**AquaEdge® 19XR**
**Single Stage and Two-Stage Semi-Hermetic Centrifugal Liquid Chillers with PIC 6 Controls and R-134a/R-513A**
**50/60 Hz**

# Start-Up, Operation, and Maintenance Instructions

## CONTENTS

## 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.

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.

**⚠ WARNING**

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.

**⚠ CAUTION**

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 Controls Operation and Troubleshooting manual that describes PIC 6 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**

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 and if required follow Carrier Long Term Storage guidelines. 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**

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 6 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**

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 6** | — | Product Integrated Controls 6 |
| **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. 1-5)

### Chiller Information Nameplate

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

### System Components

The components include cooler and condenser heat exchangers in separate vessels, motor-compressor, lubrication package, control panel/HMI, power panel, economizer, and motor starter or VFD.

### 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 compressor frames 2, 3, 4, and 5 are single-stage compressors with one impeller. Frame C, E, 6, and 7 are two-stage compressors with two impellers.

### Control Panel

The control panel includes the Carrier PIC 6 HMI touchscreen. It allows 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 preinstalled at factory, including English, Chinese, Korean, Italian, Japanese, French, and German.

## Power Panel (19XR2-E)

The power panel contains oil heater and oil pump contactors, as well as the envelope control/HGBP relay if specified. The power panel also contains transformers T1/T2 for 24 VAC control power, as well as the low voltage starter interlock and communication terminals.

## Power Panel (19XR6/7)

The control panel contains both power components for heaters, oil pump and electrical actuators as well as low voltage control components. They are separated by a barrier.

## Economizer (if available)

This chamber reduces the refrigerant pressure to an intermediate level between the cooler and condenser vessels. In the economizer, vapor is separated from 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/Factory-Mounted Starter or VFD

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

## Storage Vessel (Optional)

There are 2 sizes of storage vessels available. The vessels have double relief valves, a magnetically-coupled dial-type refrigerant level gage, a 1 in. FPT drain valve, and a 1/2-in. male flare vapor connection for the pumpout unit.

NOTE: If a storage vessel is not used at the jobsite, factory installed isolation valves on the chiller may be used to isolate the chiller charge in either the cooler or condenser. An optional pumpout system is used to transfer refrigerant from vessel to vessel.

**19XR– 52 51 3 8 H UG T* 64 –**

**Description**
**19XR** — High Efficiency Semi-Hermetic Centrifugal Liquid Chiller
**19XRV** — High Efficiency Semi-Hermetic Centrifugal Liquid Chiller with Unit-Mounted VFD

**Evaporator Size†**
10-12 (Frame 1)
15-17 (Frame 1)
20-22 (Frame 2)
30-32 (Frame 3)
35-37 (Frame 3)
40-42 (Frame 4)
45-47 (Frame 4)
50-54 (Frame 5)
5A-5C (Frame 5)**
55-59 (Frame 5)
5F-5H (Frame 5)**
5K-5R (Frame 5)††
5T-5Z (Frame 5)††
60-64 (Frame 6)
6K-6R (Frame 6)††
65-69 (Frame 6)
6T-6Z (Frame 6)††
70-74 (Frame 7)
7K-7R (Frame 7)††
75-79 (Frame 7)
7T-7Z (Frame 7)††
80-84 (Frame 8)
8K-8R (Frame 8)††
85-89 (Frame 8)
8T-8Z (Frame 8)††

**Condenser Size†**
10-12 (Frame 1)
15-17 (Frame 1)
20-22 (Frame 2)
30-32 (Frame 3)
35-37 (Frame 3)
40-42 (Frame 4)
45-47 (Frame 4)
50-54 (Frame 5)
55-59 (Frame 5)
60-64 (Frame 6)
65-69 (Frame 6)
70-74 (Frame 7)
75-79 (Frame 7)
80-84 (Frame 8)
85-89 (Frame 8)

**Compressor Frame**
**2, 3, 4, 5** — Single-Stage
**C, E** — Two-Stage

**Impeller Shroud**

**Impeller Diameter**

**Motor Code*****

**Motor Efficiency Code**
Compressor Frame 2, 3, 4, 5
**H** — High Efficiency
**S** — Standard Efficiency

**Gear Code**
Compressor Frame C
**C,E,G,J,M,P** — Gear Ratio

Compressor Frame E
**A,B,C,D,E**— A-E Gear Ratio

Compressor Frame 3, **U** Motor
**R,S,T,U,V,W**— R-W Gear Ratio

**Motor Voltage Code**

| Code | Volts-Phase-Hertz |
|---|---|
| **60** | 200-3-60 |
| **61** | 230-3-60 |
| **62** | 380-3-60 |
| **63** | 416-3-60 |
| **64** | 460-3-60 |
| **65** | 575-3-60 |
| **66** | 2400-3-60 |
| **67** | 3300-3-60 |
| **68** | 4160-3-60 |
| **69** | 6900-3-60 |
| **50** | 230-3-50 |
| **52** | 400-3-50 |
| **53** | 3000-3-50 |
| **54** | 3300-3-50 |
| **55** | 6300-3-50 |
| **5A** | 10000-3-50 |
| **5B** | 11000-3-50 |
| **6A** | 11000-3-60 |
| **6B** | 11000-3-60 |
| **6C** | 13800-3-60 |

**Special Order Indicator**
**–** — Standard
**S** — Special Order

* Digit 15 will refer to the Gear Code for the following models:
1. Digit 10 (Compressor Frame) is C or E.
2. Digit 10 (Compressor Frame) is 3 *and* Digit 13 of the Motor Code is U.

† Frame sizes 1 through 6 available on single-stage units only.
** Refer to 19XR,XRV Computer Selection Program for details on these sizes.
†† Frame sizes with K-R and T-Z are with 1-in. OD evaporator tubing.
*** Refer to the 19XR,XRV Computer Selection Program for motor size details.

**Fig. 1 — 19XR,XRV Single-stage Compressor and Two-stage Compressor Frame Size C and E**

**19XR– A45 A47 636 M N 7 –**

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

**Evaporator 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 (19XR6 only)
**4** — 3000-3-50
**5** — 3300-3-50
**6** — 6300-3-50
**7** — 10000-3-50
**8** — 11000-3-50
**A** — 380-3-60 (19XR6 only)
**C** — 460-3-60 (19XR6 only)
**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
5 (Frame 7 Only)
***Impeller Diameter (14th Digit)***
2
4
6
8
0

**SERIAL NUMBER BREAKDOWN**

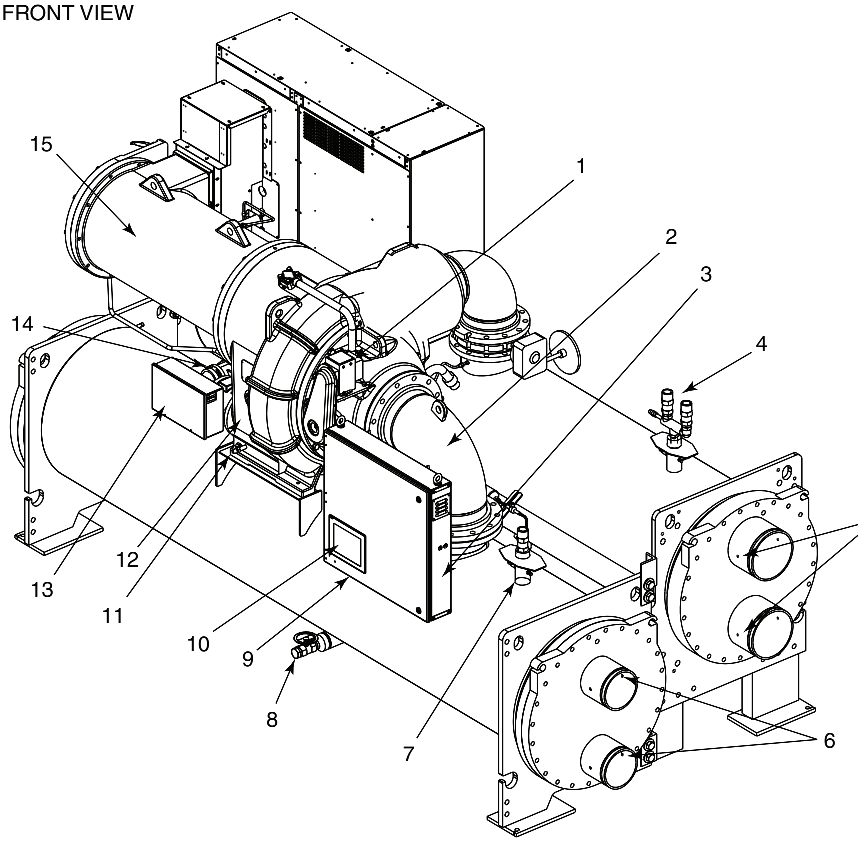
**27 18 Q 19843**

**Week of Year** — 27
**Year of Manufacture** — 18
**Place of Manufacture** — Q
**Unique Number** — 19843

* Frame sizes with A-C and F-H are with 1-in. OD tubing.
†Heat exchanger available with frame 7 compressor only.

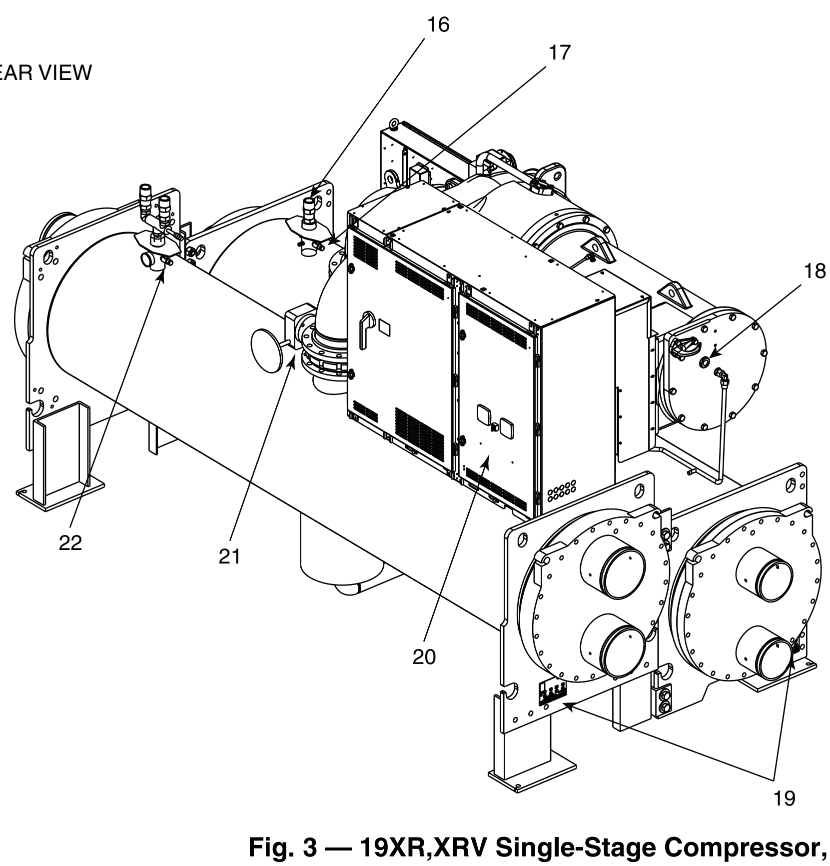
**Fig. 2 — 19XR Two-Stage Compressor Frame Size 6 and 7**

FRONT VIEW




LEGEND
**1** — Guide Vane Actuator
**2** — Suction Elbow
**3** — Chiller Identification Nameplate
**4** — Condenser Dual Relief Valves
**5** — Condenser In/Out Temperature Thermistors
**6** — Evaporator In/Out Temperature Thermistors
**7** — Evaporator Pressure Transducer
**8** — Refrigerant Storage Tank Connection
**9** — Control Panel
**10** — Carrier Controller HMI
**11** — Oil Drain/Charger Valve
**12** — Oil Level Sightglass
**13** — Power Panel
**14** — Refrigerant Oil Cooler (not shown)
**15** — Compressor Motor Housing

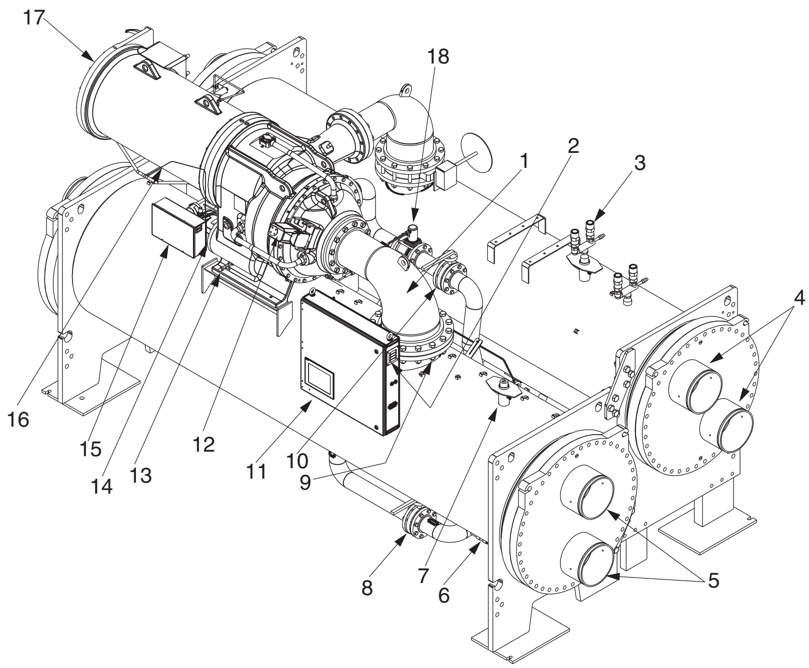
REAR VIEW




LEGEND
**16** — Evaporator Relief Valve
**17** — Refrigerant Charging Valve
**18** — Motor Sightglass
**19** — ASME Nameplates
**20** — Starter/VFD
**21** — Discharge Isolation Valve (Optional)
**22** — Refrigerant Charging Valve/ Pump Out Connection

**Fig. 3 — 19XR,XRV Single-Stage Compressor, Frame Size 2, 3, 4, 5**

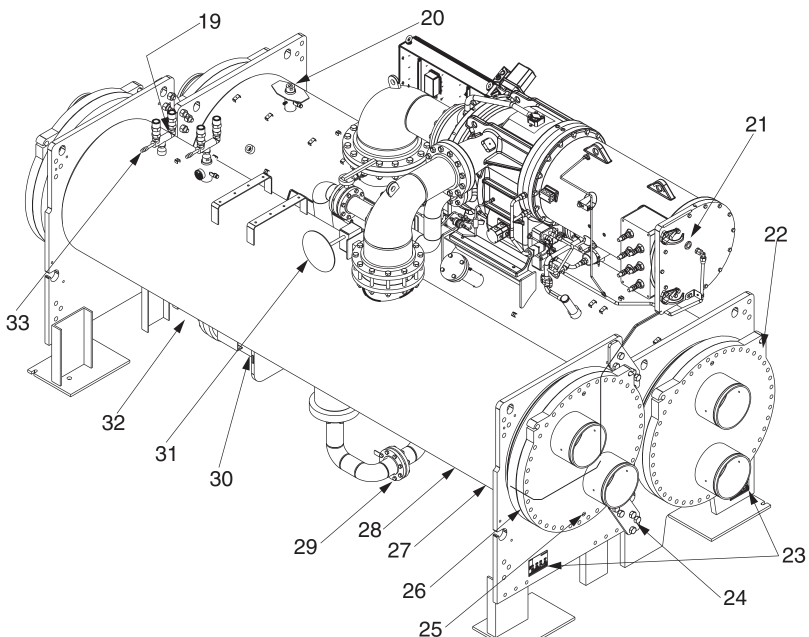
FRONT VIEW




LEGEND

**1** — Suction Elbow
**2** — Chiller Identification Nameplate
**3** — Condenser Auto Reset Relief Valves
**4** — Condenser In/Out Temperature Thermistors
**5** — Evaporator In/Out Temperature Thermistors
**6** — Refrigerant Storage Tank Connection Valve (barely visible)
**7** — Evaporator Pressure Transducer
**8** — Liquid Line Isolation Valve (optional)
**9** — Typical Flange Connection
**10** — Refrigerant Isolation Valve
**11** — Control Panel (PIC 6)
**12** — Guide Vane Actuator
**13** — Oil Level Sight Glasses
**14** — Oil Drain Charging Valve
**15** — Auxiliary Power Panel
**16** — Refrigerant Oil Evaporator (hidden)
**17** — Compressor Motor Housing
**18** — Damper Valve

REAR VIEW

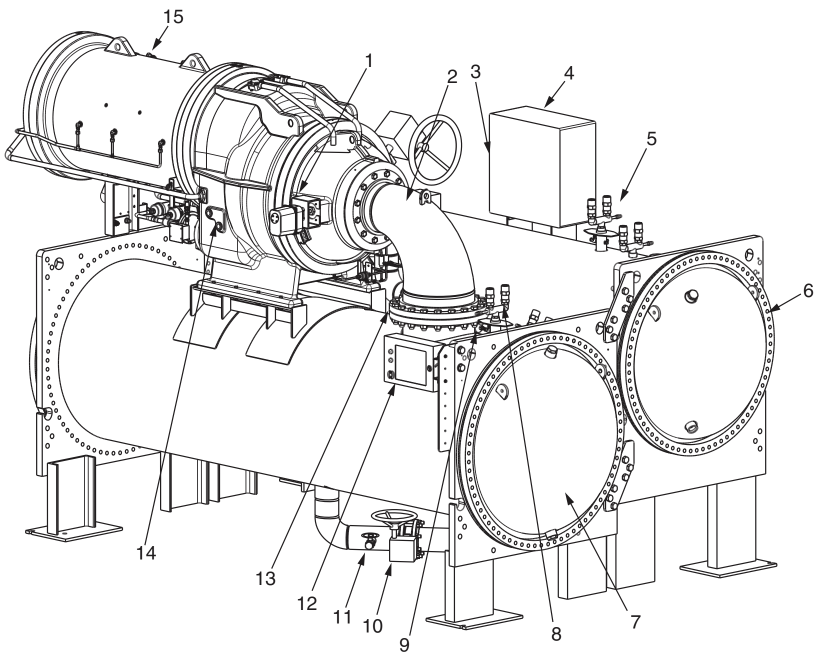



LEGEND

**19** — Refrigerant Charging Valve/Pumpout Connection
**20** — Evaporator Auto. Reset Relief Valves
**21** — Motor Sight Glass
**22** — Evaporator Waterbox Cover
**23** — ASME Nameplate
**24** — Vessel Take-Apart Connector
**25** — Typical Waterbox Drain Port
**26** — Condenser Waterbox Cover
**27** — Refrigerant Moisture/Flow Indicator (hidden)
**28** — Refrigerant Filter/Drier (hidden)
**29** — Linear Float Valve Chamber Orifice
**30** — Economizer Assembly
**31** — Discharge Isolation Valve (optional)
**32** — Economizer Float Ball Valve Assembly (far end of economizer assembly)
**33** — Condenser Pressure Transducer

**Fig. 4 — 19XR,XRV Two-Stage Compressor Frame Size C and E**

FRONT VIEW

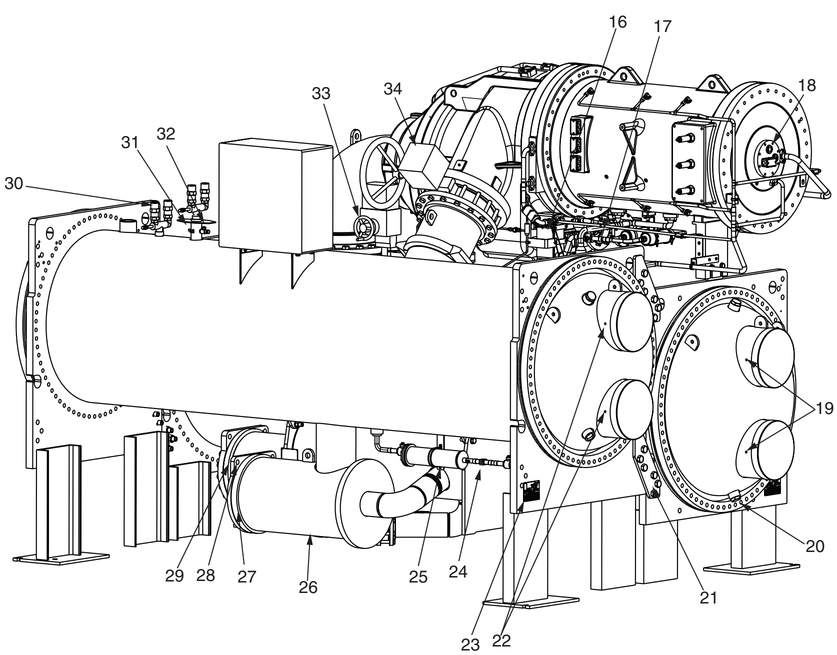



LEGEND

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

*See certified drawing for Frame 7 location.

REAR VIEW




LEGEND

**16** — Oil Evaporator
**17** — Oil Drain Changing Valve (Hidden)
**18** — Motor Sight Glass
**19** — Evaporator 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** — Evaporator Auto. Reset Relief Valve
**31** — Condenser Pressure Transducer
**32** — Refrigerant Charging Valve/Pumpout Connection
**33** — Damper Valve
**34** — Discharge Isolation Valve (Optional)

NOTE: Frame 6 is shown.

**Fig. 5 — 19XR Two-Stage Compressor Frame Sizes 6 and 7**

## REFRIGERATION CYCLE

The compressor continuously draws refrigerant vapor from the cooler at a rate set by the amount of guide vane opening and motor speed. 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 for 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 (Fig. 6 and 7). 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 re-condensed on the tubes which are cooled by entering condenser water. The liquid drains into a float valve chamber between the FLASC chamber and cooler. Here the AccuMeter™ float valve forms a liquid seal to keep FLASC chamber vapor from entering the cooler. When liquid refrigerant passes through the valve, some of it flashes to vapor in the reduced pressure on the cooler side. In flashing, it removes heat from the remaining liquid. The refrigerant is now at a temperature and pressure at which the cycle began. Refrigerant from the condenser also cools the oil and optional variable speed drive.

The refrigeration cycle for a 19XRV chiller with two-stage compressor is similar to the one described above, with the following exception: Liquid refrigerant from the condenser FLASC chamber linear float valve or orifice plate flows into an economizer at intermediate pressure (see Fig. 7). As liquid enters the chamber, due to the lower pressure in the economizer, some liquid flashes into a vapor and cools 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 raise the economizer pressure to permit proper refrigerant flow through the economizer valve during those conditions. The damper also is closed during start-up conditions to allow the second stage impeller to start unloaded.

The subcooled liquid remaining in the economizer flows through a float valve and then into the cooler.

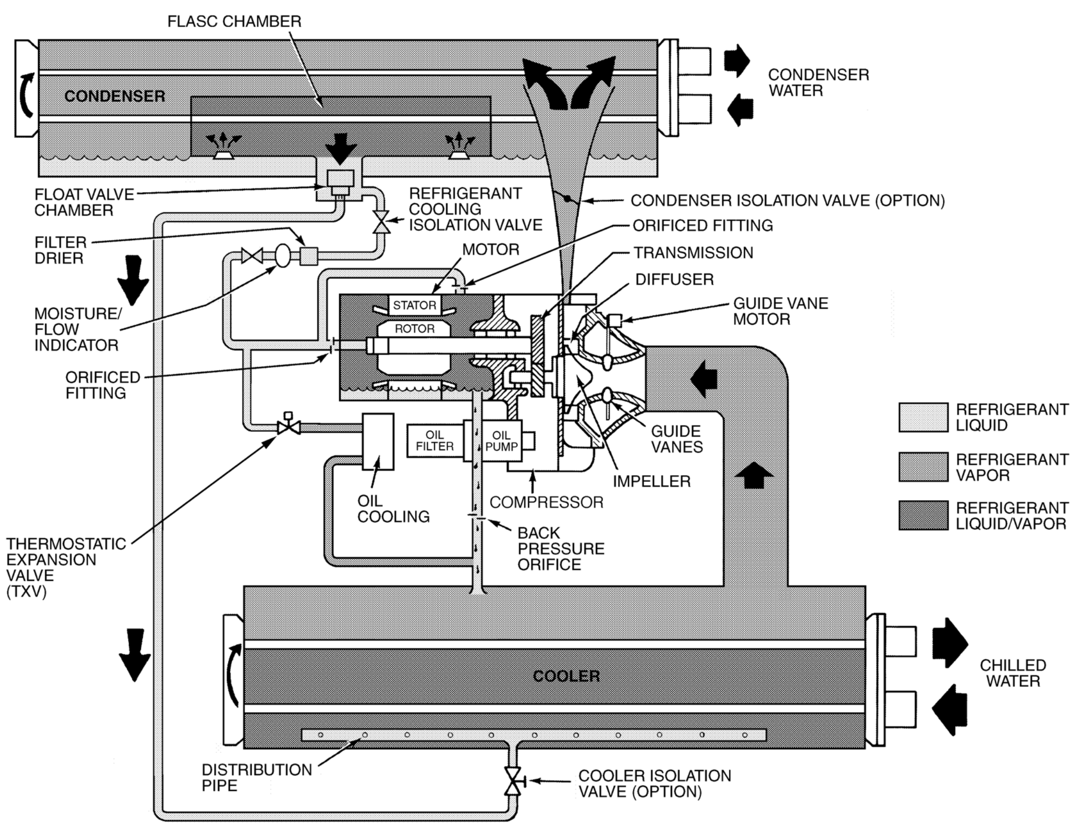



**Fig. 6 — Refrigeration Cycle — 19XR(V) Single-Stage Compressor**

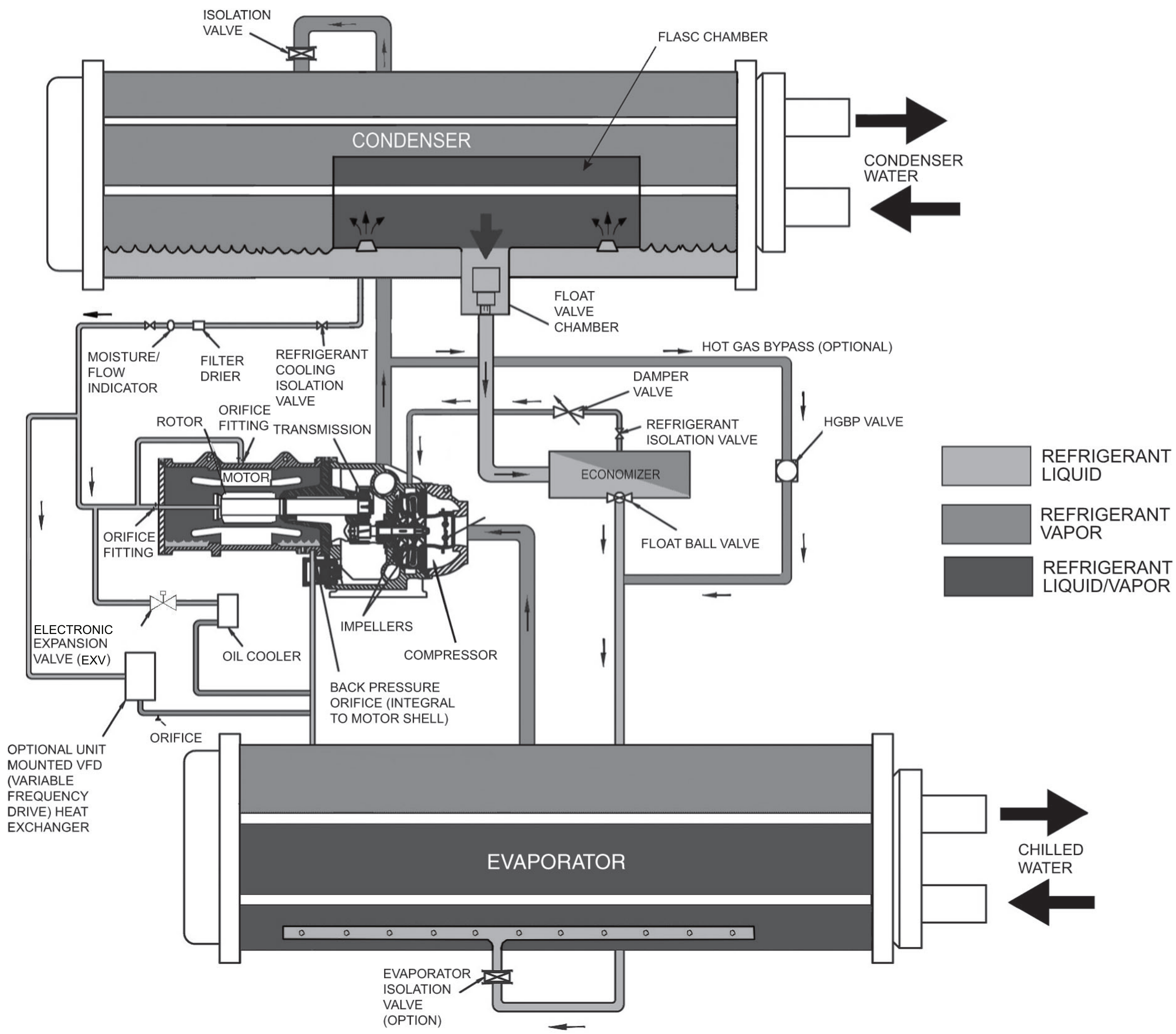



**Fig. 7 — Refrigeration Cycle — 19XR(V) Two-Stage Compressor**

## 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. 8 and 9). 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, consideration 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 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. 8), and control oil temperature to the bearings. The refrigerant leaving the oil cooler heat exchanger returns to the chiller cooler.

### VFD Cooling Cycle

If equipped with a refrigerant-cooled unit-mounted VFD, the refrigerant line that feeds the motor cooling and oil cooler also feeds the heat exchanger on the unit-mounted VFD. Refrigerant is metered through an orifice as refrigerant is leaving the VFD heat exchanger. The refrigerant leaving the heat exchanger returns to the cooler. Alternatively, if equipped with an air-cooled unit-mounted VFD the cooling of the VFD is integral to the VFD by means of cooling with ambient air.

## 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. 8 and 9).

### 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 165°F (52 and 74°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.

Ramp loading can be adjusted to help to slow the rate of guide vane opening to minimize oil foaming at start-up. If the guide vanes open quickly, the sudden drop in suction pressure can cause any refrigerant in the oil to flash. The resulting oil foam cannot be pumped efficiently; therefore, oil pressure falls off and lubrication is poor. If oil pressure falls below 15 psid (103 kPad) differential, the controls will shut down the compressor.

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. 10 and 11.

### Bearings

The 19XR compressor assemblies include a combination of radial and thrust bearings. The low speed shaft assembly is supported by two journal bearings. For 19XR2-E the bearings are located between the motor rotor and the bull gear — overhung rotor design. The 19XR6-7 is fully supported with 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.

For Frame 2 19XR compressors the high speed shaft assembly is supported by two journal bearings located at the transmission end and mid-span, behind the labyrinth seal. The transmission side of the midspan bearing also contains a tilting shoe type thrust bearing which opposes the main axial forces tending to pull the impeller towards the suction end. The impeller side face of the midspan bearing includes a babbitted thrust face, designed to handle counter-thrust forces.

For 19XR Frame 3, 4, 5, C, E, 6 and 7 compressors the high speed shaft assembly utilize rolling element bearings (radial and thrust).

Machines employing rolling element bearings can be expected to have higher oil pressure and thrust bearing temperatures than those compressors using journal bearing design.

### 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.

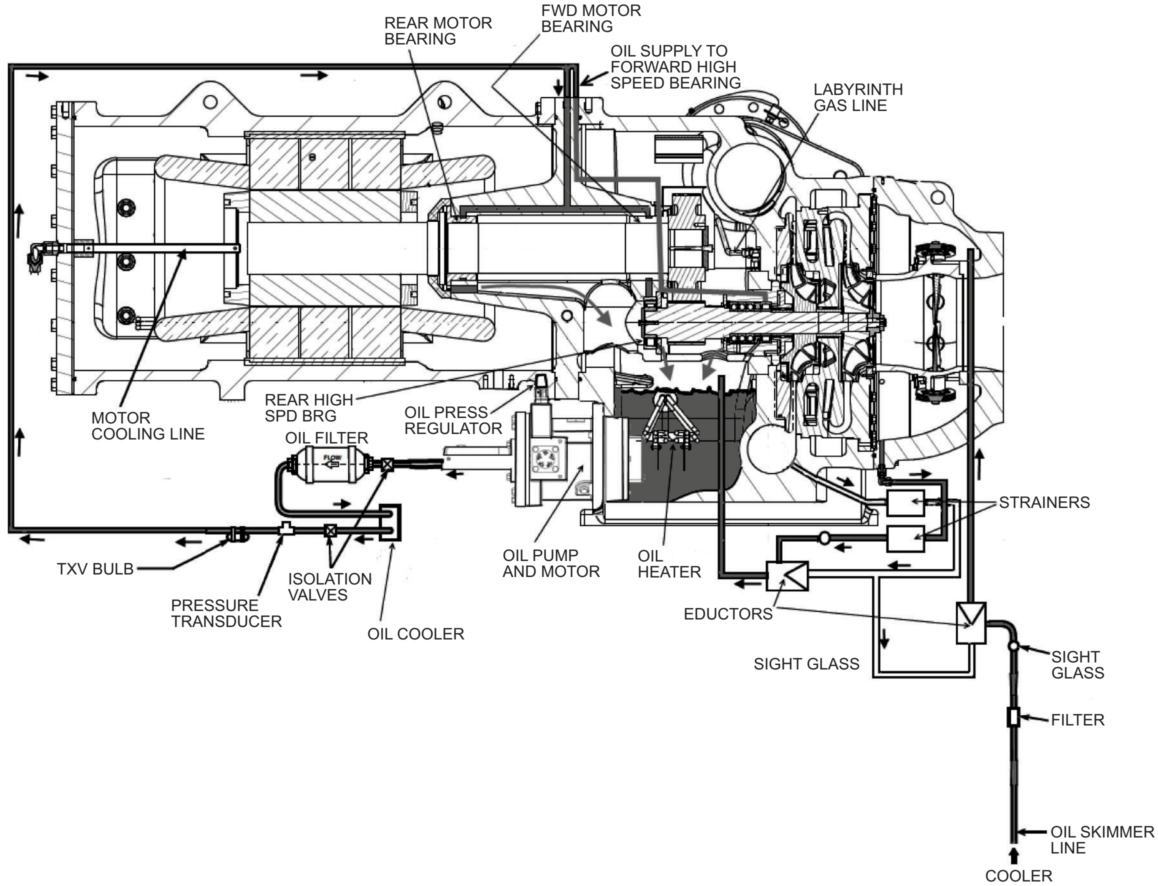



**Fig. 8 — 19XR2-E Compressor Lubrication System**

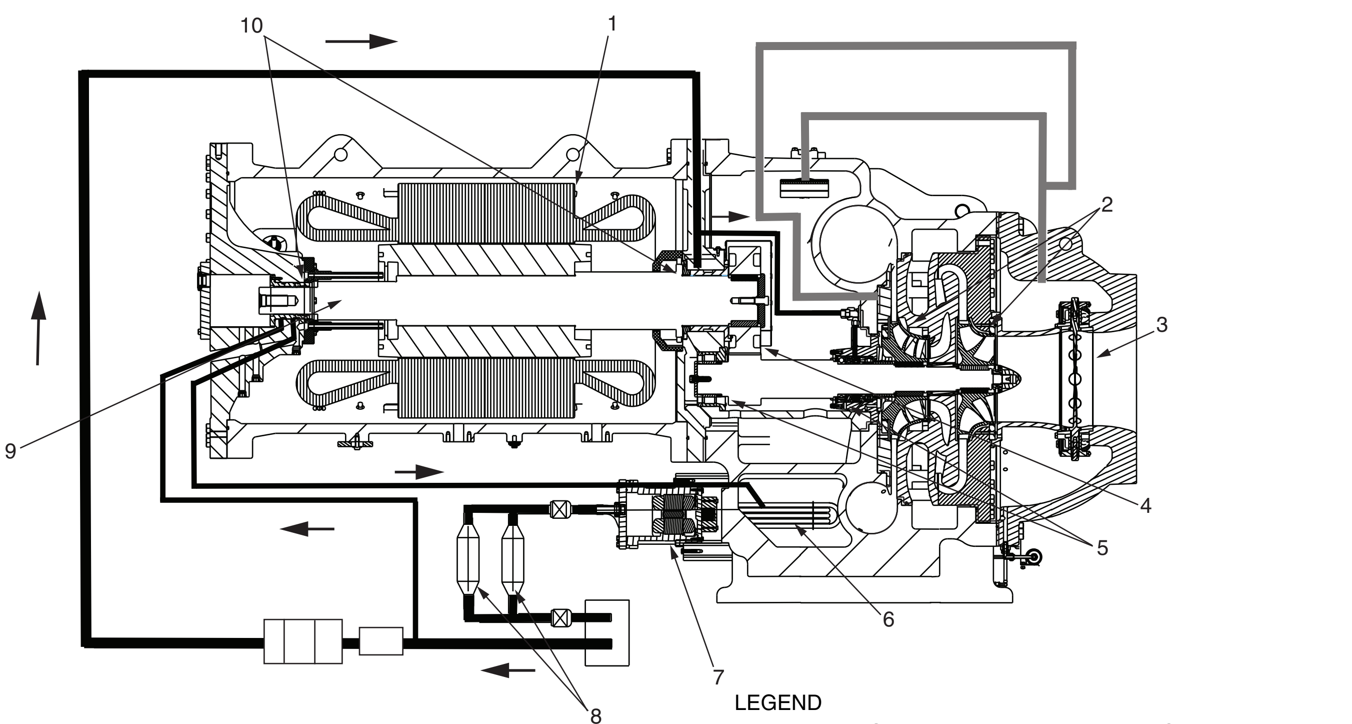
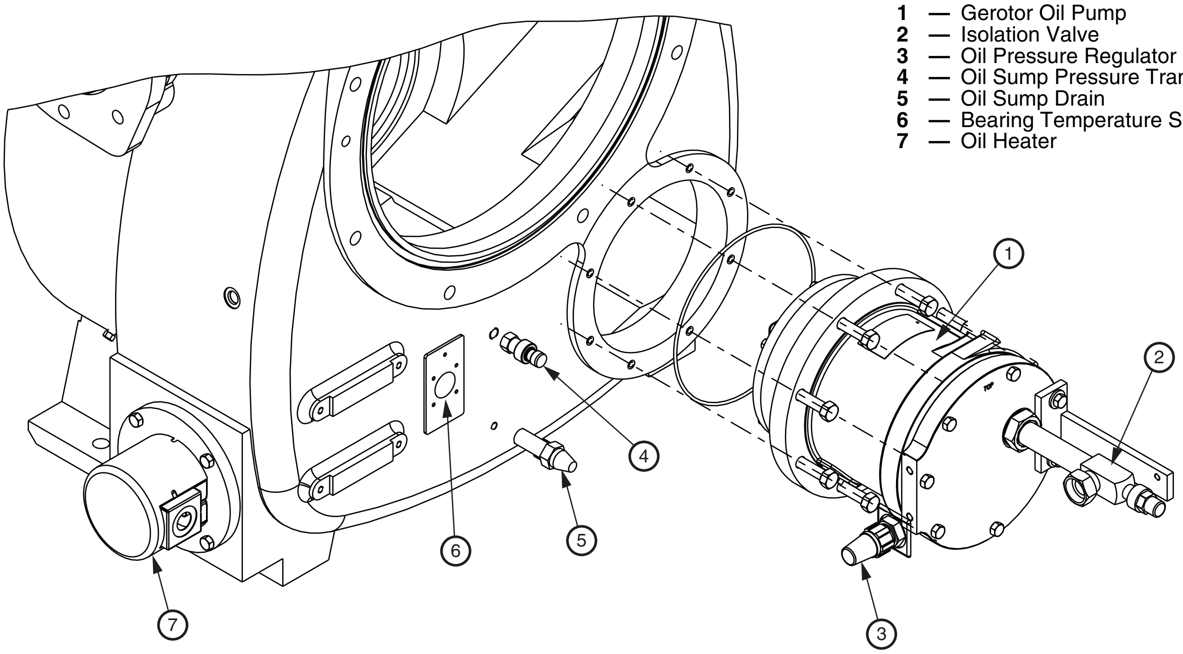


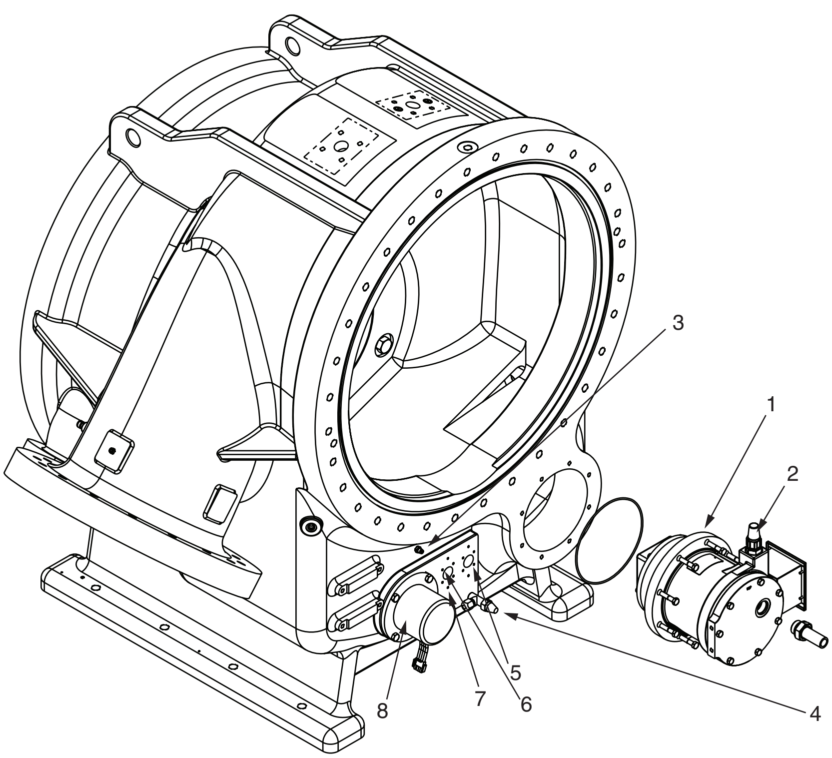

**Fig. 9 — 19XR6-7 Compressor Lubrication System**




LEGEND

**1** — Gerotor Oil Pump
**2** — Isolation Valve
**3** — Oil Pressure Regulator Valve
**4** — Oil Sump Pressure Transducer
**5** — Oil Sump Drain
**6** — Bearing Temperature Sensor Terminal Block
**7** — Oil Heater

**Fig. 10 — 19XR2-E Gerotor Oil Pump**




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. 11 — 19XR6-7 Gerotor Oil Pump**

## STARTING EQUIPMENT

The 19XR chiller requires a motor starter or VFD to operate the centrifugal hermetic compressor motor. The starter or VFD have communication wiring between itself and Carrier power panel (19XR2-E) or Carrier control panel (19XR6-7).

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

There may be multiple circuit breakers inside the starter. These include the main compressor motor circuit breaker, a circuit breaker which provides power to the chiller control panel, and a possible circuit breaker for starter specific controls. The control breaker(s) are 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. For 19XR2-E units it is typical that the starter provides control power and if specified 3-phase power to the oil pump (for medium/high voltage there is an option for a transformer). For 19XR6-7 it is typical that 3-phase power is field supplied to the Carrier control panel which powers oil-pump, heater and controls. Consult specific wiring diagrams for details.

**⚠ WARNING**

The main circuit breaker on the front of the starter/VFD 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.

### Unit-Mounted VFDs

The 19XR2-E starter options include a variable frequency drive motor controller mounted on the condenser. These unit-mounted VFDs are offered with low voltage motors between 380 and 575 vac. It reduces the starting current inrush by controlling the voltage and frequency to the compressor motor. Once the motor has accelerated to minimum speed, the PIC 6 modulates the compressor speed and guide vane position to control chilled water temperature.

Operational parameters and fault codes are displayed relative to the drive. Refer to specific drive literature along with troubleshooting sections (consult VFD nameplate on inside of door if uncertain of drive model). The display is also the interface for entering specific chiller operational parameters. These parameters have been preprogrammed at the factory. An adhesive-backed label on the inside of the drive has been provided for verification of the specific job parameters. See Initial Start-Up Checklist section for details.

NOTE: The factory offers a variety of unit-mounted VFDs. LiquiFlo2 is an active front end drive while PowerFlex 755, VLT HVAC FC-102, and PowerFlex 700L are 6-pulse passive rectifier drives. Consult Carrier Specification Z-420 and Z-417 respectively, along with drive-specific literature for details.

### Unit-Mounted Starters

The 19XR2-E chiller offers unit-mounted wye-delta and solid state starters. See Carrier Specification Z-415 for specific starter requirements.

Typically three separate circuit breakers are inside the starter. This includes (1) the main compressor motor circuit breaker, (2) a circuit breaker which provides power to chiller controls and the oil heater (provided at 115 vac), and (3) a circuit breaker which provides power at line voltage to the oil pump. The latter two are 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.

### Solid-State Starter

**⚠ WARNING**

The main circuit breaker on the front of the starter disconnects the main motor power only. Power is still energized for two other circuits. Two additional circuit breakers inside of the starter must be turned off to disconnect power to the oil pump, PIC 6 controls, and the oil heater. Failure to disconnect power will result in personal injury.

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 or wye-delta 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

### Wye-Delta Starter

The 19XR chiller may be equipped with a wye-delta starter mounted on the unit. This starter is used with low-voltage motors (under 600 v). It reduces the starting current inrush by connecting each phase of the motor windings into a wye configuration. This occurs during the starting period when the motor is accelerating up to speed. Once the motor is up to speed, the starter automatically connects the phase windings into a delta configuration. When connected in delta the currents through the motor windings is $1/\sqrt{(3)}$ (57.7%) of line current.

Additional information about current unit-mounted starters can be located as follows:

Benshaw MX$^3$ Low Voltage Solid-State Starter Manual - HVACPartners Form Number = 890003-06-01

Benshaw MX$^3$ Low Voltage Wye-Delta Starter Manual - HVACPartners Form Number = 890003-07-02

## Free-Standing Starters/VFDs

In addition to unit-mounted starters the 19XR product line offers free-standing starter types of Across the Line, Solid State, Auto-Transformer and VFD. 19XR6-7 are only offered with free-standing starters/VFDs. For free-standing starters/VFDs refer to job submittal drawings.

# 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. Additionally if a unit is equipped with VFD then the controller will control both compressor speed and guide vane for optimum efficiency at a particular load. 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 6 System Components

The chiller control system is called the PIC 6 (Product Integrated Control 6). See Table 1. As with previous PIC versions, the PIC 6 system controls the operation of the chiller by monitoring all operating conditions. The PIC 6 control system can diagnose a problem and let the operator know what the problem is and what to check. It positions the guide vanes to maintain leaving chilled water temperature. It interfaces with auxiliary equipment such as pumps and cooling tower fans to turn them on when required. It continually checks all safeties to prevent unsafe operating conditions. It also regulates the oil heater while the compressor is off and regulates the envelope control (HGBP) and any other automatic valves, if installed. The PIC 6 controls provide critical protection for the compressor motor and control the motor starter.

**Table 1 — Major PIC 6 Components and Panel Locations**

| PIC 6 COMPONENT | PANEL LOCATION |
|---|---|
| **Chiller Human Machine Interface (HMI) and Display** | HMI Control Panel |
| **Integrated Starter Module (ISM)** | Starter Cabinet |
| **Motor Starter Protection Module (e.g ISM, MX3 or drive control)** | Starter/VFD dependent |
| **Chiller IO Boards and Field Wiring Terminal Blocks** | Control Panel |
| **Oil Heater Contactor (1C)** | 19XR2-E; Power Panel<br>19XR6-7: Control Panel |
| **Oil Pump Contactor (2C)** | 19XR2-E; Power Panel<br>19XR6-7: Control Panel |
| **Hot Gas Bypass Relays (HCLR, HOPR) (Optional)** | 19XR2-E; Power Panel<br>19XR6-7: Control Panel |
| **Control Transformers (T1, T2, T3)** | 19XR2-E; Power Panel<br>19XR6-7: Control Panel |
| **Temperature Sensors** | See Fig. 12 and Fig. 13 |
| **Pressure Transducers** | See Fig. 12 and Fig. 13 |

NOTE: For detailed information about the PIC 6 HMI (human machine interface), see the 19XR with PIC 6 Controls Operation and Troubleshooting manual.

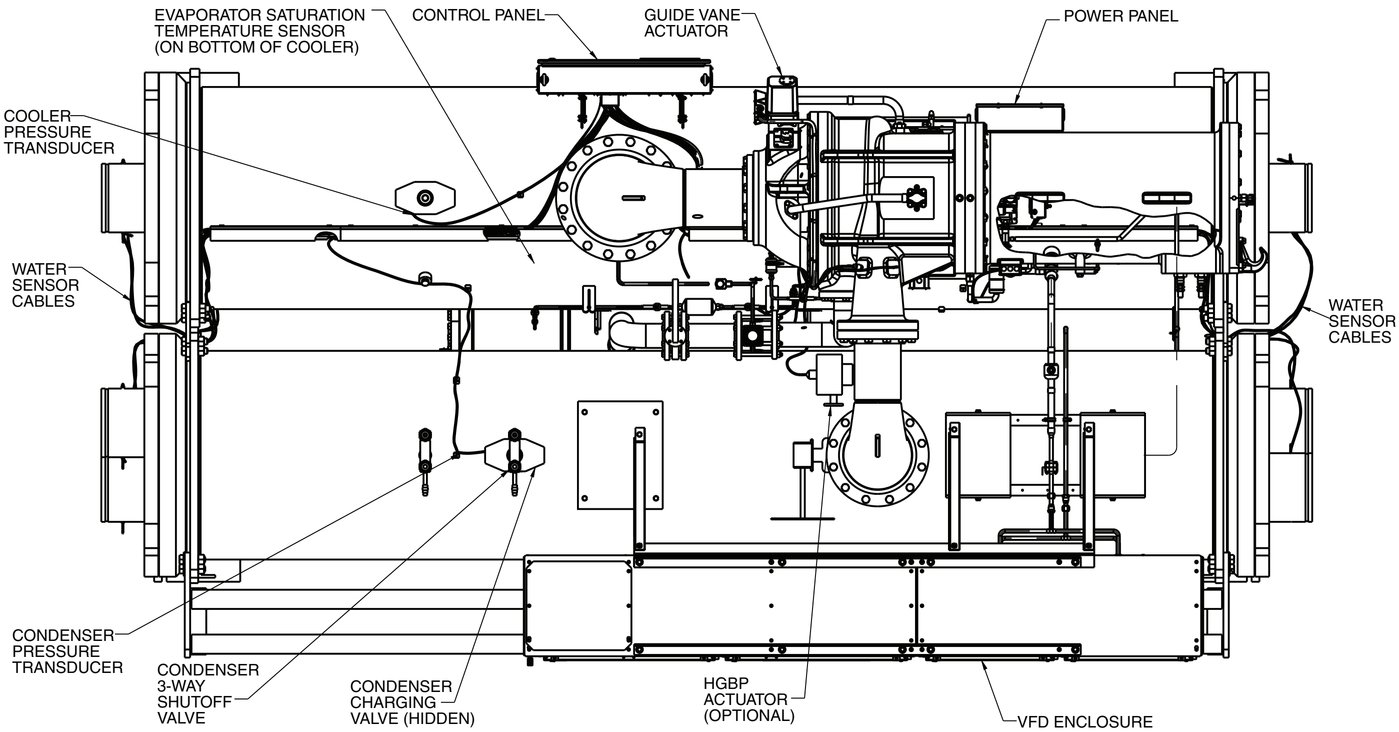



**Fig. 12 — Chiller Controls and Sensor Locations**

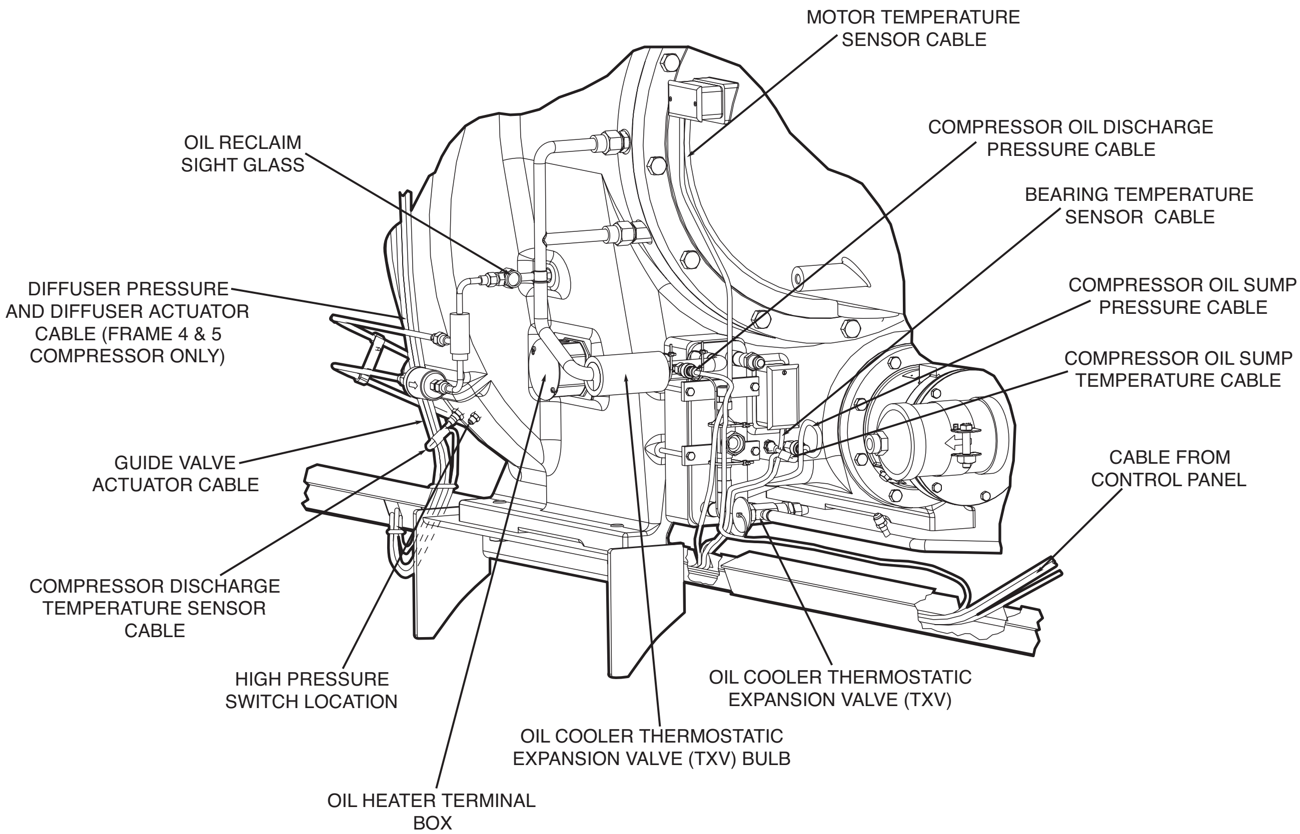



**Fig. 13 — 19XRV Compressor Controls and Sensor Locations (Reference Only)**

## 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. 14. Note the display may change based on product type and options selected.

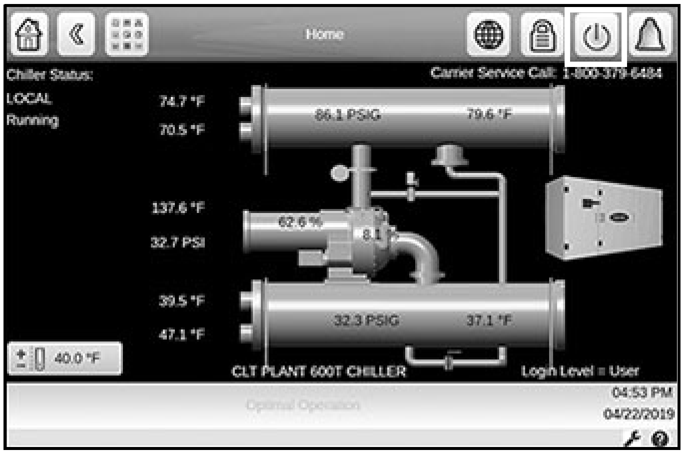



**Fig. 14 — Chiller Start/Stop Icon**

This initiates the PIC 6 starting sequence by displaying the list of operating modes. Press Local On to initiate start-up. See Fig. 15.

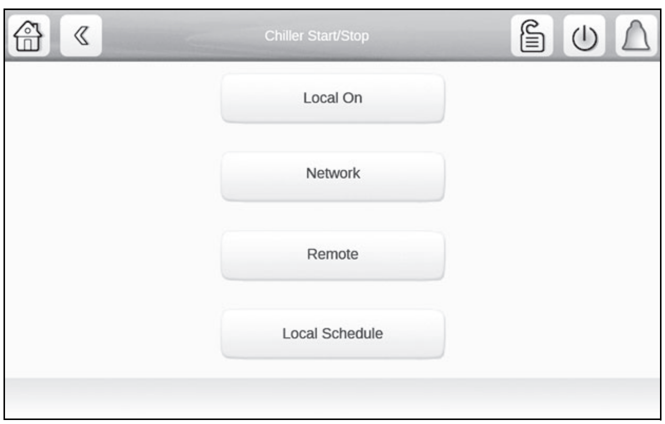



**Fig. 15 — Local On**

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 51).

When start-up is initiated, the status screen displays start-up progress and the Start/Stop icon blinks green. Once local start-up begins, the PIC 6 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 6 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 6 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 6 control system closes the vanes. If the vanes are closed and the oil pump pressure is less than 6 psi (41.4 kPa), the oil pump relay energizes. The PIC 6 control system then waits until the oil pressure (*OIL PRESS VERIFY TIME*, operator-configured, default of 40 seconds) reaches 18 psi (124 kPa) which indicates satisfactorily oil pump pressure to continue start-up. After oil pressure is verified, the PIC control system waits 40 seconds, and the compressor start relay 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 6 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 start command 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.

For normal start-up the minimum time to complete the entire prestart sequence is approximately 185 seconds. See Fig. 16 for normal start-up timing sequence. See Table 2 for a list of prestart checks.

**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 ≥ MOTOR TEMP OVERRIDE – 10°F (5.6°C) | Alarm – 231 |
| COMP DISCHARGE TEMPERATURE ≥ COMP DISCHARGE ALERT – 10°F (5.6°C) | Alarm – 232 |
| EVAP REFRIG LIQUID TEMP OR EVAP_SAT < EVAP REFRIG TRIPPOINT** + 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.
** Refrig trip point = 33°F (0.6°C) (water) and configurable for brine application.

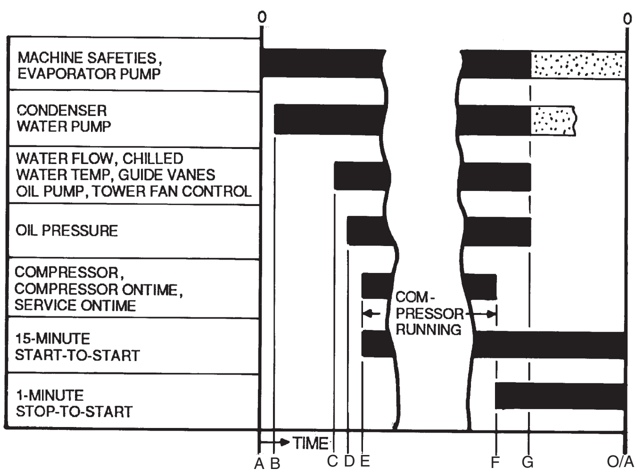
## Lubrication Control

As part of the pre-start 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. For 19XR6/7 the oil pump stir frequency has options.




**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. 16 — 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. 17).


**Fig. 17 — 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. 18)
- insulation tester for compressor motor rated at motor design voltage


**Fig. 18 — 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 19 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 small positive pressure refrigerant holding 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 23).

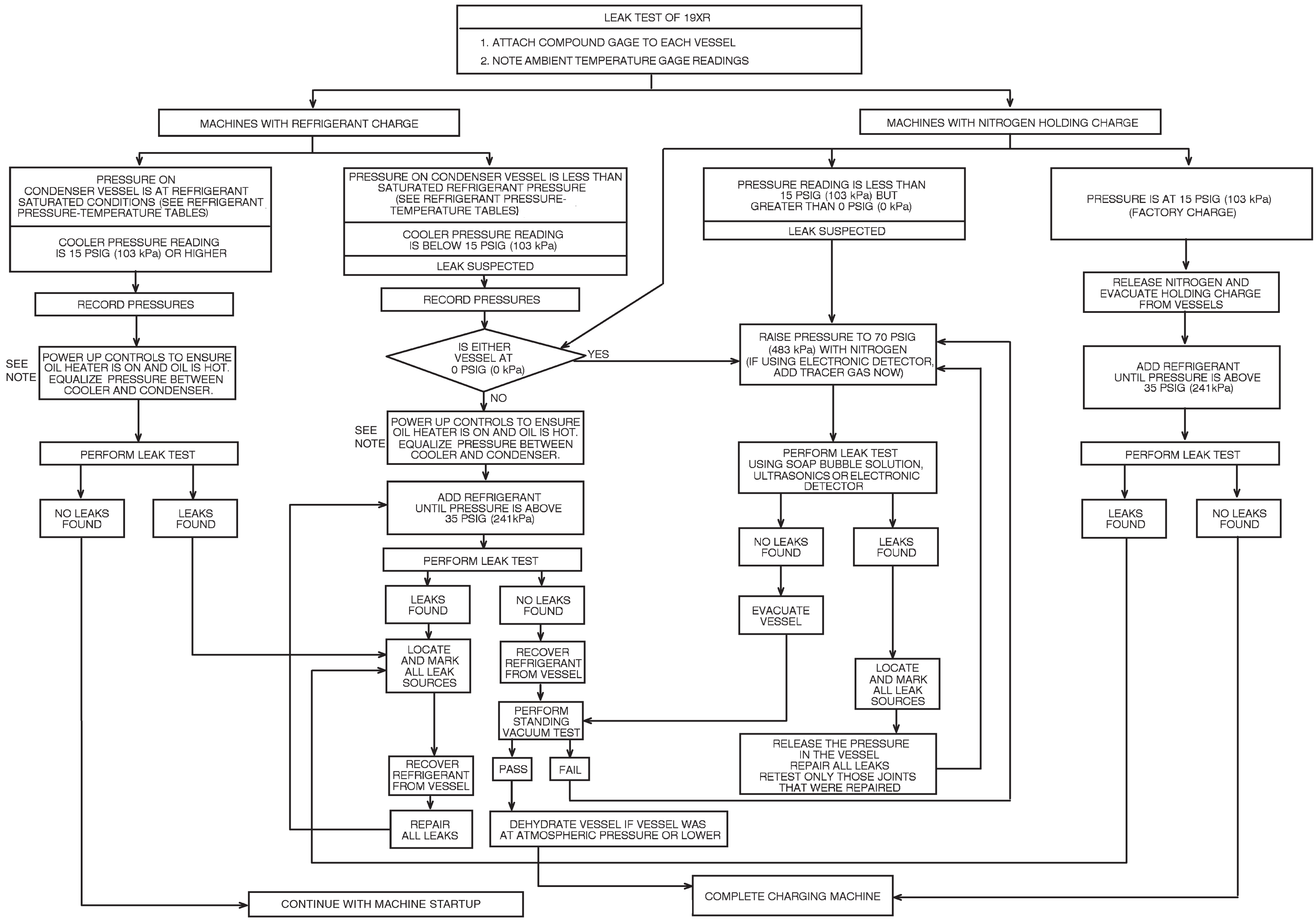
If the chiller is spring isolated, keep all springs blocked in both directions to prevent possible piping stress and damage during the transfer of refrigerant from vessel to vessel during the leak test process, or any time refrigerant is being transferred. Adjust the springs when the refrigerant is in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




NOTE: DOES NOT APPLY TO 19MV WITH MBC.

**Fig. 19 — 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 5 and 6 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 42.

**⚠ CAUTION**

Never charge liquid refrigerant into the chiller if the pressure in the chiller is less than 35 psig (241 kPa) for HFC-134a or less than 39 psig (268 kPa) for R-513A. 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 PIC 6 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 25.
   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 25. 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 42.
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. <u>If the leakage rate is less than 0.05 in. Hg (0.17 kPa)</u> in 24 hours, the chiller is sufficiently tight.
   b. <u>If the leakage rate exceeds 0.05 in. Hg (0.17 kPa)</u> 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 — Pressure — Temperature (F)

| TEMPERATURE (F) | HFC-134a PRESSURE (PSIG) | R-513A PRESSURE (PSIG) |
|---|---|---|
| **0** | 6.50 | 9.22 |
| **2** | 7.52 | 10.32 |
| **4** | 8.60 | 11.45 |
| **6** | 9.66 | 12.62 |
| **8** | 10.79 | 13.84 |
| **10** | 11.96 | 15.09 |
| **12** | 13.17 | 16.39 |
| **14** | 14.42 | 17.73 |
| **16** | 15.72 | 19.11 |
| **18** | 17.06 | 20.54 |
| **20** | 18.45 | 22.02 |
| **22** | 19.88 | 23.54 |
| **24** | 21.37 | 25.11 |
| **26** | 22.90 | 26.73 |
| **28** | 24.48 | 28.40 |
| **30** | 26.11 | 30.12 |
| **32** | 27.80 | 31.89 |
| **34** | 29.53 | 33.71 |
| **36** | 31.32 | 35.59 |
| **38** | 33.17 | 37.52 |
| **40** | 35.08 | 39.51 |
| **42** | 37.04 | 41.56 |
| **44** | 39.06 | 43.66 |
| **46** | 41.14 | 45.83 |
| **48** | 43.28 | 48.05 |
| **50** | 45.48 | 50.34 |
| **52** | 47.74 | 52.68 |
| **54** | 50.07 | 55.09 |
| **56** | 52.47 | 57.57 |
| **58** | 54.93 | 60.11 |
| **60** | 57.46 | 62.72 |
| **62** | 60.06 | 65.40 |
| **64** | 62.73 | 68.14 |
| **66** | 65.47 | 70.96 |
| **68** | 68.29 | 73.84 |
| **70** | 71.18 | 76.80 |
| **72** | 74.14 | 79.83 |
| **74** | 77.18 | 82.94 |
| **76** | 80.30 | 86.13 |
| **78** | 83.49 | 89.39 |
| **80** | 86.17 | 92.73 |
| **82** | 90.13 | 96.14 |
| **84** | 93.57 | 99.64 |
| **86** | 97.09 | 103.23 |
| **88** | 100.70 | 106.89 |
| **90** | 104.40 | 110.64 |
| **92** | 108.18 | 114.48 |
| **94** | 112.06 | 118.40 |
| **96** | 116.02 | 122.41 |
| **98** | 120.08 | 126.51 |
| **100** | 124.23 | 130.71 |
| **102** | 128.47 | 134.99 |
| **104** | 132.81 | 139.37 |
| **106** | 137.25 | 143.84 |
| **108** | 141.79 | 148.41 |
| **110** | 146.43 | 153.08 |
| **112** | 151.17 | 157.85 |
| **114** | 156.01 | 162.72 |
| **116** | 160.96 | 167.69 |
| **118** | 166.01 | 172.76 |
| **120** | 171.17 | 177.94 |
| **122** | 176.45 | 183.23 |
| **124** | 181.83 | 188.62 |
| **126** | 187.32 | 194.12 |
| **128** | 192.93 | 199.74 |
| **130** | 198.66 | 205.47 |
| **132** | 204.50 | 211.31 |
| **134** | 210.47 | 217.26 |
| **136** | 216.55 | 223.34 |
| **138** | 222.76 | 229.54 |
| **140** | 229.09 | 235.85 |

### Table 6 — Pressure — Temperature (C)

| TEMPERATURE (C) | HFC-134a PRESSURE (kPa) | R-513A PRESSURE (kPa) |
|---|---|---|
| **–17.8** | 44.8 | 63.6 |
| **–16.7** | 51.9 | 71.1 |
| **–15.6** | 59.3 | 79.0 |
| **–14.4** | 66.6 | 87.0 |
| **–13.3** | 74.4 | 95.4 |
| **–12.2** | 82.5 | 104.1 |
| **–11.1** | 90.8 | 113.0 |
| **–10.0** | 99.4 | 122.2 |
| **–8.9** | 108.0 | 131.8 |
| **–7.8** | 118.0 | 141.6 |
| **–6.7** | 127.0 | 151.8 |
| **–5.6** | 137.0 | 162.3 |
| **–4.4** | 147.0 | 173.1 |
| **–3.3** | 158.0 | 184.3 |
| **–2.2** | 169.0 | 195.8 |
| **–1.1** | 180.0 | 207.6 |
| **0.0** | 192.0 | 219.9 |
| **1.1** | 204.0 | 232.4 |
| **2.2** | 216.0 | 245.4 |
| **3.3** | 229.0 | 258.7 |
| **4.4** | 242.0 | 272.4 |
| **5.6** | 255.0 | 286.5 |
| **6.7** | 269.0 | 301.0 |
| **7.8** | 284.0 | 316.0 |
| **8.9** | 298.0 | 331.3 |
| **10.0** | 314.0 | 347.1 |
| **11.1** | 329.0 | 363.2 |
| **12.2** | 345.0 | 379.9 |
| **13.3** | 362.0 | 396.9 |
| **14.4** | 379.0 | 414.5 |
| **15.6** | 396.0 | 432.4 |
| **16.7** | 414.0 | 450.9 |
| **17.8** | 433.0 | 469.8 |
| **18.9** | 451.0 | 489.2 |
| **20.0** | 471.0 | 509.1 |
| **21.1** | 491.0 | 529.5 |
| **22.2** | 511.0 | 550.4 |
| **23.3** | 532.0 | 571.9 |
| **24.4** | 554.0 | 593.8 |
| **25.6** | 576.0 | 616.3 |
| **26.7** | 598.0 | 639.4 |
| **27.8** | 621.0 | 662.9 |
| **28.9** | 645.0 | 687.0 |
| **30.0** | 669.0 | 711.7 |
| **31.1** | 694.0 | 737.0 |
| **32.2** | 720.0 | 762.8 |
| **33.3** | 746.0 | 789.3 |
| **34.4** | 773.0 | 816.3 |
| **35.6** | 800.0 | 844.0 |
| **36.7** | 828.0 | 872.3 |
| **37.8** | 857.0 | 901.2 |
| **38.9** | 886.0 | 930.7 |
| **40.0** | 916.0 | 960.9 |
| **41.1** | 946.0 | 991.7 |
| **42.2** | 978.0 | 1023.3 |
| **43.3** | 1010.0 | 1055.4 |
| **44.4** | 1042.0 | 1088.3 |
| **45.6** | 1076.0 | 1121.9 |
| **46.7** | 1110.0 | 1156.2 |
| **47.8** | 1145.0 | 1191.1 |
| **48.9** | 1180.0 | 1226.9 |
| **50.0** | 1217.0 | 1263.3 |
| **51.1** | 1254.0 | 1300.5 |
| **52.2** | 1292.0 | 1338.4 |
| **53.3** | 1330.0 | 1377.2 |
| **54.4** | 1370.0 | 1416.7 |
| **55.6** | 1410.0 | 1456.9 |
| **56.7** | 1451.0 | 1498.0 |
| **57.8** | 1493.0 | 1539.9 |
| **58.9** | 1536.0 | 1582.6 |
| **60.0** | 1580.0 | 1626.1 |

## 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 if voltage is applied to the motor.

**⚠ 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. 20) 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.

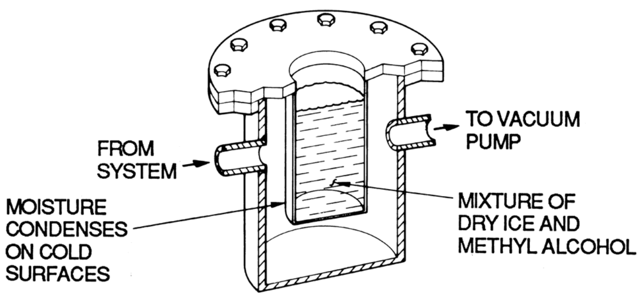



**Fig. 20 — Dehydration Cold Trap**

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. 3-5). 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 29.72 in. Hg (vac) (754.9 mm Hg), or a vacuum indicator reads 35°F (1.7°C). Operate the pump an additional 2 hours.

   Do not apply a vacuum greater than 29.73 in. Hg (vac) (755.1 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.

## 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.

## Check the Optional Pumpout Compressor Water Piping

If the optional pumpout storage tank and/or pumpout system are installed, check to ensure the pumpout condenser water has been piped in. Check for field-supplied shutoff valves and controls as specified in the job data. Check for refrigerant leaks on field-installed piping.

## Identify and Check Starter/VFD

Verify that the starter/VFD in submittal paperwork matches the actual starter/VFD on the jobsite. Typical design characteristic is for the stater/VFD to be able to operate in the following environment conditions. In all cases identify the starter by reviewing marking/part number on the inside/outside of the starter cabinet doors. See Table 7.

**Table 7 — Starter/VFD Identification**

| CONDITION | SPECIFICATION |
|---|---|
| AMBIENT TEMPERATURE (OUTSIDE NEMA 1 ENCLOSURE) | 32 to 104°F (0 to 40°C) |
| STORAGE TEMPERATURE (AMBIENT) | –40 to 149°F (–40 to 65°C) |
| HUMIDITY | 5% to 95% (non-condensing) |

Locate the appropriate wiring diagrams associated with the identified starter.

**⚠ WARNING**

BE AWARE that certain automatic start arrangements can engage the starter/VFD. Open the disconnect ahead of the starter/VFD in addition to shutting off the chiller or pump. Failure to do so could result in serious personal injury or death from electric shock.

**⚠ WARNING**

The main disconnect on the starter/VFD front panel may not de-energize all internal circuits. Open all internal and remote disconnects before servicing the starter/VFD. Failure to do so could result in serious personal injury or death from 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 the mechanical interlock between contactors to ensure that 1S and 2M contactors cannot be closed at the same time. Check all other electro-mechanical devises, 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.

## Benshaw RediStart MX3 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 VFD or 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. Confirm the field wiring does not have external power supply connected to the chiller controls/starter inputs.
6. Apply power to the starter.

## VFD Starter

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

1. Turn off, lockout, and tag the input power to the drive.
2. Wait a minimum of 5 minutes for the DC bus to discharge.
3. All wiring should be installed in conformance with the applicable local, national, and international codes (e.g.,NEC/CEC).
4. Remove any debris, such as metal shavings, from the enclosure. Metal shavings on power module enclosure will void drive warranty.
5. Check that there is adequate clearance around the machine.
6. Verify that the wiring to the terminal strip and the power terminals is correct with no external power supplied to the inputs of the Carrier/starter controls.
7. Verify that all of the VFD power module circuit board connectors are fully engaged and taped in place.
8. Check that the wire size is within terminal specifications and that the wires are tightened properly.
9. Check that specified branch circuit protection is installed and correctly rated.
10. Check that the incoming power is within 10% of chiller nameplate voltage.
11. Verify that a properly sized ground wire is installed and a suitable earth ground is used. Check for and eliminate any grounds between the power leads. Verify that all ground leads are unbroken.

## Verify Condition of Installation

Use the following instructions to verify condition of installation:

1. Turn off, lockout, and tag the input power to the drive.
2. Wait a minimum of 5 minutes for the DC bus to discharge.
3. All wiring should be installed in conformance with the applicable local, national, and international codes (e.g.,NEC/CEC).
4. Remove any debris, such as metal shavings, from the enclosure. Metal shavings on power module enclosure will void drive warranty.
5. Check that there is adequate clearance around the machine.
6. Verify that the wiring to the terminal strip and the power terminals is correct.

7. Verify that all of the VFD power module circuit board connectors are fully engaged and taped in place.
8. Check that the wire size is within terminal specifications and that the wires are tightened properly.
9. Check that specified branch circuit protection is installed and correctly rated.
10. Check that the incoming power is within 10% of chiller nameplate voltage.
11. Verify that a properly sized ground wire is installed and a suitable earth ground is used. Check for and eliminate any grounds between the power leads. Verify that all ground leads are unbroken.


## 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. On low-voltage compressors (600 v or less) connect a voltmeter across the power wires to the compressor starter and measure the voltage. Compare this reading to the voltage rating on the compressor and starter/VFD nameplates.
3. Compare the ampere rating on the starter/VFD nameplate to rating on the compressor nameplate.
4. The starter/VFD for a centrifugal compressor motor must contain the components and terminals required for PIC6 refrigeration control. Check the certified drawings. Note that the starter/VFD must share control of cooler and condenser liquid pumps.
5. Check the phase to phase and phase to ground line voltage to the starter/VFD, control panel (19XR6/7), power panel (19XR2-E) and optional pumpout compressor.

6. Ensure that fused disconnects or circuit breakers have been supplied for all power leads to the chiller or associated equipment.
7. Ensure all electrical equipment and controls are properly grounded in accordance with job drawings, certified drawings, and all applicable electrical codes.
8. 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.
9. Tighten all wiring connections and inspect power panel (19XR2-E) or control panel (19XR6/7) to ensure contractor has used the knockouts to feed the wires into the enclosures and that appropriate strain relief is provided.
10. Verify all field connected wiring including option control wiring to control panel.
11. Field-installed starters only (or for VFD units only if chiller controls indicate ground fault), test the chiller compressor motor and its power lead insulation resistance with a 500-v insulation tester such as a megohmmeter. (Use a 5000-v tester for motors rated over 600 v.) Factory mounted starters do not require a megohm test.
    a. Open the starter main disconnect switch and follow lockout/tagout rules.

**⚠ CAUTION**

If the motor starter is a solid-state starter or VFD, 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/VFD components.

**⚠ CAUTION**

Do not route control wiring carrying 30 v or less within a conduit carrying 50 v or higher. Failure to observe this precaution could result in electromagnetic interference in the control wiring.

    b. With the tester connected to the motor leads, take 10-second and 60-second megohm readings as follows:
    6-Lead Motor — Tie all 6 leads together and test between the lead group and ground. Next tie the leads in pairs: 1 and 4, 2 and 5, and 3 and 6. Test between each pair while grounding the third pair.
    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.
    NOTE: Unit-mounted starters do not have to be megohm tested.
12. Tighten all wiring connections to the plugs on the IOBs and PIC6 HMI panel.
13. On chillers with free-standing starters, inspect the power panel (19XR2/E) to ensure that the contractor has fed the wires into the bottom or side of the panel. The installation of wiring into the top of the panel can cause debris to fall into the contactors. Clean and inspect the contactors if this has occurred.
14. Torque all AC power terminals to specified torque.

**⚠ WARNING**

Do not apply power unless a qualified Carrier technician is present. Serious personal injury may result.

## Carrier Comfort Network® (CCN) and Local Equipment Network (LEN) Interface

The Communication bus wiring is supplied and installed by the electrical contractor. It consists of shielded, 3-conductor cable with drain wire. The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it. The negative pins must be wired to the negative pins. The signal ground pins must be wired to the signal ground pins. See installation manual.

NOTE: Conductors and drain wire must be 20 AWG (American Wire Gage) minimum stranded, tinned copper.

Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon[1], or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –4°F to 140°F (–20°C to 60°C) is required. See table below for cables that meet the requirements.

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

When connecting the communication bus to a system element, a color code system for the entire network is recommended to simplify installation and checkout. For freestanding Benshaw starters communicating via Modbus (RS-485), Carrier recommends to use Belden 3106A communication cable.

The following color code is recommended:

| SIGNAL TYPE | CCN BUS CONDUCTOR INSULATION COLOR | CCN TERMINAL CONNECTION |
|---|---|---|
| + | Red | Red (+) |
| GROUND | Black | Black (G) |
| – | White | White (–) |

## Check Starter

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.

1. Teflon is a registered trademark of DuPont.

## Oil Charge

The oil charge for the 19XR:

- Frame 2 compressor — 8 gal (30 L)
- Frame 3 compressor — 8 gal (30 L)
- Frame 4 compressor — 12 gal (45 L)
- Frame 4 compressor with split ring diffuser option — 12 gal (45 L)
- Frame C compressor — 14.1 gal (53.4 L)
- Frame 5 compressor — 22.5 gal (85.2 L)
- Frame E compressor — 15.3 gal (57.9 L)
- Frame 6 compressor — 28.5 gal (107.9 L)
- Frame 7 compressor — 44.4 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. 3-5). If oil is added, it must meet Carrier's specification for centrifugal compressor use as described in the Oil Specification section on page 47. 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 for 19XR2-E a circuit breaker in the starter energizes the oil heater and the control circuit. For 19XR6/7 oil heater and control circuit is powered from the control panel.

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 6 and is powered through a contactor in the power panel (19XR2-E) control panel (19XR6/7). 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. Do not assume the values in the chiller are correct. They should match the chiller labels and data sheets for the selection. If you have questions contact the Carrier Technical Service Manager or Service Engineering.

See the 19XR with PIC 6 Controls Operation and Troubleshooting manual for instructions on using the PIC 6 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 for future reference. When installing new software ensure to select to keep all configuration data so all data does not have to be reentered manually.

## Input the Design Set Points

To access the set point screen, press the Main Menu icon on the home screen. See Fig. 21.


**Fig. 21 — Main Menu Icon**

The Main Menu screen is displayed. Press the Set Point Table icon (Fig. 22). Note that Login level must exceed Basic to have access to this set point.

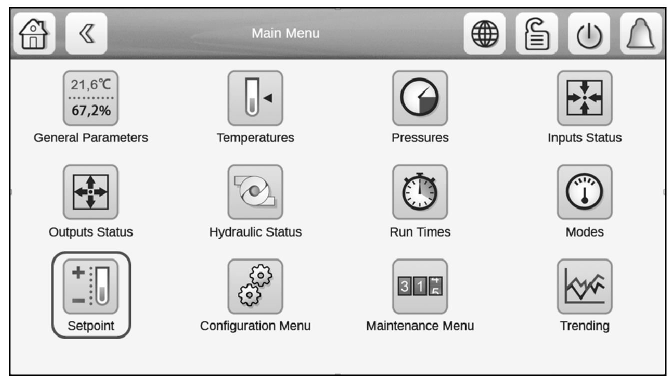



**Fig. 22 — Main Menu — Set Point Table Icon**

The set point screen is displayed (see Fig. 23). 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 6 Controls Operation and Troubleshooting manual.

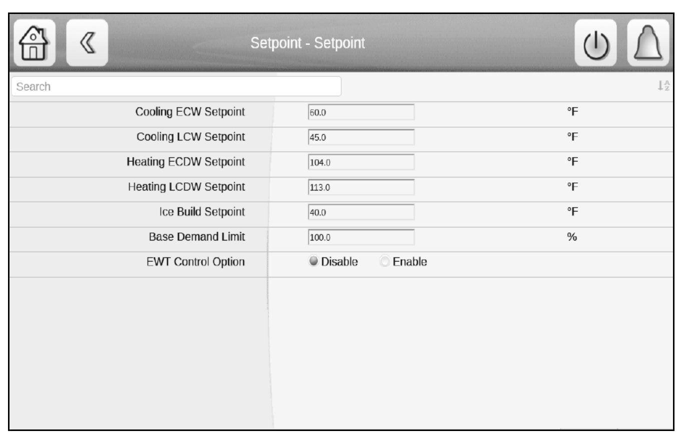



**Fig. 23 — Set Point Table Screen**

## 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 106 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 6 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 6 control system provides different levels of access: Basic access, User access, and Service access. User access provides access to the chiller controls such as Setpoint, Schedules, Time/date and Water Reset menu along with the ability to reading key input and output values pressures and temperatures. Factory user has access to factory tables - this is required in order to properly set up the chiller during commissioning. The PIC 6 default password configurations are as follows:

- Basic: No password required
- User: 1111 (factory default)
- Factory: Access Only authorized with Carrier SmartService

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. 24.

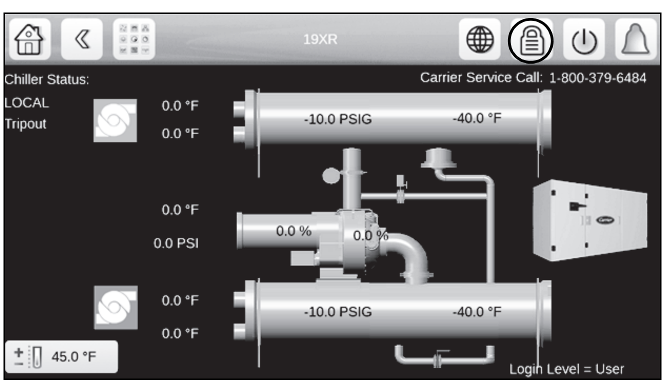



**Fig. 24 — Lock Icon**

For access levels higher than Basic there are two options. User Login (default password 1111) gives limited access to chiller tables. For full access a Factory Login is required. Factory Login access requires either Carrier SmartService web access or the SmartService app on a connected mobile device.

Service Login requires a code given by administrator, which will give temporary access to PIC6 Service Menu tables.

The User Login Screen is displayed. Enter the password on this screen. See Fig 25. The language and system of measurement can also be changed on this screen. For details, see the 19XR with PIC 6 Controls Operation and Troubleshooting guide.

To access the Service and Factory Login Menus select the Service Login icon.


NOTE: Password is validated after user presses the log-in icon.

**Fig. 25 — User Login Screen**

ENGLISH/METRIC UNITS

To change PIC display from English to metric units or to change the default language, select the Globe icon; see Fig. 26. The Globe icon is next to the Lock icon (Fig. 24).

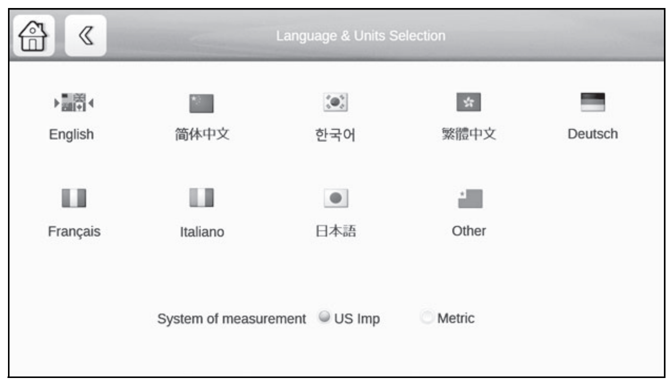



**Fig. 26 — Unit Selection**

INPUT TIME AND DATE

Set day and time and if applicable Holidays through ***Main Menu → System Configuration → 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. User password is required to access Input Time and Date menu.

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 AND VERIFY FACTORY PARAMETER TABLES

(Service Password Required)

Access the Factory Parameters table through ***Main Menu→ Configuration Menu*** to modify or view the job site parameters.

The applicable configuration tables are dependent upon the starter/VFD type and manufacturer. For all factory unit-mounted equipment all starter configurations should be completed at the factory, but will need to be verified during chiller commissioning.

For starters without ISM, the appropriate starter selection must be configured through ***MAIN MENU →CONFIGURATION MENU→ FACTORY →VFD/STARTER OPTION***.

Options are as follows:

0 = Starter with ISM

1 = Free Standing VFD with ISM [North America options: Toshiba VFD, Allen Bradley PF7000, PowerFlex 700L (unit mount)]

3 = Rockwell LF2 VFD (LiquiFlo2)

4 = Eaton VFD (LCX9000)

5 = Rockwell STD VFD (Allen Bradley PowerFlex 755)

7 = Danfoss VFD

8 = Benshaw Starter (Wye-delta or Solid State starters with MX3 (TM) and no ISM)

For constant speed machines verify all listed parameters in ISM Configuration. Similarly, for unit-mounted VFDs verify all parameters listed in UM VFD Configuration Tables 8-11. Verify against chiller electrical nameplates.

For units that are doing native communicating Modbus without a UPC gateway ensure that the Modbus Gateway Option in ***MAIN MENU→CONFIGURATION MENU→MODBUS MASTER*** is changed to 0=Native along with baud rate and Slave Device Address. Baud rate is typically 9,600 and slave address is 1.

Liquid bypass option allows bypass of the economizer. When Enabled and available the 19XR with frame C bypass valve will modulate based on lift and % Amps to allow for high cooling capacity at low load.

Dynamic Demand Limit is a control feature which will demand limit the chiller to prevent refrigerant stack-up due to high refrigerant flow at low lift. It is required to set LCW at Selection Point and LCDW at Selection Point as well as Enable the Dynamic Demand Limit function to make this feature active.

**Table 8 — Typical Job Site Parameters (Main Menu→Configuration Menu→CONF_OPT→Option Configuration [for all Starter/VFD options])**

| PARAMETER | TABLE |
|---|---|
| **AUTO RESTART OPTION** | CONF_OPT — Disable/Enable |
| **SWIFT RESTART OPTION** | CONF_OPT — Disable/Enable |
| **COMMON SENSOR OPTION** | CONF_OPT — Disable/Enable |
| **EC/HG (HGBP) VALVE OPTION** | CONF_OPT — 0=No HGBP valve, 1= Continuous (two contactor control - one to open, one to close with feedback of fully closed and open position), 2= on/off (1 contactor control - either on or off and no feedback), 3 = mA (control by 4-20 mA signal with feedback) |
| **EC/HG (HGBP) VALVE SELECTION** | CONF_OPT - 0 = Disable, 1=Surge (HGBP valve activates when surge prevention is high), 2= Low Load (EC valves activates based on IGV position and delta T for low load operation). EC valve is to Open when IGV position is less than the configured ECV Open IGV1 Position and (cooling mode) the water Delta T (ECW-LCW) is less than or equal to ECV On DT for Low Load minus ECV Low Load DB. EC valve is to Close when IGV position is greater than the ECV Close IGV1 Position and (cooling mode) water Delta T is greater than the ECV Off DT for Low Load plus ECV Low Load DB. 3=Combined (EC valves controlled by both surge and low load algorithms) |
| **HPR VLV OPTION** | Disable/Enable. When enabled, values for HPR VLV Delta Pos 0% (4 mA), HPR VLV Delta Pos 100% (20 mA), HPR VLV Min Output (minimum output %), and HPR VLV Deadband can be set.<br>Typically HPR VLV Deadband must be set at 0.5 psig for normal operation. |
| **TOWER FAN HIGH SETPOINT** | Default 75°F |
| **REFRIG LEAKAGE OPTION** | Disable/Enable |
| **OIL COOLER EXV OPTION** | Disable/Enable |
| **CUSTOMER ALERT OPTION** | Disable/Enable |
| **ICE BUILD OPTION** | Disable/Enable |
| **VAPOR SOURCE SV OPTION** | Disable/Enable |
| **VAPOR SOURCE SV DELAY** | Default 5 min |
| **EVAP LIQUID TEMP OPT** | Disable/Enable |
| **EVAP APP CAL SELECTION** | 0 = Saturation Temp, 1 = Refrigerant Temperature |

**Table 9 — Typical Job Site Parameters (Main Menu→Configuration Menu→Option2→Option Configuration [for all Starter/VFD options])**

| PARAMETER | TABLE |
|---|---|
| **IOB3 OPTION** | No/Yes (always "Yes" for North America 19XRs) |
| **IOB4 OPTION** | No/Yes (select if optional fourth IOB board is present) |
| **FREE COOLING** | No/Yes |
| **WATER PRESSURE OPTION** | 0=No, 1=WTR Flow PD TRD (dedicated water pressure transducers),<br>2=WTR Flow PD TRM (differential water flow pressure transmitter - 4-20 mA) |
| **WATER FLOW MEASUREMENT** | 0=No, 1=WTR Flow MTR (4-20 mA water flow sensors),<br>2=WTR Flow PD (based on water pressure drop measurement) |
| **WATER FLOW DETERMINATION** | 0=Saturated Temp, 1=Flow Switch, 2=Water Flow PD |
| **MARINE OPTION** | Disable/Enable |

## Table 10 — Typical Job Site Parameters (Main Menu→Configuration Menu→General [for all Starter/VFD options])

| PARAMETER | TABLE |
|---|---|
| **DEMAND LIMIT TYPE** | GENCONF - 0=Base Demand, 1=4-20mA |
| **PULLDOWN RAMP TYPE** | GENCONF - 0=Temperature, 1= Load |
| **DEMAND LIMIT SOURCE** | GENCONF - 0=Amperes, 1= kW |

NOTE: Other parameters in this menu are normally left at the default settings; they may be changed as required.

## Table 11 — Typical Job Site Parameters (19XRC) (Main Menu→Configuration Menu→Low Load)

| PARAMETER | TABLE |
|---|---|
| **ECO LBP VLV OPTION** | LQBP - Disable/Enable |
| **ECO LBP BYPASS VLV LIMIT** | LQBP - 100% |
| **DSH DEADBAND FOR LBP** | LQBP - 2^F |
| **ECO LBP VLV EVAP APPROACH** | LQBP - 5^F |
| **DYNAMIC DEMAND LIMIT (DDL)** | Disable/Enable |
| **IGNORE DDL TIME** | 30 min (default) |
| **LCW AT SELECTION POINT** | 45°F (default) |
| **LCDW AT SELECTION POINT** | 95°F (default) |
| **100% LIFT DEMAND LIMIT** | 100% (default) |
| **MIDDLE LIFT PERCENT** | 60% (default) |
| **MIDDLE LIFT DEMAND LIMIT** | 80 (default) |
| **20% LIFT DEMAND LIMIT** | 45% (default) |

## 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 configuration values match the chiller parameter labels and Chiller Builder design data sheet. See typical jobsite parameters in Tables 8 and 10. Different service tables will need to be checked based on starter selection.

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 nameplates — Located on the right side of the control panel. A unit-mounted VFD alternate information nameplate will have two additional labels. (See Fig. 27.)
  - External Machine Electrical Nameplate — located right side of the VFD (See Fig. 28).
  - Internal Machine Electrical Nameplate — located on the inside of the left VFD enclosure door.

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 29-32 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

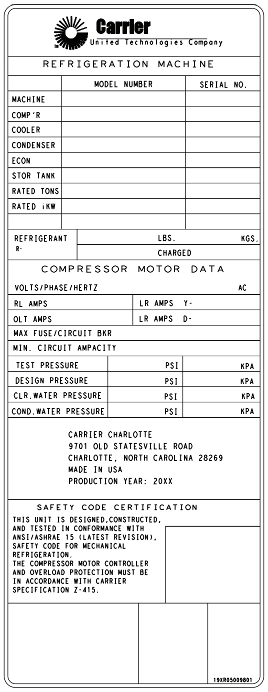
and

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

and

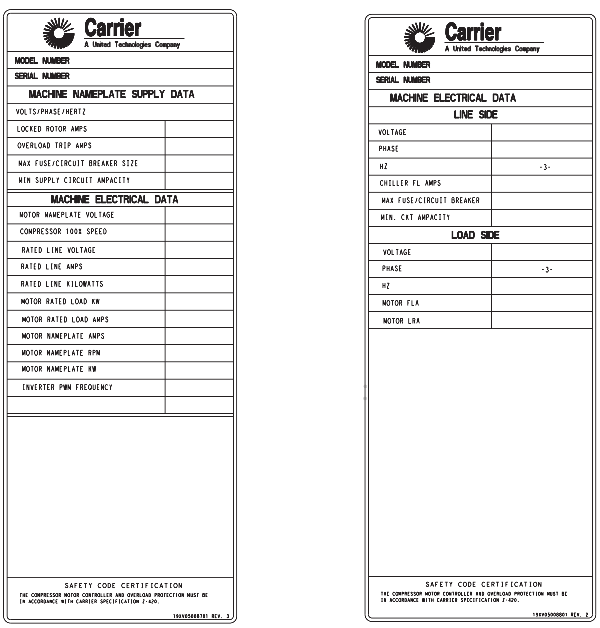
3. PERCENT LINE CURRENT < 100%

then the surge line is probably too conservative.




TYPICAL CHILLER ID NAMEPLATE — CONSTANT SPEED STARTER OR FREESTANDING VFD

**Fig. 27 — Machine Identification Nameplate**




INTERNAL EXTERNAL

**Fig. 28 — Machine Electrical Data Nameplate**

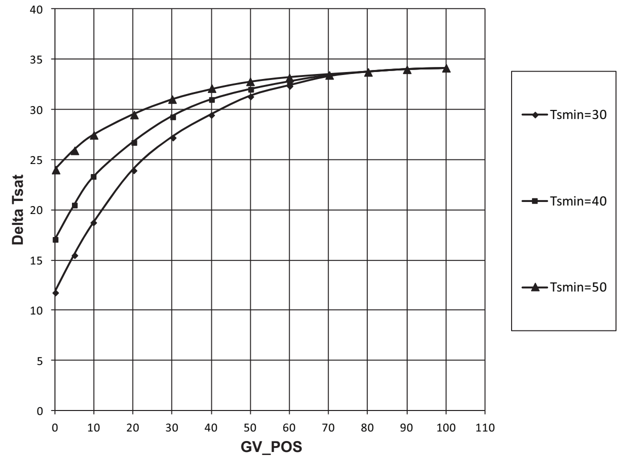



**Fig. 29 — Effect of SURGE DELTA TSMIN on Surge Prevention**

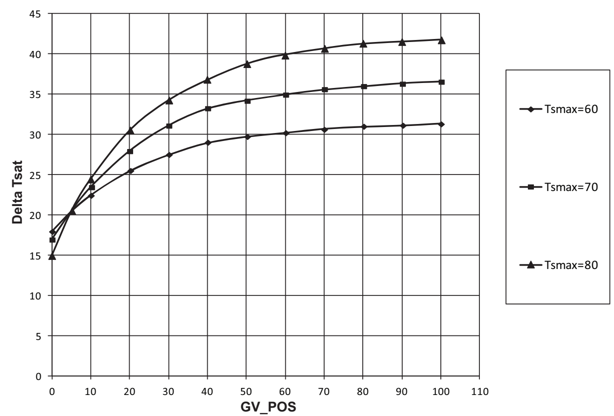



**Fig. 30 — Effect of SURGE DELTA TSMAX on Surge Prevention**

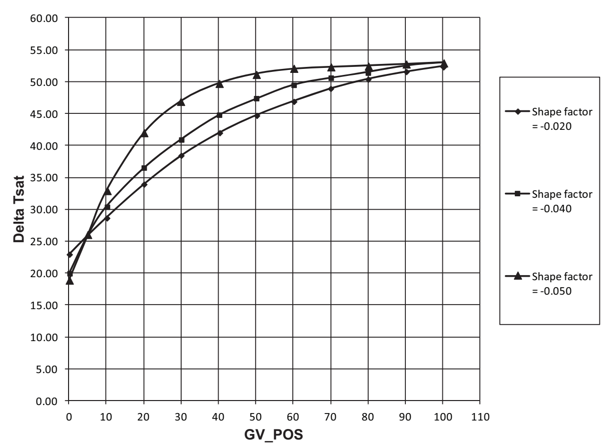



**Fig. 31 — Effect of SURGE LINE SHAPE FACTOR on Surge Prevention**

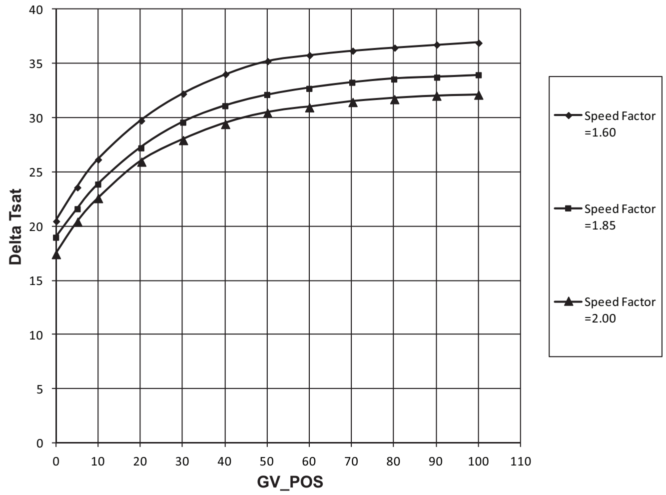



**Fig. 32 — Effect of SURGE LINE SPEED FACTOR on Surge Prevention**

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). Alternatively if Pressure Ratio Method is used for surge protection increase PR at Minimum Opening.
2. Increase SURGE DELTA TSMAX in steps of 2ºF (1.2ºC). Alternatively if Pressure Ratio Method is used for surge protection increase PR at Full Load Opening.
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

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 or PR at Minimum Opening. 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 or PR at Full Load Opening. 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 or PR at Full Load Opening to 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 or PR at Minimum Opening and SURGE DELTA TSMAX, or PR at Full Load Opening to the value specified by Chiller Builder (ECAT). Decrease both SURGE DELTA TSMIN / PR at Minimum Opening and SURGE DELTA TSMAX / PR at Full Load Opening with equal steps. 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 (less negative) in the SURGE LINE SHAPE FACTOR. Units configured with Surge Line Configuration 0=PR (Pressure Ratio) can be similarly adjusted. In lieu of changing Tsmax/Tsmin values, pressure ratios at Full/Minimum Load are to be adjusted to obtain the same results.

NOTE: A good starting point if adjustments are needed with a two stage compressor is a shape factor of 2.10 and a speed factor of –0.045.

MODIFY EQUIPMENT CONFIGURATION IF NECESSARY

The Configuration Menu has other tables to select, view, or modify parameters. Carrier's certified drawings have the configuration values required for the jobsite. Modify these values only if requested. Tables include Service Parameters, General Configuration, Reset Configuration, and Protocol Configuration. Modifications can include:

- Chilled water reset (***CONFIGURATION MENU→ RESET CONFIGURATION MENU***)
- Entering chilled water control (Enable/Disable) (***MAIN MENU→SETPOINT***)
- 4 to 20 mA demand limit (***CONFIGURATION MENU→ GENERAL CONFIGURATION***)
- Auto restart option (Enable/Disable) (***CONFIGURATION MENU →OPTION CONFIGURATION MENU***)
- Remote contact option (Enable/Disable) — active when chiller is in Remote mode

See the 19XR with PIC 6 Controls Operation and Troubleshooting guide for more details about these functions.

VFD CONTROL VERIFICATION (NON-RUNNING)

VFDs with ISM requires low voltage controls verification. The PIC software monitors VFD Target Speed (VFD_Out; J8B-1,2), VFD Speed Feedback (VFD_In; J6-1,2); it will declare abnormal condition Alarm if the VFD Target Speed and Actual VFD speed differs by greater than ±10%. The ISM outputs a 4-20 mA target speed signal to the drive from terminal J8B-1. The speed output and the actual drive frequency need to be calibrated to match along the speed curve. This low calibration is done with the drive in "Low Voltage Test Mode" or without the power leads connected to the motor so the chiller cannot start.

Go to ***MAINTENANCE MENU →ISM CALIBRATION → J8B 4-20 MA OUTPUT. ENABLE*** calibration and set for 20 mA signal. Record and enter actual mA signal as received by VFD or mA meter and execute. Then go to VFD status screen and verify that the Target VFD speed is 100.0%. It will now need to be confirmed that the target VFD speed is 100% at the drive. Then the Actual VFD Speed is verified on the PIC (this is the VFD Speed Feedback of 5 or 10 vdc (depending on selection) vdc to input of the ISM is J6-1,2. If the Target and Actual VFD Speed values are different when given a 100% target speed signal and after the signal at the VFD panel is confirmed to be 60 Hz (50 Hz), then the output voltage from the drive can be calibrated to match the actual voltage being read at ISM terminals J6-1,2 (***MAINTENANCE MENU →ISM CALIBRATION → J6 0-10V INPUT***). The chiller must be shut down to enable ISM Calibration.

Upon successful calibrating the drive and the ISM setting at the 100% target speed repeat at speed settings 90%, 80% and 70%. See Table 12.

**Table 12 — Calibration Settings**

| SIGNAL J8B (4-20 mA) | TARGET SPEED (%) | FREQ (50 Hz), Hz | FREQ (60 Hz), Hz |
|---|---|---|---|
| **20.0** | 100 | 50 | 60 |
| **18.4** | 90 | 45 | 54 |
| **16.8** | 80 | 40 | 48 |
| **15.2** | 70 | 35 | 42 |

Procedure is complete when for all points the Target VFD % matches the Actual VFD Speed % as obtained from the PIC5 VFD Status screen matches within 5% or better.

## 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 55, and High Altitude Locations, page 55.

Quick Calibration, which is also located in the Main Menu, is used to calibrate inlet guide vanes and devices with 4-20mA feedback. Calibration is mandatory for chiller function and controls will not allow the chiller to start if calibration is not completed.

## Check Optional Pumpout System Controls and Compressor

Controls include an on/off switch, a 0.5-amp fuse, the compressor overloads, an internal thermostat, a compressor contactor, refrigerant low pressure cut-out, and a refrigerant high pressure cutout. The high pressure cutout is factory set to open at 185 psig (1276 kPa) and reset at 140 psig (965 kPa). The low pressure cutout is factory set to open at 7 psia (–15.7 in. HG) and close at 9 psia (–11.6 in. HG). Ensure the water-cooled condenser has been connected. Ensure oil is visible in the compressor sight glass. Add oil if necessary.

See the Pumpout and Refrigerant Transfer Procedures and Optional Pumpout System Maintenance sections, pages 39 and 50, for details on the transfer of refrigerant, oil specifications, etc.

## 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. 33 and 34 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. 33 and 34. 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 55.

**⚠ 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. 33 and 34, 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 or 39 psig (268 kPa) for R-513A. 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. 33 and 34, 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 or consult chiller nameplates.

If low load oil loss is experienced, operate the chiller at low load with the guide vanes nearly closed and observe the flow through the sight glass in the oil skimmer line. Under low load operation one should be able to see a flow of bubbly oil and refrigerant in the sight glass. If there is no visible flow, add refrigerant. If the sight glass shows a flow of nearly clear fluid remove refrigerant.

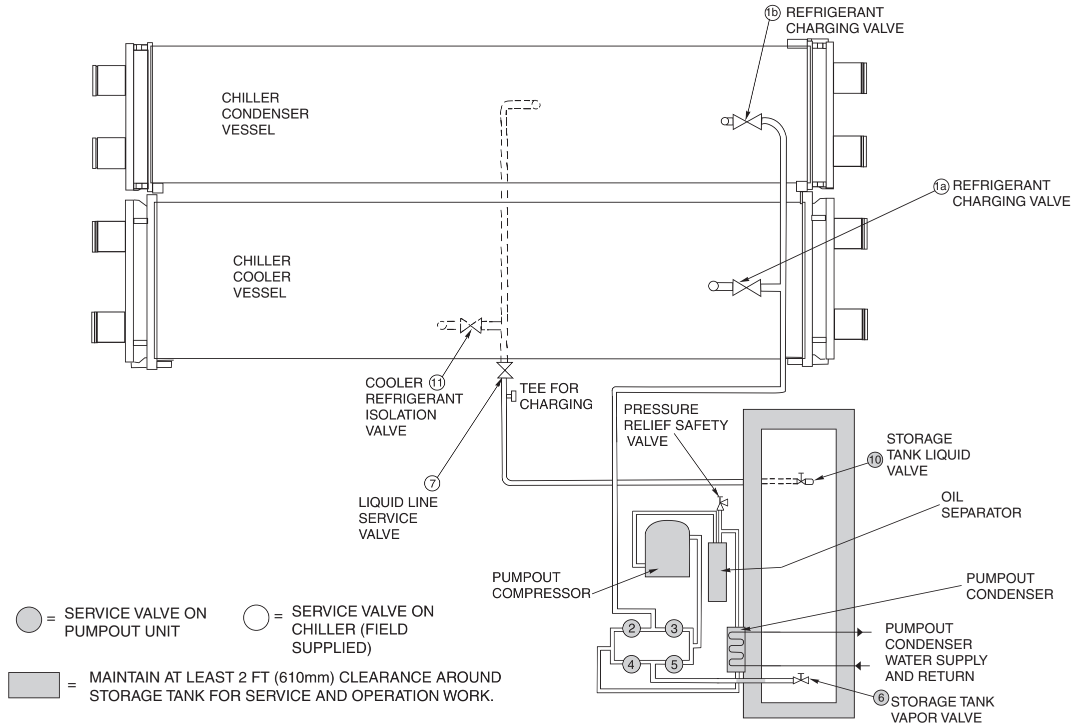



**Fig. 33 — Typical Optional Pumpout System Piping Schematic with Storage Tank**

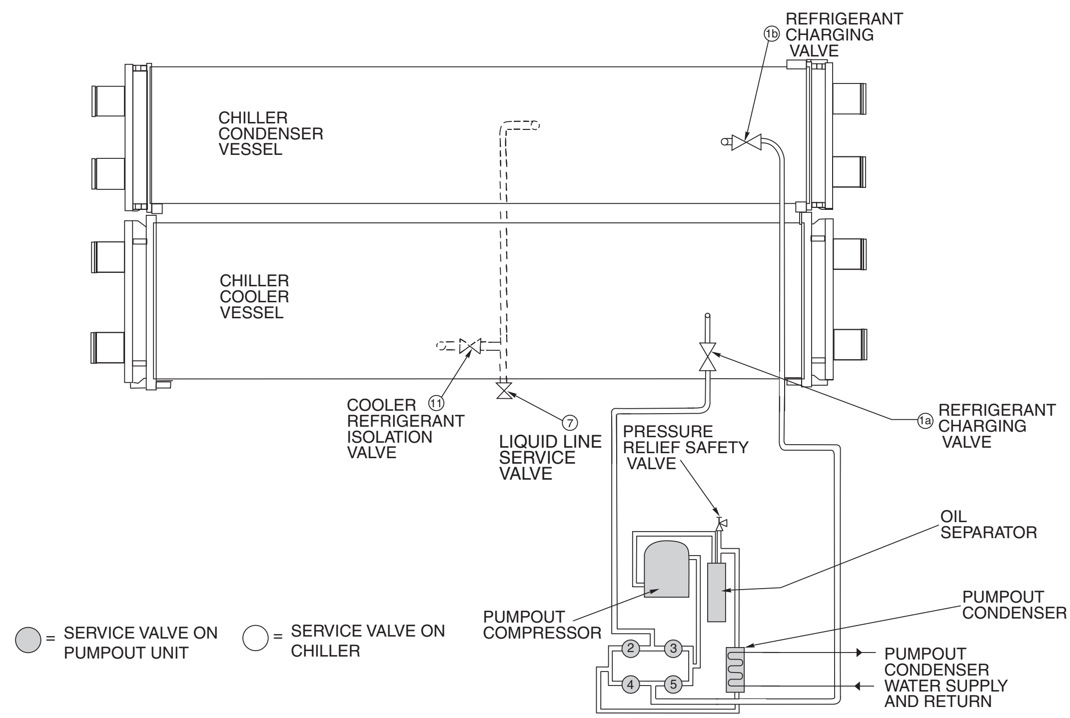



**Fig. 34 — Typical Free-Standing Pumpout System Piping Schematic without Storage Tank**

## INITIAL START-UP

IMPORTANT: Startup engineer is to be properly certified for the starter/VFD. Extended VFD warranty may be affected.

### 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 and water pressure differentials are equal to unit design. 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 starter checks for proper phase rotation as soon as power is applied to the starter and the PIC 6 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 6 control performs start-up checks.
6. When the starter is energized and the motor begins to turn, check for clockwise motor rotation (Fig. 35).

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.

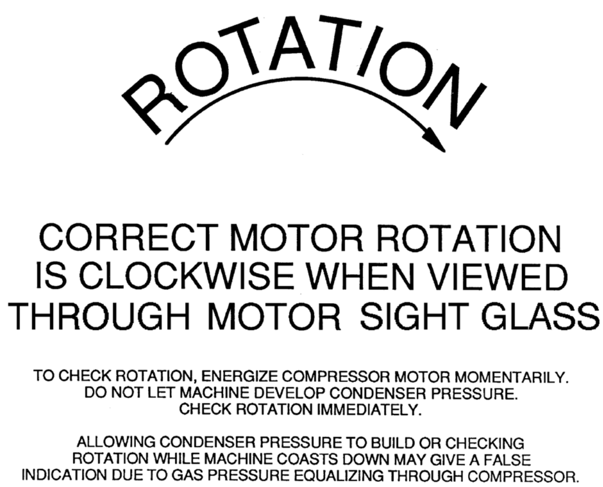



**Fig. 35 — Correct Motor Rotation**

### 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) understands 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 PUMP-OUT 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.

NOTE: Manuals and notebooks should not be stored under the VFD power module as they will block airflow into the power module cooling fan. Remove the manuals if they were placed under the power module during shipping.

## 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 37.

### 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 19.

### 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. For 19XR2-E: The bearing oil temperature accessed on the TEMP screen should be 120 to 165°F (49 to 74°C) for compressors with rolling element bearings. If the bearing temperature reads more than 180°F (83°C) with the oil pump running, stop the chiller and determine the cause of the high temperature. *Do not restart* chiller until corrected.
   For 19XR6/7: 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* 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 19. 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* 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 39) 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.

For season chiller shutdown and lay-up, if the treated water is not drained then provisions should be made to start the pumps weekly to circulate the water and avoid corrosion. Consult the water treatment company for details. Carrier is not responsible for waterside corrosion.

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 21.

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 6 Controls Operation and Troubleshooting guide.

## Refrigeration Log

A refrigeration log (as shown in Fig. 36), 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. 36. 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TIME | REFRIGERANT | | FLOW | TEMP. | | REFRIGERANT | | FLOW | TEMP. | | REFRIG. | BEARING TEMPS. | | | | OIL | | | MOTOR | | |
| | 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) | | |
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REMARKS: Indicate shutdowns on safety controls, repairs made, and oil or refrigerant added or removed. Include amounts.

**Fig. 36 — 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. 37)

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 50. The pumpout unit control wiring schematic is detailed in Fig. 38.

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. 3-5).
2. To determine pumpout storage tank pressure, a 30 in. Hg vacuum -0-400 psi (101-0-2758 kPa) gage is attached to the storage tank.
3. Refer to Fig. 33 and 34 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 33 and 34 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.

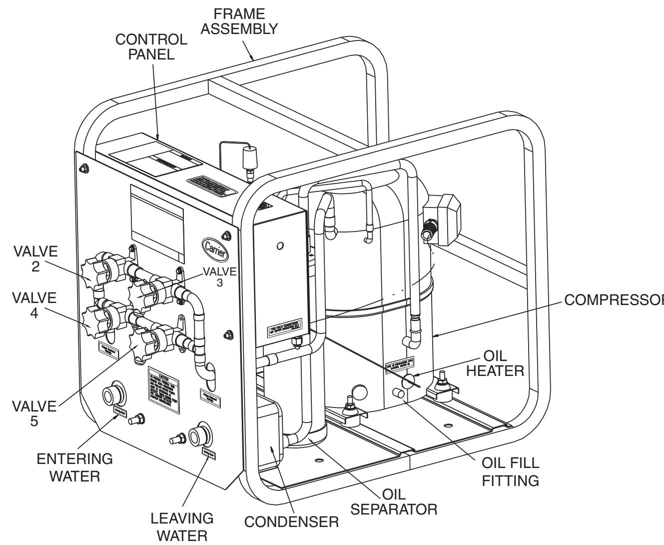



**Fig. 37 — Pumpout Unit**

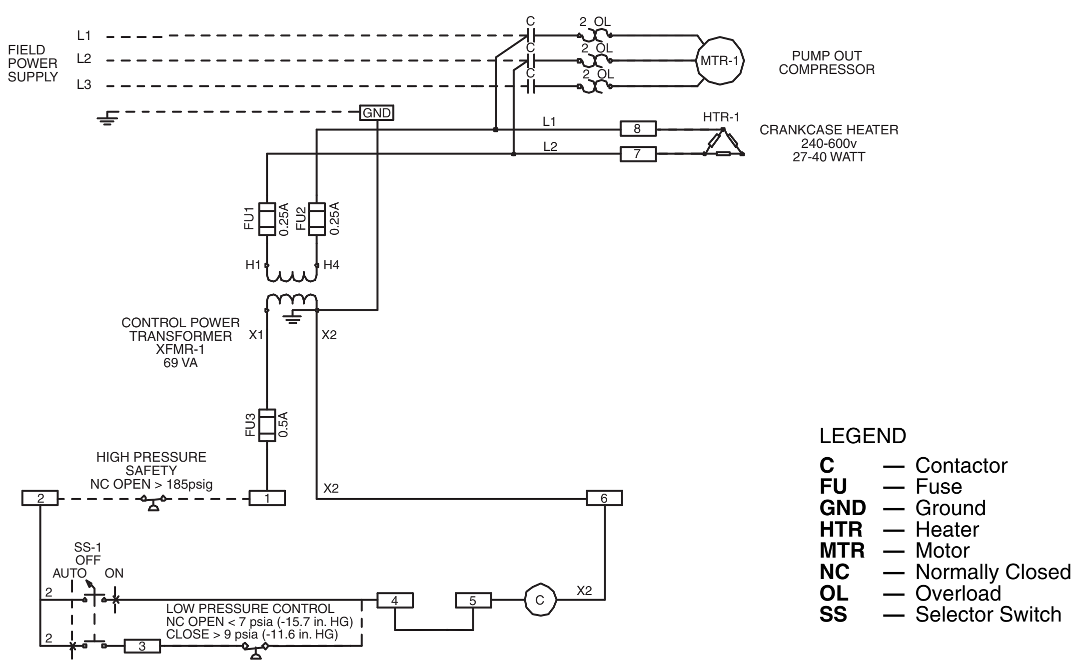



**Fig. 38 — Pumpout Unit Wiring Schematic**

### *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. 33 and 34. 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 42.
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 refrigerants for the 19XR chiller are HFC-134a/R-513A. At normal atmospheric pressure, HFC-134a/R-513A will boil at –14°F (–25°C)/ –28°F (–33°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/R-513A 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, this page.

**⚠ 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 35 psig (241 kPa) for HFC-134a or 39 psig (268 kPa) for R-513A.

### 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 44.

### 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 23 to perform a leak test.

**⚠ WARNING**

HFC-134a/HFO-513A 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 23 and 25) 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. 39-43):

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.)

### 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 42.

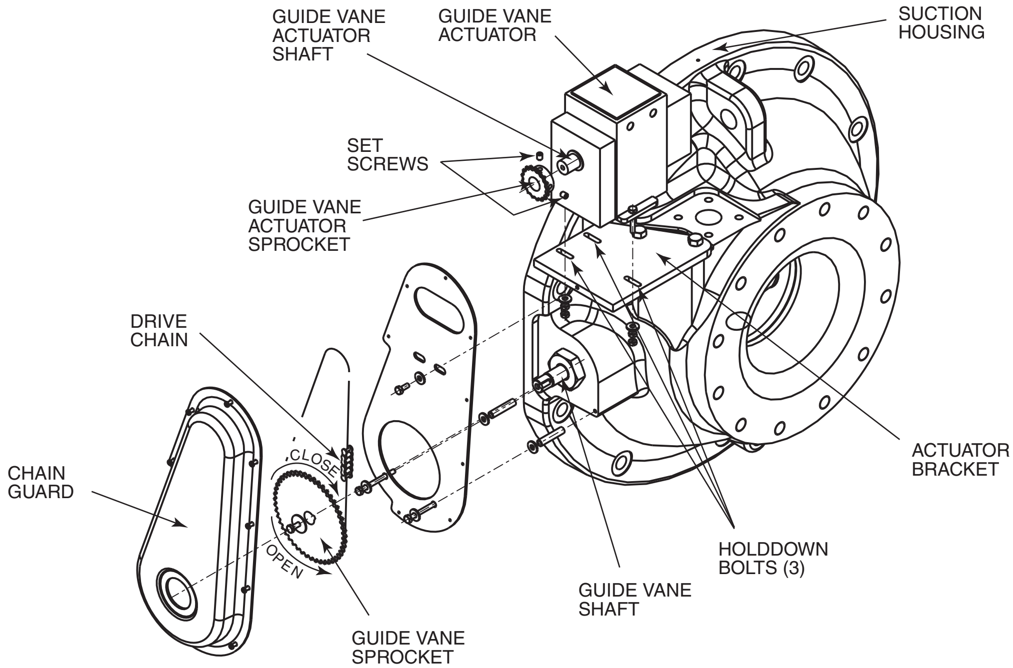



**Fig. 39 — 19XR2,3,4,5,E Guide Vane Actuator Linkage**

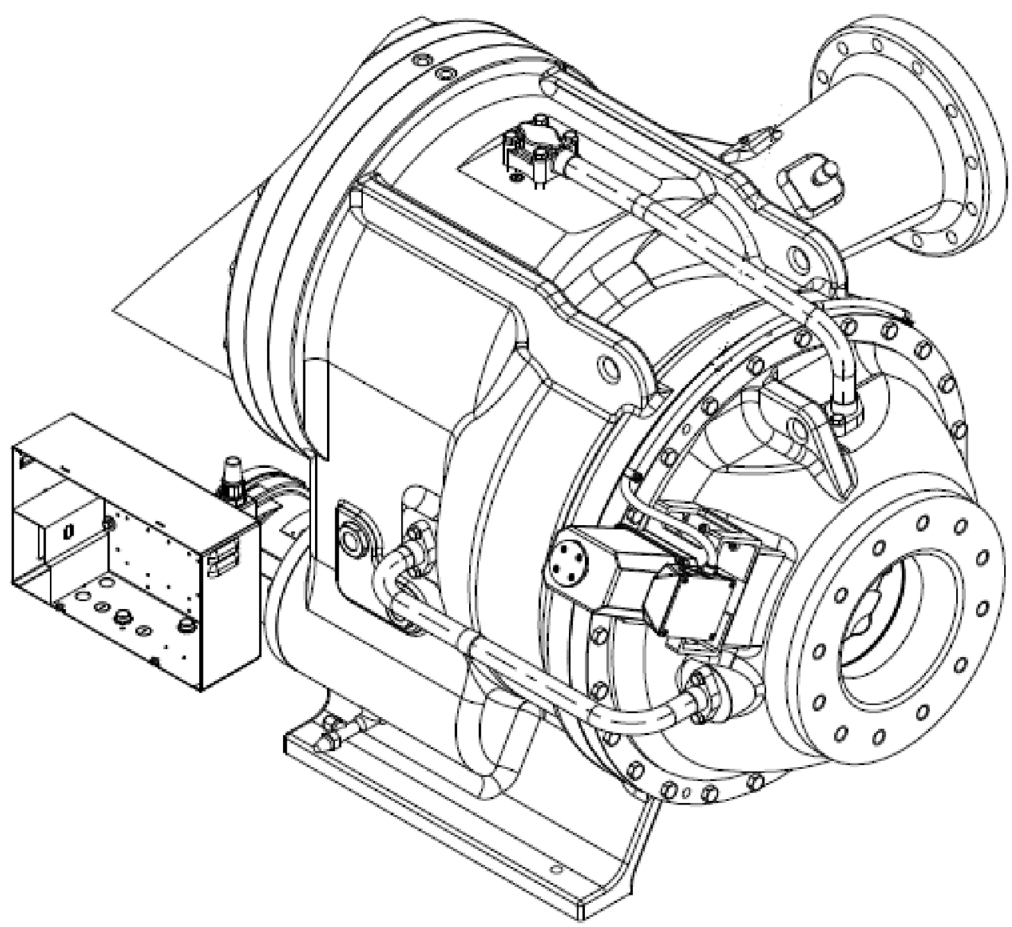


**Fig. 40 — Guide Vane Actuator, Frame Size C**

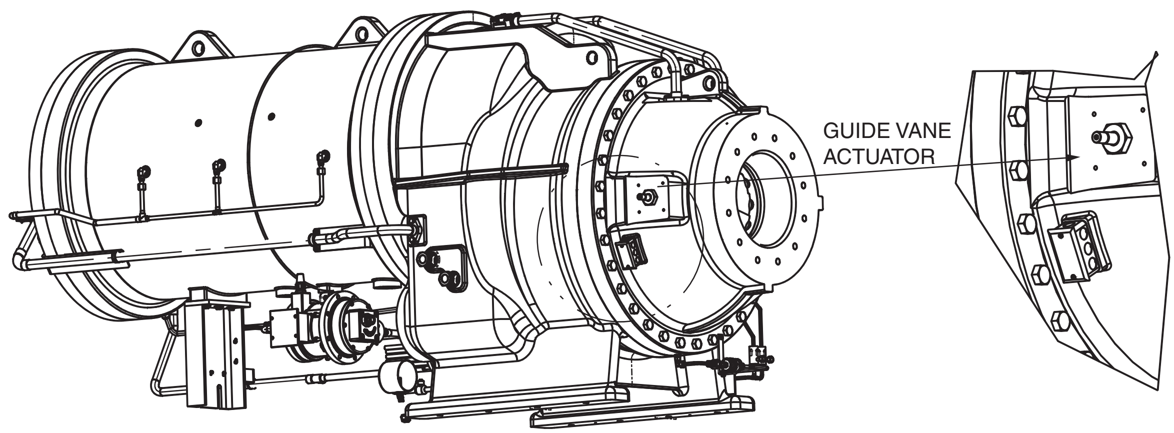



**Fig. 41 — Guide Vane Actuator, Frame Size 6**

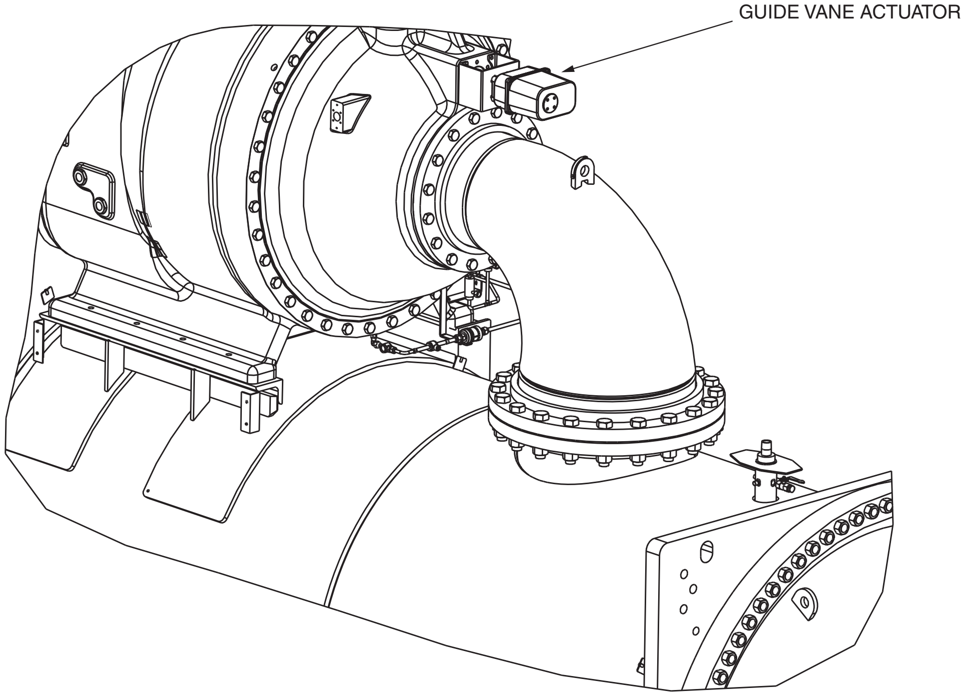
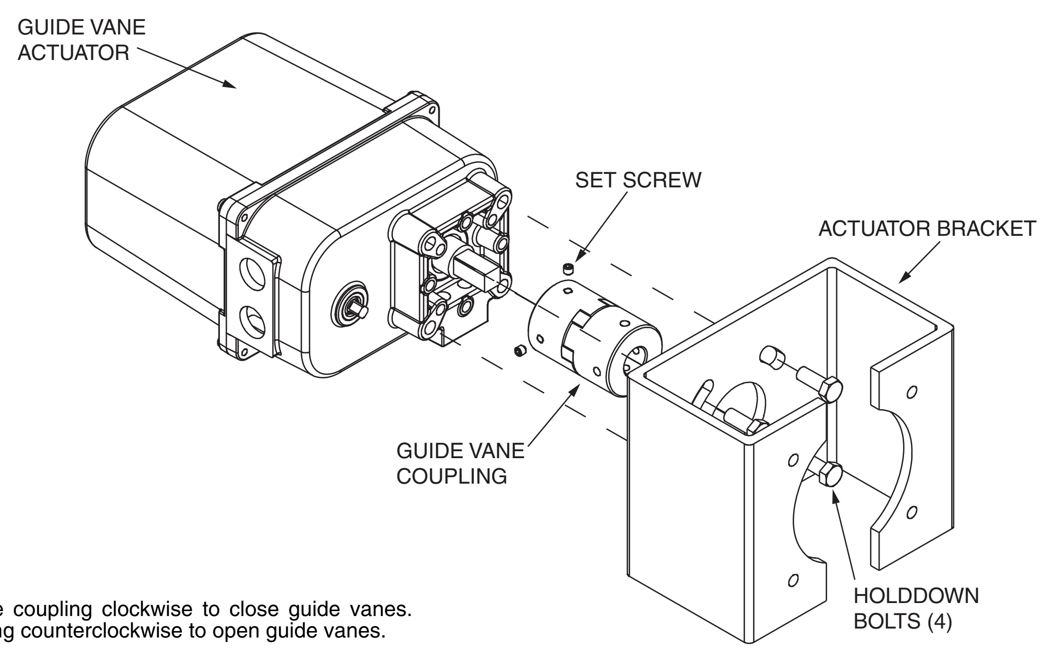



**Fig. 42 — Guide Vane Actuator, Frame Size 7**




NOTE: Rotate coupling clockwise to close guide vanes.
Rotate coupling counterclockwise to open guide vanes.

**Fig. 43 — Guide Vane Actuator Detail for XRC, XR6, XR7 (Typical)**

## 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. 3-5). A pump is required when adding oil against refrigerant pressure. See "Oil Charge" on page 28 for 19XR compressor family oil charge.

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 6 control system to maintain oil temperature (see the 19XR with PIC 6 Controls Operation and Troubleshooting manual) when the compressor is off. If the PIC 6 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 6 control system does not permit compressor start-up if the oil temperature is too low. The PIC 6 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 51 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/R-513A, 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 preventive 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. 3-5). 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 6 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. 3-5) 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.

## VFD Refrigerant Strainer (if equipped)

A refrigerant strainer is located in the 5/8 in. line that supplies refrigerant to the VFD. The strainer should be replaced once a year or more often if the strainer condition indicates a need for more frequent replacement. Change the filter by closing the refrigerant cooling line isolation valves. Refrigerant pressure can be relieved through access valves on the strainer housing. Tighten 5/8 in. flare nuts to 55 to 66 ft-lb (75 to 89 Nm).

## 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.

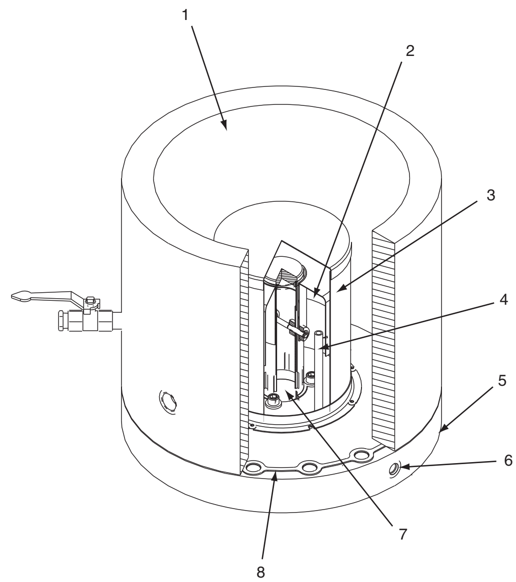
- There is a simultaneous drop in cooler pressure and increase in condenser pressure. This will be accompanied by an increase in kW/Ton.
- The liquid line downstream of the float valve feels warm. This indicates condenser gas flowing past the float. An increase in kW/Ton will also occur.

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. For linear style float valves inspect the orientation of the float slide pin. It must be pointed toward the bubbler tube for proper operation.

Note there are two styles of float valves in use on the 19XR product line. Linear float valve (Fig 44) and ball float valves (Fig. 45).

ECONOMIZER FLOAT SYSTEM (IF EQUIPPED)

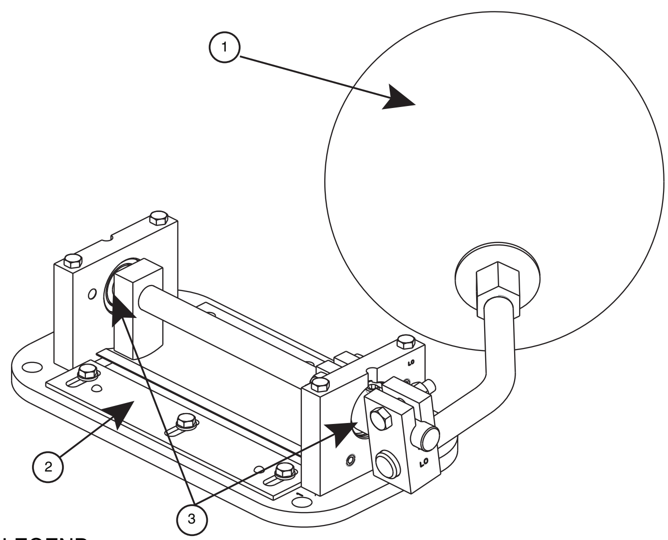
For two-stage compressors, the economizer has a low side ball type float system. The float refrigerant level can be observed through the two sight glasses located on the float cover under the condenser. See Fig. 45 for float detail. Inspect the float every five years. Clean the chamber and the float valve assembly. Be sure that the float moves freely and the ball bearings that the float moves on are clean.




LEGEND

**1** — Refrigerant Inlet from FLASC Chamber
**2** — Linear Float Assembly
**3** — Float Screen
**4** — Bubbler Line
**5** — Float Cover
**6** — Bubbler Line Connection
**7** — Refrigerant Outlet to Cooler
**8** — Gasket

**Fig. 44 — Linear Float Valve Design**



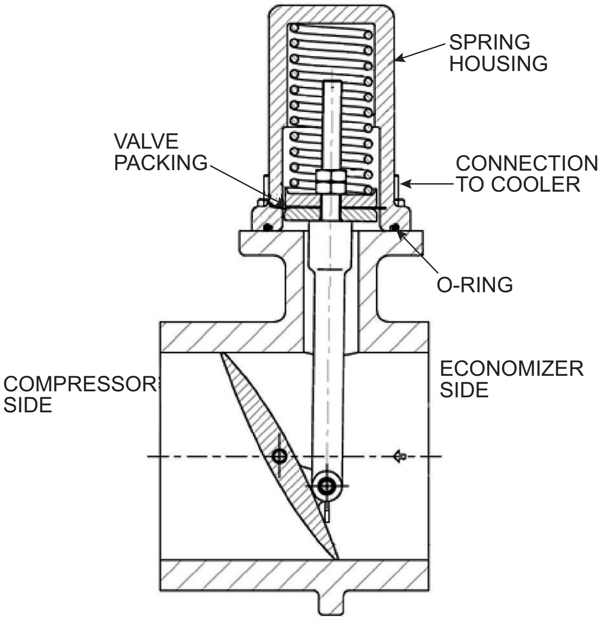

LEGEND

**1** — Float Ball
**2** — Refrigerant Exit
**3** — Bearings

**Fig. 45 — Economizer Float System (Two-Stage Compressor Chiller)**

ECONOMIZER DAMPER VALVE

The damper valve operation should be inspected annually (external inspection) and internally when the refrigerant is removed and it has been more than 5 years since last inspection or initial start-up. See Fig. 46 for economizer damper valve detail.




NOTE: Two Stage 19XR6-7 utilizes an electrical actuated butterfly valve as damper valve.

**Fig. 46 — Economizer Damper Valve (Two-Stage 19XRC, E 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. Confirm that there is no foreign debris from the system that could have lodged in the tubes potentially resulting in tube failure. 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. Confirm that there is no foreign debris from the system that could have lodged in the tubes potentially resulting in tube failure. 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. 3-5) 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 25.

## 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 or VFD

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/VFD 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.

**⚠ WARNING**

Never open isolating knife switches while equipment is operating. Electrical arching can cause serious injury.

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 55.

## 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. 47)

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.

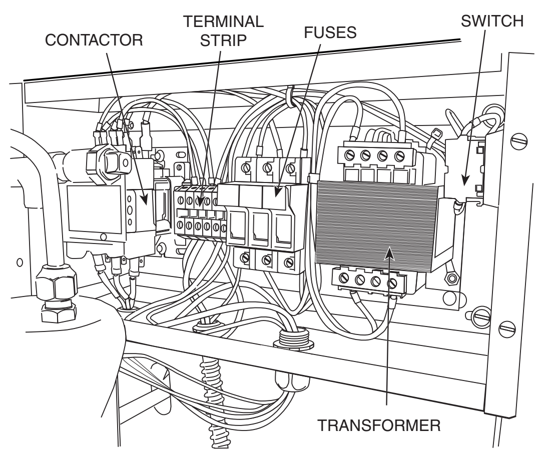



**Fig. 47 — Pumpout Control Box (Interior)**

## 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 6 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 6 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 6 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 6 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 13 and 14. The water temperature sensors can be calibrated to a value of ± 2.0°F (1.2°C).

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 13 and 14. 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 13 and 14 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 13 — Thermistor Temperature (F) vs. Resistance/Voltage Drop

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

## Table 14 — 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 6 control module, MAINTENANCE menu, offers a water 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. 3-5 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. 48-50.

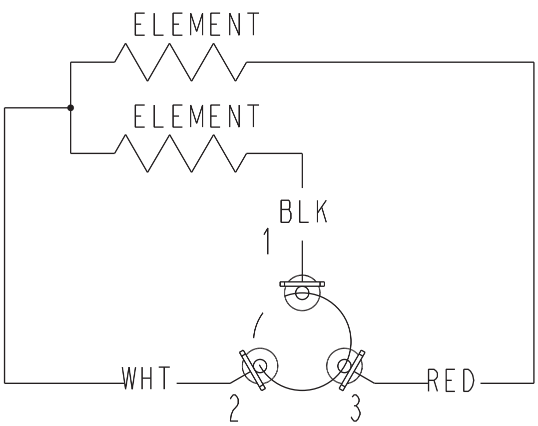



**Fig. 48 — 19XR2-E Thrust-Bearing Sensor**

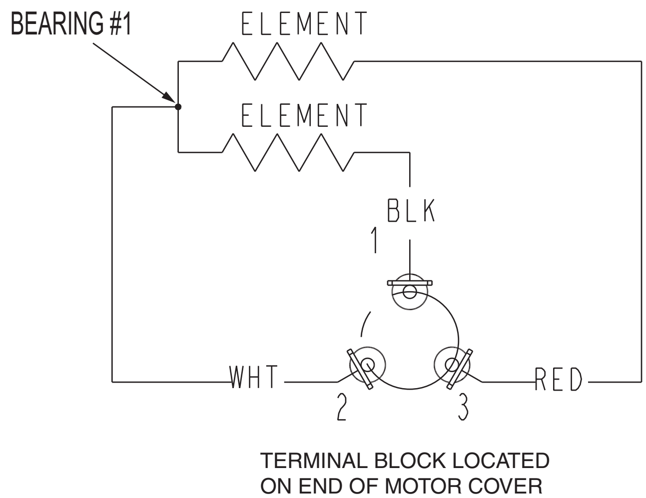



**Fig. 49 — Bearing 1 Sensor Wiring from Back of Terminal Block (XR6/7 only)**

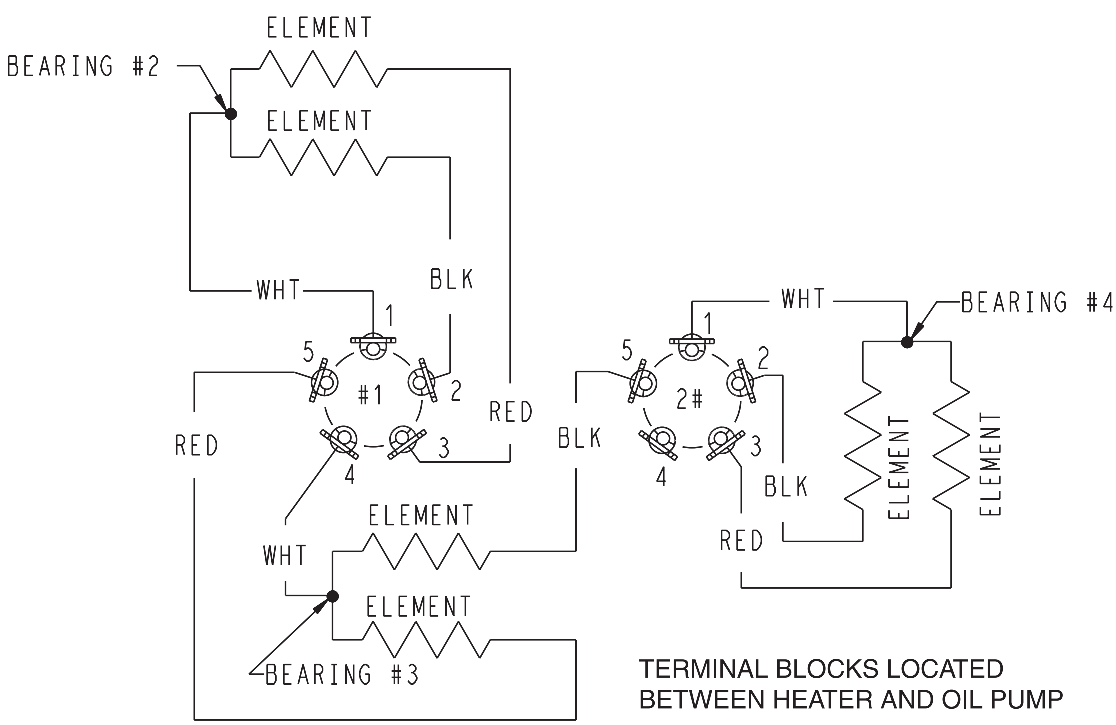



**Fig. 50 — Bearings 2-4 Sensor Wiring from Back of Terminal Block (XR6/7 only)**

## Checking Pressure Transducers

There are 4 typically factory-installed pressure transducers measuring refrigerant and oil pressure and, if equipped, 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.

PRESSURE 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. 51. Installation of pressure transducers into water nozzles using flushable dirt leg trap is suggested; see Fig. 52. Connect pressure transducer to Schrader connection. To enable this option, IOB4 must be activated and the Option must be selected in the Option Configuration menu. 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 6 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 6 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 test guide vanes, 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. Note that prior to Quick Test, components with feedback needs to be calibrated in Quick Calibration.

## 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 15-45 and Fig. 53-69 provide additional information on component weights, compressor fits and clearances, physical and electrical data, and wiring schematics for the operator's convenience during troubleshooting.

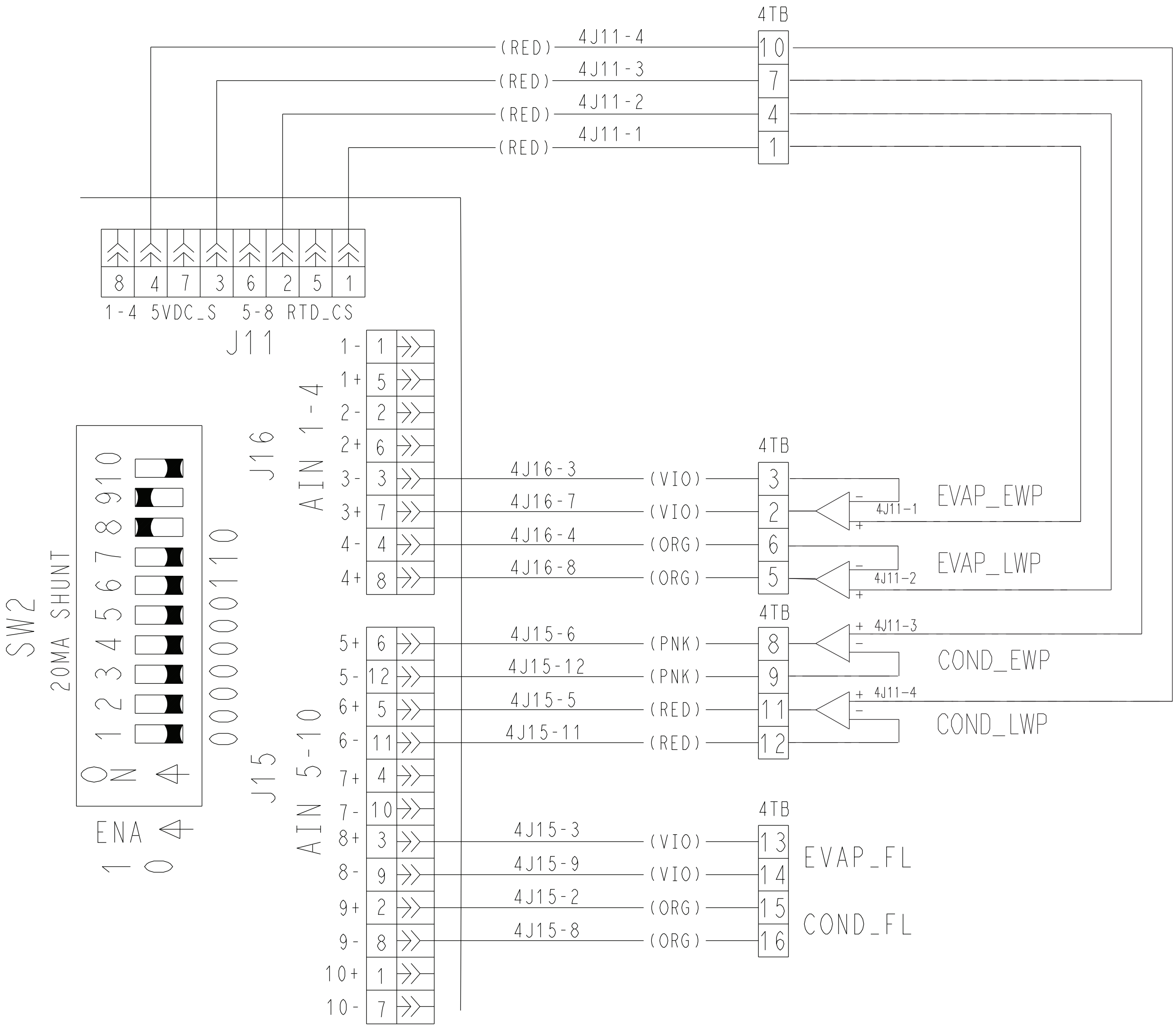



**Fig. 51 — Inputs for Optional Waterside Delta P Transducers for IOB4**

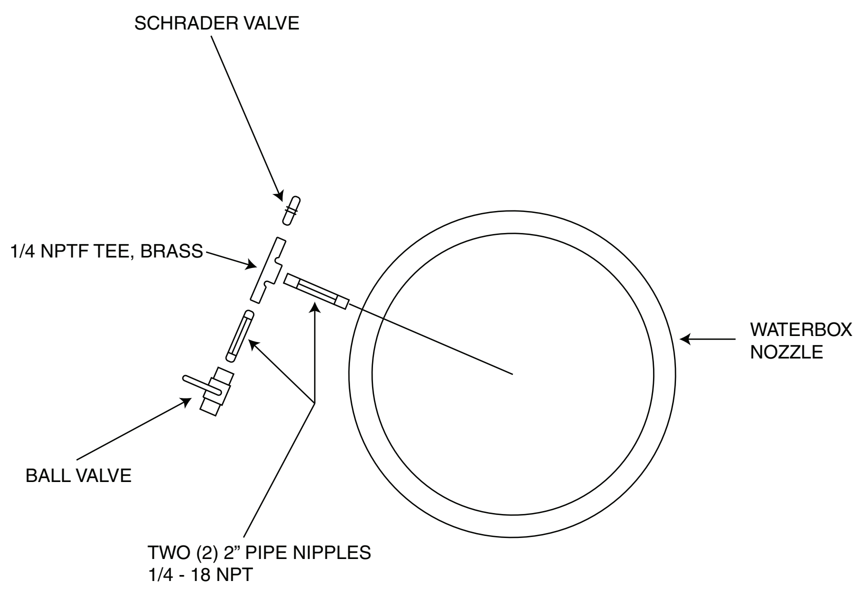



**Fig. 52 — Suggested Installation of Pressure Transducers into Water Nozzles Using Flushable Dirt Leg Trap**

## Table 15 — 19XR Heat Exchanger Weights

| CODE † | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dry Rigging Weight (lb) * | | Machine Charge | | | | Dry Rigging Weight (kg) * | | Machine Charge | | | |
| | Evaporator Only | Condenser Only | Refrigerant Weight (lb) | | Water Weight (lb) | | Evaporator Only | Condenser Only | Refrigerant Weight (kg) | | Water Weight (kg) | |
| | | | Evaporator | Condenser | Evaporator | Condenser | | | Evaporator | Condenser | Evaporator | Condenser |
| **20** | 3407 | 3373 | 416 | 252 | 402 | 398 | 1547 | 1531 | 189 | 114 | 183 | 181 |
| **21** | 3555 | 3540 | 459 | 252 | 456 | 462 | 1614 | 1607 | 208 | 114 | 207 | 210 |
| **22** | 3711 | 3704 | 505 | 252 | 514 | 526 | 1685 | 1682 | 229 | 114 | 233 | 239 |
| **30** | 4071 | 3694 | 510 | 308 | 464 | 464 | 1848 | 1677 | 232 | 140 | 211 | 211 |
| **31** | 4253 | 3899 | 565 | 308 | 531 | 543 | 1931 | 1770 | 257 | 140 | 241 | 247 |
| **32** | 4445 | 4100 | 626 | 308 | 601 | 621 | 2018 | 1861 | 284 | 140 | 273 | 282 |
| **35** | 4343 | 4606 | 577 | 349 | 511 | 513 | 1972 | 2091 | 262 | 158 | 232 | 233 |
| **36** | 4551 | 4840 | 639 | 349 | 587 | 603 | 2066 | 2197 | 290 | 158 | 266 | 274 |
| **37** | 4769 | 5069 | 709 | 349 | 667 | 692 | 2165 | 2301 | 322 | 158 | 303 | 314 |
| **40** | 4908 | 5039 | 726 | 338 | 863 | 915 | 2228 | 2288 | 330 | 153 | 392 | 415 |
| **41** | 5078 | 5232 | 783 | 338 | 930 | 995 | 2305 | 2375 | 355 | 153 | 422 | 452 |
| **42** | 5226 | 5424 | 840 | 338 | 990 | 1074 | 2373 | 2462 | 381 | 153 | 449 | 488 |
| **45** | 5363 | 5602 | 821 | 383 | 938 | 998 | 2435 | 2543 | 373 | 174 | 426 | 453 |
| **46** | 5559 | 5824 | 874 | 383 | 1014 | 1088 | 2524 | 2644 | 397 | 174 | 460 | 494 |
| **47** | 5730 | 6044 | 949 | 383 | 1083 | 1179 | 2601 | 2744 | 431 | 174 | 492 | 535 |
| **50** | 5713 | 6090 | 897 | 446 | 1101 | 1225 | 2594 | 2765 | 407 | 202 | 500 | 556 |
| **51** | 5940 | 6283 | 974 | 446 | 1192 | 1304 | 2697 | 2852 | 442 | 202 | 541 | 592 |
| **52** | 6083 | 6464 | 1021 | 446 | 1248 | 1379 | 2762 | 2935 | 464 | 202 | 567 | 626 |
| **53** | 6141 | 6529 | 1010 | 446 | 1277 | 1409 | 2788 | 2964 | 459 | 202 | 580 | 640 |
| **54** | 6192 | 6591 | 987 | 446 | 1302 | 1439 | 2811 | 2992 | 448 | 202 | 591 | 653 |
| **55** | 6257 | 6785 | 1014 | 504 | 1201 | 1339 | 2841 | 3080 | 460 | 229 | 545 | 608 |
| **56** | 6517 | 7007 | 1101 | 504 | 1304 | 1429 | 2959 | 3181 | 500 | 229 | 592 | 649 |
| **57** | 6682 | 7215 | 1154 | 504 | 1369 | 1514 | 3034 | 3276 | 524 | 229 | 622 | 687 |
| **58** | 6751 | 7291 | 1143 | 504 | 1401 | 1550 | 3065 | 3310 | 519 | 229 | 636 | 704 |
| **59** | 6811 | 7363 | 1116 | 504 | 1430 | 1583 | 3092 | 3343 | 507 | 229 | 649 | 719 |
| **5A** | 5124 | — | 491 | — | 1023 | — | 2326 | — | 223 | — | 464 | — |
| **5B** | 5177 | — | 510 | — | 1050 | — | 2350 | — | 232 | — | 477 | — |
| **5C** | 5243 | — | 532 | — | 1079 | — | 2380 | — | 242 | — | 490 | — |
| **5F** | 5577 | — | 553 | — | 1113 | — | 2532 | — | 251 | — | 505 | — |
| **5G** | 5640 | — | 575 | — | 1143 | — | 2561 | — | 261 | — | 519 | — |
| **5H** | 5716 | — | 600 | — | 1176 | — | 2595 | — | 272 | — | 534 | — |
| **5K** | 4993 | — | 673 | — | 1067 | — | 2267 | — | 306 | — | 484 | — |
| **5L** | 5090 | — | 706 | — | 1118 | — | 2311 | — | 321 | — | 508 | — |
| **5M** | 5165 | — | 742 | — | 1162 | — | 2345 | — | 337 | — | 528 | — |
| **5P** | 5041 | — | 641 | — | 1111 | — | 2289 | — | 291 | — | 504 | — |
| **5Q** | 5131 | — | 678 | — | 1155 | — | 2329 | — | 308 | — | 524 | — |
| **5R** | 5214 | — | 709 | — | 1206 | — | 2367 | — | 322 | — | 548 | — |
| **5T** | 5425 | — | 768 | — | 1162 | — | 2463 | — | 349 | — | 528 | — |
| **5U** | 5534 | — | 801 | — | 1220 | — | 2512 | — | 364 | — | 554 | — |
| **5V** | 5620 | — | 843 | — | 1270 | — | 2551 | — | 383 | — | 577 | — |
| **5X** | 5484 | — | 730 | — | 1212 | — | 2490 | — | 331 | — | 550 | — |
| **5Y** | 5584 | — | 769 | — | 1262 | — | 2535 | — | 349 | — | 573 | — |
| **5Z** | 5678 | — | 805 | — | 1320 | — | 2578 | — | 365 | — | 599 | — |
| **60** | 6719 | 6764 | 1091 | 479 | 1400 | 1521 | 3050 | 3071 | 495 | 217 | 636 | 691 |
| **61** | 6895 | 6949 | 1150 | 479 | 1470 | 1597 | 3130 | 3155 | 522 | 217 | 667 | 725 |
| **62** | 7038 | 7130 | 1202 | 479 | 1527 | 1671 | 3195 | 3237 | 546 | 217 | 693 | 759 |
| **63** | 7103 | 7199 | 1202 | 479 | 1559 | 1704 | 3225 | 3268 | 546 | 217 | 708 | 774 |
| **64** | 7161 | 7264 | 1178 | 479 | 1587 | 1735 | 3251 | 3298 | 535 | 217 | 720 | 788 |
| **65** | 7392 | 6782 | 1241 | 542 | 1530 | 1667 | 3356 | 3079 | 563 | 246 | 695 | 757 |
| **66** | 7594 | 7894 | 1309 | 542 | 1610 | 1753 | 3448 | 3584 | 594 | 246 | 731 | 796 |
| **67** | 7759 | 8102 | 1369 | 542 | 1674 | 1838 | 3523 | 3678 | 622 | 246 | 760 | 834 |
| **68** | 7836 | 8182 | 1359 | 542 | 1711 | 1875 | 3558 | 3715 | 617 | 246 | 777 | 851 |
| **69** | 7905 | 8258 | 1332 | 542 | 1743 | 1911 | 3589 | 3749 | 605 | 246 | 791 | 868 |
| **6K** | 5,716 | — | 760 | — | 1291 | — | 2595 | — | 345 | — | 586 | — |
| **6L** | 5,804 | — | 797 | — | 1341 | — | 2635 | — | 362 | — | 609 | — |
| **6M** | 5,894 | — | 828 | — | 1399 | — | 2676 | — | 376 | — | 635 | — |
| **6P** | 5,768 | — | 725 | — | 1338 | — | 2619 | — | 329 | — | 607 | — |
| **6Q** | 5,852 | — | 764 | — | 1385 | — | 2657 | — | 347 | — | 629 | — |
| **6R** | 5,938 | — | 798 | — | 1439 | — | 2696 | — | 362 | — | 653 | — |
| **6T** | 6,230 | — | 863 | — | 1405 | — | 2828 | — | 392 | — | 638 | — |
| **6U** | 6,330 | — | 905 | — | 1462 | — | 2874 | — | 411 | — | 664 | — |
| **6V** | 6,433 | — | 941 | — | 1528 | — | 2921 | — | 427 | — | 694 | — |
| **6X** | 6,293 | — | 823 | — | 1459 | — | 2857 | — | 374 | — | 662 | — |
| **6Y** | 6,388 | — | 868 | — | 1512 | — | 2900 | — | 394 | — | 686 | — |
| **6Z** | 6,487 | — | 906 | — | 1574 | — | 2945 | — | 411 | — | 715 | — |
| **70** | 9,942 | 10,786 | 1409 | 840 | 2008 | 2225 | 4514 | 4897 | 640 | 381 | 912 | 1010 |
| **71** | 10,330 | 11,211 | 1539 | 840 | 2164 | 2389 | 4690 | 5090 | 699 | 381 | 982 | 1085 |
| **72** | 10,632 | 11,622 | 1646 | 840 | 2286 | 2548 | 4827 | 5276 | 747 | 381 | 1038 | 1157 |
| **73** | 10,715 | 11,737 | 1622 | 840 | 2328 | 2604 | 4865 | 5329 | 736 | 381 | 1057 | 1182 |

## Table 15 — 19XR Heat Exchanger Weights (cont)

| CODE † | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dry Rigging Weight (lb) * | | Machine Charge | | | | Dry Rigging Weight (kg) * | | Machine Charge | | | |
| | Evaporator Only | Condenser Only | Refrigerant Weight (lb) | | Water Weight (lb) | | Evaporator Only | Condenser Only | Refrigerant Weight (kg) | | Water Weight (kg) | |
| | | | Evaporator | Condenser | Evaporator | Condenser | | | Evaporator | Condenser | Evaporator | Condenser |
| 74 | 10,790 | 11,775 | 1584 | 840 | 2366 | 2622 | 4899 | 5346 | 719 | 381 | 1074 | 1190 |
| 75 | 10,840 | 11,859 | 1599 | 950 | 2183 | 2431 | 4921 | 5384 | 726 | 431 | 991 | 1104 |
| 76 | 11,289 | 12,345 | 1747 | 950 | 2361 | 2619 | 5125 | 5605 | 793 | 431 | 1072 | 1189 |
| 77 | 11,638 | 12,814 | 1869 | 950 | 2501 | 2801 | 5284 | 5818 | 849 | 431 | 1135 | 1272 |
| 78 | 11,738 | 12,949 | 1849 | 950 | 2548 | 2864 | 5329 | 5879 | 839 | 431 | 1157 | 1300 |
| 79 | 11,828 | 12,994 | 1806 | 950 | 2592 | 2885 | 5370 | 5899 | 820 | 431 | 1177 | 1310 |
| 7K | 8,728 | — | 1047 | — | 1948 | — | 3963 | — | 475 | — | 884 | — |
| 7L | 8,959 | — | 1132 | — | 2094 | — | 4067 | — | 514 | — | 951 | — |
| 7M | 9,161 | — | 1214 | — | 2229 | — | 4159 | — | 551 | — | 1012 | — |
| 7P | 8,792 | — | 1002 | — | 2010 | — | 3992 | — | 455 | — | 913 | — |
| 7Q | 9,023 | — | 1087 | — | 2156 | — | 4096 | — | 493 | — | 979 | — |
| 7R | 9,229 | — | 1167 | — | 2295 | — | 4190 | — | 530 | — | 1042 | — |
| 7T | 9,431 | — | 1194 | — | 2115 | — | 4282 | — | 542 | — | 960 | — |
| 7U | 9,698 | — | 1292 | — | 2282 | — | 4403 | — | 587 | — | 1036 | — |
| 7V | 9,932 | — | 1403 | — | 2436 | — | 4509 | — | 637 | — | 1106 | — |
| 7X | 9,510 | — | 1142 | — | 2185 | — | 4318 | — | 518 | — | 992 | — |
| 7Y | 9,777 | — | 1240 | — | 2352 | — | 4439 | — | 563 | — | 1068 | — |
| 7Z | 10,016 | — | 1347 | — | 2511 | — | 4547 | — | 612 | — | 1140 | — |
| 80 | 12,664 | 12,753 | 1700 | 836 | 2726 | 2977 | 5749 | 5790 | 772 | 380 | 1238 | 1352 |
| 81 | 12,998 | 13,149 | 1812 | 836 | 2863 | 3143 | 5901 | 5970 | 823 | 380 | 1300 | 1427 |
| 82 | 13,347 | 13,545 | 1928 | 836 | 3005 | 3309 | 6060 | 6149 | 875 | 380 | 1364 | 1502 |
| 83 | 13,437 | 13,872 | 1877 | 836 | 3053 | 3476 | 6100 | 6298 | 852 | 380 | 1386 | 1578 |
| 84 | 13,523 | 14,217 | 1840 | 836 | 3099 | 3651 | 6139 | 6455 | 835 | 380 | 1407 | 1658 |
| 85 | 13,804 | 14,008 | 1927 | 945 | 2951 | 3238 | 6267 | 6360 | 875 | 429 | 1340 | 1470 |
| 86 | 14,191 | 14,465 | 2054 | 945 | 3108 | 3428 | 6443 | 6567 | 933 | 429 | 1411 | 1556 |
| 87 | 14,597 | 14,923 | 2186 | 945 | 3271 | 3618 | 6627 | 6775 | 992 | 429 | 1485 | 1643 |
| 88 | 14,705 | 15,311 | 2142 | 945 | 3325 | 3608 | 6676 | 6951 | 972 | 429 | 1510 | 1638 |
| 89 | 14,808 | 15,721 | 2099 | 945 | 3378 | 4009 | 6723 | 7137 | 953 | 429 | 1534 | 1820 |
| 8K | 11,153 | — | 1385 | — | 2760 | — | 5063 | — | 629 | — | 1253 | — |
| 8L | 11,400 | — | 1484 | — | 2926 | — | 5176 | — | 674 | — | 1328 | — |
| 8M | 11,650 | — | 1589 | — | 3088 | — | 5289 | — | 721 | — | 1402 | — |
| 8P | 11,219 | — | 1334 | — | 2830 | — | 5093 | — | 606 | — | 1285 | — |
| 8Q | 11,470 | — | 1430 | — | 2999 | — | 5207 | — | 649 | — | 1362 | — |
| 8R | 11,719 | — | 1535 | — | 3161 | — | 5320 | — | 697 | — | 1435 | — |
| 8T | 12,069 | — | 1580 | — | 2991 | — | 5479 | — | 717 | — | 1358 | — |
| 8U | 12,357 | — | 1694 | — | 3180 | — | 5610 | — | 769 | — | 1444 | — |
| 8V | 12,645 | — | 1814 | — | 3365 | — | 5741 | — | 824 | — | 1528 | — |
| 8X | 12,152 | — | 1522 | — | 3070 | — | 5517 | — | 691 | — | 1394 | — |
| 8Y | 12,444 | — | 1632 | — | 3264 | — | 5650 | — | 741 | — | 1482 | — |
| 8Z | 12,733 | — | 1752 | — | 3448 | — | 5781 | — | 795 | — | 1565 | — |
| A40 | 16,877 | 18,542 | 1647 | 927 | 4328 | 4553 | 7655 | 8 410 | 747 | 420 | 1963 | 2065 |
| A41 | 17,270 | 19,062 | 1773 | 927 | 4557 | 4890 | 7833 | 8 646 | 804 | 420 | 2067 | 2218 |
| A42 | 17,690 | 19,565 | 1887 | 927 | 4816 | 5213 | 8024 | 8 875 | 856 | 420 | 2184 | 2365 |
| A45 | 16,968 | 18,493 | 1599 | 927 | 4453 | 4582 | 7697 | 8 388 | 725 | 420 | 2020 | 2078 |
| A46 | 17,371 | 19,063 | 1714 | 927 | 4701 | 4949 | 7879 | 8 647 | 777 | 420 | 2132 | 2245 |
| A47 | 17,761 | 19,578 | 1837 | 927 | 4941 | 5281 | 8056 | 8 880 | 833 | 420 | 2241 | 2395 |
| A60 | 18,354 | 20,139 | 1878 | 1074 | 4721 | 5029 | 8325 | 9 135 | 852 | 487 | 2141 | 2281 |
| A61 | 18,807 | 20,745 | 2022 | 1074 | 4984 | 5415 | 8531 | 9 410 | 917 | 487 | 2261 | 2456 |
| A62 | 19,295 | 21,330 | 2152 | 1074 | 5280 | 5786 | 8752 | 9 675 | 976 | 487 | 2395 | 2624 |
| A65 | 18,469 | 20,095 | 1823 | 1074 | 4859 | 5060 | 8377 | 9 115 | 827 | 487 | 2204 | 2295 |
| A66 | 18,936 | 20,758 | 1954 | 1074 | 5144 | 5482 | 8589 | 9 416 | 886 | 487 | 2333 | 2487 |
| A67 | 19,389 | 21,357 | 2095 | 1074 | 5419 | 5862 | 8795 | 9 687 | 950 | 487 | 2458 | 2659 |
| A4A | 15,540 | 17,089 | 1681 | 861 | 4183 | 4524 | 7049 | 7 751 | 762 | 391 | 1897 | 2052 |
| A4B | 15,794 | 17,472 | 1792 | 861 | 4392 | 4859 | 7164 | 7 925 | 813 | 391 | 1992 | 2204 |
| A4C | 16,063 | 17,812 | 1897 | 861 | 4615 | 5137 | 7286 | 8 079 | 860 | 391 | 2093 | 2330 |
| A4F | 15,592 | 17,076 | 1626 | 861 | 4322 | 4588 | 7072 | 7 746 | 738 | 391 | 1960 | 2081 |
| A4G | 15,845 | 17,405 | 1736 | 861 | 4531 | 4867 | 7187 | 7 895 | 787 | 391 | 2055 | 2208 |
| A4H | 16,249 | 17,821 | 1890 | 861 | 4865 | 5219 | 7370 | 8 083 | 857 | 391 | 2207 | 2367 |
| A6A | 16,465 | 18,359 | 1917 | 998 | 4555 | 4996 | 7468 | 8 328 | 870 | 453 | 2066 | 2266 |
| A6B | 16,758 | 18,806 | 2044 | 998 | 4794 | 5368 | 7601 | 8 530 | 927 | 453 | 2175 | 2435 |
| A6C | 17,070 | 19,202 | 2164 | 998 | 5050 | 5698 | 7743 | 8 710 | 982 | 453 | 2291 | 2585 |
| A6F | 16,535 | 18,356 | 1854 | 998 | 4709 | 5068 | 7500 | 8 326 | 841 | 453 | 2136 | 2299 |
| A6G | 16,829 | 18,739 | 1979 | 998 | 4948 | 5387 | 7633 | 8 500 | 898 | 453 | 2244 | 2444 |
| A6H | 17,296 | 19,225 | 2156 | 998 | 5331 | 6156 | 7845 | 8 730 | 978 | 453 | 2418 | 2792 |
| B40 | — | 21,217 | — | 1233 | — | 5850 | — | 9 624 | — | 559 | — | 2653 |
| B41 | — | 21,965 | — | 1233 | — | 6333 | — | 9 963 | — | 559 | — | 2873 |
| B42 | — | 22,581 | — | 1233 | — | 6729 | — | 10 243 | — | 559 | — | 3052 |
| B45 | — | 21,173 | — | 1233 | — | 5904 | — | 9 604 | — | 559 | — | 2678 |
| B46 | — | 21,909 | — | 1233 | — | 6379 | — | 9 938 | — | 559 | — | 2893 |
| B47 | — | 22,653 | — | 1233 | — | 6859 | — | 10 275 | — | 559 | — | 3111 |

## Table 15 — 19XR Heat Exchanger Weights (cont)

| CODE † | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dry Rigging Weight (lb) * | | Machine Charge | | | | Dry Rigging Weight (kg) * | | Machine Charge | | | |
| | Evaporator Only | Condenser Only | Refrigerant Weight (lb) | | Water Weight (lb) | | Evaporator Only | Condenser Only | Refrigerant Weight (kg) | | Water Weight (kg) | |
| | | | Evaporator | Condenser | Evaporator | Condenser | | | Evaporator | Condenser | Evaporator | Condenser |
| **B60** | — | 23,061 | — | 1423 | — | 6464 | — | 10 460 | — | 645 | — | 2932 |
| **B61** | — | 23,932 | — | 1423 | — | 7018 | — | 10 855 | — | 645 | — | 3183 |
| **B62** | — | 24,649 | — | 1423 | — | 7473 | — | 11 181 | — | 645 | — | 3390 |
| **B65** | — | 23,022 | — | 1423 | — | 6521 | — | 10 442 | — | 645 | — | 2958 |
| **B66** | — | 23,879 | — | 1423 | — | 7066 | — | 10 831 | — | 645 | — | 3205 |
| **B67** | — | 24,745 | — | 1423 | — | 7617 | — | 11 224 | — | 645 | — | 3455 |
| **B4A** | — | 19,217 | — | 1148 | — | 5756 | — | 8 717 | — | 521 | — | 2611 |
| **B4B** | — | 19,793 | — | 1148 | — | 6243 | — | 8 978 | — | 521 | — | 2832 |
| **B4C** | — | 20,254 | — | 1148 | — | 6633 | — | 9 187 | — | 521 | — | 3009 |
| **B4F** | — | 19,217 | — | 1148 | — | 5852 | — | 8 717 | — | 521 | — | 2654 |
| **B4G** | — | 19,721 | — | 1148 | — | 6279 | — | 8 945 | — | 521 | — | 2848 |
| **B4H** | — | 20,318 | — | 1148 | — | 6785 | — | 9 216 | — | 521 | — | 3078 |
| **B6A** | — | 20,794 | — | 1326 | — | 6357 | — | 9 432 | — | 601 | — | 2883 |
| **B6B** | — | 21,465 | — | 1326 | — | 6915 | — | 9 736 | — | 601 | — | 3137 |
| **B6C** | — | 22,002 | — | 1326 | — | 7362 | — | 9 980 | — | 601 | — | 3339 |
| **B6F** | — | 20,806 | — | 1326 | — | 6462 | — | 9 487 | — | 601 | — | 2931 |
| **B6G** | — | 21,393 | — | 1326 | — | 6951 | — | 9 704 | — | 601 | — | 3153 |
| **B6H** | — | 22,088 | — | 1326 | — | 8379 | — | 10 019 | — | 601 | — | 3801 |
| **B60** | 24,704 | — | 2273 | — | 6,340 | — | 11 206 | — | 1031 | — | 2876 | — |
| **B61** | 25,337 | — | 2355 | — | 6,737 | — | 11 493 | — | 1068 | — | 3056 | — |
| **B62** | 25,964 | — | 2460 | — | 7,116 | — | 11 777 | — | 1116 | — | 3228 | — |
| **B65** | 25,014 | — | 2185 | — | 6,485 | — | 11 346 | — | 991 | — | 2941 | — |
| **B66** | 25,631 | — | 2275 | — | 6,873 | — | 11 626 | — | 1032 | — | 3118 | — |
| **B67** | 26,264 | — | 2379 | — | 7,255 | — | 11 913 | — | 1079 | — | 3291 | — |
| **B6A** | 22,819 | — | 2081 | — | 6,159 | — | 10 351 | — | 944 | — | 2794 | — |
| **B6B** | 23,299 | — | 2162 | — | 6,568 | — | 10 568 | — | 981 | — | 2979 | — |
| **B6C** | 23,829 | — | 2256 | — | 6,993 | — | 10 809 | — | 1023 | — | 3172 | — |
| **B6G** | 23,648 | — | 2019 | — | 6,774 | — | 10 727 | — | 916 | — | 3073 | — |
| **B6H** | 24,171 | — | 2120 | — | 7,194 | — | 10 964 | — | 962 | — | 3263 | — |
| **B80** | 26,184 | — | 2557 | — | 6,766 | — | 11 877 | — | 1160 | — | 3069 | — |
| **B81** | 26,922 | — | 2649 | — | 7,208 | — | 12 212 | — | 1202 | — | 3269 | — |
| **B82** | 27,627 | — | 2768 | — | 7,629 | — | 12 531 | — | 1256 | — | 3460 | — |
| **B85** | 26,438 | — | 2458 | — | 6,923 | — | 11 992 | — | 1115 | — | 3141 | — |
| **B86** | 27,157 | — | 2559 | — | 7,355 | — | 12 318 | — | 1161 | — | 3336 | — |
| **B87** | 27,868 | — | 2676 | — | 7,780 | — | 11 214 | — | 1214 | — | 3529 | — |
| **B8A** | 24,164 | — | 2341 | — | 6,580 | — | 10 952 | — | 1062 | — | 2885 | — |
| **B8B** | 24,722 | — | 2432 | — | 7,036 | — | 11 214 | — | 1103 | — | 3191 | — |
| **B8C** | 25,317 | — | 2538 | — | 7,510 | — | 11 484 | — | 1151 | — | 3406 | — |
| **B8F** | 24,403 | — | 2195 | — | 6,783 | — | 11 069 | — | 996 | — | 3077 | — |
| **B8G** | 25,011 | — | 2271 | — | 7,262 | — | 11 345 | — | 1030 | — | 3294 | — |
| **B8H** | 25,599 | — | 2385 | — | 7,731 | — | 11 612 | — | 1082 | — | 3507 | — |
| **C60** | 30,825 | 29,857 | 2647 | 1610 | 8,475 | 8,630 | 13 982 | 13 543 | 1201 | 730 | 3841 | 3914 |
| **C61** | 31,536 | 30,881 | 2751 | 1610 | 8,924 | 9,275 | 14 304 | 14 007 | 1248 | 730 | 4048 | 4207 |
| **C62** | 32,467 | 31,871 | 2875 | 1610 | 9,474 | 9,916 | 14 727 | 14 456 | 1304 | 730 | 4297 | 4498 |
| **C65** | 31,135 | 29,982 | 2562 | 1610 | 8,645 | 8,684 | 14 123 | 13 600 | 1162 | 730 | 3921 | 3939 |
| **C66** | 31,851 | 31,064 | 2666 | 1610 | 9,097 | 9,362 | 14 447 | 14 090 | 1209 | 730 | 4126 | 4247 |
| **C67** | 32,777 | 32,186 | 2793 | 1610 | 9,644 | 10,078 | 14 867 | 14 599 | 1267 | 730 | 4374 | 4571 |
| **C6A** | 28,641 | 27,676 | 2443 | 1497 | 6,898 | 8,675 | 12 991 | 12 554 | 1108 | 679 | 3129 | 3935 |
| **C6B** | 29,167 | 28,315 | 2534 | 1497 | 7,352 | 9,216 | 13 230 | 12 843 | 1149 | 679 | 3325 | 4180 |
| **C6C** | 29,750 | 28,918 | 2627 | 1497 | 7,823 | 9,752 | 13 494 | 13 117 | 1192 | 679 | 3553 | 4423 |
| **C6F** | 28,929 | 27,774 | 2334 | 1497 | 7,724 | 8,710 | 13 222 | 12 508 | 1059 | 679 | 3504 | 3951 |
| **C6G** | 29,478 | 28,457 | 2415 | 1497 | 8,194 | 9,283 | 13 371 | 12 908 | 1095 | 679 | 3717 | 4211 |
| **C6H** | 30,083 | 29,223 | 2500 | 1497 | 8,681 | 9,935 | 13 645 | 13 255 | 1134 | 679 | 3938 | 4506 |
| **C80** | 22,433 | 31,810 | 2978 | 1811 | 9,084 | 9,312 | 10 175 | 14 429 | 1351 | 821 | 4120 | 4224 |
| **C81** | 22,315 | 32,955 | 3095 | 1811 | 9,589 | 10,029 | 10 122 | 14 948 | 1404 | 821 | 4349 | 4549 |
| **C82** | 22,231 | 34,094 | 3234 | 1811 | 10,208 | 10,742 | 10 084 | 15 465 | 1467 | 821 | 4630 | 4872 |
| **C85** | 22,534 | 31,911 | 2882 | 1811 | 9,275 | 9,367 | 10 221 | 14 475 | 1307 | 821 | 4207 | 4249 |
| **C86** | 22,416 | 33,113 | 2999 | 1811 | 9,784 | 10,120 | 10 168 | 14 020 | 1360 | 821 | 4438 | 4590 |
| **C87** | 22,332 | 34,385 | 3142 | 1811 | 10,399 | 10,196 | 10 130 | 15 597 | 1425 | 821 | 4717 | 4625 |
| **C8A** | 22,432 | 19,664 | 2748 | 1684 | 7,310 | 9,387 | 10 175 | 8 919 | 1246 | 764 | 3316 | 4258 |
| **C8B** | 22,314 | 19,548 | 2851 | 1684 | 7,821 | 9,991 | 10 121 | 8 867 | 1293 | 764 | 3548 | 4532 |
| **C8C** | 22,230 | 19,463 | 2955 | 1684 | 8,351 | 10,589 | 10 083 | 8 816 | 1340 | 764 | 3788 | 4803 |
| **C8F** | 22,533 | 19,763 | 2626 | 1684 | 8,239 | 9,420 | 10 221 | 8 964 | 1191 | 764 | 3737 | 4273 |
| **C8G** | 22,415 | 19,641 | 2717 | 1684 | 8,768 | 10,059 | 10 167 | 8 909 | 1232 | 764 | 3977 | 4563 |
| **C8H** | 22,331 | 19,503 | 2813 | 1684 | 9,316 | 10,787 | 10 129 | 8 846 | 1276 | 764 | 4226 | 4893 |
| **D60** | — | 38,296 | — | 2097 | — | 11,473 | — | 17 371 | — | 951 | — | 5204 |
| **D61** | — | 39,624 | — | 2097 | — | 12,309 | — | 17 973 | — | 951 | — | 5583 |
| **D62** | — | 41,031 | — | 2097 | — | 13,210 | — | 18 611 | — | 951 | — | 5992 |
| **D65** | — | 37,624 | — | 2097 | — | 11,617 | — | 17 066 | — | 951 | — | 5269 |
| **D66** | — | 38,837 | — | 2097 | — | 12,387 | — | 17 616 | — | 951 | — | 5619 |

## Table 15 — 19XR Heat Exchanger Weights (cont)

| CODE † | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dry Rigging Weight (lb) * | | Machine Charge | | | | Dry Rigging Weight (kg) * | | Machine Charge | | | |
| | Evaporator Only | Condenser Only | Refrigerant Weight (lb) | | Water Weight (lb) | | Evaporator Only | Condenser Only | Refrigerant Weight (kg) | | Water Weight (kg) | |
| | | | Evaporator | Condenser | Evaporator | Condenser | | | Evaporator | Condenser | Evaporator | Condenser |
| **D67** | — | 40,460 | — | 2097 | — | 13,410 | — | 18 352 | — | 951 | — | 6083 |
| **D80** | — | 41,916 | — | 2359 | — | 12,447 | — | 19 013 | — | 1070 | — | 5646 |
| **D81** | — | 43,382 | — | 2359 | — | 13,388 | — | 19 678 | — | 1070 | — | 6073 |
| **D82** | — | 44,963 | — | 2359 | — | 14,401 | — | 20 395 | — | 1070 | — | 6532 |
| **D85** | — | 42,058 | — | 2359 | — | 12,609 | — | 19 077 | — | 1070 | — | 5719 |
| **D86** | — | 43,408 | — | 2359 | — | 13,475 | — | 19 690 | — | 1070 | — | 6112 |
| **D87** | — | 45,204 | — | 2359 | — | 14,626 | — | 20 504 | — | 1070 | — | 6634 |
| **D6A** | — | 35,286 | — | 1947 | — | 11,401 | — | 16 005 | — | 883 | — | 5171 |
| **D6B** | — | 36,328 | — | 1947 | — | 12,255 | — | 16 478 | — | 883 | — | 5559 |
| **D6C** | — | 37,288 | — | 1947 | — | 13,078 | — | 16 914 | — | 883 | — | 5932 |
| **D6F** | — | 34,447 | — | 1947 | — | 11,448 | — | 15 625 | — | 883 | — | 5193 |
| **D6G** | — | 35,637 | — | 1947 | — | 12,408 | — | 16 165 | — | 883 | — | 5628 |
| **D6H** | — | 36,663 | — | 1947 | — | 13,278 | — | 16 630 | — | 883 | — | 6023 |
| **D8A** | — | 38,494 | — | 2190 | — | 12,366 | — | 17 461 | — | 993 | — | 5609 |
| **D8B** | — | 39,633 | — | 2190 | — | 13,327 | — | 17 977 | — | 993 | — | 6045 |
| **D8C** | — | 40,731 | — | 2190 | — | 14,253 | — | 18 475 | — | 993 | — | 6465 |
| **D8F** | — | 38,479 | — | 2190 | — | 12,419 | — | 17 454 | — | 993 | — | 5633 |
| **D8G** | — | 39,761 | — | 2190 | — | 13,499 | — | 18 035 | — | 993 | — | 6123 |
| **D8H** | — | 40,922 | — | 2190 | — | 14,478 | — | 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.

NOTES:
1. Evaporator 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 — Economizer Weight

| FRAME SIZE | DRY WEIGHT (lb)* | REFRIGERANT WEIGHT (lb) | OPERATION WEIGHT (lb) | DRY WEIGHT (kg)* | REFRIGERANT WEIGHT (kg) | OPERATION WEIGHT (kg) |
|---|---|---|---|---|---|---|
| **XRC (fr 5 HX)** | 1019 | 210 | 1229 | 462 | 95 | 557 |
| **XRC (fr 6,7 HX)** | 1252 | 250 | 1502 | 568 | 113 | 681 |
| **XRE** | 1054 | 283 | 1337 | 478 | 128 | 606 |
| **XR6** | 1589 | 360 | 1949 | 721 | 163 | 884 |
| **XR7** | 2749 | 646 | 3395 | 1247 | 293 | 1540 |

* Includes economizer weight and all connecting piping to compressor.

## Table 17 — 19XR Additional Data for Marine Waterboxes (19XR2-E)*

| HEAT EXCHANGER FRAME, PASS | ENGLISH | | | | | SI | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PSIG | RIGGING WEIGHT (LB) | | WATER VOLUME (GAL) | | KPA | RIGGING WEIGHT (KG) | | WATER VOLUME (L) | |
| | | COOLER | CONDENSER | COOLER | CONDENSER | | COOLER | CONDENSER | COOLER | CONDENSER |
| FRAME 2, 1 AND 3 PASS | 150 | 730 | — | 84 | — | 1034 | 331 | — | 318 | — |
| FRAME 2, 2 PASS | 150 | 365 | 365 | 42 | 42 | 1034 | 166 | 166 | 159 | 159 |
| FRAME 3, 1 AND 3 PASS | 150 | 730 | — | 84 | — | 1034 | 331 | — | 318 | — |
| FRAME 3, 2 PASS | 150 | 365 | 365 | 42 | 42 | 1034 | 166 | 166 | 159 | 159 |
| FRAME 4, 1 AND 3 PASS | 150 | 1888 | — | 109 | — | 1034 | 856 | — | 412 | — |
| FRAME 4, 2 PASS | 150 | 944 | 989 | 54 | 54 | 1034 | 428 | 449 | 205 | 205 |
| FRAME 5, 1 AND 3 PASS | 150 | 2445 | — | 122 | — | 1034 | 1109 | — | 462 | — |
| FRAME 5, 2 PASS | 150 | 1223 | 1195 | 61 | 60 | 1034 | 555 | 542 | 231 | 226 |
| FRAME 6, 1 AND 3 PASS | 150 | 2860 | — | 139 | — | 1034 | 1297 | — | 524 | — |
| FRAME 6, 2 PASS | 150 | 1430 | 1443 | 69 | 69 | 1034 | 649 | 655 | 262 | 262 |
| FRAME 7, 1 AND 3 PASS | 150 | 3970 | — | 309 | — | 1034 | 1801 | — | 1170 | — |
| FRAME 7, 2 PASS | 150 | 1720 | 1561 | 155 | 123 | 1034 | 780 | 708 | 585 | 465 |
| FRAME 8, 1 AND 3 PASS | 150 | 5048 | — | 364 | — | 1034 | 2290 | — | 1376 | — |
| FRAME 8, 2 PASS | 150 | 2182 | 1751 | 182 | 141 | 1034 | 990 | 794 | 688 | 532 |
| FRAME 2, 1 AND 3 PASS | 300 | 860 | — | 84 | — | 2068 | 390 | — | 318 | — |
| FRAME 2, 2 PASS | 300 | 430 | 430 | 42 | 42 | 2068 | 195 | 195 | 159 | 159 |
| FRAME 3, 1 AND 3 PASS | 300 | 860 | — | 84 | — | 2068 | 390 | — | 318 | — |
| FRAME 3, 2 PASS | 300 | 430 | 430 | 42 | 42 | 2068 | 195 | 195 | 159 | 159 |
| FRAME 4, 1 AND 3 PASS | 300 | 2162 | — | 109 | — | 2068 | 981 | — | 412 | — |
| FRAME 4, 2 PASS | 300 | 1552 | 1641 | 47 | 47 | 2068 | 704 | 744 | 178 | 178 |
| FRAME 5, 1 AND 3 PASS | 300 | 2655 | — | 122 | — | 2068 | 1204 | — | 462 | — |
| FRAME 5, 2 PASS | 300 | 1965 | 1909 | 53 | 50 | 2068 | 891 | 866 | 199 | 190 |
| FRAME 6, 1 AND 3 PASS | 300 | 3330 | — | 139 | — | 2068 | 1510 | — | 524 | — |
| FRAME 6, 2 PASS | 300 | 2425 | 2451 | 58 | 58 | 2068 | 1100 | 1112 | 218 | 218 |
| FRAME 7, 1 AND 3 PASS | 300 | 5294 | — | 309 | — | 2068 | 2401 | — | 1170 | — |
| FRAME 7, 2 PASS | 300 | 4140 | 4652 | 146 | 94 | 2068 | 1878 | 2110 | 553 | 356 |
| FRAME 8, 1 AND 3 PASS | 300 | 6222 | — | 364 | — | 2068 | 2822 | — | 1376 | — |
| FRAME 8, 2 PASS | 300 | 4952 | 4559 | 161 | 94 | 2068 | 2246 | 2068 | 609 | 355 |

* Add to heat exchanger data for total weights or volumes.

NOTE: For the total weight of a vessel with a marine waterbox, add these values to the heat exchanger weights (or volumes).

## Table 18 — 19XRV Additional Data for Marine Waterboxes (19XR6/7)*

| HEAT EXCHANGER FRAME, PASS | COUPLING TYPE | ENGLISH (lb) psig | Rigging Weight Cooler | Rigging Weight Condenser | Water Weight Cooler | Water Weight Condenser | SI (kg) kPa | Rigging Weight Cooler | Rigging Weight Condenser | Water Weight Cooler | Water Weight Condenser |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE 6, FRAME A, 1 PASS | Victaulic | 150 | 2,794 | 2,582 | 6,515 | 5,648 | 1034 | 1267 | 1171 | 2955 | 2562 |
| | Flange | | 3,124 | 2,912 | | | | 1417 | 1321 | | |
| SIZE 6, FRAME A, 2 PASS | Victaulic | | 2,454 | 2,236 | 2,979 | 2,613 | | 1113 | 1014 | 2979 | 1185 |
| | Flange | | 2,650 | 2,432 | | | | 1202 | 1103 | | |
| SIZE 6, FRAME A, 3 PASS | Victaulic | | 2,771 | 2,840 | 4,190 | 3,950 | | 1157 | 1288 | 1900 | 1792 |
| | Flange | | 2,899 | 3,020 | | | | 1315 | 1370 | | |
| SIZE 6, FRAME B, 1 PASS | Victaulic | | — | 2,604 | — | 6,975 | | — | 1181 | — | 3162 |
| | Flange | | | 2,934 | | | | | 1331 | | |
| SIZE 6, FRAME B, 2 PASS | Victaulic | | — | 2,459 | — | 3,600 | | — | 1115 | — | 1633 |
| | Flange | | | 2,719 | | | | | 1233 | | |
| SIZE 6, FRAME B, 3 PASS | Victaulic | | — | 2,770 | — | 4,858 | | — | 1256 | — | 2203 |
| | Flange | | | 2,950 | | | | | 1338 | | |
| SIZE 7 FRAME B, 1 PASS | Victaulic | | 4,045 | — | 8,103 | — | | 1835 | — | 3675 | — |
| | Flange | | 4,375 | — | | | | 1984 | — | | |
| SIZE 7 FRAME B, 2 PASS | Victaulic | | 3,648 | — | 4,139 | — | | 1655 | — | 1877 | — |
| | Flange | | 3,908 | — | | | | 1773 | — | | |
| SIZE 7 FRAME B, 3 PASS | Victaulic | | 4,160 | — | 5,633 | — | | 1887 | — | 2555 | — |
| | Flange | | 4,340 | — | | | | 1969 | — | | |
| SIZE 7 FRAME C, 1 PASS | Victaulic | | 4,828 | 4,273 | 10,264 | 9,858 | | 2190 | 1938 | 4655 | 4472 |
| | Flange | | 5,158 | 4,713 | | | | 2340 | 2138 | | |
| SIZE 7 FRAME C, 2 PASS | Victaulic | | 4,375 | 3,714 | 5,201 | 4,826 | | 1984 | 1685 | 2359 | 2189 |
| | Flange | | 4,635 | 4,044 | | | | 2102 | 1834 | | |
| SIZE 7 FRAME C, 3 PASS | Victaulic | | 4,957 | 4,434 | 7,144 | 6,819 | | 2248 | 2011 | 3240 | 3093 |
| | Flange | | 5,137 | 4,630 | | | | 2330 | 2100 | | |
| SIZE 7 FRAME D, 1 PASS | Victaulic | | — | 4,863 | — | 12,530 | | — | 2206 | — | 5684 |
| | Flange | | — | 5,303 | | | | — | 2405 | | |
| SIZE 7 FRAME D, 2 PASS | Victaulic | | — | 4,243 | — | 6,074 | | — | 1925 | — | 2755 |
| | Flange | | — | 4,573 | | | | — | 2074 | | |
| SIZE 7 FRAME D, 3 PASS | Victaulic | | — | 5,079 | — | 8,659 | | — | 2303 | — | 3928 |
| | Flange | | — | 5,275 | | | | — | 2393 | | |
| SIZE 6, FRAME A, 1 PASS | Victaulic | 300 | 2,794 | 2,582 | 6,515 | 5,648 | 2068 | | 1171 | 2955 | 2562 |
| | Flange | | 3,124 | 2,912 | | | | 1417 | 1321 | | |
| SIZE 6, FRAME A, 2 PASS | Victaulic | | 2,454 | 2,236 | 2,979 | 2,613 | | 1113 | 1014 | 2979 | 1185 |
| | Flange | | 2,650 | 2,432 | | | | 1202 | 1103 | | |
| SIZE 6, FRAME A, 3 PASS | Victaulic | | 2,771 | 2,840 | 4,190 | 3,950 | | 1157 | 1288 | 1900 | 1792 |
| | Flange | | 2,899 | 3,020 | | | | 1315 | 1370 | | |
| SIZE 6, FRAME B, 1 PASS | Victaulic | | — | 2,604 | — | 6,975 | | — | 1181 | — | 3162 |
| | Flange | | | 2,934 | | | | | 1331 | | |
| SIZE 6, FRAME B, 2 PASS | Victaulic | | — | 2,459 | — | 3,600 | | — | 1115 | — | 1633 |
| | Flange | | | 2,719 | | | | | 1233 | | |
| SIZE 6, FRAME B, 3 PASS | Victaulic | | — | 2,770 | — | 4,858 | | — | 1256 | — | 2203 |
| | Flange | | | 2,950 | | | | | 1338 | | |
| SIZE 7 FRAME B, 1 PASS | Victaulic | | 8,305 | — | 5,783 | — | | 3767 | — | 2623 | — |
| | Flange | | 8,635 | — | | | | 3917 | — | | |
| SIZE 7 FRAME B, 2 PASS | Victaulic | | 7,426 | — | 2,382 | — | | 3368 | — | 1080 | — |
| | Flange | | 7,686 | — | | | | 3486 | — | | |
| SIZE 7 FRAME B, 3 PASS | Victaulic | | 7,785 | — | 3,268 | — | | 3531 | — | 1482 | — |
| | Flange | | 7,965 | — | | | | 3612 | — | | |
| SIZE 7 FRAME C, 1 PASS | Victaulic | | 11,001 | 9,228 | 7,030 | 7,591 | | 4990 | 4186 | 3188 | 3443 |
| | Flange | | 11,331 | 9,668 | | | | 5140 | 4385 | | |
| SIZE 7 FRAME C, 2 PASS | Victaulic | | 9,829 | 8,003 | 2,708 | 3,061 | | 4458 | 3630 | 1228 | 1388 |
| | Flange | | 10,089 | 8,333 | | | | 4576 | 3682 | | |
| SIZE 7 FRAME C, 3 PASS | Victaulic | | 10,343 | 8,647 | 3,866 | 4,468 | | 4692 | 3922 | 1753 | — |
| | Flange | | 10,053 | 8,843 | | | | 4773 | — | | |
| SIZE 7 FRAME D, 1 PASS | Victaulic | | — | 12,940 | — | 9,365 | | — | 5869 | — | 4248 |
| | Flange | | — | 13,380 | | | | — | 5927 | | |
| SIZE 7 FRAME D, 2 PASS | Victaulic | | — | 11,170 | — | 3,607 | | — | 5067 | — | 1925 |
| | Flange | | — | 11,500 | | | | — | 5102 | | |
| SIZE 7 FRAME D, 3 PASS | Victaulic | | — | 12,042 | — | 5,398 | | — | 5462 | — | — |
| | Flange | | — | 12,238 | | | | — | — | | |

* Add to heat exchanger data for total weights or volumes.
NOTE: For the total weight of a vessel with a marine waterbox, add these values to the heat exchanger weights (or volumes).

### Table 19 — 19XR,XRV Compressor and Motor Weights*— High-Efficiency Motors, Compressor Frame Size 2†

| MOTOR CODE | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Compressor Weight** (lb) | 60 Hz | | 50 Hz | | End Bell Cover Weight (lb) | Compressor Weight** (kg) | 60 Hz | | 50 Hz | | End Bell Cover Weight (kg) |
| | | Stator Weight†† (lb) | Rotor Weight (lb) | Stator Weight†† (lb) | Rotor Weight (lb) | | | Stator Weight†† (kg) | Rotor Weight (kg) | Stator Weight†† (kg) | Rotor Weight (kg) | |
| HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 v) | | | | | | | | | | | | |
| **JBH** | 2300 | 1003 | 226 | 1063 | 248 | 185 | 1043 | 455 | 103 | 482 | 112 | 84 |
| **JCH** | 2300 | 1063 | 248 | 1113 | 263 | 185 | 1043 | 482 | 112 | 505 | 119 | 84 |
| **JDH** | 2300 | 1113 | 263 | 1149 | 278 | 185 | 1043 | 505 | 119 | 521 | 126 | 84 |
| **JEH** | 2300 | 1149 | 278 | 1196 | 295 | 185 | 1043 | 521 | 126 | 542 | 134 | 84 |
| **JFH** | 2300 | 1196 | 295 | — | — | 185 | 1043 | 542 | 134 | — | — | 84 |

* Total compressor weight is the sum of the compressor aerodynamic components (compressor weight column), stator, rotor, and end bell cover weights.
† See Model Number Nomenclature.
** Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only. For high lift compressors, contact Carrier Chiller Marketing for weights.
†† Stator weight includes the stator and shell.

### Table 20 — 19XR,XRV Compressor and Motor Weights*— Standard and High-Efficiency Motors Compressor Frame Size 3†

| MOTOR CODE | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Compressor Weight** (lb) | 60 Hz | | 50 Hz | | End Bell Cover Weight (lb) | Compressor Weight** (kg) | 60 Hz | | 50 Hz | | End Bell Cover Weight (kg) |
| | | Stator Weight†† (lb) | Rotor Weight (lb) | Stator Weight†† (lb) | Rotor Weight (lb) | | | Stator Weight†† (kg) | Rotor Weight (kg) | Stator Weight†† (kg) | Rotor Weight (kg) | |
| HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 v) | | | | | | | | | | | | |
| **KBH** | 2816 | 1313 | 276 | 1353 | 285 | 274 | 1277 | 596 | 125 | 614 | 129 | 124 |
| **KCH** | 2816 | 1353 | 285 | 1381 | 291 | 274 | 1277 | 614 | 129 | 626 | 132 | 124 |
| **KDH** | 2816 | 1381 | 291 | 1417 | 307 | 274 | 1277 | 626 | 132 | 643 | 139 | 124 |
| **KEH** | 2816 | 1417 | 307 | 1441 | 313 | 274 | 1277 | 643 | 139 | 654 | 142 | 124 |
| **KFH** | 2816 | 1441 | 313 | 1470 | 320 | 274 | 1277 | 654 | 142 | 667 | 145 | 124 |
| **KGH** | 2816 | 1470 | 320 | 1505 | 333 | 274 | 1277 | 667 | 145 | 683 | 151 | 124 |
| **KHH** | 2816 | 1505 | 333 | — | — | 274 | 1277 | 683 | 151 | — | — | 124 |
| **UB** | 2816 | 1371 | 316 | 1391 | 330 | 274 | 1277 | 622 | 143 | 631 | 150 | 124 |
| **UC** | 2816 | 1391 | 330 | 1419 | 344 | 274 | 1277 | 631 | 150 | 644 | 156 | 124 |
| **UD** | 2816 | 1419 | 344 | 1455 | 372 | 274 | 1277 | 644 | 156 | 660 | 169 | 124 |
| **UE** | 2816 | 1455 | 372 | 1479 | 386 | 274 | 1277 | 660 | 169 | 671 | 175 | 124 |
| **UF** | 2816 | 1479 | 386 | 1508 | 400 | 274 | 1277 | 671 | 175 | 684 | 181 | 124 |
| **UG** | 2816 | 1508 | 400 | 1543 | 421 | 274 | 1277 | 684 | 181 | 700 | 191 | 124 |
| **UH** | 2816 | 1543 | 421 | — | — | 274 | 1277 | 700 | 191 | — | — | 124 |

* Total compressor weight is the sum of the compressor aerodynamic components (compressor weight column), stator, rotor, and end bell cover weights.
† See Model Number Nomenclature.
** Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only. For high lift compressors, contact Carrier Chiller Marketing for weights.
†† Stator weight includes the stator and shell.

## Table 21 — 19XR,XRV Compressor and Motor Weights*— High-Efficiency Motors, Compressor Frame Size 4†

| MOTOR CODE | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Compressor Weight** (lb) Fixed Ring/ Split Ring | 60 Hz | | 50 Hz | | End Bell Cover Weight (lb) | Compressor Weight** (kg) Fixed Ring/ Split Ring | 60 Hz | | 50 Hz | | End Bell Cover Weight (kg) |
| | | Stator Weight†† (lb) | Rotor Weight (lb) | Stator Weight†† (lb) | Rotor Weight (lb) | | | Stator Weight†† (kg) | Rotor Weight (kg) | Stator Weight†† (kg) | Rotor Weight (kg) | |
| **HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 v)** | | | | | | | | | | | | |
| **LBH** | 3425 / 4211 | 1875 | 364 | 1935 | 387 | 317 | 1554 / 1910 | 850 | 165 | 878 | 176 | 144 |
| **LCH** | 3425 / 4211 | 1935 | 389 | 2008 | 405 | 317 | 1554 / 1910 | 878 | 176 | 911 | 184 | 144 |
| **LDH** | 3425 / 4211 | 2008 | 406 | 2056 | 417 | 317 | 1554 / 1910 | 911 | 184 | 933 | 189 | 144 |
| **LEH** | 3425 / 4211 | 2043 | 417 | 2092 | 433 | 317 | 1554 / 1910 | 927 | 189 | 949 | 196 | 144 |
| **LFH** | 3425 / 4211 | 2092 | 434 | 2156 | 444 | 317 | 1554 / 1910 | 949 | 197 | 978 | 201 | 144 |
| **LGH** | 3425 / 4211 | 2156 | 444 | 2199 | 458 | 317 | 1554 / 1910 | 978 | 201 | 997 | 208 | 144 |
| **LHH** | 3425 / 4211 | 2199 | 458 | 2230 | 458 | 317 | 1554 / 1910 | 997 | 208 | 1012 | 208 | 144 |

* Total compressor weight is the sum of the compressor aerodynamic components (compressor weight column), stator, rotor, and end bell cover weights.
† See Model Number Nomenclature.
** Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only. For high lift compressors, contact Carrier Chiller Marketing for weights.
†† Stator weight includes the stator and shell.

## Table 22 — 19XR,XRV Compressor and Motor Weights*— High-Efficiency Motors, Compressor Frame Size 5†

| MOTOR CODE | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Compressor Weight** (lb) | 60 Hz | | 50 Hz | | End Bell Cover Weight (lb) | Compressor Weight** (kg) | 60 Hz | | 50 Hz | | End Bell Cover Weight (kg) |
| | | Stator Weight†† (lb) | Rotor Weight (lb) | Stator Weight†† (lb) | Rotor Weight (lb) | | | Stator Weight†† (kg) | Rotor Weight (kg) | Stator Weight†† (kg) | Rotor Weight (kg) | |
| **HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 v)** | | | | | | | | | | | | |
| **MBH** | 7285 | 2795 | 645 | 2856 | 665 | 414 | 3304 | 1268 | 293 | 1295 | 302 | 188 |
| **MCH** | 7285 | 2873 | 672 | 2925 | 693 | 414 | 3304 | 1303 | 305 | 1327 | 314 | 188 |
| **MDH** | 7285 | 2906 | 684 | 3013 | 724 | 414 | 3304 | 1318 | 310 | 1367 | 328 | 188 |
| **MEH** | 7285 | 2956 | 704 | 3071 | 737 | 414 | 3304 | 1341 | 319 | 1392 | 334 | 188 |
| **MFH** | 7285 | 3034 | 724 | 3153 | 791 | 414 | 3304 | 1376 | 328 | 1430 | 359 | 188 |
| **MGH** | 7285 | 3071 | 737 | — | — | 414 | 3304 | 1393 | 334 | — | — | 188 |
| **HIGH-EFFICIENCY MOTORS / MEDIUM VOLTAGE (2400-4160 v)** | | | | | | | | | | | | |
| **MBH** | 7285 | 2890 | 670 | 2970 | 696 | 414 | 3304 | 1311 | 304 | 1347 | 316 | 188 |
| **MDH** | 7285 | 2970 | 696 | 3170 | 749 | 414 | 3304 | 1347 | 316 | 1438 | 340 | 188 |
| **MFH** | 7285 | 3170 | 749 | 3460 | 830 | 414 | 3304 | 1438 | 340 | 1569 | 376 | 188 |
| **MGH** | 7285 | 3270 | 791 | — | — | 414 | 3304 | 1483 | 359 | — | — | 188 |
| **HIGH-EFFICIENCY MOTORS / MEDIUM VOLTAGE (6300-6900 v)** | | | | | | | | | | | | |
| **MBH** | 7285 | 2970 | 696 | 3120 | 736 | 414 | 3304 | 1347 | 316 | 1415 | 334 | 188 |
| **MDH** | 7285 | 3170 | 749 | 3170 | 749 | 414 | 3304 | 1438 | 340 | 1438 | 340 | 188 |
| **MFH** | 7285 | 3170 | 749 | 3460 | 830 | 414 | 3304 | 1438 | 340 | 1569 | 376 | 188 |
| **MGH** | 7285 | 3410 | 817 | — | — | 414 | 3304 | 1547 | 371 | — | — | 188 |
| **HIGH-EFFICIENCY MOTORS / HIGH VOLTAGE (10000-11000 v)** | | | | | | | | | | | | |
| **MCH** | 7285 | — | — | 3956 | 678 | 414 | 3304 | — | — | 1794 | 308 | 188 |
| **MDH** | 7285 | — | — | 3956 | 678 | 414 | 3304 | — | — | 1794 | 308 | 188 |
| **MFH** | 7285 | — | — | 4062 | 719 | 414 | 3304 | — | — | 1842 | 326 | 188 |
| **MGH** | 7285 | 3820 | 657 | — | — | 414 | 3304 | 1733 | 298 | — | — | 188 |
| **MHH** | 7285 | 3820 | 657 | — | — | 414 | 3304 | 1733 | 298 | — | — | 188 |
| **HIGH-EFFICIENCY MOTORS / HIGH VOLTAGE (13800 v)** | | | | | | | | | | | | |
| **MHH** | 7285 | 3779 | 646 | — | — | 414 | 3304 | 1714 | 293 | — | — | 188 |

* Total compressor weight is the sum of the compressor aerodynamic components (compressor weight column), stator, rotor, and end bell cover weights.
† See Model Number Nomenclature.
** Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only. For high lift compressors, contact Carrier Chiller Marketing for weights.
†† Stator weight includes the stator and shell.

## Table 23 — 19XR,XRC Compressor and Motor Weights*— Standard and High-Efficiency Motors Compressor Frame Size C†

| Motor Code | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Compressor Weight** (lb) | 50 Hz | | 60 Hz | | End Cover (lb) | Compressor Weight** (kg) | 50 Hz | | 60 Hz | | End Cover (kg) |
| | | Stator Weight†† (lb) | Rotor Weight (lb) | Stator Weight†† (lb) | Rotor Weight (lb) | | | Stator Weight†† (kg) | Rotor Weight (kg) | Stator Weight†† (kg) | Rotor Weight (kg) | |
| **HIGH EFFICIENCY MOTORS / LOW VOLTAGE (230 - 575 V)** | | | | | | | | | | | | |
| **VB** | 3265 | 1936 | 474 | 1876 | 459 | 317 | 1481 | 878 | 215 | 851 | 208 | 144 |
| **VC** | 3265 | 2008 | 494 | 1936 | 474 | 317 | 1481 | 911 | 224 | 878 | 215 | 144 |
| **VD** | 3265 | 2057 | 518 | 2008 | 494 | 317 | 1481 | 933 | 235 | 911 | 224 | 144 |
| **VE** | 3265 | 2092 | 534 | 2057 | 518 | 317 | 1481 | 949 | 242 | 933 | 235 | 144 |
| **VF** | 3265 | 2156 | 558 | 2092 | 534 | 317 | 1481 | 978 | 253 | 949 | 242 | 144 |
| **VG** | 3265 | 2200 | 591 | 2156 | 558 | 317 | 1481 | 998 | 268 | 978 | 253 | 144 |
| **VH** | 3265 | 2200 | 591 | 2200 | 591 | 317 | 1481 | 998 | 268 | 998 | 268 | 144 |
| **LB** | 3265 | 1935 | 387 | 1875 | 373 | 317 | 1481 | 878 | 176 | 851 | 169 | 144 |
| **LC** | 3265 | 2008 | 405 | 1935 | 387 | 317 | 1481 | 911 | 184 | 878 | 176 | 144 |
| **LD** | 3265 | 2056 | 417 | 2008 | 405 | 317 | 1481 | 933 | 189 | 911 | 184 | 144 |
| **LE** | 3265 | 2092 | 433 | 2056 | 417 | 317 | 1481 | 949 | 196 | 933 | 189 | 144 |
| **LF** | 3265 | 2156 | 444 | 2092 | 433 | 317 | 1481 | 978 | 201 | 949 | 196 | 144 |
| **LG** | 3265 | 2199 | 458 | 2156 | 444 | 317 | 1481 | 997 | 208 | 978 | 201 | 144 |
| **LH** | 3265 | 2230 | 458 | 2199 | 458 | 317 | 1481 | 1012 | 208 | 997 | 208 | 144 |
| **HIGH EFFICIENCY MOTORS / LOW VOLTAGE (400 V)** | | | | | | | | | | | | |
| **VB** | 3678 | 1936 | 474 | — | — | 317 | 1668 | 878 | 215 | — | — | 144 |
| **VC** | 3678 | 2008 | 494 | — | — | 317 | 1668 | 911 | 224 | — | — | 144 |
| **VD** | 3678 | 2057 | 518 | — | — | 317 | 1668 | 933 | 235 | — | — | 144 |
| **VE** | 3678 | 2092 | 534 | — | — | 317 | 1668 | 949 | 242 | — | — | 144 |
| **VF** | 3678 | 2156 | 558 | — | — | 317 | 1668 | 978 | 253 | — | — | 144 |
| **VG** | 3678 | 2200 | 591 | — | — | 317 | 1668 | 998 | 268 | — | — | 144 |
| **VH** | 3678 | 2200 | 591 | — | — | 317 | 1668 | 998 | 268 | — | — | 144 |
| **HIGH EFFICIENCY MOTORS / LOW VOLTAGE (380/3/60 or 460/3/60 or 575/3/60 V)** | | | | | | | | | | | | |
| **VB** | 3678 | 1876 | 459 | — | — | 317 | 1668 | 851 | 208 | — | — | 144 |
| **VC** | 3678 | 1936 | 474 | — | — | 317 | 1668 | 878 | 215 | — | — | 144 |
| **VD** | 3678 | 2008 | 494 | — | — | 317 | 1668 | 911 | 224 | — | — | 144 |
| **VE** | 3678 | 2057 | 518 | — | — | 317 | 1668 | 933 | 235 | — | — | 144 |
| **VF** | 3678 | 2092 | 534 | — | — | 317 | 1668 | 949 | 242 | — | — | 144 |
| **VG** | 3678 | 2156 | 558 | — | — | 317 | 1668 | 978 | 253 | — | — | 144 |
| **VH** | 3678 | 2200 | 591 | — | — | 317 | 1668 | 998 | 268 | — | — | 144 |
| **HIGH EFFICIENCY MOTORS / MEDIUM VOLTAGE (3000 - 6900 V)** | | | | | | | | | | | | |
| **DB** | 3265 | 1950 | 405 | 1950 | 405 | 338 | 1481 | 885 | 184 | 885 | 184 | 153 |
| **DD** | 3265 | 2025 | 429 | 2025 | 429 | 338 | 1481 | 919 | 195 | 919 | 195 | 153 |
| **DF** | 3265 | 2100 | 452 | 2100 | 452 | 338 | 1481 | 953 | 205 | 953 | 205 | 153 |
| **DH** | 3265 | 2380 | 522 | 2250 | 480 | 338 | 1481 | 1080 | 237 | 1021 | 218 | 153 |
| **HIGH EFFICIENCY MOTORS / HIGH VOLTAGE (10000 V)** | | | | | | | | | | | | |
| **LD** | 3265 | 2659 | 646 | — | — | 413 | 1481 | 1206 | 293 | — | — | 187 |
| **LF** | 3265 | 2665 | 646 | — | — | 413 | 1481 | 1209 | 293 | — | — | 187 |
| **LH** | 3265 | 2760 | 666 | — | — | 413 | 1481 | 1252 | 302 | — | — | 187 |
| **HIGH EFFICIENCY MOTORS / HIGH VOLTAGE (11000 V)** | | | | | | | | | | | | |
| **LD** | 3678 | 2659 | 646 | — | — | 413 | 1668 | 1206 | 293 | — | — | 187 |
| **LF** | 3678 | 2659 | 646 | — | — | 413 | 1668 | 1209 | 293 | — | — | 187 |
| **LH** | 3678 | 2754 | 666 | — | — | 413 | 1668 | 1252 | 302 | — | — | 187 |

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

† See Model Number Nomenclature.

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

†† Stator weight includes the stator and shell.

## Table 24 — 19XR,XRV Compressor and Motor Weights*— Standard and High-Efficiency Motors Compressor Frame Size E†

| MOTOR CODE | ENGLISH | | | | | | SI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Compressor Weight** (lb) | 60 Hz | | 50 Hz | | End Bell Cover Weight (lb) | Compressor Weight** (lb) | 60 Hz | | 50 Hz | | End Bell Cover Weight (lb) |
| | | Stator Weight†† (lb) | Rotor Weight (kg) | Stator Weight†† (lb) | Rotor Weight (kg) | | | Stator Weight†† (lb) | Rotor Weight (kg) | Stator Weight†† (lb) | Rotor Weight (kg) | |
| **HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (400-460 v)** | | | | | | | | | | | | |
| **MBH** | 4853 | 2795 | 645 | 2856 | 665 | 414 | 2201 | 1268 | 293 | 1295 | 302 | 188 |
| **MCH** | 4853 | 2873 | 672 | 2925 | 693 | 414 | 2201 | 1303 | 305 | 1327 | 314 | 188 |
| **MDH** | 4853 | 2906 | 684 | 3013 | 724 | 414 | 2201 | 1318 | 310 | 1367 | 328 | 188 |
| **MEH** | 4853 | 2956 | 704 | 3071 | 737 | 414 | 2201 | 1341 | 319 | 1392 | 334 | 188 |
| **MFH** | 4853 | 3034 | 724 | 3153 | 791 | 414 | 2201 | 1376 | 328 | 1430 | 359 | 188 |
| **MGH** | 4853 | 3071 | 737 | — | — | 414 | 2201 | 1393 | 334 | — | — | 188 |
| **HIGH-EFFICIENCY MOTORS / MEDIUM VOLTAGE (2400-4160 v)** | | | | | | | | | | | | |
| **MBH** | 4853 | 2890 | 670 | 2970 | 696 | 414 | 2201 | 1311 | 304 | 1347 | 316 | 188 |
| **MDH** | 4853 | 2970 | 696 | 3170 | 749 | 414 | 2201 | 1347 | 316 | 1438 | 340 | 188 |
| **MFH** | 4853 | 3170 | 749 | 3460 | 830 | 414 | 2201 | 1438 | 340 | 1569 | 376 | 188 |
| **MGH** | 4853 | 3270 | 791 | — | — | 414 | 2201 | 1483 | 359 | — | — | 188 |
| **HIGH-EFFICIENCY MOTORS / MEDIUM VOLTAGE (6300-6900 v)** | | | | | | | | | | | | |
| **MBH** | 4853 | 2970 | 696 | 3120 | 736 | 414 | 2201 | 1347 | 316 | 1415 | 334 | 188 |
| **MDH** | 4853 | 3170 | 749 | 3170 | 749 | 414 | 2201 | 1438 | 340 | 1438 | 340 | 188 |
| **MFH** | 4853 | 3170 | 749 | 3460 | 830 | 414 | 2201 | 1438 | 340 | 1569 | 376 | 188 |
| **MGH** | 4853 | 3410 | 817 | — | — | 414 | 2201 | 1547 | 371 | — | — | 188 |
| **HIGH-EFFICIENCY MOTORS / HIGH VOLTAGE (10000-11000 v)** | | | | | | | | | | | | |
| **MDH** | 4853 | — | — | 3956 | 678 | 414 | 2201 | — | — | 1794 | 308 | 188 |
| **MFH** | 4853 | — | — | 4062 | 719 | 414 | 2201 | — | — | 1842 | 326 | 188 |
| **MHH** | 4853 | 3820 | 657 | — | — | 414 | 2201 | 1733 | 298 | — | — | 188 |
| **HIGH-EFFICIENCY MOTORS / HIGH VOLTAGE (13800 v)** | | | | | | | | | | | | |
| **MHH** | 4853 | 3779 | 646 | — | — | 414 | 2201 | 1714 | 293 | — | — | 188 |

* Total compressor weight is the sum of the compressor aerodynamic components (compressor weight column), stator, rotor, and end bell cover weights.
† See Model Number Nomenclature.
** Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only. For high lift compressors, contact Carrier Chiller Marketing for weights.
†† Stator weight includes the stator and shell.

## Table 25 — 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 25 — 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 26 — 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 27 — 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 28 — 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 29 — 19XR Waterbox Cover Weights Cooler Frames 2, 3

| WATERBOX DESCRIPTION | ENGLISH (LB) | | | | METRIC (KG) | | | |
|---|---|---|---|---|---|---|---|---|
| | COOLER | | | | COOLER | | | |
| | FRAME 2 | | FRAME 3 | | FRAME 2 | | FRAME 3 | |
| | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **NIH, 1 Pass Cover, 150 psig (1034 kPa)** | 287 | 318 | 287 | 318 | 130 | 144 | 130 | 144 |
| **NIH, 2 Pass Cover, 150 psig (1034 kPa)** | 287 | 340 | 287 | 340 | 130 | 154 | 130 | 154 |
| **NIH, 3 Pass Cover, 150 psig (1034 kPa)** | 294 | 310 | 294 | 310 | 133 | 141 | 133 | 141 |
| **MWB End Cover, 150 psig (1034 kPa)** | 315 | 315 | 315 | 315 | 143 | 143 | 143 | 143 |
| **NIH/MWB Return Cover, 150 psig (1034 kPa)** | 243 | 243 | 243 | 243 | 110 | 110 | 110 | 110 |
| **NIH, 1 Pass Cover, 300 psig (2068 kPa)** | 411 | 486 | 411 | 486 | 186 | 220 | 186 | 220 |
| **NIH, 2 Pass Cover, 300 psig (2068 kPa)** | 411 | 518 | 411 | 518 | 186 | 235 | 186 | 235 |
| **NIH, 3 Pass Cover, 300 psig (2068 kPa)** | 433 | 468 | 433 | 468 | 196 | 212 | 196 | 212 |
| **NIH Plain End Cover, 300 psig (2068 kPa)** | 291 | 291 | 291 | 291 | 132 | 132 | 132 | 132 |
| **MWB End Cover, 300 psig (2068 kPa)** | 619 | 619 | 619 | 619 | 281 | 281 | 281 | 281 |
| **MWB Return Cover, 300 psig (2068 kPa)** | 445 | 445 | 445 | 445 | 202 | 202 | 202 | 202 |

LEGEND

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

NOTE: Weight for NIH 2-pass cover, 150 psig (1034 kPa), is included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 30 — 19XR Waterbox Cover Weights Condenser Frames 2, 3

| WATERBOX DESCRIPTION | ENGLISH (LB) | | | | METRIC (KG) | | | |
|---|---|---|---|---|---|---|---|---|
| | CONDENSER | | | | CONDENSER | | | |
| | FRAME 2 | | FRAME 3 | | FRAME 2 | | FRAME 3 | |
| | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **NIH, 1 Pass Cover, 150 psig (1034 kPa)** | 260 | 297 | 260 | 297 | 118 | 135 | 118 | 135 |
| **NIH, 2 Pass Cover, 150 psig (1034 kPa)** | 265 | 318 | 265 | 318 | 120 | 144 | 120 | 144 |
| **NIH, 3 Pass Cover, 150 psig (1034 kPa)** | 272 | 288 | 272 | 288 | 123 | 131 | 123 | 131 |
| **MWB End Cover, 150 psig (1034 kPa)** | 234 | 234 | 234 | 234 | 106 | 106 | 106 | 106 |
| **NIH/MWB Return Cover, 150 psig (1034 kPa)** | 225 | 225 | 225 | 225 | 102 | 102 | 102 | 102 |
| **NIH, 1 Pass Cover, 300 psig (2068 kPa)** | 379 | 454 | 379 | 454 | 172 | 206 | 172 | 206 |
| **NIH, 2 Pass Cover, 300 psig (2068 kPa)** | 379 | 486 | 379 | 486 | 172 | 220 | 172 | 220 |
| **NIH, 3 Pass Cover, 300 psig (2068 kPa)** | 401 | 436 | 401 | 436 | 182 | 198 | 182 | 198 |
| **NIH Plain End Cover, 300 psig (2068 kPa)** | 270 | 270 | 270 | 270 | 122 | 122 | 122 | 122 |
| **MWB End Cover, 300 psig (2068 kPa)** | 474 | 474 | 474 | 474 | 215 | 215 | 215 | 215 |
| **MWB Return Cover, 300 psig (2068 kPa)** | 359 | 359 | 359 | 359 | 163 | 163 | 163 | 163 |

LEGEND

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

NOTE: Weight for NIH 2-pass cover, 150 psig (1034 kPa), is included in the heat exchanger weights shown in the heat exchanger weight tables.

**Table 31 — 19XR Waterbox Cover Weights Cooler Frames 4, 5**

| WATERBOX DESCRIPTION | ENGLISH (LB) | | | | METRIC (KG) | | | |
|---|---|---|---|---|---|---|---|---|
| | COOLER | | | | COOLER | | | |
| | FRAME 4 | | FRAME 5 | | FRAME 4 | | FRAME 5 | |
| | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **NIH, 1 Pass Cover, 150 psig (1034 kPa)** | 148 | 185 | 168 | 229 | 67 | 84 | 76 | 104 |
| **NIH, 2 Pass Cover, 150 psig (1034 kPa)** | 202 | 256 | 224 | 276 | 92 | 116 | 102 | 125 |
| **NIH, 3 Pass Cover, 150 psig (1034 kPa)** | 473 | 489 | 617 | 634 | 215 | 222 | 280 | 288 |
| **MWB End Cover, 150 psig (1034 kPa)** | 317 | 317 | 393 | 393 | 144 | 144 | 178 | 178 |
| **MWB Return Cover, 150 psig (1034 kPa)** | 138 | 138 | 154 | 154 | 63 | 63 | 70 | 70 |
| **NIH, 1 Pass Cover, 300 psig (2068 kPa)** | 633 | 709 | 764 | 839 | 287 | 322 | 347 | 381 |
| **NIH, 2 Pass Cover, 300 psig (2068 kPa)** | 626 | 689 | 761 | 867 | 284 | 313 | 345 | 394 |
| **NIH, 3 Pass Cover, 300 psig (2068 kPa)** | 660 | 694 | 795 | 830 | 299 | 315 | 361 | 376 |
| **NIH/MWB End Cover, 300 psig (2068 kPa)** | 522 | 522 | 658 | 658 | 237 | 237 | 298 | 298 |

LEGEND
**NIH** — Nozzle-in-Head
**MWB** — Marine Waterbox
**STD** — Standard

NOTE: Weight for NIH 2-pass cover, 150 psig (1034 kPa), is included in the heat exchanger weights shown in the heat exchanger weight tables.

**Table 32 — 19XR Waterbox Cover Weights Condenser Frames 4, 5**

| WATERBOX DESCRIPTION | ENGLISH (LB) | | | | METRIC (KG) | | | |
|---|---|---|---|---|---|---|---|---|
| | CONDENSER | | | | CONDENSER | | | |
| | FRAME 4 | | FRAME 5 | | FRAME 4 | | FRAME 5 | |
| | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **NIH, 1 Pass Cover, 150 psig (1034 kPa)** | 148 | 185 | 168 | 229 | 67 | 84 | 76 | 104 |
| **NIH, 2 Pass Cover, 150 psig (1034 kPa)** | 191 | 245 | 224 | 298 | 87 | 111 | 102 | 135 |
| **NIH, 3 Pass Cover, 150 psig (1034 kPa)** | 503 | 519 | 629 | 655 | 228 | 235 | 285 | 297 |
| **MWB End Cover, 150 psig (1034 kPa)** | 317 | 317 | 393 | 393 | 144 | 144 | 178 | 178 |
| **MWB Return Cover, 150 psig (1034 kPa)** | 138 | 138 | 154 | 154 | 63 | 63 | 70 | 70 |
| **NIH, 1 Pass Cover, 300 psig (2068 kPa)** | 633 | 709 | 764 | 839 | 287 | 322 | 347 | 381 |
| **NIH, 2 Pass Cover, 300 psig (2068 kPa)** | 622 | 729 | 727 | 878 | 282 | 331 | 330 | 393 |
| **NIH, 3 Pass Cover, 300 psig (2068 kPa)** | 655 | 689 | 785 | 838 | 297 | 313 | 356 | 376 |
| **NIH/MWB End Cover, 300 psig (2068 kPa)** | 522 | 522 | 658 | 658 | 237 | 237 | 298 | 298 |

LEGEND
**NIH** — Nozzle-in-Head
**MWB** — Marine Waterbox
**STD** — Standard

NOTE: Weight for NIH 2-pass cover, 150 psig (1034 kPa), is included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 33 — 19XR Waterbox Cover Weights Cooler Frames 6, 7

| WATERBOX DESCRIPTION | ENGLISH (LB) | | | | METRIC (KG) | | | |
|---|---|---|---|---|---|---|---|---|
| | COOLER | | | | COOLER | | | |
| | FRAME 6 | | FRAME 7 | | FRAME 6 | | FRAME 7 | |
| | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **NIH, 1 Pass Cover, 150 psig (1034 kPa)** | 187 | 223 | 329 | 441 | 85 | 101 | 149 | 200 |
| **NIH, 2 Pass Cover, 150 psig (1034 kPa)** | 257 | 330 | 426 | 541 | 117 | 150 | 193 | 245 |
| **NIH, 3 Pass Cover, 150 psig (1034 kPa)** | 765 | 791 | 1250 | 1291 | 347 | 359 | 567 | 586 |
| **MWB End Cover, 150 psig (1034 kPa)** | 487 | 487 | 844 | 844 | 221 | 221 | 383 | 383 |
| **MWB Return Cover, 150 psig (1034 kPa)** | 172 | 172 | 315 | 315 | 78 | 78 | 143 | 143 |
| **NIH, 1 Pass Cover, 300 psig (2068 kPa)** | 978 | 1053 | 1712 | 1883 | 444 | 478 | 777 | 854 |
| **NIH, 2 Pass Cover, 300 psig (2068 kPa)** | 927 | 1078 | 1662 | 1908 | 420 | 489 | 754 | 865 |
| **NIH, 3 Pass Cover, 300 psig (2068 kPa)** | 997 | 1050 | 1724 | 1807 | 452 | 476 | 782 | 820 |
| **NIH/MWB End Cover, 300 psig (2068 kPa)** | 834 | 834 | 1378 | 1378 | 378 | 378 | 625 | 625 |

LEGEND

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

NOTE: Weight for NIH 2-pass cover, 150 psig (1034 kPa), is included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 34 — 19XR Waterbox Cover Weights Condenser Frames 6, 7

| WATERBOX DESCRIPTION | ENGLISH (LB) | | | | METRIC (KG) | | | |
|---|---|---|---|---|---|---|---|---|
| | CONDENSER | | | | CONDENSER | | | |
| | FRAME 6 | | FRAME 7 | | FRAME 6 | | FRAME 7 | |
| | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **NIH, 1 Pass Cover, 150 psig (1034 kPa)** | 187 | 223 | 329 | 441 | 85 | 101 | 149 | 200 |
| **NIH, 2 Pass Cover, 150 psig (1034 kPa)** | 245 | 330 | 404 | 520 | 111 | 150 | 183 | 236 |
| **NIH, 3 Pass Cover, 150 psig (1034 kPa)** | 772 | 843 | 1222 | 1280 | 350 | 382 | 554 | 580 |
| **MWB End Cover, 150 psig (1034 kPa)** | 487 | 487 | 781 | 781 | 221 | 221 | 354 | 354 |
| **MWB Return Cover, 150 psig (1034 kPa)** | 172 | 172 | 700 | 700 | 78 | 78 | 318 | 318 |
| **NIH, 1 Pass Cover, 300 psig (2068 kPa)** | 978 | 1053 | 315 | 315 | 444 | 478 | 143 | 143 |
| **NIH, 2 Pass Cover, 300 psig (2068 kPa)** | 923 | 1074 | 1690 | 1851 | 419 | 487 | 767 | 840 |
| **NIH, 3 Pass Cover, 300 psig (2068 kPa)** | 995 | 1049 | 1628 | 1862 | 451 | 476 | 738 | 845 |
| **NIH/MWB End Cover, 300 psig (2068 kPa)** | 834 | 834 | 1714 | 1831 | 378 | 378 | 777 | 831 |

LEGEND

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

NOTE: Weight for NIH 2-pass cover, 150 psig (1034 kPa), is included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 35 — 19XR Waterbox Cover Weights Cooler Frame 8

| WATERBOX DESCRIPTION | ENGLISH (LB) | | METRIC (KG) | |
|---|---|---|---|---|
| | COOLER | | COOLER | |
| | FRAME 8 | | FRAME 8 | |
| | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **NIH, 1 Pass Cover, 150 psig (1034 kPa)** | 417 | 494 | 189 | 224 |
| **NIH, 2 Pass Cover, 150 psig (1034 kPa)** | 540 | 693 | 245 | 314 |
| **NIH, 3 Pass Cover, 150 psig (1034 kPa)** | 1629 | 1687 | 739 | 765 |
| **MWB End Cover, 150 psig (1034 kPa)** | 1125 | 1125 | 510 | 510 |
| **MWB Return Cover, 150 psig (1034 kPa)** | 404 | 404 | 183 | 183 |
| **NIH, 1 Pass Cover, 300 psig (2068 kPa)** | 2359 | 2523 | 1070 | 1144 |
| **NIH, 2 Pass Cover, 300 psig (2068 kPa)** | 2369 | 2599 | 1075 | 1179 |
| **NIH, 3 Pass Cover, 300 psig (2068 kPa)** | 2353 | 2516 | 1067 | 1141 |
| **NIH/MWB End Cover, 300 psig (2068 kPa)** | 1951 | 1951 | 885 | 885 |

LEGEND

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

NOTE: Weight for NIH 2-pass cover, 150 psig (1034 kPa), is included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 36 — 19XR Waterbox Cover Weights Condenser Frame 8

| WATERBOX DESCRIPTION | ENGLISH (LB) | | METRIC (KG) | |
|---|---|---|---|---|
| | CONDENSER | | CONDENSER | |
| | FRAME 8 | | FRAME 8 | |
| | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **NIH, 1 Pass Cover, 150 psig (1034 kPa)** | 417 | 494 | 189 | 224 |
| **NIH, 2 Pass Cover, 150 psig (1034 kPa)** | 508 | 662 | 245 | 314 |
| **NIH, 3 Pass Cover, 150 psig (1034 kPa)** | 1469 | 1527 | 739 | 765 |
| **MWB End Cover, 150 psig (1034 kPa)** | 1007 | 1007 | 510 | 510 |
| **MWB Return Cover, 150 psig (1034 kPa)** | 1307 | 1307 | 183 | 183 |
| **NIH, 1 Pass Cover, 300 psig (2068 kPa)** | 404 | 404 | 1070 | 1144 |
| **NIH, 2 Pass Cover, 300 psig (2068 kPa)** | 1986 | 2151 | 1075 | 1179 |
| **NIH, 3 Pass Cover, 300 psig (2068 kPa)** | 1893 | 2222 | 1067 | 1141 |
| **NIH/MWB End Cover, 300 psig (2068 kPa)** | 1993 | 2112 | 885 | 885 |

LEGEND

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

NOTE: Weight for NIH 2-pass cover, 150 psig (1034 kPa), is included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 37 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 6 Cooler Frame A

| WATERBOX DESCRIPTION | PASSES | ENGLISH (LB) | | METRIC (KG) | |
|---|---|---|---|---|---|
| | | COOLER | | COOLER | |
| | | FRAME A | | FRAME A | |
| | | STANDARD NOZZLES | FLANGED | STANDARD NOZZLES | FLANGED |
| **Dished Head, 150 psig** | 1 | 1006 | 1171 | 456 | 531 |
| **MWB End Cover, 150 psig** | 1 | 976 | 976 | 443 | 443 |
| **MWB End Cover (ASME), 300 psig** | 1 | 2460 | 2460 | 1116 | 1116 |
| **Dished Head, 150 psig** | 2 | 1140 | 1336 | 517 | 606 |
| **Dished Head (Return Cover), 150 psig** | 2 | 976 | 976 | 443 | 443 |
| **MWB End Cover, 150 psig** | 2 | 1068 | 1068 | 484 | 484 |
| **MWB End Cover (Return Cover), 150 psig** | 2 | 976 | 976 | 443 | 443 |
| **MWB End Cover (ASME), 300 psig** | 2 | 2460 | 2460 | 1116 | 1116 |
| **MWB End Cover (ASME) (Return Cover), 300 psig** | 2 | 2460 | 2460 | 1116 | 1116 |
| **Dished Head, 150 psig** | 3 | 1048 | 1112 | 475 | 504 |
| **MWB End Cover, 150 psig** | 3 | 1030 | 1030 | 467 | 467 |
| **MWB End Cover (ASME), 300 psig** | 3 | 2460 | 2460 | 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 150 psig (1034 kPa) are included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 38 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 6 Condenser Frame A and B

| WATERBOX DESCRIPTION | PASSES | ENGLISH (LB) | | | | METRIC (KG) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | CONDENSER | | | | CONDENSER | | | |
| | | FRAME A | | FRAME B | | FRAME A | | FRAME B | |
| | | STANDARD NOZZLES | FLANGED | STANDARD NOZZLES | FLANGED | STANDARD NOZZLES | FLANGED | STANDARD NOZZLES | FLANGED |
| **Dished Head, 150 psig** | 1 | 895 | 1060 | 1006 | 1171 | 406 | 481 | 473 | 547 |
| **MWB, 150 psig** | 1 | 859 | 859 | 1075 | 1075 | 390 | 390 | 488 | 488 |
| **MWB (ASME), 300 psig** | 1 | 2117 | 2117 | 2744 | 2744 | 960 | 960 | 1292 | 1292 |
| **Dished Head, 150 psig** | 2 | 981 | 1179 | 1140 | 1400 | 445 | 535 | 574 | 633 |
| **Dished Head (Return Cover), 150 psig** | 2 | 824 | 824 | 976 | 976 | 374 | 374 | 481 | 481 |
| **MWB 150 psig** | 2 | 907 | 907 | 1075 | 1075 | 411 | 411 | 630 | 630 |
| **MWB (Return), 150 psig** | 2 | 824 | 824 | 976 | 976 | 374 | 411 | 488 | 488 |
| **MWB (ASME), 300 psig** | 2 | 2117 | 2117 | 2744 | 2744 | 960 | 1083 | 1440 | 1440 |
| **MWB Return Cover (ASME), 300 psig** | 2 | 2117 | 2117 | 2744 | 2744 | 960 | 960 | 1245 | 1245 |
| **Dished Head, 150 psig** | 3 | 1067 | 1157 | 1050 | 1140 | 484 | 525 | 476 | 517 |
| **MWB End Cover, 150 psig** | 3 | 942 | 942 | 1020 | 1020 | 427 | 427 | 463 | 463 |
| **MWB End Cover (ASME), 300 psig** | 3 | 2117 | 2177 | 2744 | 2744 | 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 150 psig (1034 kPa) are included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 39 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 7 Cooler Frames B, C

| WATERBOX DESCRIPTION | PASSES | ENGLISH (LB) | | | | METRIC (KG) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | COOLER | | | | COOLER | | | |
| | | FRAME B | | FRAME C | | FRAME B | | FRAME C | |
| | | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **Dished Head, 150 psig (1034 kPa)** | 1 | 1380 | 1545 | 1849 | 2014 | 626 | 701 | 839 | 914 |
| **MWB End Cover, 150 psig (1034 kPa)** | 1 | 1366 | 1366 | 1835 | 1835 | 620 | 620 | 832 | 832 |
| **MWB End Cover (ASME), 300 psig (2068 kPa)** | 1 | 3425 | 3425 | 4805 | 4805 | 1554 | 1554 | 2180 | 2180 |
| **Dished Head, 150 psig (1034 kPa)** | 2 | 1589 | 1849 | 2076 | 2336 | 721 | 839 | 942 | 1060 |
| **Dished Head (Return Cover), 150 psig (1034 kPa)** | 2 | 1367 | 1367 | 1836 | 1836 | 620 | 620 | 833 | 833 |
| **MWB End Cover, 150 psig (1034 kPa)** | 2 | 1489 | 1489 | 1987 | 1987 | 675 | 675 | 901 | 901 |
| **MWB (Return Cover), 150 psig (1034 kPa)** | 2 | 1367 | 1367 | 1836 | 1836 | 620 | 620 | 833 | 833 |
| **MWB End Cover (ASME), 300 psig (2068 kPa)** | 2 | 3425 | 3425 | 4805 | 4805 | 1554 | 1554 | 2180 | 2180 |
| **MWB (Return Cover), 300 psig (2068 kPa)** | 2 | 3425 | 3425 | 4805 | 4805 | 1554 | 1554 | 2180 | 2180 |
| **Dished Head, 150 psig (1034 kPa)** | 3 | 1514 | 1604 | 2028 | 2118 | 687 | 728 | 920 | 961 |
| **MWB End Cover, 150 psig (1034 kPa)** | 3 | 1506 | 1506 | 1995 | 1995 | 683 | 683 | 905 | 905 |
| **MWB End Cover (ASME), 300 psig (2068 kPa)** | 3 | 3425 | 3425 | 4805 | 4805 | 1554 | 1554 | 2180 | 2180 |

LEGEND

**ASME** — American Society of Mechanical Engineers
**MWB** — Marine Waterbox
**STD** — Standard

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 150 psig (1034 kPa) are included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 40 — 19XR Waterbox Cover Weights, Two-Stage Compressor Frame 7 Condenser Frames C, D

| WATERBOX DESCRIPTION | PASSES | ENGLISH (LB) | | | | METRIC (KG) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | CONDENSER | | | | CONDENSER | | | |
| | | FRAME C | | FRAME D | | FRAME C | | FRAME D | |
| | | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED | STD NOZZLES | FLANGED |
| **Dished Head, 150 psig (1034 kPa)** | 1 | 1380 | 1600 | 1849 | 2029 | 626 | 726 | 839 | 920 |
| **MWB End Cover, 150 psig (1034 kPa)** | 1 | 1367 | 1367 | 1835 | 1835 | 620 | 620 | 832 | 832 |
| **MWB End Cover (ASME), 300 psig (2068 kPa)** | 1 | 3639 | 3639 | 5249 | 5249 | 1651 | 1651 | 2353 | 2353 |
| **Dished Head, 150 psig (1034 kPa)** | 2 | 1589 | 1919 | 2076 | 2406 | 721 | 870 | 942 | 1091 |
| **Dished Head (Return Cover), 150 psig (1034 kPa)** | 2 | 1367 | 1367 | 1836 | 1836 | 620 | 620 | 833 | 833 |
| **MWB End Cover, 150 psig (1034 kPa)** | 2 | 1497 | 1497 | 1988 | 1988 | 679 | 679 | 902 | 902 |
| **MWB (Return Cover), 150 psig (1034 kPa)** | 2 | 1367 | 1367 | 1836 | 1836 | 620 | 620 | 833 | 833 |
| **MWB End Cover (ASME), 300 psig (2068 kPa)** | 2 | 3639 | 3639 | 5249 | 5249 | 1651 | 1651 | 2381 | 2381 |
| **MWB (Return Cover) (ASME), 300 psig (2068 kPa)** | 2 | 3639 | 3639 | 5249 | 5249 | 1651 | 1651 | 2381 | 2381 |
| **Dished Head, 150 psig (1034 kPa)** | 3 | 1514 | 1612 | 2028 | 2126 | 687 | 731 | 920 | 964 |
| **MWB End Cover, 150 psig (1034 kPa)** | 3 | 1493 | 1493 | 1993 | 1993 | 677 | 677 | 904 | 904 |
| **MWB End Cover (ASME), 300 psig (2068 kPa)** | 3 | 3639 | 3639 | 5249 | 5249 | 1651 | 1651 | 2381 | 2381 |

LEGEND

**ASME** — American Society of Mechanical Engineers
**MWB** — Marine Waterbox
**STD** — Standard

NOTES:
1. Consult factory for 1 and 3 pass data.
2. Weights for dished head cover and MWB end cover 150 psig (1034 kPa) are included in the heat exchanger weights shown in the heat exchanger weight tables.

## Table 41 — 19XR2-E Component Weights

| COMPONENT | FRAME 2 COMPRESSOR* | | FRAME 3 COMPRESSOR* | | FRAME 4 COMPRESSOR* | | FRAME 5 COMPRESSOR* | | FRAME C COMPRESSOR | | FRAME E COMPRESSOR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | lb | kg | lb | kg | lb | kg | lb | kg | lb | kg | lb | kg |
| SUCTION ELBOW | 116 | 53 | 185 | 84 | 239 | 108 | 407 | 185 | 303 | 137 | 337 | 171 |
| DISCHARGE ELBOW | 100 | 45 | 125 | 57 | 157 | 71 | 325 | 147 | 245 | 111 | 427 | 194 |
| CONTROL PANEL† | 92 | 72 | 92 | 72 | 92 | 72 | 92 | 72 | 92 | 42 | 92 | 42 |
| OPTIONAL COOLER INLET ISOLATION VALVE | 8 | 4 | 13 | 6 | 20 | 9 | 24 | 11 | 24 | 11 | 24 | 11 |
| OPTIONAL DISCHARGE ISOLATION VALVE | 26 | 12 | 46 | 21 | 74 | 34 | 108 | 49 | 93 | 42 | 93 | 42 |
| STD TIER VFD — 380, 400, AND 460-V (230, 335, 445 A) | 650 | 295 | 650 | 295 | — | — | — | — | 650 | 295 | — | — |
| STD TIER VFD — 380, 400, AND 460-V (DD588) | — | — | 275 | 125 | 275 | 125 | — | — | 275 | 125 | — | — |
| STD TIER VFD — 380, 400, AND 460-V (DE658, DE745, DE800) | — | — | 650 | 295 | 650 | 295 | — | — | 650 | 295 | — | — |
| STD TIER VFD — 380, 400, AND 460-V (DE800, DE990) | — | — | — | — | 700 | 318 | 700 | 318 | 700 | 318 | 700 | 318 |
| STD TIER VFD — 380, 400, AND 460-V (DP1120, DP1260, DP1460) | — | — | — | — | 3000 | 1361 | 3000 | 1361 | 3000 | 1361 | 3000 | 1361 |
| STD TIER VFD — 380, 400, AND 460-V (DP1670) | — | — | — | — | — | — | 3400 | 1542 | | | 3400 | 1542 |
| LIQUIFLO™ 2 VFD — 380, 400, AND 460-V (442 A) | 1600 | 726 | 1600 | 726 | — | — | — | — | — | — | — | — |
| LIQUIFLO 2 VFD — 380, 400, AND 460-V (608 A) | — | — | 1600 | 726 | 1600 | 726 | — | — | — | — | — | — |
| LIQUIFLO 2 VFD — 380, 400, AND 460-V (900 A) | — | — | — | — | 2800 | 1270 | 2800 | 1270 | 2800 | 1270 | 2800 | 1270 |
| LIQUIFLO 2 VFD — 380, 400, AND 460-V (1200 A) | — | — | — | — | 2850 | 1293 | 2850 | 1293 | 2850 | 1293 | 2850 | 1293 |
| LIQUIFLO 2 VFD — 575-V (390 A) | 2200 | 998 | 2200 | 998 | — | — | — | — | — | — | — | — |
| VFD SHELF (ROCKWELL VFD) | — | — | — | — | 1049 | 476 | 1049 | 476 | 1049 | 476 | 1049 | 476 |
| VFD SHELF (DANFOSS VFD) | | | 1395 | 633 | 1395 | 633 | 1499 | 680 | 1395 | 633 | 1499 | 680 |

* To determine compressor frame size, refer to 19XR,XRV Computer Selection Program.
† Included in total cooler weight.

NOTES
1. VFD sizes are available on select heat exchanger models; consult the 19XR,XRV Computer Selection program.
2. VFD Power Panel (DD558, DE658, DE745, DE800, DE880, DE990) used on frames 3, 4, C, 5, E = 300 lbs (136 kg).

## Table 42 — 19XR6-7 Component Weights

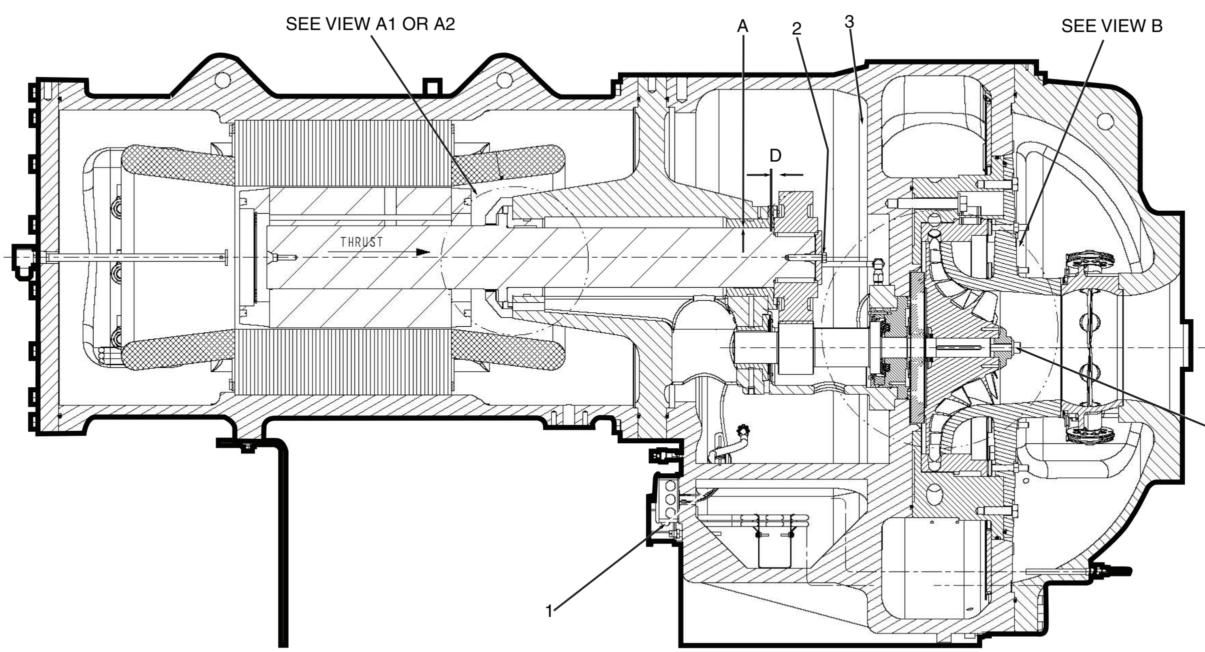
| COMPONENT | FRAME 6 COMPRESSOR | | FRAME 7 COMPRESSOR | |
|---|---|---|---|---|
| | lb | kg | lb | kg |
| TRANSMISSION ASSEMBLY (INCLUDING BULL GEAR, HIGH SPEED SHAFT, STATOR, ROTOR, MOTOR END COVER) | 11,243 | 5100 | 13,481 | 6115 |
| BULL GEAR | 121 | 55 | 220 | 100 |
| HIGH SPEED SHAFT ASSEMBLY | 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 43 — 19XR Compressor Frame 2 Through Frame 5 Fits and Clearances (in.)

| ITEM | COMPRESSOR | FRAME 2 | FRAME 3 | FRAME 4 | | FRAME 5 | |
|---|---|---|---|---|---|---|---|
| | Code | 201-299, 2ZZ | 321-389, 3ZZ, 32E-38H | 421-487, 4B1-4W7 | | 501-599 | |
| | DESCRIPTION | Oil Film Bearings | Rolling Element Bearings | Oil Film Bearings | Rolling Element Bearings | Oil Film Bearings | Rolling Element Bearings |
| A | Low Speed Journal-Gear End | .0050/.0040 | .0050/.0040 | .0055/.0043 | .0055/.0043 | .0069/.0059 | .0069/.0059 |
| B | Low Speed Journal-Motor End | .0050/.0040 | .0050/.0040 | .0053/.0043 | .0053/.0043 | .0065/.0055 | .0065/.0055 |
| C1 | Low Speed Labyrinth to Thrust Disk | .0115/.0055 | N/A | .010/.005 | N/A | N/A | N/A |
| C2 | Labyrinth to Low Speed Shaft | N/A | .010/.005 | .0095/.0055 | .0095/.0055 | .013/.009 | .013/.009 |
| D | Low Speed Shaft Thrust Float | .020/.008 | .020/.008 | .023/.008 | .023/.008 | .020/.008 | .020/.008 |
| E | Impeller Eye to Shroud | * | * | * | * | * | * |
| F1 | Impeller Bore to Shaft-Rear | –.0020/–.0005 | –.0025/–.0010 | –.0014/–.0029 | –.0014/–.0029 | –.0019/–.0005 | –.0019/–.0005 |
| F2 | Impeller Bore to Shaft-Front | N/A | N/A | –.0005/–.0025 | –.0005/–.0025 | –.0014/.0000 | N/A |
| G | Impeller Discharge to Shroud | * | * | * | * | * | * |
| H | Impeller Spacer to Shaft | .0025/.0010 | .0025/.0010 | .0025/.0010 | .0025/.0010 | .0024/.0010 | .0024/.0010 |
| I | Slinger to Shaft | .0013/.0005 | .0012/.0004 | .0012/.0004 | .0012/.0004 | .0012/.0004 | .0012/.0004 |
| J | Labyrinth to Slinger | .013/.009 | .010/.006 | .010/.006 | .010/.006 | .010/.006 | .010/.006 |
| K | Labyrinth to Impeller | .012/.008 | .012/.008 | .012/.008 | .012/.008 | .012/.008 | .012/.008 |
| L | High Speed Journal-Impeller End | .0047/.0037 | N/A | .0040/.0028 | N/A | .0048/.0038 | N/A |
| M | Thrust Assembly Seal Ring Axial Clearance | .006/.002 | N/A | .006/.002 | N/A | .006/.002 | N/A |
| N | Thrust Assembly Seal Ring to Shaft | .0045/.0015 | N/A | .0045/.0015 | N/A | .0045/.0015 | N/A |
| O | High Speed Shaft Thrust Float | .014/.008 | 0 Float | .014/.008 | Float | .014/.008 | 0 Float |
| P | High Speed Journal-Gear End | .0050/.0040 | N/A | .0048/.0038 | N/A | .0062/.0052 | N/A |

* Depends on impeller size, contact your Carrier Service Representative for more information.

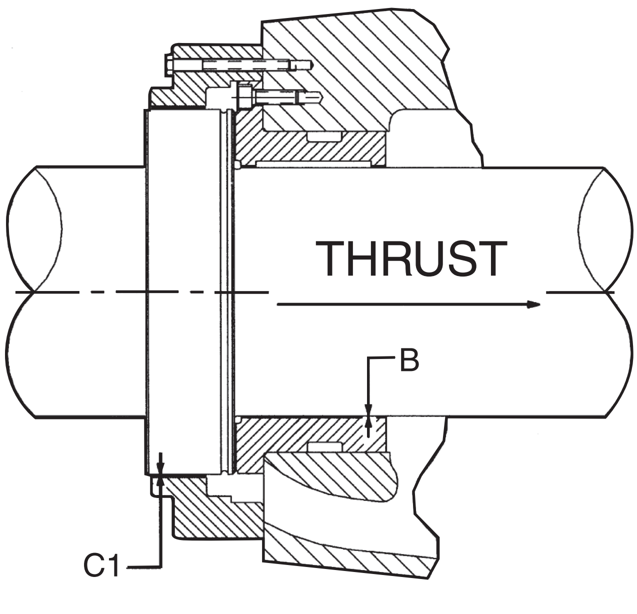
NOTES:
1. All clearances for cylindrical surfaces are diametrical.
2. Dimensions shown are with rotors in the thrust position.
3. Frame 3 rolling element style high speed shaft and bearing assembly cannot be pulled from impeller end. The transmission assembly must be removed from the compressor casting (after the impeller is removed) and the bearing temperature sensor must be removed from the high speed shaft and bearing assembly before the high speed shaft and bearing assembly can be separated from the transmission.
4. 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.
5. Impeller spacing should be performed in accordance with the most recent Carrier Impeller Spacing Service Bulletin.



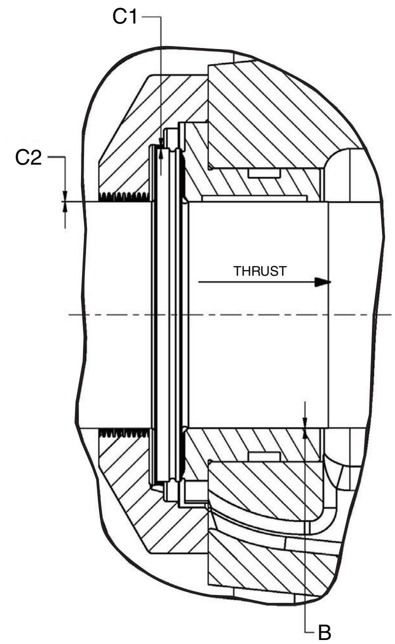

COMPRESSOR, TRANSMISSION AREA (FRAME 5 COMPRESSOR SHOWN)
1) OIL HEATER RETAINING NUT (NOT SHOWN)
2) BULL GEAR RETAINING BOLT
3) DEMISTER BOLTS (NOT SHOWN)
4) IMPELLER BOLT

COMPRESSOR, TRANSMISSION AREA (FRAME 5 COMPRESSOR SHOWN)

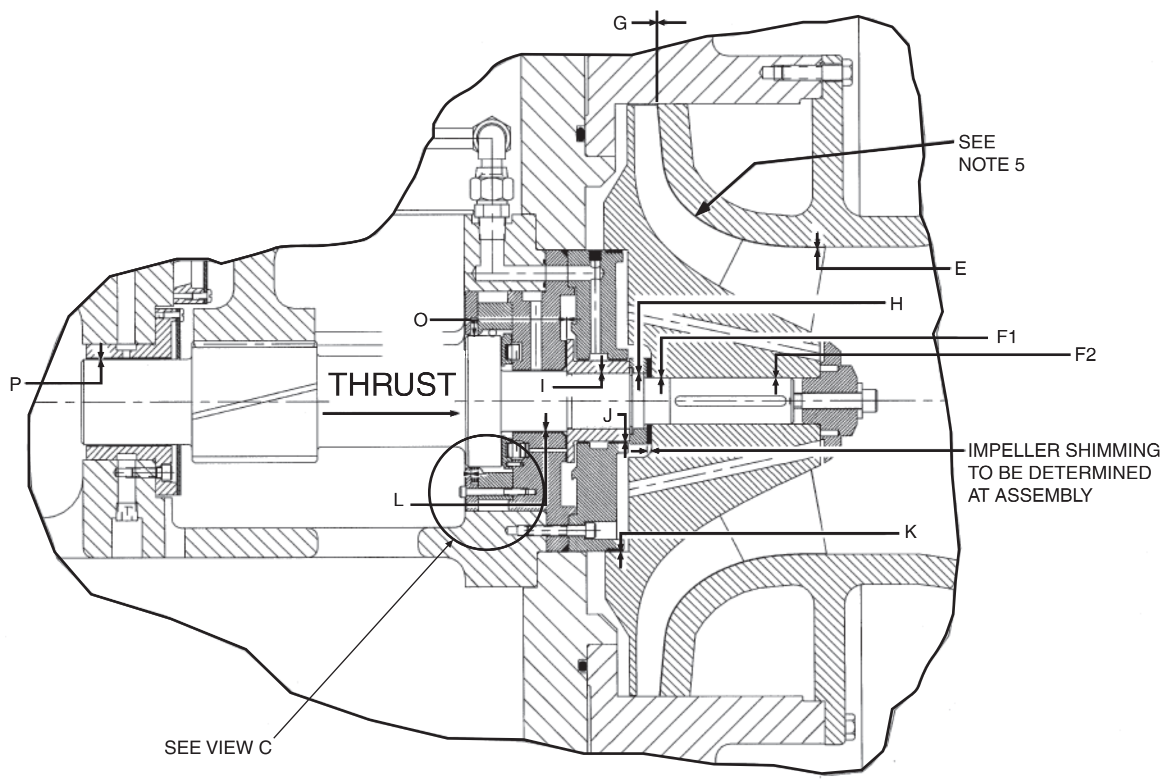
**Fig. 53 — Compressor Fits and Clearances — Single-Stage Compressors**




VIEW A1
LOW SPEED SHAFT THRUST DISK
FRAME 2 COMPRESSORS

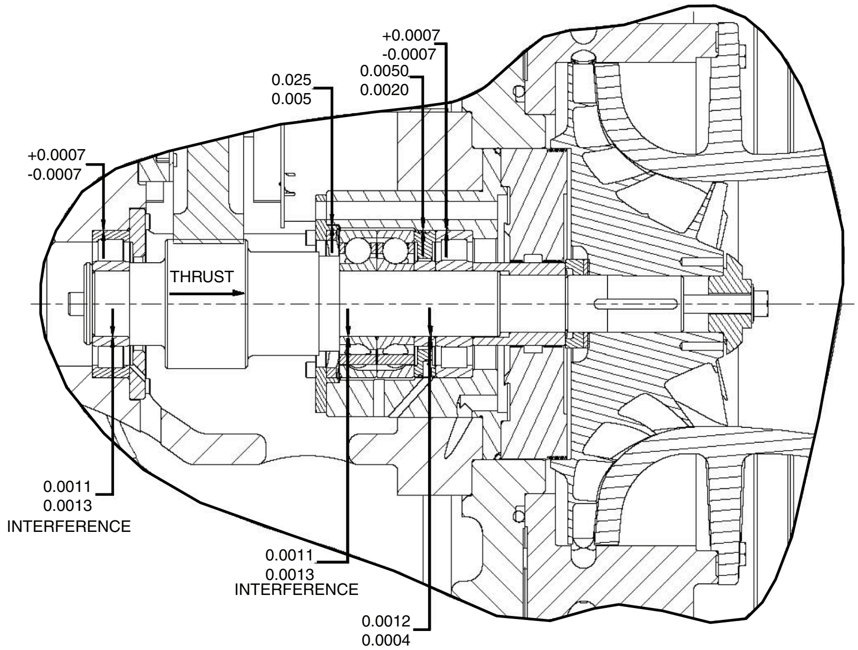



VIEW A2
LOW SPEED SHAFT THRUST DISK
FRAME 3, 4, AND 5 COMPRESSORS

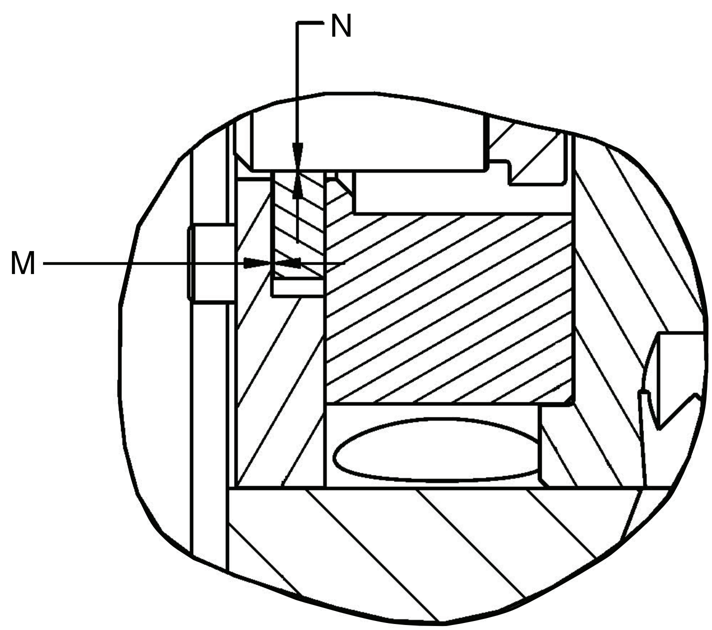



VIEW B — HIGH SPEED SHAFT, ORIGINAL DESIGN (OIL FILM BEARINGS) AND IMPELLER SECTION

**Fig. 53 — Compressor Fits and Clearances — Single-Stage Compressors (cont)**




VIEW B — HIGH SPEED SHAFT WITH ROLLING ELEMENT BEARINGS

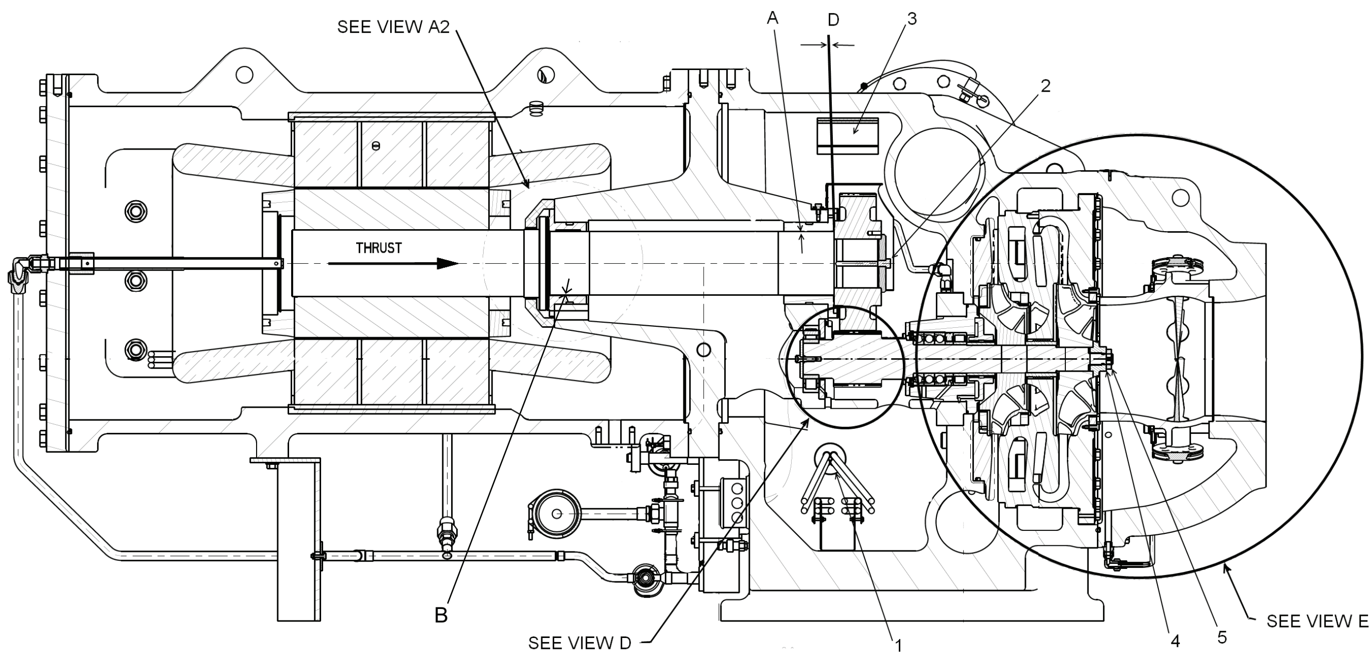



VIEW C — HIGH SPEED SHAFT RING SEAL

**Fig. 53 — Compressor Fits and Clearances — Single-Stage Compressors (cont)**

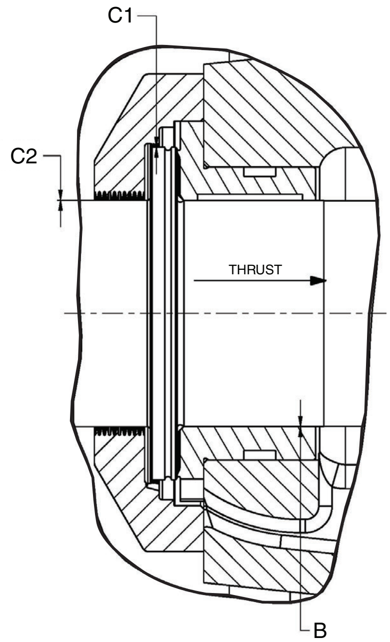
## Table 44 — 19XR Compressor Frame C, E Fits and Clearances

| ITEM | COMPRESSOR | FRAME C | FRAME E |
|---|---|---|---|
| | CODE | C21-C09 | E21-E69 |
| | DESCRIPTION | ROLLING ELEMENT BEARINGS | ROLLING ELEMENT BEARINGS |
| A | Low Speed Journal - Gear End | 0.0055/0.0043 | 0.0069/0.0059 |
| B | Low Speed Journal - Motor End | 0.0053/0.0043 | 0.0065/0.0055 |
| C1 | Low Speed Labyrinth to Thrust Disk | 0.03/0.0010 | N/A |
| C2 | Labyrinth to Low Speed Shaft | 0.010/0.005 | 0.013/0.009 |
| D | Low Speed Shaft Thrust Float | 0.023/0.008 | 0.020/0.008 |

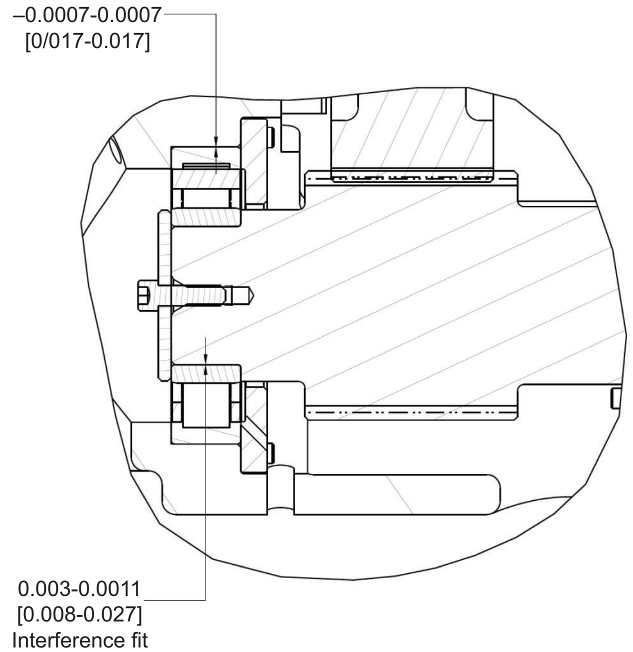



LEGEND
1 — Oil Heater Retaining Nut
2 — Bull Gear Retaining Bolt
3 — Demister Bolts
4 — First Impeller Nut (Inner)
5 — Second Impeller Nut (Outer)
6 — Guide Vane Shaft Seal (Not Shown)

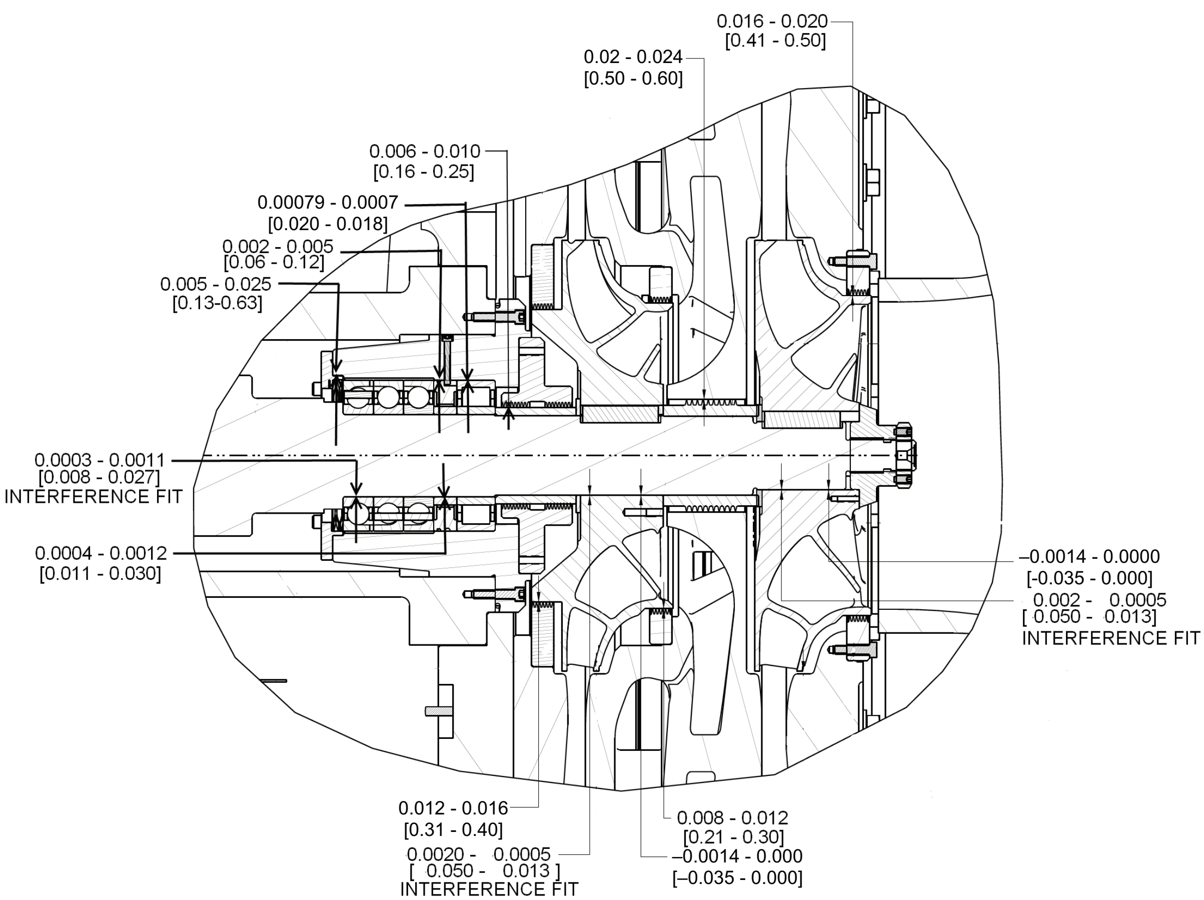
**Fig. 54 — 19XR C,E Compressor Fits and Clearances — Two-Stage Compressors**




VIEW A2
LOW SPEED SHAFT THRUST DISK




VIEW D
REAR, HIGH SPEED SHAFT BEARING




VIEW E

**Fig. 54 — 19XR C,E Compressor Fits and Clearances — Two-Stage Compressors (cont)**

**Table 45 — 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.

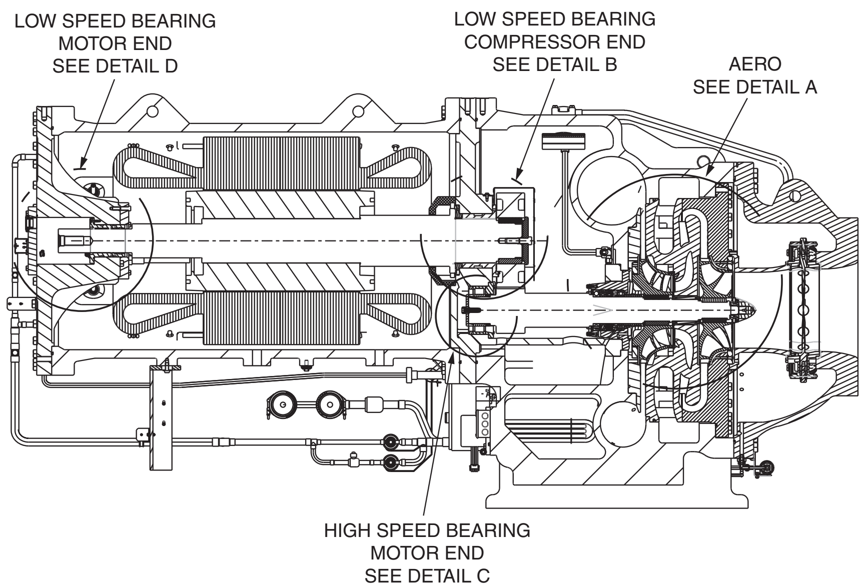
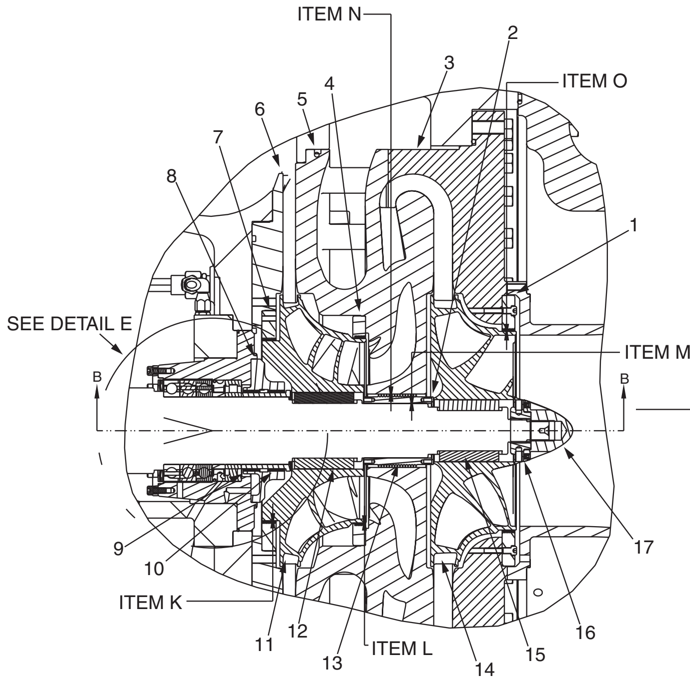
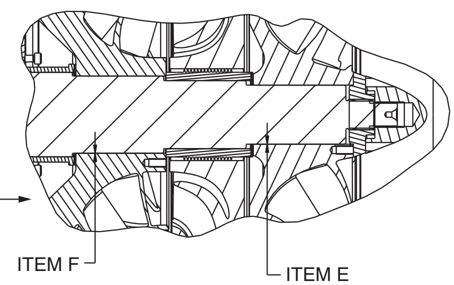



**Fig. 55 — Compressor Fits and Clearances — Two-Stage Compressor, Frame Sizes 6 and 7**



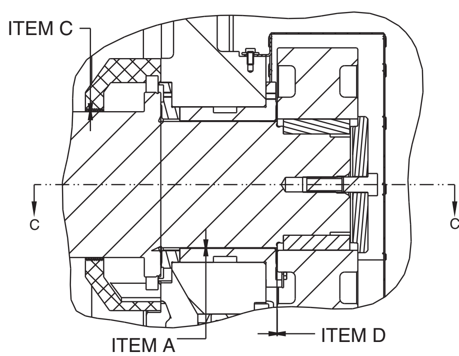

DETAIL A
AERO

SECTION B-B




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

SECTION C-C

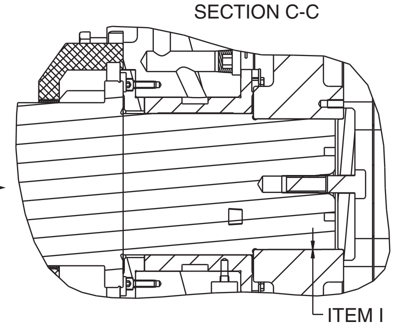
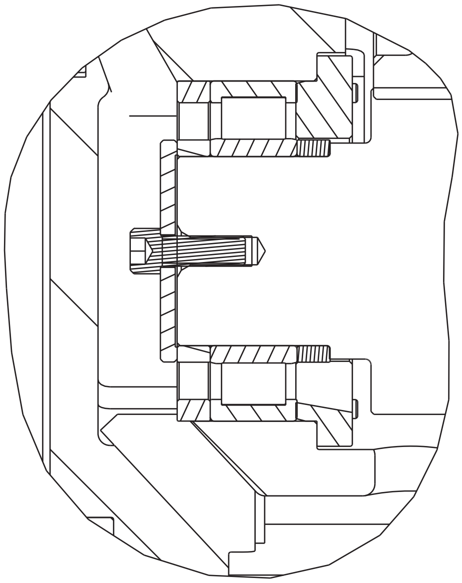
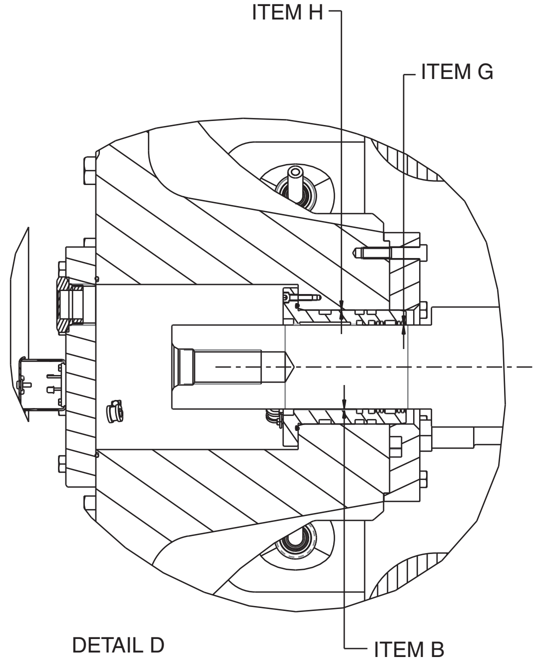


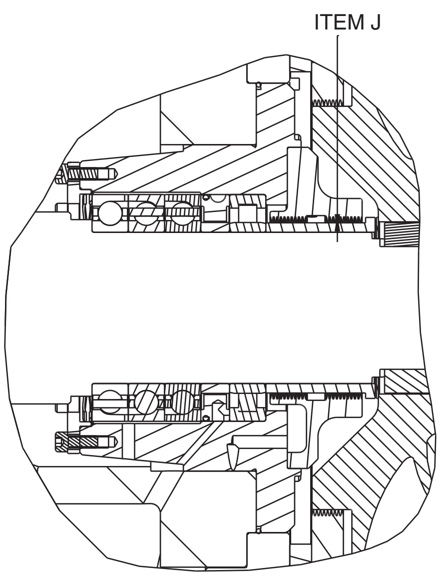

**Fig. 55 — Compressor Fits and Clearances — Two-Stage Compressor, Frames Size 6 and 7 (cont)**



DETAIL C
HIGH SPEED BEARING
MOTOR END




DETAIL D
LOW SPEED BEARING
MOTOR END




DETAIL E
HIGH SPEED BEARING
COMPRESSOR END (XR6 SHOWN)

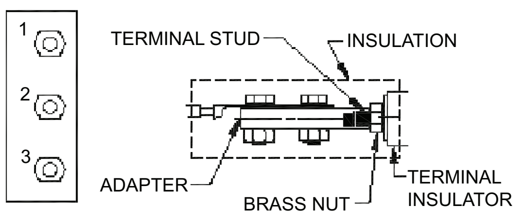
**Fig. 55 — Compressor Fits and Clearances — Two-Stage Compressor, Frame Sizes 6 and 7 (cont)**

## ⚠ CAUTION

**USE COPPER CONDUCTORS ONLY**
**UTILISEZ DES CONDUCTEURS EN CUIVRE SEULMENT**

**ALWAYS USE 2 WRENCHES TO TIGHTEN**
- **TERM INSULATOR TO MOTOR – 15-35 ft. lb.**
- **BRASS NUT TO TERM INSULATOR – 3 ft. lb. max**
- **ADAPTOR TO TERM STUD – 20-35 ft. lb.**
- **LUG BOLTS (1/2")– 32-45 ft. lb.**

**Insulate entire connection with electrical insulation including 1 inch of cable insulation and 1 inch of the term insulator.**



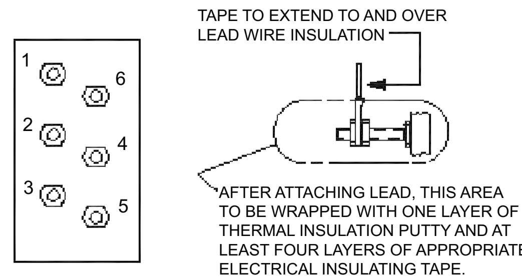

13

## ⚠ CAUTION

**USE COPPER CONDUCTORS ONLY**
**UTILISEZ DES CONDUCTEURS EN CUIVRE SEULMENT**

**ALWAYS USE 2 WRENCHES TO TIGHTEN**
- **TERM INSULATOR TO MOTOR – 15-35 ft. lb.**
- **CABLE LUG NUT – 40-45 ft. lb.**

**Insulate entire connection with electrical insulation including 1 inch of cable insulation and 1 inch of the term insulator.**




12

Mandatory for medium/high voltage.

MOTOR LEAD INSTALLATION LABELS

19XRV COMPRESSOR ASSEMBLY TORQUES

| ITEM | COMPRESSOR | FRAME 2 | FRAME 3 | FRAME 4 | FRAME 4 | FRAME 5 |
|---|---|---|---|---|---|---|
| | **CODE** | **201-299, 2ZZ** | **321-389, 3ZZ, 32E-38H** | **421-487** | **4B1-4W7** | **501-599** |
| | **DESCRIPTION** | **FIXED DIFFUSER** | **WITH ROLLING ELEMENT BEARINGS** | **FIXED DIFFUSER** | **SPLIT RING DIFFUSER** | **SPLIT RING DIFFUSER** |
| 1 | Oil Heater Retaining Nut — ft-lb (N·m) | N/A | 18-22 (25-30) | 18-22 (25-30) | 18-22 (25-30) | 18-22 (25-30) |
| 2 | Bull Gear Retaining Bolt — ft-lb (N·m) | 80-90 (108-122) | 80-90 (108-122) | 80-90 (108-122) | 80-90 (108-122) | 80-90 (108-122) |
| 3 | Demister Bolts — ft-lb (N·m) | 15-19 (20-26) | 15-19 (20-26) | 15-19 (20-26) | 15-19 (20-26) | 15-19 (20-26) |
| 4 | Impeller Bolt Torque — ft-lb (N·m) | 32-48 (43-65) | 55-60 (75-81) | 55-60 (75-81) | 55-60 (75-81) | 160-225 (217-305) |

19XRV COMPRESSOR ASSEMBLY TORQUES FRAME C, E

| ITEM | COMPRESSOR | FRAME C | FRAME E |
|---|---|---|---|
| | **CODE** | **C21-C89** | **E31-E69** |
| 1 | Oil Heater Retaining Nut — ft-lb (N·m) | 18-22 (24-30) | 18-22 (24-30) |
| 2 | Bull Gear Retaining Bolt — ft-lb (N·m) | 80-90 (108-122) | 80-90 (108-122) |
| 3 | Demister Bolts — ft-lb (N·m) | 15-19 (20-26) | 15-19 (20-26) |
| 4 | Impeller Nut (Inner) — ft-lb (N·m) | 100 (136) | 250 (339) |
| 5 | Impeller Nut (Outer) — ft-lb (N·m) | 100 (136) | 100 (136) |
| 6 | Guide Vane Shaft Seal Nut — ft-lb (N·m) | 25 (34) | 25 (34) |

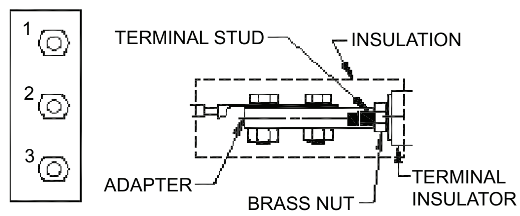
**Fig. 56 — 19XRV Compressor Assembly Torques — Single and Two-Stage Compressors**

## ⚠ CAUTION

**USE COPPER CONDUCTORS ONLY**
**UTILISEZ DES CONDUCTEURS EN CUIVRE SEULMENT**

**ALWAYS USE 2 WRENCHES TO TIGHTEN**
- **TERM INSULATOR TO MOTOR – 15-35 ft. lb.**
- **BRASS NUT TO TERM INSULATOR – 3 ft. lb. max**
- **ADAPTOR TO TERM STUD – 20-35 ft. lb.**
- **LUG BOLTS (1/2")– 32-45 ft. lb.**

**Insulate entire connection with electrical insulation including 1 inch of cable insulation and 1 inch of the term insulator.**




13

Mandatory for medium/high voltage.

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

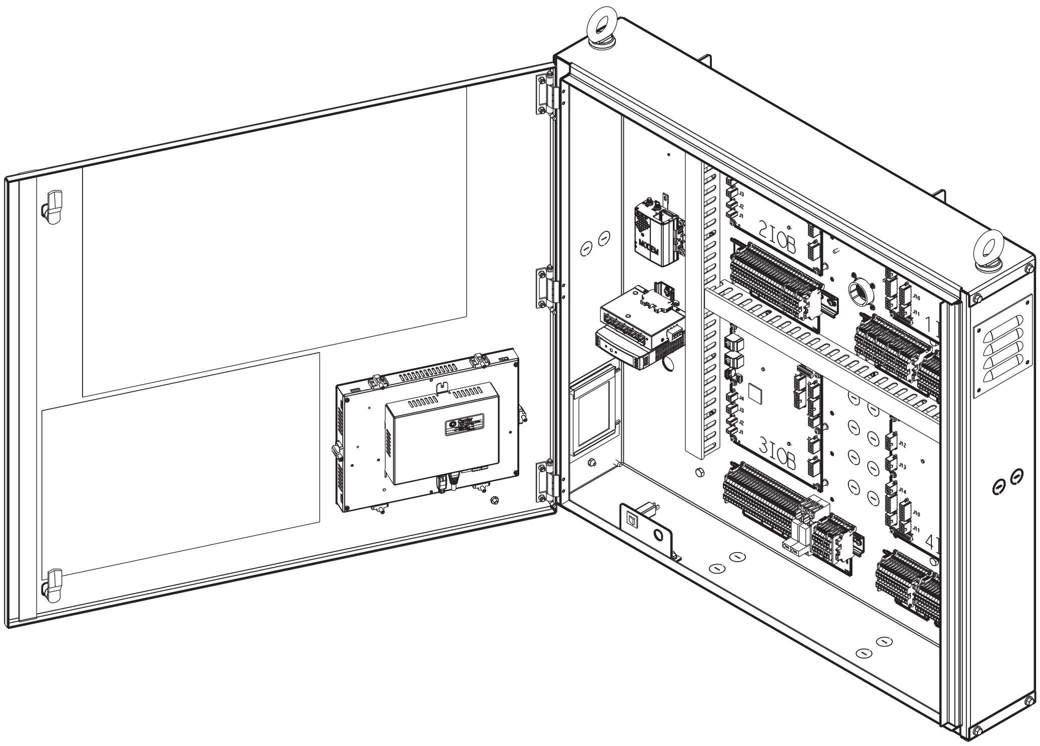



**Fig. 58 — 19XR2-E Control Panel**

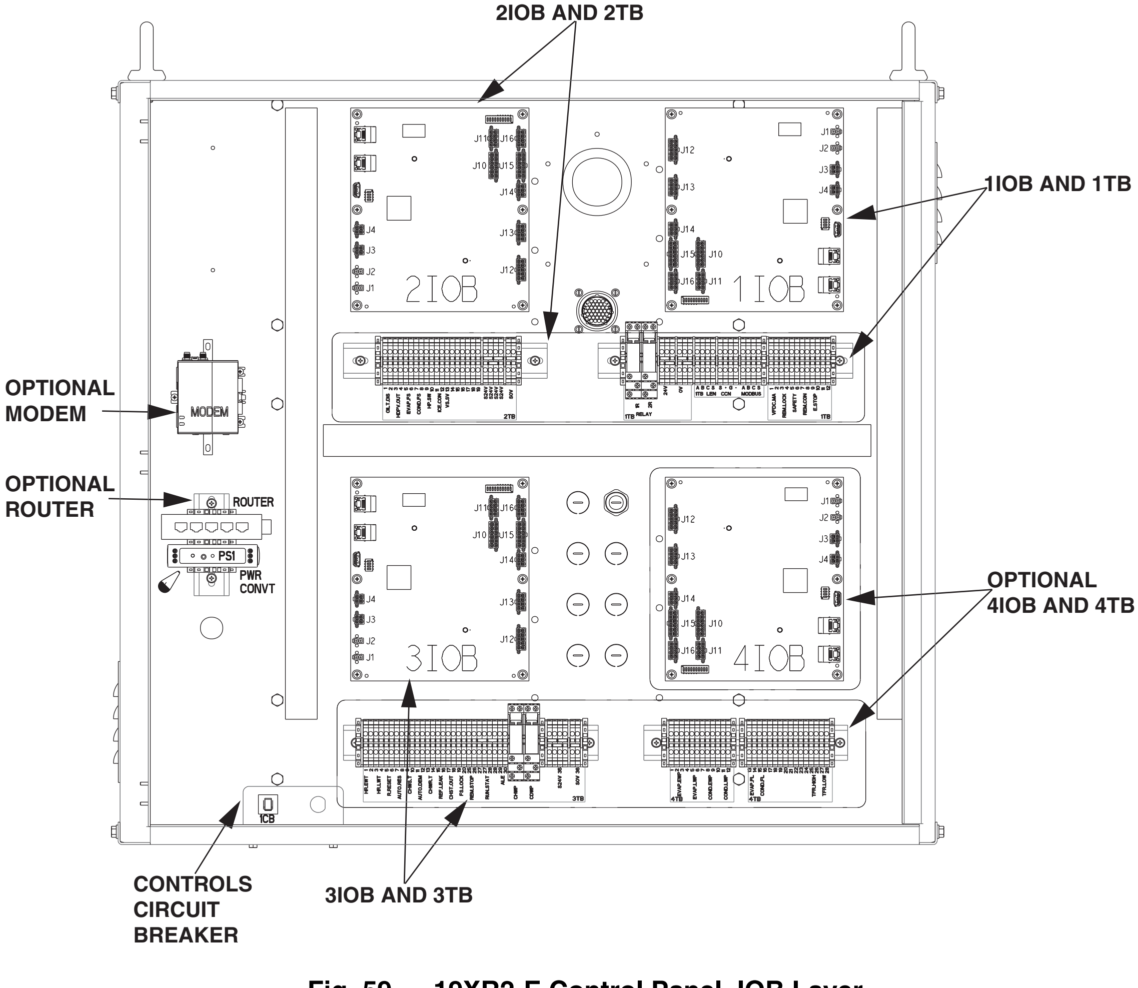



**Fig. 59 — 19XR2-E Control Panel, IOB Layer**

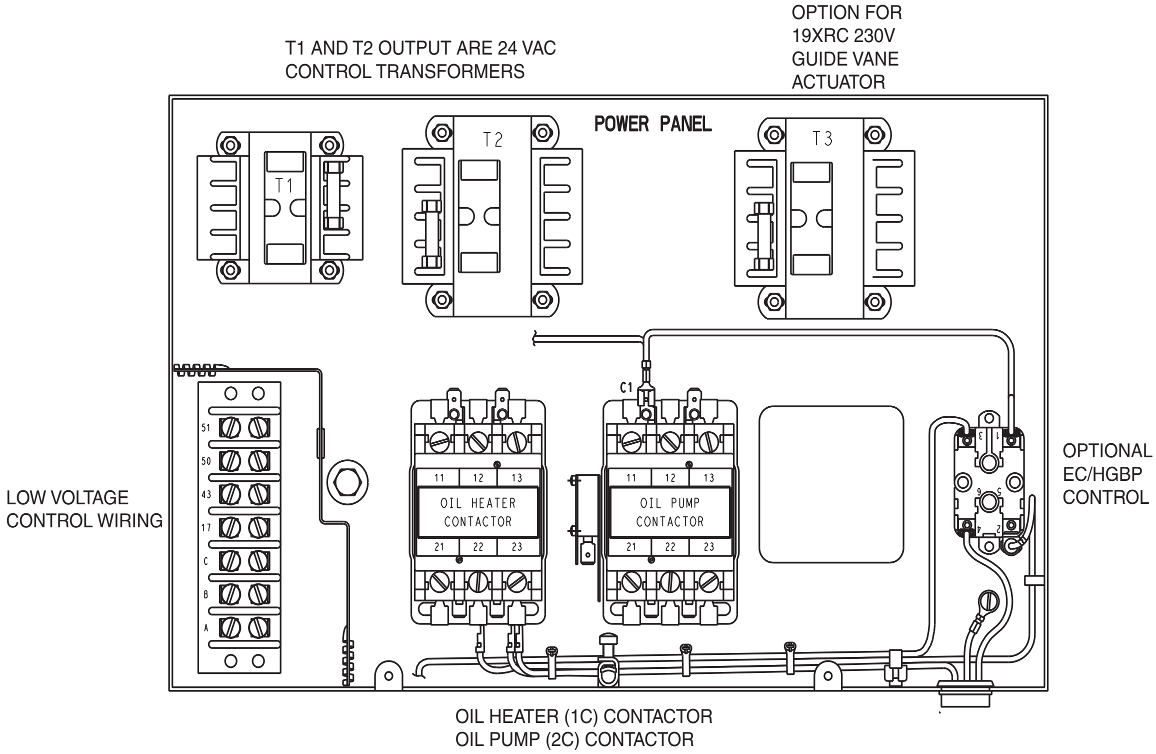



**Fig. 60 — 19XR2-E Power Panel**

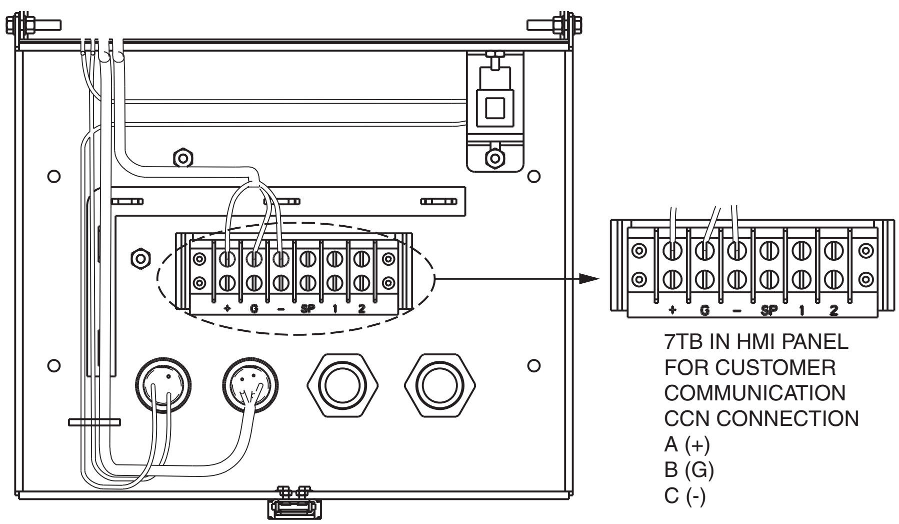



**Fig. 61 — 19XR6-7 HMI Panel**

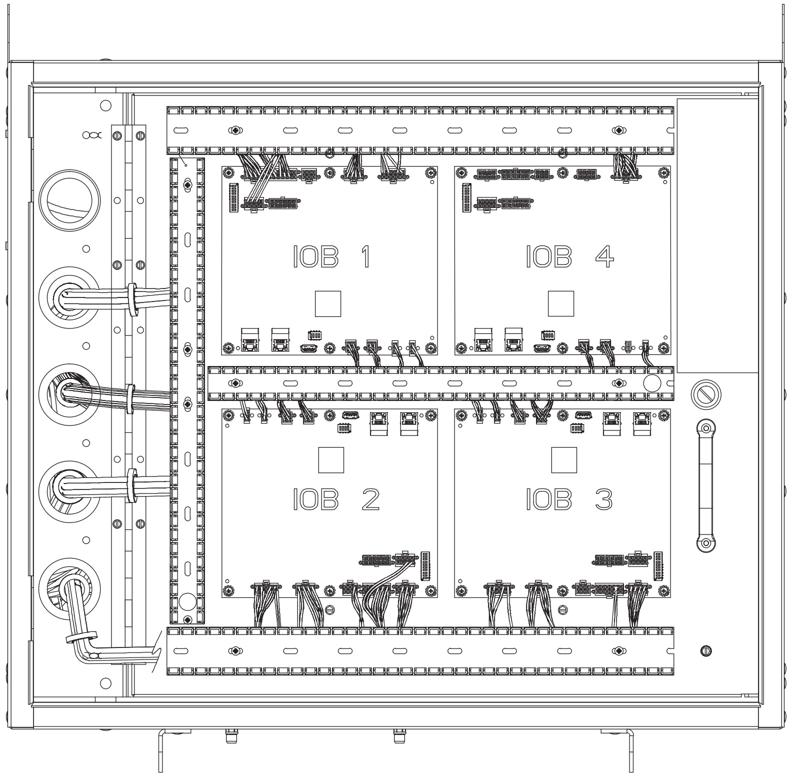



**Fig. 62 — 19XR6-7 Control Panel, IOB Layer**

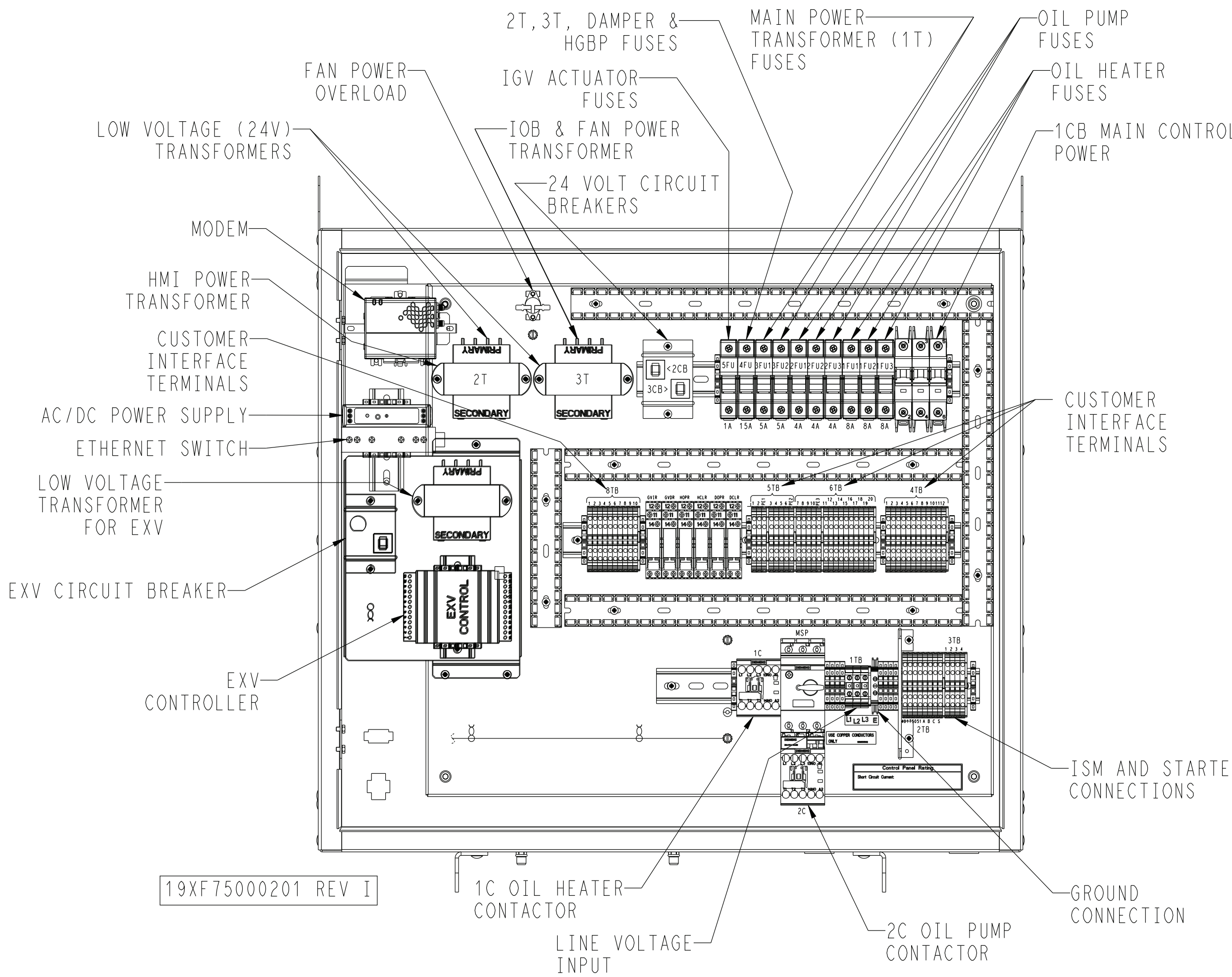
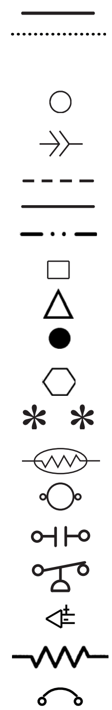



**Fig. 63 — 19XR6-7 Control Panel, Bottom Layer**

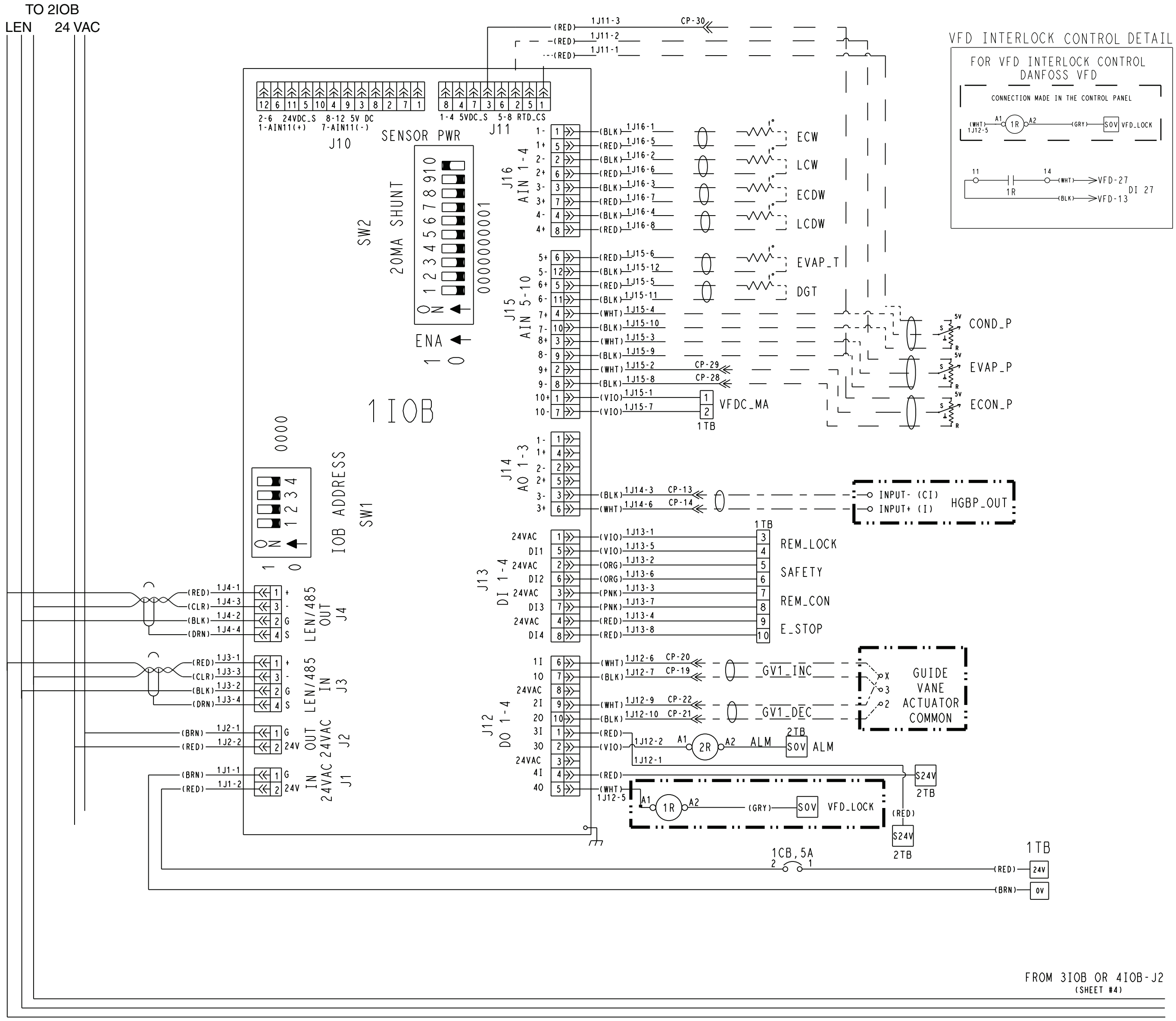
## LEGEND FOR Fig. 64
## 19XR2-E Chiller Control Schematic

| | |
|---|---|
| **1FU** | — Fuse, 5A |
| **2FU** | — Fuse, 10A |
| **1C** | — Oil Heater Contactor |
| **2C** | — Oil Pump Contactor |
| **3C** | — EC Valve Solenoid Open Relay |
| **1-4IOB** | — Carrier Input Output Board 1-4 |
| **1-4TB** | — Terminal Block 1-4 |
| **ALE** | — Chiller Alert Relay |
| **ALM** | — Chiller Alarm Relay |
| **AUTO_DEM** | — Auto Demand Limit Input |
| **AUTO_RES** | — Auto Water Temp Reset |
| **CB2/3** | — Circuit Breaker 2/3 |
| **CDW_DP** | — Cond Water Pressure Difference |
| **CDWP** | — Condenser Water Pump |
| **CDWP_V** | — Condenser Water Pump (Variable Speed) |
| **CHRS** | — Chiller Run Status |
| **CHST_OUT** | — Chiller Status Output mA |
| **CHW_DP** | — Chilled Water Pressure Difference |
| **CHWP** | — Chilled Water Pump |
| **CHWP_V** | — Chilled Water Pump (Variable Speed) |
| **CHWR_T** | — Common Chilled Water Return Temperature |
| **CHWS_T** | — Common Chilled Water Supply Temperature |
| **COND_EWP** | — Entering Cond Water Pressure |
| **COND_FL** | — Cond Water Flow Measurement |
| **COND_FS** | — Cond Water Flow Switch |
| **COND_LH** | — Cond Sump Level High |
| **COND_LL** | — Cond Sump Level Low |
| **COND_LWP** | — Leaving Cond Water Pressure |
| **COND_P** | — Condenser Pressure |
| **CUS_ALE** | — Customer Alert |
| **CVSI** | — Compressor VFD/Starter Interlock |
| **DGT** | — Compressor Discharge Temperature |
| **DIFF_OUT** | — Diffuser Output |
| **DIFF_P** | — Diffuser Pressure |
| **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 |
| **E_STOP** | — Remote Emergency Stop Input |
| **ECDW** | — Entering Condenser Water Temperature |
| **ECON_P** | — Economizer Pressure |
| **EC VALVE** | — Envelope Control Valve |
| **ECW** | — Entering Chilled Water Temperature |
| **EVAP_FL** | — Evap Water Flow Measurement |
| **EVAP_FS** | — Evap Water Flow Switch |
| **EVAP_P** | — Evaporator Pressure |
| **EVAP_T** | — Evap Refrigerant Liquid Temperature |
| **FC_MODE** | — Free Cooling Mode |
| **FC_SS** | — Free Cooling Start Switch |
| **FS_LOCK** | — Fire Security Interlock |
| **GV1_DEC** | — Stage 1 IGV Decrease |
| **GV1_INC** | — Stage 1 IGV Increase |
| **GV1_OUT** | — Guide Vane 1 Output |
| **GV1_POS** | — Guide Vane 1 Actual Position |
| **HDPV_OUT** | — head pressure output |
| **HGBP_MA** | — EC Valve Feedback |
| **HGBP_OP** | — EC Valve Solenoid/Open |
| **HGBP_OUT** | — EC Valve Output mA |
| **HMI** | — Human Machine Interface (Touch Screen) |
| **HP_SW** | — High Pressure Switch |
| **HR_EWT** | — Heat Reclaim Entering Temperature |
| **HR_LWT** | — Heat Reclaim Leaving Temperature |
| **ICE_CON** | — Ice Build Contact |
| **IGV** | — Integrated Guide Vane |
| **LCDW** | — Leaving Condenser Water Temperature |
| **LCW** | — Leaving Chilled Water Temperature |
| **LLC_EXV** | — Liquid Level EXV Output |
| **LOWLIFT_OUT** | — Low Lift Valve Output |
| **MTRB_OIL** | — Thrust Bearing Oil Temperature |
| **MTRW1** | — Motor Winding Temperature 1 |
| **MTRW2** | — Motor Winding Temperature 2 |
| **MTRW3** | — Motor Winding Temperature 3 |
| **OIL_EXVO** | — Oil EVX Output |
| **OIL_HEAT** | — Oil Heater Relay |
| **OIL_PUMP** | — Oil Pump Relay |
| **OILP_DIS** | — Oil Supply Pressure |
| **OILP_SMP** | — Oil Sump Pressure |
| **OILT_DIS** | — Oil Supply Temperature |
| **OILT_SMP** | — Oil Sump Temperature |
| **POW_FDB** | — Power Request Feedback |
| **POW_REQ** | — Power Request Output |
| **R_RESET** | — Remote Reset Sensor |
| **REF_LEAK** | — Refrigerant Leak Sensor |
| **REM_CON** | — Remote Contact Input |
| **REM_LOCK** | — Chiller Lockout Input |
| **SAFETY** | — Spare Safety |
| **T1/2** | — Transformer 1/2 |
| **TFR_HIGH** | — Tower Fan High |
| **TFR_LOW** | — Tower Fan Low |
| **TOW_FAN** | — Tower Fan (Variable Speed) |
| **VFDC_MA** | — FS VFD Load Current |
| **VS_SV** | — Vapor Source SV |



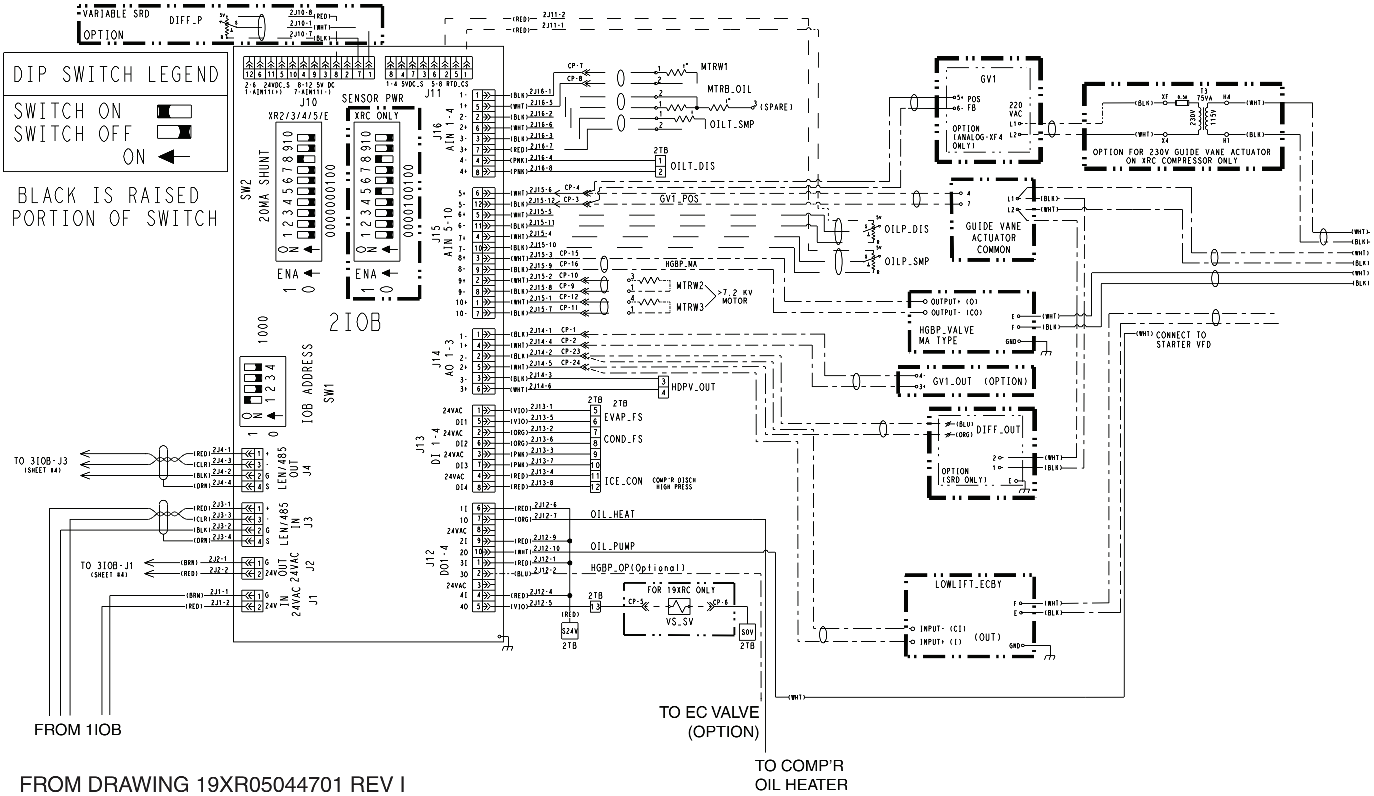
WIRING
Factory Wiring
Mechanically Connected
Power Panel Terminal Block
Conductor Male/Female Conductor
Field Wiring
Optional Wiring
Component / Panel Enclosure
Control Panel Terminal Block
Oil Pump Terminal
Wire Splice
Component Terminal
Motor Starter Panel Conn
Thermistor
Contactor / Relay Coil
Contactor Contact (N.O.)
High Pressure Switch
Pressure Transducer
Oil Heater
Circuit Breaker

| | |
|---|---|
| **BLK** | Black |
| **BLU** | Blue |
| **BRN** | Brown |
| **GRN** | Green |
| **GRY** | Gray |
| **RED** | Red |
| **WHT** | White |
| **YEL** | Yellow |
| **Y/G** | Yellow/green |
| **ORG** | Orange |



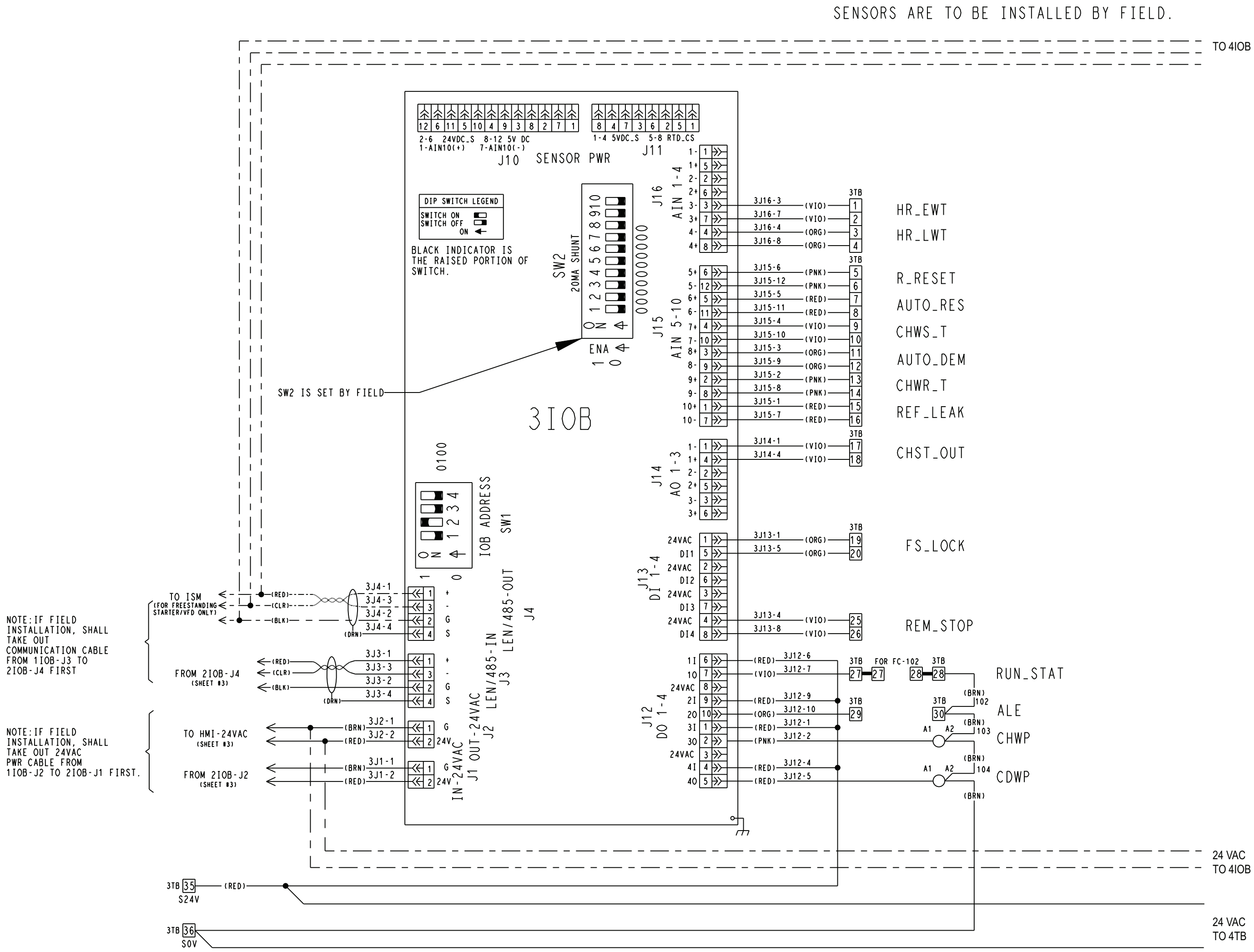

FROM DRAWING 19XR05044701 REV I

**Fig. 64 — 19XR2-E Chiller Control Schematic**



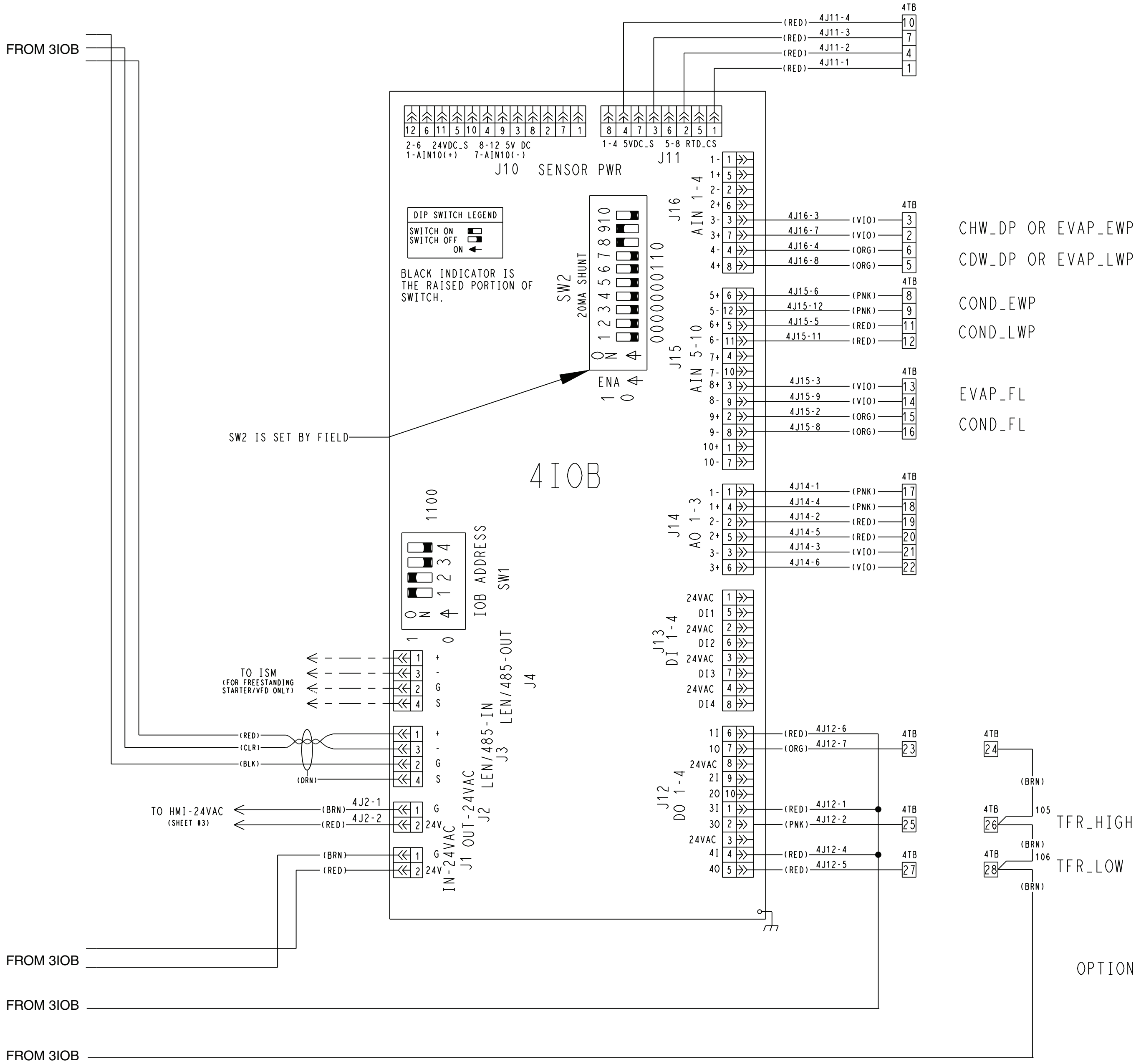

FROM DRAWING 19XR05044701 REV I

**Fig. 64 — 19XR2-E Chiller Control Schematic (cont)**



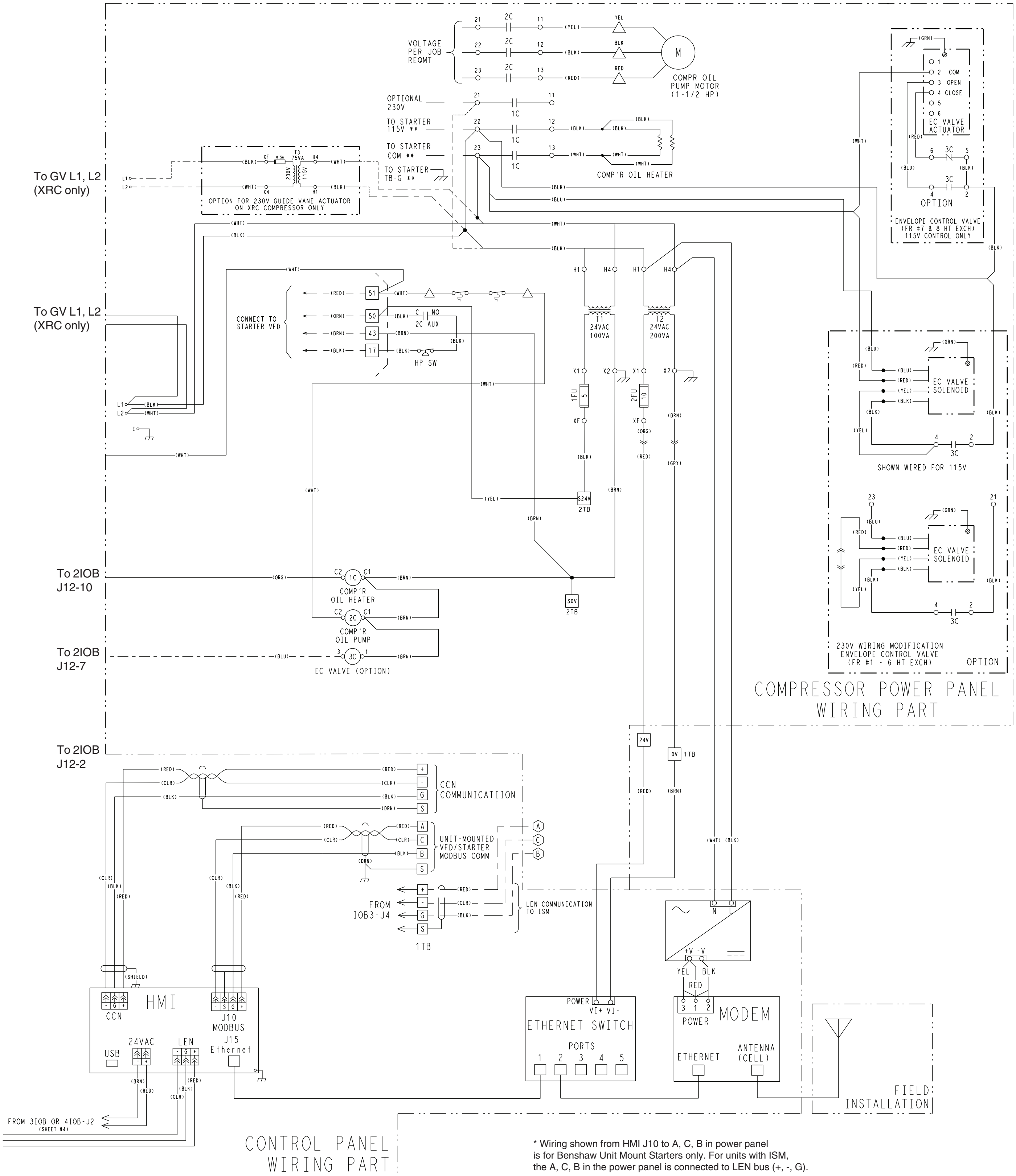

FROM DRAWING 19XR05044701 REV I

**Fig. 64 — 19XR2-E Chiller Control Schematic (cont)**



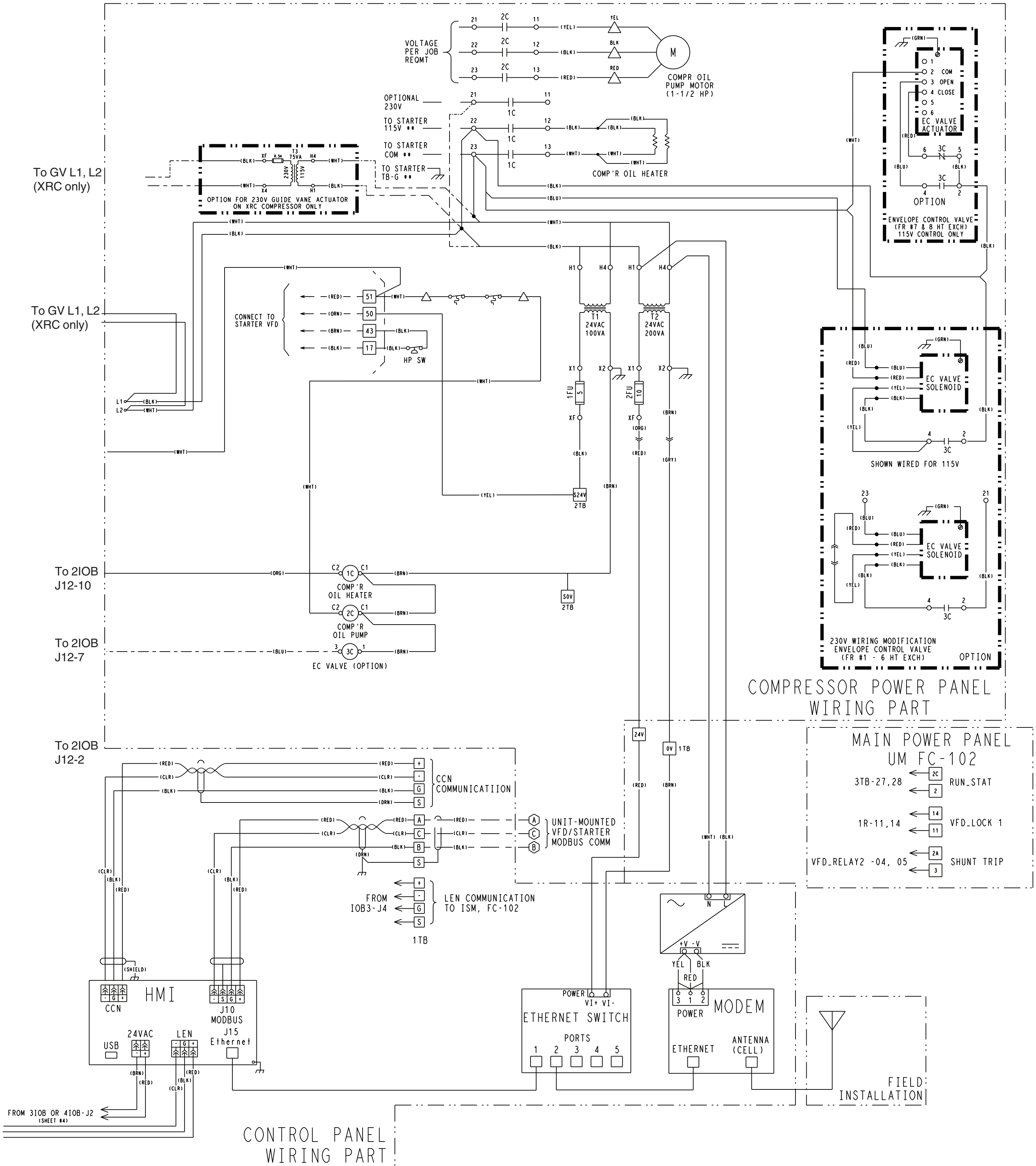

FROM DRAWING 19XR05044701 REV I

**Fig. 64 — 19XR2-E Chiller Control Schematic (cont)**




FROM DRAWING 19XR05044701 REV H

**Fig. 65 — 19XR2-E Chiller Control Schematic for Non-Unit Mount VFD Chiller (Fixed Speed Chiller and Freestanding VFD)**




FROM DRAWING 19XR05044701 REV H

**Fig. 66 — 19XR2-E Chiller Control Schematic for Unit Mount VFD Chiller**

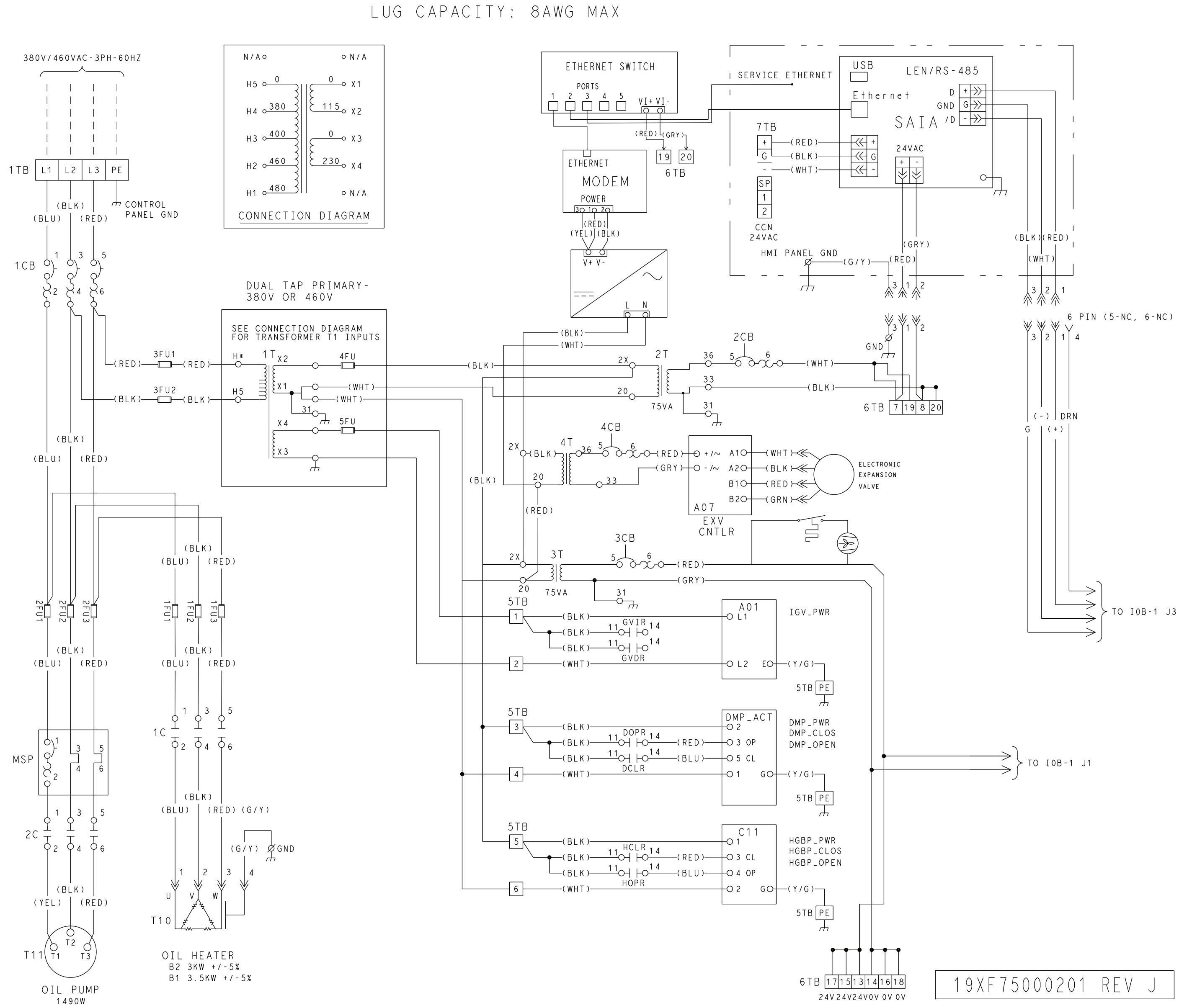



**Fig. 67 — 19XR6-7 Controls Diagram**

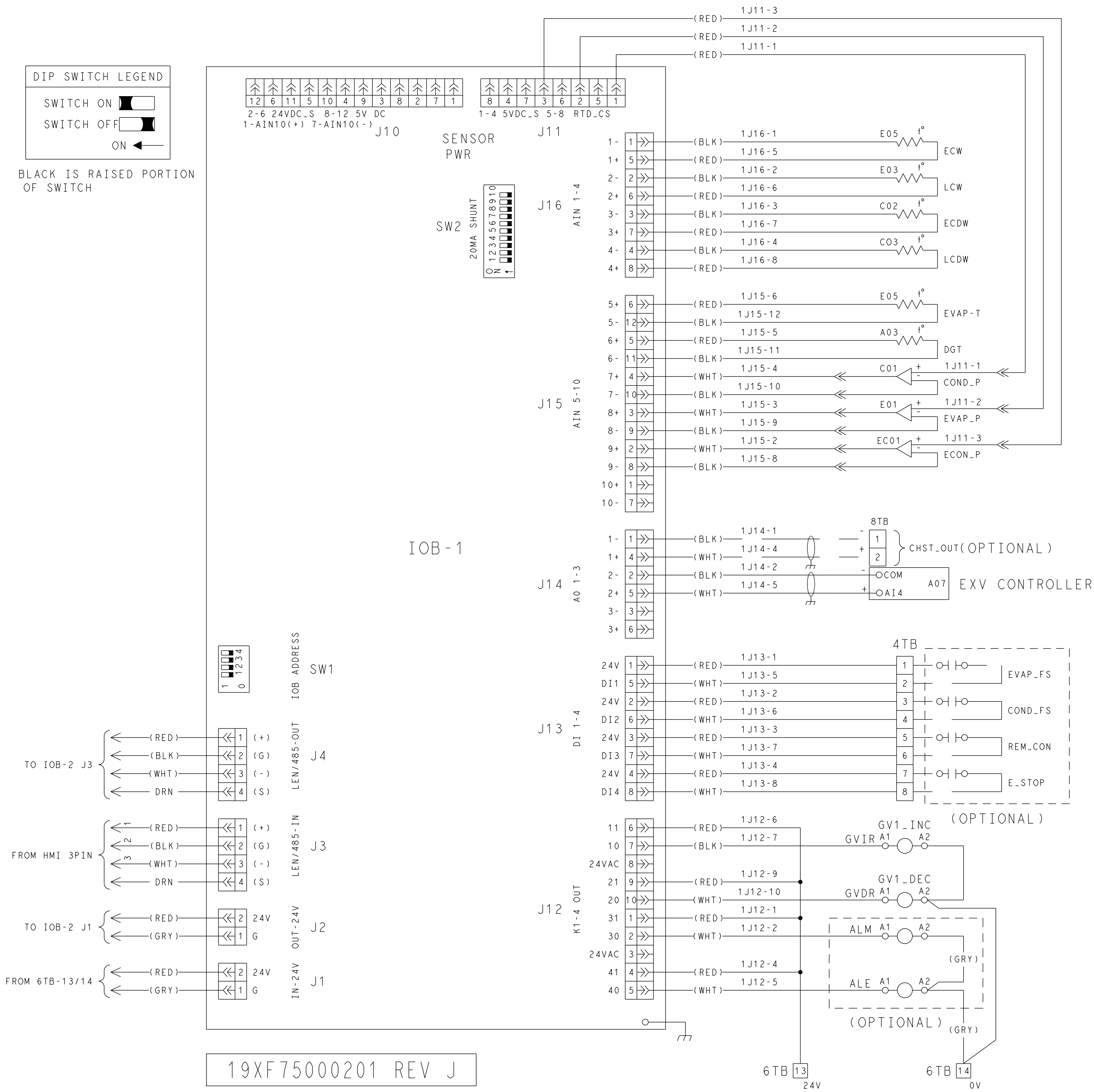


Fig. 68 — 19XR6-7 Chiller Control Schematic

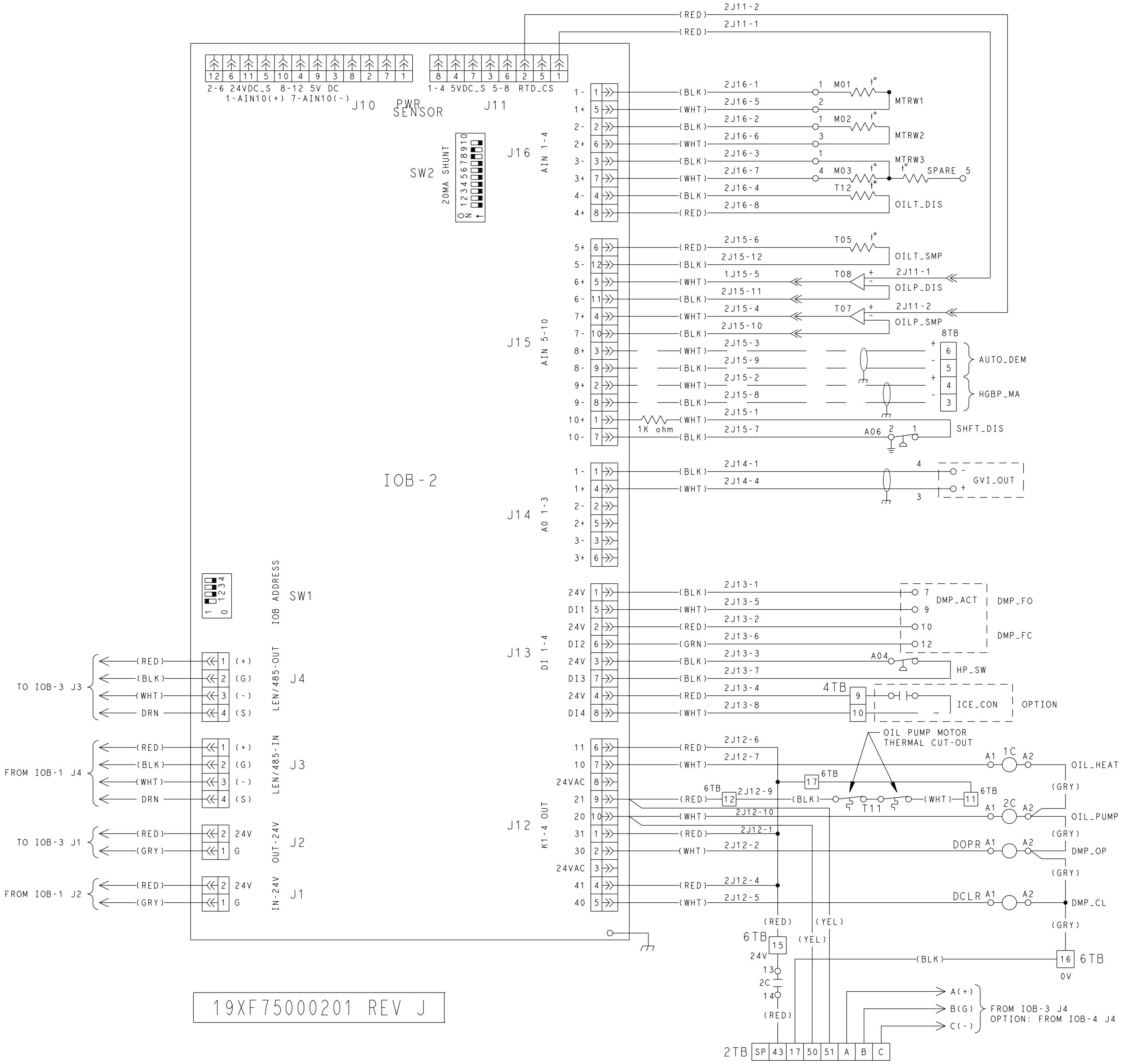


**Fig. 68 — 19XR6-7 Chiller Control Schematic (cont)**

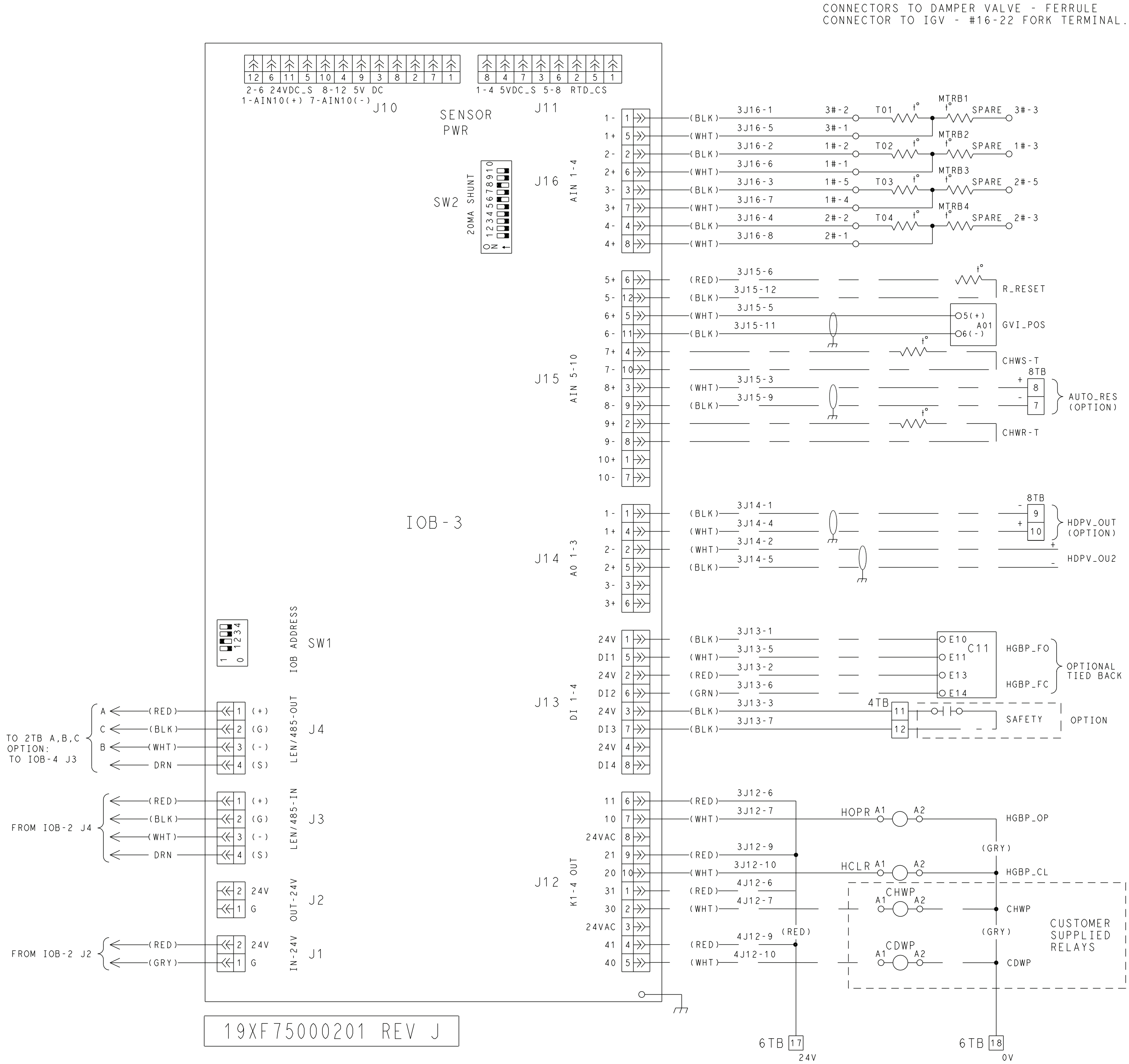



**Fig. 68 — 19XR6-7 Chiller Control Schematic (cont)**

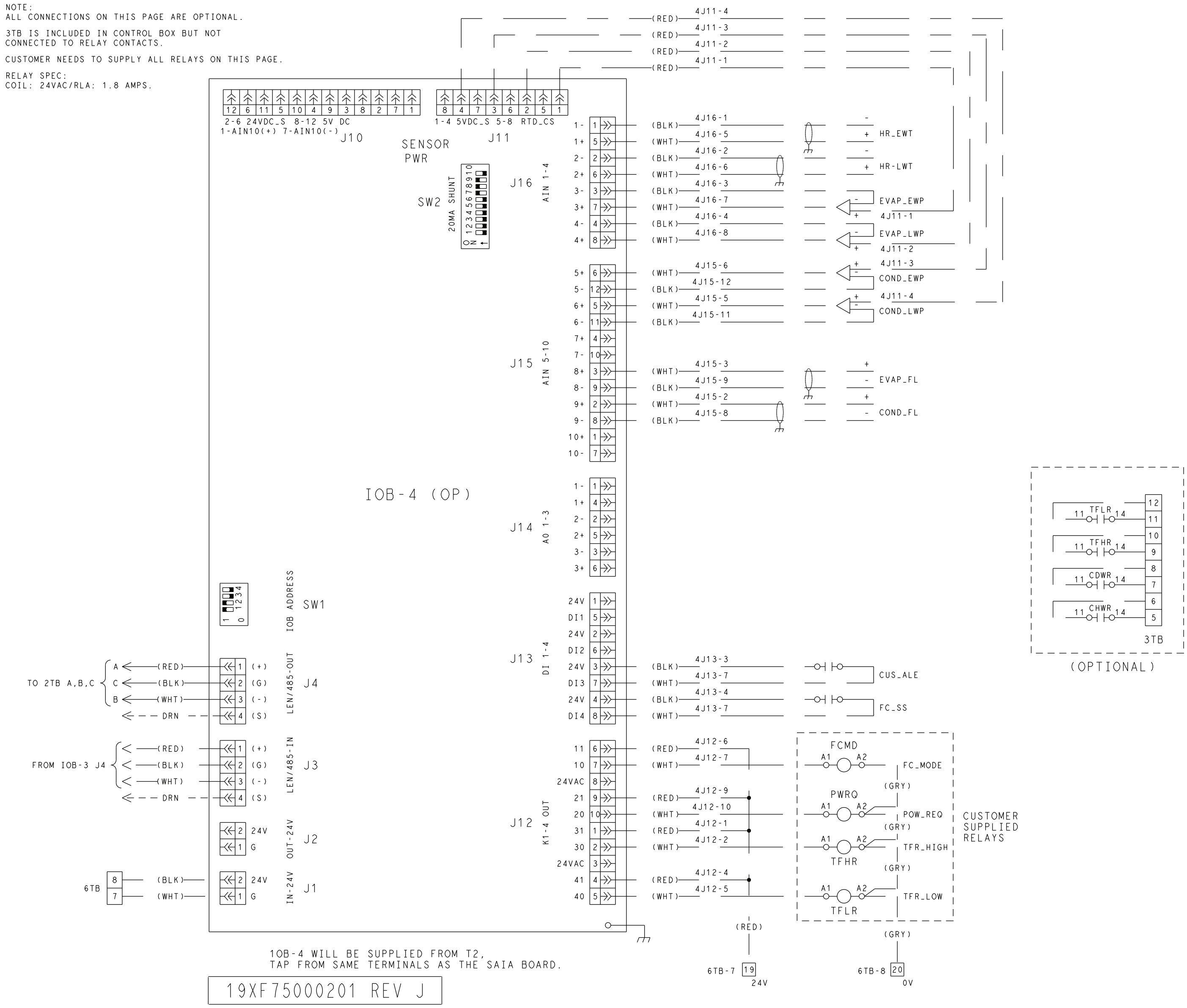



**Fig. 68 — 19XR6-7 Chiller Control Schematic (cont)**

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 |
| | | |
| | | |

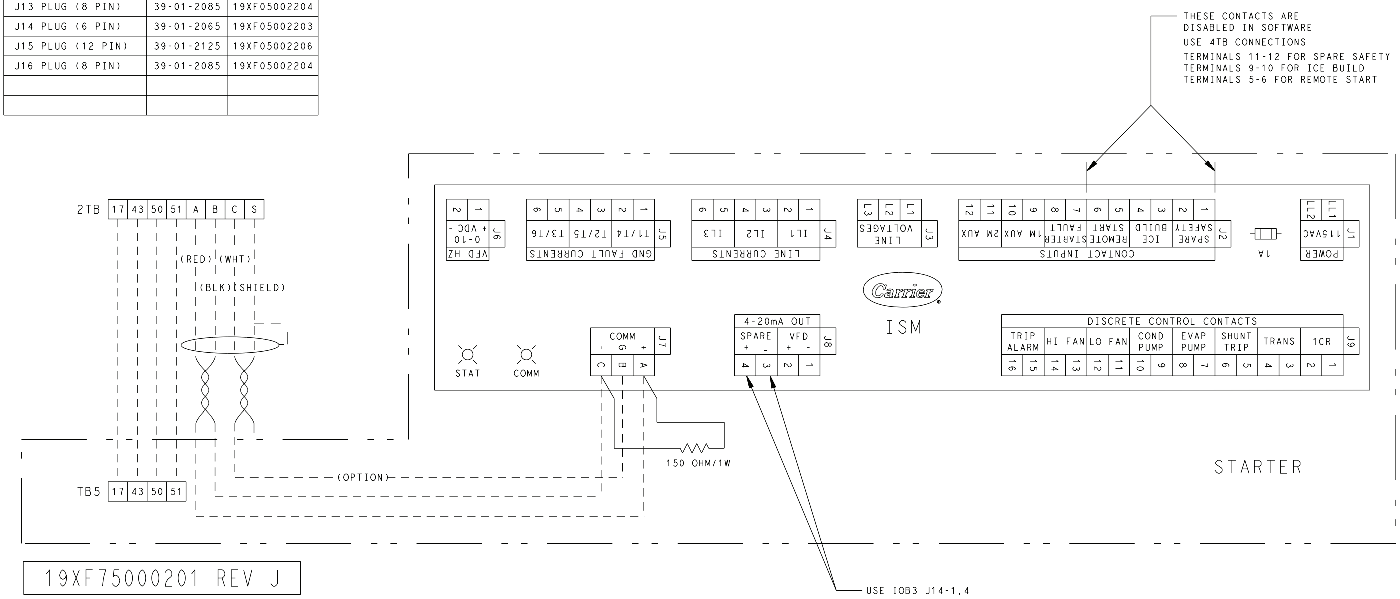



**Fig. 69 — 19XR6-7 Starter Wiring**

## LEGEND FOR Fig. 67-69

### *Control Abbreviations — Fig. 67-69*

| | |
|---|---|
| **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 |

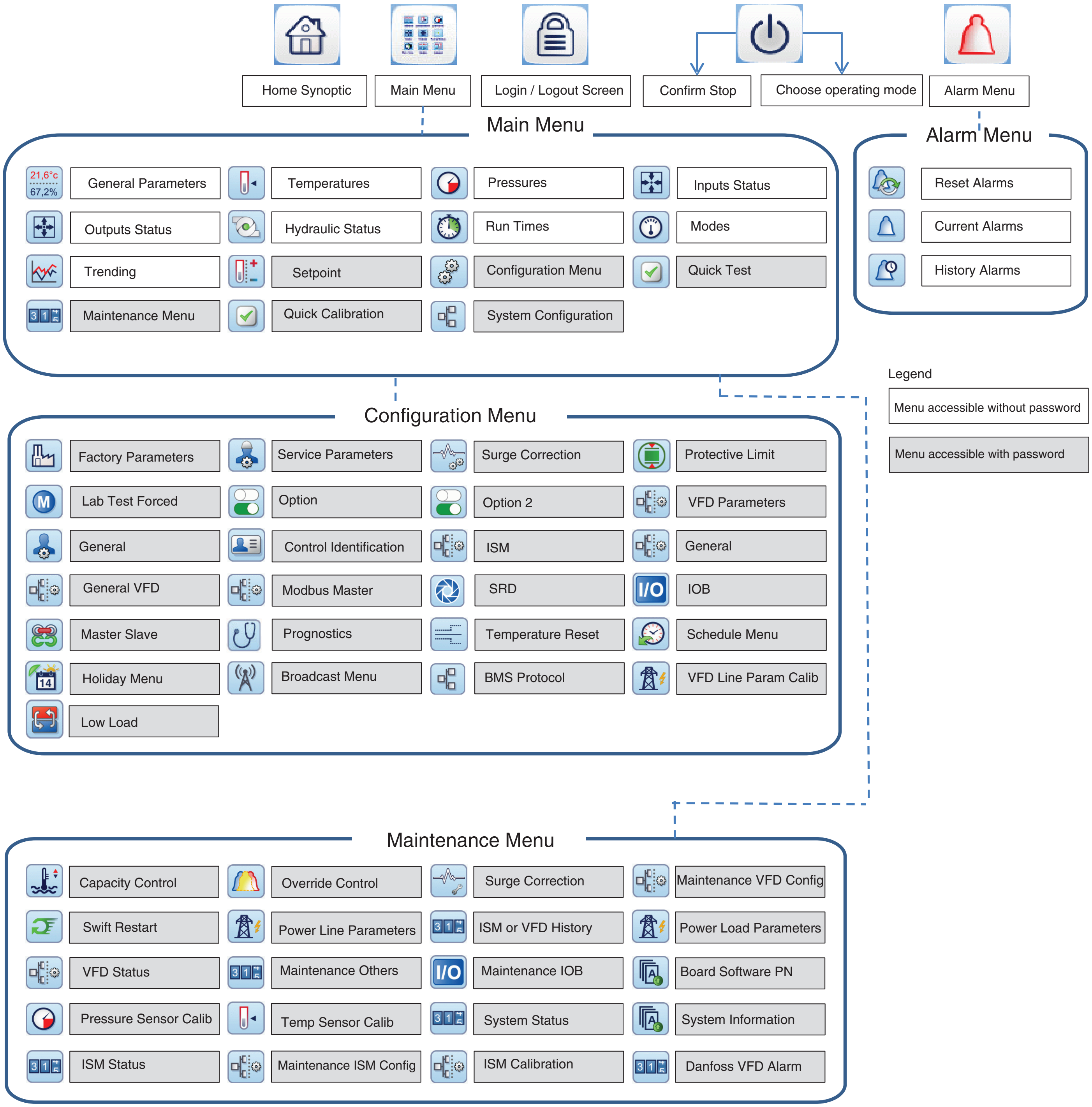
### *Wiring Codes — Fig. 67-69*

| | |
|---|---|
| **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 and 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. 67-69*

| | |
|---|---|
| ○ | 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 6 SCREEN AND TABLE STRUCTURE




19XR Menu — Note that the available menu options shown in Menu are dependent upon unit selections.

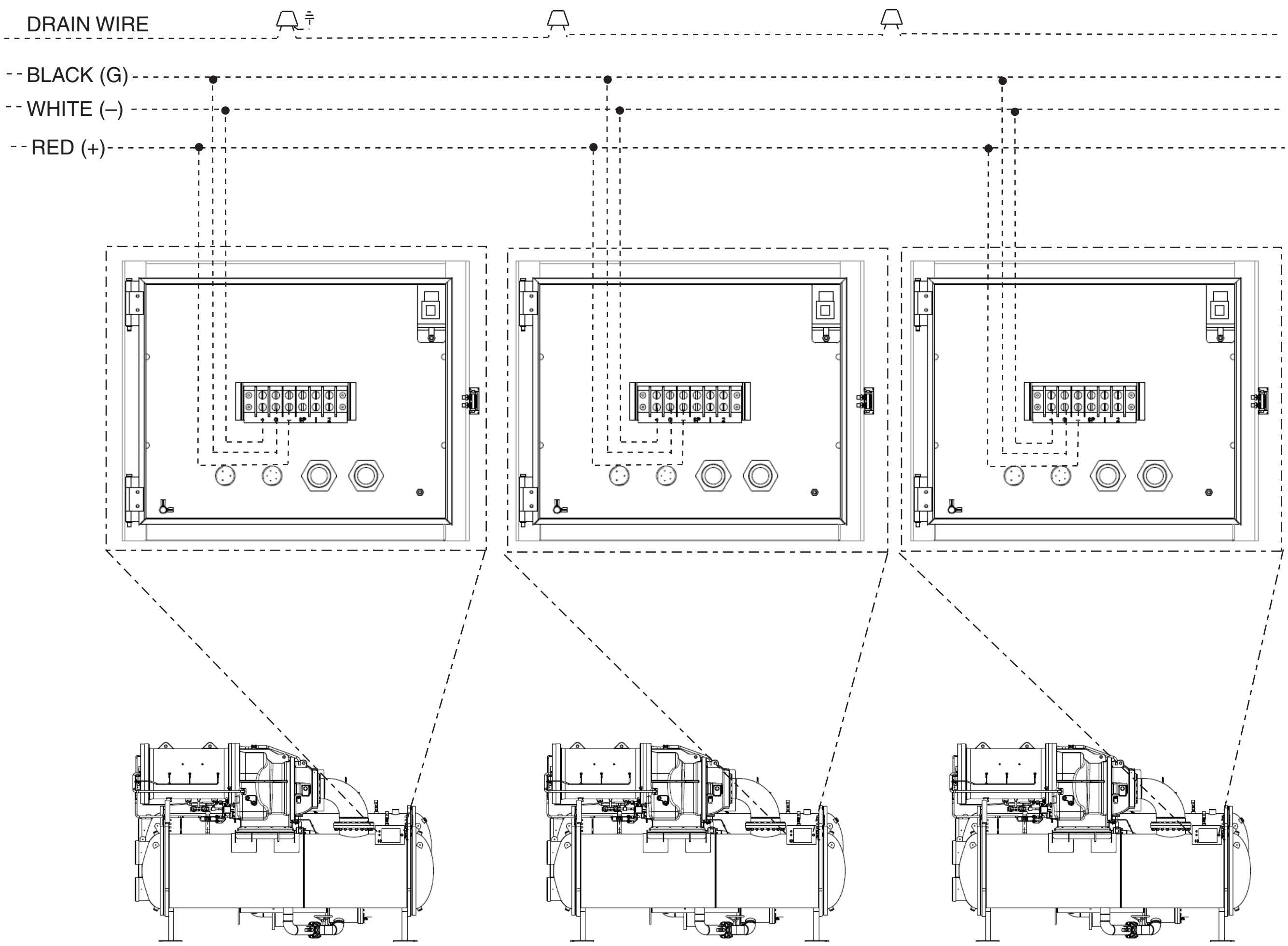
**Fig. A — Screen Structure**

## Main Menu Description

| ICON | DISPLAYED TEXT* | ACCESS | ASSOCIATED TABLE |
|---|---|---|---|
|  | General Parameters | All | GENUNIT |
|  | Temperatures | All | TEMP |
|  | Pressures | All | PRESSURE |
|  | Inputs Status | All | INPUTS |
|  | Outputs Status | All | OUTPUTS |
|  | Hydraulic Status | All | HYDRLIC |
|  | Run Times | All | RUNTIME |
|  | Modes | All | MODES |
|  | Trending | All | TRENDING |
|  | Setpoint | User | SETPOINT |
|  | Configuration Menu | User | CONFIG |
|  | Quick Test | Service | QCK_TEST |
|  | Maintenance Menu | Service | MAINTAIN |
|  | Quick Calibration | Service | QCK_CAL |
|  | System Configuration | User | System Configuration |

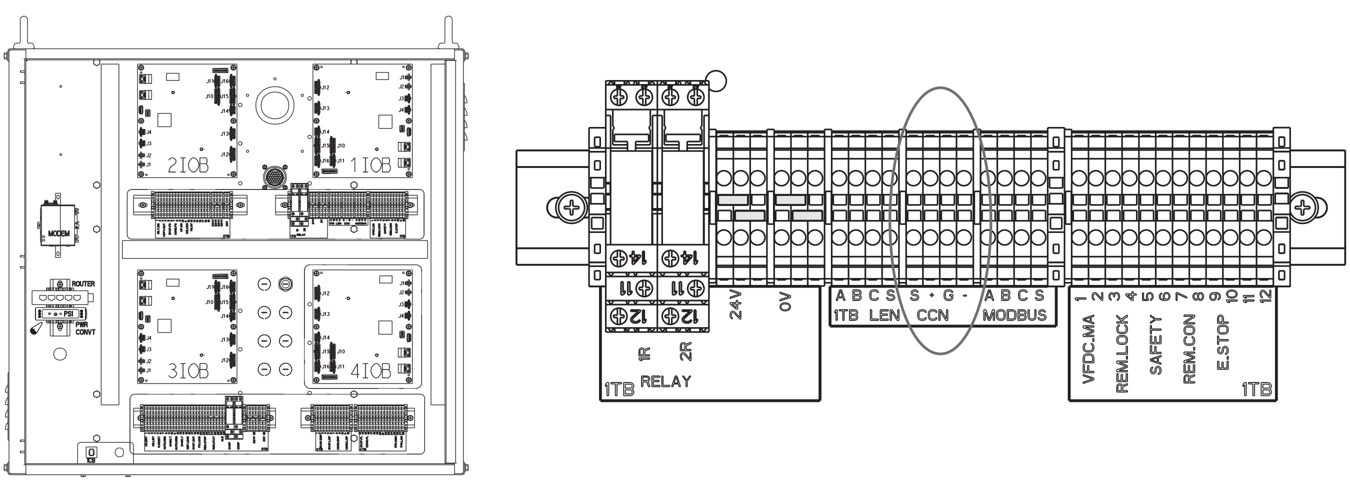
* Displayed text depends on the selected language (default is English).
NOTE: In most cases User login does not gain access to all configurations screens in a given menu.

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




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

19XR6-7 shown (HMI control box) - for 19XR2-E the CCN connection is located in the control panel (see below — 19XR2-E; CCN connection terminal block).




19XR2-E; CCN connection terminal block

## APPENDIX C — MAINTENANCE SUMMARY AND LOG SHEETS

### 19XR Maintenance Interval Requirements

| | | | |
|---|---|---|---|
| **WEEKLY** | | | |
| **COMPRESSOR** | Check Oil Level. | **CONTROLS** | Review PIC 6 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). | **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 may lose warranty coverage. See warranty terms and conditions.

## 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 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.

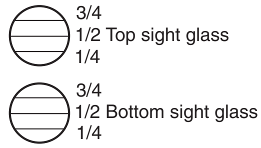
START-UP TO BE PERFORMED IN ACCORDANCE WITH APPROPRIATE MACHINE START-UP INSTRUCTIONS
JOB DATA REQUIRED:

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:




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 RLA ________ Chiller LRA Rating ________

Actual Line Voltages: Starter/VFD ____________ Oil Pump ____________ Controls/Oil Heater ____________

Verify 6-in. clearance surrounding all Starter/VFD enclosure louvers: Yes ☐ No ☐

Visually inspect down through top of power module for debris: Yes ☐ No ☐ N/A ☐

Starter/VFD Manufacturer ______________________ Starter/VFD Nameplate I.D. Number ______________________

Starter/VFD Serial Number ______________________ Starter/VFD Nameplate Input Rating ______________________

Mfd in ______________________________ on ______________________________

FIELD-INSTALLED STARTER/VFD ONLY:

Check continuity T1 to T1, etc. (Motor to VFD, disconnect motor leads T1, T2, T3). Do not megger Starter/VFD; disconnect leads to motor and megger the leads.

| MEGGER MOTOR | "PHASE TO PHASE" | | | "PHASE TO GROUND" | | |
|---|---|---|---|---|---|---|
| | T1-T2 | T1-T3 | T2-T3 | T1-G | T2-G | T3-G |
| 10-Second Readings | | | | | | |
| 60-Second Readings | | | | | | |
| Polarization Ratio | | | | | | |

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

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

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 ☐ |

NOTE: This can be accomplished through BMS interlock with Carrier controls (typically via BACnet or Modbus) or hardwire connections to pumps. Chiller MUST maintain pump control for freeze protection purposes. If answer to above is "No" the customer must sign off that this is not installed and a copy must be kept with the startup paperwork since this can result in loss of warranty coverage.

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.

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 6 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 6 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 6 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 6 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 6 ISM CONFIGURATION TABLE (CONF_ISM) CONFIGURATION SHEET
## (Must be configured for all fixed speed machines with ISM, Benshaw MX3, freestanding VFD)

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **Communication Timeout** | 0 to 255 | sec | 10 | |
| **Starter Type**<br>**0 = Full Volt 1 = Reduced Volt**<br>**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 6 General VFD Config (CFGGEVFD) CONFIGURATION SHEET
## (Must be configured for all machines with VFD

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **VFD Current Limit** | 0 to 99999 | amps | 250 | |

## UM VFD Configuration

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **Compressor Speed 100%** | 47 to 110 | Hz | 50 | |
| **Rated Line Voltage** | 200-13800 | V | 460 | |
| **Motor Nameplate Current** | 10 to 2000 | AMPS | 200 | |
| **Motor Rated Load Current** | 10 to 2000 | AMPS | 200 | |
| **Motor Nameplate Voltage** | 200 to 13800 | Volts | 460 | |
| **Motor Nameplate RPM** | 1500 to 3600 | rpm | 3000 | |
| **Motor Nameplate KW** | 0 to 5600 | KW | 1500 | |
| **Skip Frequency 1** | 0.0 to 102.0 | Hz | 102 | |
| **Skip Frequency 2** | 0.0 to 102.0 | Hz | 102 | |
| **Skip Frequency 3** | 0.0 to 102.0 | Hz | 102 | |
| **Skip Frequency Band** | 0.0 to 102.0 | Hz | 0 | |
| **Motor Rated Load Current** | 10 to 1500 | AMPS | 200 | |
| **Increase Ramp Time** | 5 to 60 | sec | 30 | |
| **Decrease Ramp Time** | 5 to 60 | sec | 30 | |
| **Line Voltage Imbalance%** | 1 to 10 | % | 10 | |
| **Line Volt Imbalance Time** | 1 to 10 | sec | 10 | |
| **Line Current Imbalance%** | 5 to 40 | % | 40 | |
| **Line Current Imbal Time** | 1 to 10 | sec | 10 | |
| **Motor Current Imbalance%** | 5 to 40 | % | 40 | |
| **Motor Current Imbal Time** | 1 to 10 | sec | 10 | |
| **Single Cycle Dropout** | 0 to 1 | | 0 | |
| **PWM Switch Frequency**<br>**0=2KHZ, 1=4KHZ** | 0 to 1 | | 0 | |

## 19XR PIC 6 OPTION CONFIGURATION TABLE (CONF_OPT) CONFIGURATION SHEET

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **CONF_OPT** | DSABLE/ENABLE | | ENABLE | |
| **Auto Restart** | DSABLE/ENABLE | | DSABLE | |
| **Swift Restart Option** | DSABLE/ENABLE | | ENABLE | |
| **Gas Torque Factor** | 0.25 to 3 | | 1.00 | |
| **Guide Vane/SRD Factor** | 0.7 to 1.2 | | 0.95 | |
| **Power Recovery Timeout** | 0 to 60 | min | 15.0 | |
| **Common Sensor Option** | DSABLE/ENABLE | | DSABLE | |
| **EC/HC Valve Option**<br>**0=No, 1=Cont., 2=On/Off, 3=mA** | | | 0 | |
| **EC/HC Valve Selection**<br>**0=Disable, 1=Surge,**<br>**2=Low Load, 3=Comb** | | | 0 | |
| **EC/HG VLV Open IGV1 Pos** | 5 to 10 | % | 5 | |
| **EC/HG VLV Close IGV1 Pos** | 1.5 to 35 | % | 10 | |
| **EC/HG VLV Low Load DB** | 0.5 to 2 | ^F | 1.0 | |
| **HPR VLV Option** | DSABLE/ENABLE | | DSABLE | |
| **HPR VLV Delta Pos 0%** | 0 to 85 | PSI | 25 | |
| **HPR VLV Delta Pos 100%** | 0 to 85 | PSI | 50 | |
| **HPR VLV Min Output** | 0 to 100 | % | 0.0 | |
| **HPR VLV Deadband** | 0 to 10 | | 1.0 | |
| **Tower Fan High Setpoint** | 55 to 105 | °F | 75 | |
| **Refrig Leakage Option** | DSABLE/ENABLE | | DSABLE | |
| **Refrig Leakage Alarm mA** | 4 to 20 | mA | 20 | |
| **Oil Cooler EXV Option** | DSABLE/ENABLE | | DSABLE | |
| **Oil Temp High Threshold** | 100 to 140 | °F | 122 | |
| **Oil Temp Low Threshold** | 90 to 130 | °F | 113 | |
| **Customer Alert Option** | DSABLE/ENABLE | | DSABLE | |
| **Ice Build Option** | DSABLE/ENABLE | | DSABLE | |
| **Ice Build Recycle** | DSABLE/ENABLE | | DSABLE | |
| **Ice Build Termin Source**<br>**0=Temp, 1=Contact, 2=Both** | | | 0 | |
| **Vapor Source SV Option** | DSABLE/ENABLE | | DSABLE | |
| **Vapor Source SV Delay** | 0 to10 | min | 5 | |
| **Evap Liquid Temp Opt** | DSABLE/ENABLE | | ENABLE | |
| **Evap App Calc Selection**<br>**0=Sat Temp, 1=Ref Temp** | | | 1 | |

## 19XR PIC 6 OPTION CONFIGURATION TABLE (CONFOPT2) CONFIGURATION SHEET

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **IOB3 Option** | No/Yes | | No | |
| **IOB4 Option** | No/Yes | | No | |
| **Water Pressure Option**<br>**0=No**<br>**1=WTR Flow PD TRD**<br>**(pressure transducers)**<br>**2=WTR Flow PD TRM**<br>**(4-20 mA differential water flow pressure transmitter)** | | | 0 | |
| **Water Flow Measurement**<br>**0=No**<br>**1=WTR Flow MTR**<br>**(4-20 mA water flow sensors)**<br>**2=WTR Flow PD**<br>**(based on water pressure drop measurement)** | | | 0 | |
| **Free Cooling Option** | No/Yes | | No | |
| **Water Flow Determination**<br>**0=Sat Temp, 1=Flow Switch,**<br>**2=WTR Flow PD** | | | | |
| **Marine Option** | Disable/Enable | Disable | | |

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## 19XR PIC 6 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 6 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 6 SERVICE PARAMETERS TABLE CONFIGURATION SHEET

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **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)**<br>**0 = No stir, 1 = 30s/30m**<br>**2 = 1m/4hr, 3 = Comb 0&1** | 0 to 3 | | 1 | |

## 19XR PIC 6 GEN_CONF TABLE CONFIGURATION SHEET

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **Stop to Start Delay** | 1 to 15 | min | 2 | |
| **Start to Start Delay** | 4 to 45 | min | 15 | |
| **Demand Limit Type**<br>**0 = Base Demand**<br>**1 = 4 to 20 mA** | 0 to 1 | | 0 | |
| **Pulldown Ramp Type**<br>**0 = Temp**<br>**1 = Load** | 0 to 1 | | 1 | |
| **Demand Limit Source**<br>**0 = Amps**<br>**1 = KW** | 0 to 1 | | 0 | |

## 19XR PIC 6 RESETCFG TABLE CONFIGURATION SHEET

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **Temp Reset Type**<br>**0 = No**<br>**1 = 4 to 20 mA**<br>**2 = Remote Temp**<br>**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 6 CONF_MS MASTER SLAVE TABLE CONFIGURATION SHEET

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **Slave Address** | 1 to 236 | | 2 | |
| **Master/Slave Select**<br>**0 = Disable**<br>**1 = Master**<br>**2 = Slave** | 0 to 2 | | 0 | |
| **Chiller Connection Type**<br>**0 = Parallel**<br>**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 6 CONNECT - BMS PROTOCOL TABLE CONFIGURATION SHEET

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **Modbus Configuration** | | | | |
| **Port J8 Option**<br>**0=None, 1=BACnet MS/TP,**<br>**2=Modbus RTU** | 0 to 2 | | 0 | |
| **Modbus TCP Enable** | DSABLE/ENABLE | | DSABLE | |
| **Modbus TCP Port Number** | 0 to 1024 | | 502 | |
| **Modbus Server UID** | NO/YES | | NO | |
| **Modbus Metric Unit** | 0 to 1024 | | 502 | |
| **Modbus RTU Parity Option**<br>**0=No, 1=Odd, 2=Even, 3=Low, 4=High** | 0 to 4 | | 0 | |
| **Modbus RTU Stop Bit**<br>**1= 1 Bit, 2= 2 Bits** | 0 to 2 | | 2 | |
| **Modbus RTU Baudrate**<br>**0=9600, 1=19200, 2=38400** | 0 to 2 | | 0 | |
| **Modbus Litte Endian** | NO/YES | | NO | |
| **Modbus Real Type** | NO/YES | | NO | |
| **BACnet Configuration** | | | | |
| **BACnet/IP Enable** | DSABLE/ENABLE | | ENABLE | |
| **BACnet Metric Unit** | NO/YES | | YES | |
| **BACnet Network** | 1 to 9999 | | 1600 | |
| **BACnet Identifier** | 0 to 9999999 | | 1600001 | |
| **BACnet Schedule Enable** | DISABLE/ENABLE | | DISABLE | |
| **MS/TP Mac address** | 1 to 127 | | 1 | |
| **MS/TP Baud rate**<br>**0=9600, 1=19200, 2=38400, 3=57600, 4=76800,**<br>**5=115200** | 0 to 5 | | 2 | |
| **MS/TP Max Master** | 0 to 127 | | 3 | |
| **MS/TP Max Info Frames** | 1 to 255 | | 5 | |

## 19XR PIC 6 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** | 0.0 to 150.0 | °F | 70.0 | |
| **Surge Delta Tsmin** | 0.0 to 150.0 | °F | 45.0 | |
| **PR at Full Load Opening** | 1.0000 to 5.0000 | | 3.0000 | |
| **PR at Min. Opening** | 1.0000 to 5.0000 | | 1.5000 | |
| **IGV1 Full Load Open Deg** | 90 to 120.0 | degree | 88.0 | |
| **Sound Ctrl IGV1 Open Deg** | 10.0 to 40.0 | degree | 27.0 | |
| **IGV1 Minimum Open Deg** | 0.0 to 10.0 | degree | 2.0 | |
| **IGV1 Actuator Max Deg** | 90.0 to120.0 | degree | 109.0 | |
| **Surge Line Offset** | 1.0 to 3.0 | °F | 2.0 | |
| **Surge Line Lower Deadband** | 0.5 to 3.0 | °F | 1.5 | |
| **Surge Line Upper Deadband** | 0.1 to 3.0 | °F | 1.5 | |
| **Surge Line Shape Factor** | –1.000 to 0.000 | | –0.010 | |
| **Sound Line Shape Factor** | 0.000 to 1.000 | | 0.010 | |
| **Surge Line Speed Factor** | 0.00 to 3.00 | | 2.00 | |
| **Surge Delay Time** | 0 to 120 | sec | 15 | |
| **Surge Time Period** | 7 to 10 | min | 8 | |
| **Surge Delta Amps %** | 5 to 40 | % | 20 | |
| **Rampdown Factor** | 0 to 1 | 10 | 0 | |
| **GV1 Close Step Surge** | 1.0 to 3.0 | % | 2.0 | |
| **VFD Speed Step Surge** | 1.0 to 5.0 | % | 1.5 | |
| **EC Valve Step Surge** | 1.0 to 10.0 | % | 4.0 | |
| **Surge Profile Step** | 0 to 2 | ^F | 1 | |
| **Surge Profile Offset** | 0.0 to 5.0 | ^F | 0.0 | |
| **High Efficiency Mode** | DSABLE/ENABLE | | DSABLE | |
| **GV Jumpover Option** | DSABLE/ENABLE | | DSABLE | |

## 19XR PIC 6 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 — 19XRPIC6** | | | | |
| **Location Description (User-defined 24-digit character string)** | | | | |
| **Software Part Number: SCG-SR-2-20S200200** | | | | |
| **Serial Number =** | | | | |

## 19XR PIC 6 LQBP - LOW LOAD CONTROL IDENTIFICATION TABLE CONFIGURATION SHEET

| DESCRIPTION | RANGE | UNITS | DEFAULT | VALUE |
|---|---|---|---|---|
| **ECO LBP VLV Option** | DSABLE/ENABLE | | DSABLE | |
| **ECO LBP VLV Limit** | 0 to 100 | % | 100 | |
| **DSH Deadband for LBP** | 0 to 20 | ^F | 2 | |
| **ECO LBP VLV EVap Appro** | 1 to 20 | ^F | 5 | |
| **Dynamic Demand Limit** | DSABLE/ENABLE | min | DSABLE | |
| **Ignore DDL Time** | 0 to 60 | | 30 | |
| **LCW at Selection Point** | 32 to 86 | °F | 45 | |
| **LCDW at Selection Point** | 59 to 113 | °F | 95 | |
| **100% Lift Demand Limit** | 10 to 100 | % | 100 | |
| **Middle Lift Percent** | 40 to 80 | % | 60 | |
| **Middle Lift Demand Limit** | 0 to 100 | % | 80 | |
| **20% Lift Demand Limit** | 0 to 100 | % | 45 | |
| **LCW at Selection Point** | 32 to 86 | °F | 45 | |
| **LCDW at Selection Point** | 59 to 113 | °F | 95 | |

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 |
|---|---|---|
| | | |

| OILPRESS | OIL TEMP | AMPS % |
|---|---|---|
| | | |

COMMUNICATION MESSAGE ______________________

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE