Cover 1034 kPa** | 98 | 111 | 110 | 124 |
| **NIH,2-Pass Cover 1034 kPa** | 78 | 120 | 87 | 135 |
| **NIH,3-Pass Cover 1034 kPa** | 103 | 111 | 118 | 126 |
| **NIH/Marine Plain End, 1034 kPa** | 71 | 71 | 78 | 78 |
| **MWB Cover, 1034 kPa** | 134 | 134 | 151 | 151 |
| **NIH,1-Pass Cover 2068 kPa** | 98 | 123 | 110 | 142 |
| **NIH,2-Pass Cover 2068 kPa** | 78 | 137 | 87 | 151 |
| **NIH,3-Pass Cover 2068 kPa** | 103 | 119 | 118 | 134 |
| **NIH/Marine Plain End, 2068 kPa** | 71 | 71 | 78 | 78 |
| **MWB Cover, 2068 kPa** | 134 | 134 | 151 | 151 |

NOTE(S):

a. Add to heat exchanger data for total weights or volumes.
b. Weight adder shown is the same for cooler and condenser of equal frame size.
c. For the total weight of a vessel with a marine waterbox, add these values to the heat exchanger weights (or volume).

LEGEND

**MWB** —Marine Waterbox
**NIH** —Nozzle-in-Head

## RIG MACHINE COMPONENTS

Refer to Fig. 16-26 and Carrier Certified Prints for machine component disassembly.

IMPORTANT: Only a qualified service technician should perform this operation.

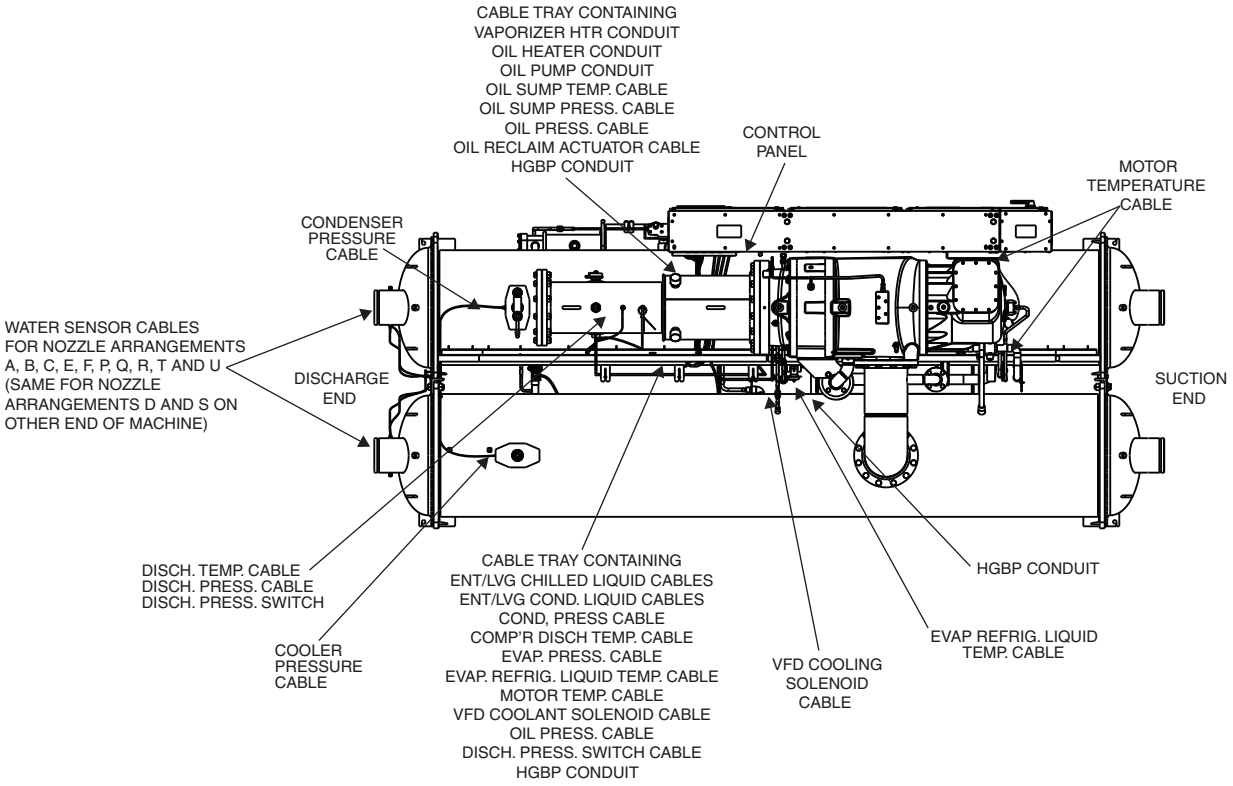
**⚠ WARNING**

Do not attempt to disconnect flanges while the machine is under pressure. Failure to relieve pressure can result in personal injury or damage to the unit.

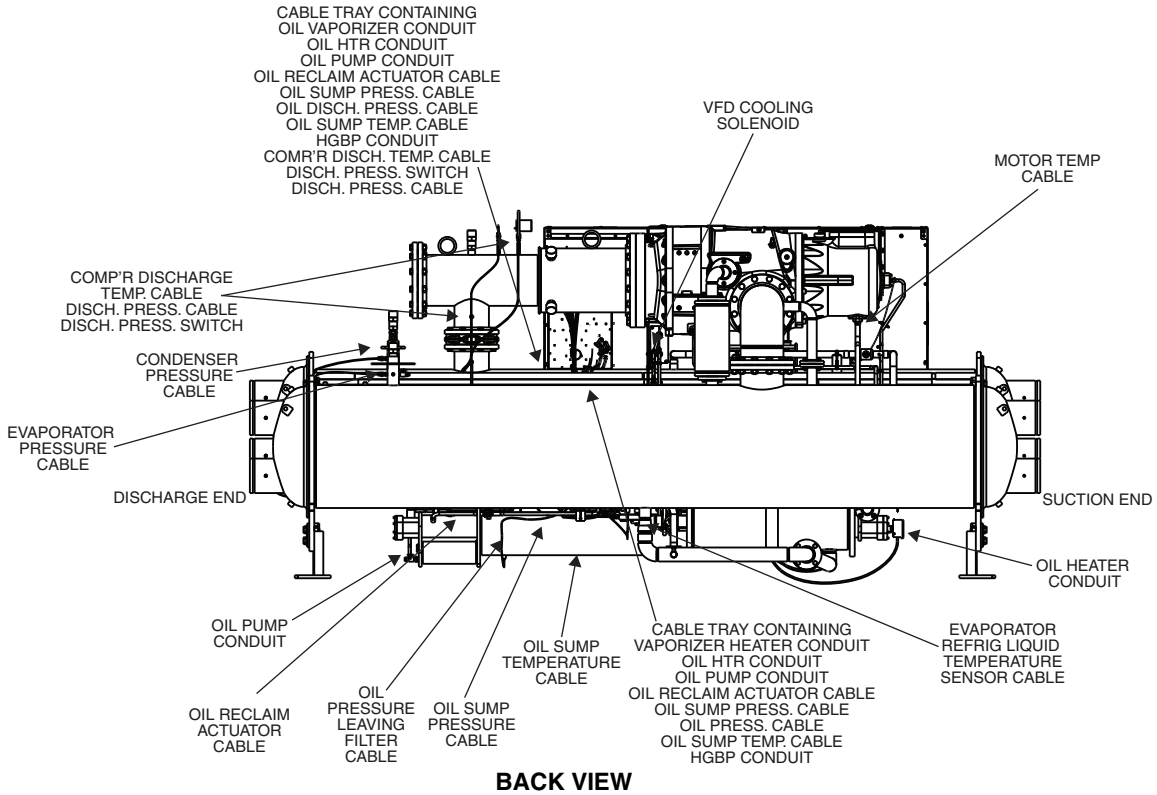
**⚠ CAUTION**

Before rigging the compressor, disconnect all wires entering the power panel.

NOTE: Label each wire before removal when wiring must be disconnected (see Fig. 16 and 17). Clip all wire ties necessary when removing pressure and temperature sensors. Disconnect all pressure transducer wires at the sensor. Temperature sensors cannot be disconnected from their cables; remove temperature sensors from their thermowells and label as required.




**TOP VIEW**




**BACK VIEW**

LEGEND

**ENT/LVG** — Entering/Leaving
**HGBP** — Hot Gas Bypass
**HTR** — Heater
**VFD** — Variable Frequency Drive

**Fig. 16 — Electrical Cable Routing (Unit with R Compressor Shown)**

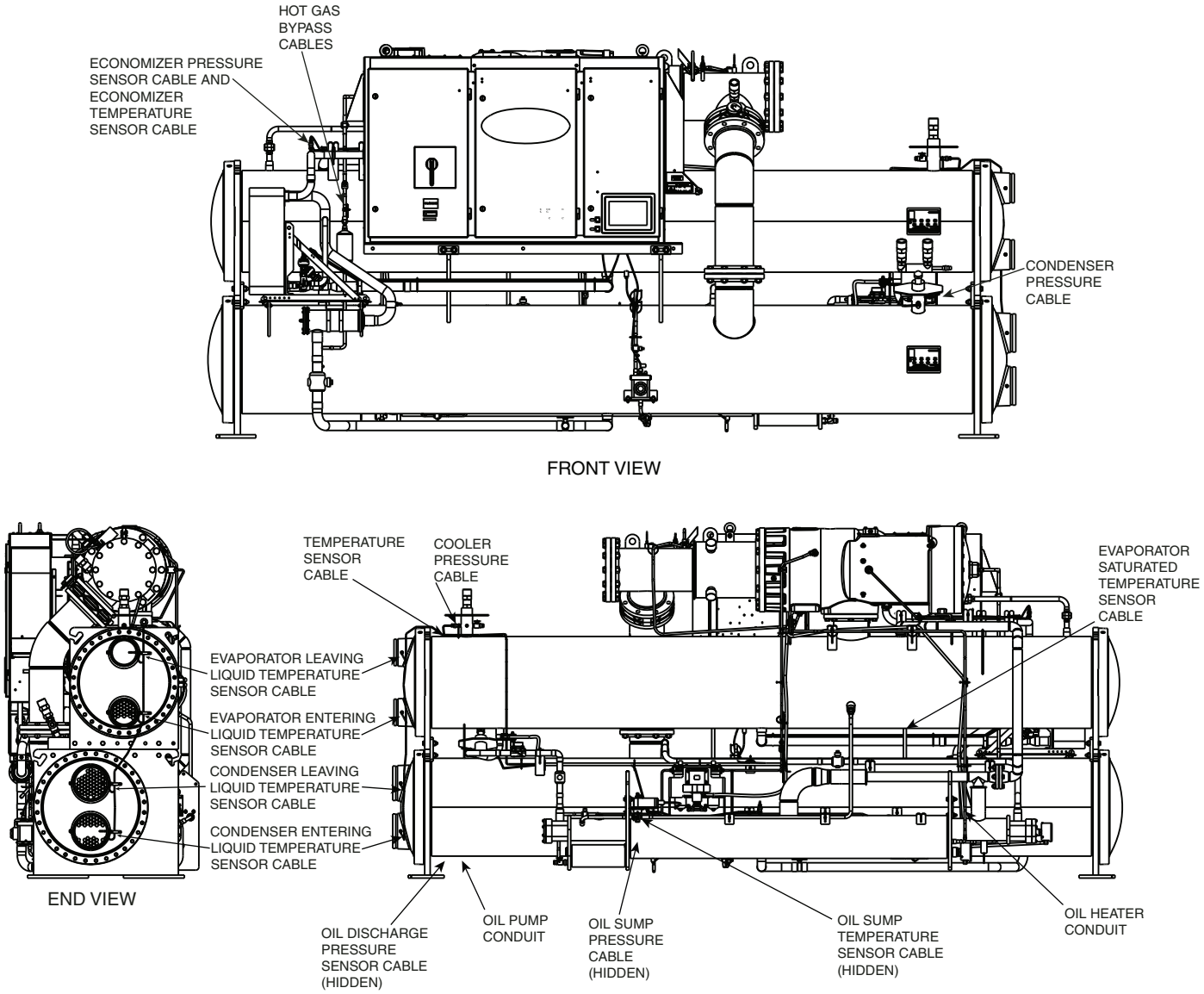
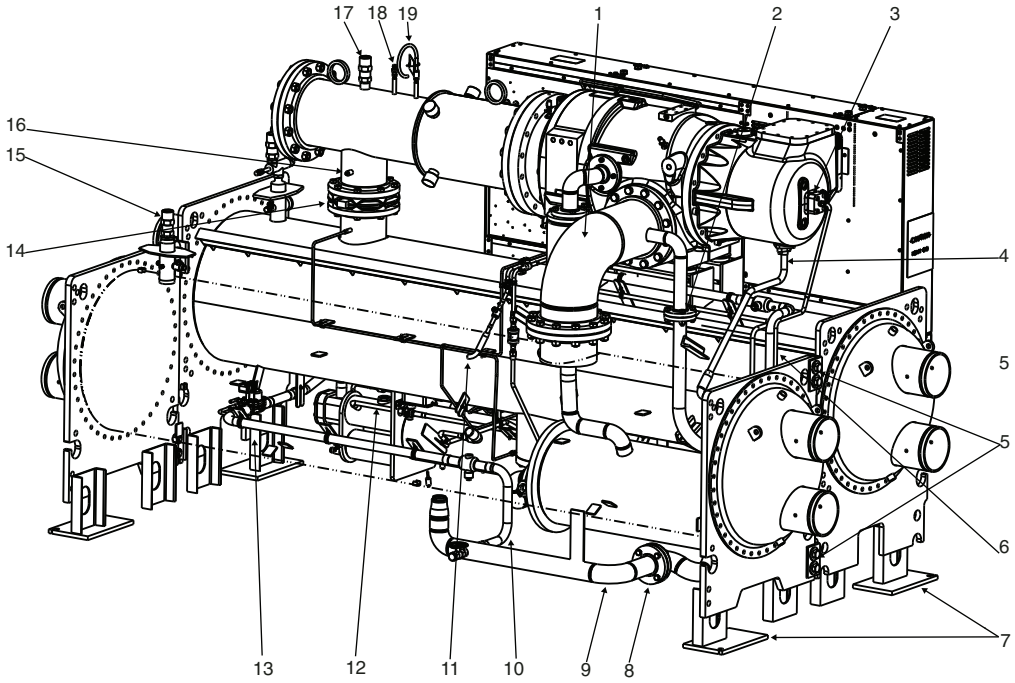
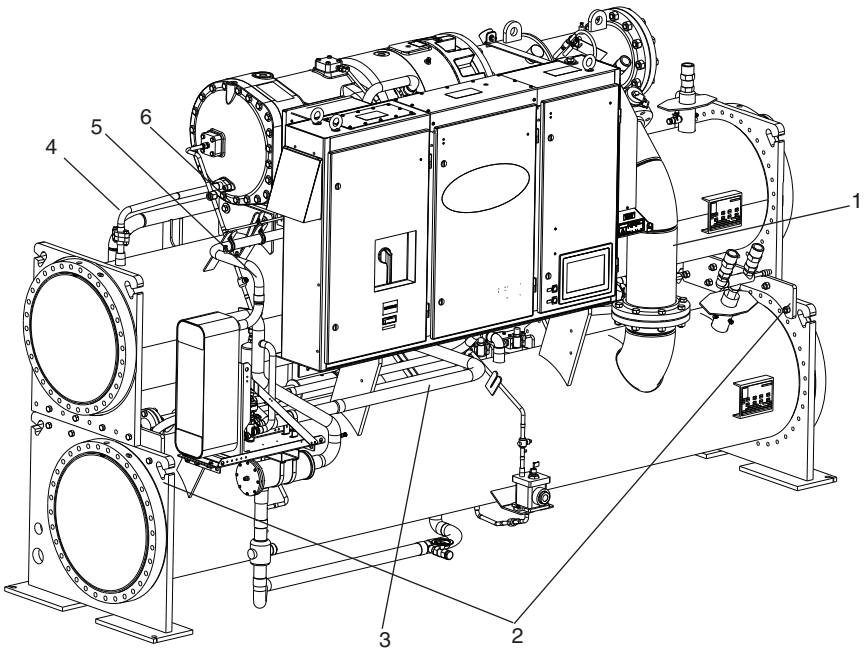



**Fig. 17 — Electrical Cable Routing (Unit with P Compressor Shown)**



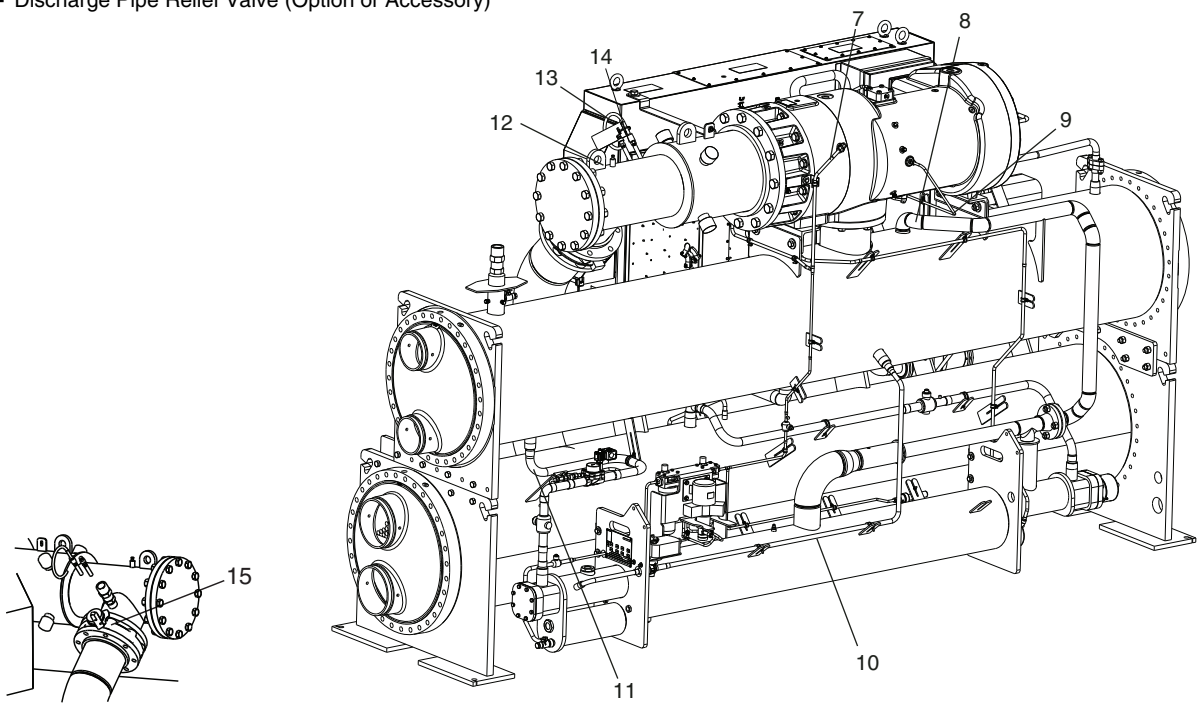

**1** — Suction Elbow (Unbolt)
**2** — Vaporizer Vent Line (Unbolt)
**3** — Motor Cooling Line (Unbolt)
**4** — Motor Cooling Drain Line (Cut)
**5** — Tubesheet Mounting Bracket
**6** — Bearing Oil Drain Line
**7** — Support Plate
**8** — In-Line Economizer Orifice Plate
**9** — Cooler Liquid Feed Line (Unbolt)
**10** — Hot Gas Bypass Line (Cut)
**11** — VFD Cooling Drain Line
**12** — Oil Reclaim Line (Cut)
**13** — Vaporizer Hot Gas Return Line (Cut)
**14** — Discharge Isolation Valve (Optional)
**15** — Condenser Relief Valves
**16** — Discharge Temperature Sensor
**17** — Discharge Pipe Assembly Relief Valve (Unscrew)
**18** — Discharge Pressure Sensor
**19** — Discharge Pressure Switch

**Fig. 18 — Cooler/Discharge Pipe Assembly Removal (Unit with R Compressor Shown)**




**FRONT VIEW**

**1** — Discharge Pipe
**2** — Tubesheet Mounting Bracket (Inside, Both Ends) (Unbolt)
**3** — Cooler Liquid Feed Line (Cut)
**4** — Motor Drain Line (Unbolt)
**5** — Motor Cooling Line (Cut)
**6** — Economizer Line to Compressor (Option) (Cut)
**7** — Oil Supply
**8** — Vaporizer Vent Line (Cut)
**9** — Motor Cooling Line
**10** — Oil Reclaim Line (Cut)
**11** — Hot Gas Bypass Line (Cut)
**12** — Compressor Discharge Temperature
**13** — Compressor Discharge Pressure
**14** — Compressor Discharge High Pressure Switch
**15** — Discharge Pipe Relief Valve (Option or Accessory)




**BACK VIEW**

**Fig. 19 — Cooler/Discharge Pipe Assembly Removal (Unit with P Compressor Shown)**

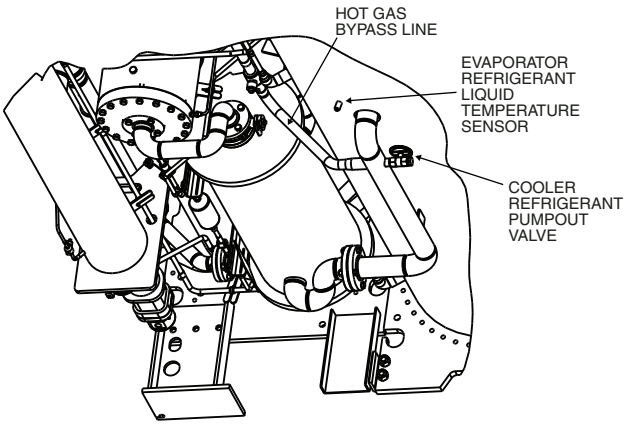



**Fig. 20 — Evaporator Refrigerant Liquid Temperature Sensor on Bottom of Cooler (Units with Q,R Compressors Shown)**

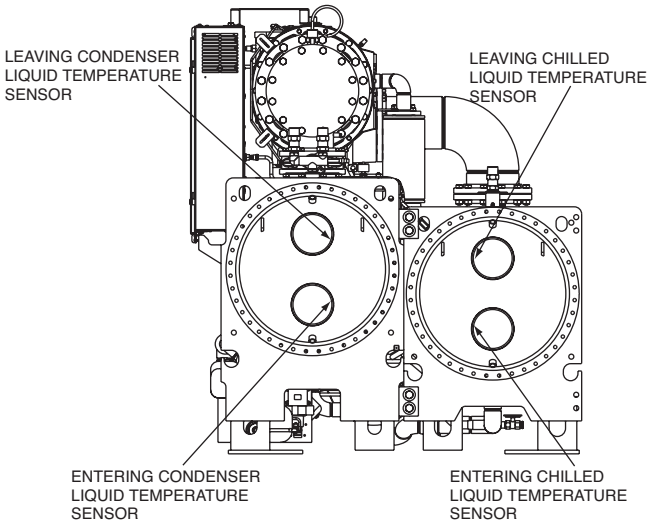



**Fig. 21 — Chiller End View (Q,R Compressors Only)**

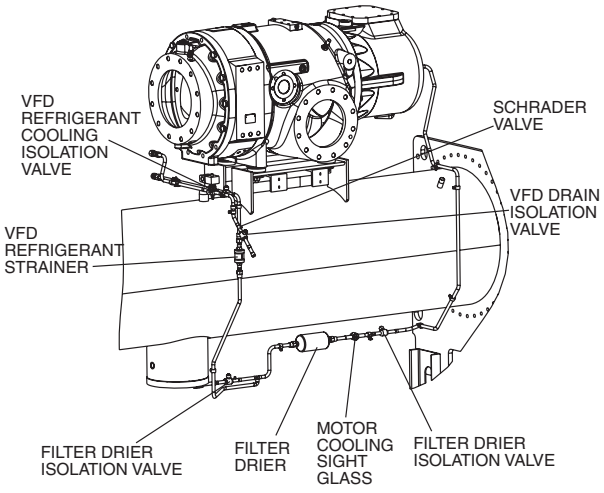



**Fig. 22 — VFD Refrigerant Isolation Valves (Q,R Compressors Only)**

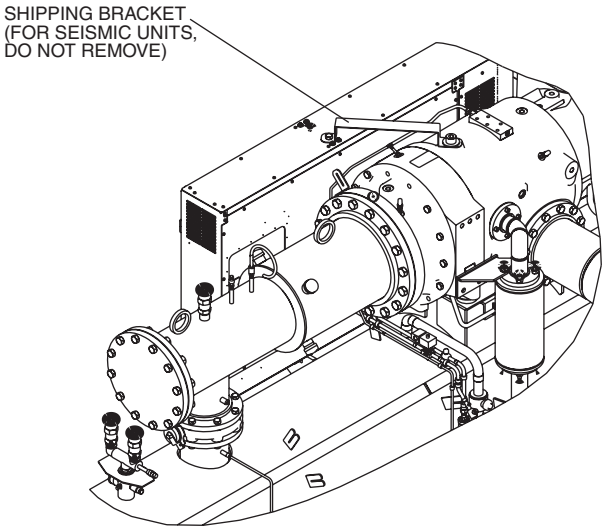



**Fig. 23 — VFD Shipping Bracket (Unit with R Compressor Shown)**

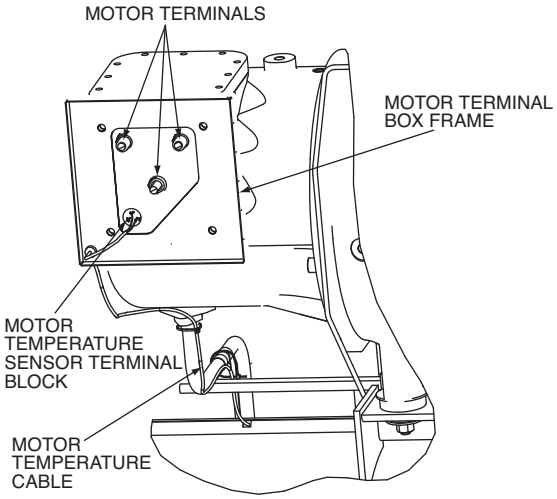



**Fig. 24 — Motor Terminals (Units with Q,R Compressors Shown)**

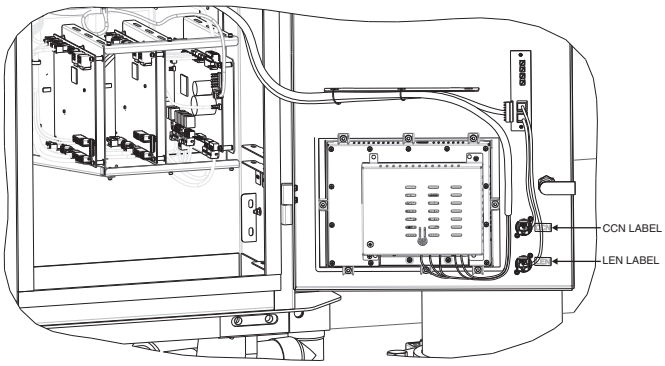



**Fig. 25 — PIC6 Wiring**

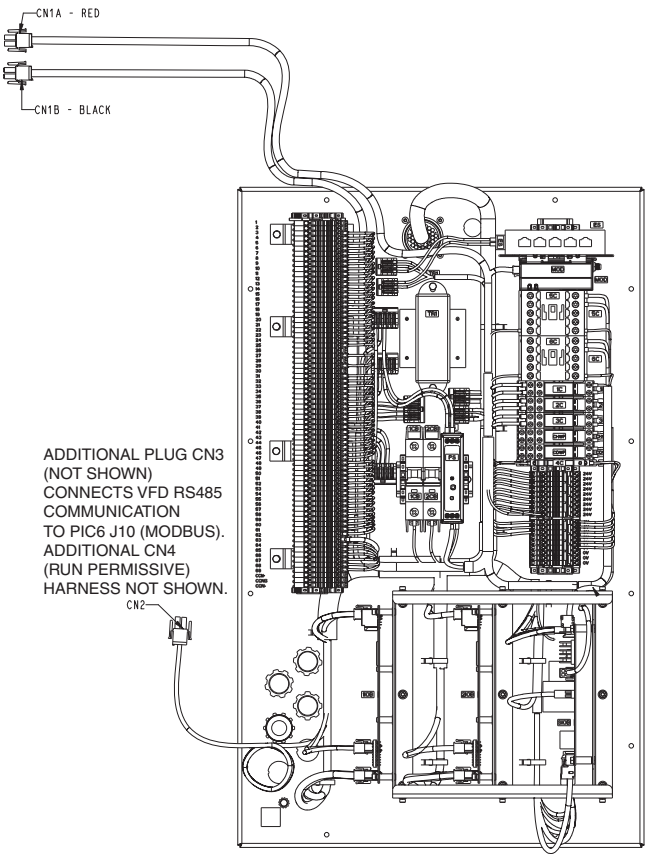



**Fig. 26 — Control Panel Connectors**

## Step 3 — Separate Machine Components

The design of the 23XRV chiller allows for disassembly at the jobsite so that the individual chiller components may be moved through existing doorways. Use the following procedures to separate the machine components.

Unit disassembly should not be performed in a condensing environment or corrosive environment that could result in internal corrosion or damage to the equipment.

If the sections of the unit are going to be disassembled for more than 8 hours or exposed to humidity levels that will result in internal corrosion, the sections should be sealed and pressurized with nitrogen.

The disassembled sections should be stored in a location with four walls and a roof that is protected from the outdoor conditions.

Suggested locations to cut piping will minimize the width of the condenser/economizer assembly.

SEPARATE COOLER AND CONDENSER

IMPORTANT: If the cooler and condenser vessels must be separated, the heat exchangers should be kept level by placing a support plate under the tube sheets. The support plate will also help to keep the vessels level and aligned when the vessels are bolted back together.

NOTE: For steps 1 through 13 refer to Fig. 18 for units with Q or R compressors, or Fig. 19 for units with P compressors. The cooler in Fig. 18 has been removed from the picture to show the pipes and lines that must be cut.

Check that the holding charge has been removed from the chiller.

1. Place a support plate under each tube sheet to keep each vessel level (does not apply to units with P compressor).
2. Remove cooler relief valve and relief valve vent piping (cooler not shown in Fig. 18 or 19, see Fig. 3, 4, or 5).
3. Cut the motor cooling refrigerant drain line (see Fig. 18, item 4) (does not apply to units with P compressor).
4. Unbolt and rig the suction elbow off (does not apply to units with P compressor) and disconnect the compressor suction line at the cooler and compressor. Remove bolts from the vaporizer vent line flange.
5. Cut the VFD cooling drain line (see Fig. 18, item 11) (does not apply to units with P compressor).
6. Cut the oil reclaim line(s) (see Fig. 18, item 12, or Fig. 19, item 10).
7. Cut the hot gas bypass line between the HGBP (hot gas bypass) solenoid valve and cooler feed line (see Fig. 18, item 10, or Fig. 19, item 11).
8. Cut or unbolt the cooler liquid feed line (see Fig. 18, item 9, or Fig. 19, item 3), near the economizer or condenser float chamber at the flanged connection. For economized units with Q or R compressors, temporarily secure the in-line economizer orifice plate to the economizer flange.
9. Cut the vaporizer refrigerant return line as shown (see Fig. 18, item 13, or Fig. 19, item 8).
10. Disconnect all sensors with cables that cross from the condenser side of the machine to the cooler side including:
    a. Evaporator refrigerant liquid temperature sensor. See Fig. 20.
    b. Entering and leaving chiller liquid temperature sensors. See Fig. 21.
    c. Evaporator pressure sensor (not shown).
11. Disconnect the tubesheet mounting brackets from the vessel connectors on the tube cooler tubesheet.
12. Cover all openings.
13. Rig the cooler away from the condenser/compressor.

NOTE: To reassemble, follow steps in reverse order. Connect sensors and cables after major components have been secured to reduce the risk of damaging them.

**⚠ CAUTION**

Do not rig the condenser before the control center and compressor are removed. The condenser/compressor assembly has a high center of gravity and may tip over when lifted at the tubesheet rigging points, which could result in equipment damage and/or serious personal injury.

REMOVE THE CONTROLS/DRIVE ENCLOSURE

Confirm that the power supply disconnect is open and all safety procedures are observed before removing the VFD. This procedure minimizes the number of sensors and cables that need to be disconnected.

**⚠ WARNING**

Do not attempt to remove the VFD without first closing the refrigerant isolation valves. Failure to do so during VFD removal will result in an uncontrolled refrigerant leak. A refrigerant leak can damage the unit as well as displace oxygen, causing asphyxiation.

1. For Q and R compressors, close the 2 filter drier isolation valves (Fig. 22) and the 2 VFD isolation valves. Isolate the refrigerant charge into the condenser to prevent a refrigerant leak if one of the motor terminals is accidentally damaged during VFD removal or installation. For Q and R

compressors, evacuate the VFD coldplate through the Schrader valve (Fig. 22) on the VFD drain isolation valve.

2. Remove the shipping bracket between the VFD and the compressor if it is still in place. See Fig. 23.

   NOTE: For seismic units, do not remove the shipping bracket.

3. Remove any conduits that bring power to the VFD.
4. Remove the nuts that secure the terminal box transition piece to the motor housing.
5. Disconnect the motor leads from the motor terminals (Fig. 24). Note the position of the motor terminal cable lugs so they can be reinstalled with sufficient clearance away from surrounding structure.
6. Remove the motor temperature sensor leads (Fig. 24), the motor ground lead, and the bolts that secure the VFD enclosure to the terminal box transition piece.
7. Disconnect the communication cables from the back of the PIC6 (Fig. 25).
8. Disconnect the high pressure switch leads. Consult the wiring diagrams in the section Make Electrical Connections (page 47) for terminal block and terminals (they are dependent on the drive type).
9. Unplug connectors CN1A, CN1B, CN2, CN3, and CN4 (Fig. 26).
10. Disconnect the control panel ground wire located next to connectors CN1A and CN1B (see Fig. 26 for all compressors).
11. Disconnect the VFD cooling lines and cover all openings (does not apply to units with P compressors).
12. Remove the 12 screws that secure the control panel to the VFD enclosure. Tilt the control panel away from the back of the control center.
13. Position the control panel on a safe surface and secure it in place to prevent damage.

***Lifting the Control Center***

Care should be used to prevent damage due to dropping or jolting when moving the control center. A fork truck or similar means of lifting and transporting may be used. Sling in a manner that will equalize the load at the pickup points. Use a spreader bar if the angle of the sling is less than 45 degrees relative to horizontal. Do not jolt while lifting.

Use the following procedure to lift the control center.

1. Remove the rubber hole plugs in the top of the control center and fully thread in 4 eyebolts or swivel hoist rings (see Fig. 27). Lifting hardware must have 3/4 in.-10 x 2 in. long threads and must have a working load limit of at least 6000 lb (2722 kg). Typical eyebolts are Chicago Hardware (size 28) or Grainger (P/N 5ZA63).
2. Attach a sling to the 4 lifting eyebolts. Make certain that the angle of the sling is not less than 45 degrees relative to horizontal.
3. Using an overhead or portable hoist (minimum 2 ton rated capacity), attach a free-fall chain to the sling secured to the drive. Take up any slack in the chain.
4. Rig the control center and remove the bolts that secure it to the VFD mounting brackets on the condenser (see Fig. 27).
5. Confirm that welding procedures comply with local Pressure Vessel Codes before removing a portion of the VFD support bracket from the condenser. Custom brackets should be fabricated if part of the VFD supports must be cut off of the condenser to reduce the width of the condenser assembly. Clamp 1/4-in. plates over both sides of the VFD bracket and drill 2 pairs of holes that straddle the line along which the VFD brackets will be cut. This allows VFD brackets to be reinstalled and welded in their original position.

NOTE: To reassemble, follow steps in reverse order. Connect sensors and cables after major components have been secured to reduce the risk of damaging them.

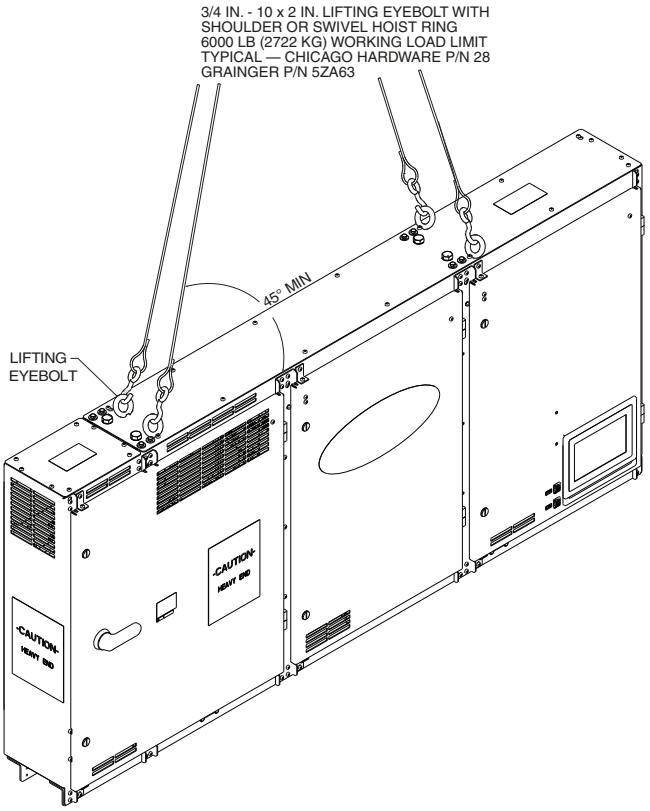



**Fig. 27 — Control Center Lifting Points**

REMOVE THE DISCHARGE PIPE ASSEMBLY FROM THE CONDENSER

NOTE: For steps 1 through 6 refer to Fig. 18 for units with Q, R compressor, or Fig. 19 for units with P compressor.

The condenser relief valve and relief valve vent piping should be removed if they will interfere with discharge pipe assembly rigging.

1. Remove the discharge pipe assembly relief valve and relief valve vent piping, if applicable.
2. Disconnect the compressor discharge temperature sensor.
3. Disconnect the compressor discharge pressure sensor and remove the high discharge pressure switch.
4. Unbolt and rig the discharge pipe assembly off and remove the bolts from the compressor discharge and condenser inlet flange. Note the position and orientation of the discharge isolation valve on the condenser inlet flange.
5. Remove the discharge pipe assembly.
6. Cover all openings.

NOTE: To reassemble, follow steps in reverse order. Connect sensors and cables after major components have been secured to reduce the risk of damaging them.

SEPARATE THE COMPRESSOR

**⚠CAUTION**

Do not rig the heat exchanger before the control center and compressor are removed. The assembly has a high center of gravity and may tip over when lifted at the tubesheet rigging points, which could result in equipment damage and/or serious personal injury.

The VFD blocks access to the compressor mounting bolts. It must be removed before the compressor can be separated from the condenser. Remove the VFD from condenser using the Remove the Controls/Drive Enclosure section on page 27. Refer to Table 20.

**Table 20 — Compressor Fastener Identification**

| COMPRESSOR FASTENERS | | SIZE |
|---|---|---|
| Discharge Pipe Assembly to Compressor Discharge Flange | | 1 in.-8 Grade 5 Hex Head |
| Suction Elbow to Compressor Inlet | Q and P Compressor | 3/4 in.-10 Grade 5 Hex Head |
| | R Compressor | 7/8 in.-9 Grade 5 Hex Head |
| Compressor Mount to Condenser | | 3/4 in.-10 Studs (A-449) |
| Economizer Line | | 5/8 in.-11 Grade 8 Hex Head |
| Motor Cooling, Motor Drain, Oil Drain | | M12x1.75 Grade 10.9 Socket Head |
| Compressor Lifting Points (2) | | M30x3.5 Threaded Holes |
| Stator Housing Lifting Point | | M30x3.5 Threaded Hole |
| Discharge Housing Lifting Point | | M30x3.5 Threaded Hole |

1. Disconnect the oil supply line in 2 places (Fig. 28 or 29). Cap the oil lines and fittings.

NOTE: Compressor oil lines and fittings between the oil filter and compressor must be kept extremely clean to prevent obstruction of the compressor inlet bearing oil orifice. Cap all orifice lines and fittings during disassembly. The compressor inlet bearing oil orifice is located at the lubrication block on top of the compressor.

2. Disconnect the motor cooling inlet flange, the motor cooling drain flange, optional economizer vapor line flange, and bearing oil drain flange (Fig. 28 and Fig. 29). Remove the economizer muffler bracket.
3. Brace the end of the discharge pipe assembly closest to the compressor if it has not already been removed. Place an oil pan under the compressor flange to collect oil that may have accumulated in the discharge pipe assembly. Unbolt the discharge pipe assembly from the compressor. It may also be necessary to loosen the bolts that attach the discharge pipe assembly to the condenser.
4. If the cooler has been removed (not applicable for P compressor), rig the suction elbow and unbolt the suction elbow at the compressor and vaporizer vent line flanges (see Fig. 18). If the cooler is still in place, it may be necessary to loosen the bolts that secure the suction elbow to the cooler.
5. Carefully remove the perforated insulation cutouts that cover the compressor lifting points. See Fig. 28 and 29. Replace the lifting shackle thread protector after the compressor is reinstalled to prevent insulation adhesive from fouling the threads.
6. Rig the compressor with lifting eyelets installed in the two M30 threaded holes provided in the top of the compressor housing (Fig. 28 and 29). Use only M30 forged eye bolts or M30 hoist rings with a sufficient working load limit to safely lift the compressor. The rubber vibration isolators may pull out of the compressor mounting bracket when the compressor is lifted off of the condenser. Applying leak detection soap solution to the outside of the vibration isolators will make it easier to press the isolators back into position.
7. Cover all openings.

NOTE: To reassemble, follow steps in reverse order. Connect sensors and cables after major components have been secure to reduce the risk damaging them.

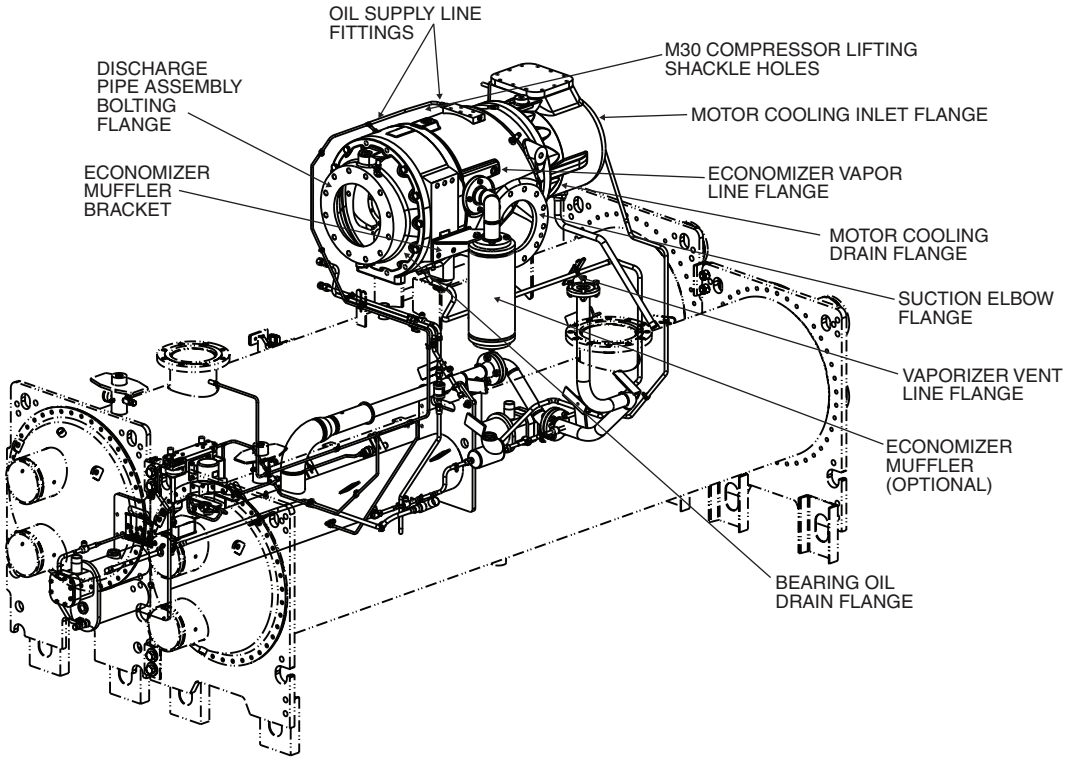



**Fig. 28 — Compressor Removal, Q and R Compressors (Unit with R Compressor Shown)**

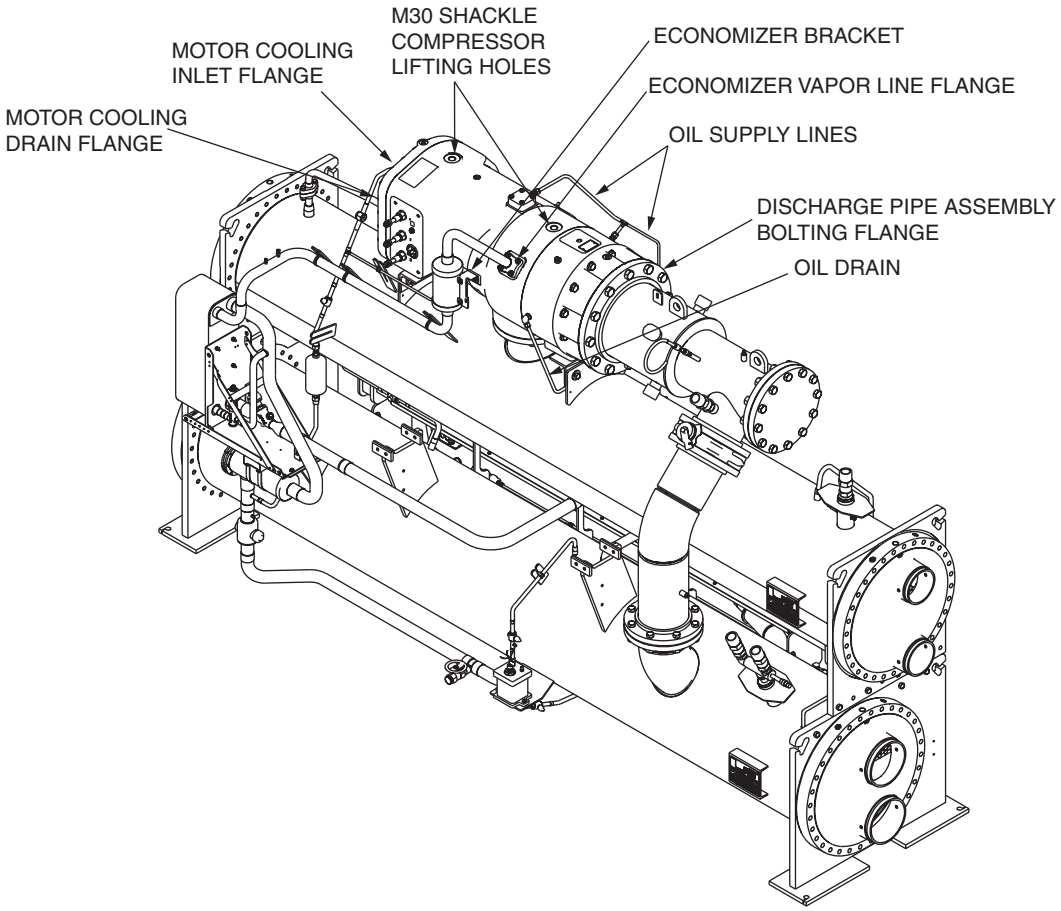



**Fig. 29 — Compressor Removal, P Compressor**

SEPARATE THE VAPORIZER FROM THE CONDENSER

The VFD mounting brackets (Fig. 30 and 31) extend beyond the outboard edge of the tubesheet. The vaporizer extends beyond the perimeter of the condenser tubesheet.

1. Cut the vaporizer hot gas supply line near the oil concentrator (Fig. 30 and 31).
2. Cut the vaporizer hot gas return line (Fig. 32).
3. Cut the bearing oil drain line near the oil sump (Fig. 32).
4. Unbolt the vaporizer vent line flange shown in Fig. 32. (Cut for P compressor.)
5. Cut the oil supply line as shown in Fig. 32.
6. Cut the oil reclaim line as shown in Fig. 32.
7. Disconnect all wires and cable leads to the vaporizer assembly (see Fig. 33) including:
   a. oil sump temperature sensor
   b. oil sump pressure cable and oil pressure leaving filter cable
   c. oil reclaim cable
   d. vaporizer heater cable in the vaporizer heater junction box (Fig. 30 and 31)
   e. oil pump cable
   f. oil sump heater conduit from its junction box (Fig. 30 and 31)
   g. vaporizer temperature sensor (Fig. 30 and 31)
8. Rig the vaporizer with the lifting points on the vaporizer mounting bracket and remove the 4 bolts that secure it to the condenser (Fig. 30 and 31).
9. Cover all openings.

NOTE: To reassemble, follow steps in reverse order. Connect sensors and cables after major components have been secured to reduce the risk damaging them.

## Step 4 — Install VFD

1. Install terminal box frame mounting studs into tapped holes using short threaded end (see section E-E in Fig. 34 and 35). Do not exceed 120 ft-lb (163 N-m).
2. Install thermal insulators, insulation frame assembly, and terminal box frame prior to attaching motor power cables.
3. Torque motor terminals to 45 to 55 ft-lb (61 to 75 N-m).
4. There may be 1 or 2 motor power cables per terminal identified as T1, T2 and T3. Position motor end lugs on terminal studs with Belleville washer located against the front terminal lug with the convex side facing toward the front terminal nut. Clinch the 2 cables together with wire ties before tightening terminal nuts. Install front terminal nut finger tight. Hold front terminal nut stationary while tightening rear terminal nut to 45 to 50 ft-lb (61 to 68 N-m). See Fig. 36 and 37.

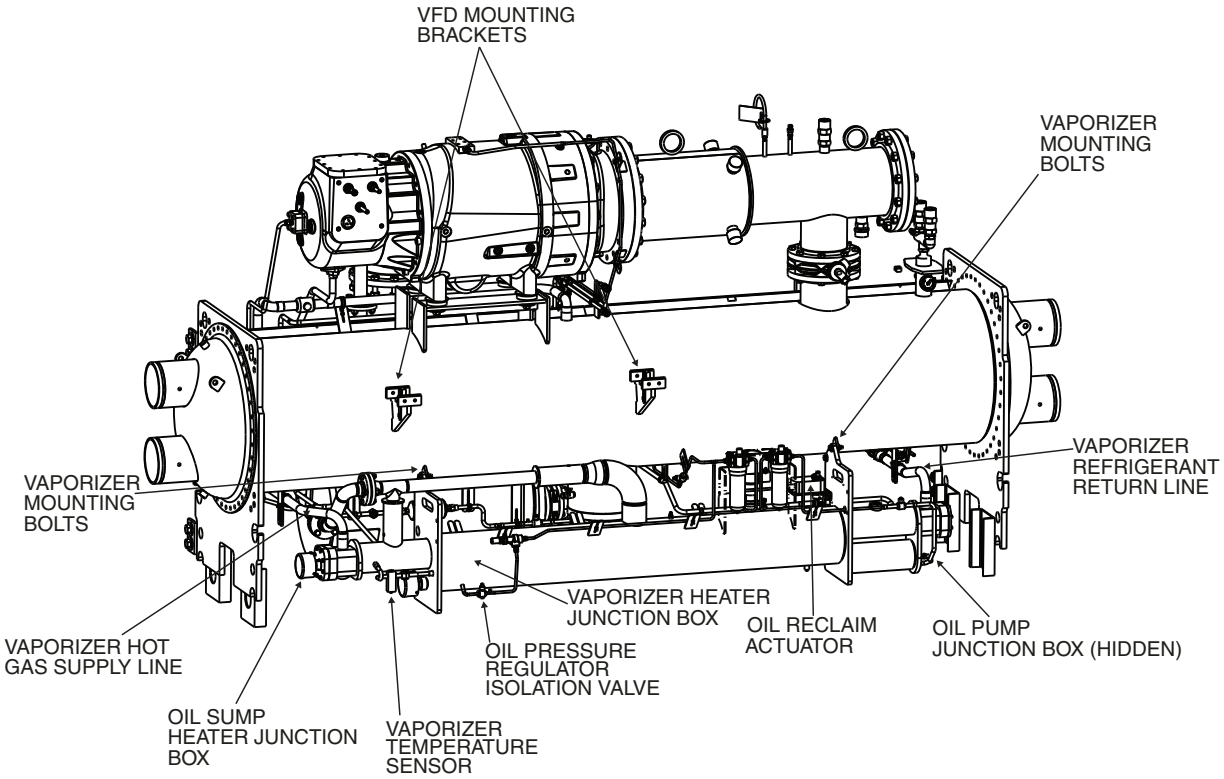



**Fig. 30 — Oil Concentrator Removal, Q and R Compressors (Unit with R Compressor Shown)**

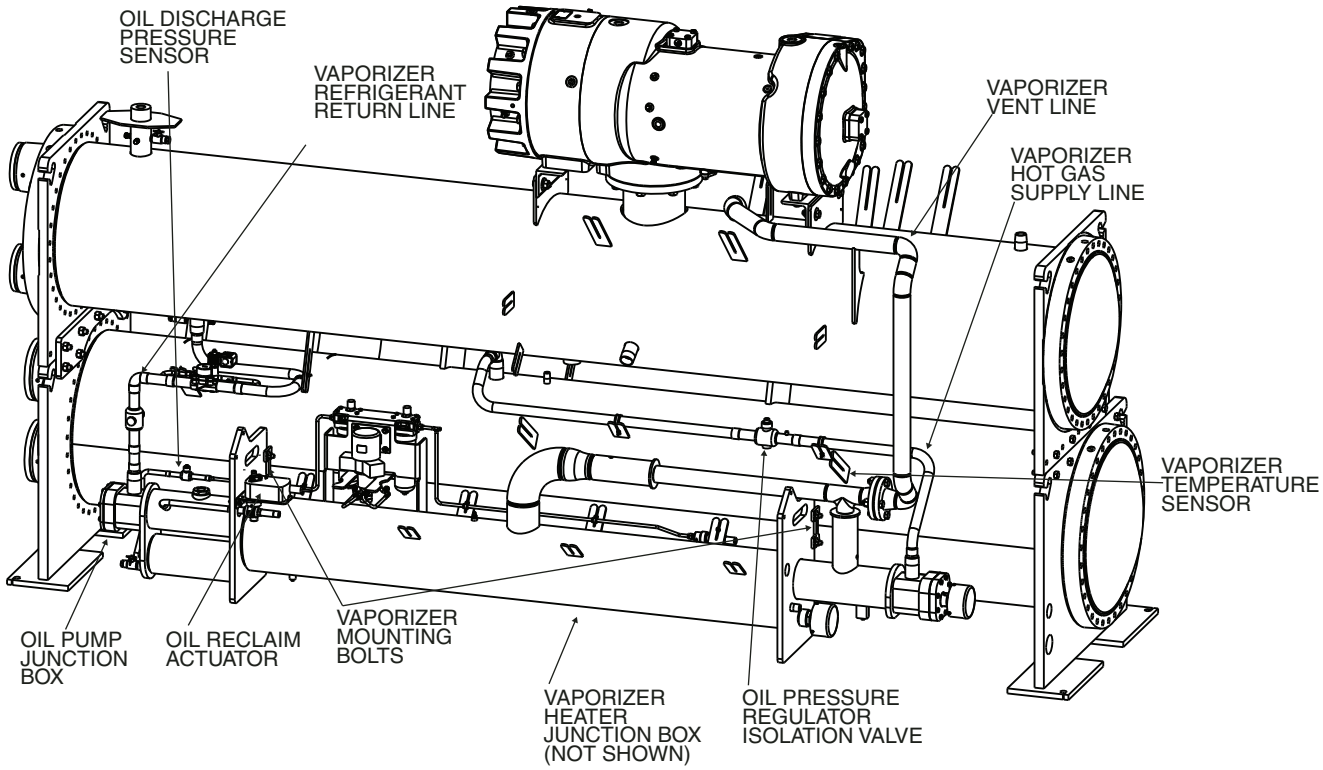



**Fig. 31 — Oil Concentrator Removal, P Compressor**

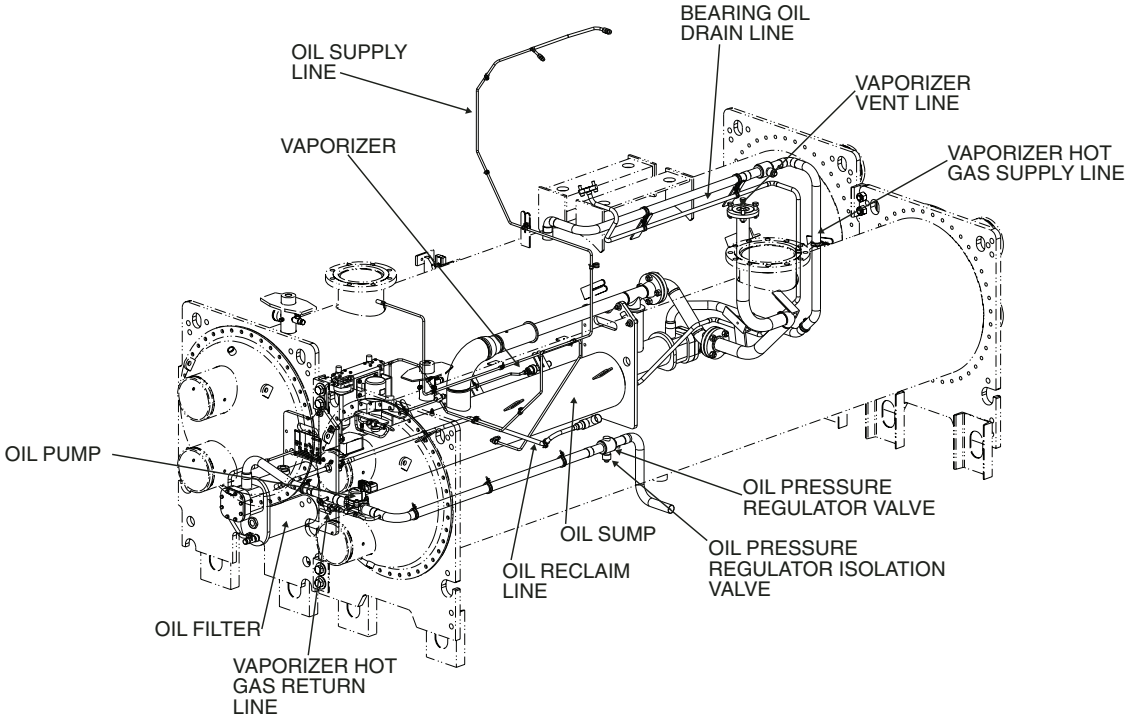



**Fig. 32 — Oil Reclaim Piping (Unit with R Compressor Shown)**

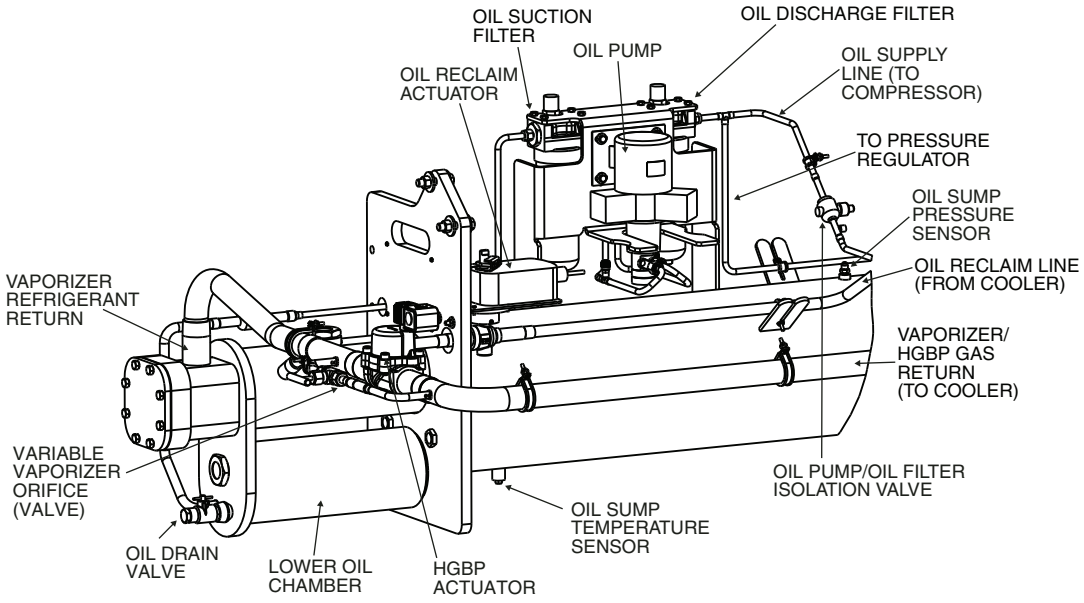



**Fig. 33 — Oil Reclaim Components (Unit with R Compressor Shown)**

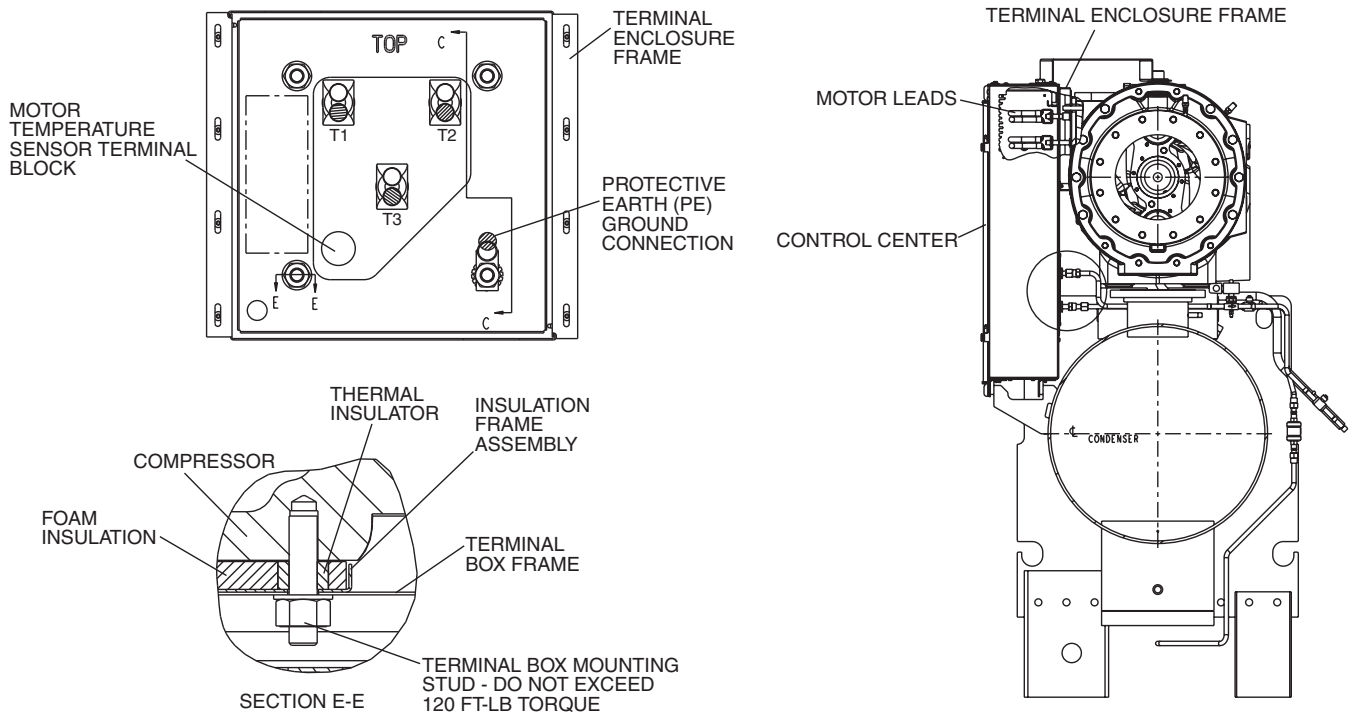



**Fig. 34 — Motor Terminal Box (Q and R Compressors)**

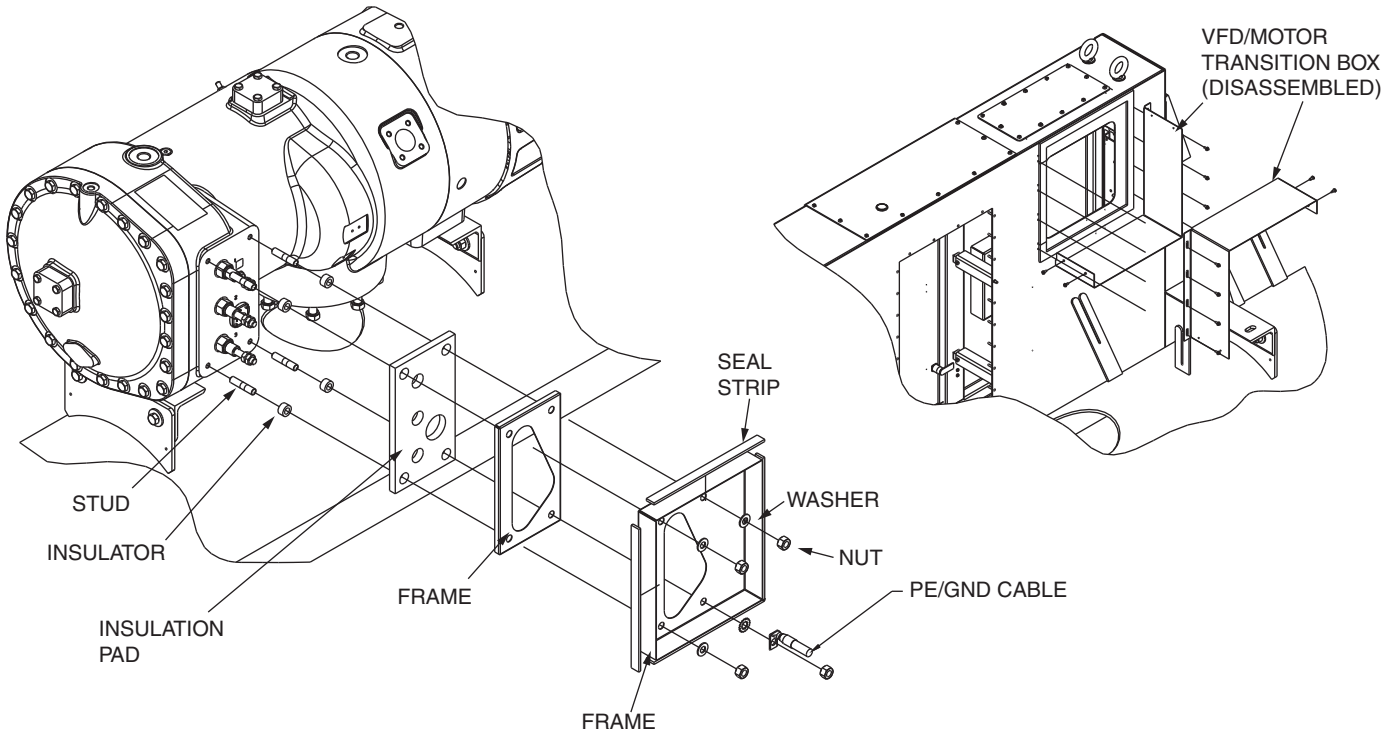



**Fig. 35 — Motor Terminal Box (P Compressor)**

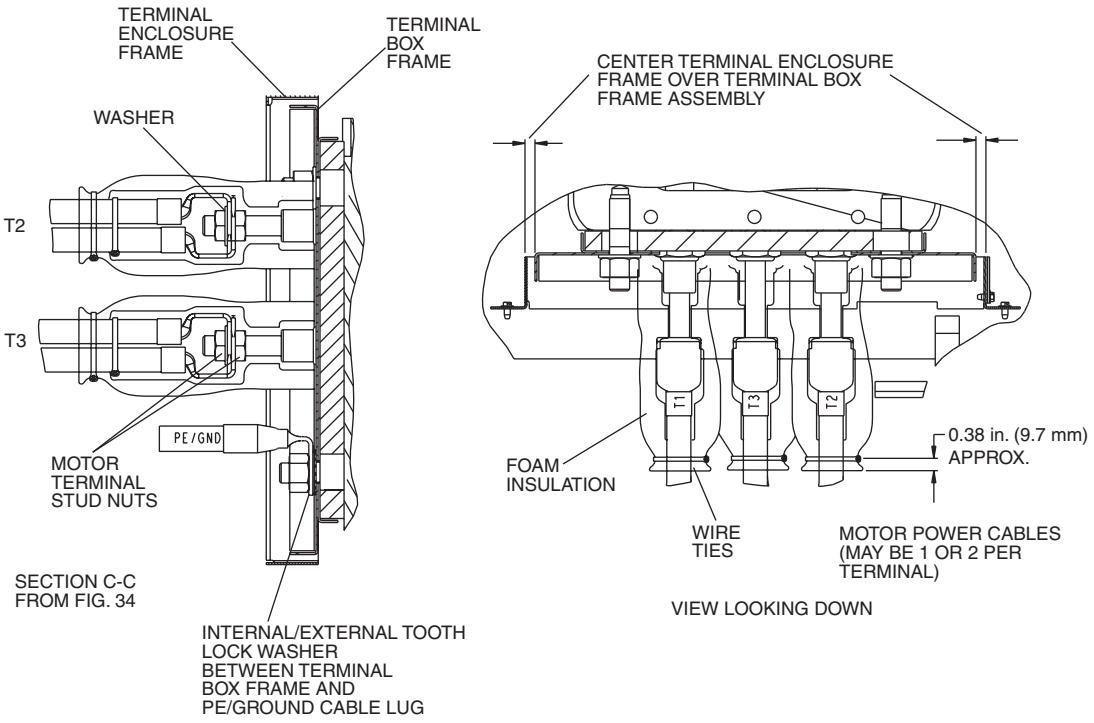



**Fig. 36 — Motor Terminal Insulation (Q and R Compressors)**

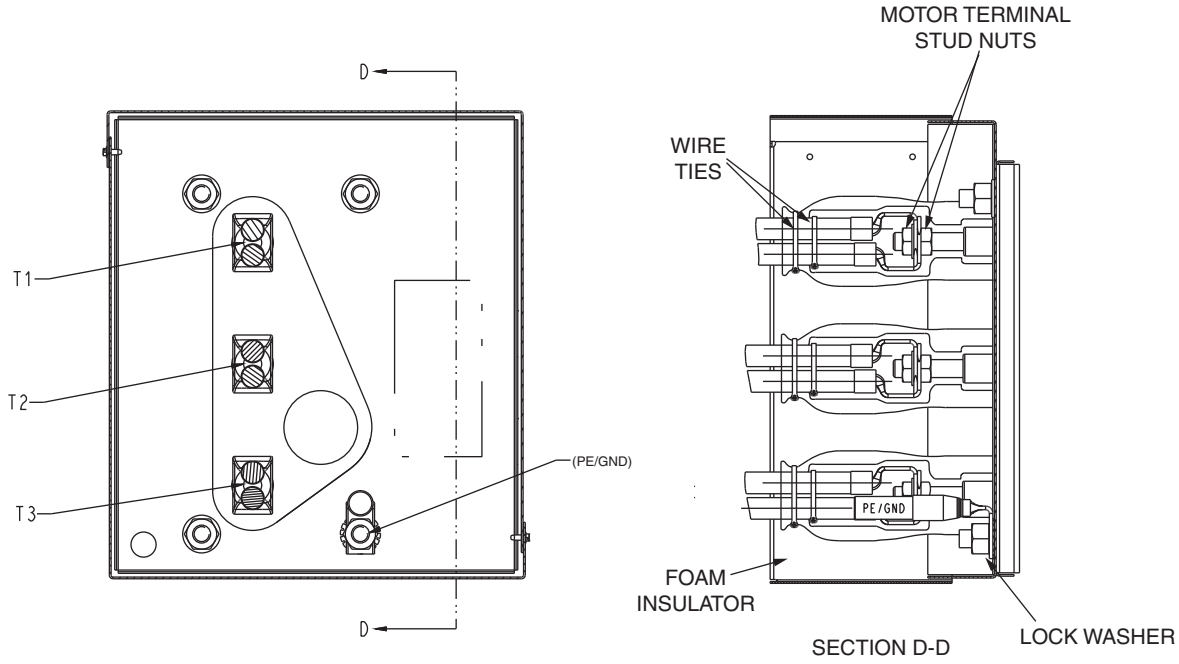



**Fig. 37 — Motor Terminal Insulation (P Compressor)**

5. Check all terminal connections for proper installation.

IMPORTANT: Do not insulate terminals until wiring arrangement has been checked and approved by Carrier start-up personnel. Motor terminals must be insulated in acceptance with national and local electrical codes.

*Insulate Motor Terminals and Lead Wire Ends*

Locate heat shrink tubing (RCD P/N LF33MM114) over power connections so that they are completely covered and tubing is against motor housing. Shrink into position. Slide foam tubing (3 in. inner diameter closed cell vinyl, neoprene, or nitrile foam) part way over the heat shrink tubing. Apply adhesive for closed cell foam insulation to motor side end of the foam tubing and push tubing the rest of the way over the terminal and against the sheet insulation on the motor side. Secure the opposite end of the foam tubing with a wire tie as shown in Fig. 36 and 37.

*Alternate Insulation for Motor Terminals and Lead Wire Ends*

Insulate compressor motor terminals, lead wire ends, and electrical wires to prevent moisture condensation and electrical arcing. Obtain Carrier approved insulation material from RCD (Replacement Components Division) consisting of 3 rolls of insulation putty and one roll of vinyl tape.

a. Insulate each terminal by wrapping with one layer of insulation putty (RCD P/N 19EA411-1102).
b. Overwrap putty with 4 layers of vinyl tape.

6. Orient PE/ground lug as shown in Fig. 38. Assemble internal/external tooth lock washer between the terminal box frame and the PE/ground cable. Torque PE/ground lug nut to 55 to 65 ft-lb (75 to 89 N-m). See section H-H in Fig. 38 for PE/ground cable routing.
7. Center terminal enclosure frame over terminal box frame assembly so the space between the frames is equal within 3/16-in. (5 mm) at the top and bottom. Use the slots in the terminal enclosure frame. Adjust spacing between the sides of the terminal enclosure frame and terminal box frame assemblies by moving the control center to the left or right.
8. Install O-rings on VFD refrigerant connections using silicone grease. Tighten connector using 2 wrenches to 27 to 33 ft-lb (37 to 45 N-m). See Detail A in Fig. 39. (Does not apply to units with P compressor.)
9. Evacuate all piping between the VFD and the VFD isolation valves after assembly and tightening of VFD fittings. Dehydration/evacuation is complete to equalize VFD piping pressure with machine pressure if machine is charged with refrigerant (Fig. 39). (Does not apply to units with P compressor.)

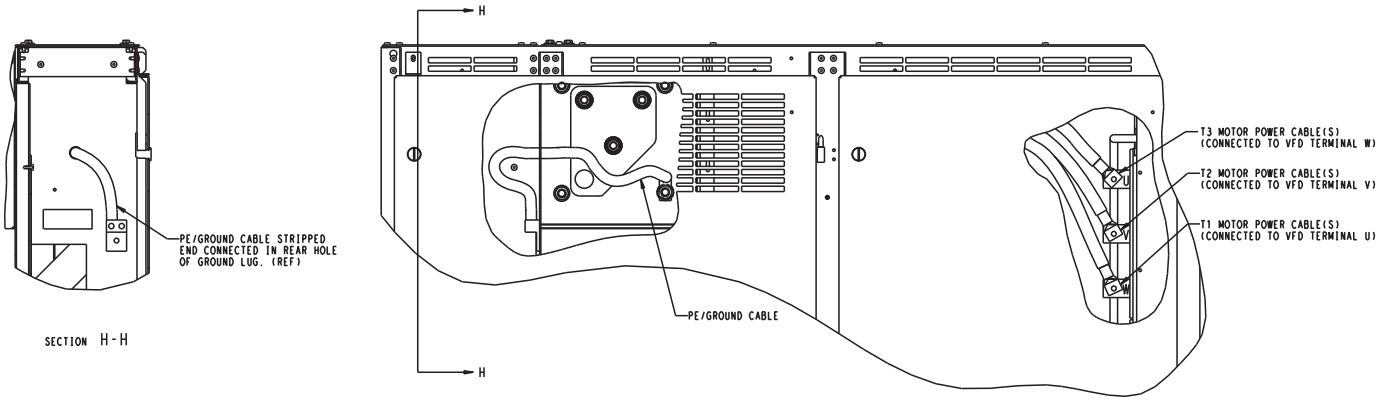
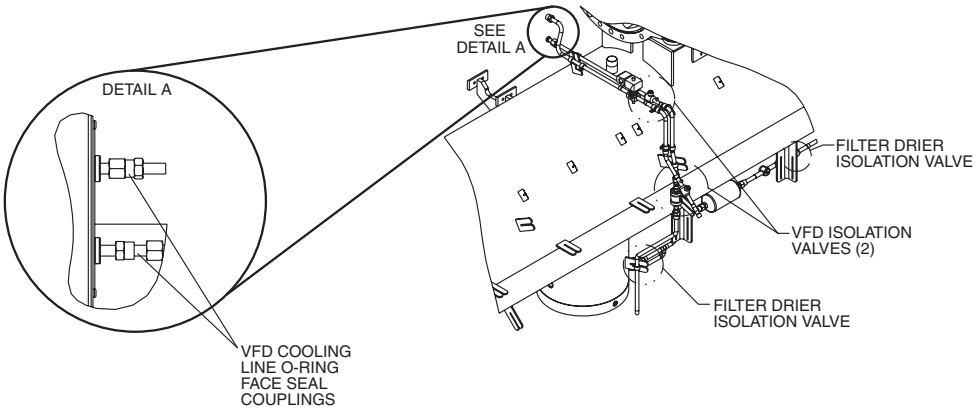



**Fig. 38 — Motor Ground Cable**




NOTE: Does not apply to VFD supplied with units with P compressors.

**Fig. 39 — VFD Refrigerant Connectors**

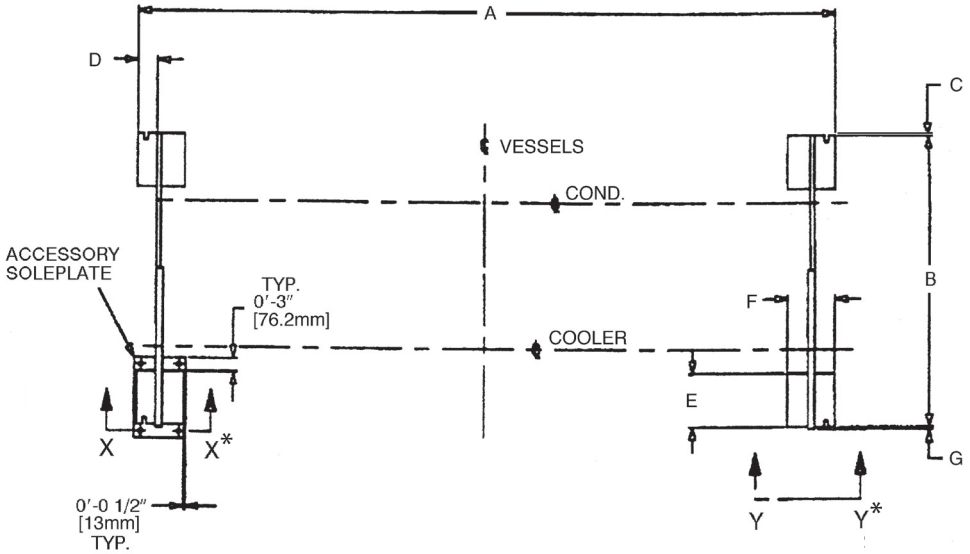
## Step 5 — Install Machine Supports

IMPORTANT: Chiller housekeeping pad, anchor bolts and attachment points to be designed by others in accordance with all applicable national and local codes.

INSTALL STANDARD ISOLATION

Figures 40-43 show the position of support plates and shear flex pads, which together form the standard machine support system.

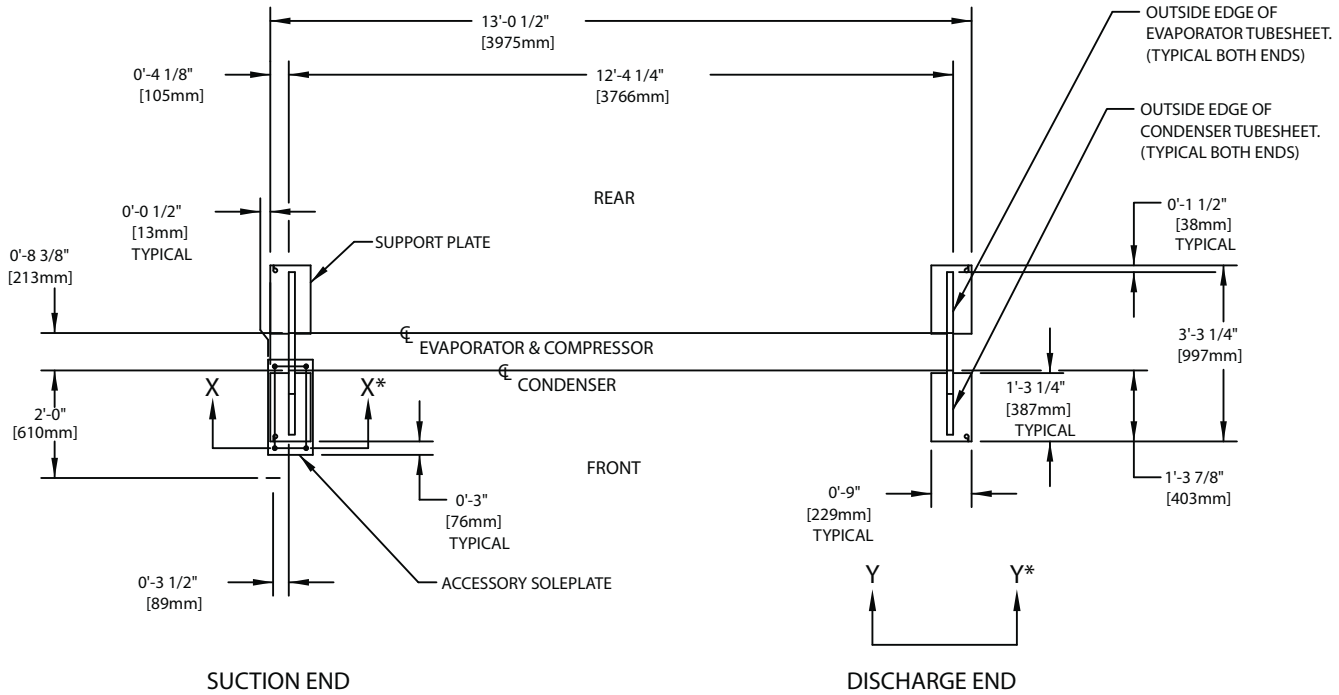
Service clearance under the chiller can be enhanced if the grout is not extended along the entire length of the heat exchangers.




*See Fig. 43 or 44.

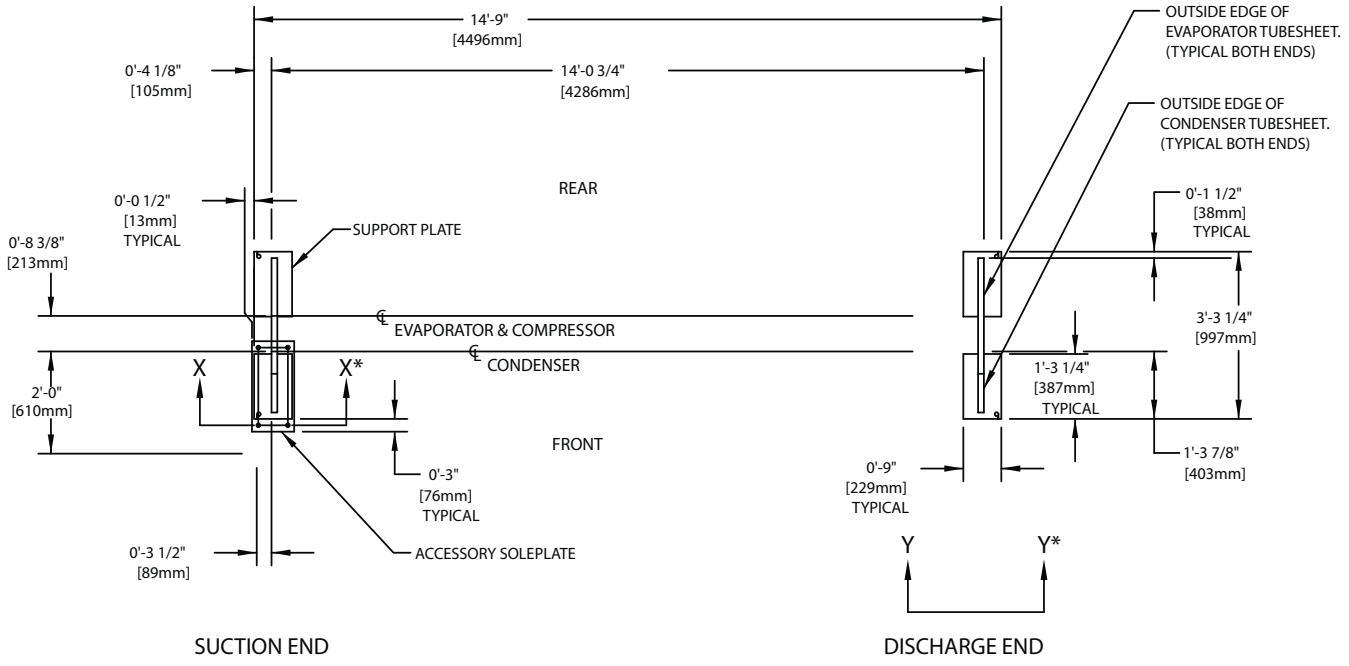
| 23XRV HEAT EXCHANGER SIZE | DIMENSIONS (ft-in.) | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G |
| **30-32** | 12-10-3/4 | 5-5-1/4 | 0 | 0-3-5/8 | 1-3-1/4 | 0-9 | 0-1/2 |
| **35-37** | 14- 7-1/4 | 5-5-1/4 | 0 | 0-3-5/8 | 1-3-1/4 | 0-9 | 0-1/2 |
| **40-42, 4D** | 12-10-3/4 | 6-0 | 0-1-1/2 | 0-3-5/8 | 1-3-1/4 | 0-9 | 0-1/2 |
| **45-47, 4E** | 14- 7-1/4 | 6-0 | 0-1-1/2 | 0-3-5/8 | 1-3-1/4 | 0-9 | 0-1/2 |
| **50-52** | 12-10-3/4 | 6-5-1/2 | 0-1/2 | 0-3-5/8 | 1-3-1/4 | 0-9 | 0-1/2 |
| **55-57** | 14- 7-1/4 | 6-5-1/2 | 0-1/2 | 0-3-5/8 | 1-3-1/4 | 0-9 | 0-1/2 |

**Fig. 40 — 23XRV30-57 Machine Footprint**



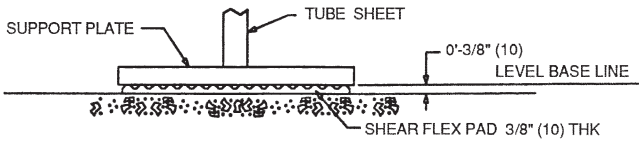

*See Fig. 43 or 44.

**Fig. 41 — 23XRV Frame Size A Machine Footprint**




*See Fig. 43 or 44.

**Fig. 42 — 23XRV Frame Size B Machine Footprint**




**VIEW Y-Y**

NOTES:
1. Dimensions in ( ) are in millimeters.
2. Isolation package includes 4 shear flex pads.

**Fig. 43 — Standard Isolation**

INSTALL ACCESSORY ISOLATION (IF REQUIRED)

Uneven floors or other considerations may dictate the use of accessory soleplates (supplied by Carrier for field installation) and leveling pads. Refer to Fig. 44.

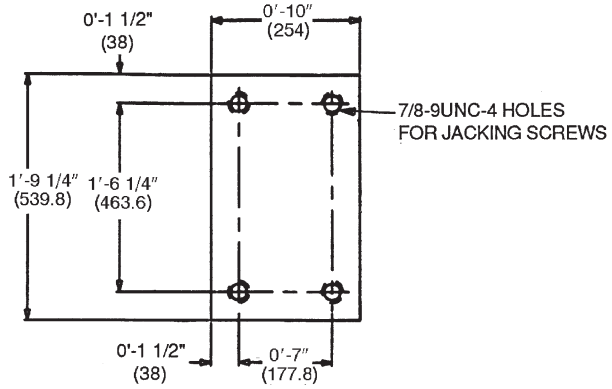
Level machine by using jacking screws in isolation soleplates. Use a level at least 24 in. (610 mm) long.

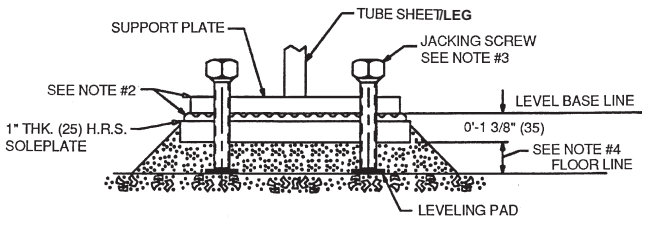
IMPORTANT: Chiller support plates must be level within 1/2 in. from one end to the other end of the heat exchangers for effective oil reclaim system operation.

For adequate and long lasting machine support, proper grout selection and placement is essential. Carrier recommends that only pre-mixed, epoxy type, non-shrinking grout be used for machine installation. Follow manufacturer's instructions in applying grout.

1. Check machine location prints for required grout thickness.
2. Carefully wax jacking screws for easy removal from grout.
3. Grout must extend above the base of the soleplate and there must be no voids in grout beneath the plates.
4. Allow grout to set and harden, per manufacturer's instructions, before starting machine.
5. Remove jacking screws from leveling pads after grout has hardened.

**ACCESSORY SOLEPLATE DETAIL**




VIEW X-X

LEGEND

**HRS** — Hot Rolled Steel

NOTES:
1. Dimensions in ( ) are in millimeters.
2. Accessory (Carrier supplied, field installed) soleplate package includes 4 soleplates, 16 jacking screws and leveling pads.
3. Jacking screws to be removed after grout has set.
4. Thickness of grout will vary, depending on the amount necessary to level chiller. Use only pre-mixed non-shrinking grout, Ceilcote 748 OR Chemrex Embeco 636 Plus Grout 0′-1-1/2″ (38.1) to 0′-2-1/4″ (57) thick.

**Fig. 44 — Accessory Isolation**

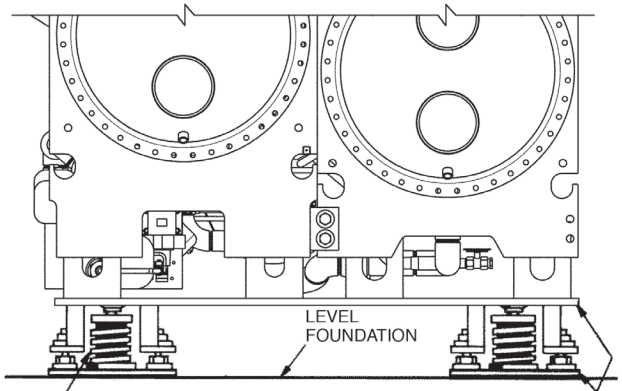
INSTALL SPRING ISOLATION

IMPORTANT: Accessory spring isolation packages are intended solely for non-seismic applications. Seismic applications must be designed by a registered professional in accordance with all applicable national and local codes.

Spring isolation may be purchased as an accessory from Carrier for field installation. It may also be field supplied and installed. Spring isolators may be placed directly under machine support plates or located under machine soleplates. See Fig. 45. Consult job data for specific arrangement. Low profile spring isolation assemblies can be field supplied to keep the machine at a convenient working height.

Obtain specific details on spring mounting and machine weight distribution from job data. Also, check job data for methods to support and isolate pipes that are attached to spring isolated machines.

NOTE: These isolators are not intended for seismic duty, but are intended to reduce the vibration and noise levels transmitted from the chiller to the surrounding environment. For installations adjacent to areas that are sensitive to noise and/or vibration, use the services of a qualified consulting engineer or acoustics expert to determine whether these springs will provide adequate noise/vibration suppression.




NOTE: The accessory spring isolators are supplied by Carrier for installation in the field.

**Fig. 45 — 23XRV Accessory Spring Isolation (Shown with Accessory Soleplates)**

## Step 6 — Connect Piping

IMPORTANT: Chiller water nozzle connections to be designed by others in accordance with all applicable national and local codes.

**⚠ CAUTION**

Remove cooler and condenser liquid temperature and optional pressure sensors before welding connecting piping to water nozzles. Refer to Fig. 6-8. Replace sensors after welding is complete.

INSTALL WATER PIPING TO HEAT EXCHANGERS

Refer to Table 7 for nozzle sizes. Install piping using job data, piping drawings, and procedures outlined below. A typical piping installation is shown in Fig. 46.

**⚠ CAUTION**

Factory-supplied insulation is not flammable but can be damaged by welding sparks and open flame. Protect insulation with a wet canvas cover.

1. Offset pipe flanges to permit removal of waterbox cover for maintenance and to provide clearance for pipe cleaning. No flanges are necessary with marine waterbox option; however, water piping should not cross in front of the waterbox cover or access will be blocked.
2. Provide openings in water piping for required pressure gauges and thermometers. For thorough mixing and temperature stabilization, wells in the leaving water pipe should extend inside pipe at least 2 in. (51 mm).
3. Install air vents at all high points in piping to remove air and prevent water hammer.
4. Install pipe hangers where needed. Make sure no weight or stress is placed on waterbox nozzles or flanges.
5. Water flow direction must be as specified in Fig. 47-49.

   NOTE: Entering water is always the lower of the 2 nozzles. Leaving water is always the upper nozzle for cooler or condenser.
6. Install waterbox vent and drain piping in accordance with individual job data. All connections are 3/4-in. FPT.
7. Install waterbox drain plugs in the unused waterbox drains and vent openings.
8. Install optional pumpout system or pumpout system and storage tank as shown in Fig. 50-54.
9. Isolation valves are recommended on the cooler and condenser piping to each chiller for service.
10. Apply appropriate torque on the retaining bolts in a crisscross pattern for the waterbox covers before insulating the waterbox cover. The gasket can relax during transportation and storage, and the waterbox cover requires retightening of the bolts.

**⚠ CAUTION**

Never charge liquid R-134a refrigerant into the chiller if the pressure is less than 35 psig (241 kPa). Charge as a gas only, with the cooler and condenser pumps running, until 35 psig (241 kPa) is reached using the pumpdown mode on the ICVC. Terminate the pumpdown mode using the ICVC. Flashing of liquid refrigerant at low pressures can cause tube freeze-up and considerable damage.

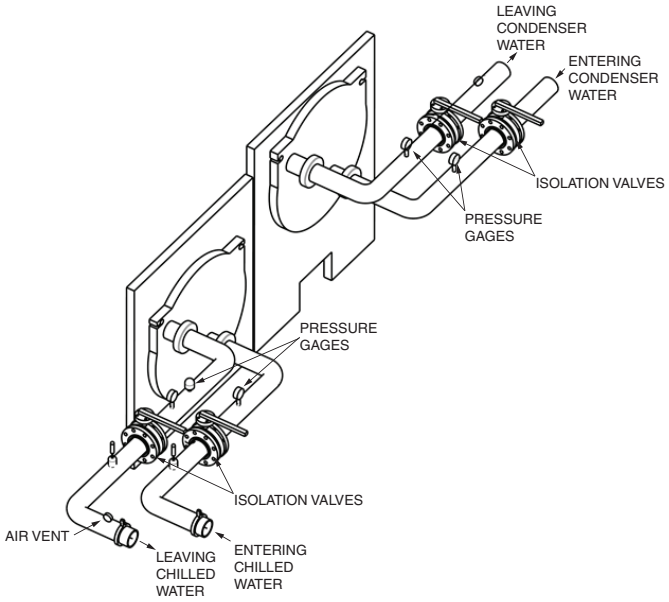
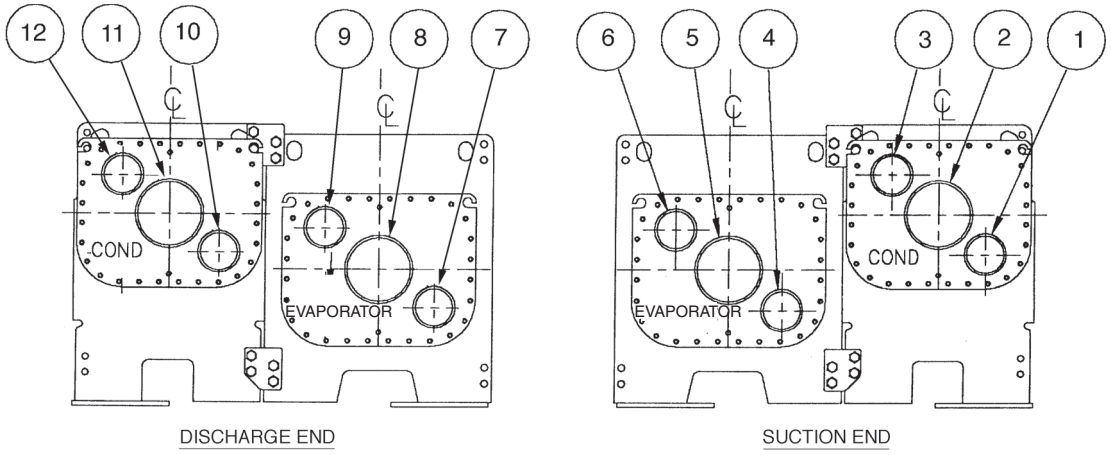
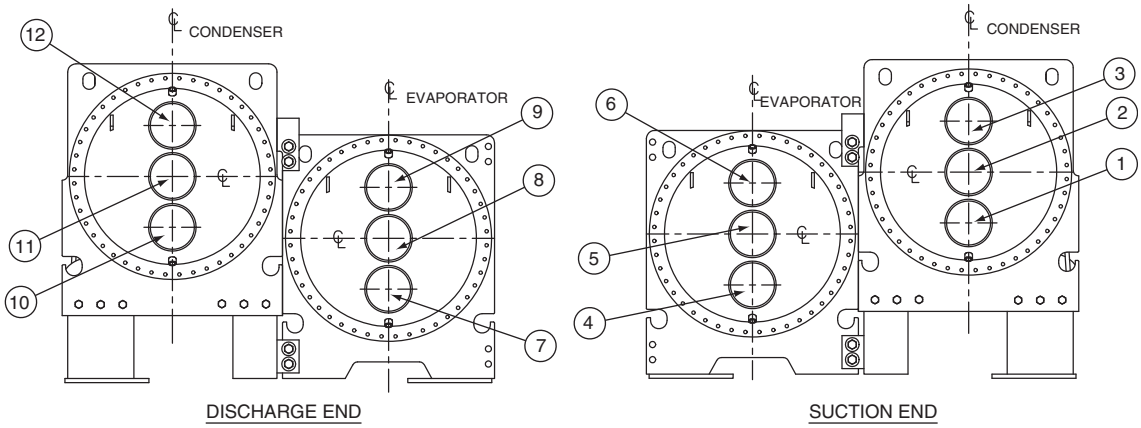



**Fig. 46 — Typical Nozzle Piping**

**NOZZLE-IN HEAD WATERBOXES**



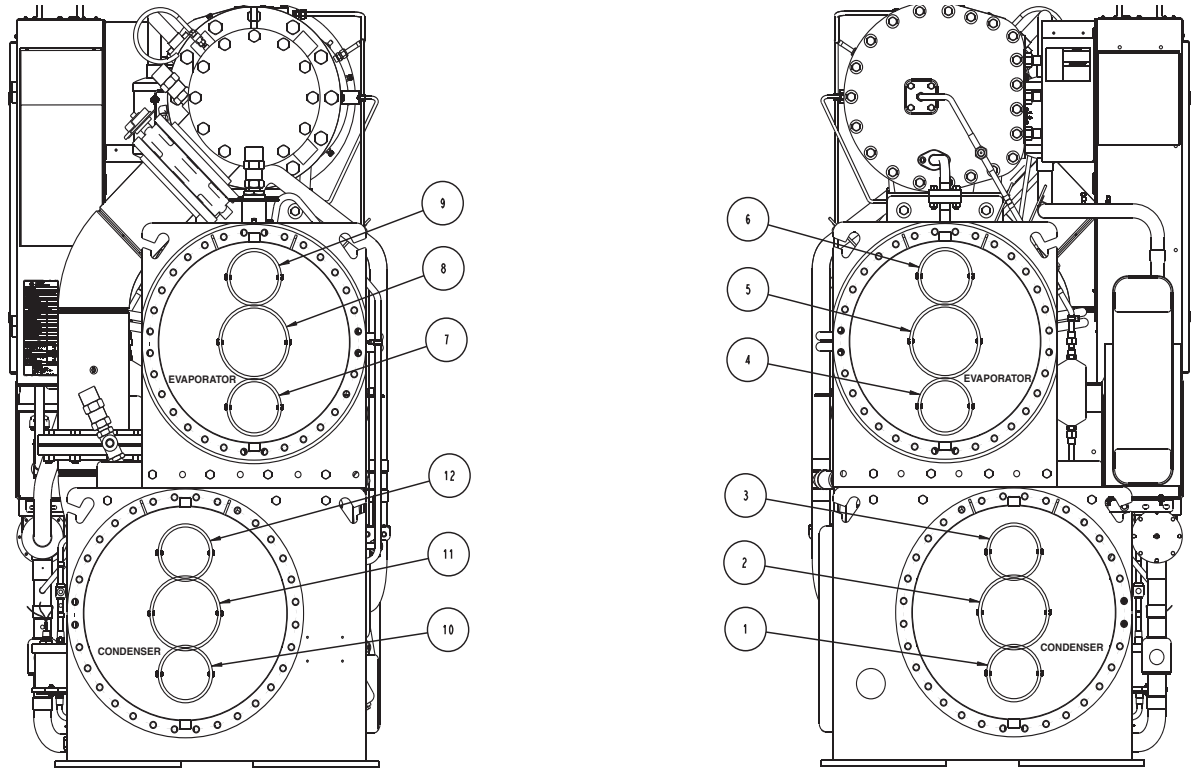

**FRAME 3**




**FRAMES 4 AND 5**

NOTE: See next page for nozzle arrangement codes.

**Fig. 47 — Piping Flow Data (NIH, Frames 3 Through 5 and A,B)**




DISCHARGE END

SUCTION END

**FRAMES A AND B**

**NOZZLE ARRANGEMENT CODES FOR ALL 23XRV NOZZLE-IN-HEAD WATERBOXES**

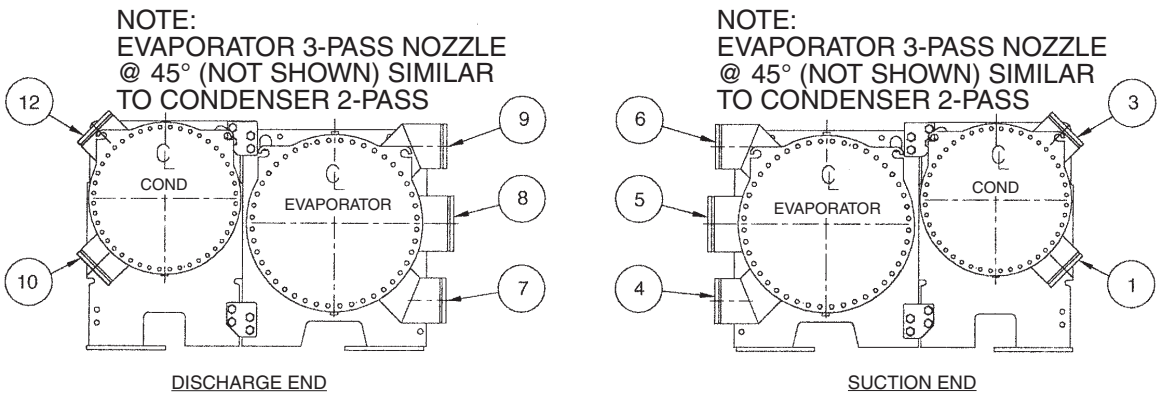
| PASS | COOLER WATERBOXES | | |
|---|---|---|---|
| | IN | OUT | ARRANGEMENT CODE* |
| 1 | 8 | 5 | A |
| | 5 | 8 | B |
| 2 | 7 | 9 | C |
| | 4 | 6 | D |
| 3 | 7 | 6 | E |
| | 4 | 9 | F |

| PASS | CONDENSER WATERBOXES | | |
|---|---|---|---|
| | IN | OUT | ARRANGEMENT CODE* |
| 1 | 11 | 2 | P |
| | 2 | 11 | Q |
| 2 | 10 | 12 | R |
| | 1 | 3 | S |
| 3 | 10 | 3 | T |
| | 1 | 12 | U |

*Refer to certified drawings.

**Fig. 47 — Piping Flow Data (NIH, Frames 3 Through 5 and A,B) (cont)**

**MARINE WATERBOXES**

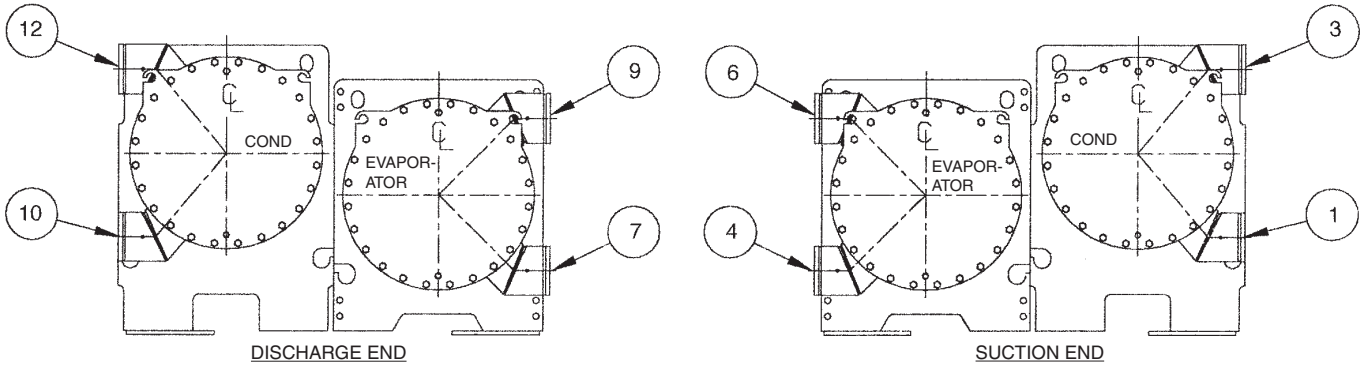



**FRAME 3**

**NOZZLE ARRANGEMENT CODES**

| PASS | COOLER WATERBOXES | | | CONDENSER WATERBOXES | | |
|---|---|---|---|---|---|---|
| | IN | OUT | ARRANGEMENT CODE | IN | OUT | ARRANGEMENT CODE |
| 1 | 8 | 5 | A | — | — | — |
| | 5 | 8 | B | — | — | — |
| 2 | 7 | 9 | C | 10 | 12 | R |
| | 4 | 6 | D | 1 | 3 | S |
| 3 | 7 | 6 | E | — | — | — |
| | 4 | 9 | F | — | — | — |

**MARINE WATERBOXES**



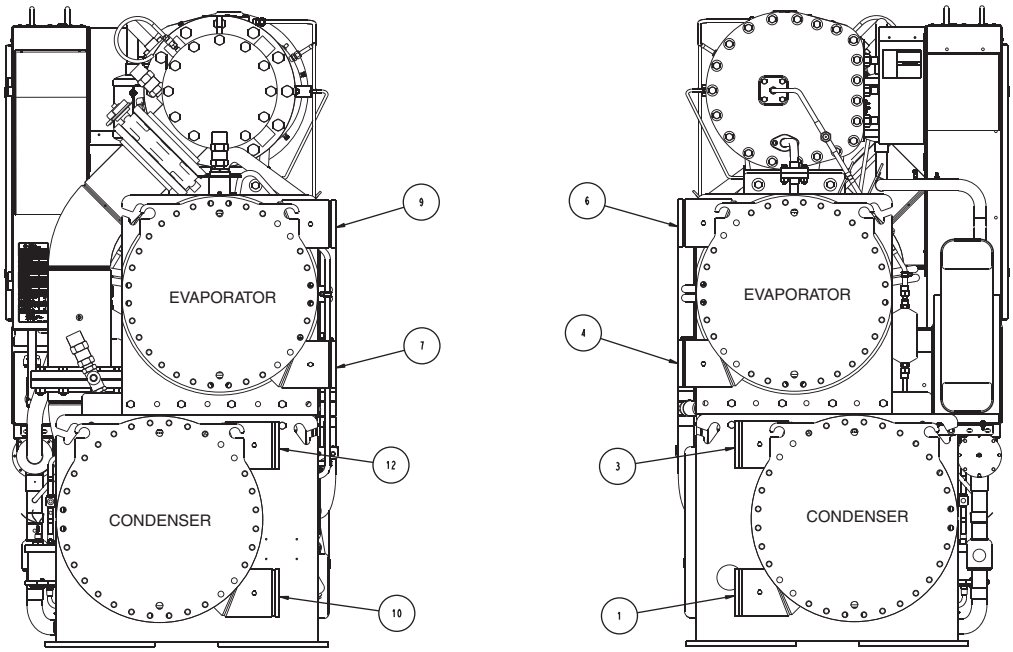

**FRAMES 4 AND 5**

**NOZZLE ARRANGEMENT CODES**

| PASS | COOLER WATERBOXES | | | CONDENSER WATERBOXES | | |
|---|---|---|---|---|---|---|
| | IN | OUT | ARRANGEMENT CODE | IN | OUT | ARRANGEMENT CODE |
| 1 | 9 | 6 | A | — | — | — |
| | 6 | 9 | B | — | — | — |
| 2 | 7 | 9 | C | 10 | 12 | R |
| | 4 | 6 | D | 1 | 3 | S |
| 3 | 7 | 6 | E | — | — | — |
| | 4 | 9 | F | — | — | — |

**Fig. 48 — Piping Flow Data (Marine Waterboxes, Frames 3 Through 5)**

**MARINE WATERBOXES**



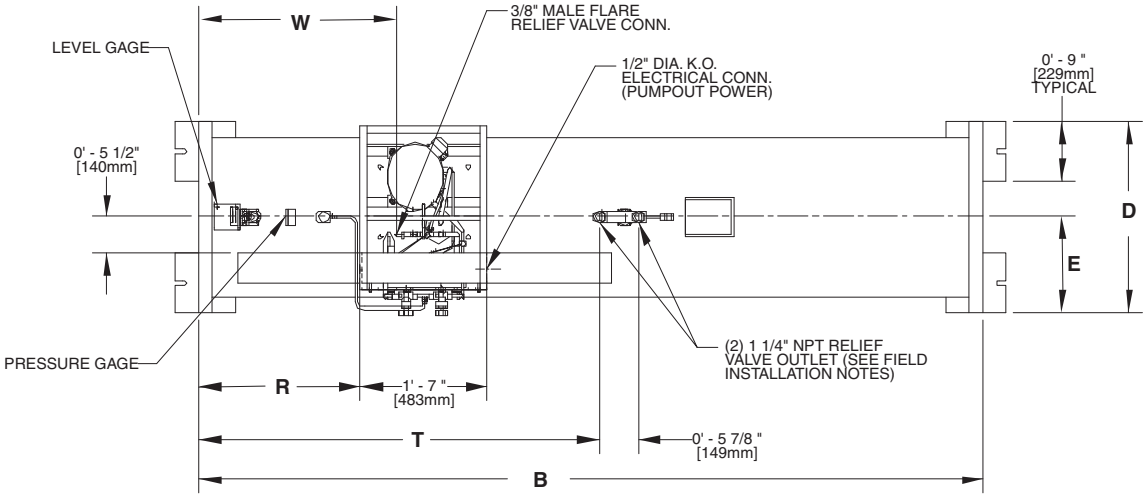

**FRAMES A AND B**

**NOZZLE ARRANGEMENT CODES**

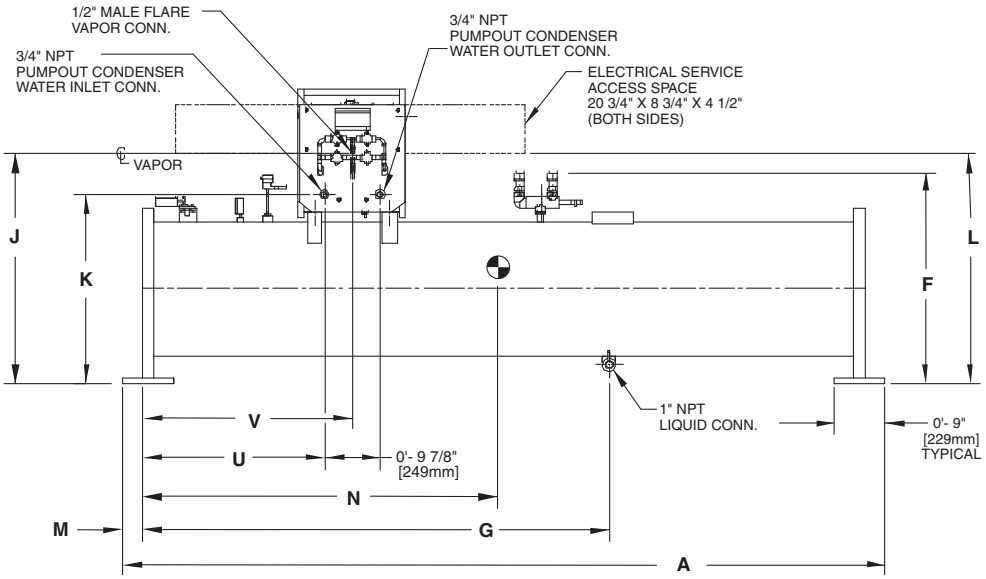
| PASS | COOLER WATERBOXES | | |
|---|---|---|---|
| | IN | OUT | ARRANGEMENT CODE |
| 1 | 9 | 6 | A |
| | 6 | 9 | B |
| 2 | 7 | 9 | C |
| | 4 | 6 | D |
| 3 | 7 | 6 | E |
| | 4 | 9 | F |

| PASS | CONDENSER WATERBOXES | | |
|---|---|---|---|
| | IN | OUT | ARRANGEMENT CODE |
| 1 | — | — | — |
| | — | — | — |
| 2 | 10 | 12 | R |
| | 1 | 3 | S |
| 3 | — | — | — |
| | — | — | — |

**Fig. 49 — Piping Flow Data (Marine Waterboxes, Frames A and B)**



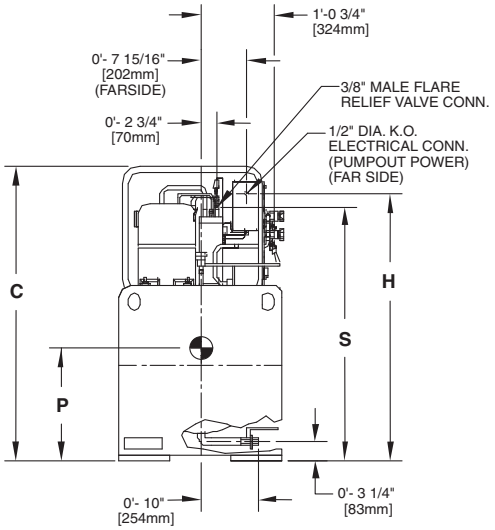

**TOP VIEW**




**FRONT VIEW**

NOTES:

1. Denotes center of gravity.
2. Dimensions in [ ] are in millimeters.
3. The weights and center of gravity values given are for an empty storage tank.
4. For additional information on the pumpout unit, see certified drawings.
5. Conduit knockout is located on the side of the control box.
6. 28 cubic ft storage tank weight: 2334 lb (1059 kg).
7. 52 cu ft storage tank weight: 3414 lb (1549 kg).




**LEFT SIDE VIEW**

**DIMENSIONS**

ENGLISH (ft-in.)

| TANK SIZE | A | B | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 0428 | 10- 5 | 9-10 | 4-4 1/4 | 2-4 3/4 | 1-2 3/8 | 3-1 1/4 | 6-4 3/16 | 3-11 3/8 | 3-4 7/8 | 2-9 9/16 |
| 0452 | 14-11 1/4 | 14- 4 1/2 | 4-8 1/4 | 2-8 1/2 | 1-4 1/4 | 3-4 1/2 | 7-2 1/4 | 4- 3 1/4 | 3-8 3/4 | 3-1 7/16 |

| TANK SIZE | L | M | N | P | R | S | T | U | V | W |
|---|---|---|---|---|---|---|---|---|---|---|
| 0428 | 3-4 5/8 | 0-3 1/2 | 4- 9 1/2 | 1-7 7/8 | 2-0 3/8 | 3-9 | 5-0 1/4 | 2-5 | 2-9 7/8 | 2-5 3/4 |
| 0452 | 3-8 1/2 | 0-3 3/8 | 6-11 5/8 | 1-8 3/4 | 2-0 5/8 | 4-1 | 5-0 1/2 | 2-5 1/4 | 2-10 1/8 | 2-6 |

SI (mm)

| TANK SIZE | A | B | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| 0428 | 3175 | 2997 | 1327 | 730 | 365 | 946 | 1935 | 1203 | 1038 | 852 |
| 0452 | 4553 | 4381 | 1429 | 826 | 413 | 1029 | 2191 | 1302 | 1137 | 951 |

| TANK SIZE | L | M | N | P | R | S | T | U | V | W |
|---|---|---|---|---|---|---|---|---|---|---|
| 0428 | 1032 | 89 | 1451 | 505 | 619 | 1143 | 1530 | 737 | 860 | 756 |
| 0452 | 1130 | 86 | 2124 | 527 | 625 | 1225 | 1537 | 742 | 867 | 762 |

**Fig. 50 — Optional Pumpout Unit and Storage Tank**

## RATED DRY WEIGHT AND REFRIGERANT CAPACITY

| TANK SIZE | TANK OD | | DRY WEIGHT* | | R-134a MAXIMUM REFRIGERANT CAPACITY (ANSI/ASHRAE 15) | | R-134a MAXIMUM REFRIGERANT CAPACITY (UL 1963) | |
|---|---|---|---|---|---|---|---|---|
| | in. | mm | lb | kg | lb | kg | lb | kg |
| **0428** | 24.00 | 610 | 2334 | 1059 | 1860 | 844 | 1716 | 778 |
| **0452** | 27.25 | 692 | 3414 | 1549 | 3563 | 1616 | 3286 | 1491 |

LEGEND

**ANSI** — American National Standard Institute
**ASHRAE** — American Society of Heating, Refrigerating, and Air-Conditioning Engineers
**OD** — Outside Diameter
**UL** — Underwriters Laboratories

*The above dry weight includes the pumpout condensing unit weight of 164 lb (75 kg).

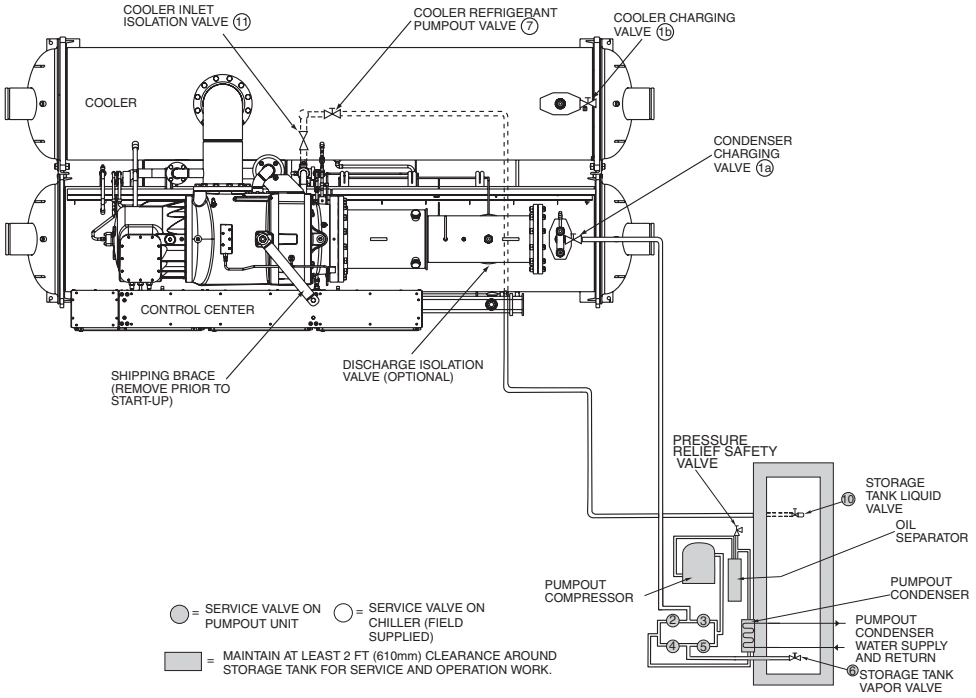



**Fig. 51 — Optional Pumpout System Piping Schematic with Storage Tank — Configured to Push Liquid Into Storage Tank (Unit with R Compressor Shown)**

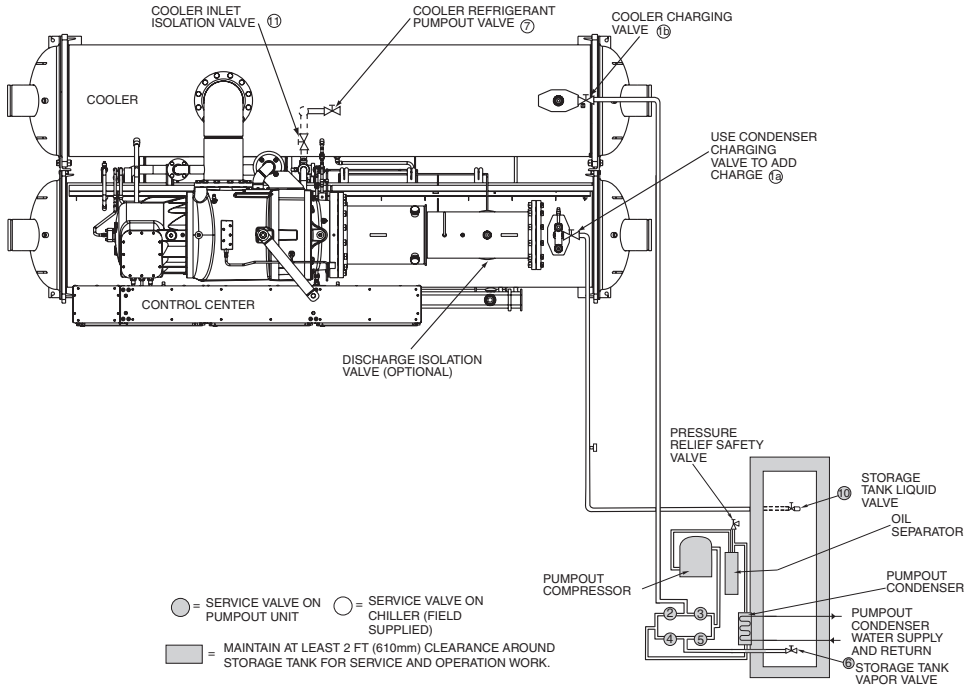



**Fig. 52 — Optional Pumpout System Piping Schematic with Storage Tank — Configured to Pull Vapor Out of Chiller or to Charge Chiller from Storage Tank (Unit with R Compressor Shown)**

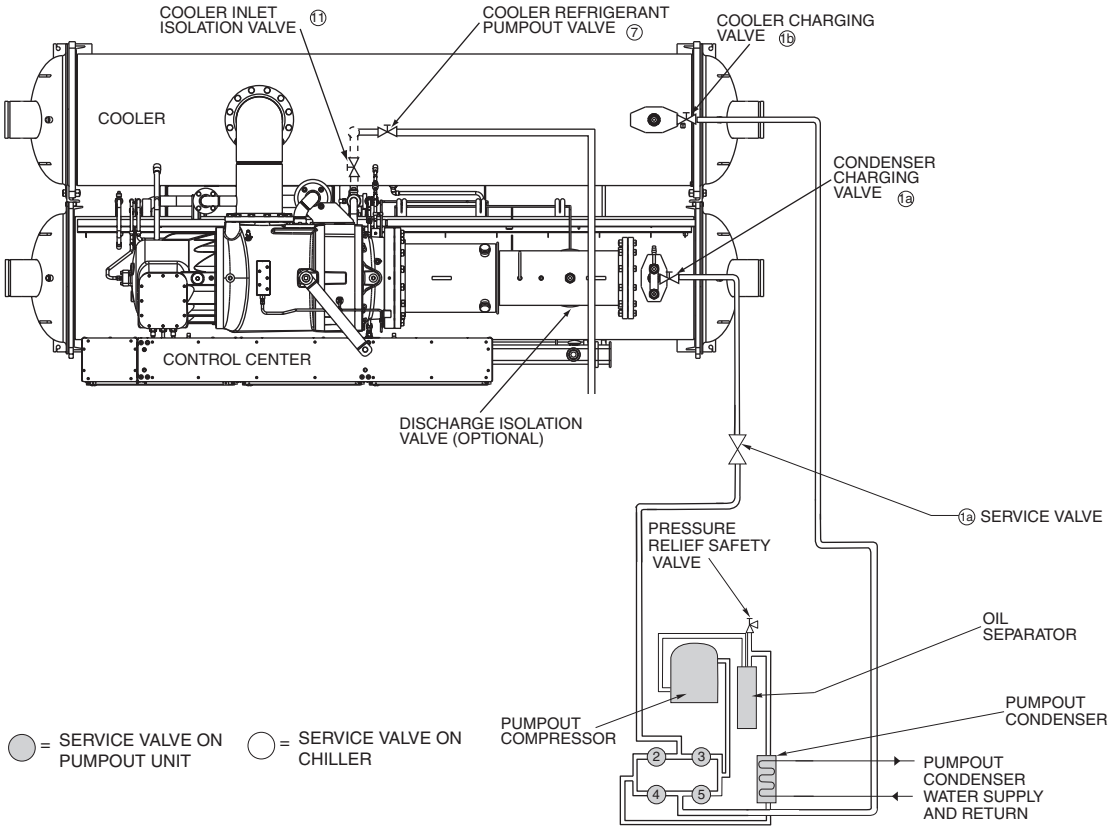



**Fig. 53 — Optional Pumpout System Piping Schematic without Storage Tank — Configured to Store Refrigerant in Cooler or Condenser (Unit with R Compressor Shown)**

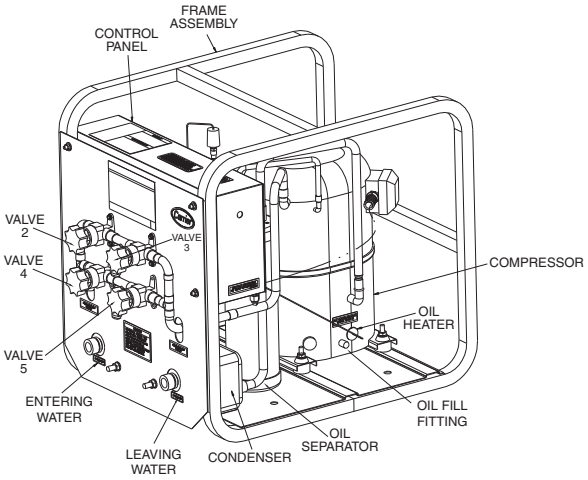



**Fig. 54 — Pumpout Unit**

INSTALL VENT PIPING TO RELIEF VALVES

The 23XRV chiller is factory equipped with relief valves on the cooler and condenser shells. Refer to Fig. 55 and Table 21 for size and location of relief devices. Vent relief devices to the outdoors in accordance with ANSI/ASHRAE 15 (latest edition) Safety Code for Mechanical Refrigeration and all other applicable codes.

**⚠ DANGER**

EXPLOSION HAZARD

Failure to follow the safety warnings exactly could result in serious injury, death, or property damage.

Pressure relief device sizing is based on the assumption that there are no combustible materials within 20 ft (7.7 m) of the pressure vessels.

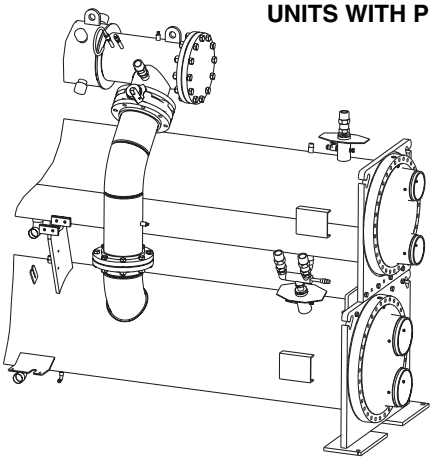
**⚠ DANGER**

Refrigerant discharged into confined spaces can displace oxygen and cause asphyxiation.

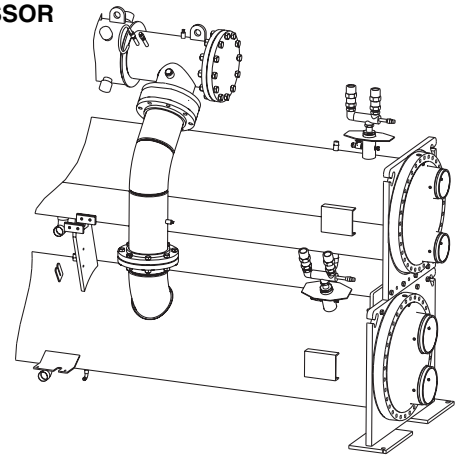
1. Dual pressure relief valves are mounted on the 3-way valves in some locations to allow testing and repair without transferring the refrigerant charge. Three-way valve shafts should be turned either fully clockwise or fully counterclockwise so only one relief valve is exposed to refrigerant pressure at a time.

   The flow area of discharge piping routed from more than one relief valve, or more than one heat exchanger, must be greater than the sum of the outlet areas of all relief valves that are expected to discharge simultaneously. All relief valves within a machinery room that are exposed to refrigerant may discharge simultaneously in the event of a fire. Discharge piping should lead to the point of final release as directly as possible with consideration of pressure drop in all sections downstream of the relief valves.
2. Provide a pipe plug near outlet side of each relief device for leak testing. Provide pipe fittings that allow vent piping to be disconnected periodically for inspection of valve mechanism.
3. Piping to relief devices must not apply stress to the device. Adequately support piping. A length of flexible tubing or piping near the relief device is essential on spring-isolated machines.
4. Cover the outdoor vent with a rain cap and place a condensation drain at the low point in the vent piping to prevent water build-up on the atmospheric side of the relief device.

**UNITS WITH P COMPRESSOR**

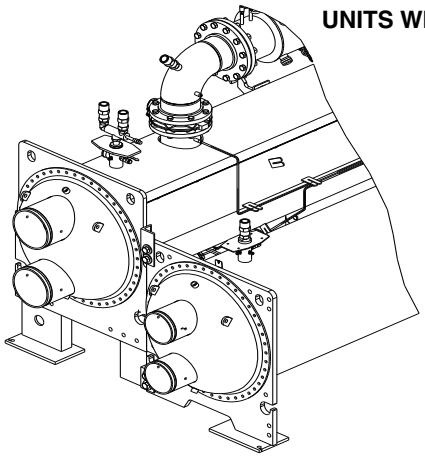


**WITH OPTIONAL ISOLATION**

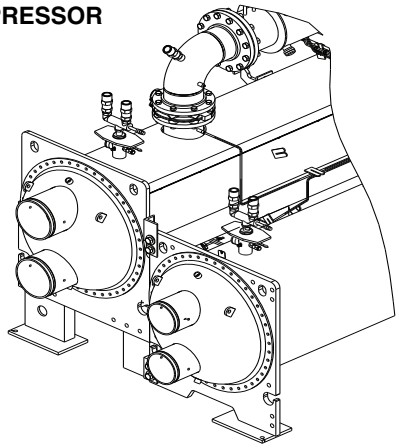


**WITHOUT OPTIONAL ISOLATION**

**UNITS WITH Q COMPRESSOR**

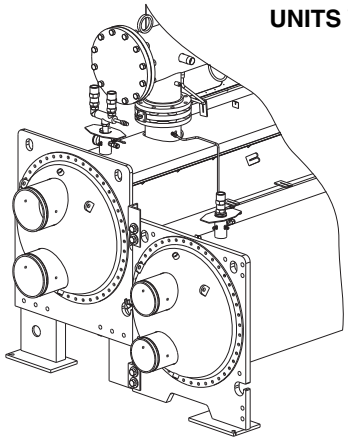


**WITH OPTIONAL ISOLATION**

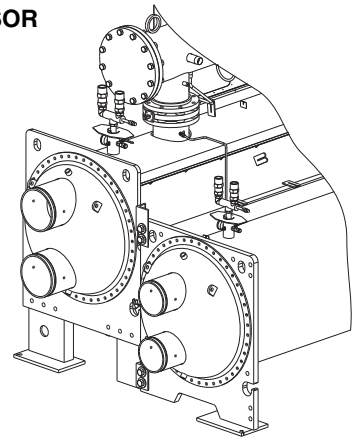


**WITHOUT OPTIONAL ISOLATION**

**UNITS WITH R COMPRESSOR**



**WITH OPTIONAL ISOLATION**



**WITHOUT OPTIONAL ISOLATION**

**Fig. 55 — Relief Valve Arrangements**

**Table 21 — Relief Valve Locations**

| LOCATION | FRAME SIZE | RELIEF VALVE OUTLET SIZE | QUANTITY WITHOUT ISOLATION VALVES | QUANTITY WITH ISOLATION VALVES |
|---|---|---|---|---|
| **Discharge Pipe Assembly** | 3-5 | 1-1/4-in. NPT FEMALE CONNECTOR | 1 | 1 |
| | A,B | 1-1/4-in. NPT FEMALE CONNECTOR | N/A | 1 |
| **Cooler** | 3-5, A,B | 1-1/4-in. NPT FEMALE CONNECTOR | 2 | 1 |
| **Condenser** | 3-5, A,B | 1-1/4-in. NPT FEMALE CONNECTOR | 2 | 2 |
| **Optional Storage Tank** | N/A | 1-1/4-in. NPT FEMALE CONNECTOR | 2 | 2 |

NOTE: All valves relieve at 185 psig (1275 kPa).

## Step 7 — Make Electrical Connections

Field wiring must be installed in accordance with job wiring diagrams and all applicable electrical codes. Refer to Fig. 56-57 for typical wiring and component layout.

**⚠ DANGER**

Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

**⚠ WARNING**

DC bus capacitors in the VFD retain hazardous voltages after input power has been disconnected. After disconnecting input power, wait 5 minutes for the DC bus capacitors to discharge then check both the VFD DPI communications interface board status LEDs and the VFD with a voltmeter to ensure the DC bus capacitors are discharged before touching any internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

**⚠ DANGER**

The drive can operate at and maintain zero speed. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audible or visual alarms, or other devices to indicate that the drive is operating or may operate at or near zero speed. Failure to observe this precaution could result in severe bodily injury or loss of life.

**⚠ DANGER**

Do not install modification kits with power applied to the drive. Disconnect and lockout incoming power before attempting such installation or removal. Failure to observe this precaution could result in severe bodily injury or loss of life.

**⚠ DANGER**

The drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution could result in bodily injury.

**⚠ CAUTION**

The user is responsible for conforming with all applicable local, national and international codes. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

These instructions are intended for qualified electrical personnel familiar with servicing and installing AC drives. Any questions or problems with the products described in this manual should be directed to your local Carrier Service Office.

Wiring diagrams in this publication are for reference only and are not intended for use during actual installation; follow job specific wiring diagrams.

**⚠ CAUTION**

Do not attempt to start compressor (even for a rotation check) or apply test voltage of any kind while machine is under dehydration vacuum. Motor insulation breakdown and serious damage may result.

**⚠ CAUTION**

Low oil level may result if the oil pump is manually operated for more than a few minutes when the chiller is not running. The oil reclaim system does not return oil to the sump when the compressor is de-energized.

GROUNDING THE CONTROLS/DRIVE ENCLOSURE

Use the following steps to ground the drive.

1. Open the left door of the control center.
2. Run a suitable equipment grounding conductor unbroken from the drive to earth ground. Tighten these grounding connections to the proper torque. See Fig. 10, 11 and 38.
3. Close the door to the control center.

INSTALLING INPUT POWER WIRING

All wiring should be installed in conformance with the applicable local, national, and international codes (e.g., NEC/CEC). Signal wiring, control wiring, and power wiring must be routed in separate conduits to prevent interference with the drive operation. Use grommets, when hubs are not provided, to guard against wire chafing.

Use the following steps to connect AC input power to the main input circuit breaker:

1. Turn off, lock out, and tag the input power to the drive.
2. Remove the input power wiring panel above the VFD circuit breaker and drill the number of openings for the AC input leads (refer to Fig. 10 and 11). Mount all conduit hardware on the input power wiring panel before re-installing the input power wiring panel on the VFD enclosure. Take care that metal chips and hardware do not enter the enclosure.
3. Wire the AC input leads by routing them through the openings in the input power wiring panel.

**⚠ CAUTION**

Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with control and drive operation. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

4. Connect the 3-phase AC input power leads (per job specifications) to the appropriate input terminals of the circuit breaker. See Fig. 10 and 11.
5. Tighten the AC input power terminals and lugs to the proper torque as specified on the input circuit breaker.

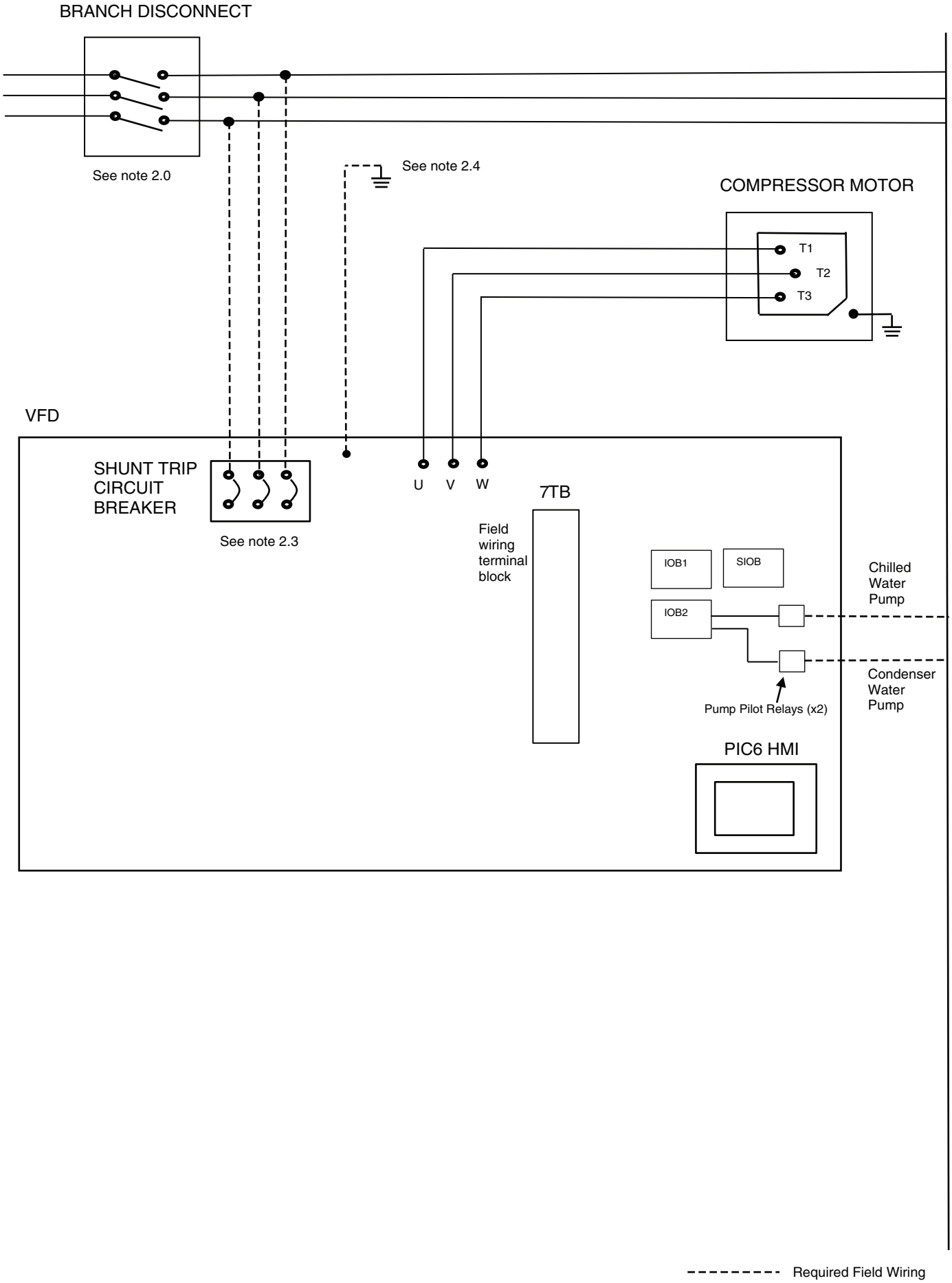



**Fig. 56 — Typical Field Wiring Schematic**

# NOTES FOR FIG. 56

GENERAL

1.0 Variable frequency drive (VFD) shall be designed and manufactured in accordance with Carrier engineering requirements.

1.1 All field-supplied conductors, devices and the field-installation wiring, termination of conductors and devices, must be in compliance with all applicable codes and job specifications.

1.2 The routing of field-installed conduit and conductors and the location of field-installed devices, must not interfere with equipment access or the reading, adjusting or servicing of any component.

1.3 Equipment installation and all starting and control devices must comply with details in equipment submittal drawings and literature.

1.4 Contacts and switches are shown in the position they would assume with the circuit de-energized and the chiller shutdown.

**⚠ CAUTION**

Do not use aluminum conductors. Contractor/installer assumes all liability resulting from the use of aluminum conductors within the VFD enclosure.

POWER WIRING TO VFD

2.0 Provide a means of disconnecting branch feeder power to VFD. Provide short circuit protection and interrupt capacity for branch feeder in compliance with all applicable codes.

2.1 If metal conduit is used for the power wires, the last 4 feet or greater should be flexible to avoid transmitting unit vibration into the power lines and to aid in serviceability.

2.2 Line side power conductor rating must meet VFD nameplate voltage and chiller minimum circuit ampacity.

2.3 Lug adapters may be required if installation conditions dictate that conductors be sized beyond the minimum ampacity required. Circuit breaker lugs will accommodate the quantity (#) and size cables (per phase) as follows:

**LF2 LUG SIZES**

| VFD MAX INPUT AMPS | STANDARD 65K AIC LUG CAPACITY (PER PHASE) | | OPTIONAL 100K AIC LUG CAPACITY (PER PHASE) | |
|---|---|---|---|---|
| | NO. OF CONDUCTORS | CONDUCTOR RANGE | NO. OF CONDUCTORS | CONDUCTOR RANGE |
| **225A** | 3 | 2/0 — 400MCM | 3 | 2/0 — 400MCM |
| **338A** | 3 | 2/0 — 400MCM | 3 | 2/0 — 400MCM |
| **440A** | 3 | 2/0 — 400MCM | 3 | 2/0 — 400MCM |
| **520A** | 3 | 2/0 — 400MCM | 3 | 2/0 — 400MCM |
| **608A** | 3 | 2/0 — 400MCM | 3 | 2/0 — 400MCM |

| VOLTAGE | CARRIER VFD MAX INPUT AMPS | STANDARD | | ALTERNATE | |
|---|---|---|---|---|---|
| | | ABB LUG | LUG CABLE RANGE | ABB LUG | LUG CABLE RANGE |
| **480** | 230 | KT5300 | (1) 250 - 500 MCM | KT5400 | (2) 3/0 - 250 MCM |
| | 335 | K6TJ | (3) 2/0 - 400 MCM | K6TH | (2) 250 - 500 MCM |
| | 445 | K6TJ | (3) 2/0 - 400 MCM | K6TH | (2) 250 - 500 MCM |
| **380/400/415** | 230 | KT5400 | (2) 3/0 - 250 MCM | KT5300 | (1) 250 - 500 MCM |
| | 335 | K6TJ | (3) 2/0 - 400 MCM | K6TH | (2) 250 - 500 MCM |
| | 445 | K6TJ | (3) 2/0 - 400 MCM | K6TH | (2) 250 - 500 MCM |
| **600** | 269 | KT5300 | (1) 250 - 500 MCM | KT5400 | (2) 3/0 - 250 MCM |

NOTE: If larger lugs are required, it may be possible to purchase them from the manufacturer of the circuit breaker.

2.4 Compressor motor and controls must be grounded by using equipment grounding lug provided inside unit mounted VFD enclosure.

CONTROL WIRING

3.0 Field-supplied control conductors to be at least 18 AWG (American Wire Gauge) or larger.

3.1 Ice build start/terminate device contacts, remote start/stop device contacts and spare safety device contacts, (devices not supplied by Carrier), must have 24 VAC rating. Max current is 60 mA, nominal current is 10 mA. Switches with gold plated bifurcated contacts are recommended.

3.2 Without pilot relays, each integrated contact output can control loads (VA) for tower fan low, tower fan high alert, alarm is rated to a maximum of 1 amp AC RMS at 24 VAC. Chilled and condenser water pumps outputs are supplied with a pilot relay with contact rating 8 amp at 250 VAC.

**⚠ CAUTION**

Control wiring required for Carrier to start pumps and establish flows must be provided to assure machine protection. If primary pump control is by other means, also provide a parallel means for control by Carrier. Failure to do so could result in machine freeze-up or over-pressure and loss of warranty.

Do not use control transformers in the control center as the power source for external or field-supplied contactor coils, actuator motors or any other loads.

3.3 Do not route control wiring carrying 30 V or less within a conduit or tray which has wires carrying 50 V or higher or along side wires carrying 50 V or higher. For field wiring use at least 18 AWG (American Wire Gauge).

## FIELD TERMINALS FOR 7TB, FIG. 56

| | No. | DESCRIPTION | POINT NAME | TYPE | NOTES |
|---|---|---|---|---|---|
| 7TB | 3<br>4 | Spare Safety | SAFETY | 24 VAC | Optional input; open/close (dry contact). Normally closed; when open chiller cannot be started. |
| | 7<br>8 | Auto Demand Limit Input | AUTO_DEM | 4-20 mA | Optional input |
| | 9<br>10 | Remote Contact Input | REM_CON | 24 VAC | Optional input; Open/Close (dry contact); normally open (closed indicate start chiller signal) |
| | 11<br>12 | Emergency Stop Input | E-STOP | 24 VAC | Optional Input; Open/Close (dry contact); normally open (closed indicate emergency stop) |
| | 13<br>14 | Evaporator water flow switch | EVAP_FS | 24 VAC | Optional Input; open/closed switch |
| | 15<br>16 | Condenser water flow switch | COND_FS | 24 VAC | Optional Input; open/closed switch |
| | 17<br>18 | Remote Reset Sensor | R_RESET | 5 kOhm | Optional input |
| | 19<br>20 | Refrigerant Leak Sensor | REF_LEAK | 4-20 mA | Optional; If used set dip switch to On for IOB1 channel 9 |
| | 21<br>22 | Auto Water Temp Reset | AUTO_RES | 4-20 mA | Optional; If used set dip switch to On for IOB1 channel 10 |
| | 24V<br>27 | Chiller Alert Relay | ALE | 24 VAC | Optional Output; Normally open dry contact. Pilot relay required. |
| | 24V<br>29 | Chiller Alarm Relay | ALM | 24 VAC | Optional output; 24 VAC indicates alarm condition. Pilot relay required |
| | 24V<br>31 | Chiller Run Status | RUN_STAT | 24 VAC | Optional Output; Normally open dry contact. Pilot relay required. |
| | 34<br>35 | Head Pressure Output | HDPV_OUT | 4-20 mA | Optional Output |
| | 36<br>37<br>64 | Evap Entering Water Pressure | EVAP_EWP | 5 VDC | Optional Input |
| | 38<br>39<br>65 | Evap Leaving Water Pressure | EVAP_LWP | 5 VDC | Optional Input |
| | 40<br>41<br>66 | Condenser Entering Water Pressure | COND_EWP | 5 VDC | Optional Input |
| | 42<br>43<br>67 | Condenser Leaving Water Pressure | COND_LWP | 5 VDC | Optional Input |
| | 44<br>45 | Evaporator Water Flow Measurement | EVAP_FL | 4-20 mA | Optional Input; If used set dip switch to On for IOB2 channel 9 |
| | 46<br>47 | Condenser Water Flow Measurement | COND_FL | 4-20 mA | Optional Input; If used set dip switch to On for IOB2 channel 9 |
| | 56<br>57 | Head Pressure Output 2 | HDPV_OUT2 | 4-20 mA | Optional Output |
| | 58<br>59 | Common Return Temperature | CR_TEMP (SPARE) | 5 kOhm | Optional input |
| | 60<br>61 | Common Supply Temperature | CS_TEMP (SPARE) | 5 kOhm | Optional input |

NOTE: For PIC6 all field wiring inputs and outputs are to be connected to 7TB or Carrier-provided pilot relays as per Fig 58.

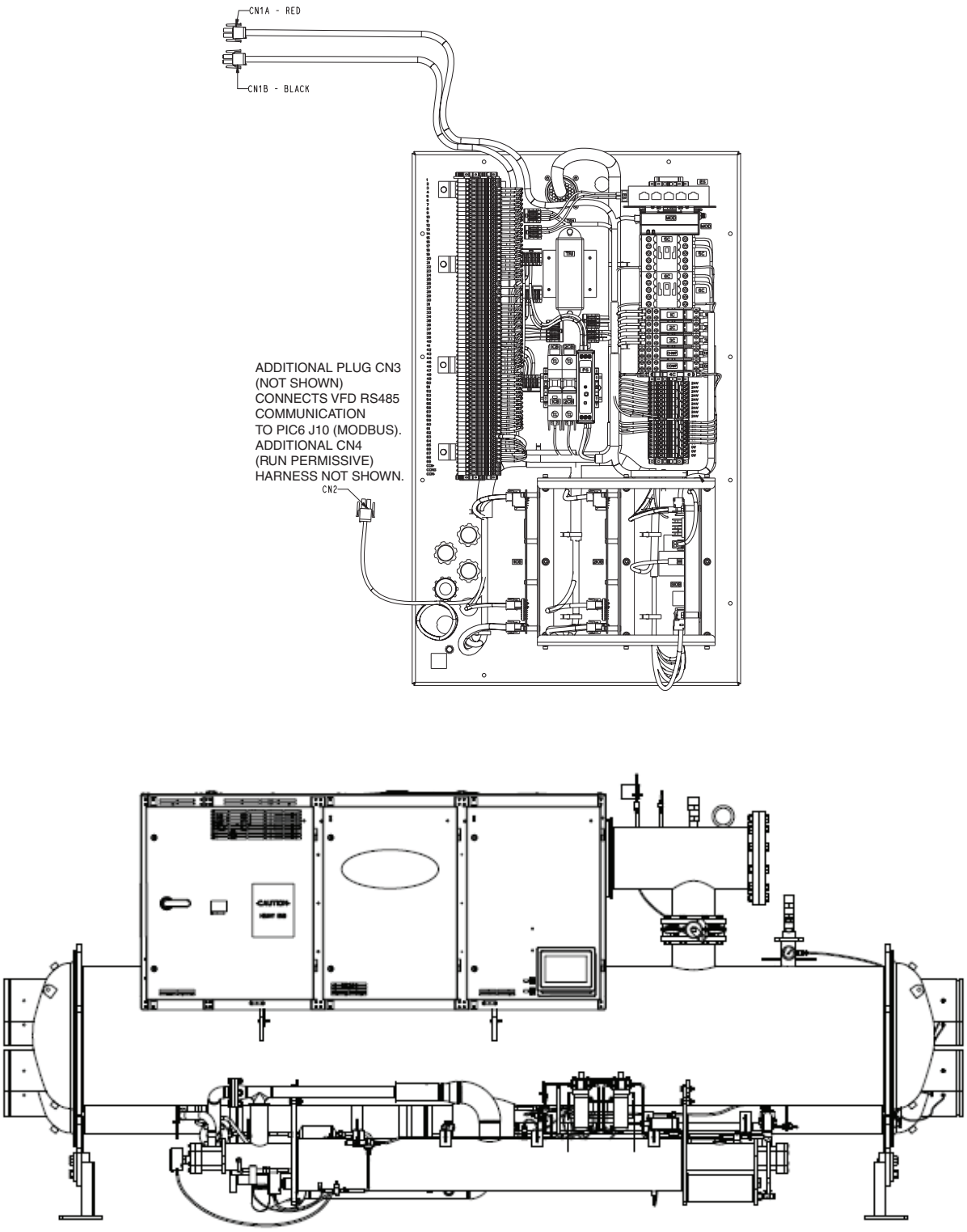



**Fig. 57 — PIC6 Control Component Layout (All Compressor Units)**

WIRING FIELD WIRING TERMINAL STRIPS (7TB)

The 7TB control terminal block is located inside the right most compartment slightly left of the PIC6 HMI. See Fig. 58-61.

NOTE: Up to 30 v may be measured across open contact terminals on the hazardous voltage terminal strip.

1. Turn off, lock out, and tag the input power to the drive. Wait 5 minutes.
2. Verify that there is no voltage at the input terminals (L1, L2, and L3) of the power module.
3. Verify that the status LEDs on the communications interface board are not lit. See Fig. 62. The location of the communications interface board is shown in Fig. 10.
4. Use a screwdriver to remove conduit twist outs in the control panel. Do not punch holes or drill into the top surface of the control center enclosure for field wiring. Knockouts are provided in the back of the control center for field wiring connections.
5. Connect the control wiring as shown in Fig. 57. Tighten all connections to 7 to 9 in.-lb.

CONNECT CONTROL INPUTS

Wiring may be specified for a spare safety switch, and a remote start/stop contact can be wired to the appropriate 7TB Field Wiring terminal. Additional inputs may be specified as well. These are wired to the machine control panel as indicated in Fig. 63.

CONNECT CONTROL OUTPUTS

Connect auxiliary equipment such as chilled and condenser water pumps, and spare alarms as required and indicated on job wiring drawings. Connect as per 7TB Field Terminal Wiring table.

CONNECT STARTER

The 23XRV chiller is equipped with a unit-mounted VFD starter (Fig. 64).

IMPORTANT: Be sure to ground the power circuit in accordance with the National Electrical Code (NEC), applicable local codes, and job wiring diagrams. Also, make sure correct phasing is observed for proper rotation.

**⚠CAUTION**

Do not punch holes or drill into the top surface of the control center, as unit damage could occur. Knockouts are provided in the back of the control center for wiring connections.

Remove the VFD shipping bracket shown in Fig. 23 for typical installations. For seismic units, do not remove the shipping bracket.

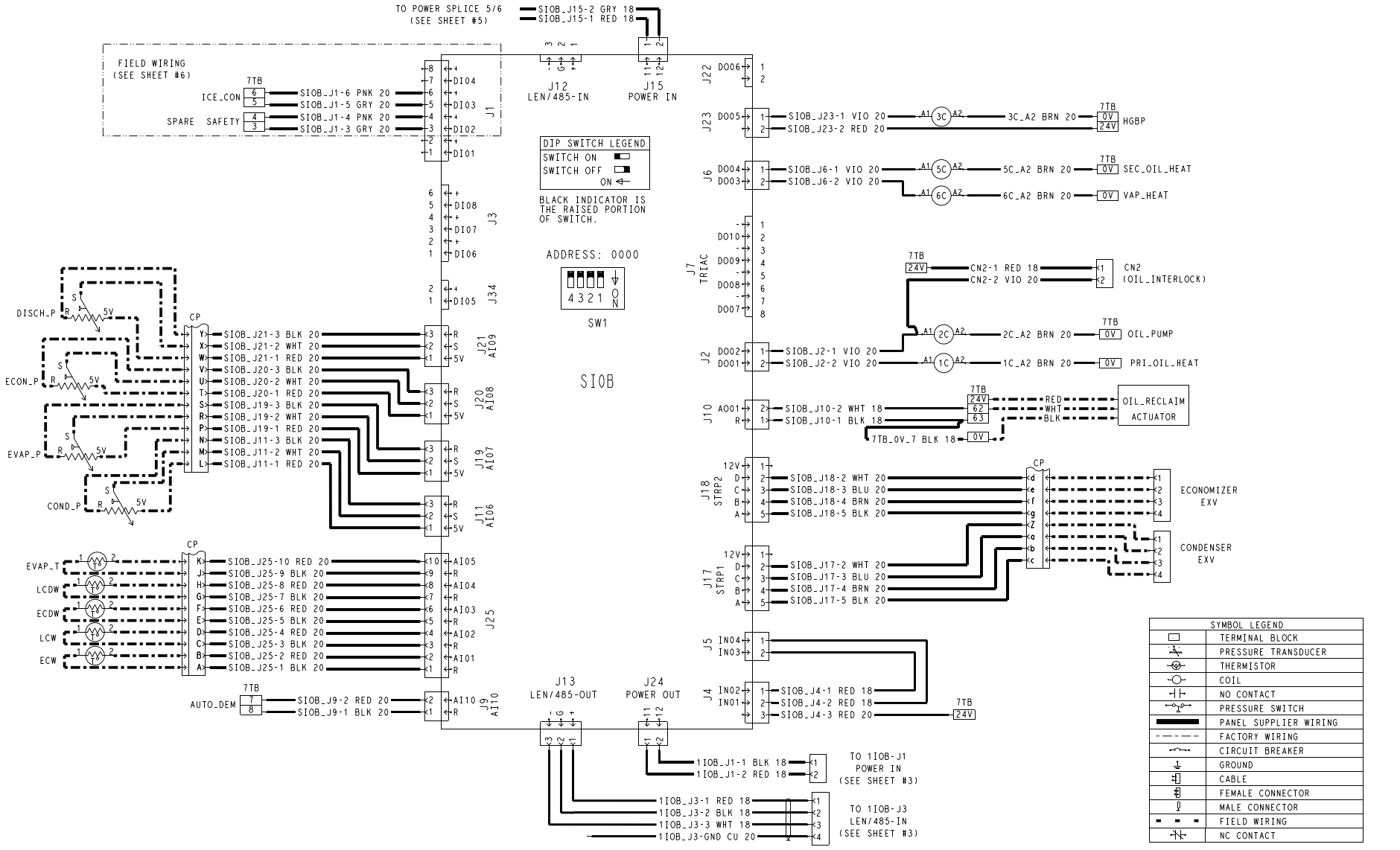



**Fig. 58 — 23XRV Controls Schematic**

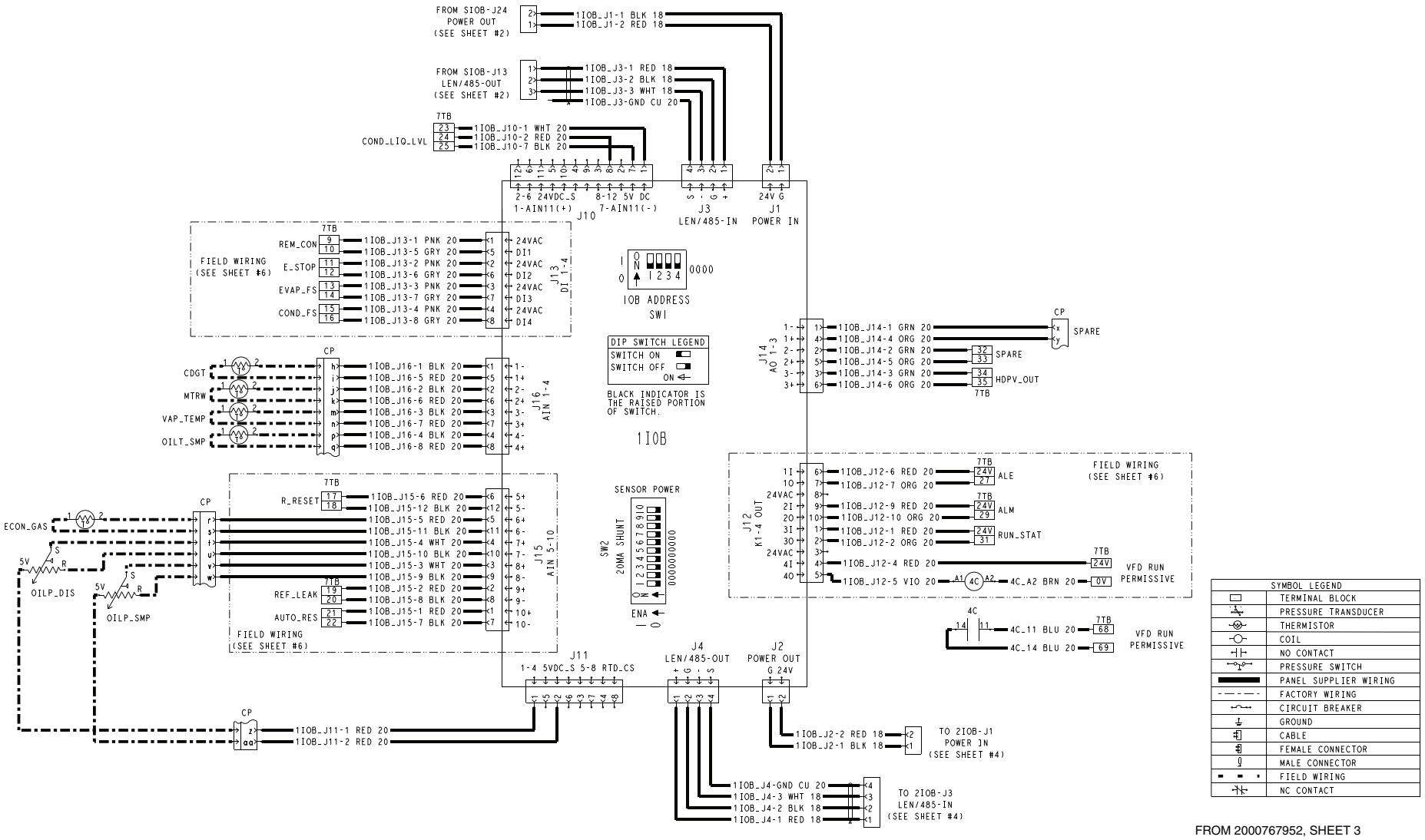



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**Fig. 58 — 23XRV Controls Schematic (cont)**

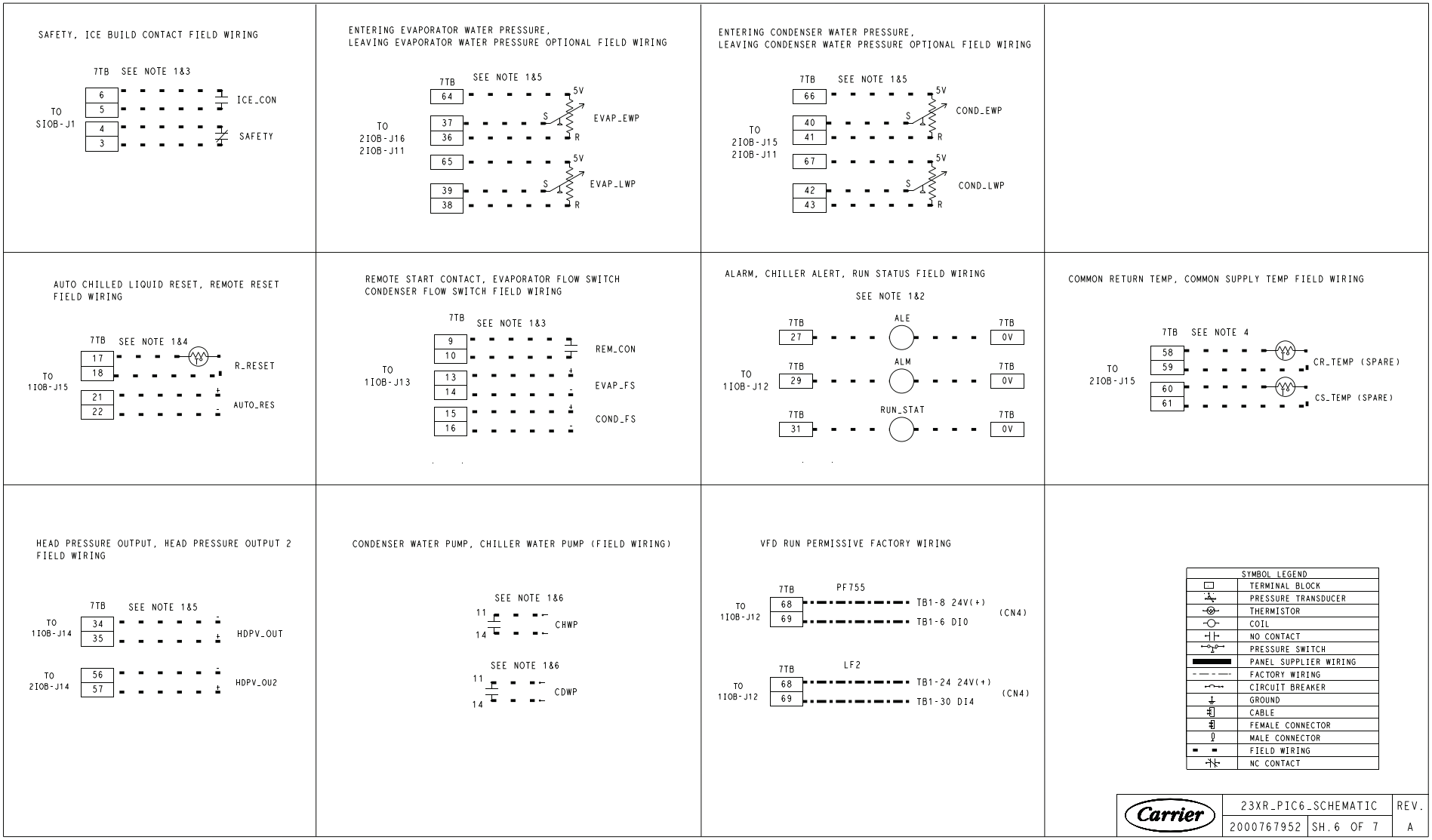
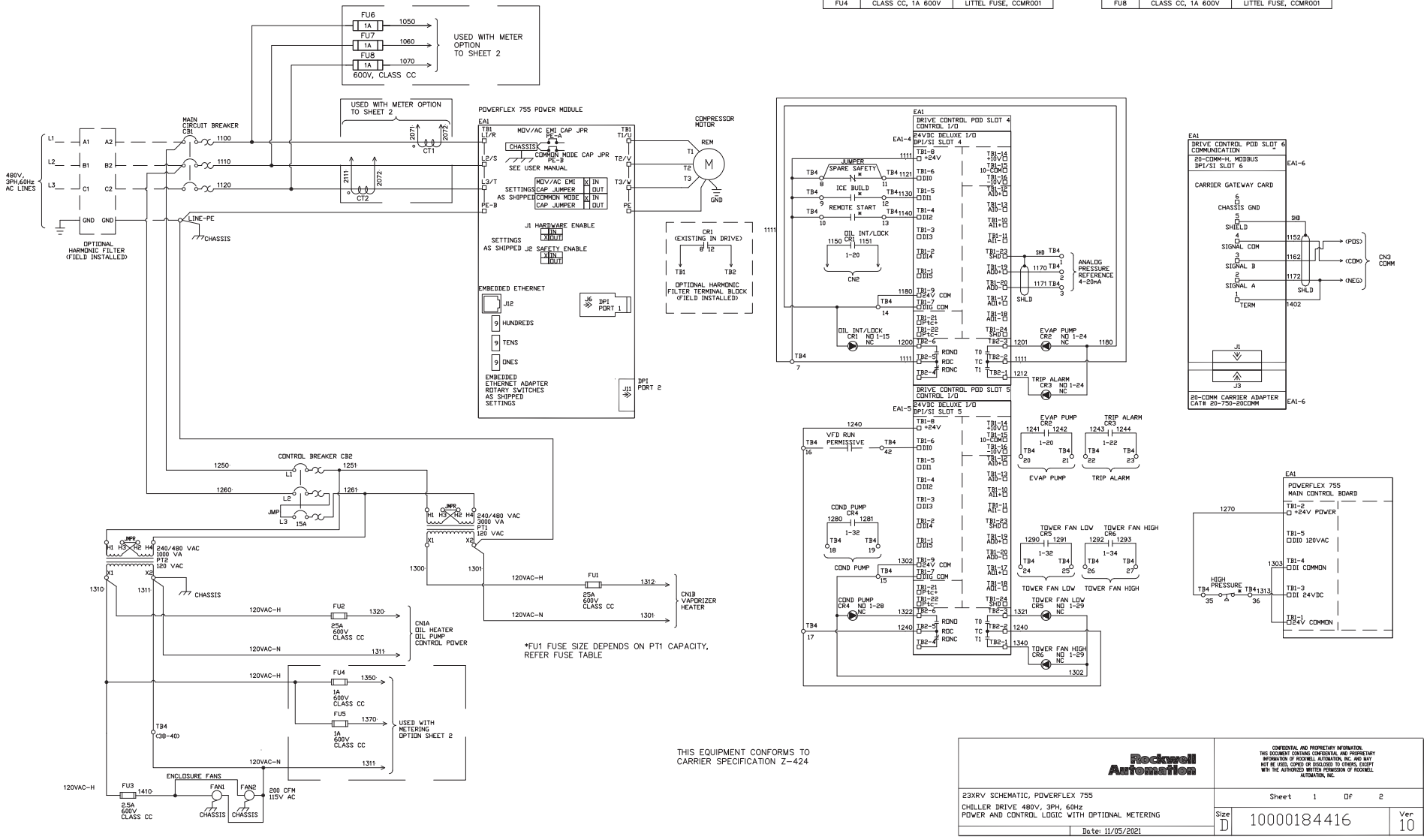



**Fig. 58 — 23XRV Controls Schematic (cont)**

| MAIN CIRCUIT BREAKER/DRIVE RATING TABLE | | | |
|---|---|---|---|
| HP | UNIT RATING | MAIN CIRCUIT BREAKER CB1 | DRIVE FRAME SIZE |
| 300HP | 361A | 600A | 7 |
| 400HP | 477A | 600A | 7 |

| FUSE TABLE | | |
|---|---|---|
| REF | FUSE DESCRIPTION | SUPPLIER & PART NUMBER |
| FU1 | CLASS CC, 15/25A 600V | LITTEL FUSE CCMR015/CCMR025 |
| FU2 | CLASS CC, 25A 600V | LITTEL FUSE, CCMR025 |
| FU3 | CLASS CC, 2.5A 600V | LITTEL FUSE, CCMR02.5 |
| FU4 | CLASS CC, 1A 600V | LITTEL FUSE, CCMR001 |

| FUSE TABLE | | |
|---|---|---|
| REF | FUSE DESCRIPTION | SUPPLIER & PART NUMBER |
| FU5 | CLASS CC, 1A 600V | LITTEL FUSE, CCMR001 |
| FU6 | CLASS CC, 1A 600V | LITTEL FUSE, CCMR001 |
| FU7 | CLASS CC, 1A 600V | LITTEL FUSE, CCMR001 |
| FU8 | CLASS CC, 1A 600V | LITTEL FUSE, CCMR001 |




Rockwell Automation

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23XRV SCHEMATIC, POWERFLEX 755

CHILLER DRIVE 480V, 3PH, 60Hz
POWER AND CONTROL LOGIC WITH OPTIONAL METERING

Date: 11/05/2021

Sheet 1 OF 2

Size D | 10000184416 | Ver 10

**Fig. 59 — 23XRV Controls Schematic (Rockwell Standard Tier VFD Shown)**

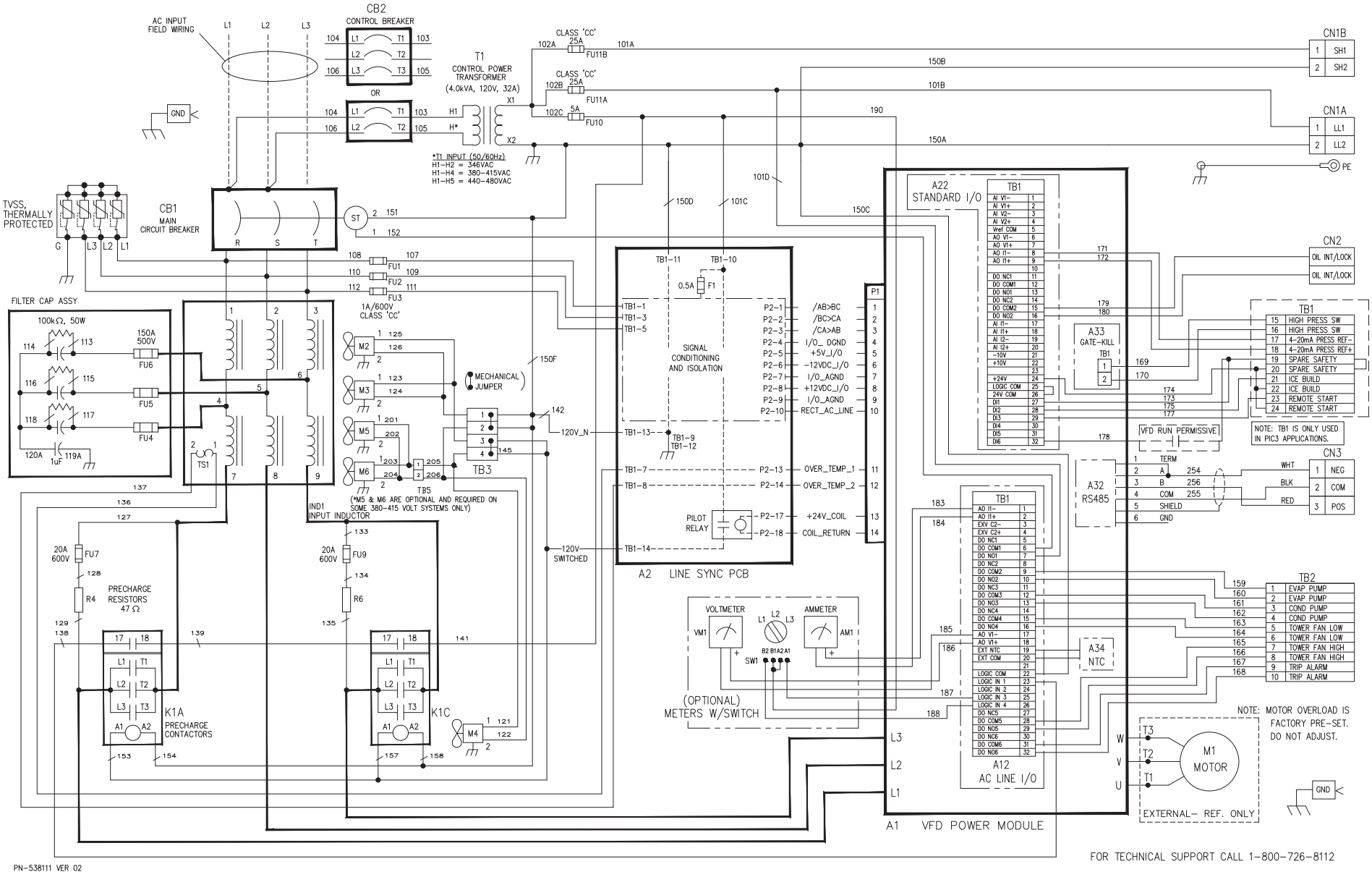



**Fig. 60 — 23XRV LF2 VFD Wiring Diagram**

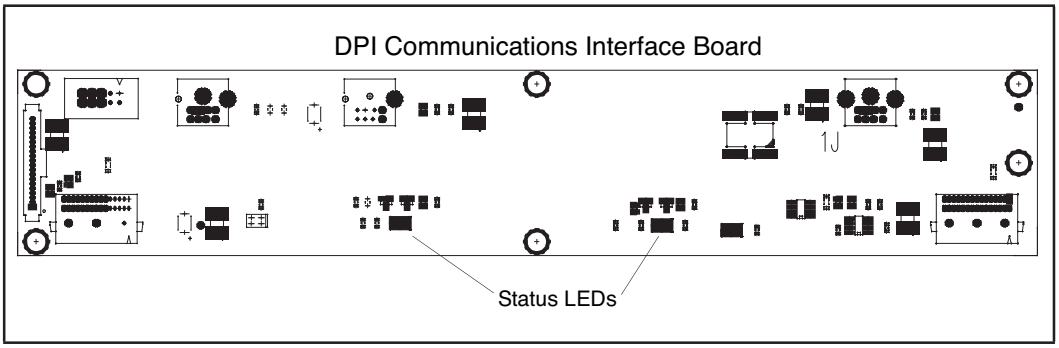
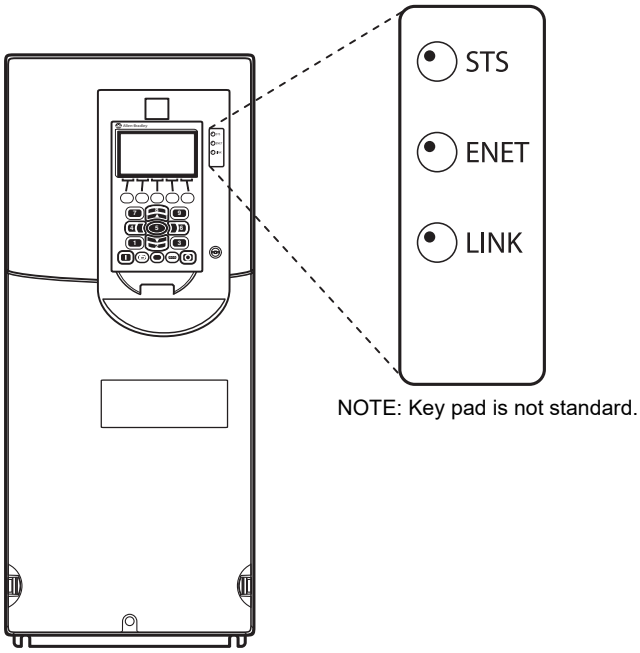


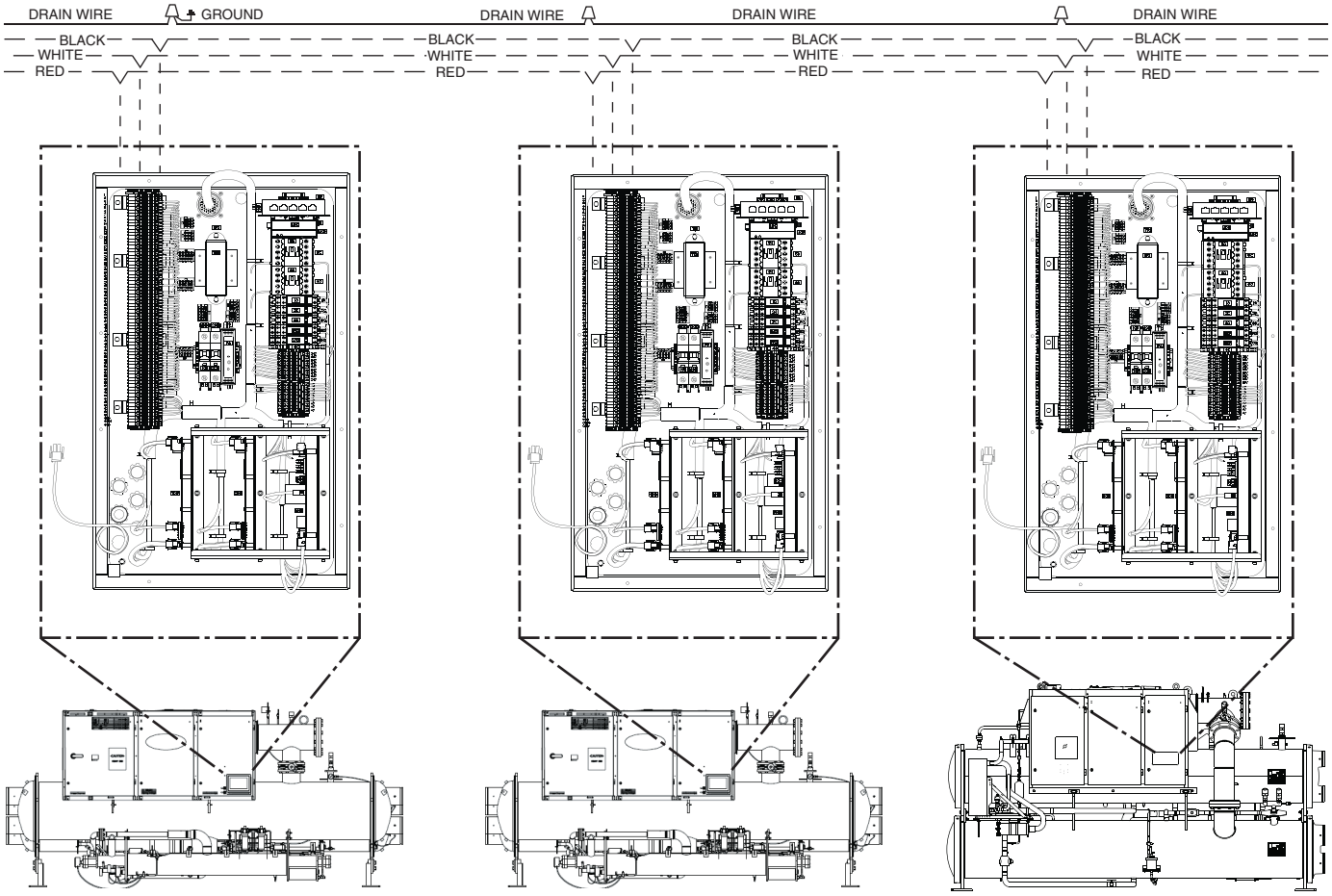

**Fig. 61 — Communications Interface Board Status LEDs (LF-2 VFD)**




| NAME | COLOR | STATE | DESCRIPTION |
|---|---|---|---|
| **STS (Status)** | Green | Flashing | Drive ready but not running, and no faults are present. |
| | | Steady | Drive running, no faults are present. |
| | Yellow | Flashing | Drive is not running. A type 2 (non-configurable) alarm condition exists and the drive cannot be started. |
| | | Steady | Drive is not running, a type 1 alarm condition exists. The drive can be started. |
| | Red | Flashing | A major fault has occurred. Drive cannot be started until fault condition is cleared. |
| | | Steady | A non-resettable fault has occurred. |
| | Red/Yellow | Flashing Alternately | A minor fault has occurred. When running, the drive continues to run. System is brought to a stop under system control. Fault must be cleared to continue. Use parameter 950 [Minor Flt Config] to enable. If not enabled, acts like a major fault. |
| | Green/Red | Flashing Alternately | Drive is flash updating. |
| **ENET** | None (Unlit) | Off | Adapter and/or network is not powered, adapter is not properly connected to the network, or adapter needs an IP address. |
| | Red | Flashing | An Ethernet/IP connection has timed out. |
| | | Steady | Adapter failed the duplicate IP address detection test. |
| | Red/Green | Flashing Alternately | Adapter is performing a self-test. |
| | Green | Flashing | Adapter is properly connected but is not communicating with any devices on the network. |
| | | Steady | Adapter is properly connected and communicating on the network. |
| **LINK** | None (Unlit) | Off | Adapter is not powered or is not transmitting on the network. |
| | Green | Flashing | Adapter is properly connected and transmitting data packets on the network. |
| | | Steady | Adapter is properly connected but is not transmitting on the network. |

NOTES:
1. A Type 1 alarm indicates that a condition exists. Type 1 alarms are user configurable.
2. A Type 2 alarm indicates that a configuration error exists and the drive cannot be started. Type 2 alarms are not configurable.

**Fig. 62 — Drive Status Indicator Status LEDs (Std Tier VFD)**



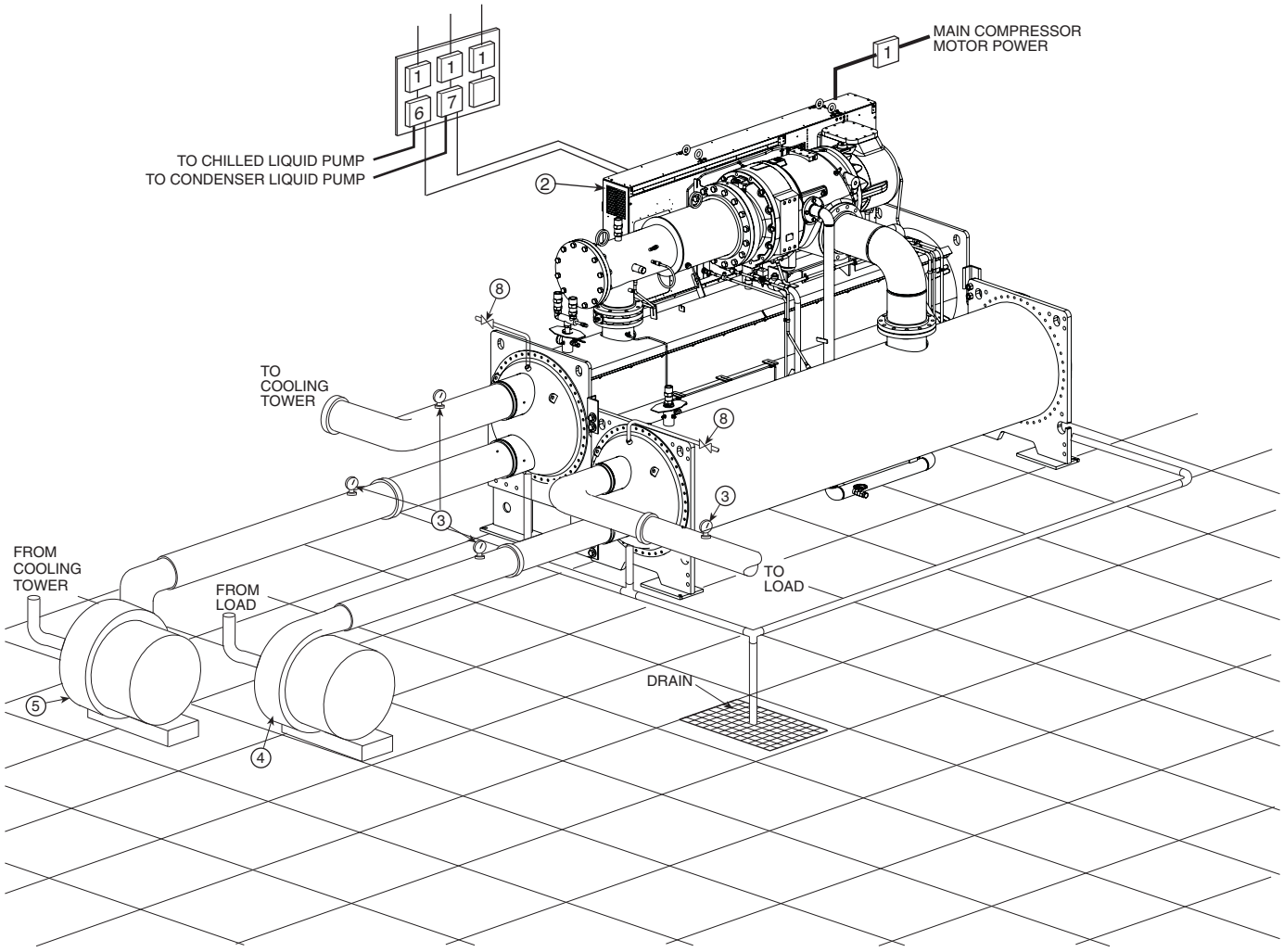

LEGEND

——— Factory Wiring

– – – – Field Wiring

NOTE: Field-supplied terminal strip must be located in control panel.

**Fig. 63 — CCN Communication Wiring for Multiple Chillers (Typical)**




LEGEND

**1** — Disconnect
**2** — Unit-Mounted VFD/Control Center
**3** — Pressure Gauges
**4** — Chilled Liquid Pump
**5** — Condenser Liquid Pump
**6** — Chilled Liquid Pump Starter
**7** — Condenser Liquid Pump Starter
**8** — Vents

Piping
Control Wiring
Power Wiring

IMPORTANT: Wiring and piping shown are for general point-of-connection only and are not intended to show details for a specific installation. Certified field wiring and dimensional diagrams are available on request.

NOTES:

1. All wiring must comply with applicable codes.
2. Refer to Carrier System Design Manual for details regarding piping techniques.
3. Wiring not shown for optional devices such as:
   - remote start-stop
   - remote alarm
   - optional safety device
   - 4 to 20 mA (1 to 5 VDC) resets
   - optional remote sensors
   - kW output
   - head pressure reference
4. Service clearance under the chiller can be enhanced if the grout is not extended along the entire length of the heat exchangers.
5. Carrier does not recommend pre-fab water piping.
3. Field-installed piping with flexible connections must be arranged and supported to avoid stress on the equipment and transmission of vibrations from the equipment as well as to prevent interference with routine access for the reading, adjusting and servicing of the equipment. Provisions shall be made for adjustment in each plane of the piping and for periodic and major servicing of the equipment.
4. Relief valves on the cooler and condenser must be vented to the outdoors as discharging refrigerant in closed spaces may displace oxygen and cause asphyxiation. All field-supplied refrigerant relief piping and devices must be used in accordance with ANSI/ASHRAE standard 15.
5. Dual pressure relief valves are mounted on the 3-way valves in some locations to allow testing and repair without transferring the refrigerant charge. Three-way valve shafts should be turned either fully clockwise or fully counterclockwise so only one relief valve is exposed to refrigerant pressure at a time.
6. The flow area of discharge piping routed from more than one relief valve, or more than one heat exchanger, must be greater than the sum of the outlet areas of all relief valves that are expected to discharge simultaneously. All relief valves within a machinery room that are exposed to refrigerant may discharge simultaneously in the event of a fire. Discharge piping should lead to the point of final release as directly as possible with consideration of pressure drop in all sections downstream of the relief valves.
7. Service access should be provided per standards ANSI/ASHRAE 15 and ANSI/NFPA 70 (NEC) and local safety codes. Unobstructed space adequate for inspection, servicing and rigging of all major components of the chiller is required. Shaded service areas are shown on the certified machine assembly drawing plan view and front view. See machine assembly component disassembly drawing for component removal. Space for rigging equipment and compressor removal is not shown. Isolation valves are recommended on the evaporator and condenser piping to each chiller for service.
8. The installation of chilled water and cooling tower water strainers should be considered to prevent debris from collecting in the waterboxes and degrading performance.
9. Flexible conduit should be used for the last few feet to the control center for vibration isolation of power wiring and control wiring.

**Fig. 64 — 23XRV with Unit-Mounted VFD/Control Center (Unit with R Compressor Shown)**

## COMPLETING THE INSTALLATION

This section provides instructions on how to perform a final check of the installation. Do not energize the VFD circuit breaker. This should only be done by qualified Carrier personnel in accordance with the 23XRV Start-Up and Service Manual.

### Checking the Installation

Use the following procedure to verify the condition of the installation:

**⚠ WARNING**

DC bus capacitors in the VFD retain hazardous voltages after input power has been disconnected. After disconnecting input power, wait 5 minutes for the DC bus capacitors to discharge then check both the VFD DPI communications interface board status LEDs and the VFD with a voltmeter to ensure the DC bus capacitors are discharged before touching any internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

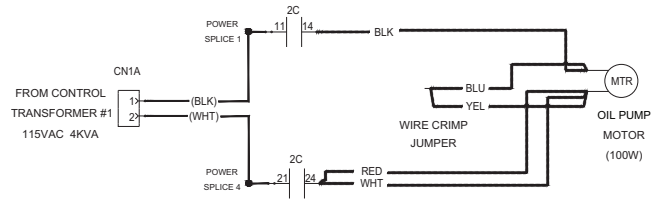
1. Turn off, lock out, and tag the input power to the drive. Wait 5 minutes.
2. Verify that there is no voltage at the input terminals (L1, L2, and L3) of the power module.
   a. For LF-2 VFD, verify that the status LEDs on the DPI communications interface board are not lit. See Fig. 61. The location of the communications interface board is shown in Fig. 10.
   b. For Std Tier VFD, verify that the keypad and drive status indicators (Fig. 62) are not lit. The location of the drive status indicator is shown in Fig. 11.
3. Remove any debris, such as metal shavings, from the enclosure.
4. Check that there is adequate clearance around the machine in accordance with the certified print.
5. Verify that the wiring to the terminal strip and the AC input power terminals is correct.
6. Check that the wire size is within terminal specifications and that the wires are tightened properly.
7. Check that specified branch circuit protection is installed and correctly rated.
8. Check that the incoming power is rated correctly.
9. Verify that a properly sized ground wire is installed and a suitable earth ground is used. Check for and eliminate any grounds between the power leads. Verify that all ground leads are unbroken.

### Oil Pump and Oil Heater

The oil pump and oil heater are wired at the factory. It is not necessary to connect additional wiring to these components. See Fig. 65-67.

**⚠ WARNING**

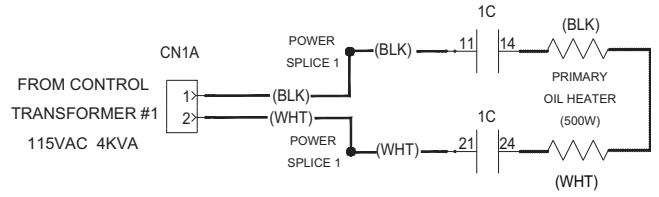
Voltage to input terminals on the 1C and 6C contactors comes from a control transformer in the starter built to Carrier specifications. Do not connect an outside source of control power to the chiller contactors. An outside power source will produce dangerous voltage at the line side of the starter, because supplying voltage at the transformer secondary terminals produces input level voltage at the transformer primary terminals (see Fig. 58, 59, and 65-67).




LEGEND

Factory Wiring
Power Panel Component Terminal
Contactor

**Fig. 65 — Oil Pump Wiring**




LEGEND

Factory Wiring
Power Panel Component Terminal

**Fig. 66 — Oil Heater and Control Power Wiring**

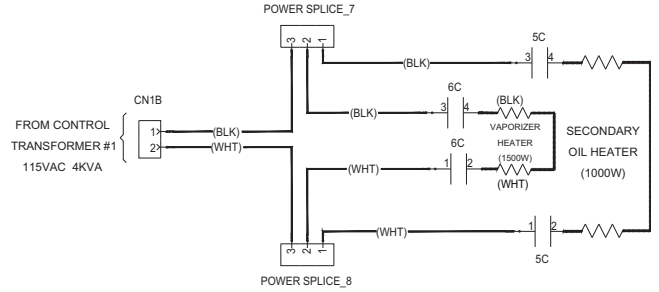



**Fig. 67 — Oil Heater and Control Power Wiring, Dual-Stage Oil Heater**

### Connect Control Wiring

All control wiring must use shielded cable. Refer to the job wiring diagrams for cable type and cable number. Make sure the control circuit is grounded in accordance with applicable electrical codes and instructions on machine control wiring label.

### Carrier Comfort Network Interface

If required, the Carrier Comfort Network® (CCN) communication bus wiring is supplied and installed by the electrical contractor. It consists of shielded, 3-conductor cable with drain wire.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it. The negative pins must be wired to the negative pins. The signal ground pins must be wired to the signal ground pins. The CCN network connections can be wired to terminal strip 7TB where it is labeled CCN (+, -, G).

NOTE: Conductors and drain wire must be 20 AWG (American Wire Gauge) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon[1], or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –4°F to 140°F (–20°C to 60°C) is required. See Table 22 for cables that meet the requirements.

1. Teflon is a registered trademark of DuPont.

**Table 22 — Cable Manufacturers**

| MANUFACTURER | CABLE NO. |
|---|---|
| ALPHA | 2413 or 5463 |
| AMERICAN | A22503 |
| BELDEN | 8772 |
| COLUMBIA | 02525 |

When connecting the CCN communication bus to a system element, a color code system for the entire network is recommended to simplify installation and checkout. See Table 23 for the recommended color codes.

**Table 23 — Insulator Codes**

| SIGNAL TYPE | CCN BUS CONDUCTOR INSULATION COLOR | CCN NETWORK INTERFACE (CONTROL PANEL) |
|---|---|---|
| + | Red | + |
| GROUND | Black | G |
| – | White | – |

If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to ground at only one single point. See Fig. 63. If the communication bus cable exits from one building and enters another, the shields must be connected to ground at the lightening suppressor in each building where the cable enters or exits the building (one point only).

To connect the 23XRV chiller to the network, proceed as follows (see Fig. 63):

1. Route wire through knockout in back of control panel.
2. Strip back leads.
3. Attach red to "+" terminal and black to "G" terminal and white to "–" terminal of CCN Network interface located in the control panel.

## Communication Option Wiring

The PIC6 control system support multiple building automation protocols. Controller can communicate via BACnet[1] MS/TP, BACnet/IP, Modbus[2] RTU or Modbus TCP/IP. Note that PIC6 Port J8 is used for BACnet MS/TP or Modbus RTU protocols.

1. BACnet is a trademark of ASHRAE.
2. Modbus is a registered trademark of Schneider Electric.

User will need a 1x Phoenix connector 1757035 (not factory provided) in order to connect to J8. Consult the latest Controls Operation and Troubleshooting book for further details.

Note that establishing communication between a site building automation system and the PIC6 controller is not part of the standard Carrier startup process. If it is necessary to support chiller control integration with the site building automation system, it will require a request from the Carrier Service Office/Distributor for a control technician to complete this task and additional charges will apply.

## Lead-Lag Control Wiring

The 23XRV chiller can be wired for lead-lag operation in either series or parallel. See Fig. 68 and 69 for applicable wiring schematics.

## Install Field Insulation

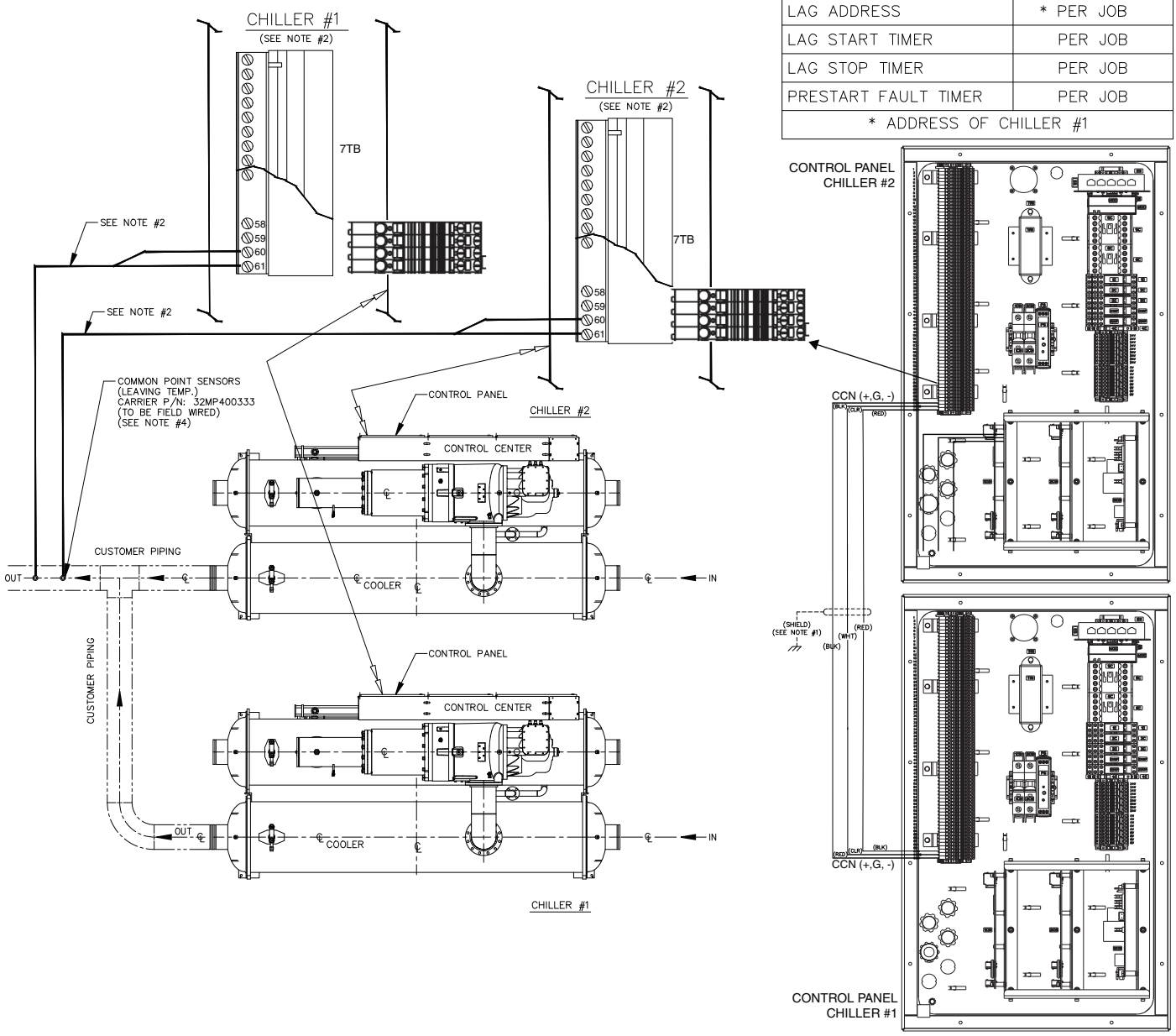
**⚠ CAUTION**

Protect insulation from weld heat damage and weld splatter. Cover with wet canvas cover during water piping installation.

When installing insulation at the job site, insulate the following components:

- compressor
- discharge pipe assembly
- cooler shell
- cooler tube sheets
- condenser shell
- condenser tubesheets
- suction piping
- economizer
- economizer muffler
- motor cooling drain
- oil reclaim piping
- vaporizer chamber
- refrigerant liquid line to cooler

NOTE: Insulation of the waterbox covers is applied only at the jobsite by the contractor. When insulating the covers, make sure there is access for removal of waterbox covers for servicing. See Fig. 70 for the insulation area for units with the P compressor. See Fig. 71 for the insulation area for units with the Q compressor. See Fig. 72 for the insulation area for units with the R compressor.




| CHILLER #2/LEAD LAG CONTROL | |
|---|---|
| LEAD LAG CONFIGURATION (LEAD=1) – (LAG=2) | PER JOB |
| LOAD BALANCE OPTION | PER JOB |
| COMMON SENSOR OPTION | DISABLE/ENABLE (SEE NOTE #3) |
| LAG % CAPACITY | PER JOB |
| LAG ADDRESS | * PER JOB |
| LAG START TIMER | PER JOB |
| LAG STOP TIMER | PER JOB |
| PRESTART FAULT TIMER | PER JOB |
| * ADDRESS OF CHILLER #1 | |

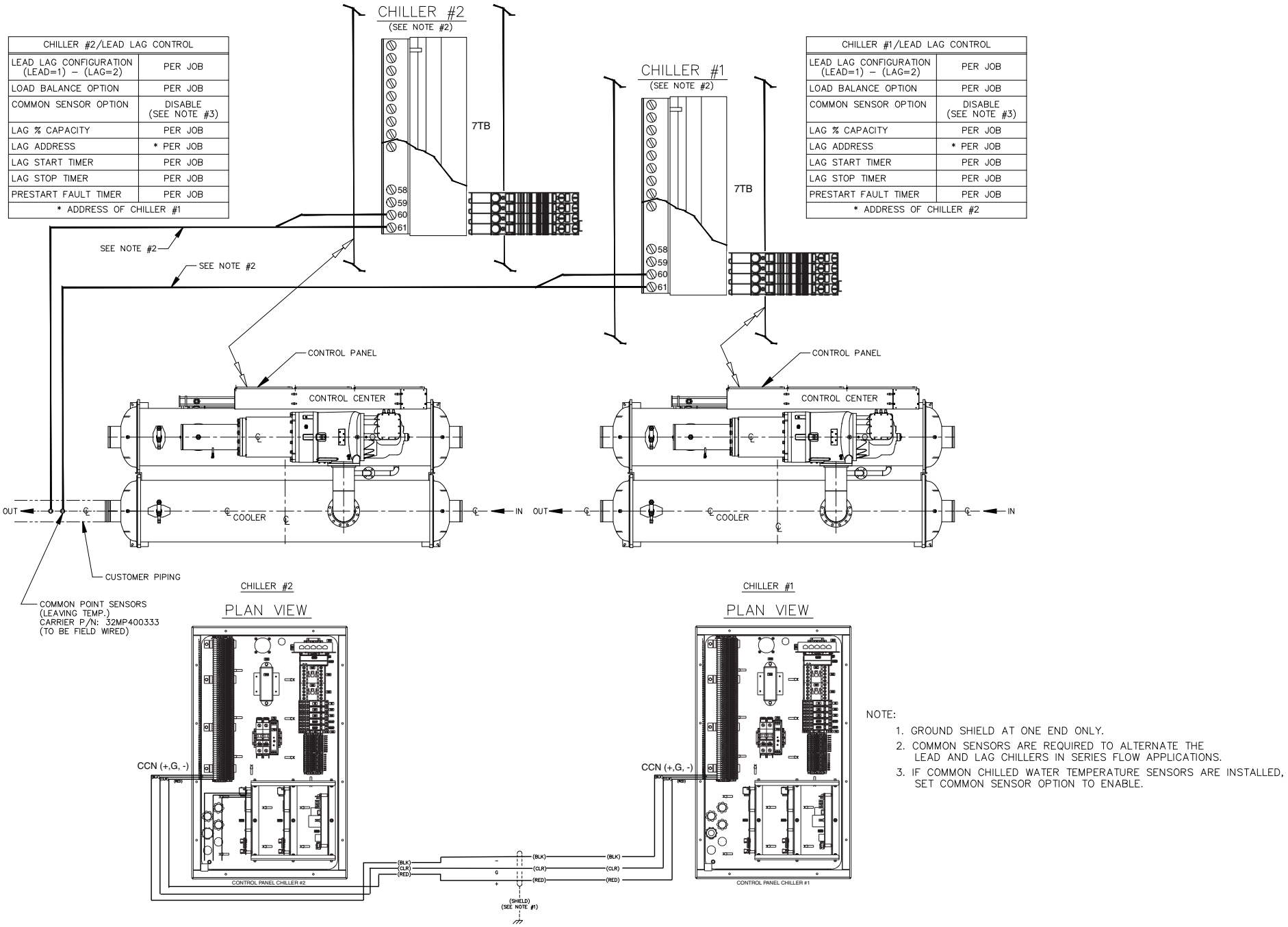
PLAN VIEW

NOTE:

1. GROUND SHIELD AT ONE END ONLY.
2. COMMON POINT SENSORS ARE REQUIRED IF THE COOLERS ON PARALLEL FLOW MACHINES ARE SUPPLIED BY A SINGLE (COMMON) CHILLED WATER PUMP.
3. IF COMMON CHILLED WATER TEMPERATURE SENSORS ARE INSTALLED, SET COMMON SENSOR OPTION TO ENABLE.
4. INSTALL COMMON POINT SENSORS A MINIMUM OF 10 PIPE DIAMETERS DOWN STREAM OF TEE.

| CHILLER #1/LEAD LAG CONTROL | |
|---|---|
| LEAD LAG CONFIGURATION (LEAD=1) – (LAG=2) | PER JOB |
| LOAD BALANCE OPTION | PER JOB |
| COMMON SENSOR OPTION | DISABLE/ENABLE (SEE NOTE #3) |
| LAG % CAPACITY | PER JOB |
| LAG ADDRESS | * PER JOB |
| LAG START TIMER | PER JOB |
| LAG STOP TIMER | PER JOB |
| PRESTART FAULT TIMER | PER JOB |
| * ADDRESS OF CHILLER #2 | |

**Fig. 68 — Lead/Lag Control Wiring, Parallel Flow Application (Unit with R Compressor Shown)**



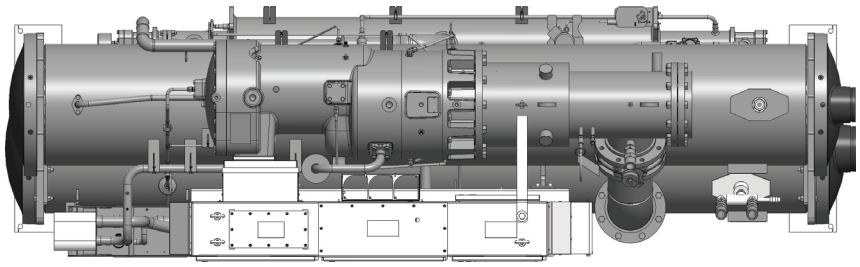

| CHILLER #2/LEAD LAG CONTROL | |
|---|---|
| LEAD LAG CONFIGURATION (LEAD=1) – (LAG=2) | PER JOB |
| LOAD BALANCE OPTION | PER JOB |
| COMMON SENSOR OPTION | DISABLE (SEE NOTE #3) |
| LAG % CAPACITY | PER JOB |
| LAG ADDRESS | * PER JOB |
| LAG START TIMER | PER JOB |
| LAG STOP TIMER | PER JOB |
| PRESTART FAULT TIMER | PER JOB |
| * ADDRESS OF CHILLER #1 | |

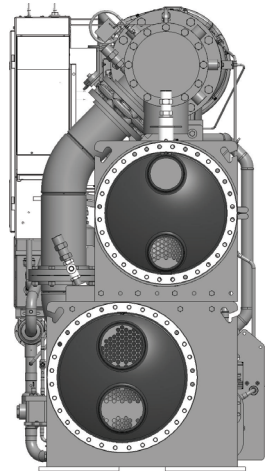
| CHILLER #1/LEAD LAG CONTROL | |
|---|---|
| LEAD LAG CONFIGURATION (LEAD=1) – (LAG=2) | PER JOB |
| LOAD BALANCE OPTION | PER JOB |
| COMMON SENSOR OPTION | DISABLE (SEE NOTE #3) |
| LAG % CAPACITY | PER JOB |
| LAG ADDRESS | * PER JOB |
| LAG START TIMER | PER JOB |
| LAG STOP TIMER | PER JOB |
| PRESTART FAULT TIMER | PER JOB |
| * ADDRESS OF CHILLER #2 | |

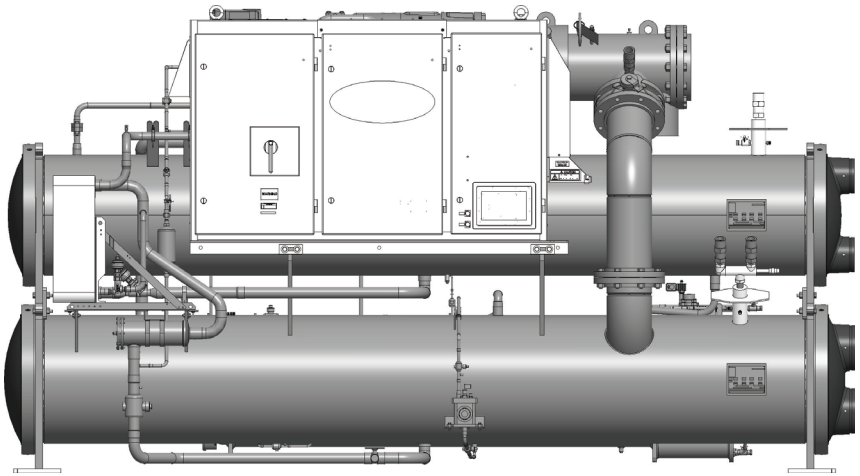
NOTE:

1. GROUND SHIELD AT ONE END ONLY.
2. COMMON SENSORS ARE REQUIRED TO ALTERNATE THE LEAD AND LAG CHILLERS IN SERIES FLOW APPLICATIONS.
3. IF COMMON CHILLED WATER TEMPERATURE SENSORS ARE INSTALLED, SET COMMON SENSOR OPTION TO ENABLE.

**Fig. 69 — Lead/Lag Control Wiring, Series Flow Application (Unit with R Compressor Shown)**







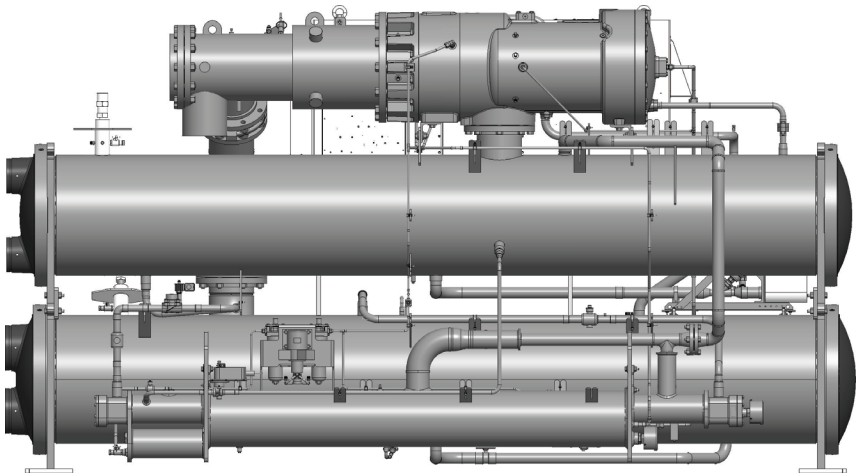


**Fig. 70 — 23XRV Insulation Area — Units with P Compressor**

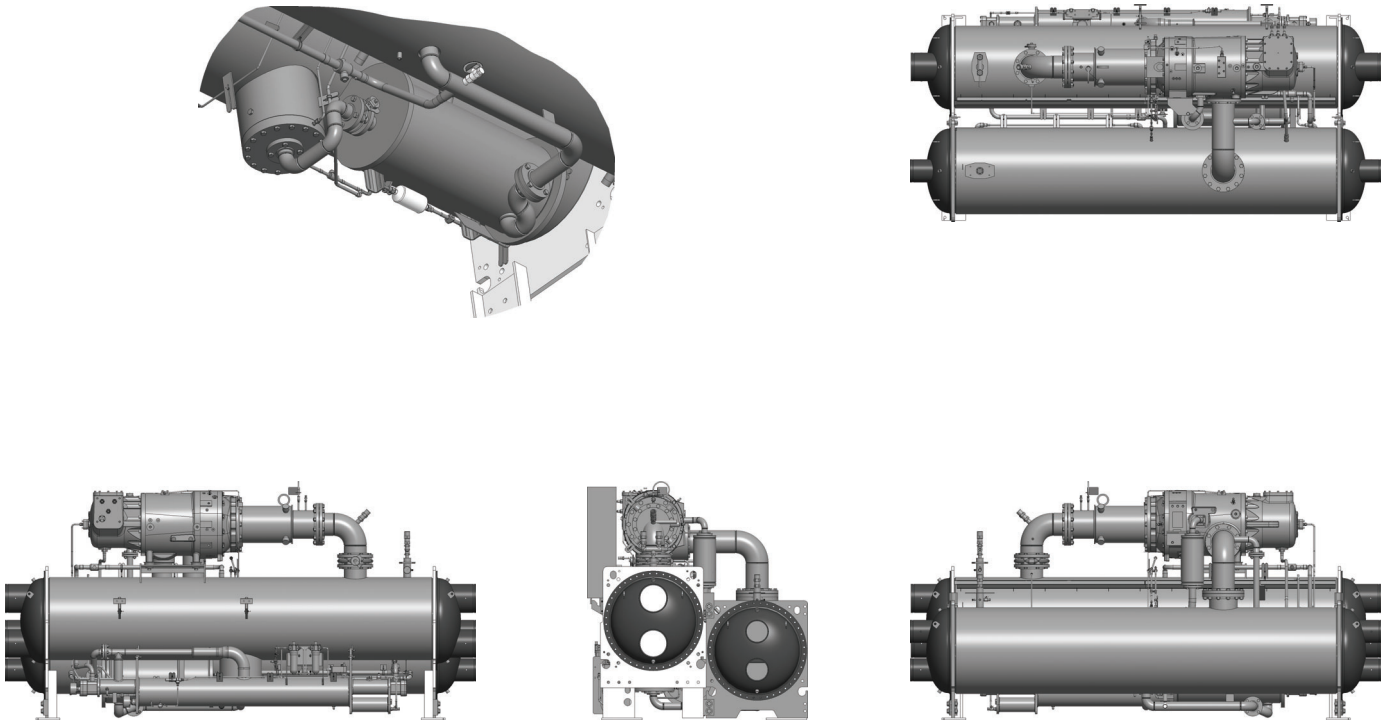


**Fig. 71 — 23XRV Insulation Area — Units with Q Compressor**

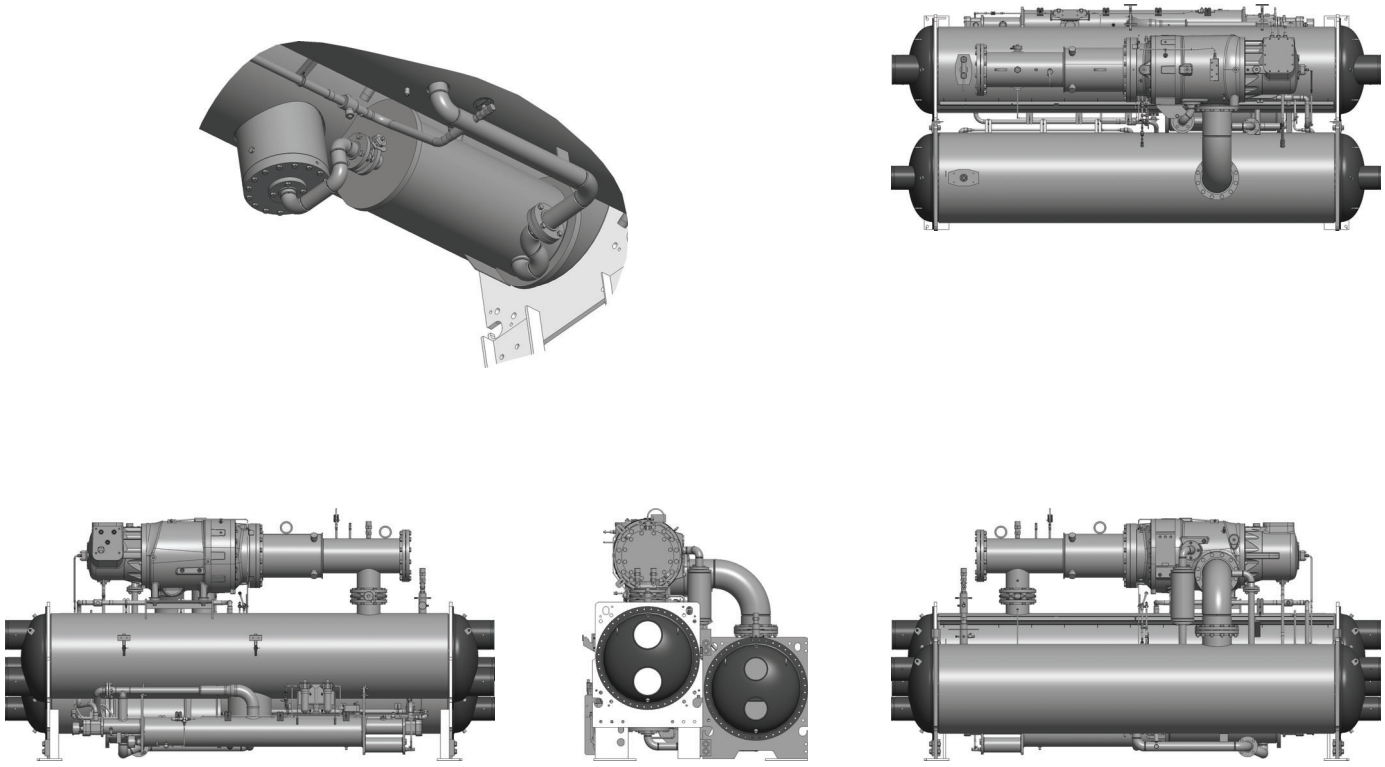


**Fig. 72 — 23XRV Insulation Area — Units with R Compressor**

## INSTALLATION START-UP REQUEST CHECKLIST

**NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation Instructions document.**

Machine Model Number: 23XRV _____ Serial Number: _____

To: _____ Date: _____

_____ Project Name: _____

_____ Carrier Job Number: _____

Attn.: _____

The following information provides the status of the chiller installation. Send a copy of this checklist to the local Carrier Service office after it has been completed and signed off by the Purchaser and Job Site Supervisor.

| | (YES/NO/N/A) | DATE TO BE COMPLETED |
|---|---|---|
| 1. The machine is level within 1/2 in. end to end. | | |
| 2. The machine components are installed and connected in accordance with the installation instructions. | | |
| 3. The isolation package and grouting (if necessary) are installed. | | |
| 4. The relief valves are piped to the atmosphere. | | |
| 5. All piping is installed and supported. Direction of flow is indicated in accordance with the installation instructions and job prints. | | |
| a. Chilled water piping | | |
| b. Condenser water piping | | |
| c. Waterbox drain piping | | |
| d. Pumpout unit condenser piping (if installed) | | |
| e. Other _____ | | |
| 6. Gauges are installed as called for on the job prints required to establish design flow for the cooler and condenser. | | |
| a. Water pressure gauges IN and OUT | | |
| b. Water temperature gauges IN and OUT | | |
| 7. The machine's control center wiring is complete. The wiring is installed per installation instructions and certified prints. | | |
| a. Power wiring to VFD circuit breaker. (If chiller was disassembled during installation, motor leads must not be taped until the Carrier technician megger tests the motor.) | | |
| b. Can the water pumps be energized from Carrier controls? Note this can be accomplished through BMS interlock with Carrier controls (typically via BACnet or Modbus) or hardwire connections to pumps. Chiller must maintain pump control for freeze protection purposes. If answer no to this question customer must sign off since this can result in loss of warranty coverage. | | |
| c. Line side voltage is within ±10% of chiller nameplate voltage. | | |
| d. Other _____ | | |

COMMENTS:

| TESTING | YES/NO | DATE TO BE COMPLETED |
|---|---|---|
| 1. The cooling tower fan has been checked for blade pitch and proper operation. | | |
| 2. The chilled water and condenser water lines have been: | | |
| a. Filled | | |
| b. Tested | | |
| c. Flushed | | |
| d. Vented | | |
| e. Strainers cleaned | | |
| 3. The chilled water and condenser water pumps have been checked for proper rotation and flow. | | |
| 4. The following cooling load will be available for start-up: | | |
| a. 25% | | |
| b. 50% | | |
| c. 75% | | |
| d. 100% | | |
| 5. The refrigerant charge is at the machine. | | |
| 6. Services such as electrical power and control air will be available at start-up. | | |
| 7. The electrical and mechanical representatives will be available to assist in commissioning the machine. | | |
| 8. Power will be applied to unit 24 hours prior to commissioning to allow oil heater to energize and heat up oil. | | |
| 9. The customer's operators will be available to receive instructions for proper operation of the chiller after start-up. | | |

Concerns about the installation/request for additional assistance:

I am aware that the start-up time for a Carrier chiller can take between 2 and 6 days depending on the model of the machine and the options and accessories used with it.

Your contact at the job site will be . . . . . .

Phone number . . . . . .

Cell/Pager number . . . . . .

Fax number . . . . . .

In accordance with our contract, we hereby request the services of your technician to render start-up services per contract terms for this job on _____ (Date). I understand that the technician's time will be charged as extra services due to correcting items in this checklist that are incomplete.

Signature of Purchaser _____

Signature of Job Site Supervisor _____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE