AquaEdge® 19XR
Two-Stage Semi-Hermetic Centrifugal Liquid Chillers with PIC 5 Controls and HFC-134a
50/60 Hz

Start-Up, Operation, and Maintenance Instructions

SAFETY CONSIDERATIONS

Centrifugal 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.

Be sure you understand and follow the procedures and safety precautions contained in the chiller instructions as well as those listed in this guide.

⚠ DANGER

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

DO NOT VENT refrigerant relief valves 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). 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. 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 chiller for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.

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 USE air for leak testing. Use only refrigerant or dry nitrogen.

DO NOT VALVE OFF any safety device.

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

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 wye-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:

1. Shut off electrical power to unit.
2. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
3. 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.
4. 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 gage for how much oil to add to the system.
5. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

DO NOT USE eyebolts or eyebolt holes to rig chiller sections or the entire assembly.

DO NOT work on high-voltage equipment unless you are a qualified electrician.

(Warnings continued on next page.)

⚠ 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 de-energized 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 overpressure 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 chiller. The introduction of the wrong refrigerant can cause damage or malfunction to this chiller.

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 chiller with other refrigerants.

DO NOT ATTEMPT TO REMOVE fittings, covers, etc., while chiller is under pressure or while chiller 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 chiller operates in a corrosive atmosphere, inspect the devices at more frequent intervals.

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

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.

⚠ 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 chiller. 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.

BE AWARE that certain automatic start arrangements CAN ENGAGE THE STARTER, TOWER FAN, OR PUMPS. Open the disconnect *ahead of* the starter, tower fans, or pumps.

USE only repair 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.

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.

INTRODUCTION

Prior to initial start-up of the 19XR unit, those involved in the start-up, operation, and maintenance should be thoroughly familiar with these instructions and other necessary job data. Procedures in this manual are arranged in the sequence required for proper chiller start-up and operation. This book also outlines the control system for those involved in the start-up, operation, and maintenance of the unit before performing start-up procedures. It is intended to be used in combination with the 19XR Two-Stage High-Efficiency Semi-Hermetic Centrifugal Liquid Chillers Controls Operation and Troubleshooting manual that describes PIC 5 controls in detail.

⚠ CAUTION

UNIT DAMAGE HAZARD

This unit uses a microprocessor-based electronic control system. ***Do not*** use jumpers or other tools to short out components or to bypass or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

⚠ CAUTION

Be aware of electrostatic discharge (static electricity) when handling or making contact with circuit boards or module connections. Always touch a chassis (grounded) part to dissipate body electrostatic charge before working inside control center.

Use extreme care when handling tools near boards and when connecting or disconnecting terminal plugs. Circuit boards can easily be damaged. Always hold boards by the edges and avoid touching components and connections.

This equipment uses, and can radiate, radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause interference to radio communications. The PIC 5 control boards have been tested and found to comply with the limits for a Class A computing device pursuant to International Standard in North America EN 61000-2/3 which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Always store and transport replacement or defective boards in anti-static shipping bag.

⚠ CAUTION

Do NOT punch holes or drill into the top surface of the starter enclosure for field wiring. Knockouts are provided for field wiring connections.

⚠ CAUTION

PROVIDE MACHINE PROTECTION. Store machine and starter indoors, protected from construction dirt and moisture. Inspect under shipping tarps, bags, or crates to be sure water has not collected during transit. Keep protective shipping covers in place until machine is ready for installation.

⚠ CAUTION

WHEN FLUSHING THE WATER SYSTEMS isolate the chiller from the water circuits to prevent damage to the heat exchanger tubes.

ABBREVIATIONS AND EXPLANATIONS

Frequently used abbreviations in this manual include:

CCN	—	Carrier Comfort Network®
ECDW	—	Entering Condenser Water
ECW	—	Entering Chilled Water
EMS	—	Energy Management System
HGBP	—	Hot Gas Bypass
HMI	—	Human Machine Interface
I/O	—	Input/Output
ISM	—	Integrated Starter Module
LCDW	—	Leaving Condenser Water
LCW	—	Leaving Chilled Water
LED	—	Light-Emitting Diode
OLTA	—	Overload Trip Amps
PIC 5	—	Product Integrated Controls 5
RLA	—	Rated Load Amps
SCR	—	Silicon Controlled Rectifier
TXV	—	Thermostatic Expansion Valve
VFD	—	Variable Frequency Drive

Factory-installed additional components are referred to as options in this manual; factory-supplied but field-installed additional components are referred to as accessories.

CHILLER FAMILIARIZATION (Fig. 1 and 2)

Chiller Information Nameplate

The information nameplate is located on the right side of the chiller control panel.

System Components

The components include the cooler and condenser heat exchangers in separate vessels, motor-compressor, lubrication package, control panel, economizer, and motor starter. All connections from pressure vessels have external threads to enable each component to be pressure tested with a threaded pipe cap during factory assembly.

Cooler

This vessel (also known as the evaporator) is located underneath the compressor. The cooler is maintained at lower temperature/pressure so evaporating refrigerant can remove heat from water flowing through its internal tubes.

Condenser

The condenser operates at a higher temperature/pressure than the cooler and has water flowing through its internal tubes in order to remove heat from the refrigerant.

Motor-Compressor

This component maintains system temperature and pressure differences and moves the heat- carrying refrigerant from the cooler to the condenser. The 19XR two-stage frame 6 and frame 7 compressors are two-stage compressors with two impellers.

Control Panel

The control panel is the user interface for controlling the chiller. It regulates the chiller's capacity as required to maintain proper leaving chilled water temperature. The control panel:

- registers cooler, condenser, and lubricating system pressures
- shows chiller operating condition and alarm shutdown conditions
- records the total chiller operating hours
- sequences chiller start, stop, and recycle under microprocessor control
- displays status of motor starter
- provides access to other CCN (Carrier Comfort Network®) devices and energy management systems
- supports languages that may be pre-installed at factory, including English, Chinese, Spanish, French, and German.

Economizer

This chamber reduces the refrigerant pressure to an intermediate level between the cooler and condenser vessels. In the economizer, vapor is separated from the liquid, the separated vapor flows to the second stage of the compressor, and the liquid flows into the cooler. The energy removed from the vaporized refrigerant in the economizer allows the liquid refrigerant in the cooler to absorb more heat when it evaporates and benefits the overall cooling efficiency cycle.

Free-Standing Starter

The starter allows for the proper start and disconnect of electrical energy for the compressor-motor, oil pump, oil heater, and control panel.

19XR– A45 A47 636 M N 7 –

Description
19XR — High Efficiency Semi-Hermetic Centrifugal Liquid Chiller

Cooler Size Code (Digits 6, 7, 8)
A40-A42
A45-A47
A4A-A4C*
A4F-A4H*
A60-A62
A65-A67
A6A-A6C*
A6F-A6H*
B60-B62†
B65-B67†
B80-B82†
B85-B87†
B6A-B6C*†
B6F-B6H*†
B8A-B8C*†
B8F-B8H*†
C60-C62†
C65-C67†
C80-C82†
C85-C87†
C6A-C6C*†
C6F-C6H*†
C8A-C8C*†
C8F-C8H*†

Condenser Size Code (Digits 9, 10, 11)
A40-A42
A45-A47
A4A-A4C*
A4F-A4H*
A60-A62
A65-A67
A6A-A6C*
A6F-A6H*
B40-B42
B45-B47
B4A-B4C*
B4F-B4H*
B60-B62*
B65-B67*
B6A-B6C*
B6F-B6H*
C60-C62†
C65-C67†
C80-C82†
C85-C87†
C6A-C6C*†
C6F-C6H*†
C8A-C8C*†
C8F-C8H*†
D60-D62†
D65-D67†
D80-D82†
D85-D87†
D6A-D6C*†
D6F-D6H*†
D8A-D8C*†
D8F-D8H*†

Special Order Indicator
– — Standard
S — Special Order

Motor Voltage Code

Code	Volts-Phase-Hertz
2	400-3-50
4	3000-3-50
5	3300-3-50
6	6300-3-50
7	10000-3-50
8	11000-3-50
A	380-3-60
C	460-3-60
E	2400-3-60
F	3300-3-60
G	4160-3-60
H	6900-3-60
J	11000-3-60
K	13800-3-60

Motor Size Code
Compressor Frame Size 6
N — 1500 HP
P — 1625 HP
Q — 1750 HP
R — 1875 HP
S — 2000 HP
T — 2100 HP
Compressor Frame Size 7
U — 2250 HP
V — 2375 HP
W — 2500 HP
X — 2625 HP
Y — 2750 HP
Z — 2900 HP

Gear Code
Compressor Frame Size 6
E
J
M
P
Compressor Frame Size 7
R
T
V
X
Y

Compressor Size Code
Frame Size (12th Digit)
6 — Frame Size 6
7 — Frame Size 7

Shroud Size (13th Digit)
1 (Frame Size 7 Only)
2
3
4 (Frame Size 6 Only)

Impeller Diameter (14th Digit)
2
4
6
8
0

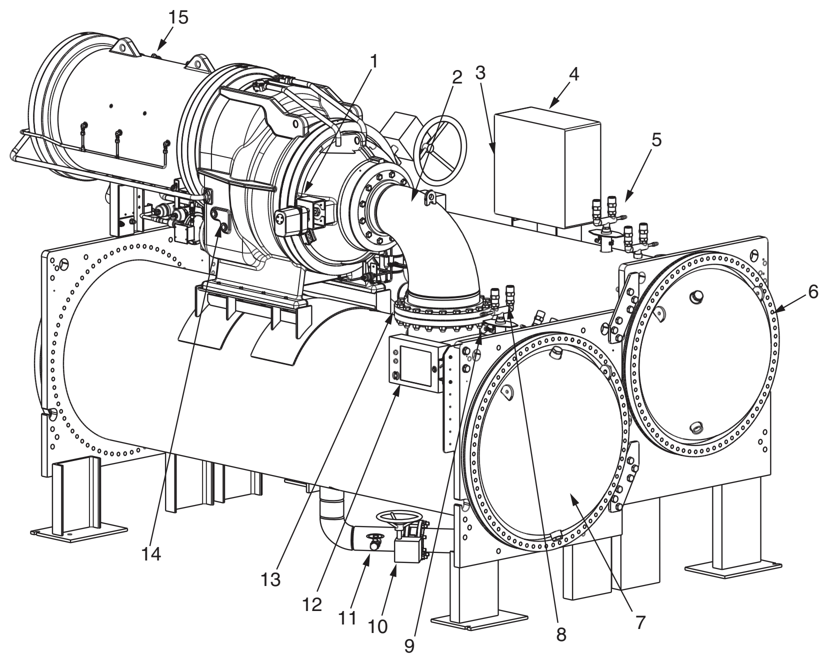
12 15 Q 19843
Week of Year — 12
Year of Manufacture — 15
Place of Manufacture — Q
Unique Number — 19843

SERIAL NUMBER STRUCTURE

*Cooler/Condenser Size Codes with A-C and F-H are with 1-in. OD evaporator tubing.
†Heat exchanger available with frame 7 compressor only.

Fig. 1 — 19XR Two-Stage Chiller Model Number Nomenclature

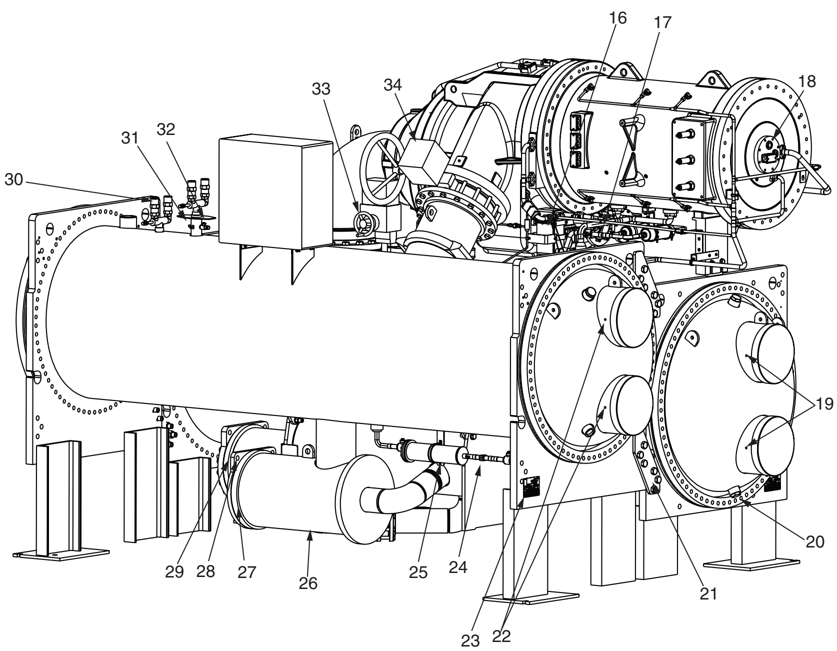
FRONT VIEW



LEGEND

1 — Guide Vane Actuator
2 — Suction Elbow
3 — Chiller Identification Nameplate
4 — Control Panel
5 — Condenser Auto. Reset Relief Valves
6 — Condenser Return End Waterbox Cover
7 — Cooler Return End Waterbox Cover
8 — Cooler Auto. Reset Relief Valves
9 — Cooler Pressure Transducer
10 — Liquid Line Isolation Valve (Optional)
11 — Refrigerant Storage Tank Connection Valve
12 — HMI (Human Machine Interface) Control Panel
13 — Typical Flange Connection
14 — Oil Level Sight Glasses
15 — Compressor Motor Housing

REAR VIEW



LEGEND

16 — Oil Cooler
17 — Oil Drain Changing Valve (Hidden)
18 — Motor Sight Glass
19 — Cooler In/Out Temperature Thermistors
20 — Typical Waterbox Drain Port
21 — Vessel Take-Apart Connector
22 — Condenser In/Out Temperature Thermistors
23 — ASME Nameplate
24 — Refrigerant Moisture/Flow Indicator
25 — Refrigerant Filter/Drier
26 — High Side Float Chamber
27 — High Side Float Ball Valve Assembly (Inside)
28 — Economizer Assembly
29 — Economizer Float Ball Assembly (Inside)
30 — Cooler Auto. Reset Relief Valve
31 — Condenser Pressure Transducer
32 — Refrigerant Charging Valve/Pumpout Connection
33 — Damper Valve
34 — Discharge Isolation Valve (Optional)

Fig. 2 — Typical 19XR 1500-3000 Ton Two-Stage Compressor Chiller Components (XR6 Shown)

REFRIGERATION CYCLE

The compressor continuously draws refrigerant vapor from the cooler at a rate set by the amount of guide vane opening. As the compressor suction reduces the pressure in the cooler, the remaining refrigerant boils at a fairly low temperature (typically 38 to 42°F [3 to 6°C]). The energy required for boiling is obtained from the water flowing through the cooler tubes. With heat energy removed, the water becomes cold enough to use in an air-conditioning circuit or process liquid cooling.

After taking heat from the water, the refrigerant vapor is compressed. Compression adds still more heat energy and the refrigerant is quite warm (typically 98 to 102°F [37 to 40°C]) when it is discharged from the compressor into the condenser.

Relatively cool (typically 65 to 90°F [18 to 32°C]) water flowing into the condenser tubes removes heat from the refrigerant, and the vapor condenses to liquid. The liquid refrigerant passes through orifices into the FLASC (flash subcooler) chamber. Since the FLASC chamber is at a lower pressure, part of the liquid refrigerant flashes to vapor, thereby cooling the remaining liquid. The FLASC vapor is recondensed on the tubes which are cooled by entering condenser water. The liquid drains into a high side float valve chamber between the FLASC chamber and the economizer. The refrigerant is then metered into the economizer. In the economizer, due to lower pressure, as liquid enters the chamber, some liquid will flash into a vapor and cool the remaining liquid. The separated vapor flows to the second stage of the compressor for greater cycle efficiency. A damper valve located on the economizer line to the compressor acts as a pressure-regulating device to stabilize low load, low condensing pressure operating conditions. The damper will back up gas flow and thereby raises the economizer pressure to permit proper refrigerant flow through the economizer valve during those conditions.

The cooled liquid left in the economizer flows through a low side float valve and then into the cooler. The float valve forms a liquid seal to keep vapor from entering the cooler. Liquid refrigerant passes through the low side valve into the cooler. The refrigerant is now at a temperature and pressure at which the cycle began. Figure 3 summarizes the refrigeration cycle.

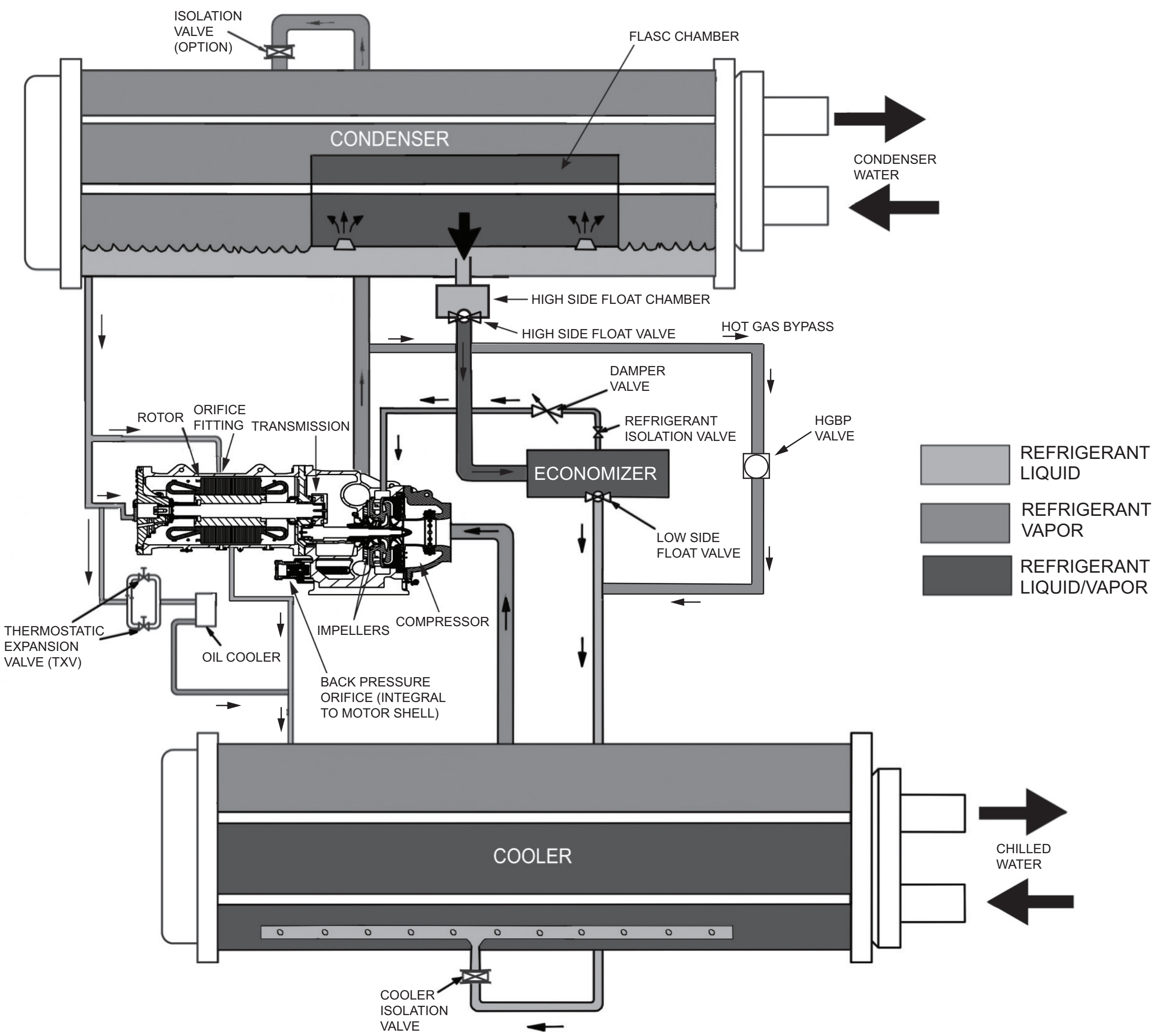


Fig. 3 — Refrigeration Cycle — 19XR Two-Stage Compressor Frame Sizes 6 and 7

MOTOR AND OIL COOLING CYCLE

The motor and the lubricating oil are cooled by liquid refrigerant taken from the bottom of the condenser vessel (Fig. 3 and 4). Refrigerant flow is maintained by the pressure differential that exists due to compressor operation. After the refrigerant flows past an isolation valve, an in-line filter, and a sight glass/moisture indicator, the flow is split between the motor cooling and oil cooling systems.

⚠ CAUTION

To avoid adverse effects on chiller operation, considerations must be made to condenser water temperature control. For steady state operation, the minimum operating refrigerant pressure differential between cooler and condenser is approximately 20 psi (138 kPa) with a maximum evaporator refrigerant temperature of 65°F (18°C). Consult Chiller Builder for required steady state operational limits. Inverted start conditions are acceptable for short durations of time, but for periods exceeding 5 minutes, a special control solution strategy should be used to allow the chiller to establish a minimum refrigerant pressure differential (and thereby adequate equipment cooling).

Flow to the motor cooling system passes through an orifice and into the motor. Once past the orifice, the refrigerant is directed over the motor by spray nozzles. The refrigerant collects in the bottom of the motor casing and is then drained back into the cooler through the motor refrigerant drain line. An orifice (in the motor shell) maintains a higher pressure in the motor shell than in the cooler. The motor is protected by a temperature sensor embedded in the stator windings. An increase in motor winding temperature past the motor override set point overrides the temperature capacity control to hold, and if the motor temperature rises 10°F (5.5°C) above this set point, the controls close the inlet guide vanes. If the temperature rises above the safety limit, the compressor shuts down.

Refrigerant that flows to the oil cooling system is regulated by expansion valves. The expansion valves regulate flow into the oil/refrigerant plate and frame-type heat exchanger (the oil cooler in Fig. 3), and control oil temperature to the bearings. The refrigerant leaving the oil cooler heat exchanger returns to the chiller cooler.

LUBRICATION CYCLE

Summary

The oil pump, oil filter, and oil cooler make up a package located partially in the transmission casing of the compressor-motor assembly. The oil is pumped into a filter assembly to remove foreign particles and is then forced into an oil cooler heat exchanger where the oil is cooled to proper operational temperatures. After the oil cooler, part of the flow is directed to the gears and the high speed shaft bearings; the remaining flow is directed to the motor shaft bearings. Oil drains into the transmission oil sump to complete the cycle (Fig. 3 and 4).

Details

Oil is charged into the lubrication system through a hand valve. Two sight glasses in the oil reservoir permit oil level observation. Normal oil level is between the middle of the upper sight glass and the top of the lower sight glass when the compressor is shut down. The oil level should be visible in at least one of the 2 sight glasses during operation. Oil sump temperature is displayed on the HMI default screen. During compressor operation, the oil sump temperature ranges between 125 and 150°F (52 and 66°C).

The oil pump suction is fed from the oil reservoir. An oil pressure relief valve maintains differential pressure in the system at the pump discharge. A range of 18 to 40 psid (124 to 172 kPad) is normal. This differential pressure can be read directly from the default HMI screen. The oil pump discharges oil to the oil filter assembly. This filter can be closed to permit removal of the filter without draining the entire oil system. The oil is then piped to the oil cooler heat exchanger. The oil cooler uses refrigerant from the condenser as the coolant. The refrigerant cools the oil to a temperature between 120 and 140°F (49 and 60°C).

As the oil leaves the oil cooler, it passes the oil pressure transducer and the sensor for the refrigerant expansion valve on the oil cooler. The oil is then divided. Part of the oil flows to the thrust bearing, forward pinion bearing, and gear spray. The rest of the oil lubricates the motor shaft bearings and the rear pinion bearing. The oil temperature is measured in the bearing housing as it leaves the bearings. The oil then drains into the oil reservoir at the base of the compressor. The control measures the temperature of the oil in the sump and maintains the temperature during shutdown. This temperature is read on the HMI default screen. See the Controls Operation and Troubleshooting Manual for details.

During the chiller start-up, the oil pump is energized and provides 40 seconds of lubrication to the bearings after pressure is verified before starting the compressor. During shutdown, the oil pump runs for 60 seconds to ensure lubrication as the compressor coasts to a stop.

The oil pump is a gerotor-style pump with external filters. A gerotor pump has two rotors, one inside the other; their center points are offset with respect to each other. This type of pump provides a smooth continuous flow. It is also quieter than other designs. See Fig. 5.

Bearings

The 19XR compressor assemblies include a combination of radial bearings and thrust bearings. The low speed shaft assembly is supported by two journal bearings located on each end of the low speed shaft. The bearing closer to the bull gear includes a smaller babbitted thrust face, designed to handle axial forces.

Oil Reclaim System

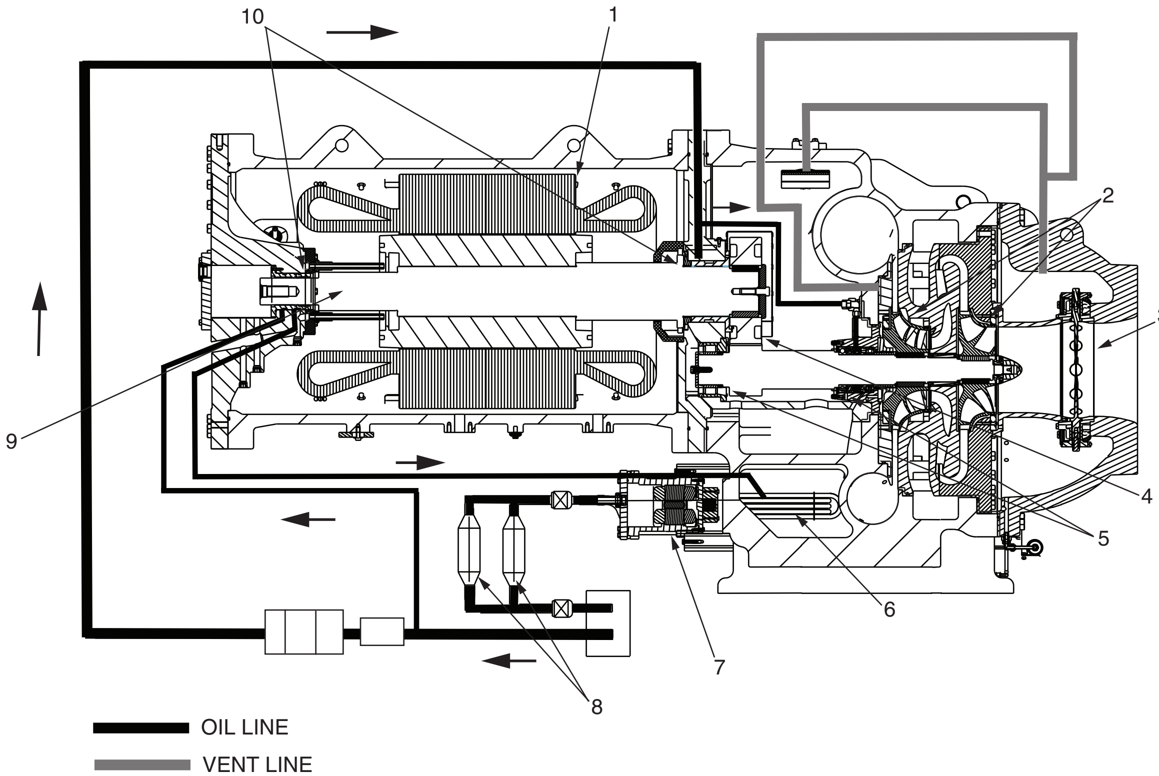
The oil reclaim system returns oil lost from the compressor housing back to the oil reservoir by recovering the oil from 2 areas on the chiller. The guide vane housing is the primary area of recovery. Oil is also recovered by skimming it from the operating refrigerant level in the cooler vessel.

PRIMARY OIL RECOVERY MODE

Oil is normally recovered through the guide vane housing on the chiller. This is possible because oil is normally entrained with refrigerant in the chiller. As the compressor pulls the refrigerant up from the cooler into the guide vane housing to be compressed, the oil normally drops out at this point and falls to the bottom of the guide vane housing where it accumulates. Using discharge gas pressure to power an eductor, the oil is drawn from the housing and is discharged into the oil reservoir.

SECONDARY OIL RECOVERY METHOD

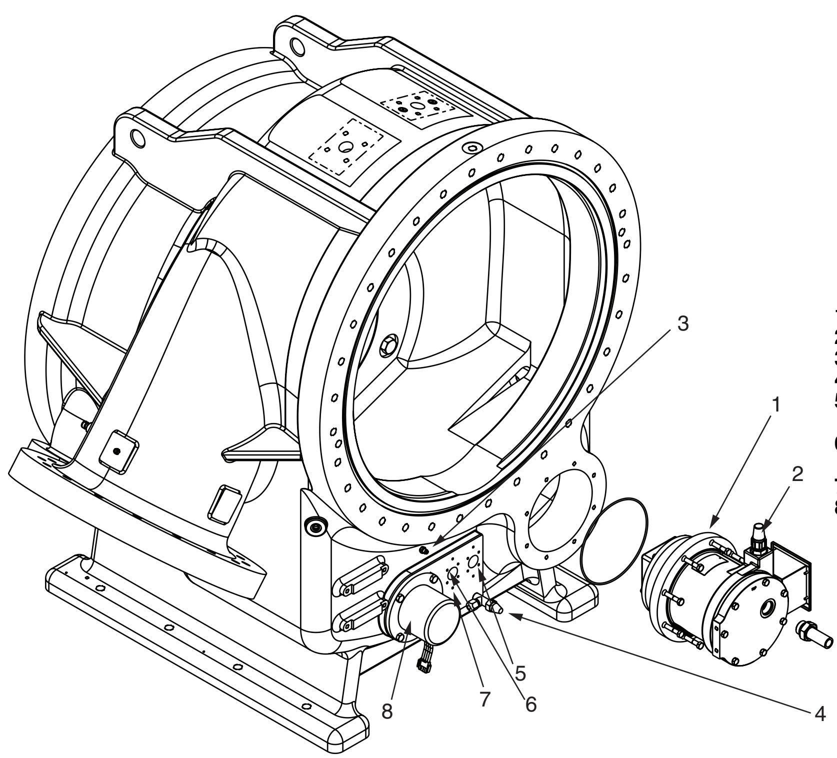
The secondary method of oil recovery is significant under light load conditions, when the refrigerant going up to the compressor suction does not have enough velocity to bring oil along. Under these conditions, oil collects in a greater concentration at the top level of the refrigerant in the cooler. Using discharge gas to power eductors, this oil and refrigerant mixture is skimmed from the side of the cooler and is then drawn up to the guide vane housing. There is a filter in this line. Because the guide vane housing pressure is much lower than the cooler pressure, the refrigerant boils off, leaving the oil behind to be collected by the primary oil recovery method.



LEGEND

1 — Motor Stator
2 — Impellers
3 — Variable Inlet Guide Vanes
4 — Transmission
5 — High Speed Shaft Bearings
6 — Oil Heater
7 — Oil Pump
8 — Oil Filters
9 — Motor Rotor
10 — Motor Shaft Bearings

Fig. 4 — 19XR Two-Stage Compressor Lubrication System



LEGEND

1 — Gerotor Oil Pump
2 — Oil Pressure Regulator Valve
3 — Oil Sump Pressure Transducer
4 — Oil Sump Drain Valve
5 — High Speed Compressor End Bearing and Low Speed Compressor End Bearing (Terminal Box #2)
6 — Low Speed Compressor End Bearing and High Speed Motor End Bearing (Terminal Box #1)
7 — Compressor Oil Sump Temperature
8 — Oil Heater

Fig. 5 — Gerotor Oil Pump

STARTING EQUIPMENT

The 19XR chiller requires a motor starter to operate the centrifugal hermetic compressor motor, the oil pump, and various auxiliary equipment components. The starter is the main field wiring interface for the contractor.

See Carrier's specification for specific starter requirements. All starters must meet these specifications in order to properly start and satisfy mechanical safety requirements.

It is possible that there are two separate circuit breakers inside the starter. These include (1) the main compressor motor circuit breaker, and (2) a circuit breaker which provides power to the chiller control panel. The latter is typically wired in parallel with the first so that power is provided to those services when the main breaker is open. The disconnect switch on the starter front cover is connected to the main breaker. Typically, separate 3-phase power sources as per job requirements are supplied to the control panel to power the oil pump, heater, and controls.

⚠ WARNING

The main circuit breaker on the front of the starter disconnects the main motor power only. Power may be still energized for other circuits. Always check wiring diagrams before initiating any work on the chiller and follow applicable lock-out/tag-out procedures. Failure to disconnect power will result in personal injury.

All starters must include a Carrier control module called the Integrated Starter Module (ISM). This module controls and monitors all aspects of the starter. See the Controls Operation and Troubleshooting guide for additional ISM information. Contact Carrier's Replacement Component Division (RCD) for replacement parts. Current standard North America starter types are Across the Line, Solid-State, Auto-Transformer, and VFD (variable frequency drive).

Solid-State Starter (Optional)

The 19XR chiller may be equipped with a solid-state, reduced-voltage starter. This starter's primary function is to provide on-off control of the compressor motor. This type of starter reduces the peak starting torque, controls the motor inrush current, and decreases mechanical shock. This capability is summed up by the phrase "soft starting." Consult E-Cat for full information about starter offerings. The solid-state starter manufacturer's name is located inside the starter access door.

A solid-state, reduced-voltage starter operates by reducing the starting voltage. The starting torque of a motor at full voltage is typically 125% to 175% of the running torque. When the voltage and the current are reduced at start-up, the starting torque is reduced as well. The object is to reduce the starting voltage to adjust the voltage necessary to develop the torque required to get the motor moving. The voltage is reduced by silicon controlled rectifiers (SCRs). The voltage and current are then ramped up in a desired period of time. Once full voltage is reached, a bypass contactor is energized to bypass the SCRs.

⚠ WARNING

When voltage is supplied to the solid-state circuitry (CB1 is closed), the heat sinks in the starter as well as the wires leading to the motor and the motor terminal are at line voltage. Do not touch the heat sinks, power wiring, or motor terminals while voltage is present or serious injury will result.

The display on the front of the solid-state starter is useful for troubleshooting and starter checkout. The display indicates:

- line voltage
- control voltage status
- power indication
- proper phasing for rotation
- start circuit energized
- ground fault
- current unbalance
- run state

The starter is further explained in the Check Starter section, page 19.

Free-Standing Medium Voltage VFD (Optional)

For optimum efficiency, the 19XR chiller can be combined with a VFD. This option is a free-standing, medium voltage current source drive that does not require a transformer between the power source and the drive. The drive meets IEEE-519 specifications.

CONTROLS

Definitions

ANALOG SIGNAL

An *analog signal* varies in proportion to the monitored source. It quantifies values between operating limits. (Example: A temperature sensor is an analog device because its resistance changes in proportion to the temperature, generating many values.)

DISCRETE SIGNAL

A *discrete signal* is a 2-position representation of the value of a monitored source. (Example: A switch produces a discrete signal indicating whether a value is above or below a set point or boundary by generating an on/off, high/low, or open/closed signal.)

General

The 19XR centrifugal liquid chiller contains a microprocessor-based control center that monitors and controls all operations of the chiller. The microprocessor control system matches the cooling capacity of the chiller to the cooling load while providing state-of-the-art chiller protection. The system controls cooling load within the set point plus the deadband by sensing the leaving chilled water or brine temperature and regulating the inlet guide vane via a mechanically linked actuator motor. The guide vane is a variable flow pre-whirl assembly that controls the refrigeration effect in the cooler by regulating the amount of refrigerant vapor flow into the compressor. An increase in guide vane opening increases capacity. A decrease in guide vane opening decreases capacity. The microprocessor-based control center protects the chiller by monitoring the digital and analog inputs and executing capacity overrides or safety shutdowns, if required.

PIC 5 System Components

The chiller control system is called the PIC 5 (Product Integrated Control 5). See Table 1. As with previous PIC versions, the PIC 5 system controls the operation of the chiller by monitoring all operating conditions. The PIC 5 control system can diagnose a problem and let the operator know what the problem is and what to check. It promptly positions the guide vanes to maintain leaving chilled water temperature. It can interface with auxiliary equipment such as pumps and cooling tower fans to turn them on when required. It continually checks all safeties to prevent any unsafe operating condition. It also regulates the oil heater while the compressor is off and regulates the hot gas bypass valve, if installed. The PIC 5 controls provide critical protection for the compressor motor and control the motor starter.

Table 1 — Major PIC 5 Components and Panel Locations

PIC 5 COMPONENT	PANEL LOCATION
Chiller Human Machine Interface (HMI) and Display	HMI Control Panel
Integrated Starter Module (ISM)	Starter Cabinet
Chiller IO Boards	Control Panel
Oil Heater Contactor (1C)	Control Panel
Oil Pump Contactor (2C)	Control Panel
Hot Gas Bypass Relays (HCLR, HOPR) (Optional)	Control Panel
Control Transformers (T1, T2, T3)	Control Panel
Temperature Sensors	See Fig. 2 and Fig. 5
Pressure Transducers	See Fig. 2 and Fig. 5

NOTE: For detailed information about the PIC 5 HMI (human machine interface), see the 19XR with PIC 5 Controls Operation and Troubleshooting manual.

START-UP/SHUTDOWN/ RECYCLE SEQUENCE

Local Start/Stop Control

Local start-up (or manual start-up) is initiated by pressing the gray Start/Stop icon on the HMI interface. See Fig. 6.

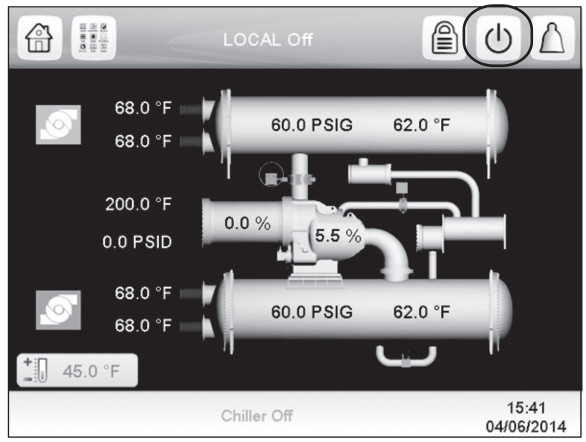


Fig. 6 — Chiller Start/Stop Icon

This initiates the PIC 5 starting sequence by displaying the list of operating modes. Press Local On to initiate start-up. See Fig. 7.

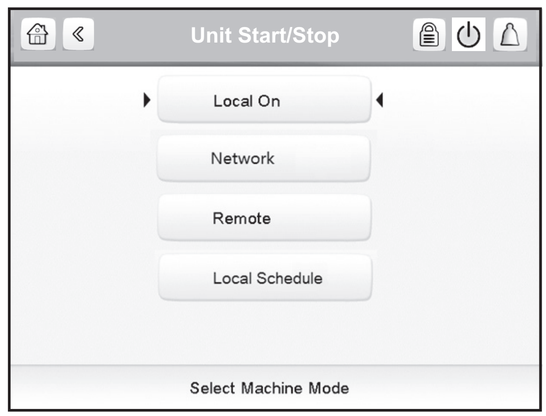


Fig. 7 — Local On

NOTE: Prior to start-up, the start-to-start timer and the stop-to-start timer must have elapsed and all alarms must be cleared (see Troubleshooting Guide section on page 43).

When start-up is initiated the status screen displays the start-up progress and the Start/Stop icon ⏻ blinks green. Once local start-up begins, the PIC 5 control system performs a series of pre-start tests to verify that all pre-start alerts and safeties are within acceptable limits. Table 2 shows appropriate Prestart Alerts/Alarms conditions. If a test is not successful, the start-up is delayed or aborted. If the tests are successful, the start-up will be in progress and the COMPRESSOR RUN STATUS shall be "Startup." The control shall then energize the chilled water/brine pump relay.

Five seconds later, the condenser pump relay energizes. Thirty seconds later the PIC 5 control system monitors the chilled water and condenser water flow devices and waits until the *WATER FLOW VERIFY TIME* (operator-configured, default 5 minutes) expires to confirm flow. After flow is verified, the chilled water temperature is compared to *CONTROL POINT* plus *1/2 CHILLED WATER DEADBAND*. If the temperature is less than or equal to this value, the PIC 5 control system turns off the condenser pump relay and goes into a Recycle mode.

If the water/brine temperature is high enough, the start-up sequence continues and checks the guide vane position. If the guide vanes are more than 4% open, the start-up waits until the

PIC 5 control system closes the vanes. If the vanes are closed and the oil pump pressure is less than 4 psi (27.6 kPa), the oil pump relay energizes. The PIC 5 control system then waits until the oil pressure (*OIL PRESS VERIFY TIME*, operator-configured, default of 40 seconds) reaches a maximum of 18 psi (124 kPa). After oil pressure is verified, the PIC control system waits 40 seconds, and the compressor start relay (1CR) energizes to start the compressor. Compressor ontime and service ontime timers start, and the compressor *STARTS IN 12 HOURS* counter and the number of starts over a 12-hour period counter advance by one.

Failure to verify any of the requirements up to this point will result in the PIC 5 control system aborting the start and displaying the applicable pre-start alert alarm state number near the bottom of the home screen on the HMI panel. A prestart failure does not advance the *STARTS IN 12 HOURS* counter. Any failure after the 1CR relay has energized results in a safety shutdown, advances the starts in 12 hours counter by one, and displays the applicable shutdown status on the display.

The minimum time to complete the entire prestart sequence is approximately 185 seconds. See Fig. 8 for normal start-up timing sequence. See Table 2 for a list of prestart checks.

Lubrication Control

As part of the prestart checks executed by the controls, the oil sump temperature is compared to the evaporator saturated refrigerant temperature. If the oil temperature is less than 140°F (60°C) and less than evaporator saturated refrigerant temperature plus 50°F (27.8°C), the start-up will be delayed until either of these conditions is no longer true. Once this temperature is confirmed, the start-up continues.

The oil heater relay is energized whenever the chiller compressor is off and the oil sump temperature is less than 140°F (60°C) or the oil sump temperature is less than the evaporator saturated refrigerant temperature plus 53°F (29.4°C). The oil heater is turned off when either of the following conditions is true:

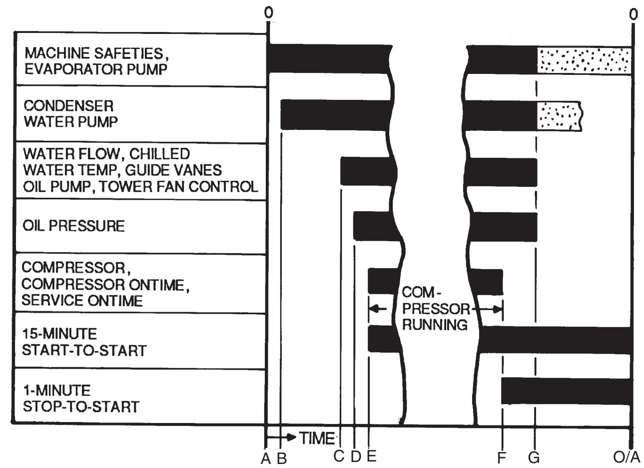
- Oil sump temperature is more than 152°F (66.7°C)
- Oil sump temperature is more than 144°F (62.2°C) and more than the evaporator saturated refrigerant temperature plus 55°F (30.6°C)

The oil heater is always off when the compressor is running. The oil pump is also energized for 30 seconds after each 30 minutes of oil heat relay being energized in order to stir the oil for more evenly distributed heating.

Table 2 — Prestart Checks

PRESTART CHECK CONDITION*	STATE NUMBER†
STARTS IN 12 HOURS ≥ 8 (not counting recycle restarts or auto restarts after power failure)	Alert – 100
OIL SUMP TEMP ≤ 140°F (60°C) and OIL SUMP TEMP ≤ EVAP_-SAT + 50°F (27.8°C)	Alert – 101
COND PRESSURE ≥ COND PRESS OVERRIDE – 20 psi	Alert – 102
#RECYCLE RESTARTS LAST 4 HOURS > 5	Alert – 103
COMP BEARING TEMPS ≥ COMP BEARING ALERT – 10°F (5.6°C)	Alarm – 230
COMP MOTOR WINDING TEMP ≥ COMP MOTOR WINDING – 10°F (5.6°C)	Alarm – 231
COMP DISCHARGE TEMPERATURE ≥ COMP DISCHARGE ALERT – 10°F (5.6°C)	Alarm – 232
EVAP_SAT < Evap trip point** + EVAP OVERRIDE DELTA T	Alarm – 233
EVAP REFRIG LIQUID TEMP < Evap trip point** + EVAP OVERRIDE DELTA T	Alarm – 233
AVERAGE LINE VOLTAGE ≤ UNDERVOLTAGE THRESHOLD	Alarm – 234
AVERAGE LINE VOLTAGE ≥ OVERVOLTAGE THRESHOLD	Alarm – 235
CHECK FOR GUIDE VANE CALIBRATION	Alarm – 236

* If Prestart Check Condition is True, then resulting State is as indicated in the State Number column.
† See the Controls Operation and Troubleshooting guide for alarm and alert codes.
** Evap trip point = 33 F (0.6 C) (water) or EVAP REFRIG TRIPPOINT (brine)



A — START INITIATED: Pre-start checks are made; evaporator pump started.*
B — Condenser water pump started (5 seconds after A).
C — Water flows verified (30 seconds to 5 minutes maximum after B). Chilled water temperatures checked against control point. Guide vanes checked for closure. Oil pump started; tower fan control enabled.
D — Oil pressure verified (15 seconds minimum, 300 seconds maximum after C).
E — Compressor motor starts; compressor ontime and service ontime start, 15-minute inhibit timer starts (10 seconds after D), total compressor starts advances by one, and the number of starts over a 12-hour period advances by one.
F — SHUTDOWN INITIATED — Compressor motor stops; compressor ontime and service ontime stop, and 1-minute inhibit timer starts.
G — Oil pump and evaporator pumps de-energized (60 seconds after F). Condenser pump and tower fan control may continue to operate if condenser pressure is high. Evaporator pump may continue if in RECYCLE mode.
O/A — Restart permitted (both inhibit timers expired: minimum of 15 minutes after E; minimum of 1 minute after F).

* Auto Restart After Power Failure Timing sequence will be faster.

Fig. 8 — Control Timing Sequence for Normal Start-Up

Shutdown

The unit can be stopped locally using the HMI by pressing the green Start/Stop icon . The Unit Start/Stop screen is displayed. Press Confirm Stop (see Fig. 9).

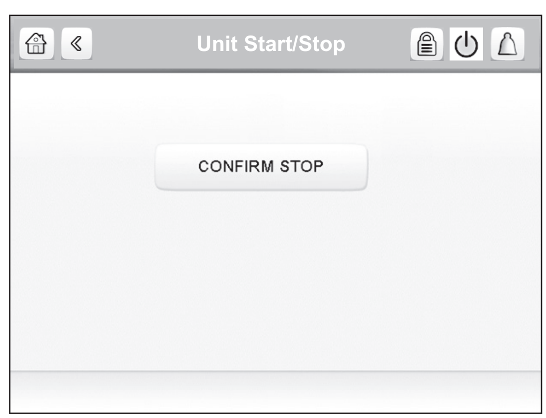


Fig. 9 — Confirm Stop

BEFORE INITIAL START-UP

Job Data Required

- list of applicable design temperatures and pressures (product data submittal)
- chiller certified prints
- starting equipment details and wiring diagrams
- diagrams and instructions for special controls or options
- 19XR Installation Instructions

Equipment Required

- mechanic's tools (refrigeration)
- digital volt-ohmmeter (DVM)
- true RMS (root mean square) digital multimeter with clamp-on current probe or true RMS digital clamp-on ammeter for at least 480 vac
- electronic leak detector
- absolute pressure manometer or wet-bulb vacuum indicator (see Fig. 10)
- insulation tester for compressor motor rated at motor design voltage

Fig. 10 — Electronic Micron Gage

Remove Shipping Packaging

Remove any packaging material from the unit and starter.

Open Oil Circuit Valves

Check to ensure the oil filter isolation valves are open by removing the valve cap and checking the valve stem.

Tighten All Gasketed Joints

Gaskets normally relax by the time the chiller arrives at the jobsite. Tighten all gasketed joints to ensure a leak-tight chiller (does not apply to refrigerant joints covered by factory insulation). Gasketed joints (excluding O-rings) may include joints at some or all of the following:

- waterbox covers
- compressor suction elbow flanges (at compressor and at the cooler)
- compressor discharge flange
- compressor discharge line spacer (both sides) if no isolation valve
- cooler inlet line spacer (both sides) if no isolation valve
- hot gas bypass valve (both sides of valve)
- hot gas bypass flange at compressor

See Tables 3 and 4 for bolt torque requirements.

Check Chiller Tightness

Figure 11 outlines the proper sequence and procedures for leak testing.

The 19XR chillers are shipped with the refrigerant contained in the condenser shell and the oil charge in the compressor. The cooler is shipped with a 15 psig (103 kPa) refrigerant charge. Units may be ordered with the refrigerant shipped separately, along with a 15 psig (103 kPa) nitrogen-holding charge in each vessel.

To determine if there are any leaks, the chiller should be charged with refrigerant. Use an electronic leak detector to check all flanges and solder joints after the chiller is pressurized. If any leaks are detected, follow the leak test procedure (page 16).

If the chiller is spring isolated, keep all springs blocked in both directions to prevent possible piping stress and damage during the transfer of refrigerant from vessel to vessel during the leak test process, or any time refrigerant is being transferred. Adjust the springs when the refrigerant is in operating condition and the water circuits are full.

Table 3 — Bolt Torque Requirements, Foot Pounds

BOLT SIZE (in.)	SAE 2, A307 GR A HEX HEAD NO MARKS LOW CARBON STEEL		SAE 5 SOCKET HEAD OR HEX WITH 3 RADIAL LINES, OR SA499 MEDIUM CARBON STEEL		SAE 8 HEX HEAD WITH 6 RADIAL LINES OR SA354 GR BD MEDIUM CARBON STEEL	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1/4	4	6	6	9	9	13
5/16	8	11	13	18	20	28
3/8	13	19	22	31	32	46
7/16	21	30	35	50	53	75
1/2	32	45	53	75	80	115
9/16	46	65	75	110	115	165
5/8	65	95	105	150	160	225
3/4	105	150	175	250	260	370
7/8	140	200	265	380	415	590
1	210	300	410	580	625	893
1 1/8	330	475	545	780	985	1,410
1 1/4	460	660	770	1,100	1,380	1,960
1 3/8	620	885	1,020	1,460	1,840	2,630
1 1/2	740	1060	1,220	1,750	2,200	3,150
1 5/8	1010	1450	1,670	2,390	3,020	4,310
1 3/4	1320	1890	2,180	3,110	3,930	5,610
1 7/8	1630	2340	2,930	4,190	5,280	7,550
2	1900	2720	3,150	4,500	5,670	8,100
2 1/4	2180	3120	4,550	6,500	8,200	11,710
2 1/2	3070	4380	5,000	7,140	11,350	16,210
2 3/4	5120	7320	8,460	12,090	15,710	22,440
3	6620	9460	11,040	15,770	19,900	28,440

Table 4 — Bolt Torque Requirements, Foot Pounds (Metric Bolts)

BOLT SIZE (METRIC)	CLASS 8.8		CLASS 10.9	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
M4	1.75	2.5	2.5	3.5
M6	6	9	8	12
M8	14	20	20	30
M10	28	40	40	57
M12	48	70	70	100
M16	118	170	170	240
M20	230	330	330	470
M24	400	570	570	810
M27	580	830	820	1175

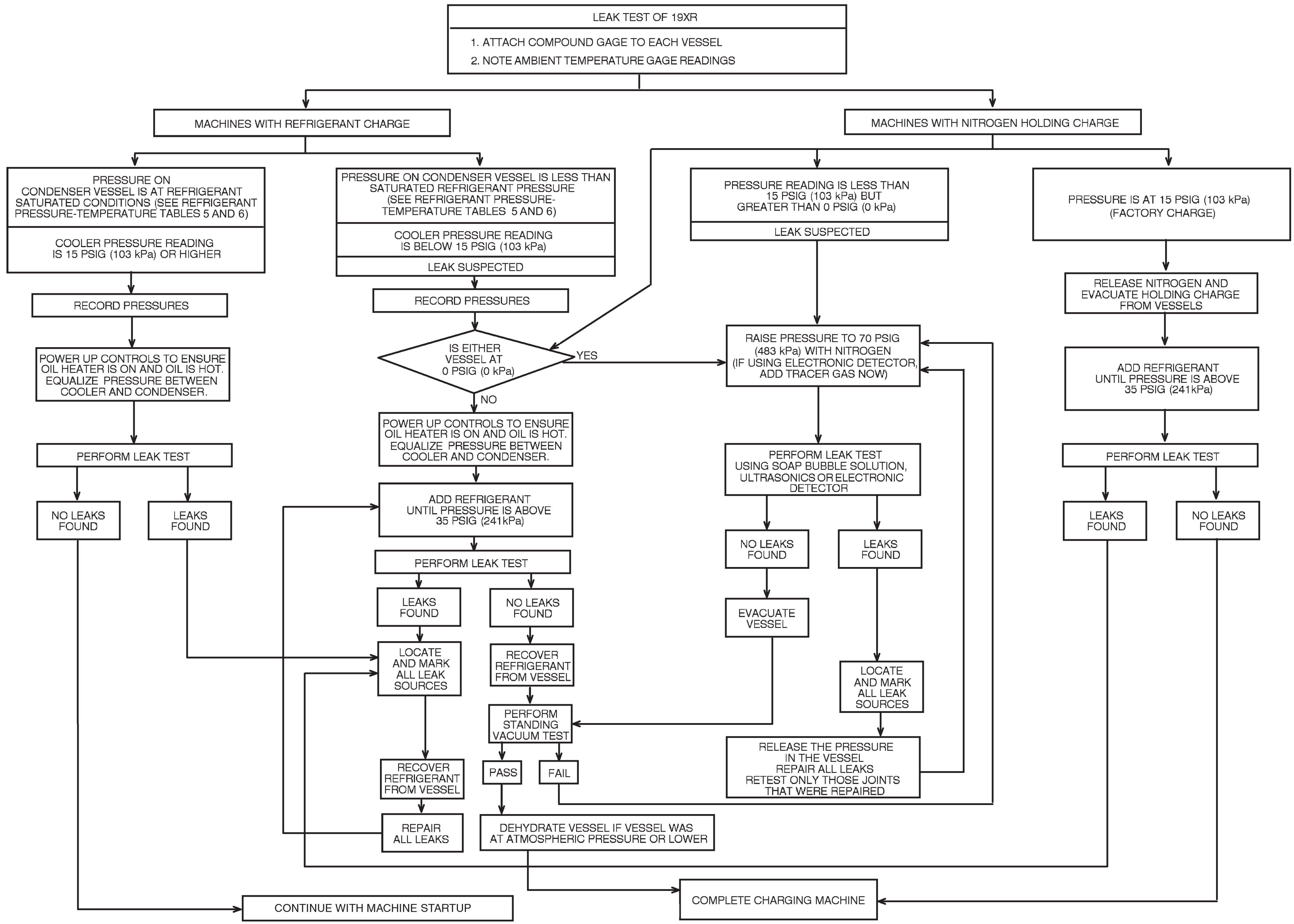


Fig. 11 — 19XR Leak Test Procedures

Refrigerant Tracer

Carrier recommends the use of an environmentally acceptable refrigerant tracer for leak testing with an electronic detector.

Ultrasonic leak detectors can also be used if the chiller is under pressure.

⚠ WARNING

Do not use air or oxygen as a means of pressurizing the chiller. Mixtures of HFC-134a and air can undergo combustion, resulting in equipment damage and possible personal injury.

Leak Test Chiller

Due to regulations regarding refrigerant emissions and the difficulties associated with separating contaminants from the refrigerant, Carrier recommends the following leak test procedure. Refer to Tables and for refrigerant pressure/temperature values.

1. If the pressure readings are normal for the chiller condition:
   a. Evacuate the holding charge from the vessels, if present.
   b. Raise the chiller pressure, if necessary, by adding refrigerant until pressure is at the equivalent saturated pressure for the surrounding temperature. Follow pumpout procedures in the Transfer Refrigerant from Pumpout Storage Tank to Chiller section, Steps 1a-e, page 35.

⚠ CAUTION

Never charge liquid refrigerant into the chiller if the pressure in the chiller is less than 35 psig (241 kPa) for HFC-134a. Charge as a gas only, with the cooler and condenser pumps running, until this pressure is reached, using PUMPDOWN/LOCKOUT (located in the Maintenance menu) and TERMINATE LOCKOUT mode on the PIC 5 control interface. Flashing of liquid refrigerant at low pressures can cause tube freeze-up and considerable damage.

   c. Leak test chiller as outlined in Steps 3 to 9.
2. If the pressure readings are abnormal for the chiller condition:
   a. Prepare to leak test chillers shipped with refrigerant (Step 2h).
   b. Check for large leaks by connecting a nitrogen bottle and raising the pressure to 30 psig (207 kPa). Soap test all joints. If the test pressure holds for 30 minutes, prepare the test for small leaks (Steps 2g and 2h).
   c. Plainly mark any leaks that are found.
   d. Release the pressure in the system.
   e. Repair all leaks.
   f. Retest the joints that were repaired.
   g. After successfully completing the test for large leaks, remove as much nitrogen, air, and moisture as possible, given the fact that small leaks may be present in the system. This can be accomplished by following the dehydration procedure outlined in the Chiller Dehydration section, page 18.
   h. Slowly raise the system pressure to a maximum of 160 psig (1103 kPa) but no less than 35 psig (241 kPa) for HFC-134a by adding refrigerant (below 35 psig refrigerant must be added as a gas). Proceed with the test for small leaks (Steps 3 to 9).
3. Check the chiller carefully with an electronic leak detector or soap bubble solution.
4. Leak Determination — If an electronic leak detector indicates a leak, use a soap bubble solution, if possible, to confirm. Total all leak rates for the entire chiller. Leakage at rates greater than 0.1% of the total charge per year must be repaired. Note the total chiller leak rate on the start-up report.
5. If no leak is found during the initial start-up procedures, complete the transfer of refrigerant gas from the storage tank to the chiller. Retest for leaks.
6. If no leak is found after a retest:
   a. Transfer the refrigerant to the storage tank and perform a standing vacuum test as outlined in the Standing Vacuum Test section, below.
   b. If the chiller fails the standing vacuum test, check for large leaks (Step 2b).
   c. If the chiller passes the standing vacuum test, dehydrate the chiller. Follow the procedure in the Chiller Dehydration section, page 18. Charge the chiller with refrigerant.
7. If a leak is found after a retest, pump the refrigerant back into the storage tank or, if isolation valves are present, pump the refrigerant into the non-leaking vessel. See the Transfer Refrigerant from Pumpout Storage Tank to Chiller section on page 35.
8. Transfer the refrigerant until the chiller pressure is at 18 in. Hg (40 kPa absolute).
9. Repair the leak and repeat the procedure, beginning from Step 2h, to ensure a leak-tight repair. (If the chiller is opened to the atmosphere for an extended period, evacuate it before repeating the leak test.)

Standing Vacuum Test

When performing the standing vacuum test or chiller dehydration, use a manometer or a digital vacuum gage. Dial gages cannot indicate the small amount of acceptable leakage during a short period of time.

1. Attach an absolute pressure manometer or digital vacuum gage to the chiller.
2. Evacuate the vessel to at least 18 in. Hg vac (41 kPa [abs]), using a vacuum pump or the pumpout unit.
3. Valve off the pump to hold the vacuum and record the manometer or indicator reading.
4. Check the leakage rate.
   a. If the leakage rate is less than 0.05 in. Hg (0.17 kPa) in 24 hours, the chiller is sufficiently tight.
   b. If the leakage rate exceeds 0.05 in. Hg (0.17 kPa) in 24 hours, re-pressurize the vessel and test for leaks if refrigerant is available. If not, use nitrogen and a refrigerant tracer. Raise the vessel pressure in increments until the leak is detected. If refrigerant is used, the maximum gas pressure is approximately 70 psig (483 kPa) for HFC-134a at normal ambient temperature. If nitrogen is used, limit the leak test pressure to 160 psig (1103 kPa) maximum.
5. Repair the leak, retest, and proceed with dehydration.

Table 5 — HFC-134a Pressure — Temperature (F)

TEMPERATURE (F)	PRESSURE (PSIG)
0	6.50
2	7.52
4	8.60
6	9.66
8	10.79
10	11.96
12	13.17
14	14.42
16	15.72
18	17.06
20	18.45
22	19.88
24	21.37
26	22.90
28	24.48
30	26.11
32	27.80
34	29.53
36	31.32
38	33.17
40	35.08
42	37.04
44	39.06
46	41.14
48	43.28
50	45.48
52	47.74
54	50.07
56	52.47
58	54.93
60	57.46
62	60.06
64	62.73
66	65.47
68	68.29
70	71.18
72	74.14
74	77.18
76	80.30
78	83.49
80	86.17
82	90.13
84	93.57
86	97.09
88	100.70
90	104.40
92	108.18
94	112.06
96	116.02
98	120.08
100	124.23
102	128.47
104	132.81
106	137.25
108	141.79
110	146.43
112	151.17
114	156.01
116	160.96
118	166.01
120	171.17
122	176.45
124	181.83
126	187.32
128	192.93
130	198.66
132	204.50
134	210.47
136	216.55
138	222.76
140	229.09

Table 6 — HFC-134a Pressure — Temperature (C)

TEMPERATURE (C)	PRESSURE (KPA)
–18.0	44.8
–16.7	51.9
–15.6	59.3
–14.4	66.6
–13.3	74.4
–12.2	82.5
–11.1	90.8
–10.0	99.4
–8.9	108.0
–7.8	118.0
–6.7	127.0
–5.6	137.0
–4.4	147.0
–3.3	158.0
–2.2	169.0
–1.1	180.0
0.0	192.0
1.1	204.0
2.2	216.0
3.3	229.0
4.4	242.0
5.0	248.0
5.6	255.0
6.1	261.0
6.7	269.0
7.2	276.0
7.8	284.0
8.3	290.0
8.9	298.0
9.4	305.0
10.0	314.0
11.1	329.0
12.2	345.0
13.3	362.0
14.4	379.0
15.6	396.0
16.7	414.0
17.8	433.0
18.9	451.0
20.0	471.0
21.1	491.0
22.2	511.0
23.3	532.0
24.4	554.0
25.6	576.0
26.7	598.0
27.8	621.0
28.9	645.0
30.0	669.0
31.1	694.0
32.2	720.0
33.3	746.0
34.4	773.0
35.6	800.0
36.7	828.0
37.8	857.0
38.9	886.0
40.0	916.0
41.1	946.0
42.2	978.0
43.3	1010.0
44.4	1042.0
45.6	1076.0
46.7	1110.0
47.8	1145.0
48.9	1180.0
50.0	1217.0
51.1	1254.0
52.2	1292.0
53.3	1330.0
54.4	1370.0
55.6	1410.0
56.7	1451.0
57.8	1493.0
58.9	1536.0
60.0	1580.0

Chiller Dehydration

Dehydration is recommended if the chiller has been open for a considerable period of time, if the chiller is known to contain moisture, or if there has been a complete loss of chiller holding charge or refrigerant pressure.

⚠ CAUTION

Do not start or megohm-test the compressor motor or oil pump motor, even for a rotation check, if the chiller is under dehydration vacuum. Insulation breakdown and severe damage may result.

⚠ WARNING

Starters must be disconnected by an isolation switch before placing the machine under a vacuum. To be safe, isolate any starter before evacuating the chiller if you are not sure if there are live leads to the hermetic motor.

Dehydration can be done at room temperatures. Using a cold trap (Fig. 12) may substantially reduce the time required to complete the dehydration. The higher the room temperature, the faster dehydration takes place. At low room temperatures, a very deep vacuum is required to boil off any moisture. If low ambient temperatures are involved, contact a qualified service representative for the dehydration techniques required.

Perform dehydration as follows:

1. Connect a high capacity vacuum pump (5 cfm [.002 m^3/s] or larger is recommended) to the refrigerant charging valve (Fig. 2). Tubing from the pump to the chiller should be as short in length and as large in diameter as possible to provide least resistance to gas flow.
2. Use an absolute pressure manometer or a digital vacuum gage to measure the vacuum.
3. If the entire chiller is to be dehydrated, open all isolation valves (if present).
4. With the chiller ambient temperature at 60°F (15.6°C) or higher, operate the vacuum pump until the manometer reads 185 psig (1275 kPa), or a vacuum indicator reads 35°F (1.7°C). Operate the pump an additional 2 hours.

   Do not apply a vacuum greater than 29.82 in. Hg vac (757.4 mm Hg) or go below 33°F (0.56°C) on the wet bulb vacuum indicator. At this temperature and pressure, isolated pockets of moisture can turn into ice. The slow rate of evaporation (sublimation) of ice at these low temperatures and pressures greatly increases dehydration time.
5. Valve off the vacuum pump, stop the pump, and record the instrument reading.
6. After a 2-hour wait, take another instrument reading. If the reading has not changed, dehydration is complete. If the reading indicates vacuum loss, repeat Steps 4 and 5.
7. If the reading continues to change after several attempts, perform a leak test up to the maximum 160 psig (1103 kPa) pressure. Locate and repair the leak, and repeat dehydration.
8. Once dehydration is complete, the evacuation process can continue. The final vacuum prior to charging the unit with refrigerant should in all cases be 29.9 in. Hg (500 microns, 0.07 kPa [abs]) or less.

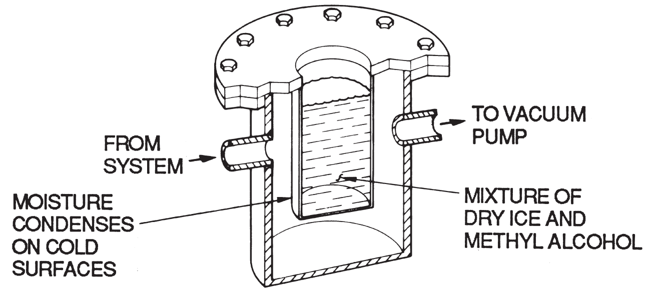


Fig. 12 — Dehydration Cold Trap

Inspect Water Piping

Refer to piping diagrams provided in the certified drawings and the piping instructions in the 19XR Installation Instructions manual. Inspect the piping to the cooler and condenser. Be sure that the flow directions are correct and that all piping specifications have been met.

Piping systems must be properly vented with no stress on waterbox nozzles and covers. Water flows through the cooler and condenser must meet job requirements. Measure the pressure drop across the cooler and the condenser.

⚠ CAUTION

Water must be within design limits, clean, and treated to ensure proper chiller performance and to reduce the potential of tube damage due to corrosion, scaling, or erosion. Carrier assumes no responsibility for chiller damage resulting from untreated or improperly treated water.

Check Relief Valves

Be sure the relief valves have been piped to the outdoors in compliance with the latest edition of ANSI/ASHRAE Standard 15 and applicable local safety codes. Piping connections must allow for access to the valve mechanism for periodic inspection and leak testing.

The standard 19XR relief valves are set to relieve at 185 psig (1275 kPa) chiller design pressure.

Inspect Wiring

⚠ WARNING

Do not check the voltage supply without proper equipment and precautions. Serious injury may result. Follow power company recommendations.

⚠ CAUTION

Do not apply any kind of test voltage, even for a rotation check, if the chiller is under a dehydration vacuum. Insulation breakdown and serious damage may result.

1. Examine the wiring for conformance to the job wiring diagrams and all applicable electrical codes.
2. Compare the ampere rating on the starter nameplate to rating on the compressor nameplate. The overload trip amps must be 108% to 120% of the rated load amps.
3. The starter for a centrifugal compressor motor must contain the components and terminals required for PIC 5 controls platform. Check the certified drawings.
4. Check the voltage to the components and compare it to the nameplate values.
5. Ensure that fused disconnects or circuit breakers have been supplied for the control panel.

6. Ensure all electrical equipment and controls are properly grounded in accordance with job drawings, certified drawings, and all applicable electrical codes.
7. Ensure the customer's contractor has verified proper operation of the pumps, cooling tower fans, and associated auxiliary equipment. This includes ensuring motors are properly lubricated and have proper electrical supply and proper rotation.
8. Test the chiller compressor motor and its power lead insulation resistance with an insulation tester such as a megohmmeter. (Use a tester rated for motor voltage.)
   a. Open the starter main disconnect switch and follow lockout/tagout rules.

⚠ CAUTION

If the motor starter is a solid-state starter, the motor leads must be disconnected from the starter before an insulation test is performed. The voltage generated from the tester can damage the starter solid-state components.

   b. With the tester connected to the motor leads, take 10-second and 60-second megohm readings as follows: 3-Lead Motor — Tie terminals 1, 2, and 3 together and test between the group and ground.
   c. Divide the 60-second resistance reading by the 10-second reading. The ratio, or polarization index, must be one or higher. Both the 10 and 60-second readings must be at least 50 megohms. If the readings on a field-installed starter are unsatisfactory, repeat the test at the motor with the power leads disconnected. Satisfactory readings in this second test indicate the fault is in the power leads.

Check Starter

⚠ WARNING

BE AWARE that certain automatic start arrangements *can engage the starter*. Open the disconnect *ahead* of the starter in addition to shutting off the chiller or pump. Failure to follow this procedure may result in personal injury by electric shock.

Use the instruction and service manual supplied by the starter manufacturer to verify the starter has been installed correctly, to set up and calibrate the starter, and for complete troubleshooting information.

⚠ WARNING

The main disconnect on the starter front panel may not de-energize all internal circuits. Open all internal and remote disconnects before servicing the starter. Failure to follow this procedure may result in personal injury by electric shock.

MECHANICAL STARTER

1. Check all field wiring connections for tightness, clearance from moving parts, and correct connection.
2. Check the contactor(s) to ensure they move freely. Check all other electro-mechanical devices, such as relays, for free movement. If the devices do not move freely, contact the starter manufacturer for replacement components.
3. Reapply starter control power (*not main chiller power*) to check the electrical functions.

   Ensure the starter (with relay 1CR closed) goes through a complete and proper start cycle.

SOLID-STATE STARTER

⚠ WARNING

This equipment is at line voltage when AC power is connected. Pressing the STOP button does not remove voltage.

⚠ CAUTION

An isolation switch or circuit breaker must be open ahead of any solid-state starter when the chiller is in a vacuum. If not, damage to the machine may result.

1. Ensure all wiring connections are properly terminated to the starter.
2. Verify the ground wire to the starter is installed properly and is sufficient size.
3. Verify the motors are properly grounded to the starter.
4. Verify the proper ac input voltage is brought into the starter according to the certified drawings.
5. Apply power to the starter.

Oil Charge

The oil charge for the 19XR two-stage compressor frame size 6 is 29 gal (110 L); for frame size 7 the oil charge is 44.5 gal (168 L).

The chiller is shipped with oil in the compressor. When the sump is full, the oil level should be no higher than the middle of the upper sight glass, and minimum level is the bottom of the lower sight glass (Fig. 2). If oil is added, it must meet Carrier's specification for centrifugal compressor use as described in the Oil Specification section on page 40. Charge the oil through the oil charging valve located near the bottom of the transmission housing. The oil must be pumped from the oil container through the charging valve due to higher refrigerant pressure. The pumping device must be able to lift from 0 to 200 psig (0 to 1380 kPa) or above unit pressure. Oil should only be charged or removed when the chiller is shut down.

Power Up Controls and Check Oil Heater

Ensure that an oil level is visible in the compressor and the chiller is not in a vacuum before energizing the controls. Typically a circuit breaker in the starter energizes the oil heater and the control circuit.

The oil heater is energized by powering the control circuit. This should be done several hours before start-up to minimize oil-refrigerant migration. The oil heater is controlled by the PIC 5 and is powered through a contactor in the control panel. A separate circuit breaker powers the heater, oil pump, and the control circuit. This arrangement allows the heater to energize when the main motor circuit breaker is off for service work or extended shutdowns.

Software Configuration

⚠ WARNING

Do not operate the chiller before the control configurations have been checked and a Control Test has been satisfactorily completed. Protection by safety controls cannot be assumed until all control configurations have been confirmed.

See the 19XR with PIC 5 Controls Operation and Troubleshooting manual for instructions on using the PIC 5 interface to configure the 19XR unit. As the unit is configured, all configuration settings should be written down. A log, such as the one shown on pages CL-1 to CL-11, provides a list for configuration values.

Input the Design Set Points

To access the set point screen, press the Main Menu icon on the home screen. See Fig. 13.

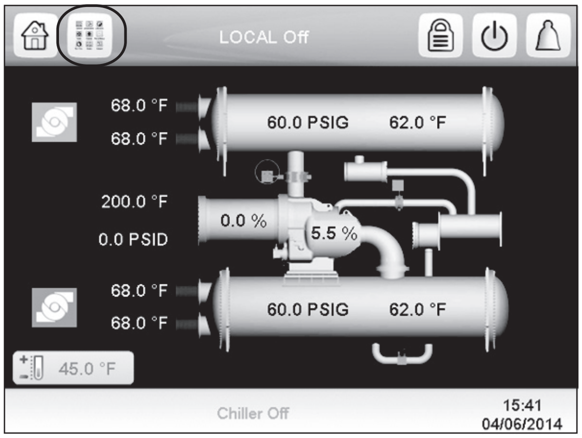


Fig. 13 — Main Menu Icon

The Main Menu screen is displayed. Press the Set Point Table icon (Fig. 14). Note that Login level must exceed Basic to have access to this set point.

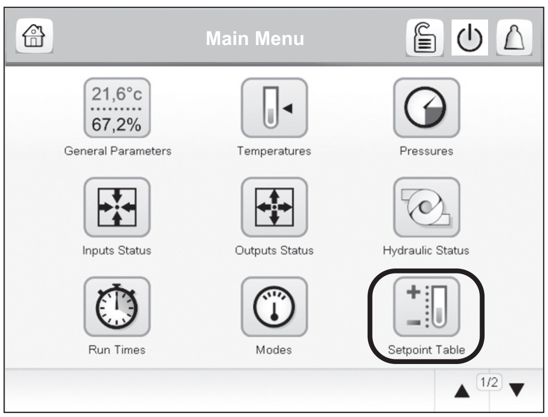


Fig. 14 — Main Menu — Set Point Table Icon

The set point screen is displayed (see Fig. 15). Set the base demand limit set point, and either the LCW set point or the ECW set point. To set a value, press the appropriate set point, enter the value, and press OK. For more information, see the 19XR with PIC 5 Controls Operation and Troubleshooting manual.

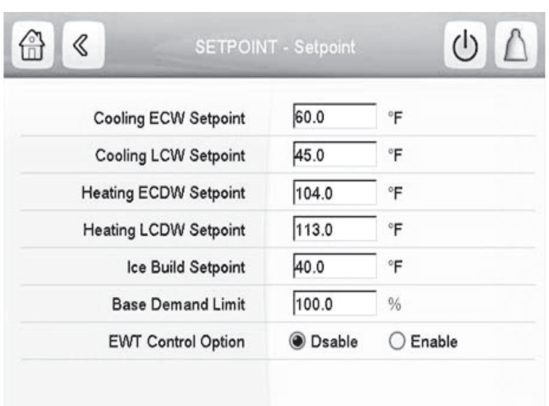


Fig. 15 — Set Point Table Screen

Input the Local Occupied Schedule

Access the schedule screen and set up the occupied time schedule according to the customer's requirements. If no schedule is available, the default is factory set for 24 hours occupied, 7 days per week including holidays. The Schedule Menu as well as the Holiday Menu can be reached through the Configuration Menu (see Appendix A on page 91 for an overview of the available menus). When the control mode is LOCAL SCHEDULE, the chiller will be automatically started if the configured local schedule is occupied; it will be shut down by the unoccupied schedule, EMSTOP software point, STOP button on HMI screen, or remote emergency stop contact.

The Network Schedule should be configured if a CCN system is being installed. When control mode is NETWORK, the chiller can be started and stopped by the CHIL_S_S software point as written by other equipment through the network command and network schedule. The chiller can be shut down by EMSTOP software point and remote emergency stop contact.

For more information about setting time schedules, see the 19XR with PIC 5 Controls Operation and Troubleshooting manual.

Input Service Configurations

For specific values for the following configurations, refer to the chiller performance data or job-specific data sheet:

- password
- log in/logout
- input time and date
- service parameters
- equipment configuration
- automated control test

PASSWORD

The PIC 5 control system provides different levels of access: Basic access, User access, and Factory access. User access provides basic access to the chiller controls. Factory user has access to factory tables. The PIC 5 default password configurations are as follows:

- Basic: No password required
- User: 1111
- Factory: Only authorized user access

When accessing the SERVICE tables, a password must be entered. The password can be changed from the Configuration Menu. USER CONFIGURATION allows change of the User access password. Passwords must be from 1 to 5 digits (range from 1 to 65535).

IMPORTANT: Be sure to remember the password. Retain a copy for future reference. Without the password, access to will not be possible unless accessed by a Carrier representative.

LOGIN/LOGOUT

Press the lock icon on the home screen to enter the password. See Fig. 16.

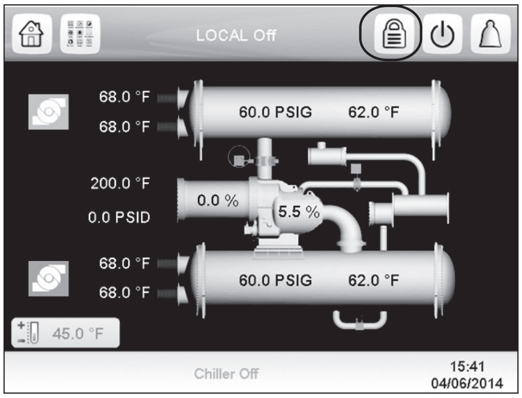


Fig. 16 — Lock Icon

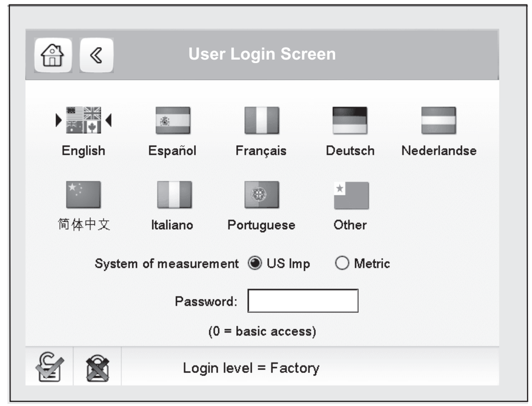


Fig. 17 — User Login Screen

The User Login Screen is displayed. Enter the password on this screen. See Fig 17. The language and system of measurement can also be changed on this screen. For details, see the 19XR with PIC 5 Controls Operation and Troubleshooting guide.

INPUT TIME AND DATE

Set day and time and if applicable Holidays through MAIN MENU → CONFIGURATION MENU → DATE/TIME CONFIGURATION. See the Controls Operation and Troubleshooting guide for details. Because a schedule is integral to the chiller control sequence, the chiller will not start until the time and date have been set.

NOTE: The date format is MM-DD-YY for English units and DD-MM-YY for SI units.

MODIFY CONTROLLER IDENTIFICATION IF NECESSARY

The module address can be changed from the Configuration Menu. Change this address under CONTROL IDENTIFICATION for each chiller if there is more than one chiller at the jobsite. Write the new address on the HMI module for future reference.

CONFIGURE SERVICE TABLES

Access the SERVICE tables through MAIN MENU → CONFIGURATION MENU to modify or view the job site parameters shown in Table . For details, see the 19XR with PIC 5 Controls Operation and Troubleshooting guide.

Table 7 — Job Site Parameters

PARAMETER	TABLE
Starter Type	CONF_ISM — Select 0 for full voltage, 1 for reduced voltage, 2 for solid state, or 3 for free-standing variable frequency drive.
Motor Rated Line Voltage	CONF_ISM — Motor rated voltage from chiller information nameplate.
Volt Transformer Ratio	CONF_ISM — Enter ratio (reduced to a ratio to 1) of power transformer wired to terminal J3 of ISM. If no transformer is used enter 1.
Motor Rated Load Amps	CONF_ISM — Per chiller nameplate data. RL AMPS on compressor nameplate.
Motor Locked Rotor Trip	CONF_ISM — Per chiller identification nameplate.
Starter LRA Rating	CONF_ISM — Enter value from nameplate in starter cabinet MAXIMUM FUSE. This value shall always be “9999” for Benshaw RediStart MX3 wye-delta and solid-state starters.
Motor Current CT Ratio	CONF_ISM — Enter ratio (reduced to a ratio to 1) of current transformers wired to terminal J4 of ISM. This value shall always be “100” for Benshaw RediStart MX3 and solid-state starters.
Current % Imbalance	CONF_ISM — Current imbalance trip threshold. Enter up to 100% for starter type 3 (VFD).
Ground Fault Current Transformers	CONF_ISM — Enter 0 if no ground fault CTs are wired to terminal J5 of ISM. Enter 1 if ground fault CTs are used.
Ground Fault CT Ratio	CONF_ISM — Enter ratio (reduced to a ratio to 1) of ground fault CT.
Single Cycle Dropout	CONF_ISM — ENABLE if motor protection required from drop in line voltage within one cycle.
Line Frequency	CONF_ISM — Enter YES for 60 Hz or NO for 50 Hz.
Line Frequency Faulting	CONF_ISM — ENABLE if motor protection required for drop in line frequency.
Hot Gas Bypass Option	CONF_OPT — 1 = HGBP for Surge Correction; 2 = HGBP for Low Load Operation; 3 = Combination HGBP; 0 = no HGBP or HGBP is Disabled.
Minimum Load Points (Tsmin, IGVmin)	CFGSURGE — Per job data — See modify load points section. Refer to table located in the control panel.
Full (Maximum) Load Points (Tsmax, IGVmax)	CFGSURGE — Chiller Requisition (TSmin, IGV min) or per job data — See modify load points section. Refer to table located in the control panel.
Surge Line Shape Factor (shapefac)	CFGSURGE — Per Chiller Requisition (shapefac). Refer to table located in the control panel.
Chilled Medium	FACTORY — Enter water or brine.
Evaporator Refrigerant Trippoint	CFGLIMIT — Usually 3°F (1.7°C) below design refrigerant temperature.
Evaporator Flow Delta P Cutout	CFGLIMIT — Per Chiller Requisition if available or enter 50% of design pressure drop to 0.5 psi (3.4 kPa).*
Condenser Flow Delta P Cutout	CFGLIMIT — Per Chiller Requisition if available or enter 50% of design pressure drop to 0.5 psi (3.4 kPa).*
High Condenser Water Delta P	CFGLIMIT — Enter the maximum allowable value for condenser water pressure drop.
Motor Rated Kilowatts	FACTORY — Enter value from chiller requisition form (product data submittal) if DEMAND LIMIT SOURCE is set to kW.

*With variable flow systems this point may be configured to the lower end of the range.

NOTE: Other parameters: Screens are normally left at the default settings; they may be changed as required. The time and persistence settings on the CONF_ISM table can be adjusted to increase or decrease the sensitivity to a fault condition. Increasing time or persistence decreases sensitivity. Decreasing time or persistence increases sensitivity to the fault condition.

Field Set Up and Verification

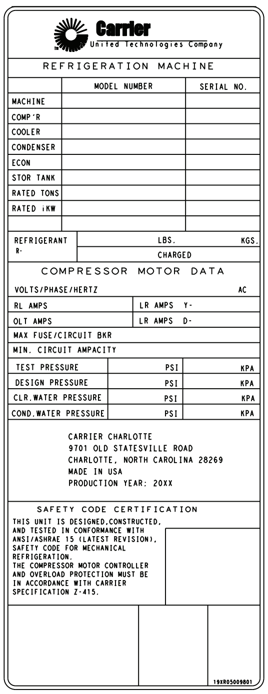
IMPORTANT: Some parameters are specific to the chiller configuration and will need to be verified prior to operation. All command functions must be initiated from the HMI.

Use the HMI touch screen to confirm that the ISM values match the chiller parameter labels and Chiller Builder design data sheet. The ISM values can be located from MAIN MENU → CONFIGURATION MENU → ISM CONFIGURATION.

LABEL LOCATIONS

Verify the following labels have been installed properly and match the chiller requisition:

- Surge Parameters — Located inside the chiller control panel.
- Chiller identification nameplate — Located on the right side of the control panel. (See Fig. 18.)



CHILLER ID NAMEPLATE — CONSTANT SPEED CHILLER

Fig. 18 — Machine Identification Nameplate

STARTER/DRIVE PROTECTION AND OTHER INCOMING WIRING

1. Verify that the branch disconnects or other local disconnects are open and properly tagged out.
2. Verify that the branch circuit protection and AC input wiring to the starter are in accordance with NEC/CEC (National Electrical Code/California Energy Commission) and all other local codes.
3. Verify that the fuses are per the field wiring diagram.
4. Verify that the incoming source does not exceed the SCCR (short circuit current rating) of the equipment marking.
5. Verify the power lugs in the starter/VFD and branch protection are properly secured. Inspect the ground cable and ensure it is properly connected at the branch and to the ground lug in the starter.
6. Verify the conduit for the power wiring in securely connected to the starter flanged cover and runs continuously to the branch protection.
7. Ensure the control and signal wires connected to the chiller controller or the starter/VFD are in separate conduits.

FINE TUNING VPF (VARIABLE PRIMARY FLOW) SURGE PREVENTION

Figures 19-22 show how the parameters defined below will affect the configured surge line. The menu can be found under MAIN MENU → CONFIGURATION MENU → SURGE CORRECTION CONFIG.

NOTE: Before tuning surge prevention, check for VFD speed limitation or capacity overrides. If the source of low capacity is found in one of these places, do not proceed with an attempt to tune the Surge Prevention configurations.

If capacity is not reached

and

1. ACTUAL GUIDE VANE POSITION < GUIDE VANE TRAVEL RANGE

and

2. SURGE PREVENTION ACTIVE = YES (can be identified in MAIN MENU → MAINTENANCE MENU → SURGE CORRECTION)

and

3. PERCENT LINE CURRENT < 100%

then the surge line is probably too conservative.

Note the following parameters from HMI when maximum ACTUAL LINE CURRENT is achieved:

- EVAPORATOR REFRIGERANT TEMP
- EVAPORATOR PRESSURE
- CONDENSER REFRIG TEMP
- CONDENSER PRESSURE
- ACTUAL GUIDE VANE POSITION
- ACTUAL LINE CURRENT

The ACTIVE DELTA TSAT and the CALC REF DELTA TSAT can be monitored on the MAINTENANCE MENU → SURGE CORRECTION screen. When ACTUAL DELTA TSAT exceeds CALC REF DELTA TSAT + ENVELOPE LINE OFFSET surge prevention will occur.

If ACTUAL GUIDE VANE POSITION is less than 30%, then increase SURGE DELTA TSMIN in steps of 2ºF (1.2ºC) until one of the three conditions listed above no longer applies. Do not change SURGE DELTA TSMAX.

If ACTUAL GUIDE VANE POSITION is greater than 60%, then increase SURGE DELTA TSMAX in steps of 2ºF (1.2ºC) until cooling capacity is reached or one of conditions listed above no longer applies. Do not change SURGE/HGBP DELTA TSMIN.

If ACTUAL GUIDE VANE POSITION is more than 30% AND less than 60%, then:

1. Increase SURGE DELTA TSMIN in steps of 2ºF (1.2ºC).
2. Increase SURGE DELTA TSMAX in steps of 2ºF (1.2ºC).
3. Repeat Steps 1 and 2 until one of the conditions listed above no longer applies.

NOTE: DELTA TSMIN should seldom need to be increased more than 10 degrees above the selection program value. Likewise, DELTA TSMAX rarely requires more than a 2ºF (1.2ºC) increase.

If surge is encountered then the controls surge prevention algorithm surge line is probably too optimistic or high. Note following parameters from HMI at surge:

- EVAPORATOR REFRIGERANT TEMP
- EVAPORATOR PRESSURE
- CONDENSER REFRIG TEMP
- CONDENSER PRESSURE
- ACTUAL GUIDE VANE POSITION
- AVERAGE LINE CURRENT

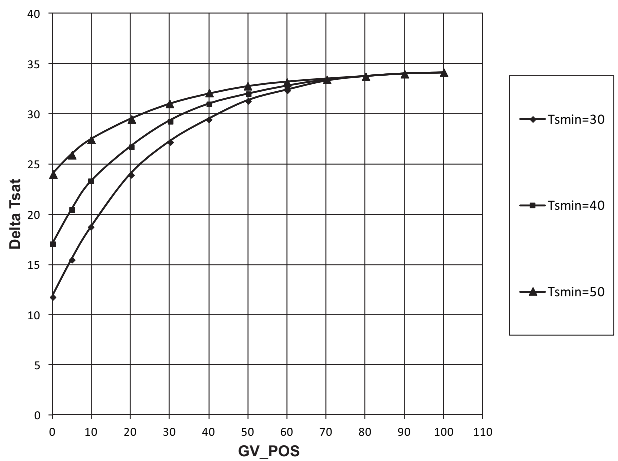


Fig. 19 — Effect of SURGE DELTA TSMIN on Surge Prevention

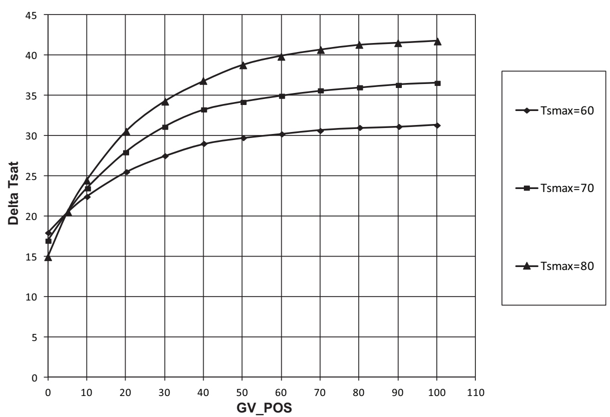


Fig. 20 — Effect of SURGE DELTA TSMAX on Surge Prevention

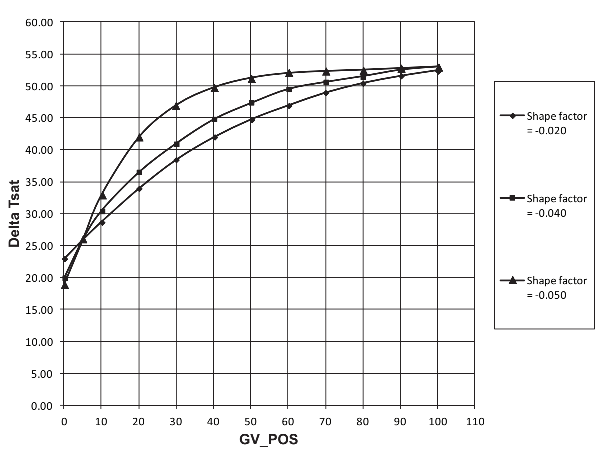


Fig. 21 — Effect of SURGE LINE SHAPE FACTOR on Surge Prevention

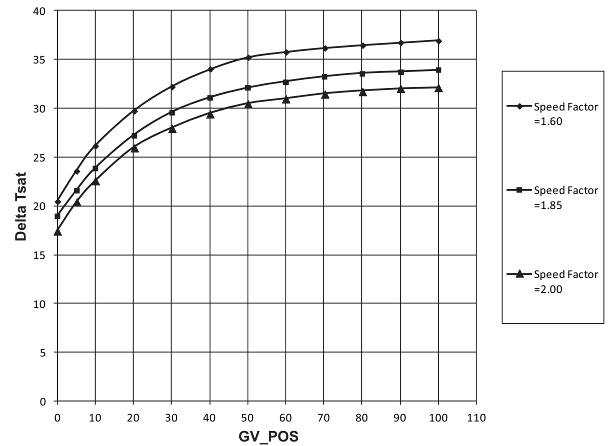


Fig. 22 — Effect of SURGE LINE SPEED FACTOR on Surge Prevention

If ACTUAL GUIDE VANE POSITION is less than 30%, go to Step 1. If ACTUAL GUIDE VANE POSITION is greater than 60%, then go to Step 3.

1. Do not change SURGE LINE SHAPE FACTOR from the value selected by Chiller Builder (ECAT). Decrease SURGE DELTA TSMIN in 1°F steps up to 5 times. Monitor chiller for surge.
2. If ACTUAL GUIDE VANE POSITION is still less than 30% and Step 1 failed, increase the value of SURGE LINE SHAPE FACTOR in steps of 0.01 up to 2 times. For example, if surge is encountered when shape factor is –0.06, increase the SURGE LINE SHAPE FACTOR to –0.05. If this does not solve the problem, go to Step 5, even if ACTUAL GUIDE VANE POSITION is less than 30%.
3. Do not change SURGE LINE SHAPE FACTOR from the value selected by Chiller Builder (ECAT). Decrease SURGE DELTA TSMAX by 1°F steps up to 5 times. Monitor chiller for surge.
4. If ACTUAL GUIDE VANE POSITION is greater than 60% and Step 3 failed to eliminate surge, then set SURGE DELTA TSMAX to 5°F below the value specified by Chiller Builder (ECAT). Increase the value of the SURGE LINE SHAPE FACTOR in steps of 0.01 up to 2 times. For example, if surge is encountered when the SURGE LINE SHAPE FACTOR is –0.06, increase the SURGE LINE SHAPE FACTOR to –0.05. If this does not solve the problem, go to Step 5, even if ACTUAL GUIDE VANE POSITION is greater than 60%.
5. If ACTUAL GUIDE VANE POSITION is greater than 30% but less than 60% or if Step 2 failed (with ACTUAL GUIDE VANE POSITION less than 30) or if Step 4 failed (with ACTUAL GUIDE VANE POSITION greater than 60), then perform this step. Do not change SURGE LINE SHAPE FACTOR from the value specified by Chiller Builder (ECAT). Reset SURGE DELTA TSMIN and SURGE DELTA TSMAX to the value specified by Chiller Builder (ECAT). Decrease SURGE DELTA TSMIN and SURGE DELTA TSMAX in steps of 1°F up to 5 times. Monitor chiller for surge.

If the chiller is equipped with a VFD and the drive does not slow down adequately at part load, then the machine is likely operating at a point above the configured "software" surge line and the machine is in surge prevention mode. Check for a surge protection message on the HMI. If the unit is not in a surge protection state, then the ENVELOPE SPEED FACTOR may need to be increased (more aggressive surge line protection) in combination with a decrease in the SURGE LINE SHAPE FACTOR.

MODIFY EQUIPMENT CONFIGURATION IF NECESSARY

The EQUIPMENT SERVICE table has screens to select, view, or modify parameters. Carrier's certified drawings have the configuration values required for the jobsite. Modify these values only if requested. Modifications can include:

- Chilled water reset
- Entering chilled water control (Enable/Disable)
- 4 to 20 mA demand limit
- Auto restart option (Enable/Disable)
- Remote contact option (Enable/Disable)

See the 19XR with PIC 5 Controls Operation and Troubleshooting guide for more details about these functions.

Perform a Controls Test (Quick Test/ Quick Calibration)

Check the safety controls status by performing an automated controls test. Actuators with feedback like inlet guide vane actuator need to be calibrated using the Quick Calibration menu prior to unit startup. Other controls tests can be done using the Quick Test Menu. The Quick Test or Quick Calibration menu can be accessed from the MAIN MENU. (The QUICK TEST screen can only be accessed when the chiller is in STOP mode.) On the QUICK TEST table screen, select a test to be performed.

The Quick Test checks all outputs and inputs for function. In order to successfully proceed with the controls test, the compressor should be off, no alarms showing, and voltage should be within ±10% of rating plate value. Each test asks the operator to confirm the operation is occurring and whether or not to continue. If an error occurs, the operator can try to address the problem as the test is being done or note the problem and proceed to the next test.

NOTE: If during the controls test the guide vanes do not open, verify the low pressure alarm is not active. (An active low pressure alarm causes the guide vanes to close.)

NOTE: The oil pump test will not energize the oil pump if cooler pressure is below –5 psig (–35 kPa).

When the controls test is finished, the test stops and the QUICK TEST menu displays. If a specific automated test procedure is not completed, access the particular control test to test the function when ready. For information about calibration, see the sections Checking Pressure Transducers, page 47, and High Altitude Locations, page 47.

Charge Refrigerant into Chiller

⚠ CAUTION

The transfer, addition, or removal of refrigerant in spring isolated chillers may place severe stress on and damage external piping if springs have not been blocked in both up and down directions.

⚠ CAUTION

Always operate the condenser and chilled water pumps during charging operations to prevent freeze-ups.

The standard 19XR chiller is shipped with the refrigerant already charged in the vessels. However, the 19XR chiller may be ordered with a nitrogen holding charge of 15 psig (103 kPa). Evacuate the nitrogen from the entire chiller, and charge the chiller from refrigerant cylinders.

CHILLER EQUALIZATION WITHOUT A PUMPOUT UNIT

⚠ CAUTION

When equalizing refrigerant pressure on the 19XR chiller after service work or during the initial chiller start-up, *do not use the discharge isolation valve to equalize.* A charging hose (connected between the charging valves on top of the cooler and condenser) should be used as the equalization valve. Failure to follow this procedure may damage equipment.

To equalize the pressure differential on a refrigerant isolated 19XR chiller, use the terminate lockout function PUMPDOWN/LOCKOUT (located in the Maintenance Menu). This helps to turn on pumps and advises the operator on proper procedures.

The following steps describe how to equalize refrigerant pressure in an isolated 19XR chiller without a pumpout unit.

1. Access terminate lockout function on the Maintenance Menu. (Alternatively, the Quick Test provides a means for cooler and condenser pump control.)

IMPORTANT: Turn on the chilled water and condenser water pumps to prevent freezing.

2. Slowly open the refrigerant charging valves. The chiller cooler and condenser pressures will gradually equalize. This process takes approximately 15 minutes.
3. Once the pressures have equalized, the cooler isolation valve, the condenser isolation valve, and the hot gas isolation valve may now be opened. Refer to Fig. 23 and 24 for the location of the valves.

⚠ WARNING

Whenever turning the discharge isolation valve, be sure to reattach the valve locking device. This prevents the valve from opening or closing during service work or during chiller operation. Failure to follow this procedure may damage equipment and result in bodily injury.

CHILLER EQUALIZATION WITH FREE-STANDING PUMPOUT UNIT

The following steps describe how to equalize refrigerant pressure on an isolated 19XR chiller using the pumpout unit.

1. Access the terminate lockout function on the PUMPDOWN/LOCKOUT screen (located in the Maintenance Menu).

IMPORTANT: Turn on the chilled water and condenser water pumps to prevent freezing.

2. Open valve 4 on the pumpout unit and open valves 1a and 1b on the chiller cooler and condenser, Fig. 23 and 24. Slowly open valve 2 on the pumpout unit to equalize the pressure. This process takes approximately 15 minutes.
3. Once the pressures have equalized, the discharge isolation valve, cooler isolation valve, optional hot gas bypass isolation valve, and refrigerant isolation valve can be opened. Close valves 1a and 1b, and all pumpout unit valves.

⚠ WARNING

Whenever turning the discharge isolation valve, be sure to reattach the valve locking device. This prevents the valve from opening or closing during service work or during chiller operation. Failure to follow this procedure may damage equipment and result in bodily injury.

The full refrigerant charge on the 19XR chiller will vary with chiller components and design conditions, as indicated on the job data specifications. An approximate charge may be determined by adding the condenser charge to the cooler charge as listed in the Heat Exchanger Data tables in the Physical Data section that begins on page 47.

⚠ CAUTION

Always operate the condenser and chilled water pumps whenever charging, transferring, or removing refrigerant from the chiller. Always confirm that water flow is established. Failure to follow this procedure may result in equipment damage.

Use the PUMPDOWN/LOCKOUT terminate lockout function to monitor conditions and start the pumps.

If the chiller has been shipped with a holding charge, the refrigerant is added through the pumpout charging connection (Fig. 23 and 24, valve 1b). First evacuate the nitrogen holding charge from the chiller vessels. Charge the refrigerant as a gas until the system pressure exceeds 35 psig (241 kPa) for HFC-134a. After the chiller is beyond this pressure the refrigerant should be charged as a liquid until all the recommended refrigerant charge has been added. The charging valve (Fig. 23 and 24, valve 7) can be used to charge liquid to the cooler if the cooler isolation valve (11) is present and is closed. Do not charge liquid backwards through any of the floats to the condenser.

TRIMMING REFRIGERANT CHARGE

The 19XR chiller is shipped with the correct charge for the design duty of the chiller. Trimming the charge can best be accomplished when the design load is available. To trim the charge, check the temperature difference between the leaving chilled water temperature and cooler refrigerant temperature at full load design conditions. If necessary, add or remove refrigerant to bring the temperature difference to design conditions or minimum differential. See the 19XR Installation Instructions manual for required chiller refrigerant charge.

The 19XR chiller refrigerant charges are shown in Tables 8 and 9. Total refrigerant charge is the sum of the cooler, condenser, and economizer charge.

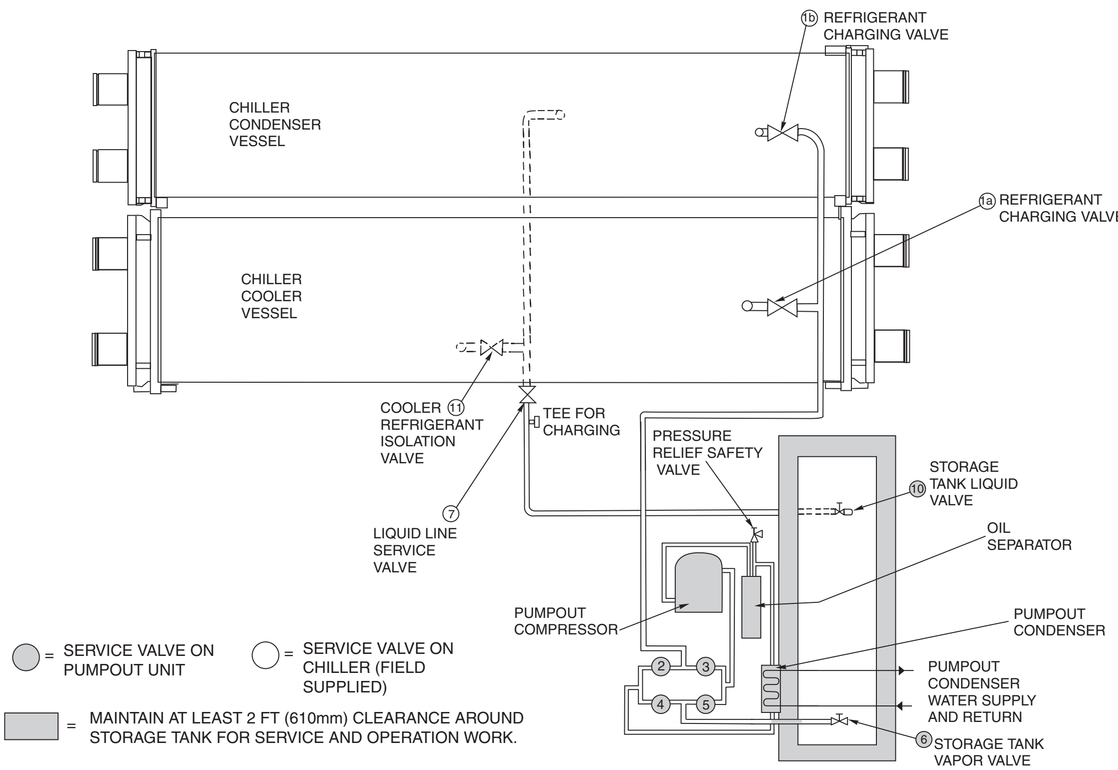


Fig. 23 — Typical Optional Pumpout System Piping Schematic with Storage Tank

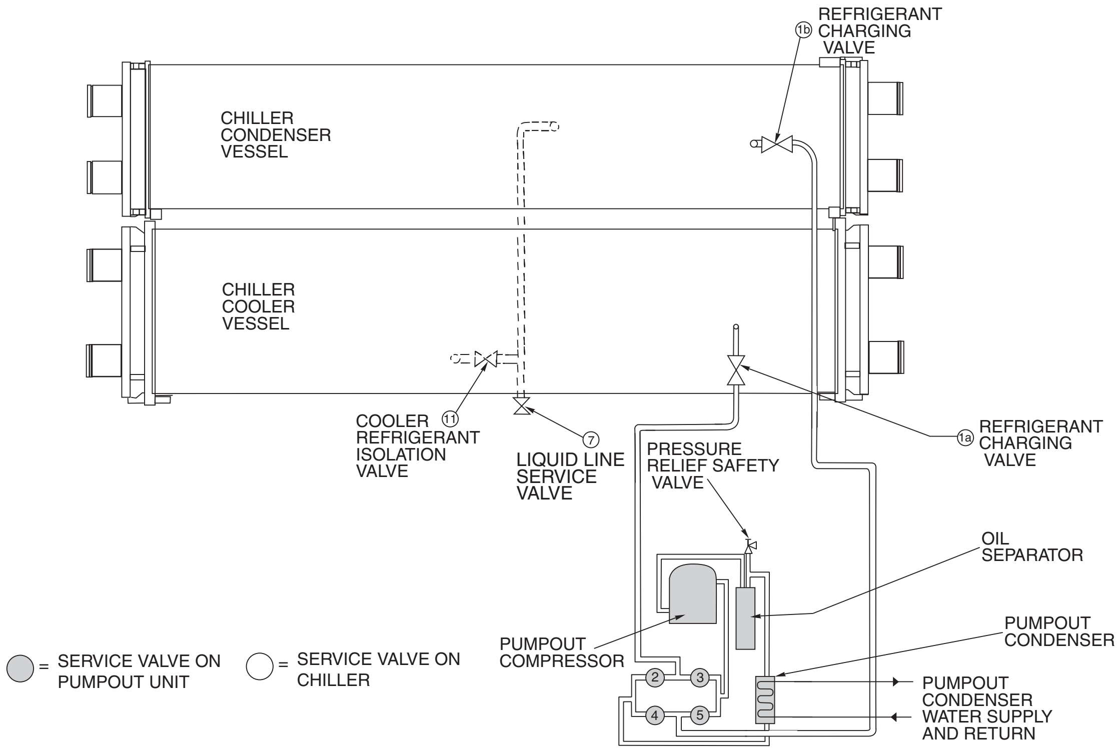


Fig. 24 — Typical Free-Standing Pumpout System Piping Schematic without Storage Tank

Table 8 — 19XR Two-Stage Compressor Frame Size 6 Heat Exchanger Refrigerant Charge

CODE*	ENGLISH			SI		
	MACHINE CHARGE			MACHINE CHARGE		
	REFRIGERANT WEIGHT (lb)			REFRIGERANT WEIGHT (kg)		
	COOLER ONLY	CONDENSER ONLY	ECONOMIZER ONLY	COOLER ONLY	CONDENSER ONLY	ECONOMIZER ONLY
A40	1647	927	360	747	420	163
A41	1773	927	360	804	420	163
A42	1887	927	360	856	420	163
A45	1599	927	360	725	420	163
A46	1714	927	360	777	420	163
A47	1837	927	360	833	420	163
A60	1878	1074	360	852	487	163
A61	2022	1074	360	917	487	163
A62	2152	1074	360	976	487	163
A65	1823	1074	360	827	487	163
A66	1954	1074	360	886	487	163
A67	2095	1074	360	950	487	163
A4A	1681	861	360	762	391	163
A4B	1792	861	360	813	391	163
A4C	1897	861	360	860	391	163
A4F	1626	861	360	738	391	163
A4G	1736	861	360	787	391	163
A4H	1890	861	360	857	391	163
A6A	1917	998	360	870	453	163
A6B	2044	998	360	927	453	163
A6C	2164	998	360	982	453	163
A6F	1854	998	360	841	453	163
A6G	1979	998	360	898	453	163
A6H	2156	998	360	978	453	163
B40	—	1233	360	—	559	163
B41	—	1233	360	—	559	163
B42	—	1233	360	—	559	163
B45	—	1233	360	—	559	163
B46	—	1233	360	—	559	163
B47	—	1233	360	—	559	163
B60	—	1423	360	—	645	163
B61	—	1423	360	—	645	163
B62	—	1423	360	—	645	163
B65	—	1423	360	—	645	163
B66	—	1423	360	—	645	163
B67	—	1423	360	—	645	163
B4A	—	1148	360	—	521	163
B4B	—	1148	360	—	521	163
B4C	—	1148	360	—	521	163
B4F	—	1148	360	—	521	163
B4G	—	1148	360	—	521	163
B4H	—	1148	360	—	521	163
B6A	—	1326	360	—	601	163
B6B	—	1326	360	—	601	163
B6C	—	1326	360	—	601	163
B6F	—	1326	360	—	601	163
B6G	—	1326	360	—	601	163
B6H	—	1326	360	—	601	163

*See Model Number Nomenclature on page 5.

Table 9 — 19XR Two-Stage Compressor Frame Size 7 Heat Exchanger Refrigerant Charge

CODE*	ENGLISH			SI		
	MACHINE CHARGE			MACHINE CHARGE		
	REFRIGERANT WEIGHT (lb)			REFRIGERANT WEIGHT (kg)		
	COOLER ONLY	CONDENSER ONLY	ECONOMIZER ONLY	COOLER ONLY	CONDENSER ONLY	ECONOMIZER ONLY
B60	2273	—	646	1031	—	293
B61	2355	—	646	1068	—	293
B62	2460	—	646	1116	—	293
B65	2185	—	646	991	—	293
B66	2275	—	646	1032	—	293
B67	2379	—	646	1079	—	293
B6A	2081	—	646	944	—	293
B6B	2162	—	646	981	—	293
B6C	2256	—	646	1023	—	293
B6F	1951	—	646	885	—	293
B6G	2019	—	646	916	—	293
B6H	2120	—	646	962	—	293
B80	2557	—	646	1160	—	293
B81	2649	—	646	1202	—	293
B82	2768	—	646	1256	—	293
B85	2458	—	646	1115	—	293
B86	2559	—	646	1161	—	293
B87	2676	—	646	1214	—	293
B8A	2341	—	646	1062	—	293
B8B	2432	—	646	1103	—	293
B8C	2538	—	646	1151	—	293
B8F	2195	—	646	996	—	293
B8G	2271	—	646	1030	—	293
B8H	2385	—	646	1082	—	293
C60	2647	1610	646	1201	730	293
C61	2751	1610	646	1248	730	293
C62	2875	1610	646	1304	730	293
C65	2562	1610	646	1162	730	293
C66	2666	1610	646	1209	730	293
C67	2793	1610	646	1267	730	293
C6A	2443	1497	646	1108	679	293
C6B	2534	1497	646	1149	679	293
C6C	2627	1497	646	1192	679	293
C6F	2334	1497	646	1059	679	293
C6G	2415	1497	646	1095	679	293
C6H	2500	1497	646	1134	679	293
C80	2978	1811	646	1351	821	293
C81	3095	1811	646	1404	821	293
C82	3234	1811	646	1467	821	293
C85	2882	1811	646	1307	821	293
C86	2999	1811	646	1360	821	293
C87	3142	1811	646	1425	821	293
C8A	2748	1684	646	1246	764	293
C8B	2851	1684	646	1293	764	293
C8C	2955	1684	646	1340	764	293
C8F	2626	1684	646	1191	764	293
C8G	2717	1684	646	1232	764	293
C8H	2813	1684	646	1276	764	293
D60	—	2097	646	—	951	293
D61	—	2097	646	—	951	293
D62	—	2097	646	—	951	293
D65	—	2097	646	—	951	293
D66	—	2097	646	—	951	293
D67	—	2097	646	—	951	293
D80	—	2359	646	—	1070	293
D81	—	2359	646	—	1070	293
D82	—	2359	646	—	1070	293
D85	—	2359	646	—	1070	293
D86	—	2359	646	—	1070	293
D87	—	2359	646	—	1070	293
D6A	—	1947	646	—	883	293
D6B	—	1947	646	—	883	293
D6C	—	1947	646	—	883	293
D6F	—	1947	646	—	883	293
D6G	—	1947	646	—	883	293
D6H	—	1947	646	—	883	293
D8A	—	2190	646	—	993	293

Table 9 — 19XR Two-Stage Compressor Frame Size 7 Heat Exchanger Refrigerant Charge (cont)

CODE*	ENGLISH			SI		
	MACHINE CHARGE			MACHINE CHARGE		
	REFRIGERANT WEIGHT (lb)			REFRIGERANT WEIGHT (kg)		
	COOLER ONLY	CONDENSER ONLY	ECONOMIZER ONLY	COOLER ONLY	CONDENSER ONLY	ECONOMIZER ONLY
D8B	—	2190	646	—	993	293
D8C	—	2190	646	—	993	293
D8F	—	2190	646	—	993	293
D8G	—	2190	646	—	993	293
D8H	—	2190	646	—	993	293

*See Model Number Nomenclature on page 5.

INITIAL START-UP

Preparation

Before starting the chiller, verify:

1. Power is on to the main starter, oil pump relay, tower fan starter, oil heater relay, and the chiller control panel.
2. Cooling tower water is at proper level and at-or-below design entering temperature.
3. Chiller is charged with refrigerant and all refrigerant and oil valves are in their proper operating positions.
4. Oil is at the proper level in the reservoir sight glasses.
5. Oil reservoir temperature is above 140°F (60°C) or above CALC EVAP SAT TEMP plus 50°F (28°C).
6. Valves in the evaporator and condenser water circuits are open.

   NOTE: If the pumps are not automatic, ensure water is circulating properly.

> **⚠ CAUTION**
>
> Do not permit water or brine that is warmer than 110°F (43°C) to flow through the cooler or condenser. Refrigerant overpressure may discharge through the relief valves and result in the loss of refrigerant charge.

7. Access the PUMPDOWN/LOCKOUT feature from the Maintenance Menu. Press the End Lockout button on the touch screen and accept the “press OK to Terminate Lockout?” prompt. The unit is reset to operating mode. The chiller is locked out at the factory in order to prevent accidental start-up.

Check Motor Rotation

1. Disengage the main starter disconnect and engage the control panel power circuit breaker.

   NOTE: The circuit breaker may be located in the starter if the disconnect and step down transformer option was ordered with the starter. If located in the starter, close the door securely after this step.
2. Close the starter enclosure door.
3. The ISM (integrated starter module) mounted in the starter enclosure checks for proper phase rotation as soon as power is applied to the starter and the PIC 5 controls power up.
4. An alarm message will appear on the HMI screen if the phase rotation is incorrect. If this occurs reverse any 2 of the 3 incoming power leads to the starter and reapply power. The motor is now ready for a rotation check.
5. Start the chiller by Local On (assumes LOCAL operation mode) by pressing the Start/Stop button on the HMI and following the prompts. The PIC 5 control performs start-up checks.
6. When the starter is energized and the motor begins to turn, check for clockwise motor rotation (Fig. 25).

> IMPORTANT: Do not check motor rotation during coast-down. Rotation may have reversed during equalization of vessel pressures.

Check Oil Pressure and Compressor Stop

1. When the motor is at full speed, note the differential oil pressure reading on the HMI default screen. It should be between 18 and 40 psid (124 and 206 kPad). The oil pump will generate design oil pressure only with the correct electrical phasing of ABC.
2. Press the Stop button and listen for any unusual sounds from the compressor as it coasts to a stop.

CORRECT MOTOR ROTATION
IS CLOCKWISE WHEN VIEWED
THROUGH MOTOR SIGHT GLASS

TO CHECK ROTATION, ENERGIZE COMPRESSOR MOTOR MOMENTARILY.
DO NOT LET MACHINE DEVELOP CONDENSER PRESSURE.
CHECK ROTATION IMMEDIATELY.

ALLOWING CONDENSER PRESSURE TO BUILD OR CHECKING ROTATION WHILE MACHINE COASTS DOWN MAY GIVE A FALSE INDICATION DUE TO GAS PRESSURE EQUALIZING THROUGH COMPRESSOR.

Fig. 25 — Correct Motor Rotation

To Prevent Accidental Start-Up

A chiller STOP override setting may be entered to prevent accidental start-up during service or whenever necessary. From the Main Menu, access the General Parameters Menu and use the down arrow to reach Stop Override on the GENUNIT table. Change Stop Override to Yes; then execute the command by touching the lightning button. The message “ALM-276 Protective Limit - Stop Override” will appear in the Home Screen message area. To restart the chiller, access the same screen and change the Stop Override option to No.

Check Chiller Operating Condition

Check to be sure that chiller temperatures, pressures, water flows, and oil and refrigerant levels indicate the system is functioning properly.

Instruct the Customer Operator

Ensure the operator(s) understand all operating and maintenance procedures. Point out the various chiller parts and explain their function as part of the complete system.

COOLER-CONDENSER

High side float chamber, relief valves, refrigerant charging valve, temperature sensor locations, pressure transducer locations, Schrader fittings, waterboxes and tubes, and vents and drains.

OPTIONAL PUMPOUT STORAGE TANK AND PUMPOUT SYSTEM

Transfer valves and pumpout system, refrigerant charging and pumpdown procedure, and relief devices.

MOTOR COMPRESSOR ASSEMBLY

Guide vane actuator, transmission, motor cooling system, oil cooling system, temperature and pressure sensors, oil sight glasses, integral oil pump, isolatable oil filter, extra oil and motor temperature sensors, synthetic oil, and compressor serviceability.

MOTOR COMPRESSOR LUBRICATION SYSTEM

Oil pump, cooler filter, oil heater, oil charge and specification, operating and shutdown oil level, temperature and pressure, and oil charging connections.

ECONOMIZER

Float valve, drain valve, Schrader fitting, damper valve.

CONTROL SYSTEM

CCN and LOCAL start, reset, menu, softkey functions, HMI operation, occupancy schedule, set points, safety controls, and auxiliary and optional controls.

AUXILIARY EQUIPMENT

Starters and disconnects, separate electrical sources, pumps, and cooling tower.

DESCRIBE CHILLER CYCLES

Refrigerant, motor cooling, lubrication, and oil reclaim.

REVIEW MAINTENANCE

Scheduled, routine, and extended shutdowns, importance of a log sheet, importance of water treatment and tube cleaning, and importance of maintaining a leak-free chiller.

SAFETY DEVICES AND PROCEDURES

Electrical disconnects, relief device inspection, and handling refrigerant.

CHECK OPERATOR KNOWLEDGE

Start, stop, and shutdown procedures, safety and operating controls, refrigerant and oil charging, and job safety.

REVIEW THE START-UP, OPERATION, AND MAINTENANCE MANUAL.

OPERATING INSTRUCTIONS

Operator Duties

1. Become familiar with the chiller and related equipment before operating the chiller.
2. Prepare the system for start-up, start and stop the chiller, and place the system in a shutdown condition.
3. Maintain a log of operating conditions and document any abnormal readings.
4. Inspect the equipment, make routine adjustments, and perform a Control Test. Maintain the proper oil and refrigerant levels.
5. Protect the system from damage during shutdown periods.
6. Maintain the set point, time schedules, and other PIC functions.

Prepare the Chiller for Start-Up

Follow the steps described in the Initial Start-Up section, page 30.

To Start the Chiller

1. Start the water pumps, if they are not automatic.
2. Press the Start/Stop icon on the HMI home screen to start the system. If the chiller is in the OCCUPIED mode and the start timers have expired, the start sequence will start. Follow the procedure described in the Start-Up/Shutdown/Recycle Sequence section, page 11.

Check the Running System

After the compressor starts, the operator should monitor the display and observe the parameters for normal operating conditions:

1. The oil reservoir temperature should be above 120°F (49°C) during shutdown. Normal operating temperature is 120 to 165°F (49 to 74°C).
2. The bearing temperature accessed from the Temperatures menu should be 140 to 210°F (60 to 99°C) for compressors with rolling element bearings. If the bearing temperature is high or in Alarm/Alert state with the oil pump running, stop the chiller and determine the cause of the high temperature. *Do not restart* the chiller until corrected.
3. The oil level should be visible anywhere in one of the two sight glasses. Foaming oil is acceptable as long as the oil pressure and temperature are within limits.
4. The oil pressure should be between 18 and 40 psid (124 and 207 kPad) differential, as seen on the HMI Transmission Status screen. Typically the reading will be 18 to 35 psid (124 to 241 kPad) at initial start-up.
5. The moisture indicator sight glass on the refrigerant motor cooling line should indicate refrigerant flow and a dry condition.
6. The condenser pressure and temperature varies with the chiller design conditions. Typically the pressure will range between 60 and 135 psig (390 and 950 kPa) with a corresponding temperature range of 60 to 105°F (15 to 41°C). The condenser entering water temperature should be controlled below the specified design entering water temperature to save on compressor kilowatt requirements.
7. Cooler pressure and temperature also will vary with the design conditions. Typical pressure range will be between 29.5 and 40.1 psig (203.4 and 276.4 kPa), with temperature ranging between 34 and 45°F (1.1 and 7.2°C).
8. The compressor may operate at full capacity for a short time after the pulldown ramping has ended, even though the building load is small. The active electrical demand setting can be overridden to limit the compressor kW, or the pulldown rate can be decreased to avoid a high demand charge for the short period of high demand operation. Pulldown rate can be based on load rate or temperature rate and is accessed on the MAINTENANCE MENU → CAPACITY CONTROLS → RAMP_DEM (Ramping Demand Limit Value).
9. The economizer (if installed) has two sight glasses that look into the float chamber. When the chiller is operating, the top sight glass is empty and the bottom sight glass is full.

To Stop the Chiller

The occupancy schedule starts and stops the chiller automatically once the time schedule is configured.

The unit can be stopped manually using the HMI by pressing the green Start/Stop icon . The Unit Start/Stop screen is displayed. Press Confirm Stop. The compressor will then follow the normal shutdown sequence as described in the Start-Up/Shutdown/Recycle Sequence section on page 11. The chiller is now in the OFF control mode.

> IMPORTANT: Do not attempt to stop the chiller by opening an isolating knife switch. High intensity arcing may occur.

If the chiller is stopped by an alarm condition, *do not restart the chiller* until the problem is diagnosed and corrected.

After Limited Shutdown

No special preparations should be necessary. Follow the regular preliminary checks and starting procedures.

Preparation for Extended Shutdown

The refrigerant should be transferred into the pumpout storage tank (if supplied; see Pumpout and Refrigerant Transfer Procedures on page 32) to reduce chiller pressure and the possibility of leaks. Maintain a holding charge of 5 to 10 lb (2.27 to 4.5 kg) of refrigerant or nitrogen to prevent air from leaking into the chiller.

If freezing temperatures are likely to occur in the chiller area, drain the chilled water, condenser water, and the pumpout condenser water circuits to avoid freeze-up. Keep the waterbox drains open. It is recommended not to store the refrigerant in the unit if below freezing temperatures are anticipated. A nitrogen holding charge is recommended in this case.

Leave the oil charge in the chiller with the oil heater and controls energized to maintain the minimum oil reservoir temperature.

After Extended Shutdown

Ensure the water system drains are closed. It may be advisable to flush the water circuits to remove any soft rust that may have formed. This is a good time to brush the tubes and inspect the Schrader fittings on the waterside flow devices for fouling, if necessary.

Check the cooler pressure on the HMI panel and compare it to the original holding charge that was left in the chiller. If (after adjusting for ambient temperature changes) any loss in pressure is indicated, check for refrigerant leaks. See Check Chiller Tightness section, page 13.

Recharge the chiller by transferring refrigerant from the pumpout storage tank (if supplied). Follow the Pumpout and Refrigerant Transfer Procedures section. Observe freeze-up precautions.

Carefully make all regular preliminary and running system checks. If the compressor oil level appears abnormally high, the oil may have absorbed refrigerant. Ensure that the oil temperature is above 40°F (4.4°C) or above the EVAP SAT TEMP plus 50°F (27°C).

Cold Weather Operation

When the entering condenser water temperature drops very low, the operator should automatically cycle the cooling tower fans off to keep the temperature up. Piping may also be arranged to bypass the cooling tower.

IMPORTANT: A field-supplied water temperature control system for condenser water should be installed. The system should maintain the leaving condenser water temperature at a temperature that is at least 20°F (11°C) above the leaving chilled water temperature.

Manual Guide Vane Operation

It is possible to manually operate the guide vanes in order to check control operation or to control the guide vanes in an emergency. Manual operation is possible by overriding the target guide vane position.

NOTE: Manual control overrides the configured pulldown rate during start-up and permits the guide vanes to open at a faster rate. Motor current above the electrical demand setting, capacity overrides, and chilled water temperature below the control point override the manual target and close the guide vanes. For descriptions of capacity overrides and set points, see the 19XR with PIC 5 Controls Operation and Troubleshooting guide.

Refrigeration Log

A refrigeration log (as shown in Fig. 26), is a convenient checklist for routine inspection and maintenance and provides a continuous record of chiller performance. It is also an aid when scheduling routine maintenance and diagnosing chiller problems.

Keep a record of the chiller pressures, temperatures, and liquid levels on a sheet similar to the one in Fig. 26. Automatic recording of data is possible by using CCN devices such as the Data Collection module and a Building Supervisor. Contact a Carrier representative for more information.

PUMPOUT AND REFRIGERANT TRANSFER PROCEDURES

Preparation

The 19XR chiller may come equipped with an optional pumpout storage tank, pumpout system, or pumpout compressor. The refrigerant can be pumped for service work to either the chiller compressor vessel or chiller condenser vessel by using the optional pumpout system. If a pumpout storage tank is supplied, the refrigerant can be isolated in the storage tank. The following procedures describe how to transfer refrigerant from vessel to vessel and perform chiller evacuation.

⚠ CAUTION

The power to the pumpout compressor oil heater must be on whenever any valve connecting the pumpout compressor to the chiller or storage tank is open. Leaving the heater off will result in oil dilution by refrigerant and can lead to compressor failure.

If the compressor is found with the heater off and a valve open, the heater must be on for at least 4 hours to drive the refrigerant from the oil. When heating the oil the compressor suction must be open to a vessel to give the refrigerant a means to leave the compressor.

⚠ CAUTION

Always run the chiller cooler and condenser water pumps and always charge or transfer refrigerant as a gas when the chiller pressure is less than 35 psig (241 kPa). Below these pressures, liquid refrigerant flashes into gas, resulting in extremely low temperatures in the cooler/condenser tubes and possibly causing tube freeze-up.

REFRIGERATION LOG CARRIER 19XR SEMI-HERMETIC CENTRIFUGAL REFRIGERATION MACHINE

PLANT__________________________ MACHINE MODEL NO. _______________________ MACHINE SERIAL NO. ____________________________

DATE _______	COOLER					CONDENSER					ECON.	COMPRESSOR									OPERATOR INITIALS	REMARKS
	REFRIGERANT		FLOW	TEMP.		REFRIGERANT		FLOW	TEMP.		REFRIG.	BEARING TEMPS.				OIL			MOTOR		
TIME	PRESS.	TEMP.	GPM	IN	OUT	PRESS.	TEMP.	GPM	IN	OUT	PRESS.	#1 LS ME	#2 LS CE	#3 HS ME	#4 HS CE	PRESS. DIFF.	SUMP TEMP	LEVEL	FLA/AMPS (OR VANE POSITION)		

REMARKS: Indicate shutdowns on safety controls, repairs made, and oil or refrigerant added or removed. Include amounts.

Fig. 26 — Refrigeration Log

⚠ DANGER

During transfer of refrigerant into and out of the optional storage tank, carefully monitor the storage tank level gage. Do not fill the tank more than 90% of capacity to allow for refrigerant expansion. Overfilling may result in damage to the tank or the release of refrigerant which will result in personal injury or death.

⚠ CAUTION

Do not mix refrigerants from chillers that use different compressor oils. Compressor damage can result.

Operating the Optional Pumpout Unit (Fig. 27)

Oil should be visible in the pumpout unit compressor sight glass under all operating conditions and during shutdown. If oil is low, add oil as described under Optional Pumpout System Maintenance section, page 42. The pumpout unit control wiring schematic is detailed in Fig. 28.

TO READ REFRIGERANT PRESSURES (during pumpout or leak testing):

1. The display on the chiller control panel is suitable for determining refrigerant-side pressures and low (soft) vacuum. To assure the desired range and accuracy when measuring evacuation and dehydration, use a quality vacuum indicator or manometer. This can be placed on the Schrader connections on each vessel by removing the pressure transducer (Fig. 2).
2. To determine pumpout storage tank pressure, a 30 in. Hg vacuum -0-400 psi (-101-0-2769 kPa) gage is attached to the storage tank.
3. Refer to Fig. 23 and 24 for valve locations and numbers.

⚠ CAUTION

Transfer, addition, or removal of refrigerant in spring- isolated chillers may place severe stress on and damage external piping if springs have not been blocked in both up and down directions.

POSITIVE PRESSURE CHILLERS WITH STORAGE TANKS

In the Valve/Condition tables that accompany these instructions, the letter “C” indicates a closed valve. Figures 23 and 24 show the locations of the valves.

⚠ CAUTION

Always run chiller cooler and condenser water pumps and always charge or transfer refrigerant as a gas when chiller vessel pressure is less than 35 psig (241 kPa). Below these pressures, liquid refrigerant flashes into gas, resulting in extremely low temperatures in the cooler/condenser tubes and possibly causing tube freeze-up.

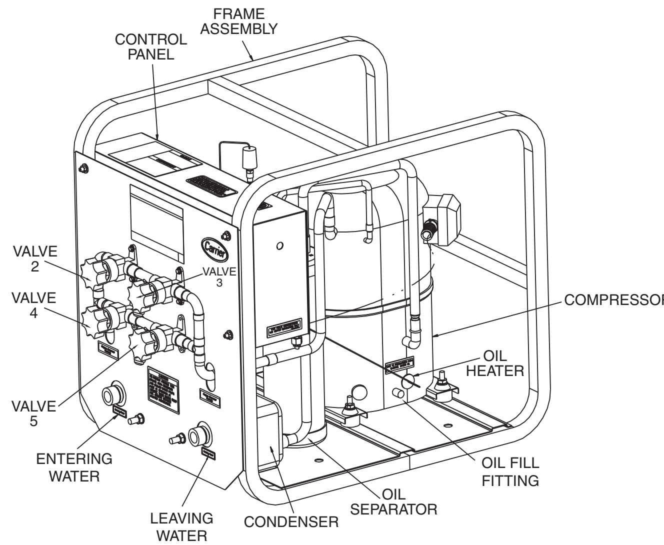


Fig. 27 — Pumpout Unit

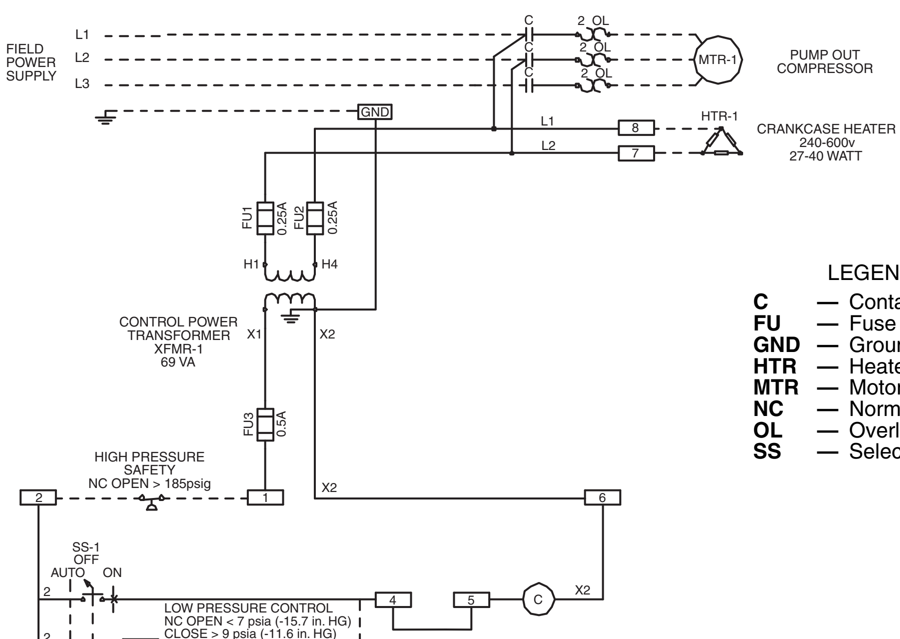


Fig. 28 — Pumpout Unit Wiring Schematic

LEGEND

C	— Contactor
FU	— Fuse
GND	— Ground
HTR	— Heater
MTR	— Motor
NC	— Normally Closed
OL	— Overload
SS	— Selector Switch

Transfer Refrigerant from Pumpout Storage Tank to Chiller

⚠ WARNING

During transfer of refrigerant into and out of the 19XR storage tank, carefully monitor the storage tank level gage. Do not fill the tank more than 90% of capacity to allow for refrigerant expansion. Overfilling may result in damage to the tank and personal injury.

1. Equalize refrigerant pressure.
   a. Turn on chiller water pumps and monitor chiller pressures.
   b. Close pumpout and storage tank valves 2, 4, 5, and 10, and close refrigerant charging valve 7; open chiller isolation valve 11 and any other chiller isolation valves, if present.
   c. Open pumpout and storage tank valves 3 and 6; open chiller valves 1a and 1b.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION			C		C	C		C	C	

   d. Gradually crack open valve 5 to increase chiller pressure to 35 psig (241 kPa). Slowly feed refrigerant to prevent freeze-up.
   e. Open valve 5 fully after the chiller pressure rises above the freezing point of the refrigerant. Let the storage tank and chiller pressure equalize. Open refrigerant charging valve 7 and storage tank charging valve 10 to let liquid refrigerant drain into the chiller.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION			C		C					

2. Transfer remaining refrigerant.
   a. Close valve 5 and open valve 4. Turn off pumpout condenser water, and turn on pumpout compressor in manual mode to push liquid refrigerant out of storage tank. Monitor the storage tank level until tank is empty.
   b. Close refrigerant charging valves 7 and 10.
   c. Turn off the pumpout compressor.
   d. Turn off the chiller water pumps.
   e. Close valves 3 and 4.
   f. Open valves 2 and 5.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION				C	C			C	C	

   g. Turn on pumpout condenser water.
   h. Run the pumpout compressor in manual mode until the storage tank pressure reaches 5 psig (34 kPa), 18 in. Hg vacuum (41 kPa absolute).
   i. Turn off the pumpout compressor.
   j. Close valves 1a, 1b, 2, 5, and 6.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION	C	C	C	C	C	C	C	C	C	

   k. Turn off pumpout condenser water.

Transfer the Refrigerant from Chiller to Pumpout Storage Tank

1. Equalize refrigerant pressure.
   a. Valve positions:

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION			C		C	C		C	C	

   b. Slowly open valve 5 and refrigerant charging valves 7 and 10 to allow liquid refrigerant to drain by gravity into the storage tank.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION			C		C					

2. Transfer the remaining liquid.
   a. Turn off pumpout condenser water. Place valves in the following positions:

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION				C	C					

   b. Run the pumpout compressor in automatic mode until vacuum switch is satisfied and compressor stops. Close valves 7 and 10.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION				C	C			C	C	

   c. Turn off the pumpout compressor.
3. Remove any remaining refrigerant.
   a. Turn on chiller water pumps.
   b. Turn on pumpout condenser water.
   c. Place valves in the following positions:

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION			C			C		C	C	

   d. Run the pumpout compressor until the chiller pressure reaches 35 psig (241 kPa); then shut off the pumpout compressor. Warm chiller condenser water will boil off any entrapped liquid refrigerant and chiller pressure will rise.
   e. When chiller pressure rises to 40 psig (276 kPa), turn on the pumpout compressor until the pressure again reaches 35 psig (241 kPa); then turn off the pumpout compressor. Repeat this process until the chiller pressure no longer rises; then turn on the pumpout compressor and pump out until the chiller pressure reaches 18 in. Hg vacuum (41 kPa absolute). This can be done in On or Automatic mode.
   f. Close valves 1a, 1b, 3, 4, and 6.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION	C	C	C	C	C	C	C	C	C	

   g. Turn off the pumpout condenser water.
4. Establish vacuum for service. To conserve refrigerant, operate the pumpout compressor as described in Step 3e until the chiller pressure is reduced to 18 in. Hg vacuum (41 kPa absolute).

   This operation can be done in Automatic or On mode. In Automatic mode, the compressor will stop automatically at approximately 15 in. Hg vacuum (51 kPa absolute).

CHILLERS WITH ISOLATION VALVES

The valves referred to in the following instructions are shown in Fig. 23 and 24. Valve 7 remains closed.

Transfer All Refrigerant to Chiller Condenser Vessel

1. Push refrigerant into chiller condenser vessel.
   a. Turn on the chiller water pumps and monitor the chiller pressure.
   b. Valve positions:

VALVE	1A	1B	2	3	4	5	11
CONDITION				C	C		

   c. Equalize refrigerant in the chiller cooler and condenser.
   d. Turn off chiller water pumps and pumpout condenser water supply.
   e. Turn on pumpout compressor to push liquid out of the chiller cooler vessel.
   f. When all liquid has been pushed into the chiller condenser vessel, close the cooler refrigerant isolation valve (11).
   g. Turn on the chiller water pumps.

h. Turn off the pumpout compressor.
2. Evacuate gas from chiller cooler vessel.
   a. Close liquid line service valves 2 and 5; open valves 3 and 4.

VALVE	1A	1B	2	3	4	5	11
CONDITION			C			C	C

   b. Turn on pumpout condenser water.
   c. Run pumpout compressor until the chiller cooler vessel pressure reaches 18 in. Hg vacuum (41 kPa absolute). Monitor pressures on the chiller control panel and on refrigerant gages. This operation can be done in Automatic or On mode. In Automatic mode, the compressor will stop automatically at approximately 15 in. Hg vacuum (51 kPa absolute).
   d. Close valve 1a.
   e. Turn off pumpout compressor.
   f. Close valves 1b, 3, and 4.

VALVE	1A	1B	2	3	4	5	11
CONDITION	C	C	C	C	C	C	C

   g. Turn off pumpout condenser water.
   h. Turn off chiller water pumps and lock out chiller compressor.

Transfer All Refrigerant to Chiller Cooler Vessel

1. Push refrigerant into the chiller cooler vessel.
   a. Turn on the chiller water pumps and monitor the chiller pressure.
   b. Valve positions:

VALVE	1A	1B	2	3	4	5	11
CONDITION				C	C		

   c. Equalize refrigerant in the chiller cooler and condenser.
   d. Turn off chiller water pumps and pumpout condenser water.
   e. Turn on pumpout compressor to push refrigerant out of the chiller condenser.
   f. When all liquid is out of the chiller condenser, close valve 11 and any other liquid isolation valves on the chiller.
   g. Turn off the pumpout compressor.
2. Evacuate gas from chiller condenser vessel.
   a. Turn on chiller water pumps.
   b. Make sure that liquid line service valves 3 and 4 are closed and valves 2 and 5 are open.

VALVE	1A	1B	2	3	4	5	11
CONDITION				C	C		C

   c. Turn on pumpout condenser water.
   d. Run the pumpout compressor until the chiller condenser reaches 18 in. Hg vacuum (41 kPa absolute) in Manual or Automatic mode. Monitor pressure at the chiller control panel and refrigerant gages.
   e. Close valve 1b.
   f. Turn off pumpout compressor.
   g. Close valves 1a, 2, and 5.

VALVE	1A	1B	2	3	4	5	11
CONDITION	C	C	C	C	C	C	C

   h. Turn off pumpout condenser water.
   i. Turn off chiller water pumps and lock out chiller compressor.

Return Refrigerant to Normal Operating Conditions

1. Be sure that the chiller vessel that was opened has been evacuated.
2. Turn on chiller water pumps.
3. Open valves 1a, 1b, and 3.

VALVE	1A	1B	2	3	4	5	11
CONDITION			C		C	C	C

4. Crack open valve 5, gradually increasing pressure in the evacuated chiller vessel to 35 psig (241 kPa). Feed refrigerant slowly to prevent tube freeze-up.
5. Leak test to ensure chiller vessel integrity.
6. Open valve 5 fully.

VALVE	1A	1B	2	3	4	5	11
CONDITION			C		C		C

7. Close valves 1a, 1b, 3, and 5.
8. Open chiller isolation valve 11 and any other isolation valves, if present.

VALVE	1A	1B	2	3	4	5	11
CONDITION	C	C	C	C	C	C	

9. Turn off chiller water pumps.

DISTILLING THE REFRIGERANT

1. Transfer the refrigerant from the chiller to the pumpout storage tank as described in the Transfer the Refrigerant from Chiller to Pumpout Storage Tank section on page 35.
2. Equalize the refrigerant pressure.
   a. Turn on chiller water pumps and monitor chiller pressures.
   b. Close pumpout and storage tank valves 2, 4, 5, and 10, and close chiller charging valve 7; open chiller isolation valve 11 and any other chiller isolation valves, if present.
   c. Open pumpout and storage tank valves 3 and 6; open chiller valves 1a and 1b.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION			C		C	C		C	C	

   d. Gradually crack open valve 5 to increase chiller pressure to 35 psig (241 kPa). Slowly feed refrigerant to prevent freeze-up.
   e. Open valve 5 fully after the chiller pressure rises above the freezing point of the refrigerant. Let the storage tank and chiller pressure equalize.
3. Transfer remaining refrigerant.
   a. Close valve 3.
   b. Open valve 2.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION				C	C			C	C	

   c. Turn on pumpout condenser water.
   d. Run the pumpout compressor until the storage tank pressure reaches 5 psig (34 kPa), 18 in. Hg vacuum (41 kPa absolute) in Manual or Automatic mode.
   e. Turn off the pumpout compressor.
   f. Close valves 1a, 1b, 2, 5, and 6.
   g. Turn off pumpout condenser water.

VALVE	1A	1B	2	3	4	5	6	7	10	11
CONDITION	C	C	C	C	C	C	C	C	C	

4. Drain the contaminants from the bottom of the storage tank into a container. Dispose of contaminants safely.

GENERAL MAINTENANCE

Refrigerant Properties

The standard refrigerant for the 19XR chiller is HFC-134a. At normal atmospheric pressure, HFC-134a will boil at –14°F

(–25°C) and must, therefore, be kept in pressurized containers or storage tanks. The refrigerant is practically odorless when mixed with air and is noncombustible at atmospheric pressure. Read the Material Safety Data Sheet and the latest ASHRAE Safety Guide for Mechanical Refrigeration to learn more about safe handling of this refrigerant.

⚠ DANGER

HFC-134a will dissolve oil and some nonmetallic materials, dry the skin, and, in heavy concentrations, may displace enough oxygen to cause asphyxiation. When handling this refrigerant, protect the hands and eyes and avoid breathing fumes.

Adding Refrigerant

Follow the procedures described in Trim Refrigerant Charge section, page 39.

⚠ CAUTION

Always use the compressor pumpdown function in the PUMPDOWN/LOCKOUT feature to turn on the cooler pump and lock out the compressor when transferring refrigerant. Liquid refrigerant may flash into a gas and cause possible freeze-up when the chiller pressure is below 30 psig (207 kPa) for HFC-134a.

Adjusting the Refrigerant Charge

If the addition or removal of refrigerant is required to improve chiller performance, follow the procedures given under the Trim Refrigerant Charge section, page 39.

Refrigerant Leak Testing

Because HFC-134a is above atmospheric pressure at room temperature, leak testing can be performed with refrigerant in the chiller. Use an electronic halogen leak detector, soap bubble solution, or ultrasonic leak detector. Ensure that the room is well ventilated and free from concentration of refrigerant to keep false readings to a minimum. Before making any necessary repairs to a leak, transfer all refrigerant from the leaking vessel.

Leak Rate

It is recommended by ASHRAE that chillers be taken off line immediately and repaired if the refrigerant leak rate for the entire chiller is more than 10% of the operating refrigerant charge per year.

In addition, Carrier recommends that leaks totaling less than the above rate but more than a rate of 0.1% of the total charge per year should be repaired during annual maintenance or whenever the refrigerant is transferred for other service work.

Test After Service, Repair, or Major Leak

If all the refrigerant has been lost or if the chiller has been opened for service, the chiller or the affected vessels must be pressure tested and leak tested. Refer to the Leak Test Chiller section on page 16 to perform a leak test.

⚠ WARNING

HFC-134a should not be mixed with air or oxygen and pressurized for leak testing. In general, this refrigerant should not be present with high concentrations of air or oxygen above atmospheric pressures, because the mixture can undergo combustion.

TESTING WITH REFRIGERANT TRACER

Use an environmentally acceptable refrigerant as a tracer for leak test procedures. Use dry nitrogen to raise the machine pressure to leak testing levels.

TESTING WITHOUT REFRIGERANT TRACER

Another method of leak testing is to pressurize with nitrogen only and to use a soap bubble solution or an ultrasonic leak detector to determine if leaks are present.

TO PRESSURIZE WITH DRY NITROGEN

NOTE: Pressurizing with dry nitrogen for leak testing should not be done if the full refrigerant charge is in the vessel because purging the nitrogen is very difficult.

1. Connect a copper tube from the pressure regulator on the cylinder to the refrigerant charging valve. Never apply full cylinder pressure to the pressurizing line. Follow the listed sequence.
2. Open the charging valve fully.
3. Slowly open the cylinder regulating valve.
4. Observe the pressure gage on the chiller and close the regulating valve when the pressure reaches test level. *Do not exceed* 140 psig (965 kPa).
5. Close the charging valve on the chiller. Remove the copper tube if it is no longer required.

Repair the Leak, Retest, and Apply Standing Vacuum Test

After pressurizing the chiller, test for leaks with an electronic halide leak detector, soap bubble solution, or an ultrasonic leak detector. Bring the chiller back to atmospheric pressure, repair any leaks found, and retest.

After retesting and finding no leaks, apply a standing vacuum test. Then dehydrate the chiller. Refer to the Standing Vacuum Test and Chiller Dehydration sections (pages 16 and 18) in the Before Initial Start-Up section.

Checking Guide Vanes

During normal shutdown, when the chiller is off, the guide vanes are closed. Check that the coupling is tight on the shaft and make sure that the guide vane shaft is closed. Complete the following steps to adjust position (see Fig. 29-31):

1. Remove the set screw in the guide vane coupling.
2. Loosen the holddown bolts on the guide vane actuator.
3. Pull the guide vane actuator away from the suction housing.
4. If required, rotate the guide vane sprocket fully clockwise and spot-drill the guide vane actuator shaft. Spot-drilling is necessary when the guide vane actuator sprocket set screws on the guide vane actuator shaft need to be reseated. (Remember: Spot-drill and tighten the first set screw before spot-drilling for the second set screw.)

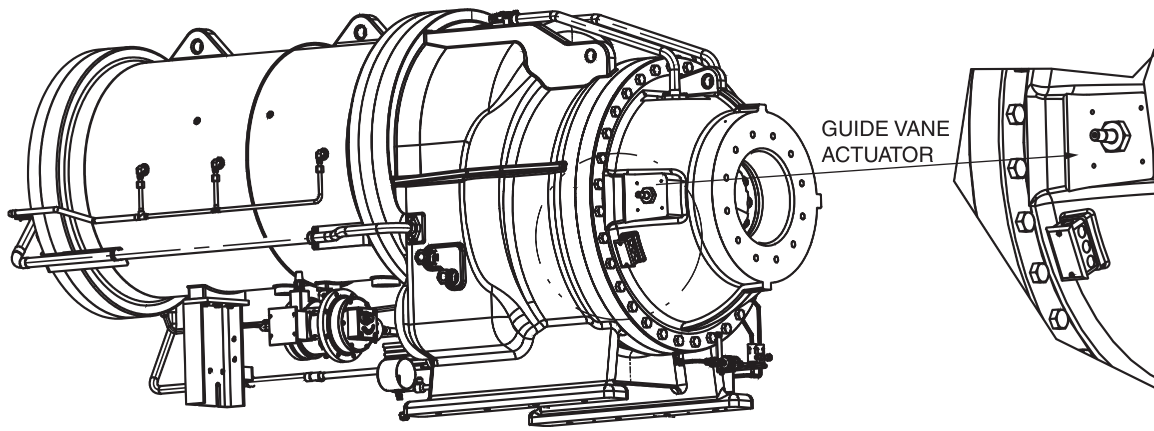


Fig. 29 — Guide Vane Actuator, Frame Size 6

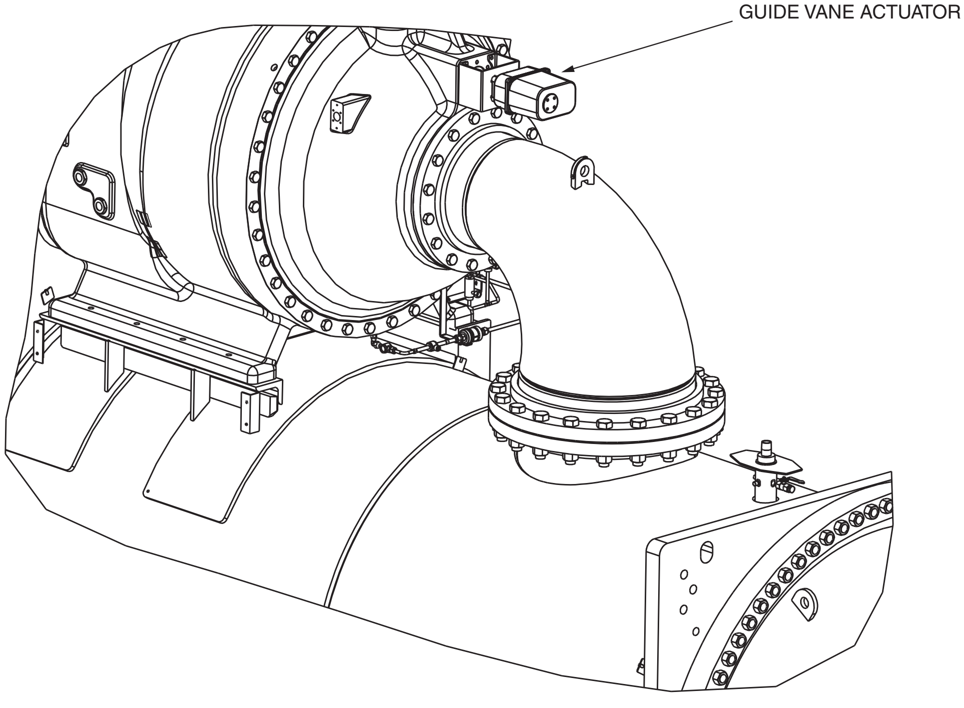


Fig. 30 — Guide Vane Actuator, Frame Size 7

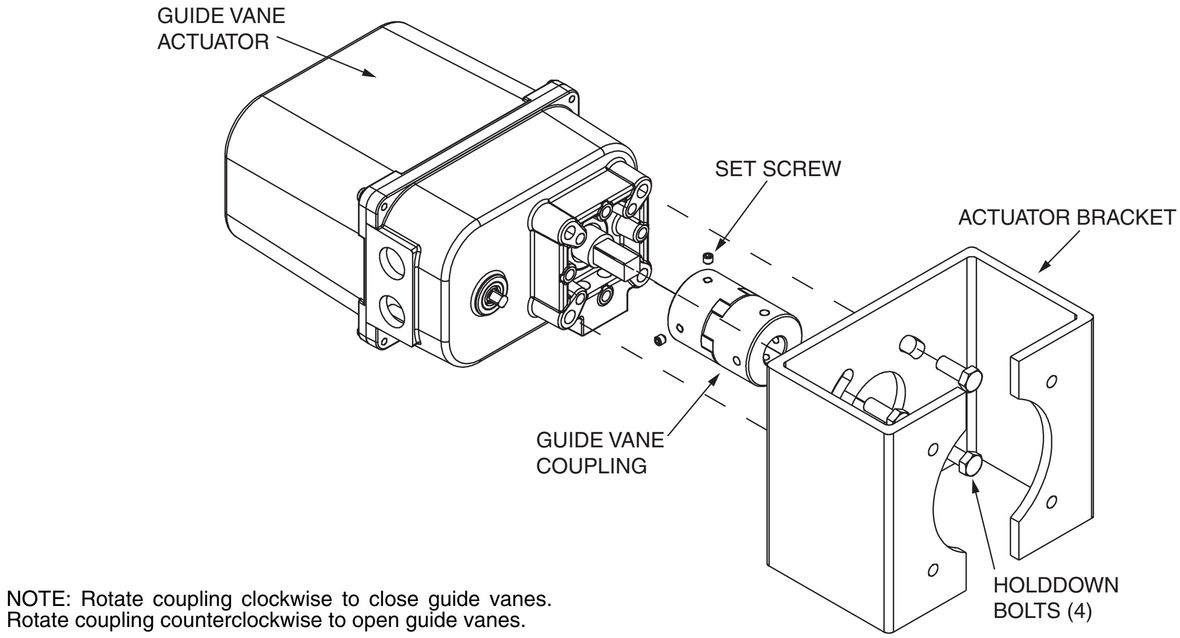


Fig. 31 — Guide Vane Actuator Detail

Trim Refrigerant Charge

If to obtain optimal chiller performance it becomes necessary to adjust the refrigerant charge, operate the chiller at design load and then add or remove refrigerant slowly until the difference between the leaving chilled water temperature and the cooler refrigerant temperature reaches design conditions or becomes a minimum. *Do not overcharge.*

Refrigerant may be added either through the storage tank or directly into the chiller as described in the Charge Refrigerant into Chiller section.

To remove any excess refrigerant, follow the procedure in Transfer Refrigerant from Chiller to Pumpout Storage Tank section, Steps 1a and b, page 35.

WEEKLY MAINTENANCE

Check the Lubrication System

Mark the oil level on the reservoir sight glass, and observe the level each week while the chiller is shut down.

If the level goes below the lower sight glass, check the oil reclaim system for proper operation. If additional oil is required, add it through the oil drain charging valve (Fig. 2). A pump is required when adding oil against refrigerant pressure. The oil charge for the 19XR two-stage compressor frame size 6 is 29 gal. (110 L); for frame size 7 the oil charge is 44.5 gal (168 L).

The added oil *must* meet Carrier specifications for the 19XR chiller. Refer to Changing Oil Filter and Oil Changes sections. Any additional oil that is added should be logged by noting the amount and date. Any oil that is added due to oil loss that is not related to service will eventually return to the sump. It must be removed when the level is high.

An oil heater is controlled by the PIC 5 control system to maintain oil temperature (see the 19XR with PIC 5 Controls Operation and Troubleshooting manual) when the compressor is off. If the PIC 5 control system shows that the heater is energized and if the sump is still not heating up, the power to the oil heater may be off or the oil level may be too low. Check the oil level, the oil heater contactor voltage, and oil heater resistance.

The PIC 5 control system does not permit compressor start-up if the oil temperature is too low. The PIC 5 control system continues with start-up only after the temperature is within allowable limits.

SCHEDULED MAINTENANCE

Establish a regular maintenance schedule based on your actual chiller requirements such as chiller load, run hours, and water quality. *The time intervals listed in this section are offered as guides to service only.*

Service Ontime

The HMI will display a SERVICE ONTIME value on the MAIN MENU → RUN TIMES screen. This value should be reset to zero by the service person or the operator each time major service work is completed so that the time between service events can be viewed and tracked.

Inspect the Control Panel

Maintenance consists of general cleaning and tightening of connections. Vacuum the cabinet to eliminate dust build-up. If the chiller control malfunctions, refer to the Troubleshooting Guide section on page 43 for control checks and adjustments.

⚠ WARNING

Ensure power to the starter is isolated when cleaning and tightening connections inside the starter enclosure. Failure to disconnect power could result in electrocution. The oil filter housing is at a high pressure. Relieve this pressure slowly. Failure to do so could result in serious personal injury.

Changing Oil Filter

Change the oil filter on a yearly basis or when the chiller is opened for repairs. The 19XR chiller has an isolatable oil filter so that the filter may be changed with the refrigerant remaining in the chiller. Use the following procedure:

1. Ensure the compressor is off and the disconnect for the compressor is open.
2. Disconnect the power to the oil pump.
3. Close the oil filter isolation valves.
4. Close the isolation valves located on both ends of the oil filter. Have rags and a catch basin available to collect oil spillage.
5. Equalize the filter's higher internal pressure to ambient by connecting an oil charging hose to the Schrader valve on

the oil filter housing. Collect the oil-refrigerant mixture which is discharged.
6. Remove the oil filter assembly by loosening the hex nuts on both ends of the filter assembly.
7. Insert the replacement filter assembly with the arrow on the housing pointing away from the oil pump.
8. Rotate the assembly so that the Schrader drain valve is oriented at the bottom, and tighten the connection nut on each end to a torque of approximately 30 ft-lb (41 N-m).

⚠ WARNING

The oil filter housing is at a high pressure. Relieve this pressure slowly. Failure to do so could result in serious personal injury.

9. Evacuate the filter housing by placing a vacuum pump on the charging valve. Follow the normal evacuation procedures. Shut the charging valve when done and reconnect the valve so that new oil can be pumped into the filter housing. Fill with the same amount that was removed; then close the charging valve.
10. Remove the hose from the charging valve, open the isolation valves to the filter housing, and turn on the power to the pump and the motor.

Oil Specification

If oil is added, it must meet Carrier specifications. For units using R-134a, use inhibited polyolester-based synthetic compressor oil formatted for use with HFC, gear-driven, hermetic compressors, with ISO Viscosity Grade 68. The polyolester-based oil (P/N: PP23BZ103) may be ordered from your local Carrier representative.

Oil Changes

Carrier recommends that a yearly oil analysis be performed to determine when to change oil and when to perform a compressor inspection. However, if yearly analysis is not performed or available, the time between oil changes should be no longer than 5 years. Additionally Carrier recommends vibration measurement done at regular intervals to obtain a signature of the moving compressor parts as part of a total productive maintenance (TPM) program.

TO CHANGE THE OIL

1. Transfer the refrigerant into the chiller condenser vessel (for isolatable vessels) or to a pumpout storage tank.
2. Mark the existing oil level.
3. Open the control and oil heater circuit breaker.
4. When the chiller pressure is 5 psig (34 kPa) or less, drain the oil reservoir by opening the oil charging valve (Fig. 2). Slowly open the valve against refrigerant pressure.
5. Change the oil filter at this time. See Changing Oil Filter section.
6. Change the refrigerant filter at this time. See the next section, Refrigerant Filter.
7. Charge the chiller with oil. Charge until the oil level is equal to the oil level marked in Step 2. Turn on the power to the oil heater and let the PIC 5 warm it up to at least 140°F (60°C). Operate the oil pump manually, using the Control Test function, for 2 minutes. For shutdown conditions, the oil level should be full in the lower sight glass. If the oil level is above $^1/_2$ full in the upper sight glass, remove the excess oil. The oil level should now be equal to the amount shown in Step 2.

Refrigerant Filter

A refrigerant filter/drier, located on the refrigerant cooling line to the motor, should be changed once a year or more often if filter condition indicates a need for more frequent replacement. Change the filter by closing the filter isolation valves (Fig. 2) and slowly opening the flare fittings with a wrench and back-up wrench to relieve the pressure. A moisture indicator sight glass is located beyond this filter to indicate the volume and moisture in the refrigerant. If the moisture indicator indicates moisture, locate the source of water immediately by performing a thorough leak check.

Oil Reclaim Filter

The oil reclaim system has a strainer on the eductor suction line, a strainer on the discharge pressure line, and a filter on the cooler scavenging line. Replace the filter once every 5 years or when the machine is opened for service. This filter does not contain desiccant for moisture removal, so changing the filter will not change the moisture indicator status. Change the filter by closing the filter isolation valves and slowly opening the flare fitting with a wrench and back-up wrench to relieve the pressure. Change the strainers once every 5 years or whenever refrigerant is evacuated from the cooler.

Inspect Refrigerant Float System

Perform this inspection only if the following symptoms are seen.

- There is a simultaneous drop in cooler pressure and increase in condenser pressure. This will be accompanied by an increase in kW/Ton.
- The liquid line downstream of the float valve feels warm. This indicates condenser gas flowing past the float. An increase in kW/Ton will also occur.

1. Transfer the refrigerant into the cooler vessel or into a pumpout storage tank.
2. Remove the float access cover.
3. Clean the chamber and valve assembly thoroughly. Be sure the valve moves freely. Ensure that all openings are free of obstructions.
4. Examine the cover gasket and replace if necessary. Inspect the orientation of the float slide pin. It must be pointed toward the bubbler tube for proper operation.

ECONOMIZER FLOAT SYSTEM

For two-stage compressors, the economizer has a low side ball type float system. The float refrigerant level can be observed through the two sight glasses located on the float cover under the condenser. See Fig. 32 for float detail. Inspect the float every five years. Clean the chamber and the float valve assembly. Be sure that the float moves freely and the ball bearings that the float moves on are clean.

ECONOMIZER DAMPER VALVE

The damper valve should be inspected every 5 years or when the condenser is opened for service. Check the economizer damper actuator's movement and wiring.

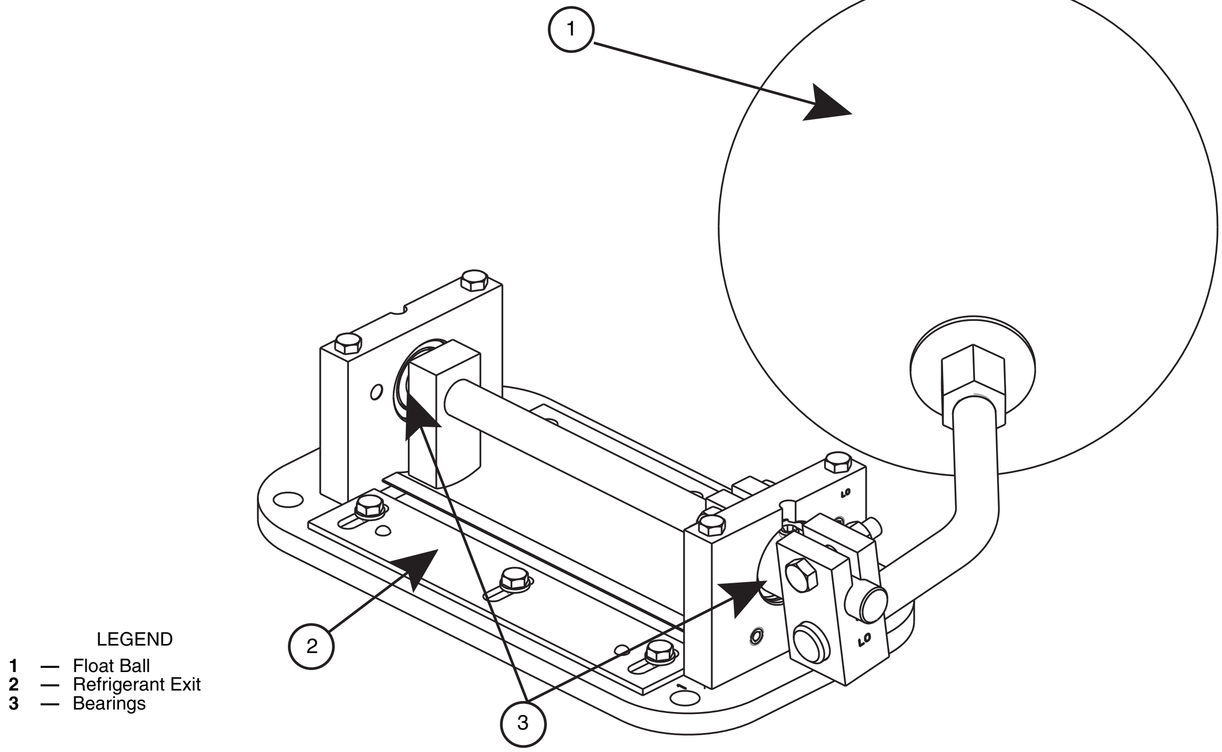


Fig. 32 — Economizer Float System (Two-Stage Compressor Chiller)

Inspect Relief Valves and Piping

The relief valves on this chiller protect the system against the potentially dangerous effects of overpressure. To ensure against damage to the equipment and possible injury to personnel, these devices must be kept in peak operating condition.

As a minimum, the following maintenance is required.

1. At least once a year, disconnect the vent piping at the valve outlet and carefully inspect the valve body and mechanism for any evidence of internal corrosion or rust, dirt, scale, leakage, etc.
2. If corrosion or foreign material is found, do not attempt to repair or recondition. *Replace the valve.*
3. If the chiller is installed in a corrosive atmosphere or the relief valves are vented into a corrosive atmosphere, inspect the relief valves at more frequent intervals.

Compressor Bearing and Gear Maintenance

The key to good bearing and gear maintenance is proper lubrication. Use the proper grade of oil, maintained at recommended level, temperature, and pressure. Inspect the lubrication system regularly and thoroughly. Annual oil analysis and vibration measurements are recommended.

Excessive bearing wear can sometimes be detected through increased vibration or increased bearing temperature. Gears, babbitted journal bearings, and thrust bearings should be examined for signs of wear based on the results of the annual oil analysis and vibration levels. To inspect the bearings, a complete compressor teardown is required. Only a trained service technician should remove and examine the bearings. The frequency of examination is determined by the hours of chiller operation, load conditions during operation, and the condition of the oil and the lubrication system. High speed shaft rolling element bearings cannot be field inspected; excessive vibration is the primary sign of wear or damage. If either symptom appears, contact an experienced and responsible service organization for assistance.

Inspect the Heat Exchanger Tubes and Flow Devices

COOLER AND OPTIONAL FLOW DEVICES

Inspect and clean the cooler tubes at the end of the first operating season. Because these tubes have internal ridges, a rotary-type tube cleaning system is needed to fully clean the tubes. Inspect the tubes' condition to determine the scheduled frequency for future cleaning and to determine whether water treatment in the chilled water/brine circuit is adequate. Inspect the entering and leaving chilled water temperature sensors and flow devices for signs of corrosion or scale. Replace a sensor or Schrader fitting if corroded or remove any scale if found.

CONDENSER AND OPTIONAL FLOW DEVICES

Since this water circuit is usually an open-type system, the tubes may be subject to contamination and scale. Clean the condenser tubes with a rotary tube cleaning system at least once per year and more often if the water is contaminated. Inspect the entering and leaving condenser water sensors and flow devices for signs of corrosion or scale. Replace the sensor or Schrader fitting if corroded or remove any scale if found.

Higher than normal condenser pressures, together with the inability to reach full refrigeration load, usually indicate dirty tubes or air in the chiller. If the refrigeration log indicates a rise above normal condenser pressures, check the condenser refrigerant temperature against the leaving condenser water temperature. If this reading is more than what the design difference is supposed to be, the condenser tubes may be dirty or water flow may be incorrect. Because HFC-134a is a high-pressure refrigerant, air usually does not enter the chiller.

During the tube cleaning process, use brushes specially designed to avoid scraping and scratching the tube wall. Contact your Carrier representative to obtain these brushes. Do not use wire brushes.

Hard scale may require chemical treatment for its prevention or removal. Consult a water treatment specialist for proper treatment.

Water Leaks

The refrigerant moisture indicator on the refrigerant motor cooling line (Fig. 2) indicates whether there is water leakage during chiller operation. Water leaks should be repaired immediately.

> **⚠ CAUTION**
>
> The chiller must be dehydrated after repair of water leaks or damage may result. See Chiller Dehydration section, page 18.

Water Treatment

Untreated or improperly treated water may result in corrosion, scaling, erosion, or algae. The services of a qualified water treatment specialist should be obtained to develop and monitor a treatment program.

> **⚠ CAUTION**
>
> Water must be within design flow limits, clean, and treated to ensure proper chiller performance and reduce the potential of tube damage due to corrosion, scaling, erosion, and algae. Carrier assumes no responsibility for chiller damage resulting from untreated or improperly treated water.

Inspect the Starting Equipment

Before working on any starter, shut off the chiller, open and tag all disconnects supplying power to the starter.

> **⚠ CAUTION**
>
> The motor leads must be disconnected from the starter before an insulation test is performed. The voltage generated from the tester can damage the starter components.

> **⚠ WARNING**
>
> The disconnect on the starter front panel does not always de-energize all internal circuits. Open all internal and remote disconnects before servicing the starter. Failure to follow this procedure may result in personal injury by electric shock.

Periodically vacuum accumulated debris on the internal parts. Use electrical cleaner for electrical parts as required.

Power connections on newly installed starters may relax and loosen after a month of operation. Turn power off and retighten. Recheck annually thereafter.

> **⚠ CAUTION**
>
> Loose power connections can cause voltage spikes, overheating, malfunctioning, or failures.

Recalibrate Pressure Transducers

Once a year, the pressure transducers should be checked against a pressure gage reading. Check all eight transducers: the 2 oil differential pressure transducers, the condenser pressure transducer, the cooler pressure transducer, and the optional waterside pressure transducer pairs (consisting of 4 flow devices: 2 cooler, 2 condenser). For details, see page 47.

Optional Pumpout System Maintenance

For pumpout unit compressor maintenance details, refer to the 19XR Positive Pressure Storage System Installation, Start-Up, and Service Instructions.

OPTIONAL PUMPOUT COMPRESSOR OIL CHARGE

Use oil conforming to Carrier specifications for reciprocating compressor usage. Oil requirements are as follows:

ISO Viscosity	68 or 220
Carrier Part Number	PP23BZ103 or PP23BZ104

The total oil charge is 13 oz. (0.5 L).

Oil should be visible in the pumpout compressor sight glass both during operation and at shutdown. Always check the oil level before operating the pumpout compressor. Before adding changing oil, relieve the refrigerant pressure through the access valves.

Relieve refrigerant pressure and add oil to the pumpout unit as follows:

1. Close service valves 2 and 4.
2. Run the pumpout compressor in Automatic mode for one minute or until the vacuum switch is satisfied and compressor shuts off.
3. Move the pumpout selector switch to OFF. Pumpout compressor shell should now be under vacuum.
4. Oil can be added to the shell with a hand oil pump through the access valve in the compressor base.

NOTE: The compressor access valve has a self-sealing fitting which will require a hose connection with a depressor to open.

OPTIONAL PUMPOUT SAFETY CONTROL SETTINGS (FIG. 33)

The optional pumpout system high-pressure switch opens at 185 psig (1276 kPa) and closes at 140 psig (965 kPa). Check the switch setting by operating the pumpout compressor and slowly throttling the pumpout condenser water.

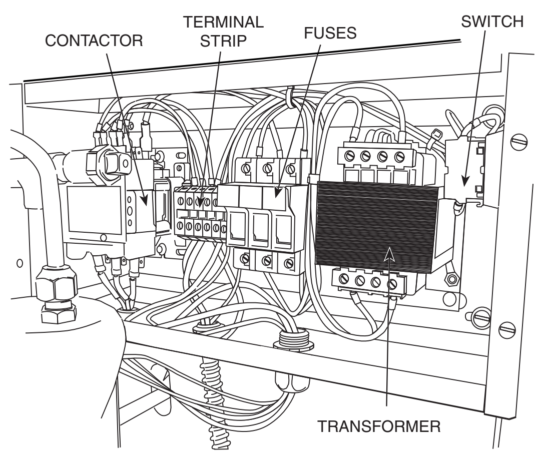


Fig. 33 — Pumpout Control Box (Interior)

Ordering Replacement Chiller Parts

When ordering Carrier specified parts, the following information must accompany an order:

- chiller model number and serial number
- name, quantity, and part number of the part required
- delivery address and method of shipment.

TROUBLESHOOTING GUIDE

Overview

The PIC 5 control system has many features to help the operator and technician troubleshoot a 19XR chiller.

- The HMI shows the chiller's actual operating conditions and can be viewed while the unit is running.
- The HMI default screen indicates when an alarm occurs. Once all alarms have been cleared (by correcting the problems), the HMI default screen indicates normal operation. For information about displaying and resetting alarms and a list of alert codes, see the 19XR with PIC 5 Controls Operation and Troubleshooting manual.
- The Configuration menu screens display information that helps to diagnose problems with chilled water temperature control, chilled water temperature control overrides, hot gas bypass, surge algorithm status, and time schedule operation.
- The quick test feature facilitates the proper operation and test of temperature sensors, pressure transducers, the guide vane actuator, diffuser actuator (if equipped), oil pump, water pumps, tower control, and other on/off outputs while the compressor is stopped. It also has the ability to lock off the compressor and turn on water pumps for pumpout operation. The HMI shows the temperatures and pressures required during these operations.
- If an operating fault is detected, an alarm indicator is displayed on the HMI default screen. A more detailed message — along with a diagnostic message — is also stored in the Current Alarms table.
- Review the Alarms History table to view other less critical events which may have occurred. Compare timing of relevant events and alarms.

For detailed information about alarms, see the 19XR with PIC 5 Controls Operation and Troubleshooting manual. Press the bell icon in the top right corner of the home screen to access current alarms and alarm history, and to reset alarms.

Checking Display Messages

The first area to check when troubleshooting the 19XR is the HMI display. Status messages are displayed at the bottom of the screen, and the alarm icon indicates a fault. For a complete list of alarms, see the 19XR with PIC 5 Controls Operation and Troubleshooting manual.

Checking Temperature Sensors

All temperature sensors are thermistor-type sensors. This means that the resistance of the sensor varies with temperature. All sensors have the same resistance characteristics. If the controls are on, determine sensor temperature by measuring voltage drop; if the controls are powered off, determine sensor temperature by measuring resistance. Compare the readings to the values listed in Tables 10 and 11.

RESISTANCE CHECK

Turn off the control power and, from the module, disconnect the terminal plug of the sensor in question. With a digital ohmmeter, measure sensor resistance between receptacles as designated by the wiring diagram. The resistance and corresponding temperature are listed in Tables 10 and 11. Check the resistance of both wires to ground. This resistance should be infinite.

VOLTAGE DROP

The voltage drop across any energized sensor can be measured with a digital voltmeter while the control is energized. Tables 10 and 11 list the relationship between temperature and sensor voltage drop (volts dc measured across the energized sensor). Exercise care when measuring voltage to prevent damage to the sensor leads, connector plugs, and modules. Sensors should also be checked at the sensor plugs.

⚠ CAUTION

Relieve all refrigerant pressure or drain the water before removing any thermowell threaded into the refrigerant pressure boundary. Failure to do so could result in personal injury and equipment damage.

Table 10 — Thermistor Temperature (F) vs. Resistance/Voltage Drop

TEMPERATURE (F)	PIC VOLTAGE DROP (V)	RESISTANCE (OHMS)	TEMPERATURE (F)	PIC VOLTAGE DROP (V)	RESISTANCE (OHMS)	TEMPERATURE (F)	PIC VOLTAGE DROP (V)	RESISTANCE (OHMS)
–25	4.700	97,706	**66**	2.565	6,568	**157**	0.630	893
–24	4.690	94,549	**67**	2.533	6,405	**158**	0.619	876
–23	4.680	91,474	**68**	2.503	6,246	**159**	0.609	859
–22	4.670	88,480	**69**	2.472	6,092	**160**	0.599	843
–21	4.659	85,568	**70**	2.440	5,942	**161**	0.589	827
–20	4.648	82,737	**71**	2.409	5,796	**162**	0.579	812
–19	4.637	79,988	**72**	2.378	5,655	**163**	0.570	797
–18	4.625	77,320	**73**	2.347	5,517	**164**	0.561	782
–17	4.613	74,734	**74**	2.317	5,382	**165**	0.551	768
–16	4.601	72,229	**75**	2.287	5,252	**166**	0.542	753
–15	4.588	69,806	**76**	2.256	5,124	**167**	0.533	740
–14	4.576	67,465	**77**	2.227	5,000	**168**	0.524	726
–13	4.562	65,205	**78**	2.197	4,880	**169**	0.516	713
–12	4.549	63,027	**79**	2.167	4,764	**170**	0.508	700
–11	4.535	60,930	**80**	2.137	4,650	**171**	0.499	687
–10	4.521	58,915	**81**	2.108	4,539	**172**	0.491	675
–9	4.507	56,981	**82**	2.079	4,432	**173**	0.484	663
–8	4.492	55,129	**83**	2.050	4,327	**174**	0.476	651
–7	4.477	53,358	**84**	2.021	4,225	**175**	0.468	639
–6	4.461	51,669	**85**	1.993	4,125	**176**	0.460	628
–5	4.446	50,062	**86**	1.965	4,028	**177**	0.453	616
–4	4.429	48,536	**87**	1.937	3,934	**178**	0.445	605
–3	4.413	47,007	**88**	1.909	3,843	**179**	0.438	595
–2	4.396	45,528	**89**	1.881	3,753	**180**	0.431	584
–1	4.379	44,098	**90**	1.854	3,667	**181**	0.424	574
0	4.361	42,715	**91**	1.827	3,582	**182**	0.418	564
1	4.344	41,380	**92**	1.800	3,500	**183**	0.411	554
2	4.325	40,089	**93**	1.773	3,420	**184**	0.404	544
3	4.307	38,843	**94**	1.747	3,342	**185**	0.398	535
4	4.288	37,639	**95**	1.721	3,266	**186**	0.392	526
5	4.269	36,476	**96**	1.695	3,192	**187**	0.385	516
6	4.249	35,354	**97**	1.670	3,120	**188**	0.379	508
7	4.229	34,270	**98**	1.644	3,049	**189**	0.373	499
8	4.209	33,224	**99**	1.619	2,981	**190**	0.367	490
9	4.188	32,214	**100**	1.595	2,914	**191**	0.361	482
10	4.167	31,239	**101**	1.570	2,849	**192**	0.356	474
11	4.145	30,298	**102**	1.546	2,786	**193**	0.350	466
12	4.123	29,389	**103**	1.523	2,724	**194**	0.344	458
13	4.101	28,511	**104**	1.499	2,663	**195**	0.339	450
14	4.079	27,663	**105**	1.476	2,605	**196**	0.333	442
15	4.056	26,844	**106**	1.453	2,547	**197**	0.328	435
16	4.033	26,052	**107**	1.430	2,492	**198**	0.323	428
17	4.009	25,285	**108**	1.408	2,437	**199**	0.318	421
18	3.985	24,544	**109**	1.386	2,384	**200**	0.313	414
19	3.960	23,826	**110**	1.364	2,332	**201**	0.308	407
20	3.936	23,130	**111**	1.343	2,282	**202**	0.304	400
21	3.911	22,455	**112**	1.321	2,232	**203**	0.299	393
22	3.886	21,800	**113**	1.300	2,184	**204**	0.294	387
23	3.861	21,163	**114**	1.279	2,137	**205**	0.290	381
24	3.835	20,556	**115**	1.259	2,092	**206**	0.285	374
25	3.808	19,967	**116**	1.239	2,047	**207**	0.281	368
26	3.782	19,396	**117**	1.219	2,003	**208**	0.277	362
27	3.755	18,843	**118**	1.200	1,961	**209**	0.272	356
28	3.727	18,307	**119**	1.180	1,920	**210**	0.268	351
29	3.700	17,787	**120**	1.161	1,879	**211**	0.264	345
30	3.672	17,284	**121**	1.143	1,840	**212**	0.260	339
31	3.644	16,797	**122**	1.124	1,801	**213**	0.256	334
32	3.617	16,325	**123**	1.106	1,764	**214**	0.252	329
33	3.588	15,868	**124**	1.088	1,727	**215**	0.248	323
34	3.559	15,426	**125**	1.070	1,691	**216**	0.245	318
35	3.530	14,997	**126**	1.053	1,656	**217**	0.241	313
36	3.501	14,582	**127**	1.036	1,622	**218**	0.237	308
37	3.471	14,181	**128**	1.019	1,589	**219**	0.234	303
38	3.442	13,791	**129**	1.002	1,556	**220**	0.230	299
39	3.412	13,415	**130**	0.986	1,524	**221**	0.227	294
40	3.382	13,050	**131**	0.969	1,493	**222**	0.224	289
41	3.353	12,696	**132**	0.953	1,463	**223**	0.220	285
42	3.322	12,353	**133**	0.938	1,433	**224**	0.217	280
43	3.291	12,021	**134**	0.922	1,404	**225**	0.214	276
44	3.260	11,699	**135**	0.907	1,376	**226**	0.211	272
45	3.229	11,386	**136**	0.893	1,348	**227**	0.208	267
46	3.198	11,082	**137**	0.878	1,321	**228**	0.205	263
47	3.167	10,787	**138**	0.864	1,295	**229**	0.203	259
48	3.135	10,500	**139**	0.849	1,269	**230**	0.198	255
49	3.104	10,221	**140**	0.835	1,244	**231**	0.195	251
50	3.074	9,949	**141**	0.821	1,219	**232**	0.192	248
51	3.042	9,689	**142**	0.808	1,195	**233**	0.190	244
52	3.010	9,436	**143**	0.795	1,172	**234**	0.187	240
53	2.978	9,190	**144**	0.782	1,149	**235**	0.184	236
54	2.946	8,951	**145**	0.769	1,126	**236**	0.182	233
55	2.914	8,719	**146**	0.756	1,104	**237**	0.179	229
56	2.882	8,494	**147**	0.744	1,083	**238**	0.176	226
57	2.850	8,275	**148**	0.731	1,062	**239**	0.174	223
58	2.819	8,062	**149**	0.719	1,041	**240**	0.172	219
59	2.788	7,855	**150**	0.707	1,021	**241**	0.169	216
60	2.756	7,655	**151**	0.696	1,002	**242**	0.167	213
61	2.724	7,460	**152**	0.684	983	**243**	0.164	210
62	2.692	7,271	**153**	0.673	964	**244**	0.162	207
63	2.660	7,088	**154**	0.662	945	**245**	0.160	204
64	2.628	6,909	**155**	0.651	928	**246**	0.158	201
65	2.596	6,736	**156**	0.640	910	**247**	0.155	198
						248	0.153	195

Table 11 — Thermistor Temperature (C) vs. Resistance/Voltage Drop

TEMPERATURE (C)	PIC VOLTAGE DROP (V)	RESISTANCE (OHMS)	TEMPERATURE (C)	PIC VOLTAGE DROP (V)	RESISTANCE (OHMS)
–33	4.722	105 616	**44**	1.338	2 272
–32	4.706	99 640	**45**	1.300	2 184
–31	4.688	93 928	**46**	1.263	2 101
–30	4.670	88 480	**47**	1.227	2 021
–29	4.650	83 297	**48**	1.192	1 944
–28	4.630	78 377	**49**	1.158	1 871
–27	4.608	73 722	**50**	1.124	1 801
–26	4.586	69 332	**51**	1.091	1 734
–25	4.562	65 205	**52**	1.060	1 670
–24	4.538	61 343	**53**	1.029	1 609
–23	4.512	57 745	**54**	0.999	1 550
–22	4.486	54 411	**55**	0.969	1 493
–21	4.458	51 341	**56**	0.941	1 439
–20	4.429	48 536	**57**	0.913	1 387
–19	4.399	45 819	**58**	0.887	1 337
–18	4.368	43 263	**59**	0.861	1 290
–17	4.336	40 858	**60**	0.835	1 244
–16	4.303	38 598	**61**	0.811	1 200
–15	4.269	36 476	**62**	0.787	1 158
–14	4.233	34 484	**63**	0.764	1 117
–13	4.196	32 613	**64**	0.741	1 079
–12	4.158	30 858	**65**	0.719	1 041
–11	4.119	29 211	**66**	0.698	1 006
–10	4.079	27 663	**67**	0.677	971
–9	4.037	26 208	**68**	0.657	938
–8	3.994	24 838	**69**	0.638	906
–7	3.951	23 545	**70**	0.619	876
–6	3.906	22 323	**71**	0.601	846
–5	3.861	21 163	**72**	0.583	818
–4	3.814	20 083	**73**	0.566	791
–3	3.765	19 062	**74**	0.549	765
–2	3.716	18 097	**75**	0.533	740
–1	3.667	17 185	**76**	0.518	715
0	3.617	16 325	**77**	0.503	692
1	3.565	15 513	**78**	0.488	670
2	3.512	14 747	**79**	0.474	648
3	3.459	14 023	**80**	0.460	628
4	3.406	13 341	**81**	0.447	608
5	3.353	12 696	**82**	0.434	588
6	3.298	12 087	**83**	0.422	570
7	3.242	11 510	**84**	0.410	552
8	3.185	10 963	**85**	0.398	535
9	3.129	10 444	**86**	0.387	518
10	3.074	9 949	**87**	0.376	502
11	3.016	9 486	**88**	0.365	487
12	2.959	9 046	**89**	0.355	472
13	2.901	8 628	**90**	0.344	458
14	2.844	8 232	**91**	0.335	444
15	2.788	7 855	**92**	0.325	431
16	2.730	7 499	**93**	0.316	418
17	2.672	7 160	**94**	0.308	405
18	2.615	6 839	**95**	0.299	393
19	2.559	6 535	**96**	0.291	382
20	2.503	6 246	**97**	0.283	371
21	2.447	5 972	**98**	0.275	360
22	2.391	5 711	**99**	0.267	349
23	2.335	5 463	**100**	0.260	339
24	2.280	5 226	**101**	0.253	330
25	2.227	5 000	**102**	0.246	320
26	2.173	4 787	**103**	0.239	311
27	2.120	4 583	**104**	0.233	302
28	2.067	4 389	**105**	0.227	294
29	2.015	4 204	**106**	0.221	286
30	1.965	4 028	**107**	0.215	278
31	1.914	3 861	**108**	0.210	270
32	1.865	3 701	**109**	0.205	262
33	1.816	3 549	**110**	0.198	255
34	1.768	3 404	**111**	0.193	248
35	1.721	3 266	**112**	0.188	242
36	1.675	3 134	**113**	0.183	235
37	1.629	3 008	**114**	0.178	229
38	1.585	2 888	**115**	0.174	223
39	1.542	2 773	**116**	0.170	217
40	1.499	2 663	**117**	0.165	211
41	1.457	2 559	**118**	0.161	205
42	1.417	2 459	**119**	0.157	200
43	1.377	2 363	**120**	0.153	195

CHECK SENSOR ACCURACY

Place the sensor in a medium of known temperature and compare that temperature to the measured reading. The thermometer used to determine the temperature of the medium should be of laboratory quality with 0.5°F (0.25°C) graduations. The sensor in question should be accurate to within 2°F (1.2°C).

Note that the PIC 5 control module, MAINTENANCE menu, offers a temperature sensor calibration feature where the sensor temperature can be offset. To use this feature, place the sensor at 32°F (0°C) or other known temperature. Read the raw temperature and calculate offset based on the reading seen in the TEMP_CAL menu. Enter and execute the offset, which cannot exceed ± 2°F (1.2°C).

See Fig. 2 for sensor locations. The sensors are immersed directly in the refrigerant or water circuits. When installing a new sensor, apply a pipe sealant or thread sealant to the sensor threads.

An additional thermistor, factory installed in the bottom of the cooler barrel, is displayed as Evap Refrig Liquid Temp on the TEMPERATURES display screen. This thermistor provides additional protection against a loss of water flow.

DUAL TEMPERATURE SENSORS

For servicing convenience, there are 2 redundant sensors each on the bearing and motor temperature sensors. If one of the sensors is damaged, the other can be used by simply moving a wire. The number 2 terminal in the sensor terminal box is the common line. To use the second sensor, move the wire from the number 1 position to the number 3 position. See Fig. 34 or Fig. 35.

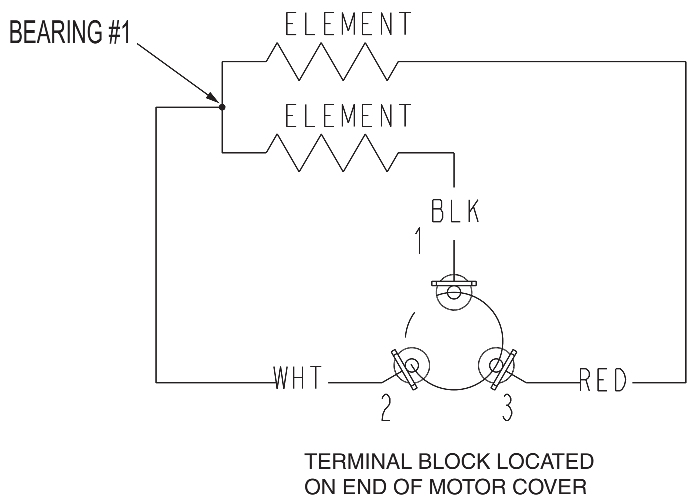


Fig. 34 — Bearing 1 Sensor Wiring from Back of Terminal Block

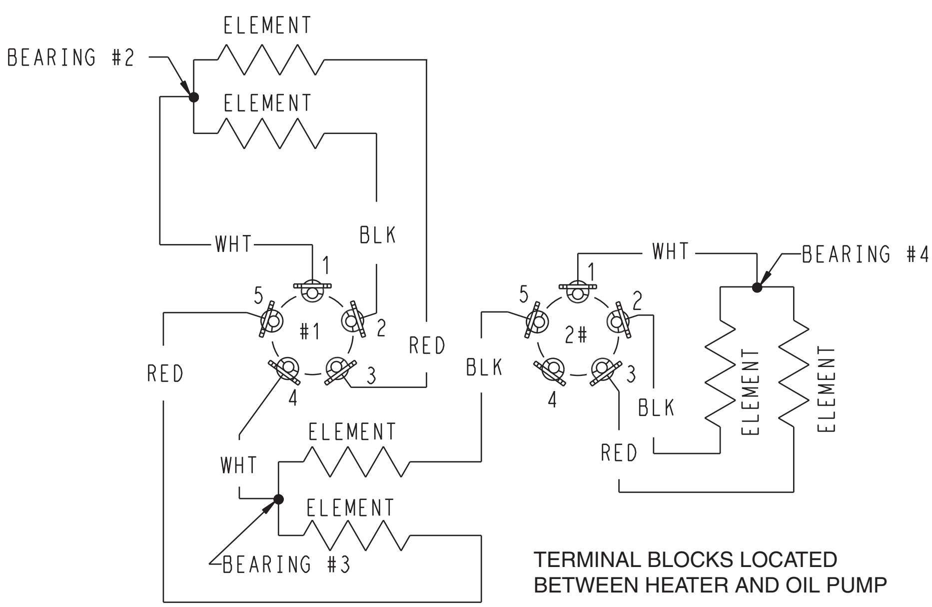


Fig. 35 — Bearings 2-4 Sensor Wiring from Back of Terminal Block

Checking Pressure Transducers

There are 4 factory-installed pressure transducers measuring refrigerant and oil pressure, and a fifth pressure transducer measuring economizer pressure.

These transducers can be calibrated if necessary. It is necessary to calibrate at initial start-up, particularly at high altitude locations, to ensure the proper refrigerant temperature/pressure relationship. Each transducer is supplied with 5 vdc power. If the power supply fails, a transducer voltage reference alarm occurs. If the transducer reading is suspected of being faulty, check the TRANSDUCER VOLTAGE REF supply voltage. It should be 5 vdc ± 0.5 v as displayed in MAINTENANCE MENU → MAINTENANCE OTHERS, where all the transducer voltages are shown. If the TRANSDUCER VOLTAGE REF supply voltage is correct, the transducer should be recalibrated or replaced.

Also check that inputs have not been grounded and are not receiving anything other than a 4 to 20 mA signal.

TRANSDUCER REPLACEMENT

Since the transducers are mounted on Schrader-type fittings, there is no need to remove refrigerant from the vessel when replacing the transducers. Disconnect the transducer wiring. *Do not pull on the transducer wires*. Unscrew the transducer from the Schrader fitting. When installing a new transducer, do not use pipe sealer (which can plug the sensor). Put the plug connector back on the sensor and snap into place. Check for refrigerant leaks.

⚠ WARNING

Be sure to use a back-up wrench on the Schrader fitting whenever removing a transducer, since the Schrader fitting may back out with the transducer, causing a large leak and possible injury to personnel.

COOLER AND CONDENSER PRESSURE TRANSDUCER CALIBRATION

Calibration can be checked by comparing the pressure readings from the transducer to an accurate refrigeration gage reading. These readings can be viewed or calibrated from the HMI screen. The transducer can be checked and calibrated at 2 pressure points. These calibration points are 0 psig (0 kPa) and between 25 and 250 psig (173 and 1724 kPa). Wiring is shown in Fig. 36. Installation of pressure transducers into water nozzles using flushable dirt leg trap is suggested; see Fig. 37. Connect pressure transducer to Schrader connection. To calibrate these transducers:

1. Shut down the compressor, cooler, and condenser pumps.
   NOTE: There should be no flow through the heat exchangers.
2. Disconnect the transducer in question from its Schrader fitting for cooler or condenser transducer calibration. For oil pressure or flow device calibration, leave the transducer in place.
   NOTE: If the cooler or condenser vessels are at 0 psig (0 kPa) or are open to atmospheric pressure, the transducers can be calibrated for zero without removing the transducer from the vessel.
3. Access the PRESSURE or HYDRAULIC STATUS screen and view the particular transducer reading. To calibrate oil pressure or waterside flow device, view the particular reading. It should read 0 psig (0 kPa). If the reading is not 0 psig (0 kPa), but within ± 5 psig (35 kPa), the value may be set to zero from the Maintenance Menu while the appropriate transducer parameter is highlighted. The value will now go to zero.
   If the transducer value is not within the calibration range, the transducer returns to the original reading. If the pressure is within the allowed range (noted above), check the voltage ratio of the transducer. To obtain the voltage ratio, divide the voltage (dc) input from the transducer by the supply voltage signal or measure across the positive (+ red) and negative (– black) leads of the transducer. The input to reference voltage ratio must be between 0.80 and 0.11 for the software to allow calibration. Rotate the waterside flow pressure device from the inlet nozzle to the outlet nozzle and repeat this step. If rotating the waterside flow device does not allow calibration, pressurize the transducer until the ratio is within range. Then attempt calibration again.
4. Pressures can be calibrated between 100 and 250 psig (689.5 and 1723.7 kPa) by attaching a regulated 250 psig (1724 kPa) pressure (usually from a nitrogen cylinder). For calibration, access the Pressure Sensor Calibration Menu from the Maintenance Menu and calibrate the appropriate sensor.

The PIC 5 control system does not allow calibration if the transducer is too far out of calibration. In this case, a new transducer must be installed and re-calibrated. If calibration problems are encountered on the OIL PRESSURE DELTA P channel, sometimes swapping the compressor oil discharge pressure transducer and the oil sump pressure transducer will offset an adverse transducer tolerance stack up and allow the calibration to proceed.

HYDRAULIC STATUS

The HYDRAULIC STATUS screen (access from the Main Menu) provides a convenient way to detect if any of the cooler/condenser pressure switches (if installed) are in need of calibration. With no flow and no added resistors the water delta should read zero psig (0 kPa). If it does not, the value may be set to zero using PRESSURE SENSOR CALIB located in the Maintenance Menu.

High Altitude Locations

Because the chiller is initially calibrated at sea level, it is necessary to recalibrate the pressure transducers if the chiller has been moved to a high altitude location. See the calibration procedure in the 19XR with PIC 5 Controls Operation and Troubleshooting guide. Note that Atmospheric Pressure can be adjusted in the Service Parameters Menu (located in the Configuration Menu).

Quick Test

The Quick Test feature is located in the Main Menu. Use this feature to calibrate guide vane, test chiller status, test the status of various actuators, view water temperature deltas, and test oil pump and oil heater relays, as well as control inlet guide vane, hot gas bypass, economizer damper, alarms, condenser, and chilled water pumps. The tests can help to determine whether a switch is defective or a pump relay is not operating, as well as other useful troubleshooting issues. During pumpdown operations, the pumps are energized to prevent freeze-up and the vessel pressures and temperatures are displayed.

Pumpdown/Lockout

The Pumpdown/Lockout feature, available from the Maintenance Menu, prevents compressor start-up when there is no refrigerant in the chiller or if the vessels are isolated. The Terminate Lockout feature ends the Pumpdown/Lockout after the pumpdown procedure is reversed and refrigerant is added.

Physical Data

Tables 12-38 and Fig. 38-50 provide additional information on component weights, compressor fits and clearances, physical and electrical data, and wiring schematics for the operator's convenience during troubleshooting.

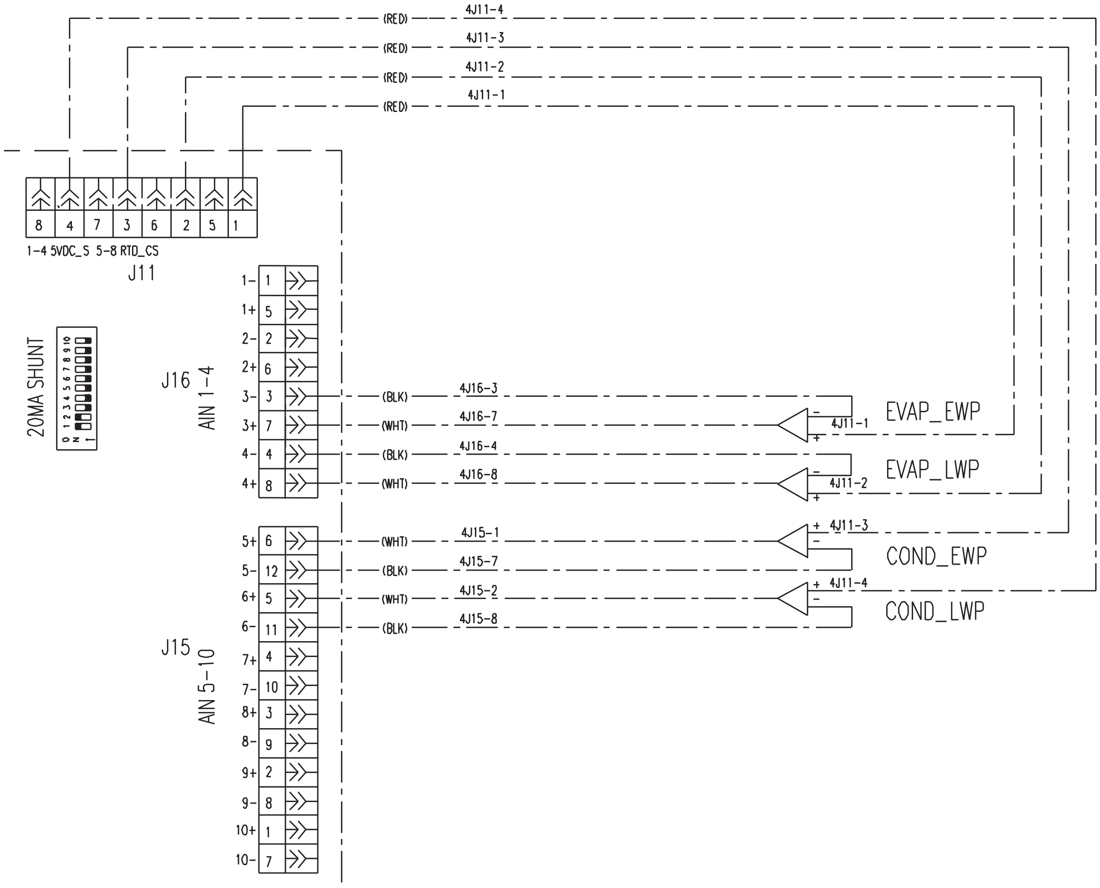


Fig. 36 — Inputs for Optional Waterside Delta P Transducers for IOB4

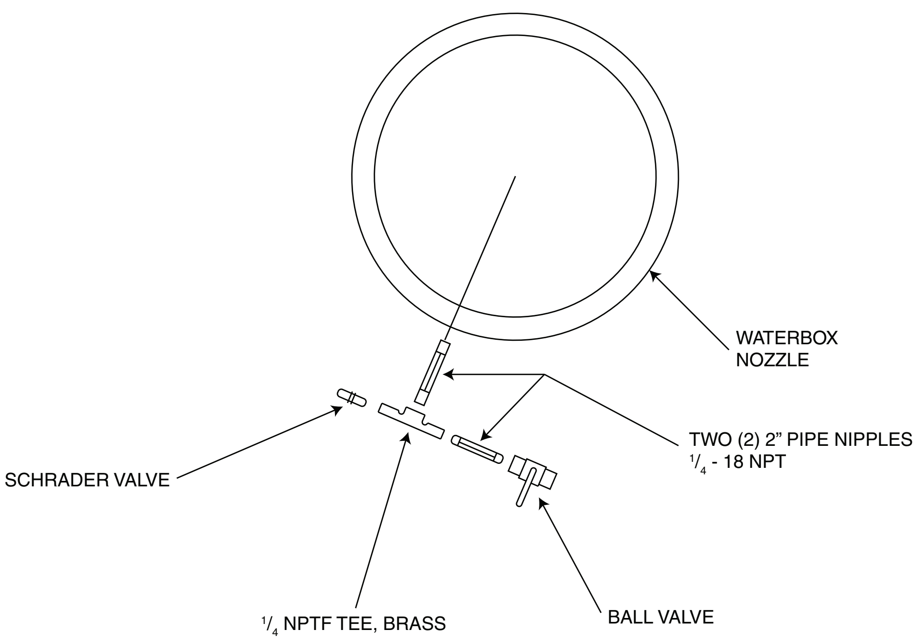


Fig. 37 — Suggested Installation of Pressure Transducers into Water Nozzles Using Flushable Dirt Leg Trap

Table 12 — 19XR Two-Stage Compressor Frame Size 6 Heat Exchanger Weights (English)

CODE†	DRY RIGGING WEIGHT (lb)*		REFRIGERANT WEIGHT (lb)		WATER WEIGHT (lb)	
	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY
A40	16,877	18,542	1647	927	4328	4553
A41	17,270	19,062	1773	927	4557	4890
A42	17,690	19,565	1887	927	4816	5213
A45	16,968	18,493	1599	927	4453	4582
A46	17,371	19,063	1714	927	4701	4949
A47	17,761	19,578	1837	927	4941	5281
A60	18,354	20,139	1878	1074	4721	5029
A61	18,807	20,745	2022	1074	4984	5415
A62	19,295	21,330	2152	1074	5280	5786
A65	18,469	20,095	1823	1074	4859	5060
A66	18,936	20,758	1954	1074	5144	5482
A67	19,389	21,357	2095	1074	5419	5862
A4A	15,540	17,089	1681	861	4183	4524
A4B	15,794	17,472	1792	861	4392	4859
A4C	16,063	17,812	1897	861	4615	5137
A4F	15,592	17,076	1626	861	4322	4588
A4G	15,845	17,405	1736	861	4531	4867
A4H	16,249	17,821	1890	861	4865	5219
A6A	16,465	18,359	1917	998	4555	4996
A6B	16,758	18,806	2044	998	4794	5368
A6C	17,070	19,202	2164	998	5050	5698
A6F	16,535	18,356	1854	998	4709	5068
A6G	16,829	18,739	1979	998	4948	5387
A6H	17,296	19,225	2156	998	5331	6156
B40	—	21,217	—	1233	—	5850
B41	—	21,965	—	1233	—	6333
B42	—	22,581	—	1233	—	6729
B45	—	21,173	—	1233	—	5904
B46	—	21,909	—	1233	—	6379
B47	—	22,653	—	1233	—	6859
B60	—	23,061	—	1423	—	6464
B61	—	23,932	—	1423	—	7018
B62	—	24,649	—	1423	—	7473
B65	—	23,022	—	1423	—	6521
B66	—	23,879	—	1423	—	7066
B67	—	24,745	—	1423	—	7617
B4A	—	19,217	—	1148	—	5756
B4B	—	19,793	—	1148	—	6243
B4C	—	20,254	—	1148	—	6633
B4F	—	19,217	—	1148	—	5852
B4G	—	19,721	—	1148	—	6279
B4H	—	20,318	—	1148	—	6785
B6A	—	20,794	—	1326	—	6357
B6B	—	21,465	—	1326	—	6915
B6C	—	22,002	—	1326	—	7362
B6F	—	20,806	—	1326	—	6462
B6G	—	21,393	—	1326	—	6951
B6H	—	22,088	—	1326	—	8379

*Rigging weights are for standard tubes of standard wall thickness (0.025-in. [0.635 mm] wall) and do not include refrigerant weight.
†See Model Number Nomenclature on page 5.
NOTES:
1. Cooler weight includes the suction elbow and the distribution piping to the economizer and two-pass Victaulic dished heads.
2. Condenser weight includes the high side float chamber, discharge pipe, and the distribution piping weight from the economizer to the float chamber and two-pass Victaulic dished heads.

Table 13 — 19XR Two-Stage Compressor Frame Size 6 Heat Exchanger Weights (SI)

CODE†	DRY RIGGING WEIGHT (kg)*		REFRIGERANT WEIGHT (kg)		WATER WEIGHT (kg)	
	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY
A40	7655	8410	747	420	1963	2065
A41	7833	8646	804	420	2067	2218
A42	8024	8875	856	420	2184	2365
A45	7697	8388	725	420	2020	2078
A46	7879	8647	777	420	2132	2245
A47	8056	8880	833	420	2241	2395
A60	8325	9135	852	487	2141	2281
A61	8531	9410	917	487	2261	2456
A62	8752	9675	976	487	2395	2624
A65	8377	9115	827	487	2204	2295
A66	8589	9416	886	487	2333	2487
A67	8795	9687	950	487	2458	2659
A4A	7049	7751	762	391	1897	2052
A4B	7164	7925	813	391	1992	2204
A4C	7286	8079	860	391	2093	2330
A4F	7072	7746	738	391	1960	2081
A4G	7187	7895	787	391	2055	2208
A4H	7370	8083	857	391	2207	2367
A6A	7468	8328	870	453	2066	2266
A6B	7601	8530	927	453	2175	2435
A6C	7743	8710	982	453	2291	2585
A6F	7500	8326	841	453	2136	2299
A6G	7633	8500	898	453	2244	2444
A6H	7845	8730	978	453	2418	2792
B40	—	9624	—	559	—	2653
B41	—	9963	—	559	—	2873
B42	—	10,243	—	559	—	3052
B45	—	9604	—	559	—	2678
B46	—	9938	—	559	—	2893
B47	—	10,275	—	559	—	3111
B60	—	10,460	—	645	—	2932
B61	—	10,855	—	645	—	3183
B62	—	11,181	—	645	—	3390
B65	—	10,442	—	645	—	2958
B66	—	10,831	—	645	—	3205
B67	—	11,224	—	645	—	3455
B4A	—	8717	—	521	—	2611
B4B	—	8978	—	521	—	2832
B4C	—	9187	—	521	—	3009
B4F	—	8717	—	521	—	2654
B4G	—	8945	—	521	—	2848
B4H	—	9216	—	521	—	3078
B6A	—	9432	—	601	—	2883
B6B	—	9736	—	601	—	3137
B6C	—	9980	—	601	—	3339
B6F	—	9487	—	601	—	2931
B6G	—	9704	—	601	—	3153
B6H	—	10,019	—	601	—	3801

*Rigging weights are for standard tubes of standard wall thickness (0.025-in. [0.635 mm] wall) and do not include refrigerant weight.
†See Model Number Nomenclature on page 5.
NOTES:
1. Cooler weight includes the suction elbow and the distribution piping to the economizer and two-pass Victaulic dished heads.
2. Condenser weight includes the high side float chamber, discharge pipe, and the distribution piping weight from the economizer to the float chamber and two-pass Victaulic dished heads.

Table 14 — 19XR Two-Stage Compressor Frame Size 7 Heat Exchanger Weights (English)

CODE†	DRY RIGGING WEIGHT (lb)*		REFRIGERANT WEIGHT (lb)		WATER WEIGHT (lb)	
	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY
B60	24,704	—	2273	—	6,340	—
B61	25,337	—	2355	—	6,737	—
B62	25,964	—	2460	—	7,116	—
B65	25,014	—	2185	—	6,485	—
B66	25,631	—	2275	—	6,873	—
B67	26,264	—	2379	—	7,255	—
B6A	22,819	—	2081	—	6,159	—
B6B	23,299	—	2162	—	6,568	—
B6C	23,829	—	2256	—	6,993	—
B6F	23,139	—	1951	—	6,344	—
B6G	23,648	—	2019	—	6,774	—
B6H	24,171	—	2120	—	7,194	—
B80	26,184	—	2557	—	6,766	—
B81	26,922	—	2649	—	7,208	—
B82	27,627	—	2768	—	7,629	—
B85	26,438	—	2458	—	6,923	—
B86	27,157	—	2559	—	7,355	—
B87	27,868	—	2676	—	7,780	—
B8A	24,164	—	2341	—	6,580	—
B8B	24,722	—	2432	—	7,036	—
B8C	25,317	—	2538	—	7,510	—
B8F	24,403	—	2195	—	6,783	—
B8G	25,011	—	2271	—	7,262	—
B8H	25,599	—	2385	—	7,731	—
C60	30,825	29,857	2647	1610	8,475	8,630
C61	31,536	30,881	2751	1610	8,924	9,275
C62	32,467	31,871	2875	1610	9,474	9,916
C65	31,135	29,982	2562	1610	8,645	8,684
C66	31,851	31,064	2666	1610	9,097	9,362
C67	32,777	32,186	2793	1610	9,644	10,078
C6A	28,641	27,676	2443	1497	6,898	8,675
C6B	29,167	28,315	2534	1497	7,352	9,216
C6C	29,750	28,918	2627	1497	7,823	9,752
C6F	28,929	27,774	2334	1497	7,724	8,710
C6G	29,478	28,457	2415	1497	8,194	9,283
C6H	30,083	29,223	2500	1497	8,681	9,935
C80	22,433	31,810	2978	1811	9,084	9,312
C81	22,315	32,955	3095	1811	9,589	10,029
C82	22,231	34,094	3234	1811	10,208	10,742
C85	22,534	31,911	2882	1811	9,275	9,367
C86	22,416	33,113	2999	1811	9,784	10,120
C87	22,332	34,385	3142	1811	10,399	10,196
C8A	22,432	19,664	2748	1684	7,310	9,387
C8B	22,314	19,548	2851	1684	7,821	9,991
C8C	22,230	19,463	2955	1684	8,351	10,589
C8F	22,533	19,763	2626	1684	8,239	9,420
C8G	22,415	19,641	2717	1684	8,768	10,059
C8H	22,331	19,503	2813	1684	9,316	10,787
D60	—	38,296	—	2097	—	11,473
D61	—	39,624	—	2097	—	12,309
D62	—	41,031	—	2097	—	13,210
D65	—	37,624	—	2097	—	11,617
D66	—	38,837	—	2097	—	12,387
D67	—	40,460	—	2097	—	13,410
D80	—	41,916	—	2359	—	12,447
D81	—	43,382	—	2359	—	13,388
D82	—	44,963	—	2359	—	14,401
D85	—	42,058	—	2359	—	12,609
D86	—	43,408	—	2359	—	13,475
D87	—	45,204	—	2359	—	14,626

Table 14 — 19XR Two-Stage Compressor Frame Size 7 Heat Exchanger Weights (English) (cont)

CODE†	DRY RIGGING WEIGHT (lb)*		REFRIGERANT WEIGHT (lb)		WATER WEIGHT (lb)	
	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY
D6A	—	35,286	—	1947	—	11,401
D6B	—	36,328	—	1947	—	12,255
D6C	—	37,288	—	1947	—	13,078
D6F	—	34,447	—	1947	—	11,448
D6G	—	35,637	—	1947	—	12,408
D6H	—	36,663	—	1947	—	13,278
D8A	—	38,494	—	2190	—	12,366
D8B	—	39,633	—	2190	—	13,327
D8C	—	40,731	—	2190	—	14,253
D8F	—	38,479	—	2190	—	12,419
D8G	—	39,761	—	2190	—	13,499
D8H	—	40,922	—	2190	—	14,478

*Rigging weights are for standard tubes of standard wall thickness (0.025-in. [0.635 mm] wall) and do not include refrigerant weight.

†See Model Number Nomenclature on page 5.

NOTES:

1. Cooler weight includes the suction elbow and the distribution piping to the economizer and two-pass Victaulic dished heads.
2. Condenser weight includes the high side float chamber, discharge pipe, and the distribution piping weight from the economizer to the float chamber and two-pass Victaulic dished heads.

Table 15 — 19XR Two-Stage Compressor Frame Size 7 Heat Exchanger Weights (SI)

CODE†	DRY RIGGING WEIGHT (kg)*		REFRIGERANT WEIGHT (kg)		WATER WEIGHT (kg)	
	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY
B60	11 206	—	1031	—	2876	—
B61	11 493	—	1068	—	3056	—
B62	11 777	—	1116	—	3228	—
B65	11 346	—	991	—	2941	—
B66	11 626	—	1032	—	3118	—
B67	11 913	—	1079	—	3291	—
B6A	10 351	—	944	—	2794	—
B6B	10 568	—	981	—	2979	—
B6C	10 809	—	1023	—	3172	—
B6F	10 496	—	885	—	2878	—
B6G	10 727	—	916	—	3073	—
B6H	10 964	—	962	—	3263	—
B80	11 877	—	1160	—	3069	—
B81	12 212	—	1202	—	3269	—
B82	12 531	—	1256	—	3460	—
B85	11 992	—	1115	—	3141	—
B86	12 318	—	1161	—	3336	—
B87	11 214	—	1214	—	3529	—
B8A	10 952	—	1062	—	2885	—
B8B	11 214	—	1103	—	3191	—
B8C	11 484	—	1151	—	3406	—
B8F	11 069	—	996	—	3077	—
B8G	11 345	—	1030	—	3294	—
B8H	11 612	—	1082	—	3507	—
C60	13 982	13 543	1201	730	3841	3914
C61	14 304	14 007	1248	730	4048	4207
C62	14 727	14 456	1304	730	4297	4498
C65	14 123	13 600	1162	730	3921	3939
C66	14 447	14 090	1209	730	4126	4247
C67	14 867	14 599	1267	730	4374	4571
C6A	12 991	12 554	1108	679	3129	3935
C6B	13 230	12 843	1149	679	3325	4180
C6C	13 494	13 117	1192	679	3553	4423
C6F	13 222	12 508	1059	679	3504	3951
C6G	13 371	12 908	1095	679	3717	4211
C6H	13 645	13 255	1134	679	3938	4506
C80	10 175	14 429	1351	821	4120	4224
C81	10 122	14 948	1404	821	4349	4549
C82	10 084	15 465	1467	821	4630	4872
C85	10 221	14 475	1307	821	4207	4249
C86	10 168	14 020	1360	821	4438	4590
C87	10 130	15 597	1425	821	4717	4625
C8A	10 175	8 919	1246	764	3316	4258
C8B	10 121	8 867	1293	764	3548	4532
C8C	10 083	8 816	1340	764	3788	4803
C8F	10 221	8 964	1191	764	3737	4273
C8G	10 167	8 909	1232	764	3977	4563
C8H	10 129	8 846	1276	764	4226	4893
D60	—	17 371	—	951	—	5204
D61	—	17 973	—	951	—	5583
D62	—	18 611	—	951	—	5992
D65	—	17 066	—	951	—	5269
D66	—	17 616	—	951	—	5619
D67	—	18 352	—	951	—	6083
D80	—	19 013	—	1070	—	5646
D81	—	19 678	—	1070	—	6073
D82	—	20 395	—	1070	—	6532
D85	—	19 077	—	1070	—	5719
D86	—	19 690	—	1070	—	6112
D87	—	20 504	—	1070	—	6634

Table 15 — 19XR Two-Stage Compressor Frame Size 7 Heat Exchanger Weights (SI) (cont)

CODE†	DRY RIGGING WEIGHT (kg)*		REFRIGERANT WEIGHT (kg)		WATER WEIGHT (kg)	
	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY	COOLER ONLY	CONDENSER ONLY
D6A	—	16 005	—	883	—	5171
D6B	—	16 478	—	883	—	5559
D6C	—	16 914	—	883	—	5932
D6F	—	15 625	—	883	—	5193
D6G	—	16 165	—	883	—	5628
D6H	—	16 630	—	883	—	6023
D8A	—	17 461	—	993	—	5609
D8B	—	17 977	—	993	—	6045
D8C	—	18 475	—	993	—	6465
D8F	—	17 454	—	993	—	5633
D8G	—	18 035	—	993	—	6123
D8H	—	18 562	—	993	—	6567

*Rigging weights are for standard tubes of standard wall thickness (0.025-in. [0.635 mm] wall) and do not include refrigerant weight.
†See Model Number Nomenclature on page 5.

NOTES:
1. Cooler weight includes the suction elbow and the distribution piping to the economizer and two-pass Victaulic dished heads.
2. Condenser weight includes the high side float chamber, discharge pipe, and the distribution piping weight from the economizer to the float chamber and two-pass Victaulic dished heads.

Table 16 — 19XR Two-Stage Compressor Frame Sizes 6 and 7 Economizer Weight

FRAME SIZE	DRY WEIGHT (lb)*	REFRIGERANT WEIGHT (lb)	OPERATION WEIGHT (lb)	DRY WEIGHT (kg)*	REFRIGERANT WEIGHT (kg)	OPERATION WEIGHT (kg)
XR6	1589	360	1949	721	163	884
XR7	2749	646	3395	1247	293	1540

*Includes economizer weight and all connecting piping to the compressor.

Table 17 — Additional Weights for 19XR 150 psig (1034 kPa) Marine Waterboxes* Two-Stage Compressors, Frame Size 6† — English (lb)

FRAME	NUMBER OF PASSES	COOLER			CONDENSER		
		Rigging Wgt		Water Wgt	Rigging Wgt		Water Wgt
		Victaulic	Flange		Victaulic	Flange	
A	1	2794	3124	6515	2582	2912	5648
	2	2454	2650	2979	2236	2432	2613
	3	2771	2899	4190	2840	3020	3950
B	1	—	—	—	2604	2934	6975
	2	—	—	—	2459	2719	3600
	3	—	—	—	2770	2950	4858

*Add to cooler and condenser weights for total weights. Cooler and condenser weights may be found in Table 12. The first digit of the heat exchanger code (first column) is the heat exchanger frame size.

†Values are for Victaulic nozzles, two-pass dished head design.

Table 18 — Additional Weights for 19XR 150 psig (1034 kPa) Marine Waterboxes* Two-Stage Compressors, Frame Size 6† — SI (kg)

FRAME	NUMBER OF PASSES	COOLER			CONDENSER		
		Rigging Wgt		Water Wgt	Rigging Wgt		Water Wgt
		Victaulic	Flange		Victaulic	Flange	
A	1	1267	1417	2955	1171	1321	2562
	2	1113	1202	2979	1014	1103	1185
	3	1157	1315	1900	1288	1370	1792
B	1	—	—	—	1181	1331	3162
	2	—	—	—	1115	1233	1633
	3	—	—	—	1256	1338	2203

*Add to cooler and condenser weights for total weights. Condenser weights may be found in Table 13. The first digit of the heat exchanger code (first column) is the heat exchanger frame size.

†Values are for Victaulic nozzles, two-pass dished head design.

Table 19 — Additional Weights for 19XR 300 psig (2068 kPa) ASME Marine Waterboxes* Two-Stage Compressors, Frame Size 6 — English (lb)

FRAME	NUMBER OF PASSES	COOLER			CONDENSER		
		Rigging Wgt		Water Wgt	Rigging Wgt		Water Wgt
		Victaulic	Flange		Victaulic	Flange	
A	1	6379	6709	5058	5573	5903	4426
	2	5594	5790	2101	4834	5030	1890
	3	6031	6159	3005	5310	5490	2688
B	1	—	—	—	7084	7414	5509
	2	—	—	—	6474	6734	2577
	3	—	—	—	6816	6996	3340

*Add to cooler and condenser weights for total weights. Condenser weights may be found in Table 12. The first digit of the heat exchanger code (first column) is the heat exchanger frame size.

Table 20 — Additional Weights for 19XR 300 psig (2068 kPa) ASME Marine Waterboxes* Two-Stage Compressors, Frame Size 6 — SI (kg)

FRAME	NUMBER OF PASSES	COOLER			CONDENSER		
		Rigging Wgt		Water Wgt	Rigging Wgt		Water Wgt
		Victaulic	Flange		Victaulic	Flange	
A	1	2893	3043	2294	2528	2678	2008
	2	2537	2626	953	2193	2282	857
	3	2736	2794	1363	2409	2490	1219
B	1	—	—	—	3213	3363	2499
	2	—	—	—	2937	3054	1169
	3	—	—	—	3092	3173	1515

*Add to cooler and condenser weights for total weights. Condenser weights may be found in Table 13. The first digit of the heat exchanger code (first column) is the heat exchanger frame size.

Table 21 — Additional Weights for 19XR 150 psig (1034 kPa) Marine Waterboxes* Two-Stage Compressors, Frame Size 7† — English (lb)

FRAME	NUMBER OF PASSES	COOLER			CONDENSER		
		Rigging Wgt		Water Wgt	Rigging Wgt		Water Wgt
		Victaulic	Flange		Victaulic	Flange	
B	1	4045	4375	8103	—	—	—
	2	3648	3908	4139	—	—	—
	3	4160	4340	5633	—	—	—
C	1	4828	5158	10,264	4273	4713	9858
	2	4375	4635	5201	3714	4044	4826
	3	4957	5137	7144	4434	4630	6819
D	1	—	—	—	4863	5303	12,530
	2	—	—	—	4243	4573	6074
	3	—	—	—	5079	5275	8659

*Add to cooler and condenser weights for total weights. Cooler and condenser weights may be found in Table 14. The first digit of the heat exchanger code (first column) is the heat exchanger frame size.
†Values are for Victaulic nozzles, two-pass dished head design.

Table 22 — Additional Weights for 19XR 150 psig (1034 kPa) Marine Waterboxes* Two-Stage Compressors, Frame Size 7† — SI (kg)

FRAME	NUMBER OF PASSES	COOLER			CONDENSER		
		Rigging Wgt		Water Wgt	Rigging Wgt		Water Wgt
		Victaulic	Flange		Victaulic	Flange	
B	1	1835	1984	3675	—	—	—
	2	1655	1773	1877	—	—	—
	3	1887	1969	2555	—	—	—
C	1	2190	2340	4655	1938	2138	4472
	2	1984	2102	2359	1685	1834	2189
	3	2248	2330	3240	2011	2100	3093
D	1	—	—	—	2206	2405	5684
	2	—	—	—	1925	2074	2755
	3	—	—	—	2303	2393	3928

*Add to cooler and condenser weights for total weights. Condenser weights may be found in Table 15. The first digit of the heat exchanger code (first column) is the heat exchanger frame size.
†Values are for Victaulic nozzles, two-pass dished head design.

Table 23 — Additional Weights for 19XR 300 psig (2068 kPa) ASME Marine Waterboxes* Two-Stage Compressors, Frame Size 7 — English (lb)

FRAME	NUMBER OF PASSES	COOLER			CONDENSER		
		Rigging Wgt		Water Wgt	Rigging Wgt		Water Wgt
		Victaulic	Flange		Victaulic	Flange	
B	1	8305	8635	5783	—	—	—
	2	7426	7686	2382	—	—	—
	3	7785	7965	3268	—	—	—
C	1	11,001	11,331	7030	9228	9668	7591
	2	9829	10,089	2708	8003	8333	3061
	3	10,343	10,053	3866	8647	8843	4468
D	1	—	—	—	12940	13380	9365
	2	—	—	—	11170	11500	3607
	3	—	—	—	12042	12238	5398

*Add to cooler and condenser weights for total weights. Cooler and condenser weights may be found in Table 14. The first digit of the heat exchanger code (first column) is the heat exchanger frame size.

Table 24 — Additional Weights for 19XR 300 psig (2068 kPa) ASME Marine Waterboxes* Two-Stage Compressors, Frame Size 7 — SI (kg)

FRAME	NUMBER OF PASSES	COOLER			CONDENSER		
		Rigging Wgt		Water Wgt	Rigging Wgt		Water Wgt
		Victaulic	Flange		Victaulic	Flange	
B	1	3767	3917	2623	—	—	—
	2	3368	3486	1080	—	—	—
	3	3531	3612	1482	—	—	—
C	1	4990	5140	3188	4186	4385	3443
	2	4458	4576	1228	3630	3682	1388
	3	4692	4773	1753	3922	—	—
D	1	—	—	—	5869	5927	4248
	2	—	—	—	5067	5102	1925
	3	—	—	—	5462	—	—

*Add to cooler and condenser weights for total weights. Cooler and condenser weights may be found in Table 15. The first digit of the heat exchanger code (first column) is the heat exchanger frame size.

Table 25 — 19XR Compressor and Motor Weights* — High-Efficiency Motors Two-Stage Compressor Frame Size 6, 50 Hz

MOTOR CODE	ENGLISH				SI			
	COMPRESSOR WEIGHT† (lb)	STATOR AND HOUSING WEIGHT (lb)	ROTOR AND SHAFT WEIGHT (lb)	END BELL COVER WEIGHT (lb)	COMPRESSOR WEIGHT† (kg)	STATOR AND HOUSING WEIGHT (kg)	ROTOR AND SHAFT WEIGHT (kg)	END BELL COVER WEIGHT (kg)
Voltage: 400-3-50								
N	10,287	1153	5917	1021	4666	2684	523	463
P	10,287	1153	5919	1021	4666	2685	523	463
Q	10,287	1179	6105	1021	4666	2769	535	463
R	10,287	1179	6107	1021	4666	2770	535	463
S	10,287	1188	6149	1021	4666	2789	539	463
T	10,287	1188	6151	1021	4666	2790	539	463
Voltage: 3000-3-50								
N	10,287	5918	1212	1021	4666	2684	550	463
P	10,287	6006	1230	1021	4666	2724	558	463
Q	10,287	6094	1248	1021	4666	2764	566	463
R	10,287	6184	1264	1021	4666	2805	573	463
S	10,287	6274	1280	1021	4666	2846	581	463
T	10,287	6296	1280	1021	4666	2856	581	463
Voltage: 3300-3-50								
N	10,287	5913	1212	1021	4666	2682	550	463
P	10,287	6007	1230	1021	4666	2725	558	463
Q	10,287	6101	1248	1021	4666	2767	566	463
R	10,287	6192	1264	1021	4666	2809	573	463
S	10,287	6283	1280	1021	4666	2850	581	463
T	10,287	6266	1280	1021	4666	2842	581	463
Voltage: 6300-3-50								
N	10,287	6277	1280	1021	4666	2847	581	463
P	10,287	6333	1298	1021	4666	2873	589	463
Q	10,287	6389	1316	1021	4666	2898	600	463
R	10,287	6473	1316	1021	4666	2936	600	463
S	10,287	6556	1316	1021	4666	2974	600	463
T	10,287	6609	1351	1021	4666	2998	613	463
Voltage: 10000-3-50								
N	10,287	6281	1280	1021	4666	2849	581	463
P	10,287	6281	1281	1021	4666	2849	581	463
Q	10,287	6281	1281	1021	4666	2849	581	463
R	10,287	6441	1316	1021	4666	2922	600	463
S	10,287	6600	1351	1021	4666	2994	613	463
T	10,287	6156	1351	1021	4666	2792	613	463
Voltage: 11000-3-50								
N	10,287	6600	1351	1021	4666	2994	613	463
P	10,287	6600	1351	1021	4666	2994	613	463
Q	10,287	6600	1351	1021	4666	2994	613	463
R	10,287	6765	1385	1021	4666	3069	628	463
S	10,287	6930	1419	1021	4666	3143	644	463
T	10,287	6930	1419	1021	4666	3143	644	463

*Total compressor weight is the sum of the compressor aerodynamic components (compressor weight column), stator, rotor, and end bell cover weights.
†Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only.

Table 26 — 19XR Compressor and Motor Weights* — High-Efficiency Motors Two-Stage Compressor Frame Size 6, 60 Hz

MOTOR CODE	ENGLISH				SI			
	COMPRESSOR WEIGHT† (lb)	STATOR AND HOUSING WEIGHT (lb)	ROTOR AND SHAFT WEIGHT (lb)	END BELL COVER WEIGHT (lb)	COMPRESSOR WEIGHT† (kg)	STATOR AND HOUSING WEIGHT (kg)	ROTOR AND SHAFT WEIGHT (kg)	END BELL COVER WEIGHT (kg)
Voltage: 380-3-60								
N	10,287	1153	5928	1021	4666	2689	523	463
P	10,287	1153	5928	1021	4666	2689	523	463
Q	10,287	1179	6107	1021	4666	2770	535	463
R	10,287	1153	6109	1021	4666	2771	523	463
S	10,287	1153	6144	1021	4666	2787	523	463
T	10,287	1179	6151	1021	4666	2790	535	463
Voltage: 460-3-60								
N	10,287	1153	5946	1021	4666	2697	523	463
P	10,287	1153	5948	1021	4666	2698	523	463
Q	10,287	1179	6107	1021	4666	2770	535	463
R	10,287	1179	6111	1021	4666	2772	535	463
S	10,287	1188	6149	1021	4666	2789	539	463
T	10,287	1188	6153	1021	4666	2791	539	463
Voltage: 2400-3-60								
N	10,287	5929	1212	1021	4666	2689	550	463
P	10,287	6021	1230	1021	4666	2731	558	463
Q	10,287	6112	1248	1021	4666	2772	566	463
R	10,287	6190	1264	1021	4666	2808	573	463
S	10,287	6268	1280	1021	4666	2843	581	463
T	10,287	6259	1280	1021	4666	2839	581	463
Voltage: 3300-3-60								
N	10,287	5927	1212	1021	4666	2688	550	463
P	10,287	6019	1230	1021	4666	2730	558	463
Q	10,287	6110	1248	1021	4666	2771	566	463
R	10,287	6187	1264	1021	4666	2806	573	463
S	10,287	6263	1280	1021	4666	2841	581	463
T	10,287	6277	1280	1021	4666	2847	581	463
Voltage: 4160-3-60								
N	10,287	6103	1247	1021	4666	2768	566	463
P	10,287	6103	1248	1021	4666	2768	566	463
Q	10,287	6103	1248	1021	4666	2768	566	463
R	10,287	6185	1264	1021	4666	2805	573	463
S	10,287	6268	1280	1021	4666	2843	581	463
T	10,287	6268	1280	1021	4666	2843	581	463
Voltage: 6900-3-60								
N	10,287	6558	1316	1021	4666	2975	600	463
P	10,287	6559	1316	1021	4666	2975	600	463
Q	10,287	6559	1316	1021	4666	2975	600	463
R	10,287	6566	1316	1021	4666	2978	600	463
S	10,287	6574	1316	1021	4666	2982	600	463
T	10,287	6604	1351	1021	4666	2996	613	463
Voltage: 11000-3-60								
N	10,287	6587	1351	1021	4666	2988	613	463
P	10,287	6587	1351	1021	4666	2988	613	463
Q	10,287	6587	1351	1021	4666	2988	613	463
R	10,287	6716	1385	1021	4666	3036	628	463
S	10,287	6844	1419	1021	4666	3104	644	463
T	10,287	6844	1419	1021	4666	3104	644	463

Table 26 — 19XR Compressor and Motor Weights* — High-Efficiency Motors Two-Stage Compressor Frame Size 6, 60 Hz (cont)

MOTOR CODE	ENGLISH				SI			
	COMPRESSOR WEIGHT† (lb)	STATOR AND HOUSING WEIGHT (lb)	ROTOR AND SHAFT WEIGHT (lb)	END BELL COVER WEIGHT (lb)	COMPRESSOR WEIGHT† (kg)	STATOR AND HOUSING WEIGHT (kg)	ROTOR AND SHAFT WEIGHT (kg)	END BELL COVER WEIGHT (kg)
Voltage: 13800-3-60								
N	10,287	6554	1351	1021	4666	2973	613	463
P	10,287	6554	1351	1021	4666	2973	613	463
Q	10,287	6554	1351	1021	4666	2973	613	463
R	10,287	6709	1385	1021	4666	3043	628	463
S	10,287	6864	1419	1021	4666	3113	644	463
T	10,287	6864	1419	1021	4666	3113	644	463

*Total compressor weight is the sum of the compressor aerodynamic components (compressor weight column), stator, rotor, and end bell cover weights.
†Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only.

Table 27 — 19XR Compressor and Motor Weights* — High-Efficiency Motors Two-Stage Compressor Frame Size 7, 50 Hz

MOTOR CODE	ENGLISH				SI			
	COMPRESSOR WEIGHT† (lb)	STATOR AND HOUSING WEIGHT (lb)	ROTOR AND SHAFT WEIGHT (lb)	END BELL COVER WEIGHT (lb)	COMPRESSOR WEIGHT† (kg)	STATOR AND HOUSING WEIGHT (kg)	ROTOR AND SHAFT WEIGHT (kg)	END BELL COVER WEIGHT (kg)
Voltage: 3000-3-50								
U	16,024	6725	1443	983	7268	3050	654	446
V	16,024	6716	1443	983	7268	3046	654	446
W	16,024	6706	1443	983	7268	3042	654	446
X	16,024	6802	1460	983	7268	3085	662	446
Y	16,024	6899	1476	983	7268	3129	670	446
Z	16,024	7066	1509	983	7268	3205	684	446
Voltage: 3300-3-50								
U	16,024	6743	1443	983	7268	3059	654	446
V	16,024	6739	1443	983	7268	3057	654	446
W	16,024	6734	1443	983	7268	3054	654	446
X	16,024	6826	1460	983	7268	3096	662	446
Y	16,024	6917	1476	983	7268	3137	670	446
Z	16,024	7075	1509	983	7268	3209	684	446
Voltage: 6300-3-50								
U	16,024	6743	1443	983	7268	3059	654	446
V	16,024	6900	1476	983	7268	3130	670	446
W	16,024	7058	1509	983	7268	3201	684	446
X	16,024	7130	1526	983	7268	3234	692	446
Y	16,024	7203	1542	983	7268	3267	699	446
Z	16,024	7203	1542	983	7268	3267	699	446
Voltage: 10000-3-50								
G	16,024	7269	1631	983	7268	3297	740	446
H	16,024	7269	1631	983	7268	3297	740	446
J	16,024	7269	1631	983	7268	3297	740	446
K	16,024	7602	1768	983	7268	3448	802	446
L	16,024	7602	1768	983	7268	3448	802	446
M	16,024	7769	1837	983	7268	3523	833	446
U	16,024	6904	1476	983	7268	3132	670	446
V	16,024	6907	1476	983	7268	3133	670	446
W	16,024	6910	1476	983	7268	3134	670	446
X	16,024	7074	1509	983	7268	3209	684	446
Y	16,024	7238	1542	983	7268	3283	699	446
Z	16,024	7401	1575	983	7268	3357	714	446
Voltage: 11000-3-50								
G	16,024	7434	1700	983	7268	3372	771	446
H	16,024	7602	1768	983	7268	3448	802	446
J	16,024	7602	1768	983	7268	3448	802	446
K	16,024	7602	1768	983	7268	3448	802	446
L	16,024	7602	1768	983	7268	3448	802	446
M	16,024	7767	1837	983	7268	3523	833	446
U	16,024	7139	1509	983	7268	3238	684	446
V	16,024	7186	1526	983	7268	3260	692	446
W	16,024	7234	1542	983	7268	3281	699	446
X	16,024	7234	1542	983	7268	3281	699	446
Y	16,024	7234	1542	983	7268	3281	699	446
Z	16,024	7383	1575	983	7268	3349	714	446

*Total compressor weight is the sum of the compressor aerodynamic components (compressor weight column), stator, rotor, and end bell cover weights.
†Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only.

Table 28 — 19XR Compressor and Motor Weights* — High-Efficiency Motors Two-Stage Compressor Frame Size 7, 60 Hz

MOTOR CODE	ENGLISH				SI			
	COMPRESSOR WEIGHT† (lb)	STATOR AND HOUSING WEIGHT (lb)	ROTOR AND SHAFT WEIGHT (lb)	END BELL COVER WEIGHT (lb)	COMPRESSOR WEIGHT† (kg)	STATOR AND HOUSING WEIGHT (kg)	ROTOR AND SHAFT WEIGHT (kg)	END BELL COVER WEIGHT (kg)
Voltage: 2400-3-60								
U	16,024	6719	1443	983	7268	3048	654	446
V	16,024	6718	1443	983	7268	3047	654	446
W	16,024	6717	1443	983	7268	3047	654	446
X	16,024	6811	1460	983	7268	3089	662	446
Y	16,024	6906	1476	983	7268	3132	670	446
Z	16,024	7073	1509	983	7268	3208	684	446
Voltage: 3300-3-60								
U	16,024	6723	1443	983	7268	3049	654	446
V	16,024	6730	1443	983	7268	3053	654	446
W	16,024	6736	1443	983	7268	3055	654	446
X	16,024	6816	1460	983	7268	3092	662	446
Y	16,024	6895	1476	983	7268	3128	670	446
Z	16,024	7055	1509	983	7268	3200	684	446
Voltage: 4160-3-60								
U	16,024	6739	1443	983	7268	3057	654	446
V	16,024	6721	1443	983	7268	3049	654	446
W	16,024	6703	1443	983	7268	3040	654	446
X	16,024	6778	1460	983	7268	3074	662	446
Y	16,024	6853	1476	983	7268	3108	670	446
Z	16,024	7069	1509	983	7268	3206	684	446
Voltage: 6900-3-60								
U	16,024	6730	1443	983	7268	3053	654	446
V	16,024	6909	1476	983	7268	3134	670	446
W	16,024	7088	1509	983	7268	3215	684	446
X	16,024	7076	1509	983	7268	3210	684	446
Y	16,024	7064	1509	983	7268	3204	684	446
Z	16,024	7141	1542	983	7268	3239	699	446
Voltage: 11000-3-60								
G	16,024	7434	1700	983	7268	3372	771	486
H	16,024	7602	1768	983	7268	3448	802	486
J	16,024	7602	1768	983	7268	3448	802	486
K	16,024	7602	1768	983	7268	3448	802	446
L	16,024	7602	1768	983	7268	3448	802	486
M	16,024	7767	1837	983	7268	3523	833	486
U	16,024	7042	1509	983	7268	3194	684	446
V	16,024	7085	1526	983	7268	3214	692	446
W	16,024	7128	1542	983	7268	3233	699	446
X	16,024	7131	1542	983	7268	3235	699	446
Y	16,024	7135	1542	983	7268	3236	699	446
Z	16,024	7313	1575	983	7268	3317	714	446
Voltage: 13800-3-60								
U	16,024	7073	1509	983	7268	3208	684	446
V	16,024	7109	1526	983	7268	3225	692	446
W	16,024	7146	1542	983	7268	3241	699	446
X	16,024	7146	1542	983	7268	3241	699	446
Y	16,024	7146	1542	983	7268	3241	699	446
Z	16,024	7295	1575	983	7268	3309	714	446

*Total compressor weight is the sum of the compressor aerodynamic components (compressor weight column), stator, rotor, and end bell cover weights.

†Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only.

Table 29 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 6 — English (lb) Two-Stage Compressor Frame 6; Cooler Frame A

WATERBOX DESCRIPTION	PASSES	COOLER	
		FRAME A	
		STANDARD NOZZLES	FLANGED
Dished Head, 150 psig	1	1006	1171
MWB End Cover, 150 psig	1	976	976
MWB End Cover (ASME), 300 psig	1	2460	2460
Dished Head, 150 psig	2	1140	1336
Dished Head (Return Cover), 150 psig	2	976	976
MWB End Cover, 150 psig	2	1068	1068
MWB End Cover (Return Cover), 150 psig	2	976	976
MWB End Cover (ASME), 300 psig	2	2460	2460
MWB End Cover (ASME) (Return Cover), 300 psig	2	2460	2460
Dished Head, 150 psig	3	1048	1112
MWB End Cover, 150 psig	3	1030	1030
MWB End Cover (ASME), 300 psig	3	2460	2460

LEGEND

ASME — American Society of Mechanical Engineers
MWB — Marine Waterbox

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 150 psig are included in the heat exchanger weights shown in Tables 12 and 13.

Table 30 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 6 — English (lb) Two-Stage Compressor Frame 6; Condenser Frame A and B

WATERBOX DESCRIPTION	PASSES	CONDENSER			
		FRAME A		FRAME B	
		STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
Dished Head, 150 psig	1	895	1060	1006	1171
MWB, 150 psig	1	859	859	1075	1075
MWB (ASME), 300 psig	1	2117	2117	2744	2744
Dished Head, 150 psig	2	981	1179	1140	1400
Dished Head (Return Cover), 150 psig	2	824	824	976	976
MWB 150 psig	2	907	907	1075	1075
MWB (Return), 150 psig	2	824	824	976	976
MWB (ASME), 300 psig	2	2117	2117	2744	2744
MWB Return Cover (ASME), 300 psig	2	2117	2117	2744	2744
Dished Head, 150 psig	3	1067	1157	1050	1140
MWB End Cover, 150 psig	3	942	942	1020	1020
MWB End Cover (ASME), 300 psig	3	2117	2177	2744	2744

LEGEND

ASME — American Society of Mechanical Engineers
MWB — Marine Waterbox

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 150 psig are included in the heat exchanger weights shown in Tables 12 and 13.

Table 31 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 6 — SI (kg)
Two-Stage Compressor Frame 6; Cooler Frame A

WATERBOX DESCRIPTION	PASSES	COOLER FRAME A STANDARD NOZZLES	COOLER FRAME A FLANGED
Dished Head, 1034 kPa	1	456	531
MWB End Cover, 1034 kPa	1	443	443
MWB End Cover (ASME), 2068 kPa	1	1116	1116
Dished Head, 1034 kPa	2	517	606
Dished Head (Return Cover), 1034 kPa	2	443	443
MWB End Cover, 1034 kPa	2	484	484
MWB (Return Cover), 1034 kPa	2	443	443
MWB End Cover (ASME), 2068 kPa	2	1116	1116
MWB (Return Cover), 2068 kPa	2	1116	1116
Dished Head, 1034 kPa	3	475	504
MWB End Cover, 1034 kPa	3	467	467
MWB End Cover (ASME), 2068 kPa	3	1116	1116

LEGEND

ASME — American Society of Mechanical Engineers
MWB — Marine Waterbox

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 1034 kPa are included in the heat exchanger weights shown in Tables 12 and 13.

Table 32 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 6 — SI (kg)
Two-Stage Compressor Frame 6; Condenser Frame A and B

WATERBOX DESCRIPTION	PASSES	CONDENSER			
		FRAME A		FRAME B	
		STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
Dished Head, 1034 kPa	1	406	481	473	547
MWB End Cover, 1034 kPa	1	390	390	488	488
MWB End Cover (ASME), 2068 kPa	1	960	960	1292	1292
Dished Head, 1034 kPa	2	445	535	574	633
Dished Head (Return Cover), 1034 kPa	2	374	374	481	481
MWB End Cover, 1034 kPa	2	411	411	630	630
MWB (Return Cover), 1034 kPa	2	374	411	488	488
MWB End Cover (ASME), 2068 kPa	2	960	1083	1440	1440
MWB (Return Cover), 2068 kPa	2	960	960	1245	1245
Dished Head, 1034 kPa	3	484	525	476	517
MWB End Cover, 1034 kPa	3	427	427	463	463
MWB End Cover (ASME), 2068 kPa	3	960	987	1245	1245

LEGEND

ASME — American Society of Mechanical Engineers
MWB — Marine Waterbox

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 1034 kPa are included in the heat exchanger weights shown in Tables 12 and 13.

Table 33 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 7 — English (lb) Two-Stage Compressor Frame 7; Cooler Frames B, C

WATERBOX DESCRIPTION	PASSES	COOLER			
		FRAME B		FRAME C	
		STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
Dished Head, 150 psig	1	1380	1545	1849	2014
MWB End Cover, 150 psig	1	1366	1366	1835	1835
MWB End Cover (ASME), 300 psig	1	3425	3425	4805	4805
Dished Head, 150 psig	2	1589	1849	2076	2336
Dished Head (Return Cover), 150 psig	2	1367	1367	1836	1836
MWB End Cover, 150 psig	2	1489	1489	1987	1987
MWB (Return Cover), 150 psig	2	1367	1367	1836	1836
MWB End Cover (ASME), 300 psig	2	3425	3425	4805	4805
MWB (Return Cover), 300 psig	2	3425	3425	4805	4805
Dished Head, 150 psig	3	1514	1604	2028	2118
MWB End Cover, 150 psig	3	1506	1506	1995	1995
MWB End Cover (ASME), 300 psig	3	3425	3425	4805	4805

LEGEND

ASME — American Society of Mechanical Engineers
MWB — Marine Waterbox

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 150 psig are included in the heat exchanger weights shown in Tables 14 and 15.

Table 34 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 7 — English (lb) Two-Stage Compressor Frame 7; Condenser Frames C, D

WATERBOX DESCRIPTION	PASSES	CONDENSER			
		FRAME C		FRAME D	
		STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
Dished Head, 150 psig	1	1380	1600	1849	2029
MWB End Cover, 150 psig	1	1367	1367	1835	1835
MWB End Cover (ASME), 300 psig	1	3639	3639	5249	5249
Dished Head, 150 psig	2	1589	1919	2076	2406
Dished Head (Return Cover), 150 psig	2	1367	1367	1836	1836
MWB End Cover, 150 psig	2	1497	1497	1988	1988
MWB (Return Cover), 150 psig	2	1367	1367	1836	1836
MWB End Cover (ASME), 300 psig	2	3639	3639	5249	5249
MWB (Return Cover) (ASME), 300 psig	2	3639	3639	5249	5249
Dished Head, 150 psig	3	1514	1612	2028	2126
MWB End Cover, 150 psig	3	1493	1493	1993	1993
MWB End Cover (ASME), 300 psig	3	3639	3639	5249	5249

LEGEND

ASME — American Society of Mechanical Engineers
MWB — Marine Waterbox

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 150 psig are included in the heat exchanger weights shown in Tables 14 and 15.

Table 35 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 7 — SI (kg) Two-Stage Compressor Frame 7; Cooler Frames B, C

WATERBOX DESCRIPTION	PASSES	COOLER			
		FRAME B		FRAME C	
		STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
Dished Head, 1034 kPa	1	626	701	839	914
MWB End Cover, 1034 kPa	1	620	620	832	832
MWB End Cover (ASME), 2068 kPa	1	1554	1554	2180	2180
Dished Head, 1034 kPa	2	721	839	942	1060
Dished Head (Return Cover), 1034 kPa	2	620	620	833	833
MWB End Cover, 1034 kPa	2	675	675	901	901
MWB (Return Cover), 1034 kPa	2	620	620	833	833
MWB End Cover (ASME), 2068 kPa	2	1554	1554	2180	2180
MWB (Return Cover), 2068 kPa	2	1554	1554	2180	2180
Dished Head, 1034 kPa	3	687	728	920	961
MWB End Cover, 1034 kPa	3	683	683	905	905
MWB End Cover (ASME), 2068 kPa	3	1554	1554	2180	2180

LEGEND

ASME — American Society of Mechanical Engineers
MWB — Marine Waterbox

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 1034 kPa are included in the heat exchanger weights shown in Tables 14 and 15.

Table 36 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 7 — SI (kg) Two-Stage Compressor Frame 7; Condenser Frames C, D

WATERBOX DESCRIPTION	PASSES	CONDENSER			
		FRAME C		FRAME D	
		STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
Dished Head, 1034 kPa	1	626	726	839	920
MWB End Cover, 1034 kPa	1	620	620	832	832
MWB End Cover (ASME), 2068 kPa	1	1651	1651	2353	2353
Dished Head, 1034 kPa	2	721	870	942	1091
Dished Head (Return Cover), 1034 kPa	2	620	620	833	833
MWB End Cover, 1034 kPa	2	679	679	902	902
MWB (Return Cover), 1034 kPa	2	620	620	833	833
MWB End Cover (ASME), 2068 kPa	2	1651	1651	2381	2381
MWB (Return Cover), 2068 kPa	2	1651	1651	2381	2381
Dished Head, 1034 kPa	3	687	731	920	964
MWB End Cover, 1034 kPa	3	677	677	904	904
MWB End Cover (ASME), 2068 kPa	3	1651	1651	2381	2381

LEGEND

ASME — American Society of Mechanical Engineers
MWB — Marine Waterbox

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 1034 kPa are included in the heat exchanger weights shown in Tables 14 and 15.

Table 37 — Compressor Component Weights

COMPONENT	FRAME 6 COMPRESSOR		FRAME 7 COMPRESSOR	
	lb	kg	lb	kg
TRANSMISSION ASSEMBLY (INCLUDING BULL GEAR, HIGH SPEED SHAFT, STATOR, ROTOR, MOTOR END COVER)	11,243	5100	13,481	6115
BULL GEAR	121	55	220	100
HIGH SPEED SHAFT ASSEMBLY	523	237	700	318
SUCTION ASSEMBLY (INCLUDING BLADE RING)	1520	689	2125	964
BLADE RING ASSEMBLY	109	49	384	174
COMPRESSOR BASE	5450	2472	7898	3582
MOTOR END COVER	1021	463	1072	486
INTAKE WALL	220	100	959	435
DISCHARGE WALL	172	78	296	134
DIAPHRAGM	700	318	820	372
OIL PUMP	124	56	124	56
TOTAL WEIGHT (INCLUDING MAX MOTOR STATOR, ROTOR, MOTOR END COVER)	19,657	8916	25,983	11,786

Table 38 — 19XR Two-stage Compressor Frames 6 and 7 Fits and Clearances

ITEM	COMPRESSOR DESCRIPTION	FRAME 6 (in.)	FRAME 6 (mm)	FRAME 7 (in.)	FRAME 7 (mm)
A	Low Speed Journal — Compressor End	0.006/0.007	0.15/0.18	0.006/0.008	0.15/0.19
B	Low Speed Journal —Motor End	0.004/0.005	0.10/0.11	0.004/0.006	0.10/0.15
C	Low Speed Labyrinth — Compressor End	0.009/0.013	0.23/0.32	0.009/0.013	0.23/0.33
D	Low Speed Shaft Thrust Float	0.008/0.020	0.20/0.50	0.008/0.020	0.20/0.50
E	Impeller Bore to Shaft — 1st Impeller	–0.002/0.000	–0.05/0.01	–0.002/0.000	–0.05/–0.01
F	Impeller Bore to Shaft — 2nd Impeller	–0.002/0.000	–0.06/0.01	–0.002/0.000	–0.05/–0.01
G	Low Speed Bearing Labyrinth to Shaft — Motor End	0.009/0.013	0.23/0.33	0.010/0.012	0.25/0.30
H	Low Speed Bearing to Cover Assembly	0.002/0.004	0.04/0.10	0.001/0.003	0.03/0.08
I	Bull Gear to Low Speed Shaft	–0.001/0.000	–0.03/0.00	–0.0013/0.0000	–0.033/0.000
J	High Speed Shaft Labyrinth to High Speed Labyrinth Sleeve	0.006/0.009	0.15/0.23	0.006/0.009	0.15/0.23
K	Balance Piston Labyrinth to 2nd Stage Impeller	0.008/0.012	0.20/0.30	0.008/0.012	0.20/0.30
L	2nd Stage Eye Labyrinth to Impeller	0.008/0.012	0.20/0.30	0.012/0.016	0.30/0.40
M	Interstage Labyrinth Spacer to High Speed Shaft	0.001/0.002	0.02/0.05	0.001/0.003	0.04/0.07
N	Interstage Labyrinth Seal	0.011/0.017	0.29/0.42	0.009/0.012	0.23/0.30
O	1st Stage Eye Labyrinth to Impeller	0.016/0.020	0.41/0.50	0.024/0/028	0.62/0.72

NOTES:
1. All clearances for cylindrical surfaces are diametrical.
2. Dimensions shown are with rotors in the thrust position.
3. If any components within a rolling element high speed shaft and bearing assembly are damaged it is recommended that the entire high speed shaft and bearing assembly be replaced.

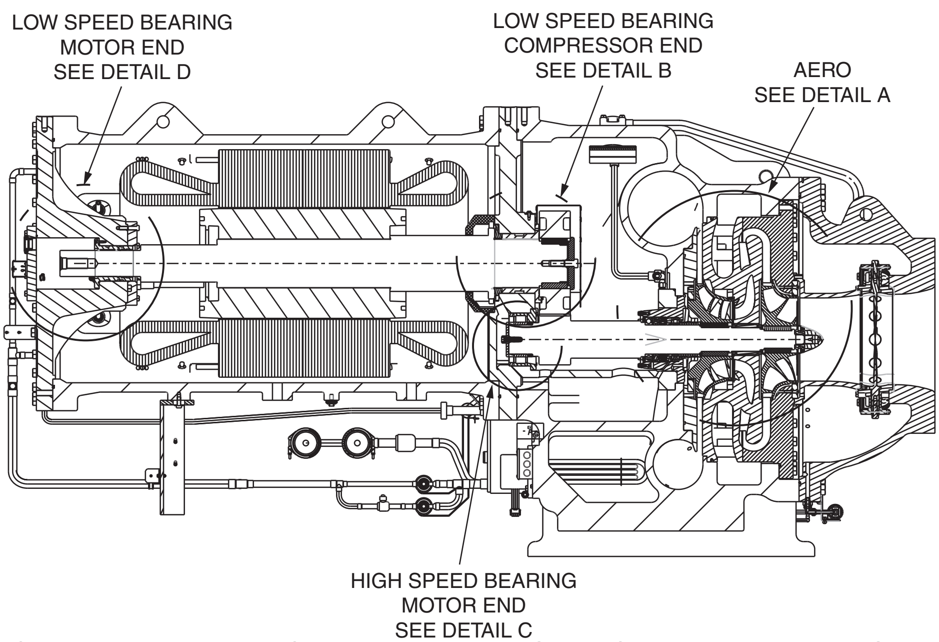
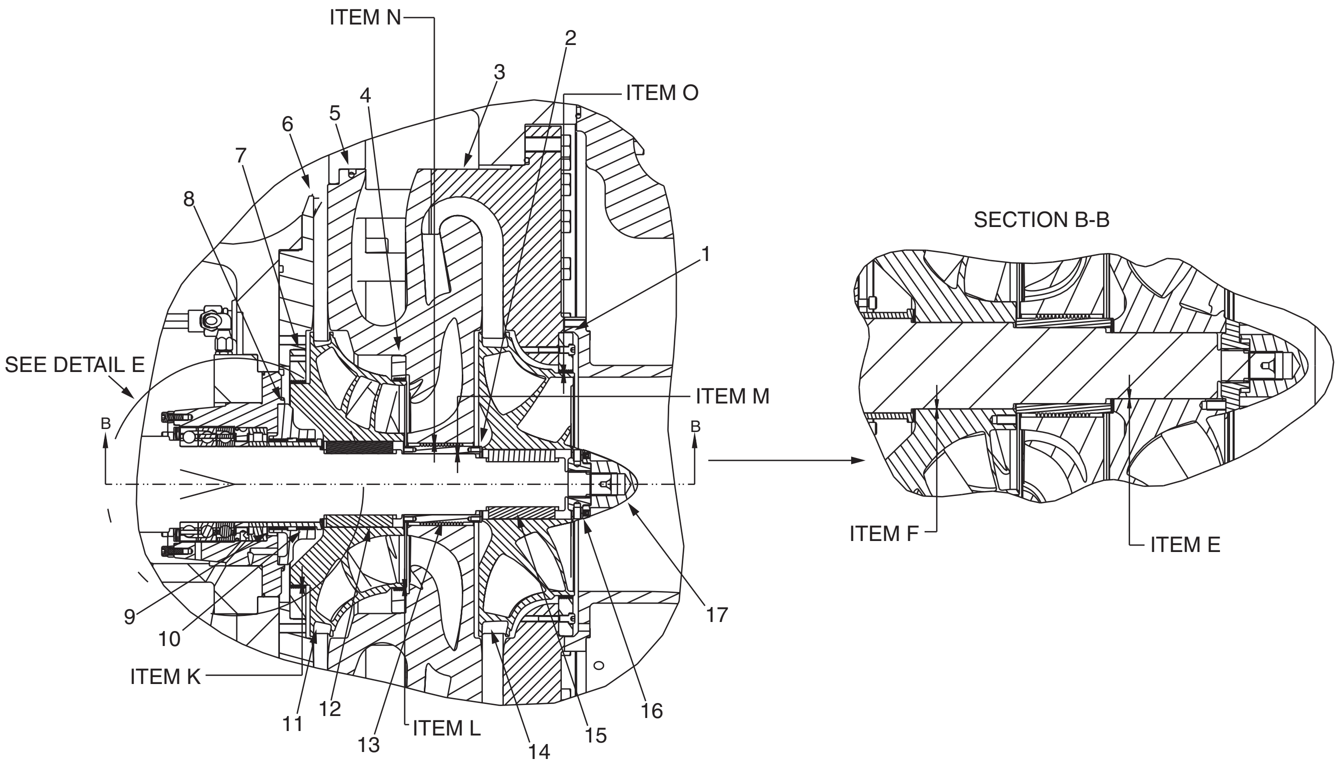


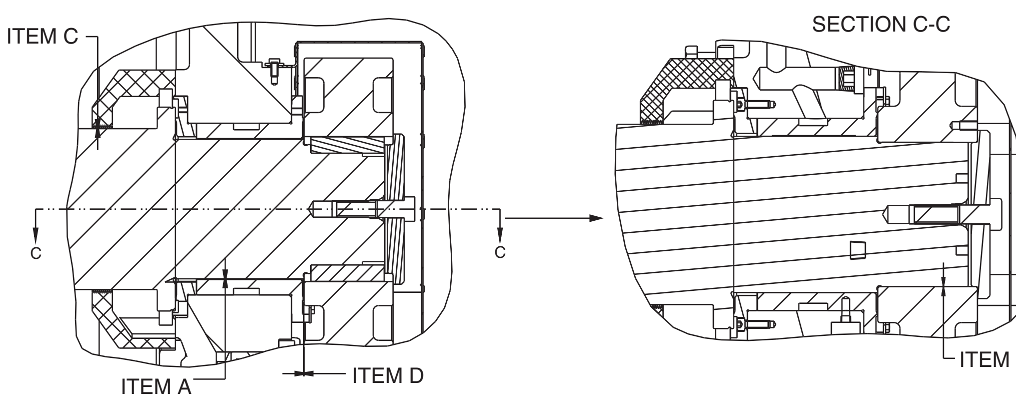
Fig. 38 — Compressor Fits and Clearances — Two-Stage Compressor, Frame Sizes 6 and 7



DETAIL A
AERO

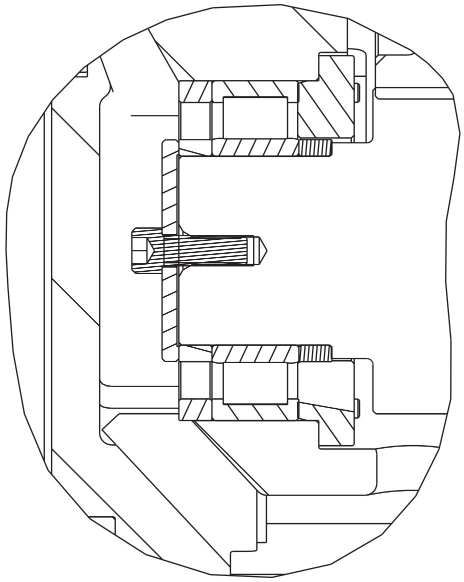
LEGEND

1 — 1st Stage Eye Labyrinth
2 — 1st Stage Impeller Shim
3 — Intake Wall
4 — 2nd Stage Eye Labyrinth
5 — Diaphragm
6 — Discharge Wall
7 — Balance Piston Labyrinth
8 — High Speed Shelf Labyrinth
9 — High Speed Shelf Labyrinth Shaft
10 — High Speed Shelf Labyrinth Sleeve
11 — 2nd Stage Impeller
12 — 2nd Stage Impeller Key
13 — Interstage Labyrinth Spacer
14 — 1st Stage Impeller
15 — 1st Stage Impeller Key
16 — Impeller Locknut
17 — Nose Piece

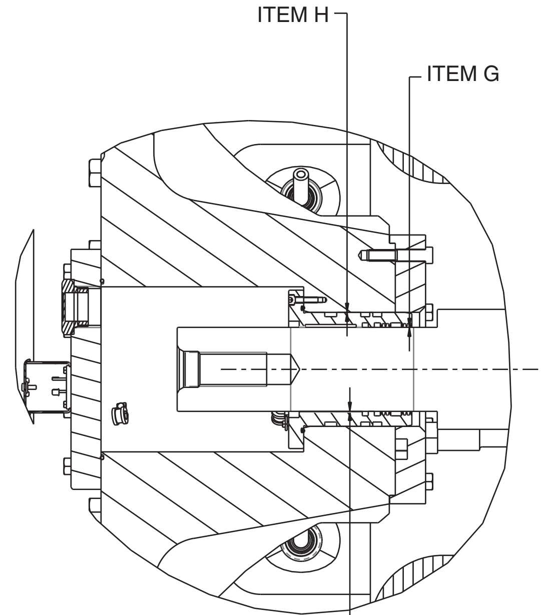


DETAIL B
LOW SPEED BEARING
COMPRESSOR END

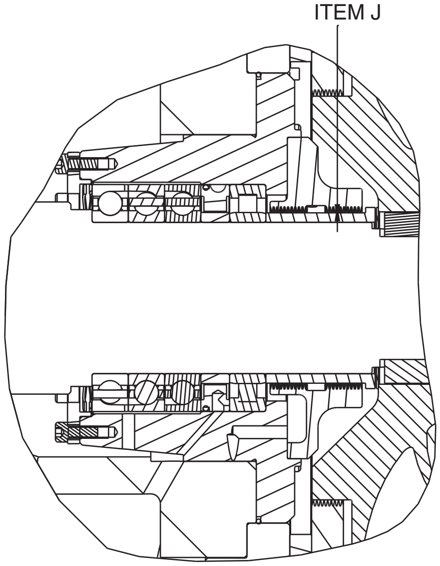
Fig. 38 —Compressor Fits and Clearances — Two-Stage Compressor, Frames Size 6 and 7 (cont)



DETAIL C
HIGH SPEED BEARING
MOTOR END

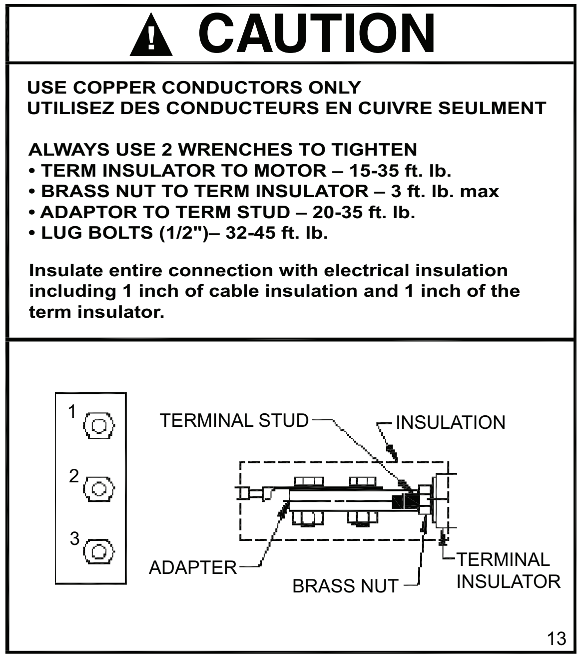


DETAIL D
LOW SPEED BEARING
MOTOR END



DETAIL E
HIGH SPEED BEARING
COMPRESSOR END (XR6 SHOWN)

Fig. 38 —Compressor Fits and Clearances — Two-Stage Compressor, Frame Sizes 6 and 7 (cont)



MOTOR LEAD INSTALLATION LABEL

19XR TWO-STAGE COMPRESSOR ASSEMBLY TORQUES

COMPRESSOR	FRAME 6	FRAME 7
Oil Heater Retaining Nut — ft-lb (N·m)	40-60 (54-81)	40-60 (54-81)
Bull Gear Retaining Bolt — ft-lb (N·m)	72-88 (98-119)	72-88 (98-119)
Demister Bolts — ft-lb (N·m)	15-19 (20-26)	15-19 (20-26)
Impeller Nut (Inner Locknut) — ft-lb (N·m)	243-257 (329-348)	243-257 (329-348)
Impeller Nut (Outer) — ft-lb (N·m)	95-105 (129-142)	95-105 (129-142)
Guide Vane Shaft Seal Nut/Bolts — ft-lb (N·m)	23-27 (31-37)	48-70 (64-94)

Fig. 39 — Compressor Assembly Torques — 19XR Two-Stage Compressors Frame Sizes 6 and 7

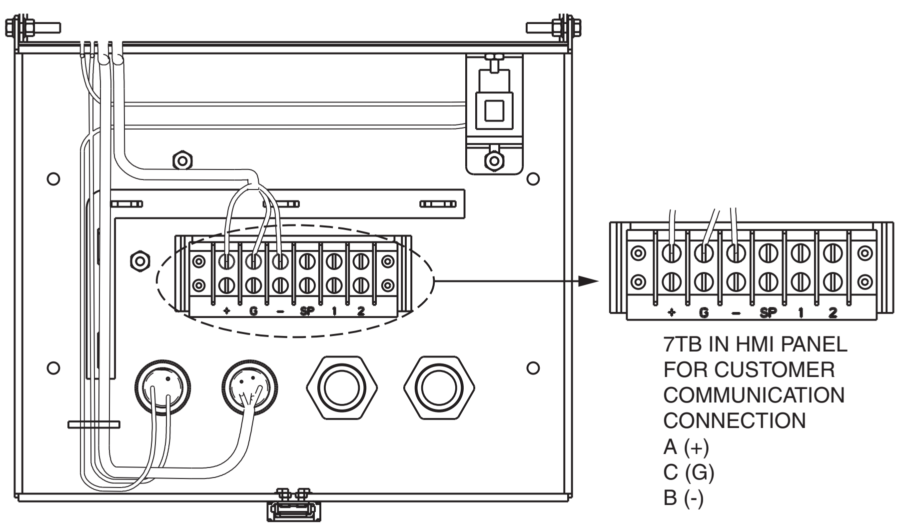


Fig. 40 — HMI Panel

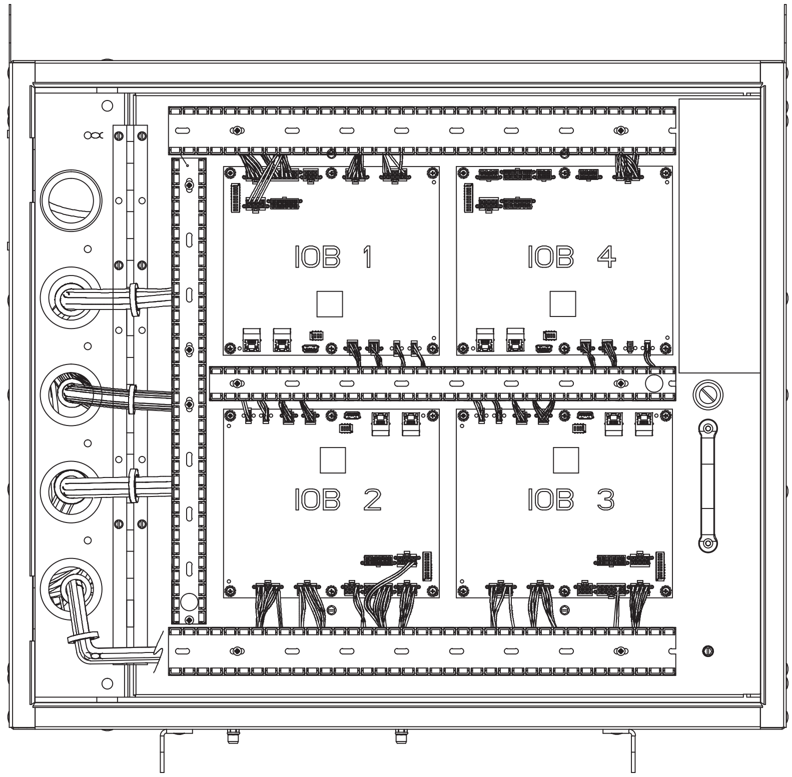
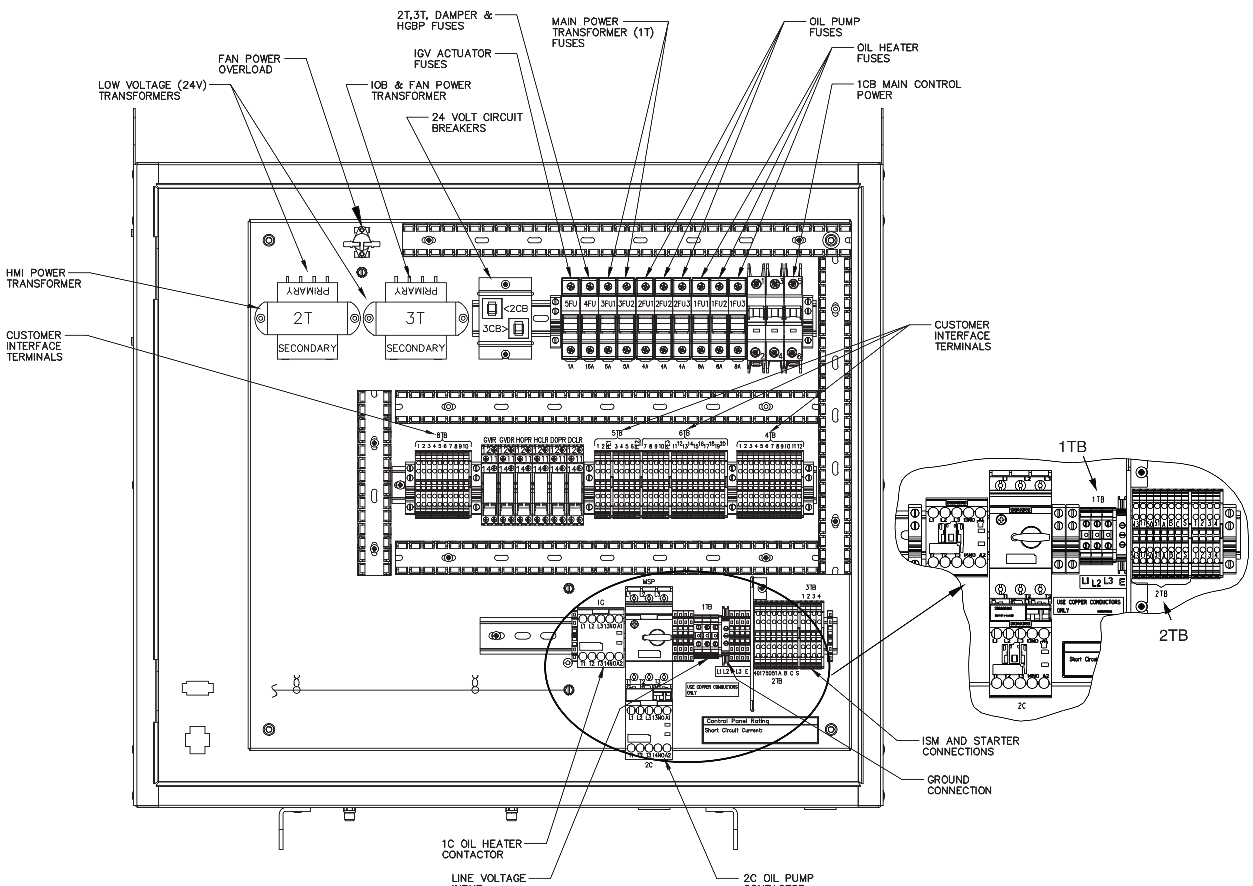


Fig. 41 — Control Panel, IOB Layer



1TB — CUSTOMER 3-PHASE POWER CONNECTION FOR CONTROL PANEL

2TB — FIELD WIRING CONNECTION FROM STARTER

Fig. 42 — Control Panel, Bottom Layer

LEGEND AND NOTES FOR FIG. 43, 19XR WITH FREE-STANDING STARTER (MEDIUM VOLTAGE)

REF. NO.	EXPLANATION
1	3 Phase Under/Over Voltage
	Phase Loss/Imbalance/Reversal
	Motor Overload Protection
	Frequency Shift
	kW Transducer/kW Hours/Demand kW
	Single Cycle Dropout
	Motor/Starter Overcurrent
	Control Power Transformer (3KVA) (Integral)
	Controls and Oil Heater Circuit Breaker (integral)
	Oil Pump Circuit Breaker
	Oil Pump Circuit Breaker with Transformer
	3 Phase Analog Volts/Amps Meter Package
	Power Factor Correction Package
	Lightning/Surge Arrestor Package
	Auxiliary Run Status Contacts N.O./N.C.
	Run Indicating Light
	Emergency Stop Switch
	Phase to Ground Fault Detection
2	Compressor Motor Starter Branch Disconnect
A	Evaporator Liquid Pump Starter Disconnect
B	Evaporator Liquid Pump Motor Starter
C	Condenser Liquid Pump Starter Disconnect
D	Condenser Liquid Pump Motor Starter
E	Cooling Tower Fan Motor Starter Disconnect (Low Fan/#1)
F	Cooling Tower Fan Motor Starter (Low Fan/#1)
G	Cooling Tower Fan Motor Starter Disconnect (High/#2)
H	Cooling Tower Fan Motor Starter (High Fan/#2)
L	Remote Alarm See Note 3.3
M	Remote Annunciator See Note 3.3
N	Lug Adapters See Note 2.1

I. GENERAL

1.0 Starters shall be designed and manufactured in accordance with Carrier Engineering Requirement Z-415.

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.

⚠ CAUTION

To prevent damage to machine, do NOT punch holes or drill into the top surface of the starter enclosure for field wiring. Knockouts are provided on the side of the starter enclosure for field wiring connections.

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 chiller shutdown.

1.5 WARNING — Do not use aluminum conductors.

1.6 Installer is responsible for any damage caused by improper wiring between starter and machine.

1.7 All field-installed wiring is field-supplied.

II. POWER WIRING TO STARTER

2.0 Provide a means of disconnecting power to starter.

2.1 Lug adapters may be required if installation conditions dictate that conductors be sized beyond the minimum ampacity required. Contact starter supplier for lug information.

2.2 Compressor motor and controls must be grounded by using equipment grounding lug provided inside starter enclosure.

III. CONTROL WIRING

3.0 Field-supplied control conductors to be at least 18 AWG 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 Each integrated contact output can control loads (VA) for evaporator pump, condenser pump, tower fan low, tower fan high, and alarm annunciator devices rated 5 amps at 115 VAC and up to 3 amps at 277 VAC.

⚠ CAUTION

Control wiring for Carrier to start pumps and tower fan motors and establish flows must be provided to assure machine protection. If primary pump, tower fan, and flow control is by other means, also provide parallel means for control by Carrier. Failure to do so could result in machine freeze-up or overpressure.

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 which has wires carrying 50 v or higher or along side wires carrying 50 v or higher.

3.4 Control wiring between starter and control panel must be separate shielded cables with minimum rating 600 v, 80 C. Ground shield at starter.

3.5 If optional circuit breaker is not supplied within the starter enclosure, it must be located within sight of machine with wiring routed to suit.

3.6 When providing conductors for oil pump motor and oil heater power, refer to sizing data on label located on the chiller control panel, equipment submittal documentation, or equipment product data catalog.

3.7 Spare 4-20 mA output signal is designed for controllers with a non-grounded 4-20 mA input signal and a maximum input impedance of 500 ohms.

IV. POWER WIRING BETWEEN FREE-STANDING STARTER AND COMPRESSOR MOTOR

4.0 Low voltage (below 600 volts) compressor motors have (6) terminals and medium/high voltage (above 600 volts) have (3) terminals. Medium voltage (over 600 volts) compressor motors have (3) terminals. Motor terminal connections between 1kV and 5 kV are $^3/_4$-in. threaded and above 5 kV they are $^9/_{16}$-in. threaded stud. For medium/high voltage terminations the supplied 3 adapters should be used for connecting a NEMA lug for two 1/2 in stud connections per phase.Use suitable connectors and insulation for high voltage alternating current cable terminations (these items are not supplied by Carrier). Compressor motor starter must have nameplate stamped as to conforming with Carrier Engineering requirement "Z-415."

4.1 Power conductor rating must meet minimum unit nameplate voltage and compressor motor RLA. Refer to the label located on the side of the chiller control panel, equipment submittal documentation, or equipment product data catalog for conductor sizing data. (Conductor as defined below may be a single lead or multiple smaller ampacity leads in parallel for the purpose of carrying the equivalent or higher current of a single larger lead.)

When (3) conductors are used:

Minimum ampacity per conductor = 1.25 x compressor RLA

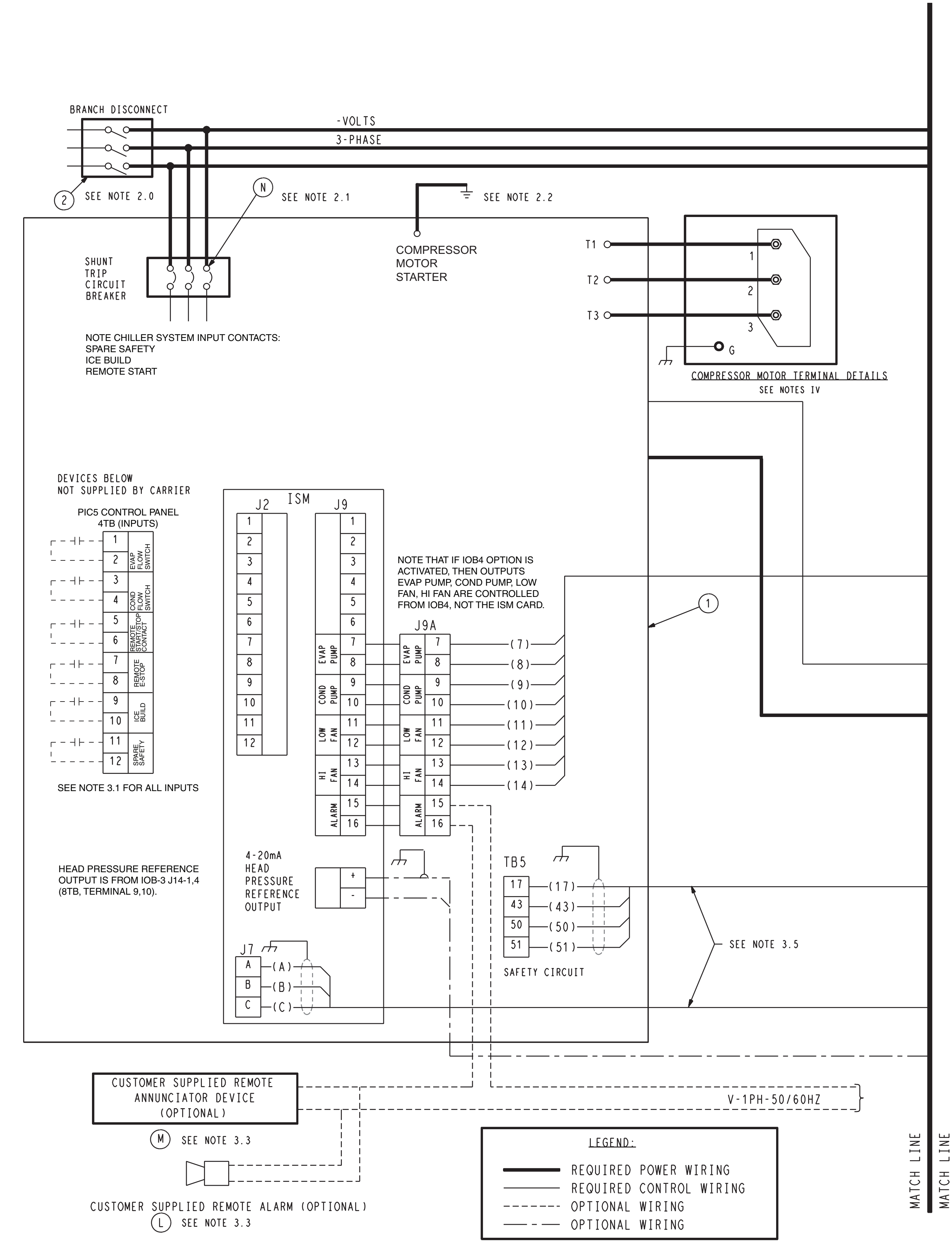
4.2 When more than one conduit is used to run conductors from starter to compressor motor terminal box, an equal number of leads from each phase (conductor) must be in each conduit to prevent excessive heating. (For example, conductors to motor terminals 1, 2, and 3 in one conduit, and those to 4, 5, and 6 in another.)

4.3 Compressor motor power conductors may enter terminal box through top, left side, or bottom left using holes cut by contractor to suit conduit. Flexible conduit should be used for the last few feet to the terminal box for unit vibration isolation. Use of stress cones may require an oversize (special) motor terminal box (not supplied by Carrier).

4.4 Compressor motor frame to be grounded in accordance with the National Electrical Code (NFPA-70) and applicable codes. Means for grounding compressor motor is a #4 AWG to 500 MCM pressure connector, supplied and located in the lower left corner of the compressor motor terminal box.

4.5 Do not allow motor terminals to support weight of wire cables. Use cable supports and strain reliefs as required.

4.6 Use 2 wrenches to tighten:
- Terminal insulator to motor - 15-35 ft-lb
- Brass nut to terminal insulator (medium/high voltage) - 3 ft-lb max
- Adapter to terminal stud:
  a) 9/16" stud - 30-35 ft-lb
  b) 3/4" stud - 35-40 ft-lb
- For low voltage terminal box busbar connection clamp busbar between 1-1/2" nuts - 130-150 ft-lb (see separately field supplied low voltage terminal box installation instructions).



NOTE: See Legend on page 71.

Fig. 43 — 19XR Typical Field Wiring with Free-Standing Starter (Medium Voltage)

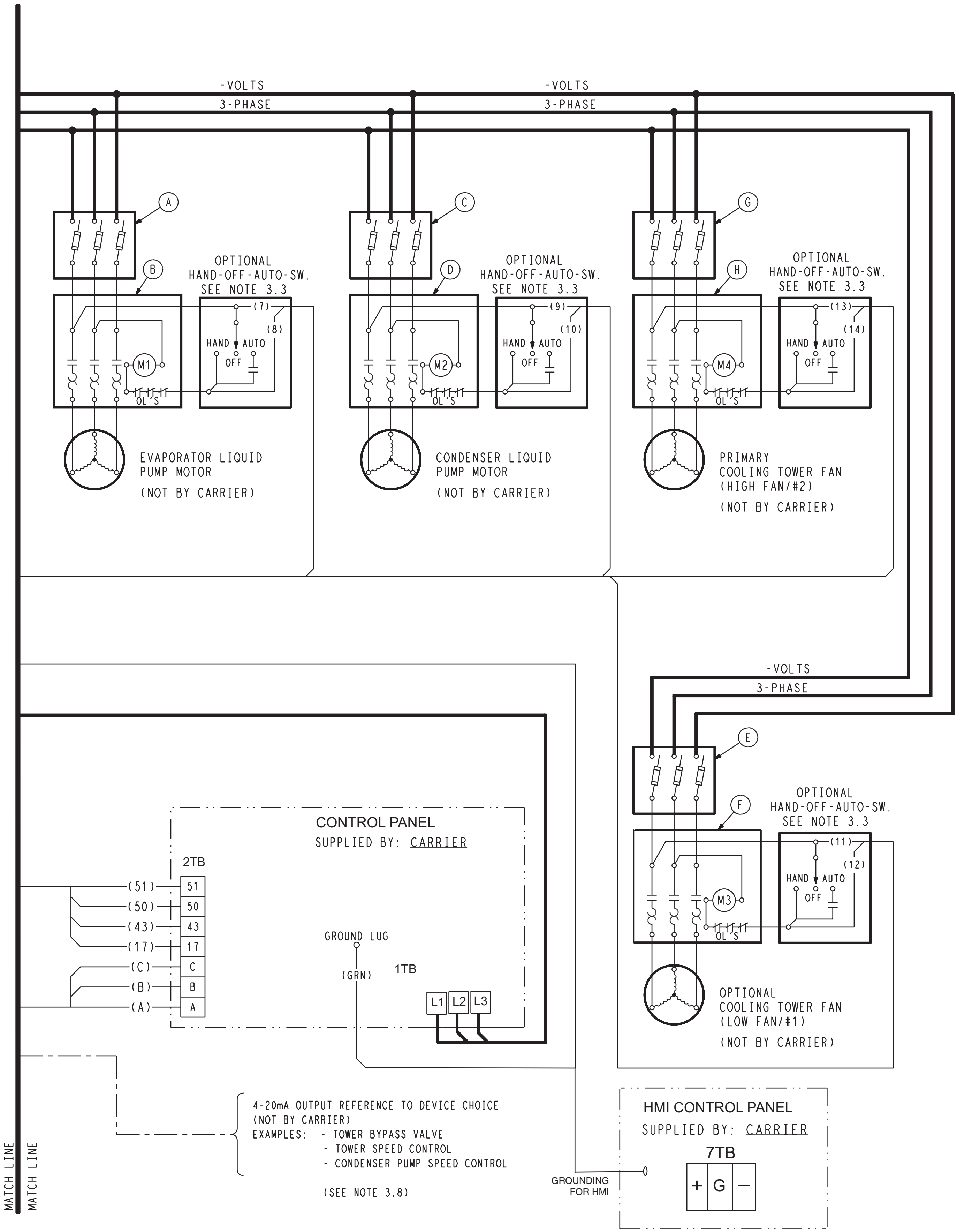
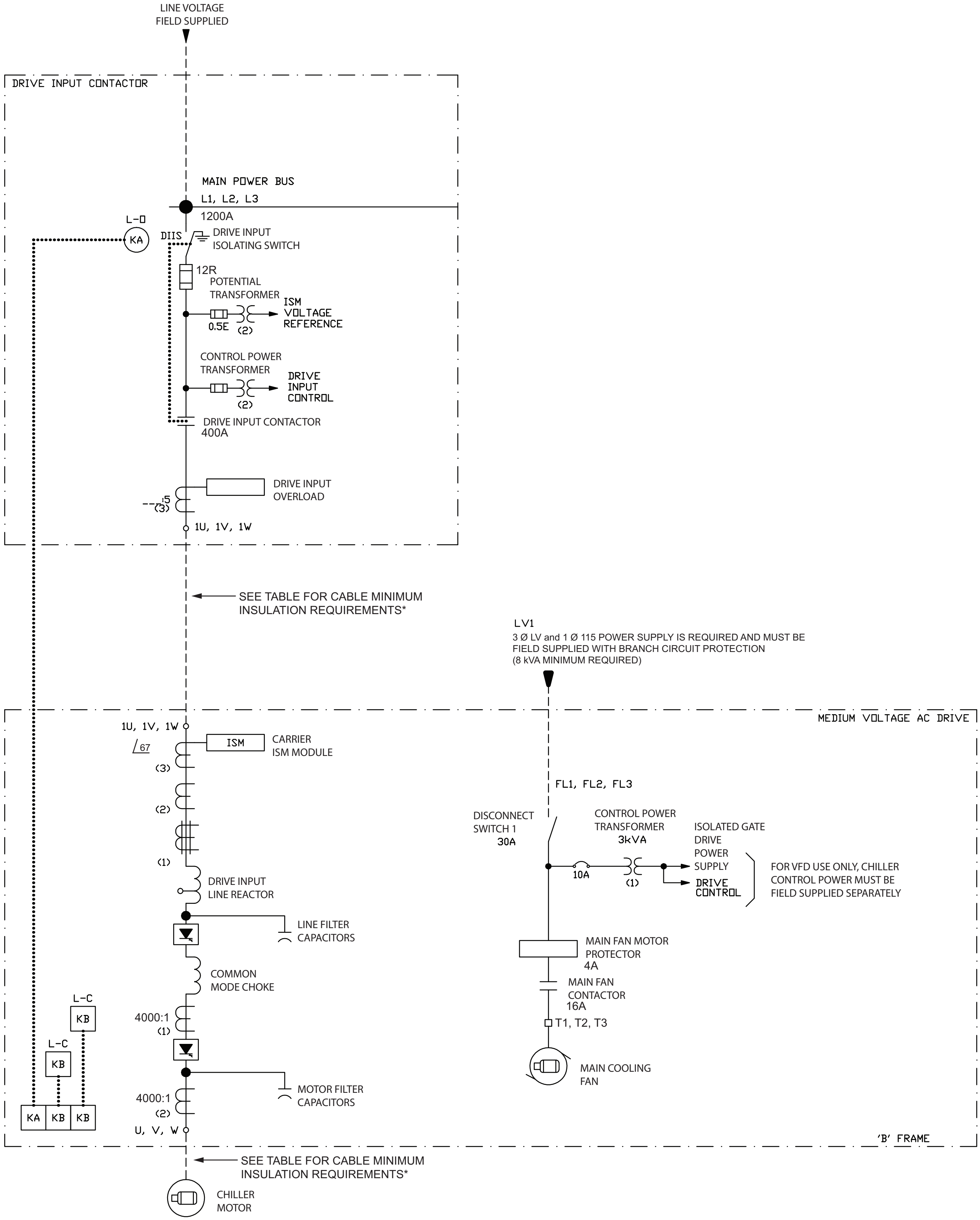


Fig. 43 —19XR Typical Field Wiring with Free-Standing Starter (Medium Voltage) (cont)



*See page 83.

Fig. 44 — 19XR Typical Field Wiring with Free-Standing Variable Frequency Drive (VFD) (Medium Voltage)

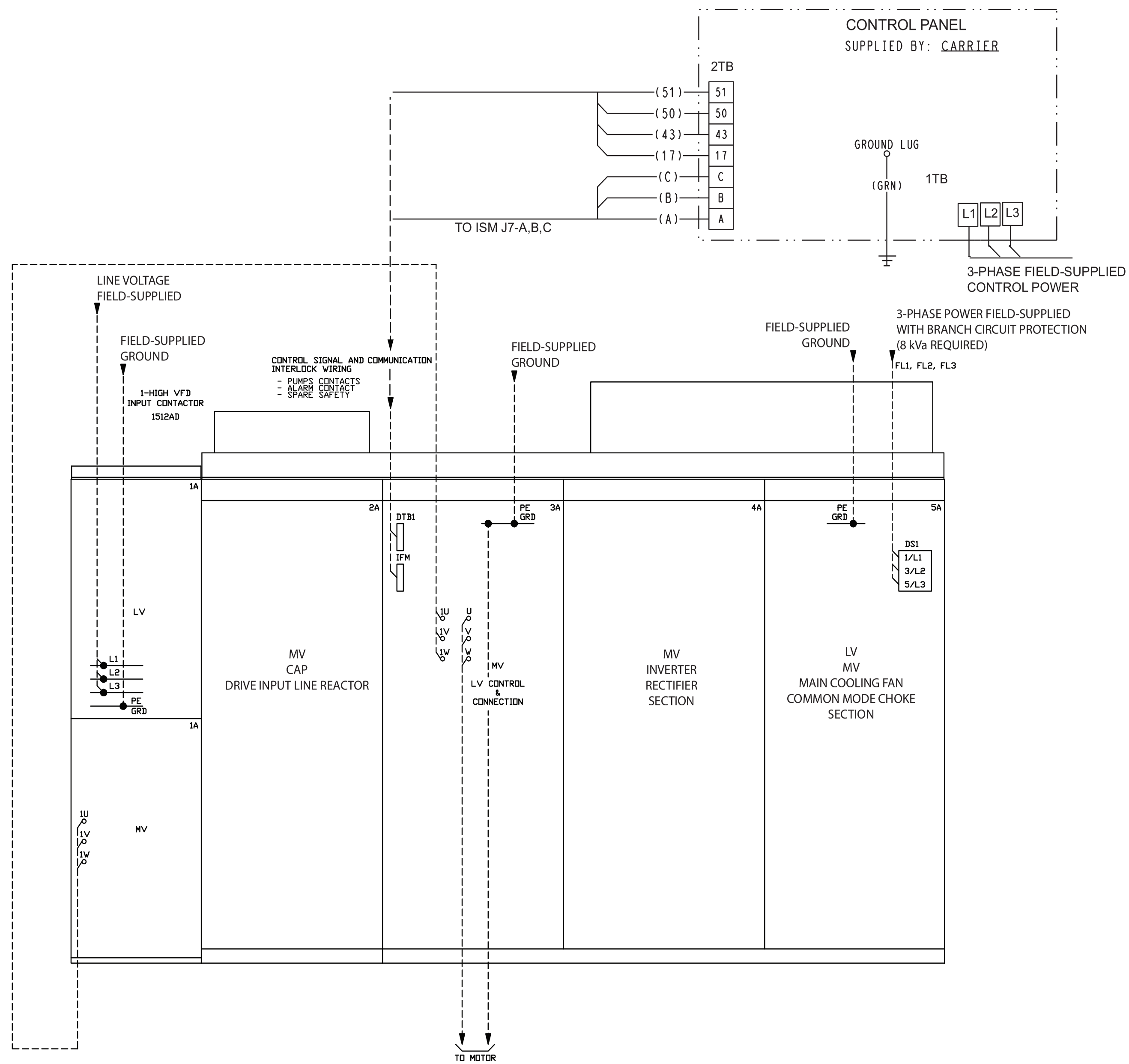
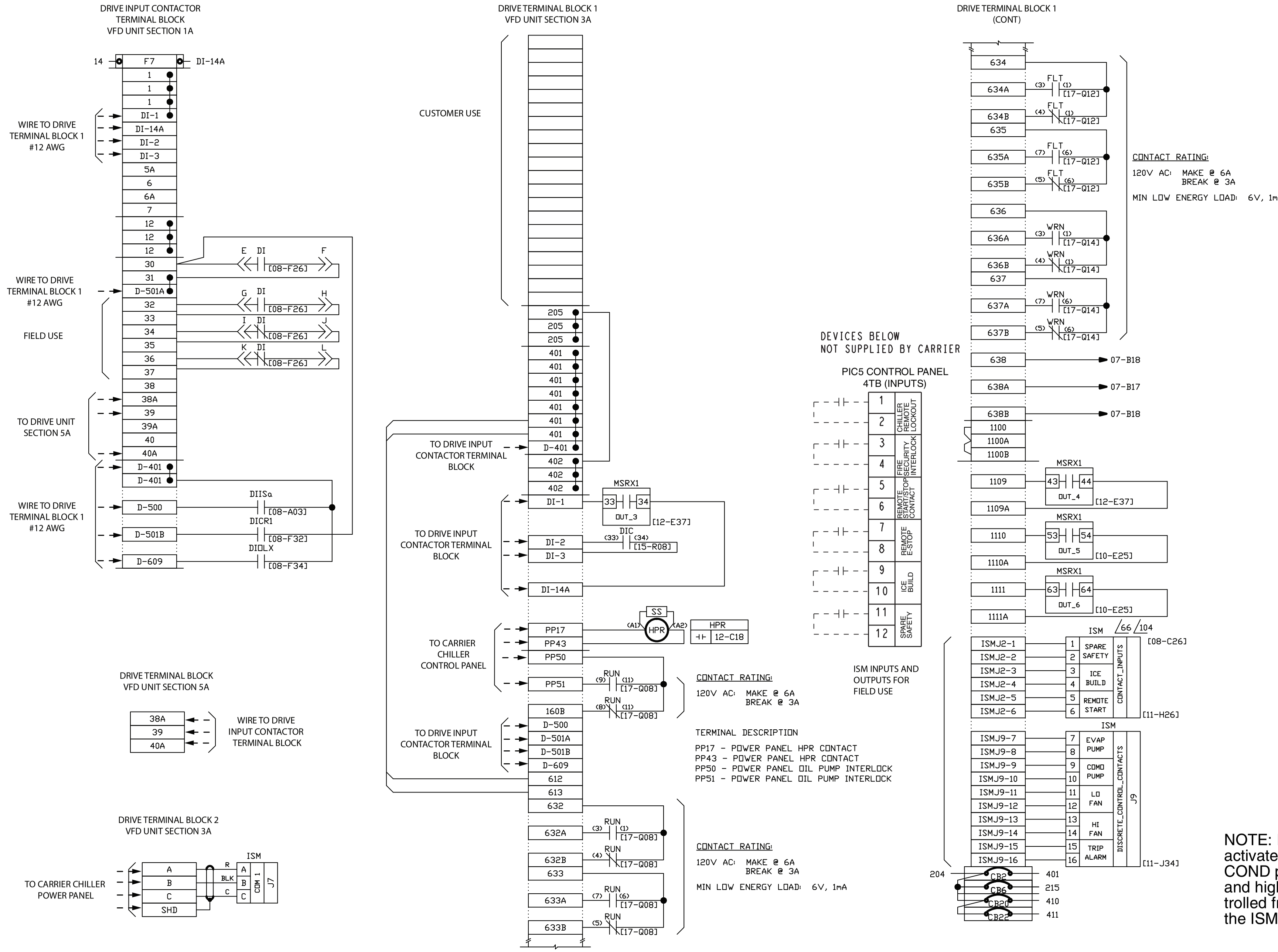


Fig. 44 —Typical Field Wiring with Free-Standing Variable Frequency Drive (VFD) (Medium Voltage) (cont)



NOTE: If IOB4 option is activated, EVAP pump, COND pump, low fan, and high fan are controlled from IOB4, not the ISM card.

Fig. 44 —Typical Field Wiring with Free-Standing Variable Frequency Drive (VFD) (Medium Voltage) (cont)

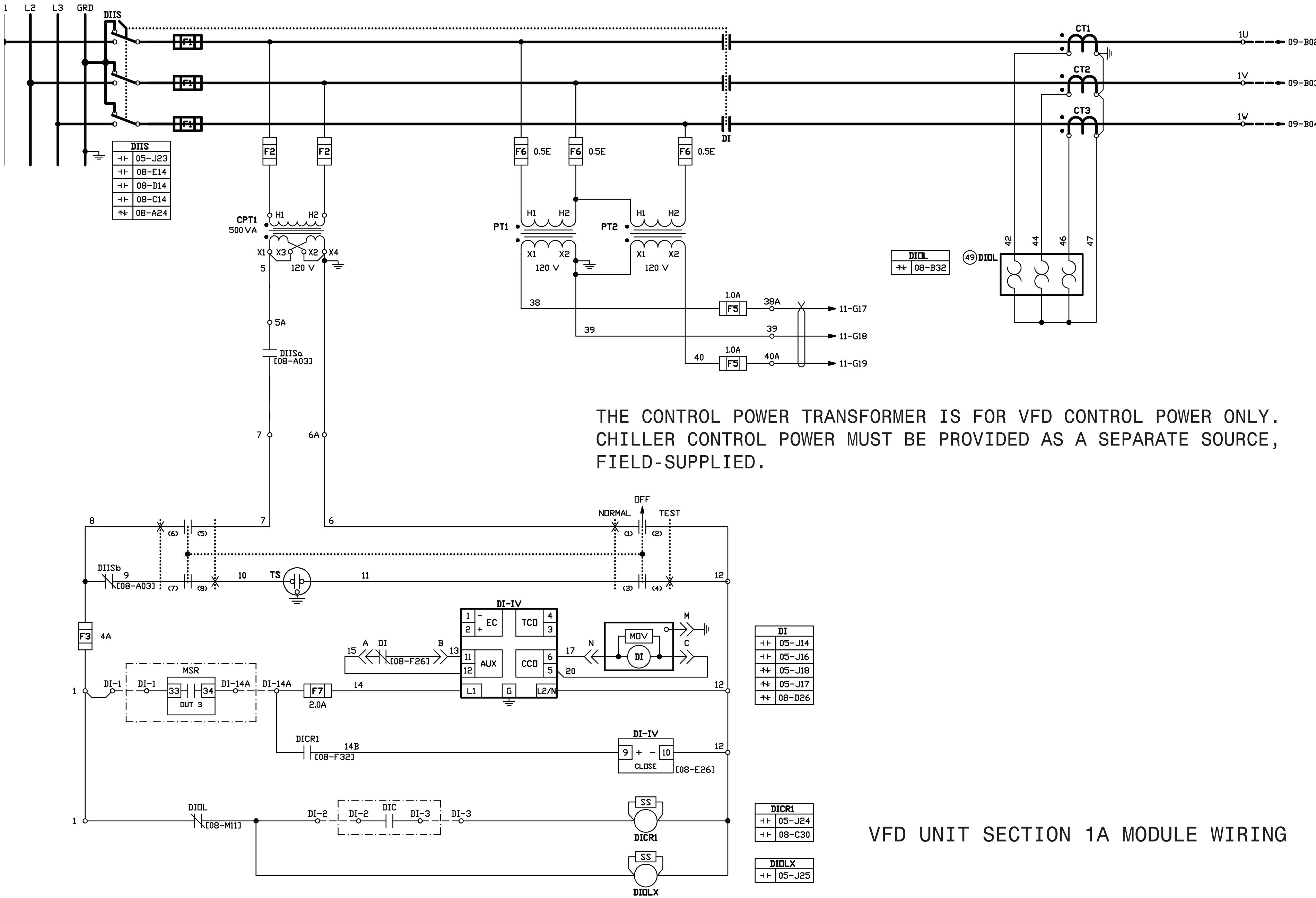


Fig. 44 —Typical Field Wiring with Free-Standing Variable Frequency Drive (VFD) (Medium Voltage) (cont)

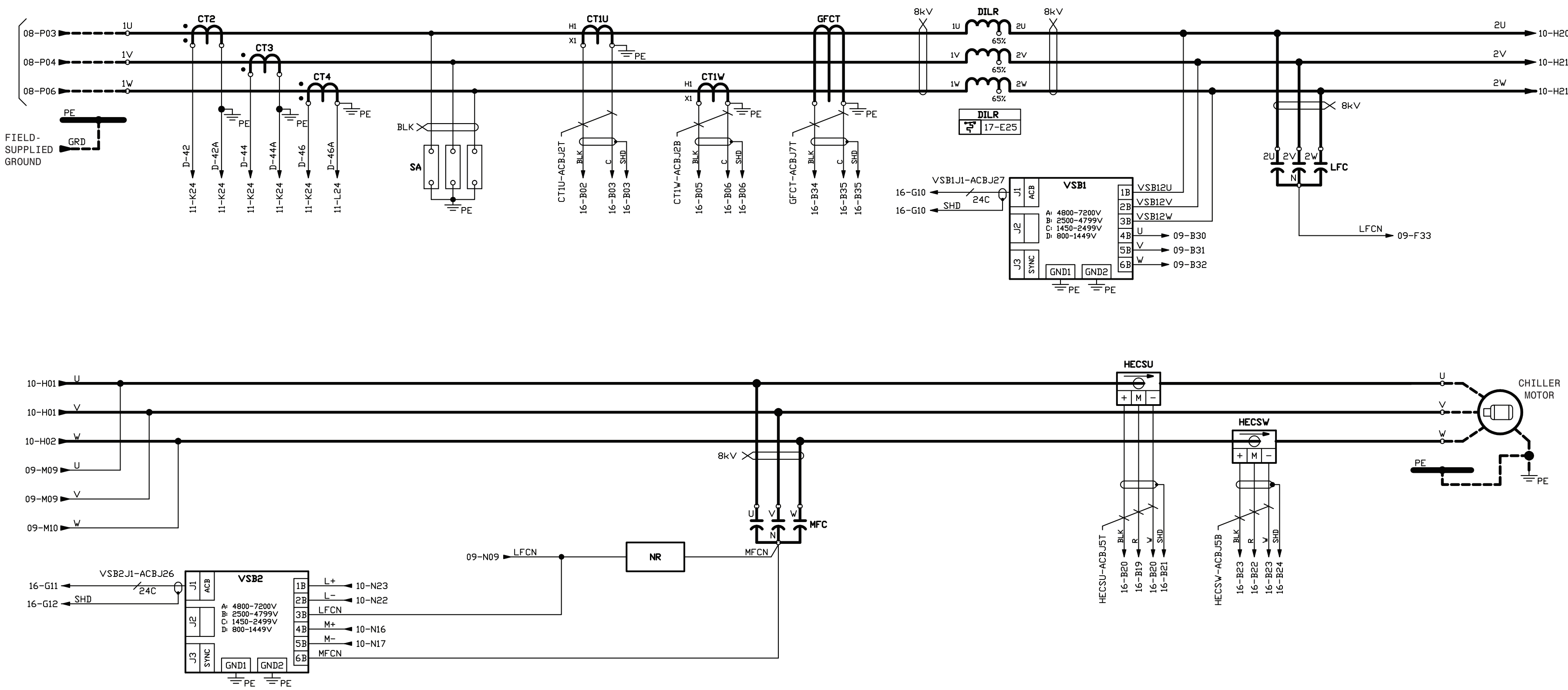


Fig. 44 —Typical Field Wiring with Free-Standing Variable Frequency Drive (Medium Voltage) (VFD) (cont)

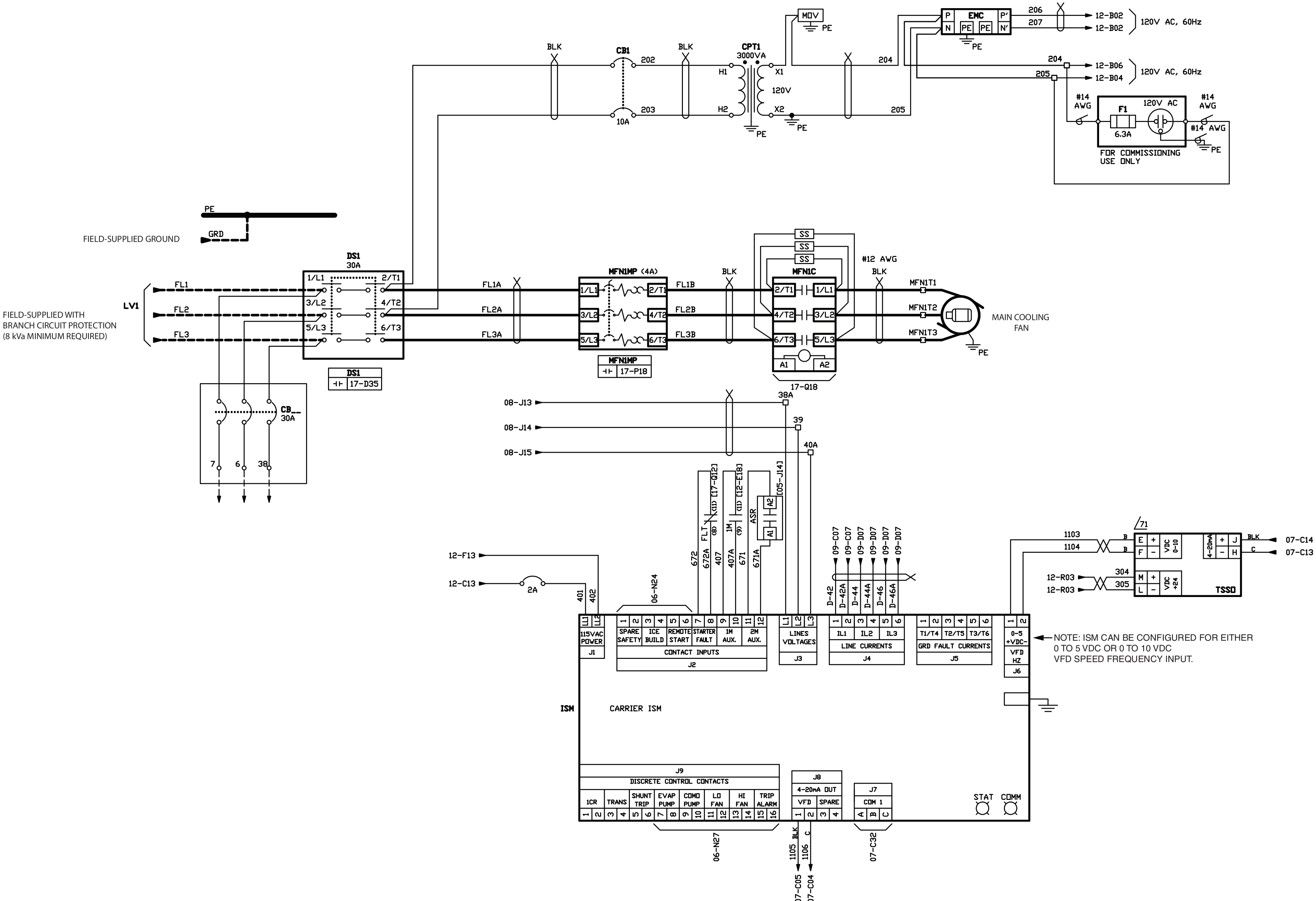


Fig. 44 —Typical Field Wiring with Free-Standing Variable Frequency Drive (VFD) (Medium Voltage) (cont)

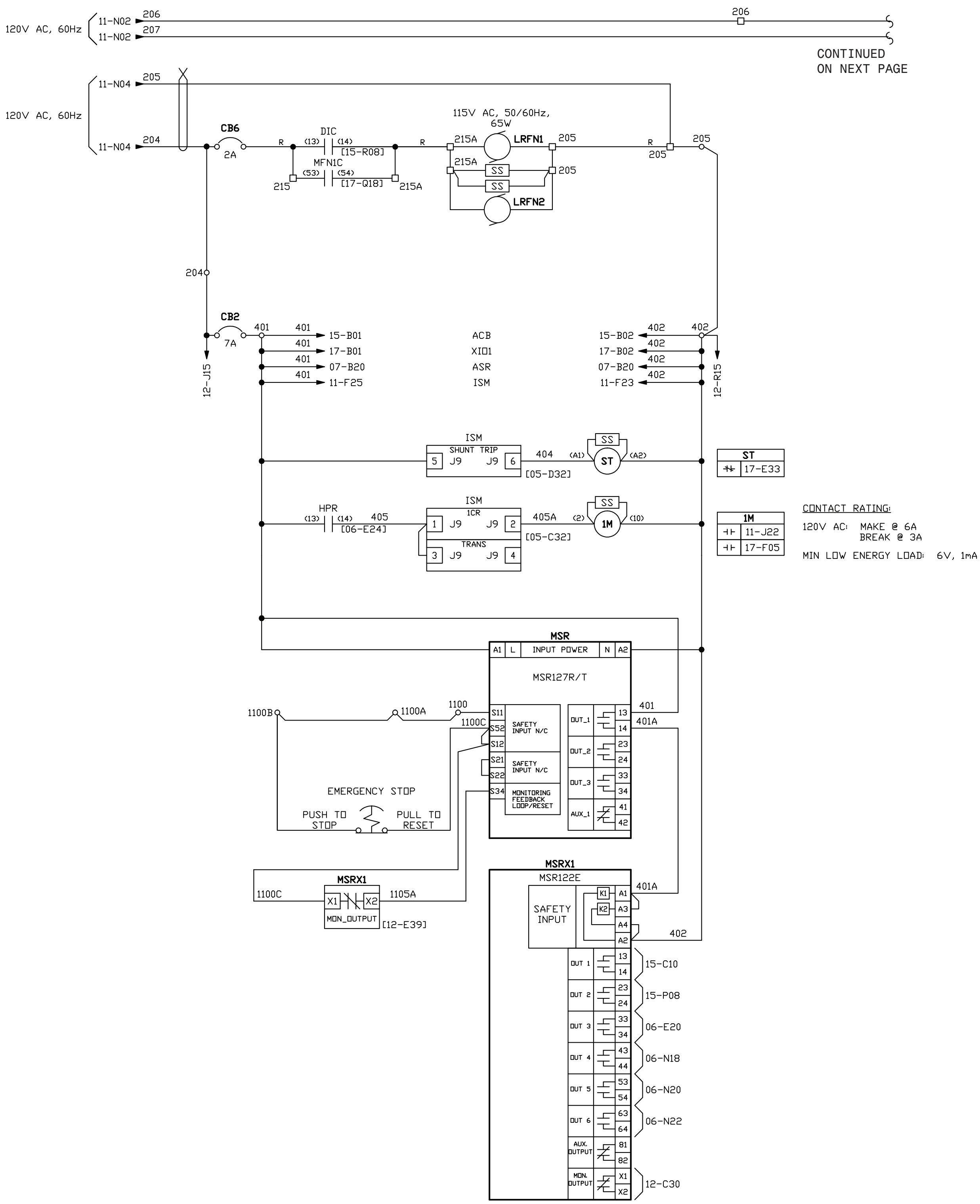


Fig. 44 —Typical Field Wiring with Free-Standing Variable Frequency Drive (VFD) (Medium Voltage) (cont)

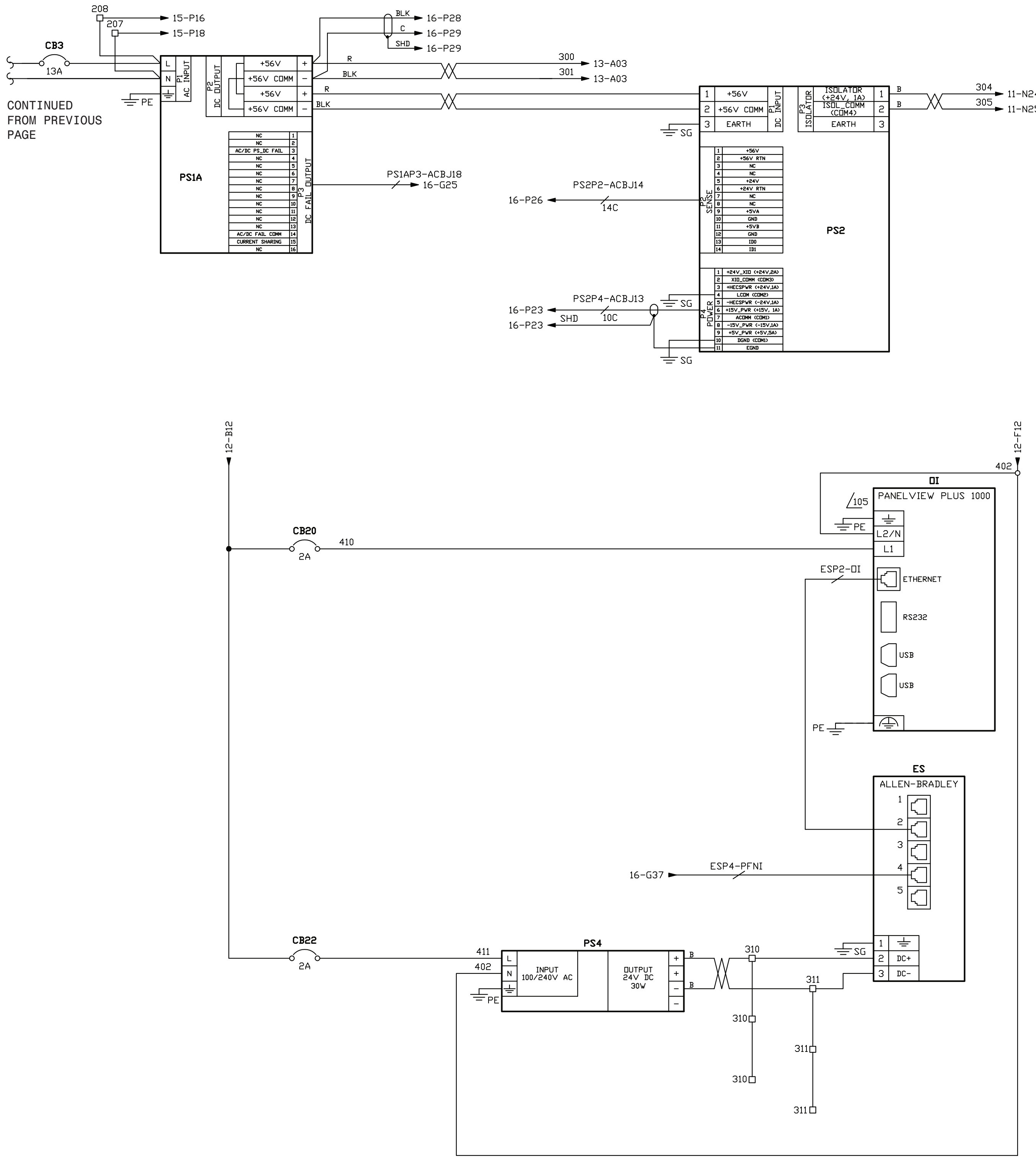


Fig. 44 —Typical Field Wiring with Free-Standing Variable Frequency Drive (VFD) (Medium-Voltage) (cont)

LEGEND AND NOTES FOR FIG. 44, 19XR WITH FREE-STANDING MEDIUM VOLTAGE VFD

AC	—	Alternating Current
ACB	—	Analog Control Board
AWG	—	American Wire Gage
CBx	—	Circuit Breaker
CPTx	—	Control Power Transformer
CTx	—	Current Transformer
DI	—	Drive Input Contactor
DI-IV	—	Drive Input Contactor Intellivac Module
DIC	—	Drive Input Control Relay
DICR1	—	Drive Input Contactor Pilot Relay
DIIS	—	Drive Input Isolating Switch
DILR	—	Drive Input Line Reactor
DIOL	—	Drive Input Overload
DIOLx	—	Drive Input Overload Auxiliary Relay
DITB	—	Drive Input Contactor Terminal Blocks
DSx	—	Disconnect Switch
EMC	—	Electro-Magnetic Choke
ES	—	Ethernet Switch
FLT	—	Fault Relay
Fx	—	Fuse
GFCT	—	Ground Fault Current Transformer
GND	—	Ground
GRD	—	Ground
HECSU	—	Hall Effect Current Sensor (U Phase)
HECSW	—	Hall Effect Current Sensor (W Phase)
HPR	—	High Pressure Relay
IFM	—	Interface Module
ISM	—	Integrated Starter Module
LFC	—	Line Filter Capacitors
LFRNx	—	Line Reactor Fan x
LV	—	Low Voltage
LVx	—	External Low Voltage Supply
MFC	—	Motor Filter Capacitors
MFN1C	—	Main Fan Contactor
MFN1MP	—	Main Fan Motor Protector
MOV	—	Metal Oxide Varistor
MSR	—	Monitoring Safety Relay
MSRXx	—	Monitoring Safety Relay Auxiliary Relay x
MV	—	Medium Voltage
NR	—	Neutral Resistor
PE	—	Earth Ground
PFN1	—	Powerflex Interface Board
PP	—	Carrier Power Panel
PS1A	—	AC/DC Converter
PS2	—	DC/DC Converter
PS4	—	AC/DC Converter
RUN	—	Run Relay
SS	—	Surge Suppressor
ST	—	Shunt Trip
VFD	—	Variable Frequency Drive
VSBx	—	Voltage Sensing Board
WRN	—	Warning Relay
XIOx	—	External Inputs/Outputs
1M	—	Start Relay

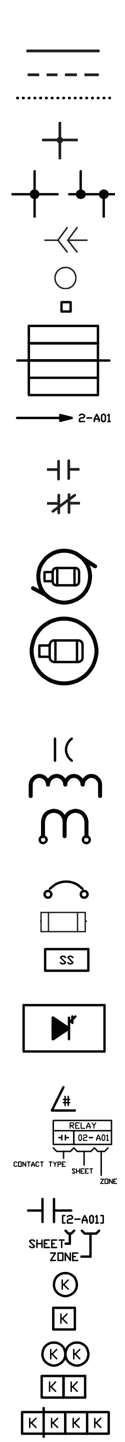
66 Carrier ISM to be programmed by Carrier before start-up. Relay contacts shown without signal power applied.

71 Calibrate for 4-20 mA; 0-5 vdc (Default 0-10 vdc).

100 WARNING: Ground must be connected to prevent high voltages from being applied to drive control boards.

104 Located in drive low voltage control section.

105 Device is mounted on the low voltage door of the drive.



WIRING
Factory Wiring
Field Wiring
Mechanically Connected
Conductor, Crossing of Paths or Conductors Not Connected
Conductor, Junction of Connected Paths, Conductors or Wires
Conductor, Separable or Jacks Engaged
Terminal
Terminal (Rockwell Automation use only)
Terminal Blocks
— Barrier
Wired To/From Destination

SWITCHES AND INPUT DEVICES
Contact Normally Open (Make)
Contact Normally Closed (Break)

OUTPUT DEVICES
Fan (3 Phase Induction Motor)
Induction Machine

RESISTORS, CAPS, WINDINGS AND GROUND
Capacitor
Winding
Transformer, Current

PROTECTION
Circuit Breaker, Control/Power
Fuse, Control/Power
Surge Suppressor

POWER ELECTRONIC DEVICES
Symmetrical Gate-Commutated Thyristor and Gate Driver Board

MISCELLANEOUS
Note Number Indicator
Contact Location Description
Relay Location Description
Key Interlock on Isolation Switch
Key Interlock on MV Door
Multiple Barrel Key Interlock on Isolation Switch
Multiple Barrel Key Interlock on MV Door
Transfer Block

I. GENERAL

1.0 Variable Frequency Drive (VFD) shall be designed and manufactured in accordance with Carrier Engineering Requirement Z-416.

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.

> **⚠ CAUTION**
>
> To prevent damage to machine, do NOT punch holes or drill into the top surface of the VFD enclosure for field wiring. Field wiring knockouts are provided on the top and side of the VFD enclosure for field wiring connections.

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 chiller shutdown.

1.5 WARNING - Do not use aluminum conductors.

1.6 Installer is responsible for any damage caused by improper wiring between VFD and machine.

1.7 All field-installed wiring is field-supplied.

II. POWER WIRING TO VFD

2.0 Provide a means of disconnecting power to VFD.

2.1 Lug adapters may be required if installation conditions dictate that conductors be sized beyond the minimum ampacity required. Contact VFD supplier for lug information.

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

III. CONTROL WIRING

3.0 Field supplied control conductors to be at least 18 AWG or larger.

3.1 Optional ice build start/terminate device contacts, optional remote start/stop device contacts, and optional 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 Each integrated contact output can control loads (VA) for evaporator pump, condenser pump, tower fan low, tower fan high, and alarm annunciator devices rated 5 amps at 115 VAC and up to 3 amps at 277 VAC.

> **⚠ CAUTION**
>
> Control wiring for Carrier to start pumps and tower fan motors and establish flows must be provided to assure machine protection. If primary pump, tower fan, and flow control is by other means, also provide parallel means for control by Carrier. Failure to do so could result in machine freeze-up or overpressure.

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 which has wires carrying 50 v or higher or along side wires carrying 50 v or higher.

3.4 Control wiring between VFD and power panel must be separate shielded cables with minimum rating 600 v, 80 C. Ground shield at VFD.

3.5 If optional pumpout/oil pump circuit breaker is not supplied within the starter enclosure, it must be located within sight of machine with wiring routed to suit.

3.6 When providing conductors for oil pump motor and oil heater power, refer to sizing data on label located on the chiller power panel, equipment submittal documentation, or equipment product data catalog.

3.7 Spare 4-20 mA output signal is designed for controllers with a non-grounded 4-20 mA input signal and a maximum input impedance of 500 ohms.

IV. POWER WIRING BETWEEN FREE-STANDING VFD AND COMPRESSOR MOTOR

4.0 Medium voltage (over 600 volts) compressor motors have (3) terminals. Motor terminal connections below 2.1 kV are 3/4-in. threaded and above 2.1 kV they are 9/16-in. threaded stud. A compression lug with a single hole can be connected directly to the stud or 3 adapters are supplied for connecting a NEMA lug for two 1/2-in. stud connections per phase. Use suitable connectors and insulation for high voltage alternating current cable terminations (these items are not supplied by Carrier). Compressor motor starter must have nameplate stamped as to conforming with Carrier Engineering requirement " Z-416."

4.1 Power conductor rating must meet minimum unit nameplate voltage and compressor motor RLA. Refer to the label located on the side of the chiller control panel, equipment submittal documentation, or equipment product data catalog for conductor sizing data. (Conductor as defined below may be a single lead or multiple smaller ampacity leads in parallel for the purpose of carrying the equivalent or higher current of a single larger lead.)

When (3) conductors are used:

Minimum ampacity per conductor = 1.25 x compressor RLA

When 96) conductors are used:

Minimum ampacity per conductor = 1.25 x compressor RLA/2

4.2 When more than one conduit is used to run conductors from VFD to compressor motor terminal box, an equal number of leads from each phase (conductor) must be in each conduit to prevent excessive heating (for example, conductors to motor terminals 1, 2, and 3 in one conduit, and to 1, 2, and 3 in another conduit).

4.3 Compressor motor power conductors may enter terminal box through top, left side, or bottom left using holes cut by contractor to suit conduit. Flexible conduit should be used for the last few feet to the terminal box for unit vibration isolation. Use of stress cones may require an oversize (special) motor terminal box (not supplied by Carrier).

4.4 Compressor motor frame to be grounded in accordance with the National Electrical Code (NFPA-70) and applicable codes. Means for grounding compressor motor is a #4 AWG to 500 MCM pressure connector, supplied and located in the lower left corner of the compressor motor terminal box.

4.5 Do not allow motor terminals to support weight of wire cables. Use cable supports and strain reliefs as required.

4.6 Use backup wrench when tightening lead connectors to motor terminal studs. Torque to 30-35 ft-lb for the 9/16-in. stud and 35-40 ft-lb for the ¾-in. stud.

4.7 Do not exceed 100 ft. maximum power cable length between the VFD and motor terminals without consulting Carrier for special requirements.

CABLE INSULATION REQUIREMENTS

SYSTEM VOLTAGE	CABLE INSULATION RATING (kV) (MAX. PEAK LINE-TO-GROUND)	
	LINE SIDE	MACHINE SIDE
2400	> 2.20	> 2.20
3000	> 2.75	> 2.75
3300	> 3.00	> 3.00
4160	> 3.80	> 3.80
6000	> 5.50	> 5.50
6300	> 5.80	> 5.80
6600	> 6.00	> 6.00

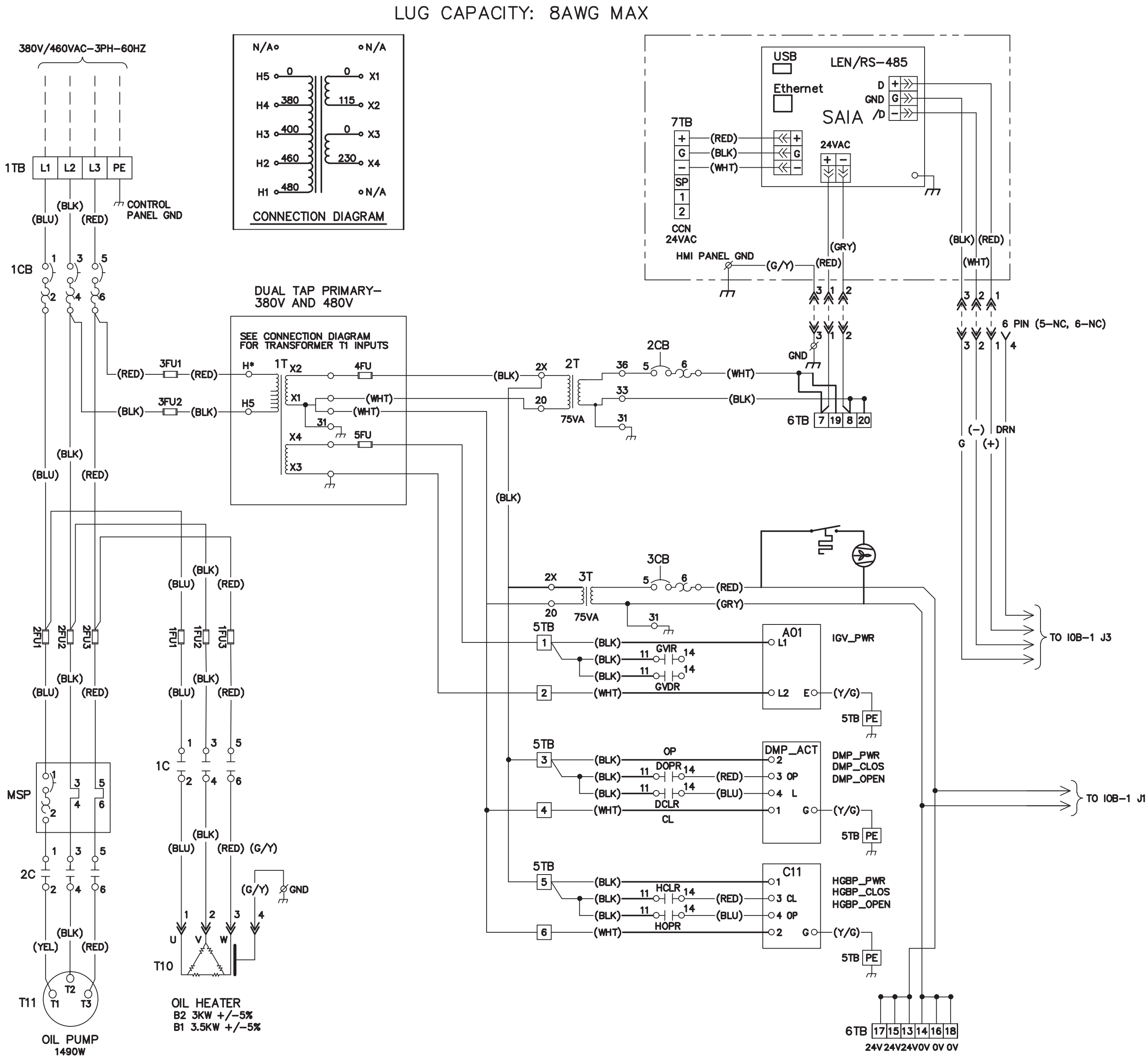


Fig. 45 — Controls Diagram

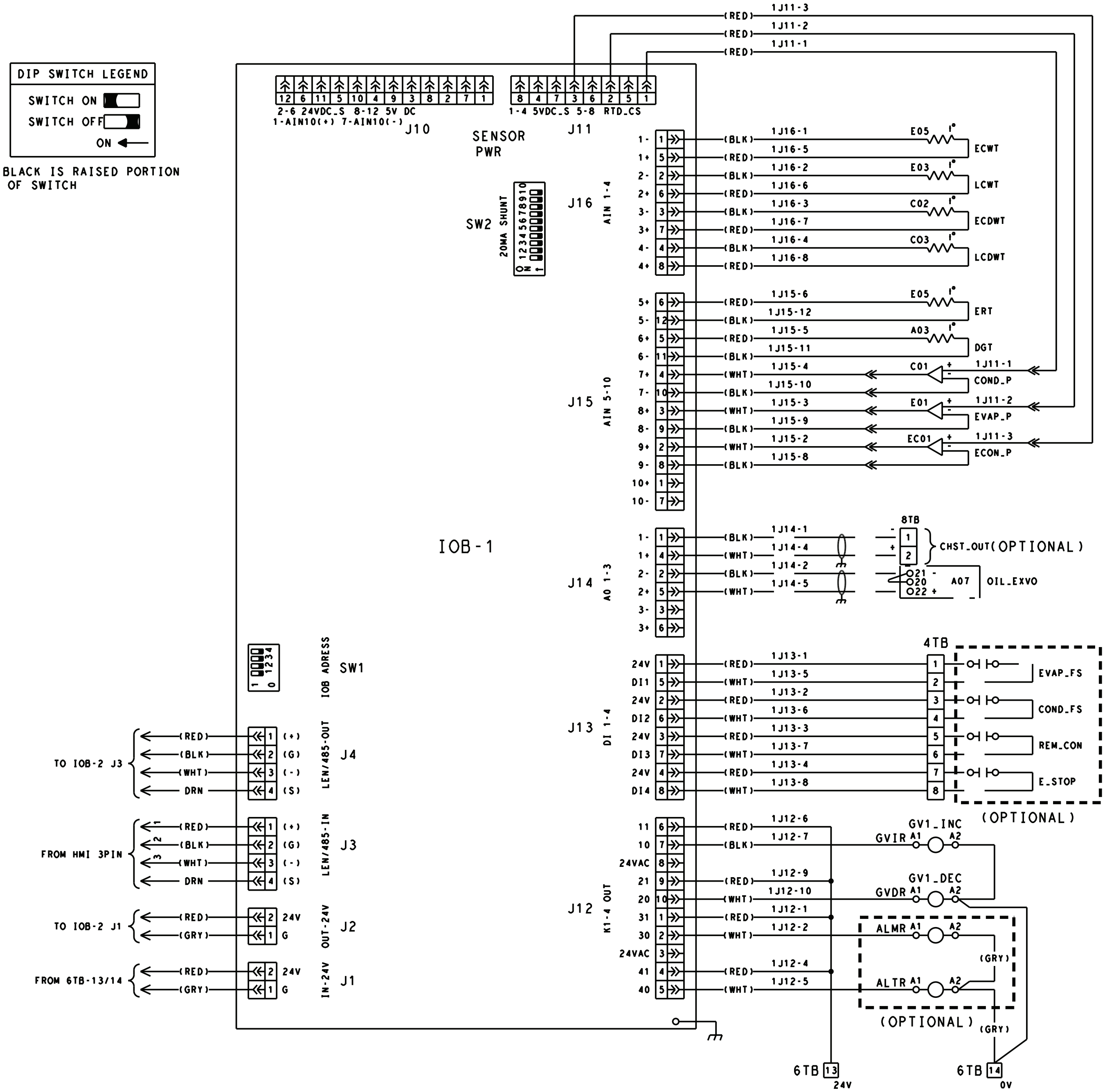

DIP SWITCH LEGEND
SWITCH ON
SWITCH OFF
ON
BLACK IS RAISED PORTION OF SWITCH
2-6 24VDC_S 8-12 5V DC
1-AIN10(+) 7-AIN10(-)
J10
SENSOR PWR
1-4 5VDC_S 5-8 RTD_CS
J11
J16
AIN 1-4
SW2
20MA SHUNT
J15
AIN 5-10
IOB-1
J14
AO 1-3
J13
DI 1-4
J12
K1-4 OUT
SW1
IOB ADRESS
J4
LEN/485-OUT
J3
LEN/485-IN
J2
OUT-24V
J1
IN-24V
TO IOB-2 J3
FROM HMI 3PIN
TO IOB-2 J1
FROM 6TB-13/14
ECWT
LCWT
ECDWT
LCDWT
ERT
DGT
COND_P
EVAP_P
ECON_P
8TB
CHST_OUT(OPTIONAL)
A07
OIL_EXVO
4TB
EVAP_FS
COND_FS
REM_CON
E_STOP
(OPTIONAL)
GV1_INC
GVIR
GV1_DEC
GVDR
ALMR
ALTR
(OPTIONAL)
6TB 13
24V
6TB 14
0V

Fig. 46 — IOB 1

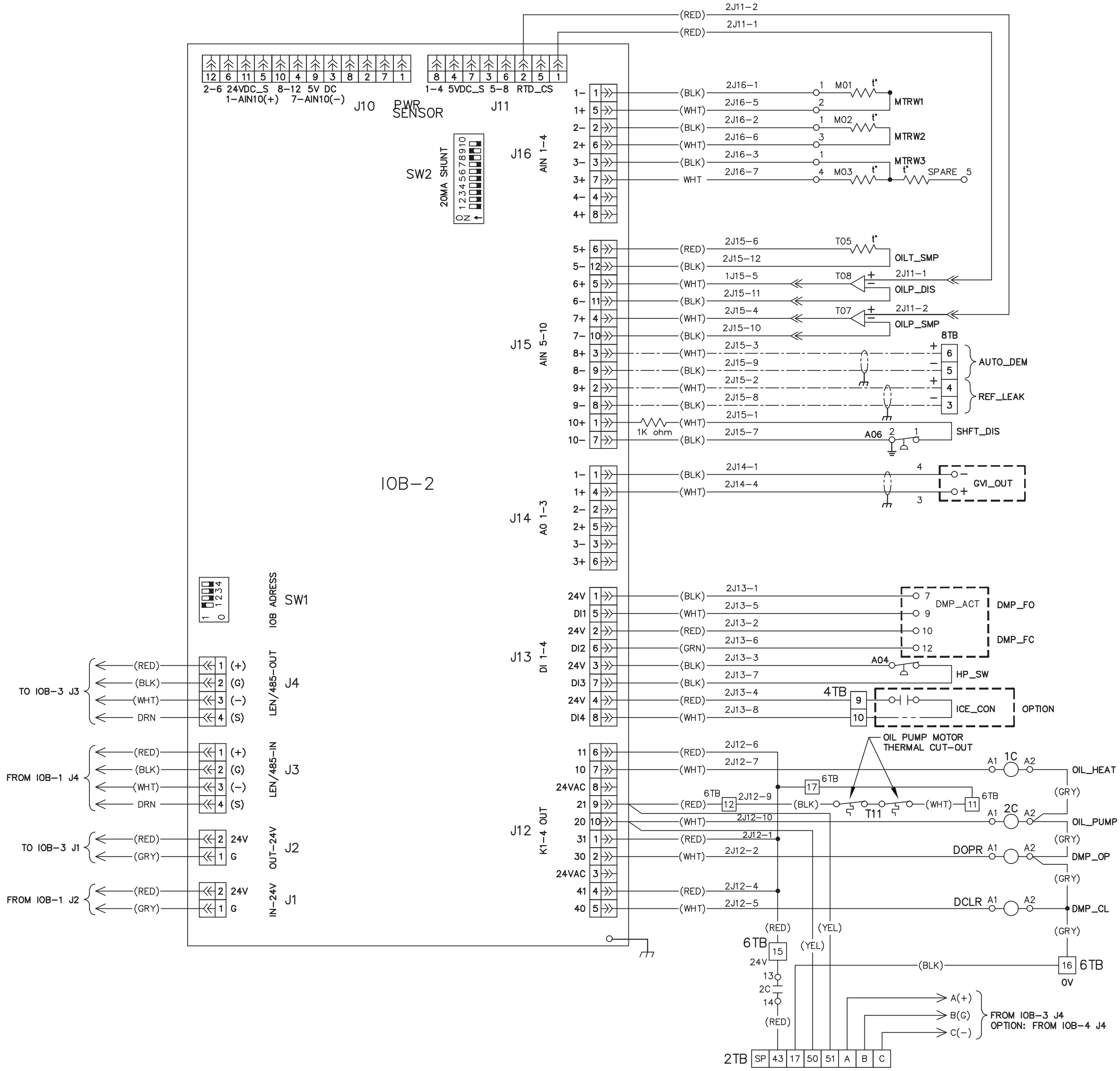

IOB−2
J10
PWR SENSOR
J11
SW2
20MA SHUNT
J16
AIN 1-4
J15
AIN 5-10
J14
AO 1-3
J13
DI 1-4
J12
K1-4 OUT
SW1
IOB ADRESS
J4
LEN/485-OUT
J3
LEN/485-IN
J2
OUT-24V
J1
IN-24V
TO IOB-3 J3
FROM IOB-1 J4
TO IOB-3 J1
FROM IOB-1 J2
MTRW1
MTRW2
MTRW3
SPARE
OILT_SMP
OILP_DIS
OILP_SMP
AUTO_DEM
REF_LEAK
SHFT_DIS
GVI_OUT
DMP_ACT
DMP_FO
DMP_FC
HP_SW
ICE_CON
OPTION
OIL PUMP MOTOR THERMAL CUT-OUT
OIL_HEAT
OIL_PUMP
DMP_OP
DMP_CL
FROM IOB-3 J4
OPTION: FROM IOB-4 J4
2TB
6TB
4TB
8TB

Fig. 47 — IOB 2

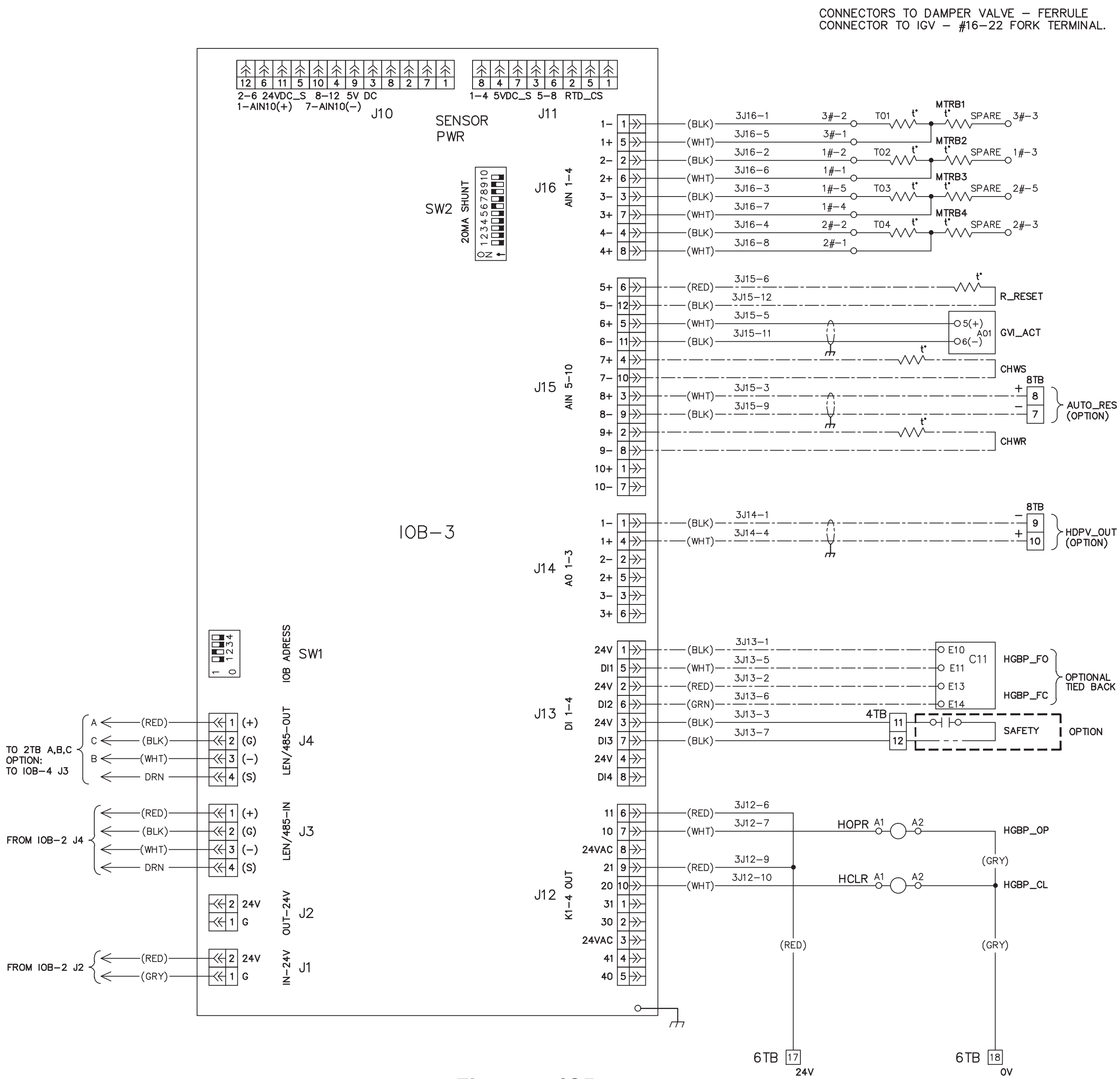

CONNECTORS TO DAMPER VALVE – FERRULE
CONNECTOR TO IGV – #16–22 FORK TERMINAL.
IOB–3
J10
2–6 24VDC_S 8–12 5V DC
1–AIN10(+) 7–AIN10(–)
J11
1–4 5VDC_S 5–8 RTD_CS
SENSOR PWR
SW2
20MA SHUNT
J16
AIN 1–4
MTRB1
MTRB2
MTRB3
MTRB4
T01
T02
T03
T04
SPARE
3J16–1
3J16–5
3J16–2
3J16–6
3J16–3
3J16–7
3J16–4
3J16–8
J15
AIN 5–10
3J15–6
3J15–12
3J15–5
3J15–11
3J15–3
3J15–9
R_RESET
GVI_ACT
A01
CHWS
8TB
AUTO_RES (OPTION)
CHWR
J14
AO 1–3
3J14–1
3J14–4
HDPV_OUT (OPTION)
J13
DI 1–4
3J13–1
3J13–5
3J13–2
3J13–6
3J13–3
3J13–7
C11
HGBP_FO
HGBP_FC
OPTIONAL TIED BACK
4TB
SAFETY
OPTION
J12
K1–4 OUT
3J12–6
3J12–7
3J12–9
3J12–10
HOPR
HCLR
HGBP_OP
HGBP_CL
6TB 17 24V
6TB 18 0V
SW1
IOB ADRESS
J4
LEN/485–OUT
TO 2TB A,B,C
OPTION:
TO IOB–4 J3
J3
LEN/485–IN
FROM IOB–2 J4
J2
OUT–24V
J1
IN–24V
FROM IOB–2 J2

Fig. 48 — IOB 3

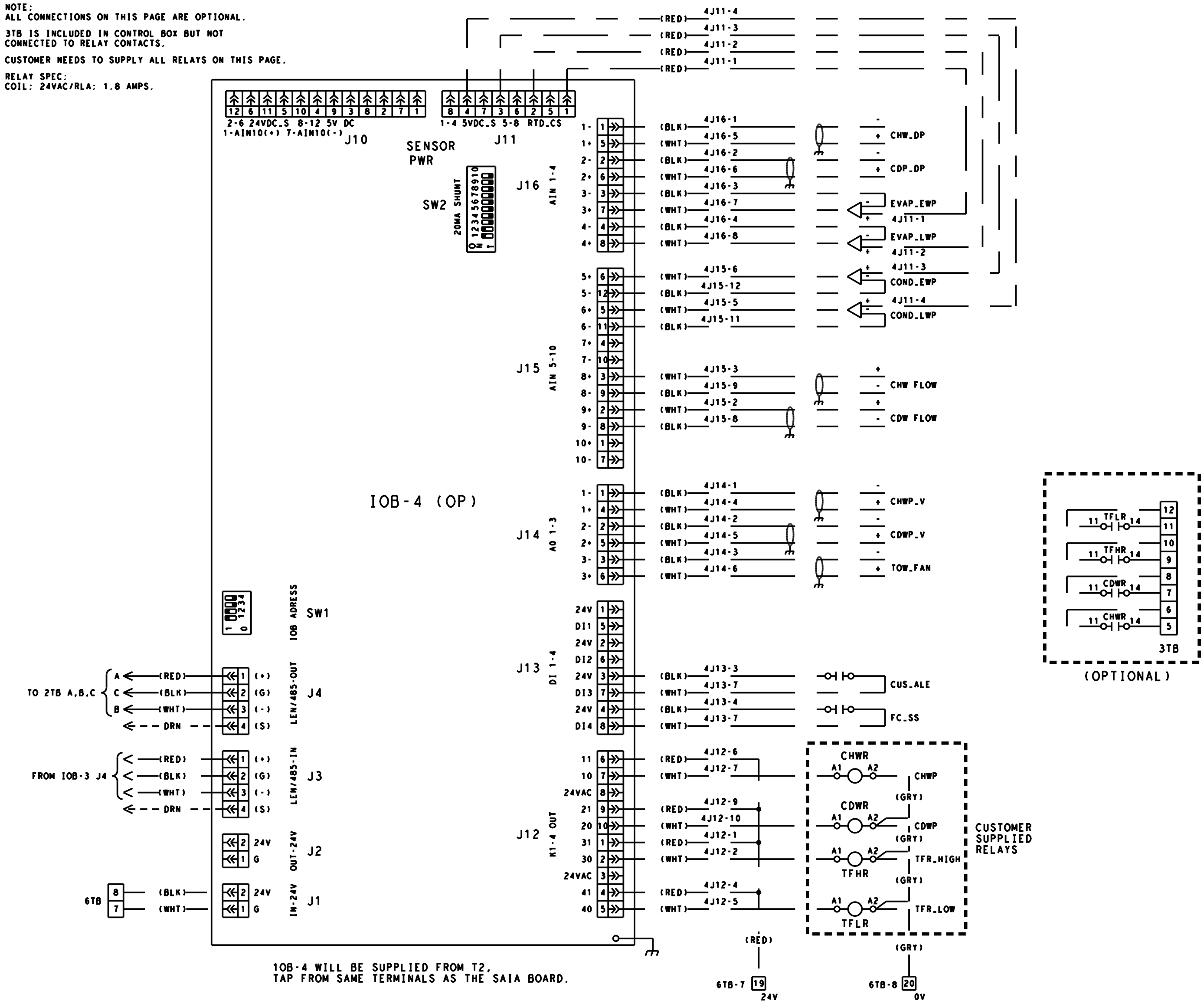

NOTE:
ALL CONNECTIONS ON THIS PAGE ARE OPTIONAL.
3TB IS INCLUDED IN CONTROL BOX BUT NOT CONNECTED TO RELAY CONTACTS.
CUSTOMER NEEDS TO SUPPLY ALL RELAYS ON THIS PAGE.
RELAY SPEC:
COIL: 24VAC/RLA: 1.8 AMPS.
IOB-4 (OP)
SENSOR PWR
J10
J11
J16
J15
J14
J13
J12
J4
J3
J2
J1
SW1
SW2
CHW_DP
CDP_DP
EVAP_EWP
EVAP_LWP
COND_EWP
COND_LWP
CHW FLOW
CDW FLOW
CHWP_V
CDWP_V
TOW_FAN
CUS_ALE
FC_SS
CHWP
CDWP
TFR_HIGH
TFR_LOW
CUSTOMER SUPPLIED RELAYS
(OPTIONAL)
3TB
TO 2TB A,B,C
FROM IOB-3 J4
6TB
IOB-4 WILL BE SUPPLIED FROM T2,
TAP FROM SAME TERMINALS AS THE SAIA BOARD.
6TB-7
24V
6TB-8
0V

Fig. 49 — IOB 4

FOR CUSTOMER SUPPLIED CONNECTION POINTS
USE MOLEX CONNECTOR AND FEMALE PIN SHOWN HERE.

CUSTOMER OPTIONAL PLUG CONNECTOR P/N		
ITEM	MOLEX P/N	CARRIER P/N
PIN REMOVAL TOOL	11–03–0044	––
FEMALE PIN	46018–1541	19XF05002401
J1 PLUG (2 PIN)	39–01–2025	19XF05002201
J3 PLUG (4 PIN)	39–01–2045	19XF05002202
J11 PLUG (8PIN–BLACK)	50–36–1713	19XF05002207
J12 PLUG (10 PIN)	39–01–2105	19XF05002205
J13 PLUG (8 PIN)	39–01–2085	19XF05002204
J14 PLUG (6 PIN)	39–01–2065	19XF05002203
J15 PLUG (12 PIN)	39–01–2125	19XF05002206
J16 PLUG (8 PIN)	39–01–2085	19XF05002204

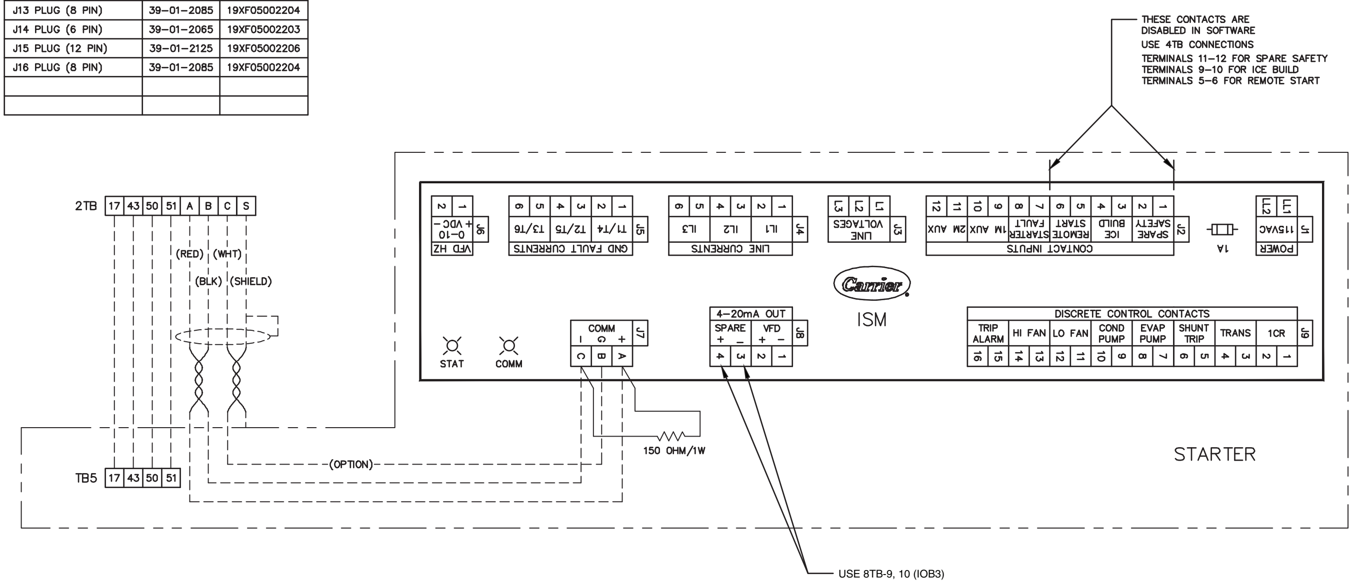


Fig. 50 — Starter Wiring

LEGEND FOR FIG. 45-50

Control Abbreviations — Fig. 45-50

ALE — Chiller Alert
ALM — Chiller Alarm
AUTO_DEM — Demand Limit Input
AUTO_RES — Auto Water Temp Reset
CHST_OUT — Chiller Running (On/Off/Ready)
CHW_DP — Chilled Water Pressure Difference
CHWP — Chilled Water Pump
CHWP_V — Chilled Water Pump (Variable)
CHWR — Chilled Water Return
CHWS — Chilled Water Supply
CDWP — Condenser Water Pump
CDWP-V — Condenser Water Pump (Variable)
CHWP — Chilled Water Pump
CHWP_V — Chilled Water Pump (Variable)
COND_EWP — Entering Condenser Water Pressure
COND_FL — Condenser Water Flow Measurement
COND_FS — Condenser Water Flow Switch
COND_LWP — Leaving Condenser Water Pressure
COND_P — Condenser Pressure
CUS_ALE — Customer Alert
DGT — Compressor Discharge Temperature
DMP_CL — Economizer Damper Valve Close
DMP_FC — Damper Valve Feedback Fully Close
DMP_FO — Damper Valve Feedback Fully Open
DMP_OP — Economizer Damper Valve Open
ECDW — Entering Condenser Water Temperature
ECON_P — Economizer Pressure
ECW — Entering Chilled Water Temperature
ERT — Evaporator Refrigerant Temperature
EVAP_EWP — Entering Evaporator Water Pressure
EVAP_FL — Evaporator Water Flow Measurement
EVAP_LWP — Leaving Evaporator Water Pressure
EVAP_P — Evaporator Pressure
FS-SS — Free Cooling Start Switch
GV1-ACT — IGV1 Position Input
GV1_OUT — IGV1 Control Signal
HDPV_OUT — Head Pressure Output
HGBP_CL — Hot Gas Bypass (HGBP) Valve Close
HGBP_FC — Hot Gas Bypass Valve Feedback Fully Close
HGBP_FO — Hot Gas Bypass Valve Feedback Fully Open
HGBP_OP — Hot Gas Bypass Valve Open
HP_SW — High Pressure Switch
ICE_CON — Ice Build Contact
LCDW — Leaving Condenser Water Temperature
LCW — Leaving Chilled Water Temperature
MTRB1 — Low Speed Motor End Bearing Temperature (Thermistor/PT100)
MTRB2 — Low Speed Compressor End Bearing Temperature (Thermistor/PT100)
MTRB3 — High Speed Motor End Bearing Temperature (Thermistor/PT100)
MTRB4 — High Speed Compressor End Bearing Temperature (Thermistor/PT100)
MTRW1 — Motor Winding Temperature 1
MTRW2 — Motor Winding Temperature 2
MTRW3 — Motor Winding Temperature 3
OIL_HEAT — Oil Heater On/Off
OIL_PUMP — Oil Pump On/Off
OILP_DIS — Oil Pump Discharge Pressure
OILP_SMP — Oil Sump Pressure
OILT_SMP — Oil Sump Temperature
REM_CON — Remote Connect Input
REM_LOCK — Chiller Lockout Input
REM_STP — Remote Stop Lock
SAFETY — Spare Safety
SHFT_DIS — Bearing Shaft Displacement Switch
TFR_HIGH — Tower Fan High
TFR_LOW — Tower Fan Low

Wiring Codes — Fig. 45-50

1C — Oil Heater Contactor
2C — Oil Pump Contactor
1CB — Micro Circuit Breaker, Control Box
2CB — Micro Circuit Breaker, HMI
3FU1,2 — Transformer 1 Primary Fuse
3FU3,4 — Transformer 1 Secondary Fuse
1R — Alarm Relay
1T — Transformer 1
2T — Transformer 2
3T — Transformer 3
1TB — Terminal Block for Customer Power Connection
2TB — Terminal Block for Field Connection
3TB — Terminal Block for Customer Optional Connection
4TB — HMI Terminal Block Field CCN Connection
5TB — Terminal Block for Control Panel Internal Connection
6TB — Terminal Block for Guide Vane, HGBP amd Damper Valve
7TB — Terminal Block for Guide Vane Actuator (220 v)
A01 — IGV/Stage 1 IGV
A03 — Discharge Gas Temperature Thermistor
A04 — High Pressure Switch
A06 — Bearing Displacement Switch
C11 — HGBP Valve Actuator
E01 — Evaporator Pressure Transducer
E03 — Leaving Chilled Water Temperature Thermistor
E05 — Evaporator Refrigerant Liquid Temperature Thermistor
EC01 — Economizer Pressure Transducer
EC06 — Damper Valve Actuator
HMI — Human Interface Panel
ISM — Integrated Starter Module
M01 — Motor Winding Temperature 1 (Thermistor/PT100)
M02 — Motor Winding Temperature 2 (Thermistor/PT100)
M03 — Motor Winding Temperature 3 (Thermistor/PT100)
MSP — Motor Starter Protection
SAIA — SAIA Touch Screen and Main Board
T01 — Low Speed Motor End Bearing Temperature (Thermistor/PT100)
T02 — Low Speed Compressor End Bearing Temperature (Thermistor/PT100)
T03 — High Speed Motor End Bearing Temperature (Thermistor/PT100)
T04 — High Speed Compressor End Bearing Temperature (Thermistor/PT100)
T05 — Oil Sump Temperature Thermistor
T07 — Oil Sump Pressure Transducer
T08 — Oil Pump Discharge Pressure Transducer
T10 — Oil Heater
T11 — Oil Pump

Symbols — Fig. 45-50

○	Component Terminal
→≻	Conductor Male/Female Connector
— —	Field Wiring
—— ·	Optional Wiring
—— ·	Component/Panel Enclosure
□	Terminal Block for Field Wiring
⌀	Terminal Block for Internal Connection
•	Wire Splice

APPENDIX A — PIC 5 SCREEN AND MENU STRUCTURE

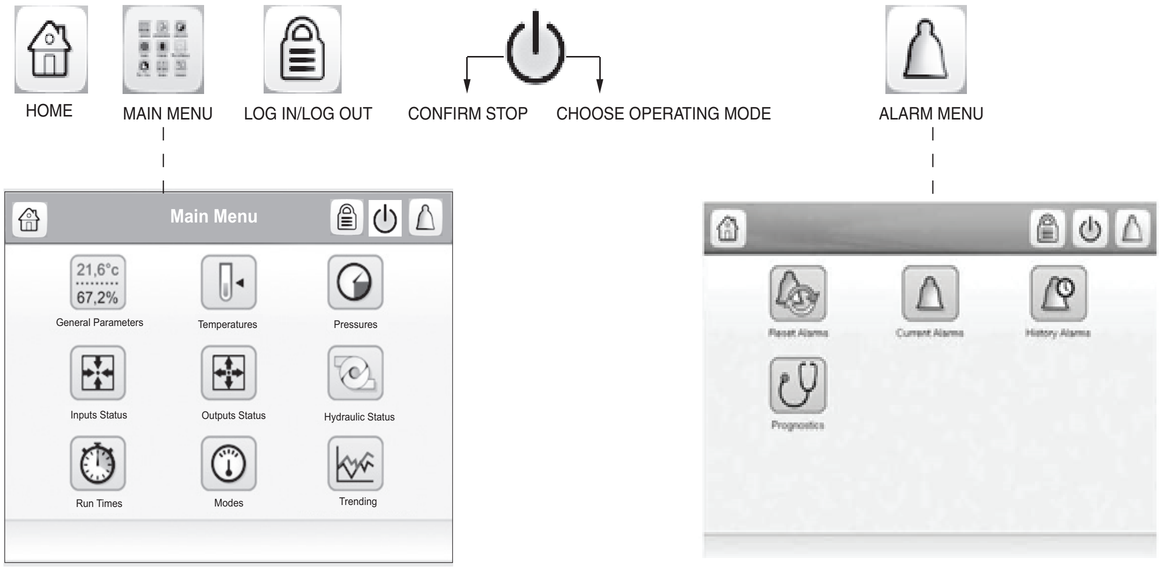


Fig. A — Screen Structure, Basic Level (All) Access (No Password Required)

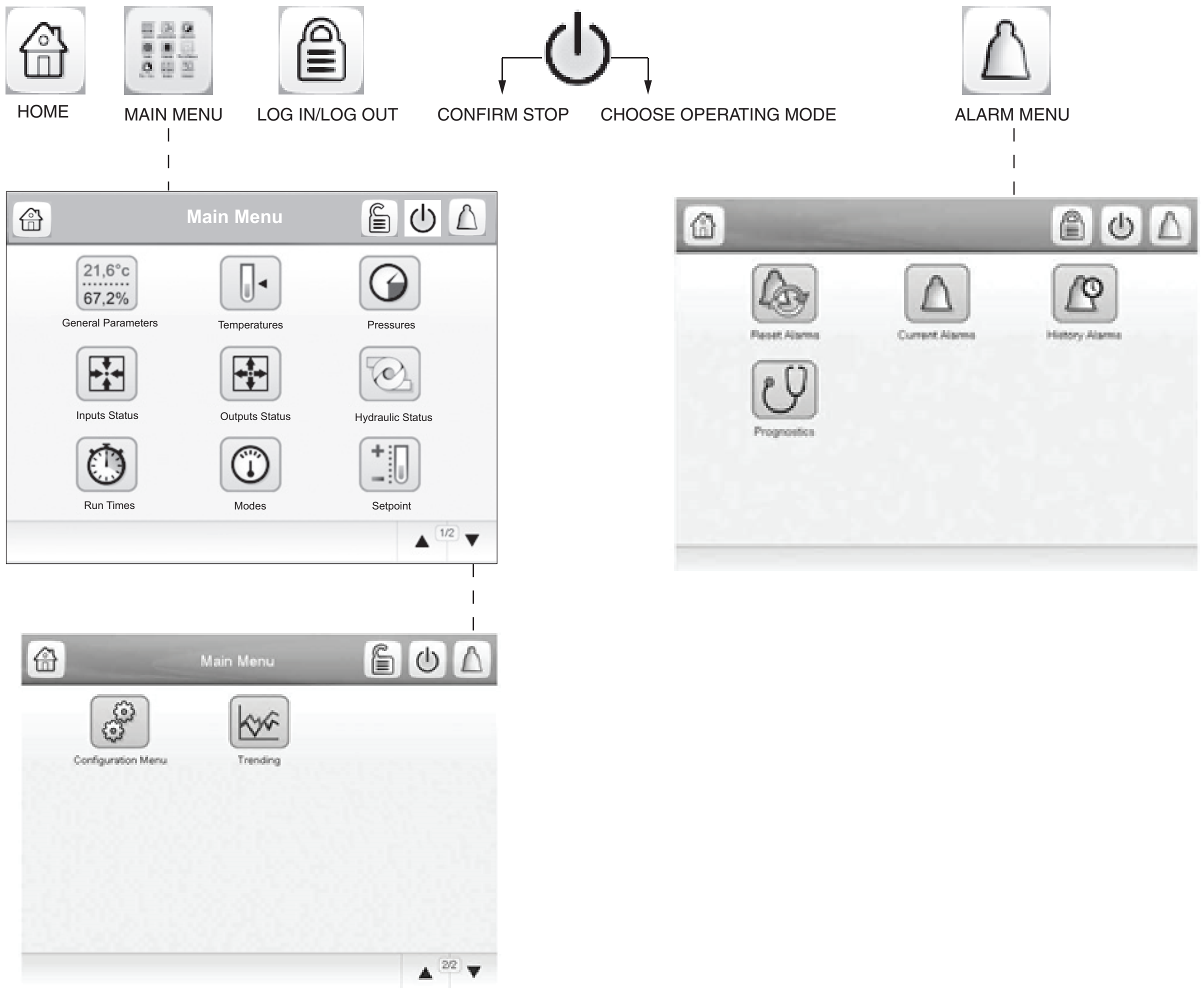


Fig. B — Screen Structure, User Level Access (User Password Required)

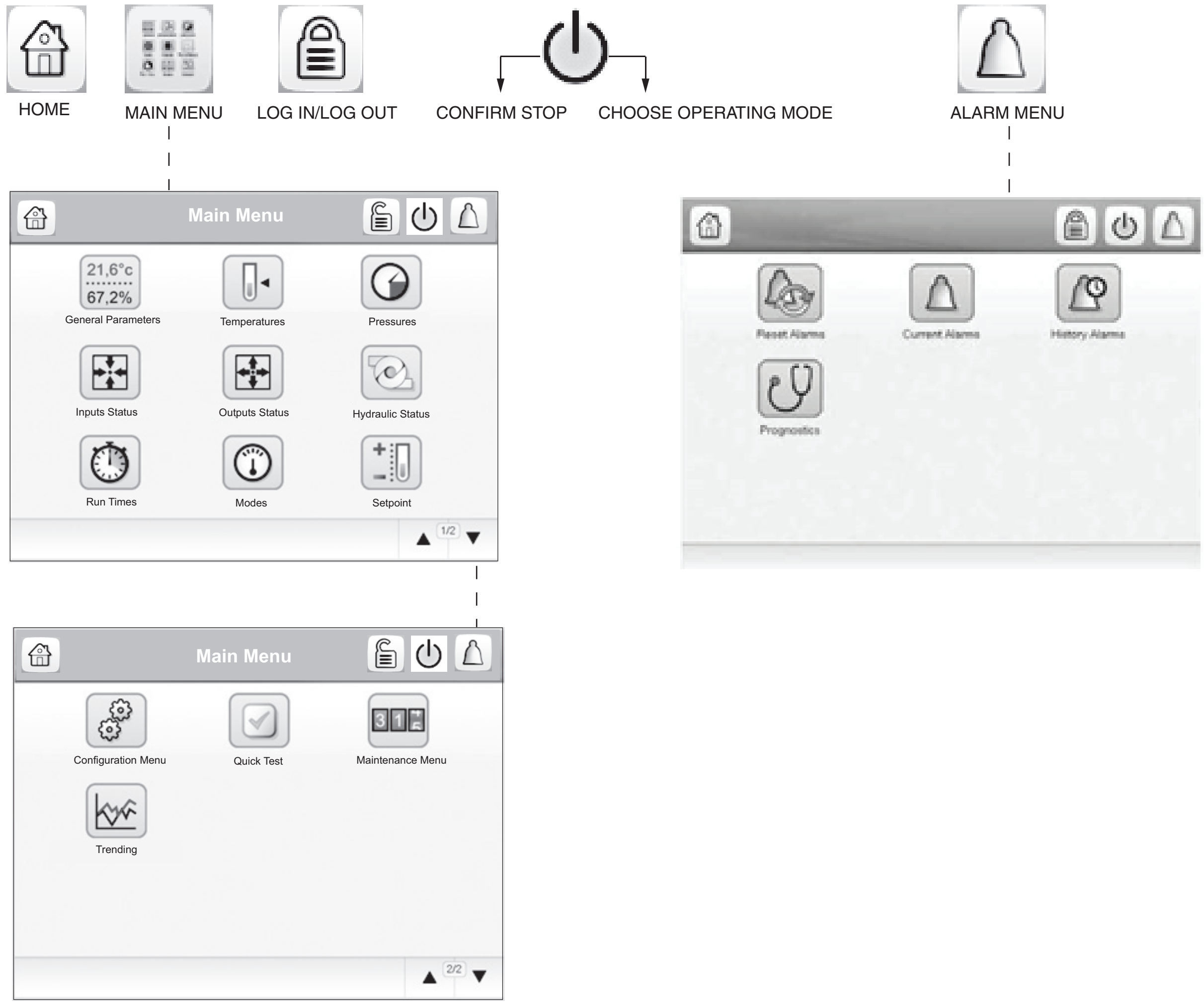


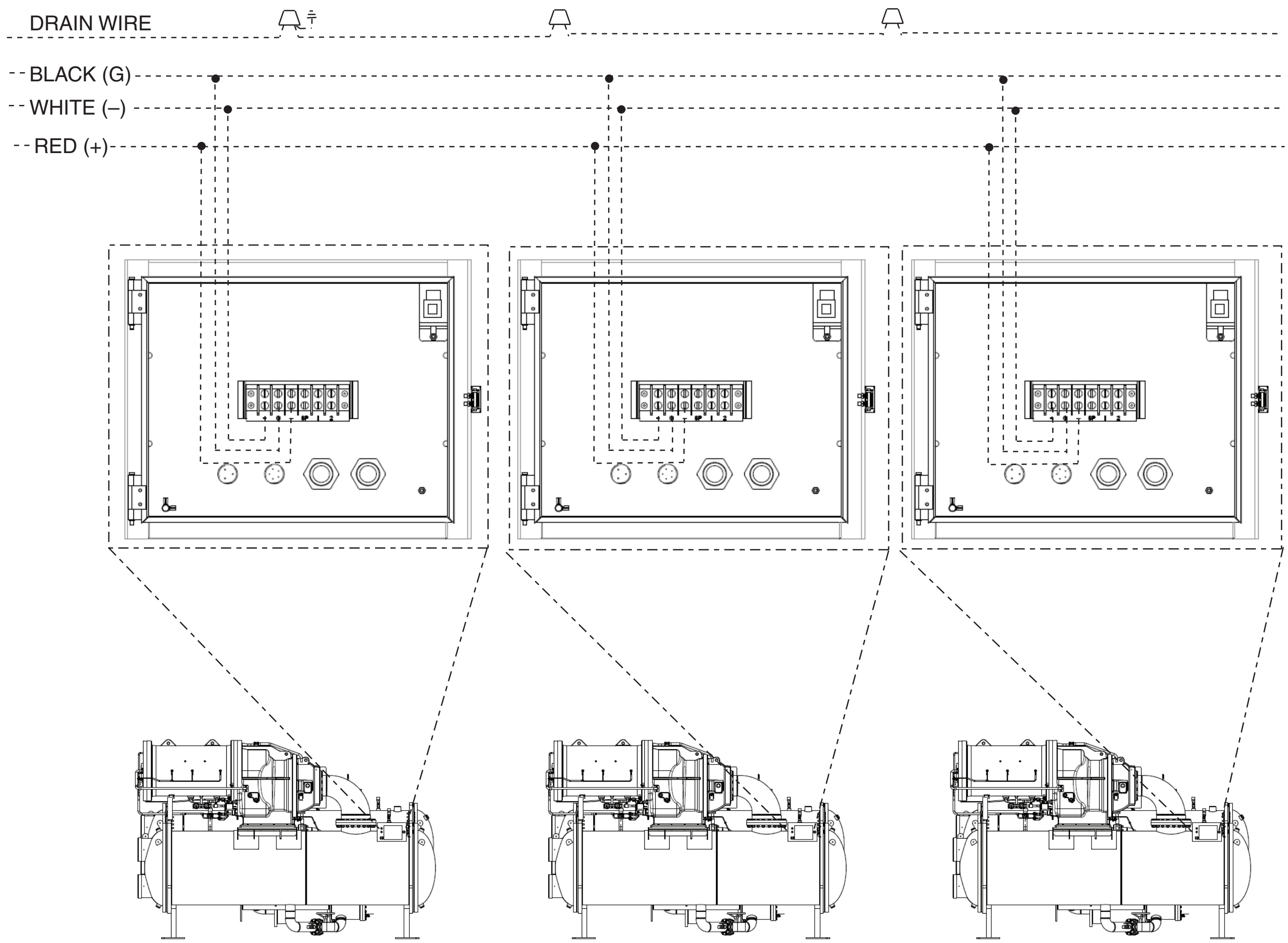
Fig. C — Screen Structure, Factory Level Access Password Required)

Main Menu Description

ICON	DISPLAYED TEXT*	ACCESS	ASSOCIATED TABLE†
	General Parameters	Basic, User, Factory	GENUINT
	Temperatures	Basic, User, Factory	TEMP
	Pressures	Basic, User, Factory	PRESSURE
	Inputs Status	Basic, User, Factory	INPUTS
	Outputs Status	Basic, User, Factory	OUTPUTS
	Hydraulic Status	Basic, User, Factory	HYDRLIC
	Run Times	Basic, User, Factory	RUNTIME
	Modes	Basic, User, Factory	MODES
	Set point	User, Factory	SETPOINT
	Configuration Menu	User, Factory	CONFIG
	Quick Test	Factory	QCK_TEST
	Maintenance Menu	Factory	MAINTAIN
	Trending	Basic, User, Factory	TRENDING

*Displayed text depends on the selected language (default is English).
†See the 19XR Controls Operation and Troubleshooting manual for table details.

APPENDIX B — CCN COMMUNICATION WIRING FOR MULTIPLE CHILLERS (TYPICAL)



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

APPENDIX C — MAINTENANCE SUMMARY AND LOG SHEETS

19XR Maintenance Interval Requirements

WEEKLY			
COMPRESSOR	Check Oil Level.	**CONTROLS**	Review PIC 5 Alarm/Alert History.
COOLER	None.	**STARTER**	None.
CONDENSER	None.	**OIL RECLAIM**	None.
MONTHLY			
COMPRESSOR	None.	**CONTROLS**	Perform an Automated Controls test.
COOLER	None.	**STARTER**	None.
CONDENSER	None.	**OIL RECLAIM**	None.
FIRST YEAR			
COMPRESSOR	Change oil filter. Send oil sample out for analysis. Change oil if required by analysis. Leak test.	**CONTROLS**	Perform general cleaning. Tighten connections. Check pressure transducers. Confirm accuracy of thermistors.
COOLER	Inspect and clean cooler tubes. Inspect relief valves. Leak test. Verify water pressure differential. Inspect water pumps and cooling tower.	**STARTER**	Perform general cleaning. Tighten connections. Change VFD refrigerant strainer.
CONDENSER	Replace refrigerant filter/drier. Inspect and clean condenser tubes. Inspect relief valves. Leak test. Verify water pressure differential. Inspect water pumps and cooling tower.	**OIL RECLAIM**	Inspect oil sump strainer.
ANNUALLY			
COMPRESSOR	Change oil filter. Send oil sample out for analysis. Change oil if required by analysis. Leak test.	**CONTROLS**	Perform general cleaning. Tighten connections. Check pressure transducers. Confirm accuracy of thermistors.
COOLER	Inspect and clean cooler tubes. Inspect relief valves. Leak test. Verify water pressure differential. Inspect water pumps and cooling tower.	**STARTER**	Perform general cleaning. Tighten connections.
CONDENSER	Replace refrigerant filter/drier. Inspect and clean condenser tubes. Inspect relief valves. Leak test. Verify water pressure differential. Inspect water pumps and cooling tower.	**OIL RECLAIM**	None.
STARTING EQUIPMENT	Follow all lockout-tagout procedures. Inspect inside of enclosure for contaminant build-up. Vacuum any accumulated dust or debris from internal parts. Use electronic cleaner as required.		
EVERY 3-5 YEARS			
COMPRESSOR	None.	**CONTROLS**	None.
COOLER	Perform eddy current test.	**STARTER**	None.
CONDENSER	Inspect float valve and strainer. Perform eddy current test.	**OIL RECLAIM**	None.
EVERY 5 YEARS			
COMPRESSOR	Change oil charge (if required based on oil analysis or if oil analysis has not been performed). Inspect compressor shafts and bearings (every 5-10 years).	**CONTROLS**	None.
COOLER	None.	**STARTER**	None.
CONDENSER	None.	**OIL RECLAIM**	Inspect oil sump strainer. Inspect oil sump heater. Replace the oil reclaim filter.
SEASONAL SHUTDOWN			
COMPRESSOR	None.	**CONTROLS**	Do not disconnect control power.
COOLER	Isolate and drain waterbox. Remove waterbox cover from one end. Use compressed air to clear tubes.	**STARTER**	None.
CONDENSER	Isolate and drain waterbox. Remove waterbox cover from one end. Use compressed air to clear tubes.	**OIL RECLAIM**	None.

NOTE: Equipment failures caused by lack of adherence to the Maintenance Interval Requirements are not covered under warranty.

APPENDIX C — MAINTENANCE SUMMARY AND LOG SHEETS (cont)

19XR Monthly Maintenance Log

MONTH			1	2	3	4	5	6	7	8	9	10	11	12
DATE			/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /
OPERATOR														

UNIT SECTION	ACTION	UNIT	ENTRY											
COMPRESSOR	Change Oil Charge	yes/no												
	Change Oil Filter	yes/no												
	Send Oil Sample Out for Analysis	yes/no												
	Leak Test	ppm												
	Inspect Compressor Rotors	yes/no												
	Bearing Inspection	yes/no												
COOLER	Inspect and Clean Cooler Tubes	yes/no												
	Inspect Relief Valves	yes/no												
	Leak Test	ppm												
	Record Water Pressure Differential (PSI)	PSI												
	Inspect Water Pumps	yes/no												
	Eddy Current Test	yes/no												
CONDENSER	Leak Test	ppm												
	Inspect and Clean Condenser Tubes	yes/no												
	Record Water Pressure Differential (PSI)	PSI												
	Inspect Water Pumps and Cooling Tower	yes/no												
	Inspect Relief Valves	yes/no												
	Replace Refrigerant Filter Drier	yes/no												
	Inspect Float Valve and Strainer	yes/no												
	Eddy Current Test	yes/no												
CONTROLS	General Cleaning and Tightening Connections	yes/no												
	Check Pressure Transducers	yes/no												
	Confirm Accuracy of Thermistors	yes/no												
	Perform Automated Controls Test	yes/no												
STARTER	General Tightening and Cleaning Connections	yes/no												
OIL RECLAIM	Inspect Oil Sump Strainer	yes/no												
	Inspect Oil Sump Heater	yes/no												

NOTE: Equipment failures caused by lack of adherence to the Maintenance Interval Requirements are not covered under warranty.

APPENDIX C — MAINTENANCE SUMMARY AND LOG SHEETS (cont)

19XR Seasonal Shutdown Log

MONTH		1	2	3	4	5	6	7	8	9	10	11	12
DATE		/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /
OPERATOR													

UNIT SECTION	ACTION	ENTRY											
COOLER	Isolate and Drain Waterbox												
	Remove Waterbox Cover from One End												
	Use Compressed Air to Clean Tubes												
CONDENSER	Isolate and Drain Waterbox												
	Remove Waterbox Cover from One End												
	Use Compressed Air to Clean Tubes												
CONTROLS	Do Not Disconnect Control Power												

NOTE: Equipment failures caused by lack of adherence to the Maintenance Interval Requirements are not covered under warranty.

INDEX

INITIAL START-UP CHECKLIST
FOR 19XR SEMI-HERMETIC TWO-STAGE CENTRIFUGAL LIQUID CHILLER
(REMOVE AND USE FOR JOB FILE.)

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 Start-Up, Operation, and Maintenance Instructions document.

MACHINE INFORMATION:

NAME ____________________ JOB NO. ____________________

ADDRESS ____________________ MODEL ____________________

CITY __________ STATE __________ ZIP __________ S/N __________

DESIGN CONDITIONS:

	TONS	BRINE	FLOW RATE	TEMPERATURE IN	TEMPERATURE OUT	PRESSURE DROP	PASS	SUCTION TEMPERATURE	CONDENSER TEMPERATURE
COOLER									******
CONDENSER								******	

COMPRESSOR: Volts __________ RLA __________ OLTA __________

STARTER: Mfg __________ Type __________ S/N __________

OIL PUMP: Volts __________ RLA __________ OLTA __________

CONTROL PANEL SUPPLY: Voltage __________ Hertz __________

REFRIGERANT: Type: ______ Charge ______

CARRIER OBLIGATIONS:
- Assemble... . . . . Yes ☐ No ☐
- Leak Test . . . . Yes ☐ No ☐
- Dehydrate . . . . Yes ☐ No ☐
- Charging . . . . Yes ☐ No ☐
- Operating Instructions ____________________ Hrs.

START-UP TO BE PERFORMED IN ACCORDANCE WITH APPROPRIATE MACHINE START-UP INSTRUCTIONS

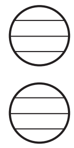
JOB DATA REQUIRED:

1. Machine Installation Instructions . . . . Yes ☐ No ☐
2. Machine Assembly, Wiring and Piping Diagrams . . . . . . Yes ☐ No ☐
3. Starting Equipment Details and Wiring Diagrams . . . . . . Yes ☐ No ☐
4. Applicable Design Data (see above) . . . . Yes ☐ No ☐
5. Diagrams and Instructions for Special Controls . . . . Yes ☐ No ☐

INITIAL MACHINE PRESSURE: ______________

	YES	NO
Was Machine Tight?		
If Not, Were Leaks Corrected?		
Was Machine Dehydrated After Repairs?		

CHECK OIL LEVEL AND RECORD:



3/4
1/2 Top sight glass
1/4

3/4
1/2 Bottom sight glass
1/4

ADD OIL: Yes ☐ No ☐
Amount: ________________

RECORD PRESSURE DROPS: Cooler ______________ Condenser ________________

CHARGE REFRIGERANT: Initial Charge ______________ Final Charge After Trim ______________

INSPECT WIRING AND RECORD ELECTRICAL DATA:
RATINGS:

Motor Voltage ________ Motor(s) Amps ________ Oil Pump Voltage ________ Starter LRA Rating ________

Line Voltages: Motor _____________ Oil Pump ____________ Controls/Oil Heater ___________

RECORD THE FOLLOWING POWER ON CHECKS:

Line Voltage: Phase - Phase	A-B:	B-C:	A-C:
Line Voltage: Phase - Ground	A-G:	B-G:	C-G:

What type and size of transformer supplies power to the unit?

Delta with No Ground _____
Corner Grounded Delta _____
Wye with Center Ground _____
Wye with No Ground _____
Transformer Size _____kVa

CONTROLS: SAFETY, OPERATING, ETC.

Perform Controls Test (Yes/No) ________

CAUTION
COMPRESSOR MOTOR AND CONTROL PANEL **MUST** BE PROPERLY AND INDIVIDUALLY CONNECTED BACK TO THE EARTH GROUND IN THE STARTER (IN ACCORDANCE WITH CERTIFIED DRAWINGS).

Yes ____

WATER/BRINE PUMP CONTROL: Can the Carrier controls independently start the pumps?

Condenser Water Pump Yes ☐ No ☐
Chilled Water Pump Yes ☐ No ☐

RUN MACHINE: Do these safeties shut down machine?

Condenser Water Flow Yes ☐ No ☐
Chilled Water Flow Yes ☐ No ☐
Pump Interlocks Yes ☐ No ☐

INITIAL START:

Line up all valves in accordance with instruction manual: ________

Start water pumps and establish water flow ________

Oil level OK and oil temperature OK ________ Check oil pump rotation-pressure ________

Check compressor motor rotation (motor end sight glass) and record: Clockwise ________

Restart compressor, bring up to speed. Shut down. Any abnormal coastdown noise? Yes* ☐ No ☐

*If yes, determine cause.

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START MACHINE AND OPERATE. COMPLETE THE FOLLOWING:

A: Trim charge and record under Charge Refrigerant section.

B: Take at least two sets of operational log readings and record.

C: After machine has been successfully run and set up, shut down and mark shutdown oil and refrigerant levels.

D: Give operating instructions to owner's operating personnel. Hours Given: _________ Hours

E: Call your Carrier factory representative to report chiller start-up.

SIGNATURES:

CARRIER
TECHNICIAN ____DATE ______________

CUSTOMER
REPRESENTATIVE ____DATE ______________

19XR PIC 5 SET POINT TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	VALUE
Cooling ECW set point	15.0 to 120.0	°F	
Cooling LCW set point	10.0 to 120.0	°F	
Heating ECDW set point	63.0 to 150.0	°F	
Heating LCDW set point	63.0 to 150.0	°F	
Ice Build set point	15.0 to 60.0	°F	
Base Demand Limit	10.0 to 100.0	%	
EWT Control Option	DSABLE/ENABLE	—	

HMI Software Version Number: ____________________

HMI Controller Identification: BUS: ________________________ ADDRESS: ______________________________

19XR PIC 5 TIME SCHEDULE CONFIGURATION SHEET PERIOD 1

	DAY FLAG M	T	W	T	F	S	S	H	OCCUPIED TIME	UNOCCUPIED TIME
Period 1:										
Period 2:										
Period 3:										
Period 4:										
Period 5:										
Period 6:										
Period 7:										
Period 8:										

19XR PIC 5 TIME SCHEDULE CONFIGURATION SHEET PERIOD 2

	DAY FLAG M	T	W	T	F	S	S	H	OCCUPIED TIME	UNOCCUPIED TIME
Period 1:										
Period 2:										
Period 3:										
Period 4:										
Period 5:										
Period 6:										
Period 7:										
Period 8:										

19XR PIC 5 TIME SCHEDULE CONFIGURATION SHEET PERIOD 3

	DAY FLAG M	T	W	T	F	S	S	H	OCCUPIED TIME	UNOCCUPIED TIME
Period 1:										
Period 2:										
Period 3:										
Period 4:										
Period 5:										
Period 6:										
Period 7:										
Period 8:										

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19XR PIC 5 ISM CONFIGURATION TABLE (CONF_ISM) CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Communication Timeout	0 to 255	sec	10	
Starter Type **0 = Full Volt 1 = Reduced Volt** **2 = Solid State 3 = FS VFD**	0 to 3		0	
Single Cycle Dropout	DSABLE/ENABLE		DSABLE	
Motor Rated Load Amps	10 to 5000	amps	200	
Motor Rated Kilowatts	1000 to 8000	kW	1500	
Motor Locked Rotor Trip	100 to 65535	amps	1000	
Locked Rotor Start Delay	1 to 10	cycles	5	
Starter LRA Rating	100 to 65535	amps	2000	
Motor Rated Line Voltage	200 to 13800	volts	460	
Current Imbal Threshold	5 to 100	%	15	
Voltage Imbal Threshold	1 to 10	%	5	
Motor Current CT Ratio:1	3 to 1000		100	
Volt Transformer Ratio:1	1 to 115		1	
Current Imbal Persist	1 to 10	sec	5	
Voltage Imbal Persist	1 to 10	sec	5	
Line Frequency Faulting	DSABLE/ENABLE		DSABLE	
Frequency (NO = 50 Hz, YES = 60 Hz)	NO/YES		NO	
Ground Fault Protection	DSABLE/ENABLE		ENABLE	
Ground Fault Current	1 to 25	amps	15	
Ground Fault Persistence	1 to 10	cycles	5	
Ground Fault Start Delay	1 to 20	cycles	10	
Ground Fault CT Ratio:1	150 to 150		150	
Overvoltage Threshold	105 to 115	%	115	
Undervoltage Threshold	85 to 95	%	85	
Over Under Volt Persist	1 to 10	sec	5	
Under Volt Start Delay	1 to 4	sec	1	

19XR PIC 5 OPTION CONFIGURATION TABLE (CONF_OPT) CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Auto Restart Option	DSABLE/ENABLE		DSABLE	
Common Sensor Option	DSABLE/ENABLE		DSABLE	
Water Pressure Option	DSABLE/ENABLE		DSABLE	
EC Valve Option **0 = No, 1 = Cont** **2 = On/Off, 3 = 4-20 mA**	0 to 3		0	
EC Selection **0 = Disable, 1 = Surge** **2 = Low Load, 3 = Comb**	0 to 3		0	
ECV Open IGV1 Position	0.5 to 10	%	5.0	
ECV Close IGV1 Position	1.5 to 20	%	10.0	
ECV Off DT for Low Load	0.5 to 10.0	^F	4.0	
ECV On DT for Low Load	0.5 to 10.0	^F	2.0	
ECV Low Load DB	0.5 to 2.0	^F	1.0	
Head Pres Valve Option	DSABLE/ENABLE		DSABLE	
Head Pres Delta P 0%	20.0 to 85.0	psig	25.0	
Head Pres Delta P 100%	20.0 to 85.0	psig	50.0	
Head Pressure Min Output	0.0 to 100.0	%	0.0	
Ice Build Option	DSABLE/ENABLE		DSABLE	
Ice Build Recycle	DSABLE/ENABLE		DSABLE	
Ice Build Termin Source **0 = Temp, 1 = Contact, 2 = Both**	0 to 2		0	
Tower Fan High set point	55 to 105		75	
Refrigerant Leak Option	DSABLE/ENABLE		DSABLE	
Refrig Leakage Alarm mA	4 to 20	mA	20	
Oil EXV Option	DSABLE/ENABLE		DSABLE	
Oil Temp High Threshold	100 to 140	°F	120	
Oil Temp Low Threshold	90 to 130	°F	110	
Gas Torque Factor	0.25 to 3.0	°F	1	
Guide Vane/SRD Factor	0.7 to 1.20		0.95	
Power Recovery Timeout	0 to 60	min	15	
Evap Liquid Temp Opt	DSABLE/ENABLE		ENABLE	
Evap App Calc Selection **Sat Temp = 0, Ref Temp = 1**	0/1		1	
Condenser Flush Alert	DSABLE/ENABLE		DSABLE	
Customer Alert Option	DSABLE/ENABLE		DSABLE	
Water Flow Measurement **0 = No, 1 = Digital, 2 = Analog**	0-2		0	
Water Flow at 4 mA	0-200	GPS	0.00	
Water Flow at 20mA	0-200	GPS	0.00	
Evap Flow Rate Baseline	0-150	GPS	0.00	
Evap Pres Drop Baseline	0-20	PSI	0.00	
Cond Flow Rate Baseline	0-150	PSI	0.00	
Cond Pres Drop Baseline	0-20	PSI	0.00	
Water Pres Drop @ 20mA	0-40	PSI	10.00	
Vapor Source SV Delay	0-10	min	5.0	
Max Oil Pressure Diff	35-60	PSI	50	
Oil Pump VFD Max Step	0-10	%	7	
Vapor Source SV Delay	0-10	min	5	
Vapor Source SV Option	DSABLE/ENABLE		DSABLE	

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19XR PIC 5 SRD TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Diffuser Option	DSABLE/ENABLE		DSABLE	
SRD IGV Offset Select	1 to 5		3	
Low Lift Profile Select	1 to 5		3	
Diffuser Full Span mA	15.0 to 22.0	mA	18.0	
GV 1 Pos @ 25% Load	0.0 to 83.0	%	6.4	
GV 1 Pos @ 50% Load	0.0 to 83.0	%	22.9	
GV 1 Pos @ 75% Load	0.0 to 83.0	%	41.3	
SRD POS @ 25% Load	0.0 to 100.0	%	73.5	
SRD POS @ 50% Load	0.0 to 100.0	%	35.1	
SRD POS @ 75% Load	0.0 to 100.0	%	19.5	
High Lift @ 100% Load	0.0 to 100.0	^F	67.5	
High Lift @ 25% Load	0.0 to 100.0	^F	52.4	
Low Lift @ 25% Load	0.0 to 100.0	^F	27.2	
Peak Detection Threshold	0.0000 to 5.0000	Volts	0.0000	

19XR PIC 5 PROTECTIVE LIMIT TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Evap Approach Alert	0.5 to 15.0	^F	5.0	
Cond Approach Alert	0.5 to 15.0	^F	6.0	
Cond Press Override Low	90.0 to 157.0	psi	140.0	
Cond Press Override High	200.0 to 265.0	psi	250.0	
Cond Press Cutout Low	160.0 to 165.0	°F	160.0	
Cond Press Cutout High	270.0 to 275.0	°F	275.0	
Evap Override Delta T	2.0 to 5.0	^F	3.0	
Evap Refrig Trippoint	0.0 to 40.0	°F	33.0	
High Evap Press Override	90 to 157	psig	140	
High Evap Press Cutout	160 to 170	°F	165	
Condenser Freeze Point	–20.0 to 35.0	°F	34.0	
Comp Discharge Alert	125.0 to 200.0	°F	200.0	
Comp Motor Temp Override	150.0 to 200.0	°F	200.0	
Comp Bearing Temp Alert	155.0 to 175.0	°F	175.0	
Comp Bearing Temp Trip	175.0 to 185.0	°F	185.0	
Comp Bearing Alert XR6/7	185.0 to 210.0	°F	210.0	
Comp Bearing Trip XR6/7	210.0 to 220.0	°F	220.0	
Minimum Brine LWT	10.0 to 34.0	°F	34.0	
Heating LWT Protect Set	41.0 to 50.0	°F	42.8	
Evap Flow Delta P Cutout	0.5 to 50.0	psi	5.0	
Cond Flow Delta P Cutout	0.5 to 50.0	psi	5.0	
Cond Hi Flow DP Limit	0.5 to 50.0	psi	50.0	
Cond Hi Flow Alarm	DSABLE/ENABLE		DSABLE	

19XR PIC 5 SERVICE PARAMETERS TABLE CONFIGURATION SHEET

DESCRIPTION	STATUS	UNITS	DEFAULT	VALUE
Service Password	0 to 65535		2222	
Atmospheric Pressure	8 to 15	psi	14.5	
GV1 Travel Limit	30 to 100	%	80	
GV1 Closure at Startup	0 to 40	%	4	
Controlled Fluid DB	0.5 to 2.0	^F	1	
Derivative EWT Gain	1.0 to 3.0		2.0	
Proportional Dec Band	2.0 to 10.0		6	
Proportional Inc Band	2.0 to 10.0		6.5	
Maximum GV Movement	2 to 4	%	2	
Demand Limit At 20 mA	10 to 100	%	40	
Demand Limit Prop Band	3.0 to 15.0	%	10.0	
Amps or KW Ramp per Min.	5.0 to 20.0		10.0	
Temp Ramp Rate per Min.	1 to 10	^F	3	
Recycle Shutdown Delta T	0.5 to 4.0	°F	1	
Recycle Restart Delta T	2.0 to 10.0	°F	5.0	
Damper Valve Act Delay	0 to 20	min	5	
Damper Valve Close DB	2.0 to 10.0	^psi	5.0	
Damper Valve Open DB	10.0 to 20.0	^psi	13.0	
Damper Action Delta T	4.0 to 10.0	^F	7.0	
Oil Press Verify Time	15 to 300	sec	40	
Soft Stop Amps Threshold	40 to 100	%	70	
Water Flow Verify Time	0.5 to 5.0	min	5.0	
Power Calibration Factor	0.900 to 1.000		0.97	
Enable Excessive Starts	NO/YES		NO	
Oil Stir Cycle (19XR6/7) 0 = No stir, 1 = 30s/30m 2 = 1m/4hr, 3 = Comb 0&1				

19XR PIC 5 GEN_CONF TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
User Password	1 to 9999		1111	
Stop to Start Delay	1 to 15	min	2	
Start to Start Delay	4 to 45	min	15	
Demand Limit Type 0 = Base Demand 1 = 4 to 20 mA	0 to 1		0	
Pulldown Ramp Type 0 = Temp 1 = Load	0 to 1		1	
Demand Limit Source 0 = Amps 1 = KW	0 to 1		0	

19XR PIC 5 RESETCFG TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Temp Reset Type 0 = No 1 = 4 to 20 mA 2 = Remote Temp 3 = Water DT	0 to 3		0	
Degrees Reset At 20 mA	–30.0 to 30.0	^F	10.0	
Maximum Deg Temp Reset	–30.0 to 30.0	^F	10.0	
Remote Temp Full Reset	–40.0 to 245.0	°F	65.0	
Remote Temp No Reset	–40.0 to 245.0	°F	85.0	
Deg Reset Water DT Full	–30.0 to 30.0	^F	10.0	
Controlled DT Full Reset	0.0 to 15.0	^F	0.0	
Controlled DT No Reset	0.0 to 15.0	^F	10.0	

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19XR PIC 5 CONF_MS MASTER SLAVE TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Slave Address	1 to 236		2	
Master/Slave Select **0 = Disable** **1 = Master** **2 = Slave**	0 to 2		0	
Chiller Connection Type **0 = Parallel** **1 = Series**	0 to 1		0	
Middle Sensor Option	YES/NO		YES	
Master Lead Lag Select	0 to 1		0	
Series Counter Flow	NO/YES		NO	
Master per Capacity	25 to 75	%	50	
Lag Shutdown Threshold	25 to 75	%	50	
Prestart Fault Timer	2 to 30	min	5	
Lead Unload Threshold	50 to 100	%	100	
Lead/Lag Balance Delta	40 to 400	hr	168	
Lag Start Timer	2 to 30	min	10	
Lag Stop Timer	2 to 30	min	10	
Lead Pulldown Time	0 to 60	min	0	
Lag Minimum Running Time	0 to 150	min	0	
Lag Run Delta T	0 to 10.0	^F	3.0	
Lag Off Delta T	0 to 10.0	^F	1.8	

19XR PIC 5 CONF_PROG PROGNOSTICS CONFIG TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Prog Function Enable	NO/YES		NO	
Oil Change Done	NO/YES		YES	
Oil Filter Change Done	NO/YES		YES	
Trans Calibration Done	NO/YES		YES	
Refrigerant Charge Done	NO/YES		YES	
Oil Filter PD Threshold	–6.7 to 420.0	psi	10	
Oil Lub Expire Time	1000.0 to 8000.0	hr	2000	
Oil Storage Expire Time	5000.0 to 15,000.0	hr	8640	
Trans Calib Threshold	0.0 to 5.0	psi	2	
Low Charge Cond Approach	20.0 to 40.0	^F	20	
Evap Design Approach	0.0 to 10.0	^F	3	
Bearing Degradation	100 to 230	°F	200	

19XR PIC 5 CONNECT CONFIG TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Call Home Configuration				
Call Home Option	DSABLE/ENABLE		Dsable	
Call Home IP Addr Part 1	0-255		140	
Call Home IP Addr Part 2	0-255		206	
Call Home IP Addr Part 3	0-255		129	
Call Home IP Addr Part 4	0-255		10	
Modbus Configuration				
Modbus Option	DSABLE/ENABLE		Dsable	
Modbus Server Type **0 = IP, 1 = RS485**	0/1		1	
Modbus Server UID	1-255		1	
Modbus Metric Unit	No/Yes		Yes	
Modbus IP Port Number	0-1024		502	
Modbus RS485 Config Parity Option **0 = No Parity, 1 = Odd Parity** **2 = Even Parity, 3 = Force Parity Low** **4 = Force Parity High** **5 = Multi Drop parity**	0-5		0	
Stop Bit Number **0 = 1 Bit, 1 = 2 Bits**	0-1		0	
Modbus RS485 Baudrate	9600-38400		9600	
BACnet Configuration				
BACnet Enable	DSABLE/ENABLE		ENABLE	
BACnet Metric Unit	NO/YES		YES	
BACnet Network	1 to 999		1601	
BACnet Identifier	0 to 9999999		1600001	

19XR PIC 5 CFGSURGE SURGE CORRECTION CONFIG TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Surge Line Configuration **0 = PR** **1 = Delta T**	0 to 1		0	
IGV1 Pos Configuration **0 = Degree** **1 = Percentage**	0 to 1		0	
Surge Delta Tsmax	0 to 150	^F	70	
Surge Delta Tsmin	0 to 150	^F	45	
PR at Full Load Opening	1 to 5		3.0	
PR at Min Load Opening	1 to 5		1.5	
IGV1 Full Load Open Deg	80 to 120	degrees	88	
Sound Ctrl IGV1 Open Deg	10 to 40	degrees	27	
IGV1 Minimum Open Deg	0 to 10	degrees	2	
IGV1 Maximum Open Deg	90 to 120	degrees	109	
IGV1 Minimum Position	0 to 100	%	5	
IGV1 Full Load Position	0 to 100	%	100	
Envelop Line Offset	1 to 3	^F	2	
Envelop Lower Deadband	0.5 to 3	^F	1.5	
Envelop Upper Deadband	0.1 to 3	^F	1.5	
Surge Line Shape Factor	–1 to 0		–0.010	
Sound Line Shape Factor	0 to 1		0.010	
Envelop Speed Factor	0 to 2		2.0	
Surge Delay Time	0 to 120	sec	15	
Surge Time Period	7 to 10	min	8	
Surge Delta Amps %	5 to 40	%	20	
GV1 Close Step Surge	1 to 3	%	2	
VFD Speed Step Surge	1 to 5	%	3	
EC Valve Step Surge	1.0 to 10.0	%	4.0	
Surge Profile Offset	0.0 to 5.0	^F	0.0	
High Efficiency Mode	DSABLE/ENABLE		ENABLE	
High Noise Alert	DSABLE/ENABLE		DSABLE	

19XR PIC 5 CTRL_ID CONTROL IDENTIFICATION TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
CCN Element Number	0 to 239		1	
CCN Bus Number	0 to 239		0	
CCN Baud Rate	9600, 19200, 38400		9600	
Device Description — 19XRPIC5				
Location Description (User-defined 24-digit character string)				
Software Part Number: SCG-SR-2-M200300330				
Serial Number = 1				

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

DISPLAY AND ALARM SHUTDOWN STATE RECORD SHEET

PRIMARY MESSAGE: ______________________ DATE: __________ TIME: __________

SECONDARY MESSAGE: ______________________ COMPRESSOR ONTIME: __________

CHW IN	CHW OUT	EVAP REF
CDW IN	**CDW OUT**	**COND REF**
OILPRESS	**OIL TEMP**	**AMPS %**

COMMUNICATION MESSAGE ______________________________

DISPLAY AND ALARM SHUTDOWN STATE RECORD SHEET

PRIMARY MESSAGE: ______________________ DATE: __________ TIME: __________

SECONDARY MESSAGE: ______________________ COMPRESSOR ONTIME: __________

CHW IN	CHW OUT	EVAP REF
CDW IN	**CDW OUT**	**COND REF**
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COMMUNICATION MESSAGE ______________________________

CUT ALONG DOTTED LINE

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