AquaEdge®
19XRV
Single-Stage or Two-Stage
Semi-Hermetic Centrifugal Liquid Chillers
with PIC III Controls and HFC-134a
50/60 Hz

Start-Up, Operation, and Maintenance Instructions

SAFETY CONSIDERATIONS

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

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

⚠ DANGER

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

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

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

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

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

DO NOT USE air for leak testing. Use only refrigerant or dry nitrogen.

DO NOT VALVE OFF any safety device.

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

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

⚠ WARNING

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

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

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

a. Shut off electrical power to unit.
b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
c. 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.
d. 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.
e. 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 deenergized before resuming work.

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

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

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

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

(Warnings continued on next page.)

⚠ WARNING

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

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

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

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

DO NOT install relief devices in series or backwards.

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

⚠ CAUTION

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

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

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

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

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

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

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

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

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

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

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

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

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

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INTRODUCTION

Prior to initial start-up of the 19XRV unit, those involved in the start-up, operation, and maintenance should be thoroughly familiar with these instructions and other necessary job data. This book is outlined to familiarize those involved in the start-up, operation, and maintenance of the unit with the control system before performing start-up procedures. Procedures in this manual are arranged in the sequence required for proper chiller start-up and operation.

⚠ CAUTION

This unit uses a microprocessor control system. Do not short or jumper between terminations on circuit boards or modules; control or board failure may result.

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. It has been tested and found to comply with the limits for a Class A computing device pursuant to International Standard in North America EN61000-2/3 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.

ABBREVIATIONS AND EXPLANATIONS

Frequently used abbreviations in this manual include:

CCM	— Chiller Control Module
CCN	— Carrier Comfort Network®
CCW	— Counterclockwise
CW	— Clockwise
ECDW	— Entering Condenser Water
ECW	— Entering Chilled Water
EMS	— Energy Management System
HGBP	— Hot Gas Bypass
I/O	— Input/Output
ICVC	— International Chiller Visual Controller
LCD	— Liquid Crystal Display
LCDW	— Leaving Condenser Water
LCW	— Leaving Chilled Water
LED	— Light-Emitting Diode
OLTA	— Overload Trip Amps
PIC III	— Product Integrated Controls III
RLA	— Rated Load Amps
SI	— International System of Units
SRD	— Split Ring Diffuser
TXV	— Thermostatic Expansion Valve
UPC	— Universal Protocol Card
VFD	— Variable Frequency Drive

Words printed in all capital letters or in italics may be viewed on the International Chiller Visual Controller (ICVC) (e.g., LOCAL, CCN, ALARM, etc.).

Words printed in *both* all capital letters and italics can also be viewed on the ICVC and are parameters (e.g., *CONTROL MODE, COMPRESSOR START RELAY, ICE BUILD OPTION*, etc.) with associated values (e.g., modes, temperatures, percentages, pressures, on, off, etc.).

Words printed in all capital letters and in a box represent softkeys on the ICVC control panel (e.g., ENTER, EXIT, INCREASE, QUIT, etc.).

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

The chiller software part number of the 19XRV unit is located on the back of the ICVC.

CHILLER FAMILIARIZATION (FIG. 1-3)

Chiller Information Nameplate — The information nameplate is located on the right side of the chiller control panel.

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

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

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

Motor-Compressor — This component maintains system temperature and pressure differences and moves the heat-carrying refrigerant from the cooler to the condenser. Compressor Frames 2-5 are single-stage compressors with one impeller. Frame E compressors are two-stage compressors with two impellers.

Economizer (Optional) — The economizer is a separate vessel in the flow path after the condenser that improves the refrigerant cycle by allowing a small amount of refrigerant to flash into vapor. This phase change decreases the temperature of the remaining liquid refrigerant. The vapor is drawn into the second stage of the compressor, which saves energy because the refrigerant does not have to be compressed by both stages.

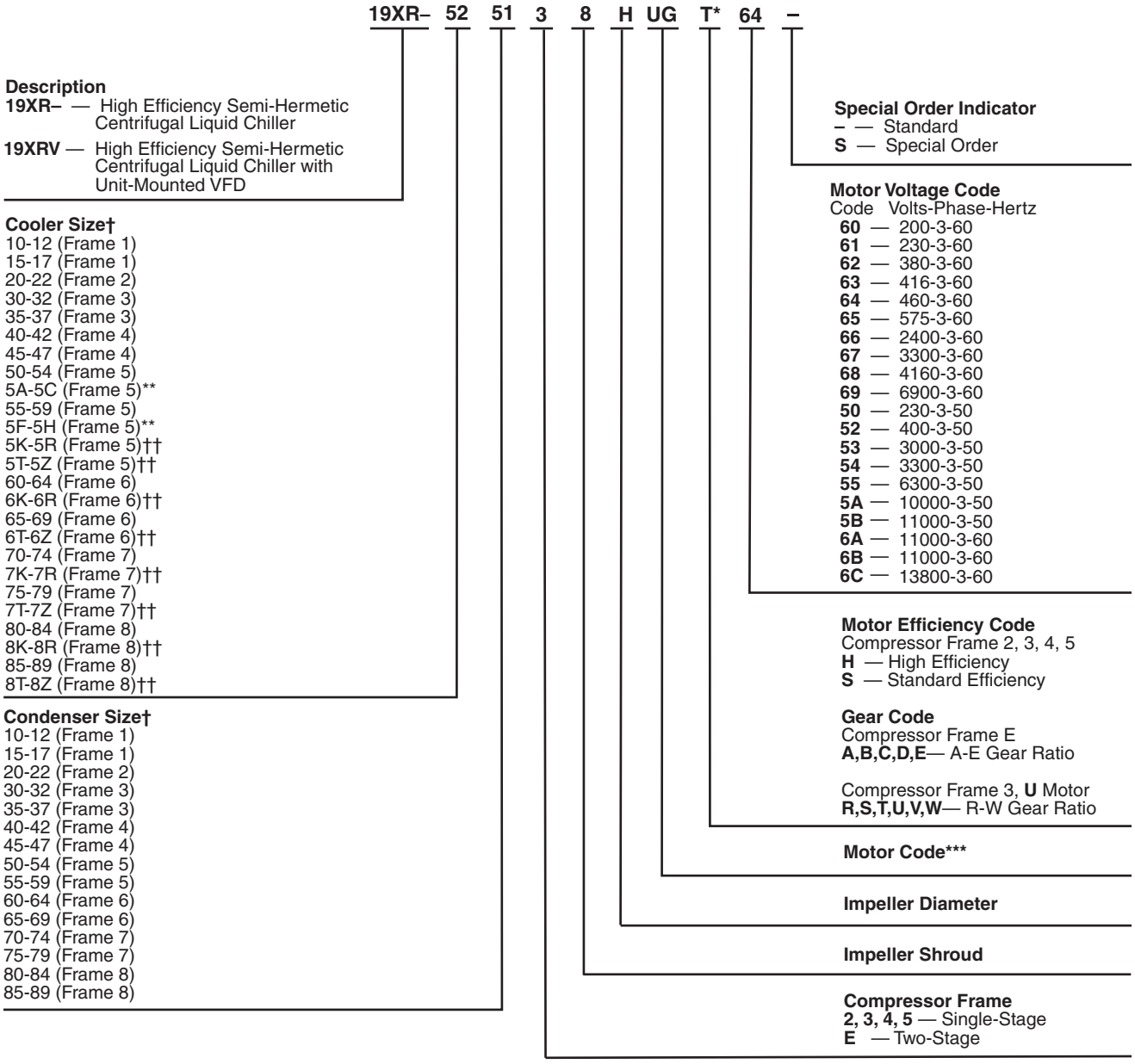
Control Panel — The control panel is the user interface for controlling the chiller. It regulates the chiller's capacity as required to maintain proper leaving chilled water temperature. The control panel:

- registers cooler, condenser, and lubricating system pressures
- shows the chiller operating condition and the alarm shutdown conditions
- records the total chiller operating hours
- sequences chiller start, stop, and recycle under microprocessor control
- displays the status of the VFD
- provides access to other CCN (Carrier Comfort Network®) devices and energy management systems
- languages pre-installed at factory include: English, Chinese, Japanese, and Korean.
- International Language Translator (ILT) is available for conversion of extended ASCII characters.

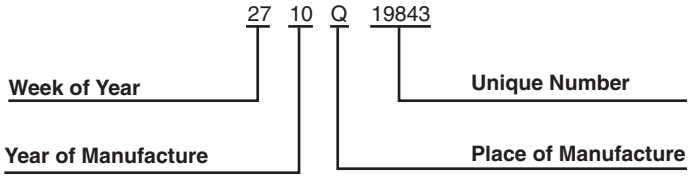
Variable Frequency Drive (VFD) — The VFD allows for the proper start and disconnect of electrical energy for the compressor-motor, oil pump, oil heater, and control panel.

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 one-inch 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.



MODEL NUMBER NOMENCLATURE



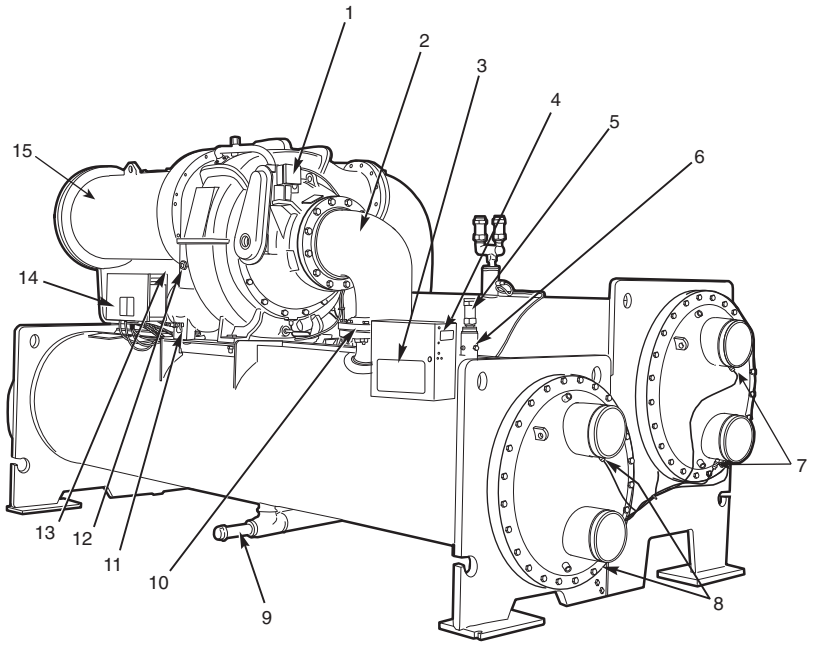
SERIAL NUMBER BREAKDOWN

* Digit 15 will refer to the Gear Code for the following models:
1. Digit 10 (Compressor Frame) is 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 — 19XRV Identification

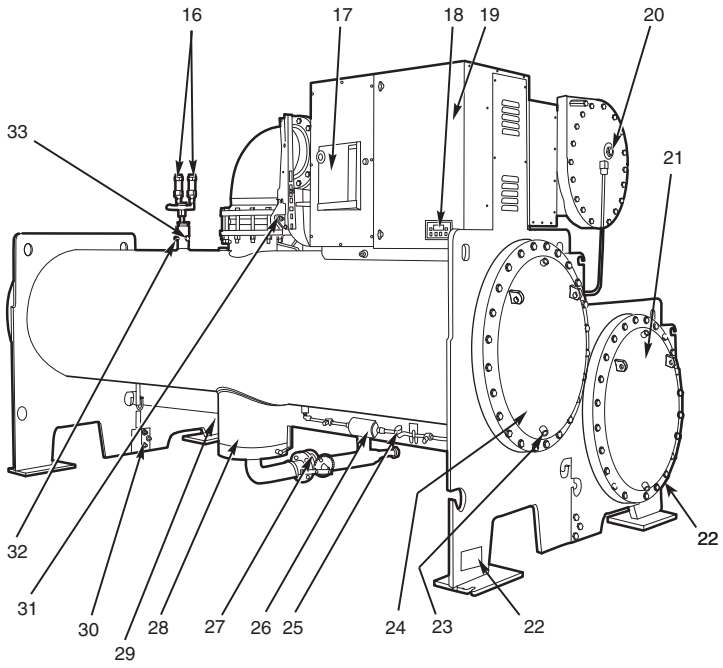
FRONT VIEW



LEGEND

1 — Guide Vane Actuator
2 — Suction Elbow
3 — International Chiller Visual Control (ICVC)
4 — Chiller Identification Nameplate
5 — Cooler Auto Reset Relief Valves
6 — Cooler Pressure Transducer
7 — Condenser In/Out Temperature Thermistors
8 — Cooler In/Out Temperature Thermistors
9 — Refrigerant Storage Tank Connection Valve
10 — Typical Flange Connection
11 — Oil Drain Valve
12 — Oil Level Sight Glasses
13 — Refrigerant Oil Cooler (Hidden)
14 — Auxiliary Power Panel
15 — Motor Housing

REAR VIEW

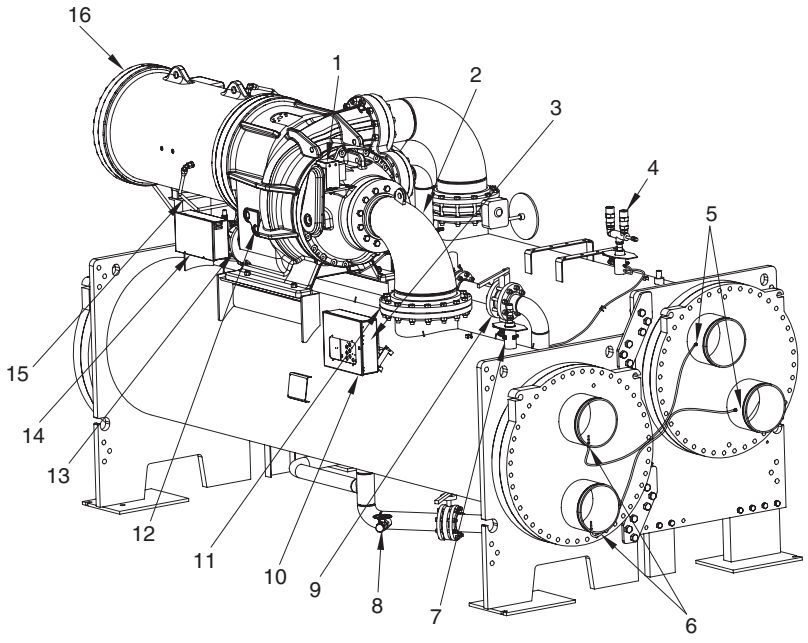


LEGEND

16 — Condenser Auto. Reset Relief Valves
17 — Motor Circuit Breaker
18 — Solid-State Starter Control Display
19 — Unit-Mounted Starter or VFD (Optional) Solid-State Starter Shown
20 — Motor Sight Glass
21 — Cooler Return-End Waterbox Cover
22 — ASME Nameplate (One Hidden)
23 — Typical Waterbox Drain Port
24 — Condenser Return-End Waterbox Cover
25 — Refrigerant Moisture/Flow Indicator
26 — Refrigerant Filter/Drier
27 — Liquid Line Isolation Valve (Optional)
28 — Liquid Float Valve Chamber
29 — Refrigerant Charging Valve (Hidden)
30 — Vessel Take-Apart Connector
31 — Discharge Isolation Valve (Optional)
32 — Condenser Pressure Transducer
33 — Refrigerant Charging Valve/Pumpout Connection

Fig. 2 — Typical 19XRV Single-Stage Compressor Components

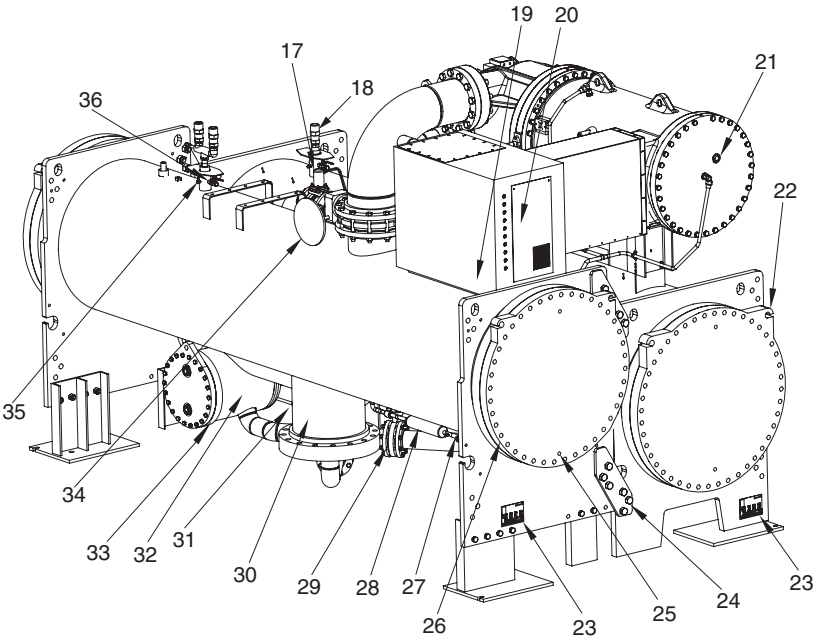
FRONT VIEW



LEGEND

1 — Guide Vane Actuator
2 — Suction Elbow
3 — Chiller Identification Nameplate
4 — Condenser Auto Reset Relief Valves
5 — Condenser In/Out Temperature Thermistors
6 — Cooler In/Out Temperature Thermistors
7 — Cooler Pressure Transducer
8 — Refrigerant Storage Tank Connection Valve
9 — Refrigerant Isolation Valve
10 — Chiller Visual Controller/International Chiller Visual Control (ICVC)
11 — Typical Flange Connection
12 — Oil Level Sight Glasses
13 — Oil Drain Charging Valve
14 — Auxiliary Power Panel
15 — Refrigerant Oil Cooler (Hidden)
16 — Compressor Motor Housing

REAR VIEW



LEGEND

17 — Damper Valve
18 — Cooler Auto. Reset Relief Valves
19 — Solid-State Starter Control Display (Optional)
20 — Unit-Mounted Starter (Optional)
21 — Motor Sight Glass
22 — Cooler Return-End Waterbox Cover
23 — ASME Nameplate
24 — Vessel Take-Apart Connector
25 — Typical Waterbox Drain Port
26 — Condenser Return-End Waterbox Cover
27 — Refrigerant Moisture/Flow Indicator
28 — Refrigerant Filter/Drier
29 — Liquid Line Isolation Valve (Optional)
30 — Linear Float Valve Chamber
31 — Economizer Assembly
32 — Refrigerant Charging Valve (Hidden)
33 — Economizer Float Ball Valve Assembly (Inside)
34 — Discharge Isolation Valve (Optional)
35 — Condenser Pressure Transducer
36 — Refrigerant Charging Valve/Pumpout Connection

Fig. 3 — Typical 19XRV Two-Stage Compressor Components

REFRIGERATION CYCLE

The compressor continuously draws refrigerant vapor from the cooler at a rate set by the amount of guide vane opening. As the compressor suction reduces the pressure in the cooler, the remaining refrigerant boils at a fairly low temperature (typically 38 to 42 F [3 to 6 C]). The energy required for boiling is obtained from the water flowing through the cooler tubes. With heat energy removed, the water becomes cold enough to use in an air conditioning circuit or 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. 4 and 5). 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 flows into an economizer at intermediate pressure (see Fig. 5). 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.

MOTOR AND LUBRICATING OIL COOLING CYCLE

The motor and the lubricating oil are cooled by liquid refrigerant taken from the bottom of the condenser vessel (Fig. 4 and 5). 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.

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

Flow to the motor cooling system passes through an orifice and into the motor. Once past the orifice, the refrigerant is directed over the motor by a spray nozzle. 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, closes the inlet guide vanes. If the temperature rises above the safety limit, the compressor shuts down.

Refrigerant that flows to the oil cooling system is regulated by thermostatic expansion valves (TXVs). The TXVs regulate flow into the oil/refrigerant plate and frame-type heat exchanger (the oil cooler in Fig. 4 and 5). The expansion valve bulbs control oil temperature to the bearings. The refrigerant leaving the oil cooler heat exchanger returns to the chiller cooler.

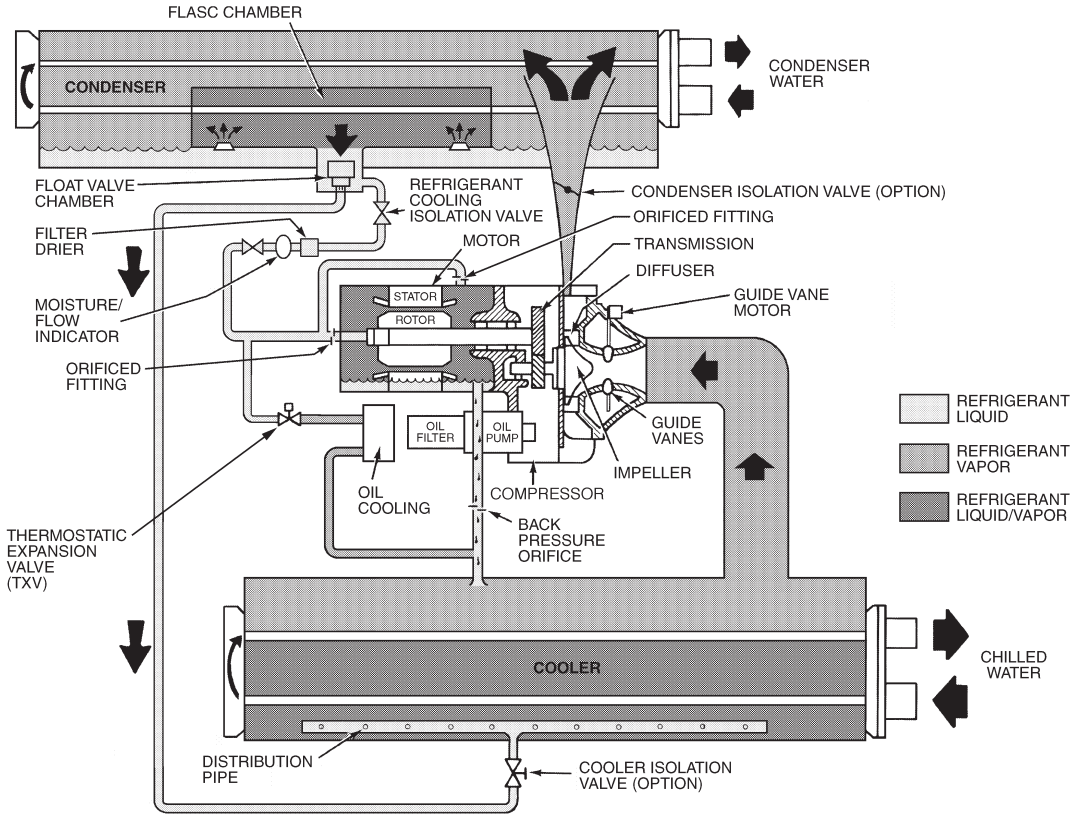


Fig. 4 — Refrigeration Cycle — 19XRV Single-Stage Compressor

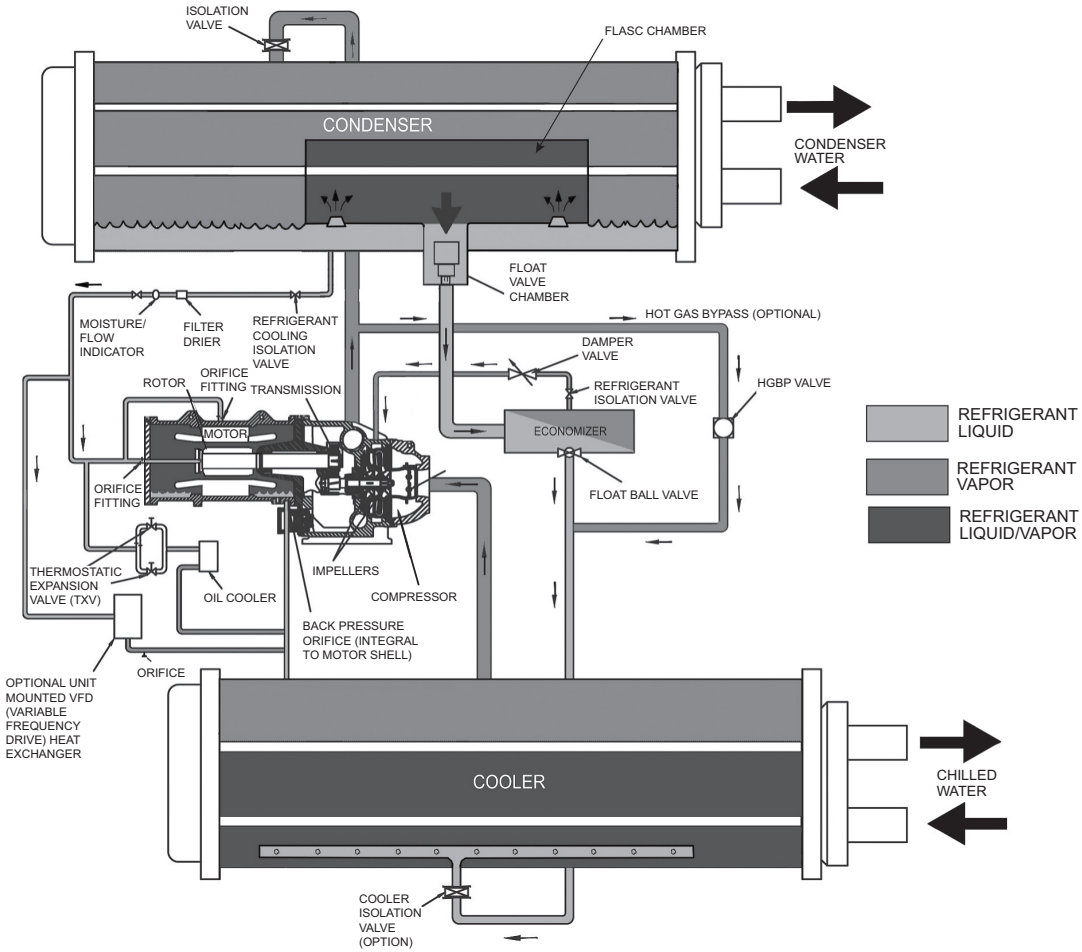


Fig. 5 — Refrigeration Cycle — 19XRV Two-Stage Compressor

VFD COOLING CYCLE

The unit-mounted variable frequency drive (VFD) is cooled in a manner similar to the motor and lubricating oil cooling cycle (Fig. 6 and 7).

If equipped with a 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. The refrigerant leaving the heat exchanger returns to the cooler.

LUBRICATION CYCLE

Summary — The oil pump, oil filter, and oil cooler make up a package located partially in the transmission casing of the compressor-motor assembly. The oil is pumped into a filter assembly to remove foreign particles and is then forced into an oil cooler heat exchanger where the oil is cooled to proper operational temperatures. After the oil cooler, part of the flow is directed to the gears and the high speed shaft bearings; the remaining flow is directed to the motor shaft bearings. Oil drains into the transmission oil sump to complete the cycle (Fig. 6 and 7).

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 ICVC (International Chiller Visual Controller) default screen. During compressor operation, the oil sump temperature ranges between 125 and 150 F (52 and 66 C).

The oil pump suction is fed from the oil reservoir. An oil pressure relief valve maintains 18 to 30 psid (124 to 207 kPad) differential pressure in the system at the pump discharge. The normal oil pressure on compressors equipped with rolling element bearings is between 18 and 40 psid (124 and 276 kPad). This differential pressure can be read directly from the ICVC default 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 (see Maintenance sections, pages 87 to 93 for details). 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 thermal bulb 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 thrust and forward journal bearings. The outer bearing race temperature is measured on compressors with rolling element bearings. The oil then drains into the oil reservoir at the base of the compressor. The PIC III (Product Integrated Control III) measures the temperature of the oil in the sump and maintains the temperature during shutdown (see Oil Sump Temperature and Pump Control section, page 50). This temperature is read on the ICVC default screen.

During chiller start-up, the PIC III energizes the oil pump and provides 45 seconds of pre-lubrication to the bearings after pressure is verified before starting the compressor. During shutdown, the oil pump will run for 60 seconds to post-lubricate after the compressor shuts down. The oil pump can also be energized for testing purposes during a Control Test.

Ramp loading can be adjusted 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 PIC III will shut down the compressor.

If the controls are subject to a power failure that lasts more than 3 hours, the oil pump will be energized periodically when the power is restored. This helps to eliminate refrigerant that has migrated to the oil sump during the power failure. The controls energize the pump for 30 seconds every 30 minutes until the chiller is started.

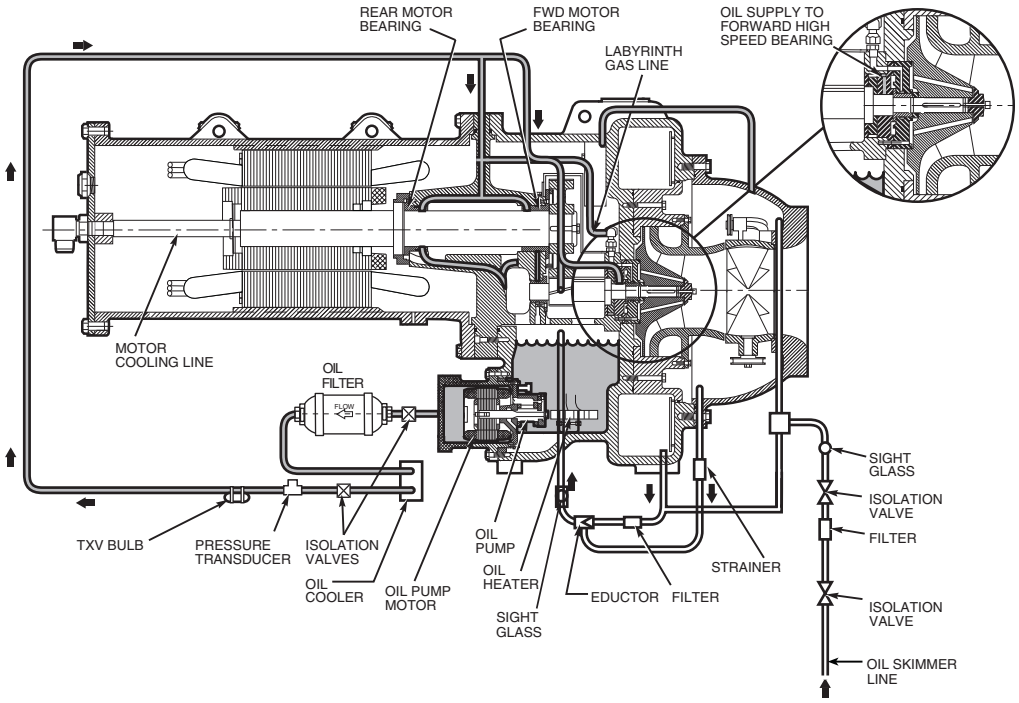


Fig. 6 — Single-Stage Lubrication System

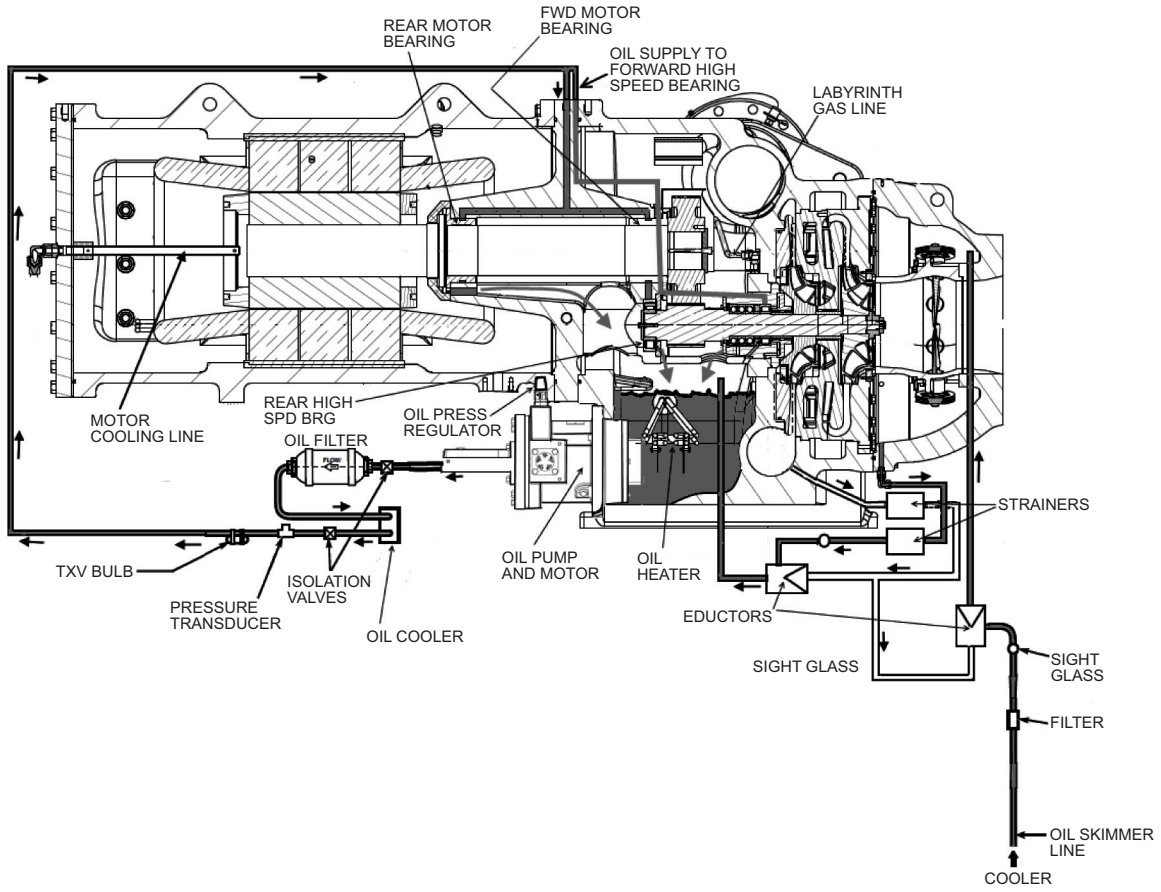


Fig. 7 — Two-Stage Lubrication System

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. This oil and refrigerant mixture is skimmed from the side of the cooler and is then drawn up to the guide vane housing using discharge gas pressure to power an eductor. 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.

There are three pump-filter configurations. The original vane pump, in which the oil filter is contained in the pump housing, followed by the vane pump with the oil filter being external in the oil piping between the oil pump and the oil cooler. The third configuration is the gerotor pump, also with the external oil filter.

A gerotor pump has two rotors, one is inside the other and 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.

The gerotor pump can be most easily identified by the external location of the oil pressure regulator. The regulator is located on the bottom of the pump pointing horizontally to the left. See Fig. 8.

Bearings — The 19XRV compressor assemblies include four radial bearings and four thrust bearings. The low speed shaft assembly is supported by two journal bearings located between the motor rotor and the bull gear. The bearing closer to the rotor includes a babbitted thrust face which opposes the normal axial forces which tend to pull the assembly towards the transmission. The bearing closer to the bull gear includes a smaller babbitted thrust face, designed to handle counterthrust forces.

For Frame 2 19XRV 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 counterthrust forces.

For 19XRV Frame 3, Frame 4, Frame 5, and Frame E compressors today (earlier versions had journal bearings), the high speed shaft assembly has been redesigned to utilize rolling element bearings (radial and thrust). Machines employing the rolling element bearings can be expected to have higher oil pressure and thrust bearing temperatures than those compressors using the alternate bearing design.

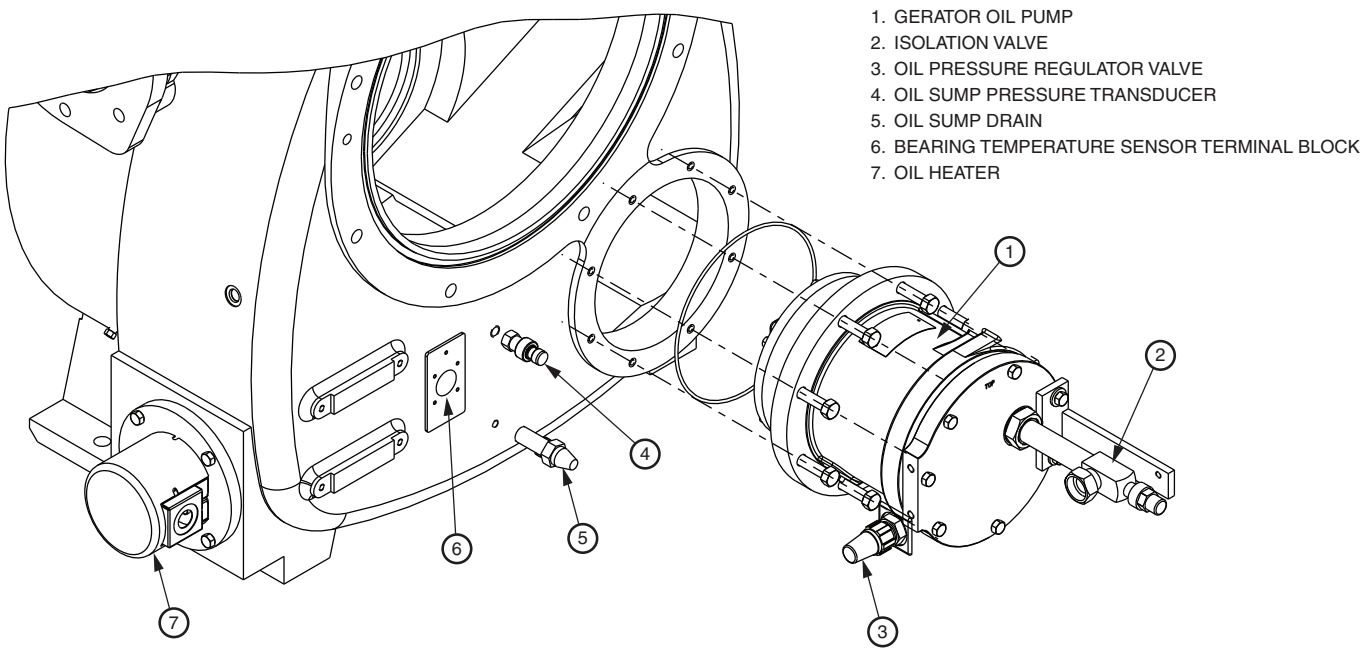


Fig. 8 — Gerotor Oil Pump

STARTING EQUIPMENT

All 19XRV units are equipped with a VFD to operate the centrifugal hermetic compressor motor. A power panel controls the oil pump, and various auxiliary equipment. The VFD and power panel are the main field wiring interfaces for the installing contractor. The VFD is mounted directly on the chiller.

NOTE: This publication provides start-up and service information for the LiquiFlo™ 2.0 (LF2) VFDs. For information on Std Tier VFDs, refer to associated Start-Up and Service Instructions for the Rockwell PowerFlex 755 VFD or the Eaton LCX 9000 VFD.

Three separate circuit breakers are inside the VFD. Circuit breaker CB1 is the VFD circuit breaker. The disconnect switch on the VFD front cover is connected to this breaker. Circuit breaker CB1 supplies power to the VFD.

⚠ WARNING

The main circuit breaker (CB1) on the front of the VFD disconnects the main VFD current only. Power is still energized for the other circuits. Two more circuit breakers inside the VFD must be turned off to disconnect power to the oil pump, PIC III controls, and oil heater.

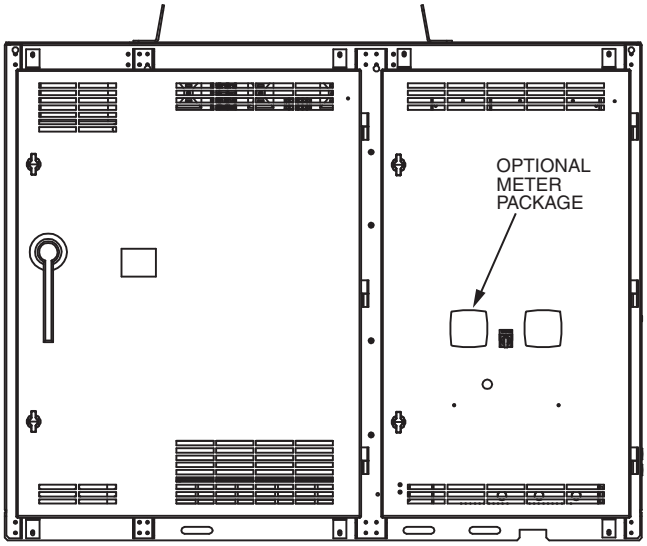
Circuit breaker CB2 supplies 115-v power to the oil pump control panel, oil heater, and portions of the VFD controls.

⚠ WARNING

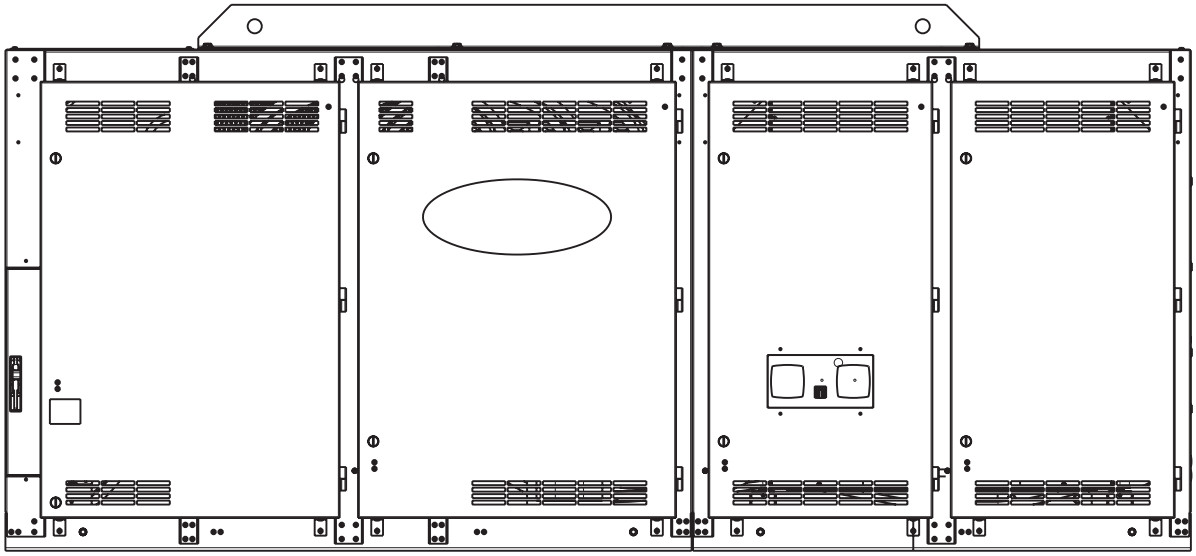
Do not touch the power wiring or motor terminals while voltage is present, or serious injury will result.

Unit-Mounted VFD — The 19XRV chiller is equipped with a variable frequency drive motor controller mounted on the condenser. See Fig. 9-12. This VFD is used with low voltage motors between 380 and 460 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 III modulates the compressor speed and guide vane position to control chilled water temperature. The VFD is further explained in the Controls section and Troubleshooting Guide section, pages 18 and 93.

Operational parameters and fault codes are displayed relative to the drive. Refer to specific drive literature along with troubleshooting sections. 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.

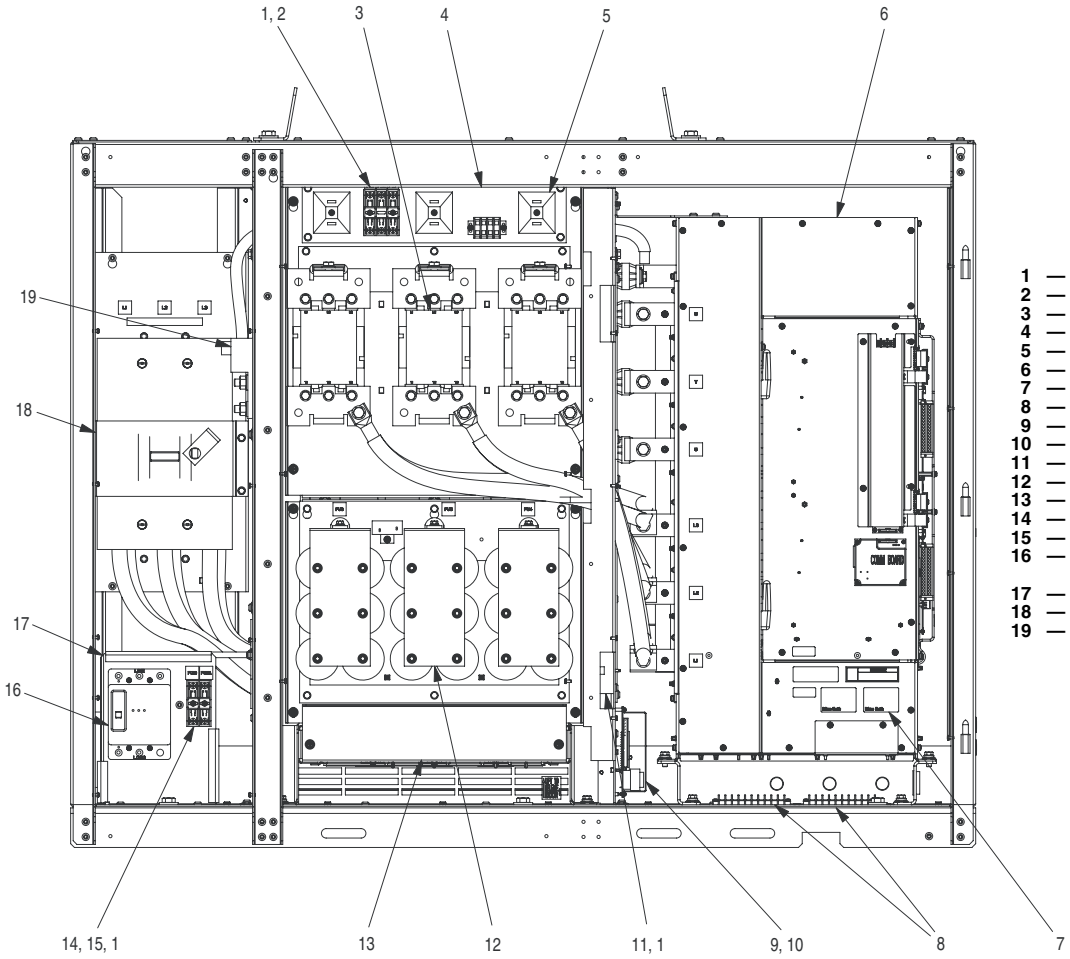


442A AND 608A VFDs



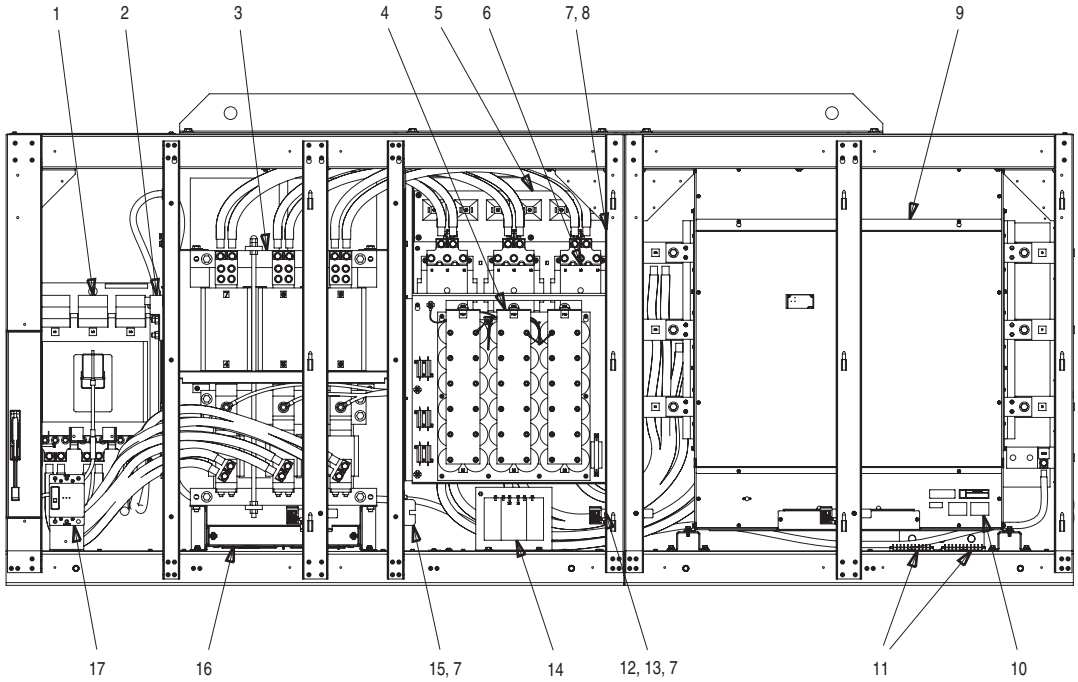
900A AND 1200A VFDs

Fig. 9 — LiquiFlo™ 2 Variable Frequency Drive (VFD) External



1 — Fuse Block, 30A, 600V, Class CC
2 — Fuse, Class CC, 600V, 20A (3)
3 — AC Contactor (3) — Pre-Charge
4 — Input Conductor Assembly
5 — Pre-Charge Resistor Assembly
6 — Power Module Assembly
7 — Power Module Nameplate
8 — Terminal Block, 10-Position (2)
9 — Line Sync Board Cover
10 — Line Sync PC Board Assembly
11 — Fuse, Class CC, 600V, 1A (3)
12 — Capacitor Bank Assembly
13 — Fan, 115V (3)
14 — Fuse, Class CC, 600V, 5A (1)
15 — Fuse, Class CC, 600V, 20A (1)
16 — Circuit Breaker, Control Power, 600V, 15A
17 — Transformer, 3k VA
18 — Circuit Breaker, 600V
19 — Lug, Ground, 2-600 MCM

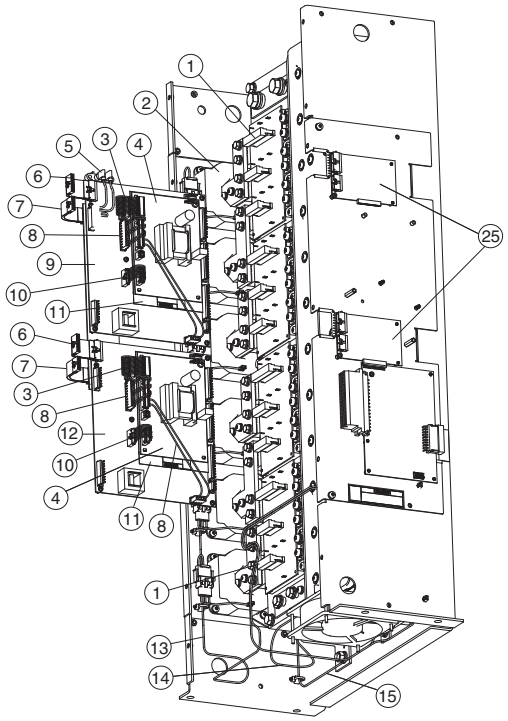
442A AND 608A VFDs



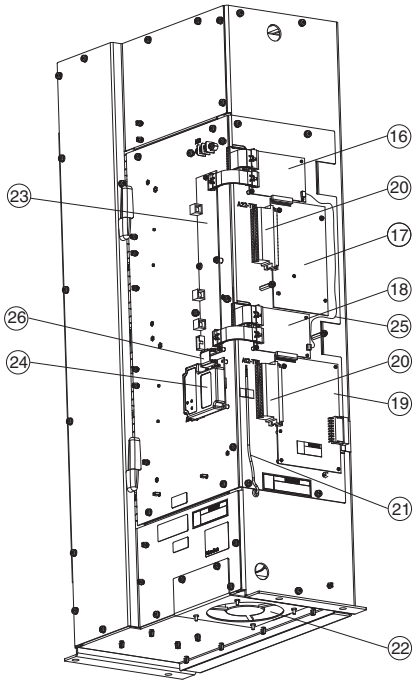
1 — Circuit Breaker, 600V
2 — Lug, Ground, 2-600 MCM
3 — Input Conductor Assembly
4 — Capacitor Bank Assembly
5 — Pre-Charge Resistor Assembly
6 — AC Contactor (3) — Pre-Charge
7 — Fuse Block, 30A, 600V, Class CC
8 — Fuse, Class CC, 600V, 20A (3)
9 — Power Module Assembly
10 — Power Module Nameplate
11 — Terminal Block, 10-Position (2)
12 — Fuse, Class CC, 600V, 20A (1)
13 — Fuse, Class CC, 600V, 5A (1)
14 — Transformer, 3k VA
15 — Fuse, Class CC, 600V, 1A (3)
16 — Fan, 115V (3)
17 — Circuit Breaker, Control Power, 600V, 15A

900A AND 1200A VFDs

Fig. 10 — LiquiFlo™ 2 Variable Frequency Drive (VFD) Internal



Door Open



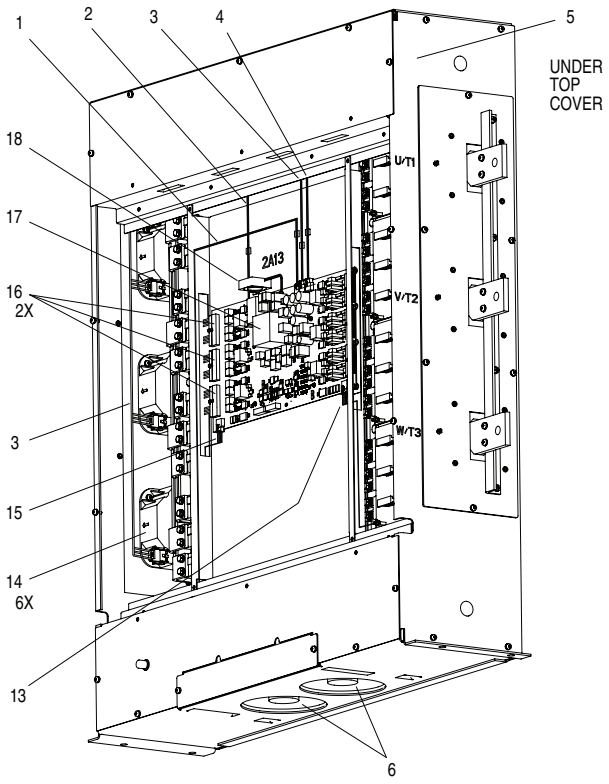
Door Closed

1 — Wire Harness Assembly, Gate Driver
2 — Current Feedback Device, 1000 A
3 — Wire Harness Assembly, Power Supply, Logic
4 — 80 W Power Supply Assembly
5 — Terminal Block, 2-Position
6 — Cable Assembly, 40-Pin
7 — Cable Assembly, 30-Pin
8 — Wire Harness Assembly, Power Supply, Upper Gate
9 — Inverter Power Interface Assembly
10 — Wire Harness Assembly, Power Supply, Lower Gate
11 — Insulation Sheet
12 — Rectifier Power Interface Assembly
13 — Wire Harness Assembly, Current Feedback Device
14 — Wire Harness Assembly, DC Bus Bleeder Resistors
15 — Wire Harness Assembly, Line Sync
16 — Inverter Control Assembly*
17 — Standard I/O Option, 24 V Assembly
18 — Rectifier Control Assembly*
19 — AC Line I/O Assembly
20 — Connector, Terminal Block, 32-Pin
21 — NTC Assembly
22 — Internal Fan
23 — DPI Communications Interface Assembly
24 — VFD Gateway
25 — Wire Harness Assembly, Control Sync
26 — Cable Assembly, 20-pin

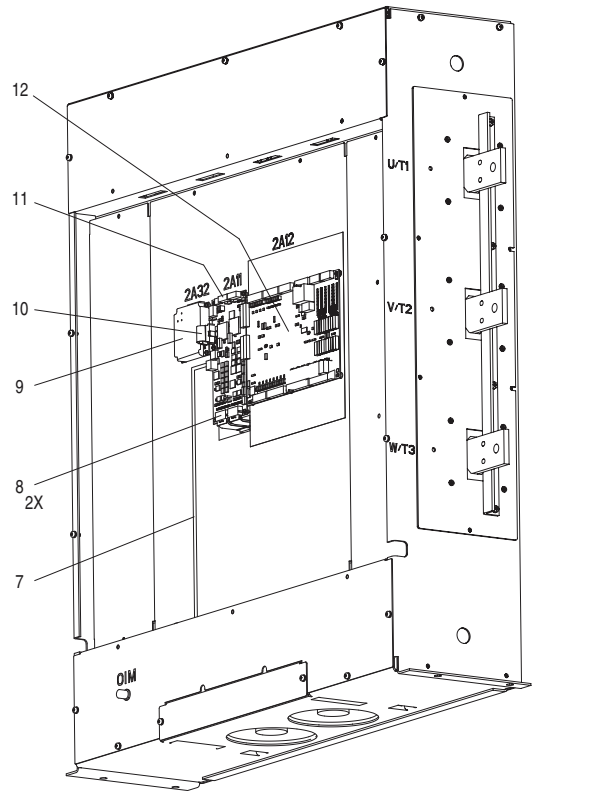
*The inverter control assembly (item 16) and rectifier control assembly (item 18) are physically similar but are loaded with different software. These boards are NOT interchangeable.

442A AND 608A VFDs

Fig. 11 — LiquiFlo™ 2 Power Module Components



Door Open



Door Closed

1 — Wire Harness Assembly, Internal Fan
2 — Wire Harness Assembly, DC Power
3 — Wire Harness Assembly, Current Feedback Device, Rectifier Side
4 — Wire Harness Assembly, Current Feedback Device, Inverter Side
5 — Wire Harness Assembly, DC Bus Resistors
6 — Internal Fan, 24 VDC
7 — Cable, Mini DIN, 8 Pos., Male/Male, 1 Meter Long
8 — Cable Assembly, 40-Pin
9 — RS-485 Communications Assembly
10 — Cable Assembly, 20-Pin
11 — Combined Control PCB Assembly
12 — Combined I/O PCB Assembly
13 — Wire Harness Assembly, RTD, Inverter Side
14 — Current Feedback Device, 2000A
15 — Wire Harness Assembly, RTD, Rectifier Side
16 — Wire Harness Assembly, Gate Driver
17 — Combined Power PCB Assembly, 1215 Amps
18 — Internal Fan, 24 VDC

900A AND 1200A VFDs

Fig. 11 — LiquiFlo™ 2 Power Module Components (cont)

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 19XRV semi-hermetic centrifugal liquid chiller contains a microprocessor-based control panel that monitors and controls all operations of the chiller. See Fig. 12-14. 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 the cooling load within the set point plus the deadband by sensing the leaving chilled water or brine temperature and regulating the inlet guide vane via a mechanically linked actuator motor. The guide vane is a variable flow pre-whirl assembly that controls the refrigeration effect in the cooler by regulating the amount of refrigerant vapor flow into the compressor. An increase in guide vane opening increases capacity. A decrease in guide vane opening decreases capacity. The microprocessor-based controls protect the chiller by monitoring the digital and analog inputs and executing capacity overrides or safety shutdowns, if required.

PIC III System Components — The chiller control system is called the PIC III (Product Integrated Control III). See Table 1. The PIC III controls the operation of the chiller by monitoring all operating conditions. The PIC III can diagnose a problem and let the operator know what the problem is and what to check. It promptly positions the guide vanes to maintain leaving chilled water temperature. It can interface with auxiliary equipment such as pumps and cooling tower fans to turn them on when required. It continually checks all safeties to prevent any unsafe operating condition. It also regulates the oil heater while the compressor is off and regulates the hot gas bypass valve, if installed. The PIC III controls provide critical protection for the compressor motor and controls the VFD. The PIC III can interface with the Carrier Comfort Network® (CCN) system if desired. It can communicate with other PIC I, PIC II, or PIC III equipped chillers and other CCN devices.

The PIC III consists of 3 modules housed inside 3 major components. The component names and corresponding control voltages are listed below (also see Table 1):

- control panel
  — all extra low-voltage wiring (24 v or less)
- power panel
  — 115 vac control voltage (per job requirement)
  — 115 vac power for oil heater and actuators
  — up to 460 vac for oil pump power
- VFD cabinet
  — chiller power wiring (per job requirement)

Table 1 — Major PIC III Components and Panel Locations*

PIC III COMPONENT	PANEL LOCATION
International Chiller Visual Controller (ICVC) and Display	Control Panel
Chiller Control Module (CCM)	Control Panel
Control Transformer Circuit Breakers CB1, CB2	Control Panel
Oil Heater Contactor (1C)	Power Panel
Oil Pump Contactor (2C)	Power Panel
Hot Gas Bypass Relay (3C) (Optional)	Power Panel
Control Transformers (T1, T2, T3)	Power Panel
Temperature Sensors	See Fig. 12.
Pressure Transducers	See Fig. 12.

*See Fig. 14 and 15.

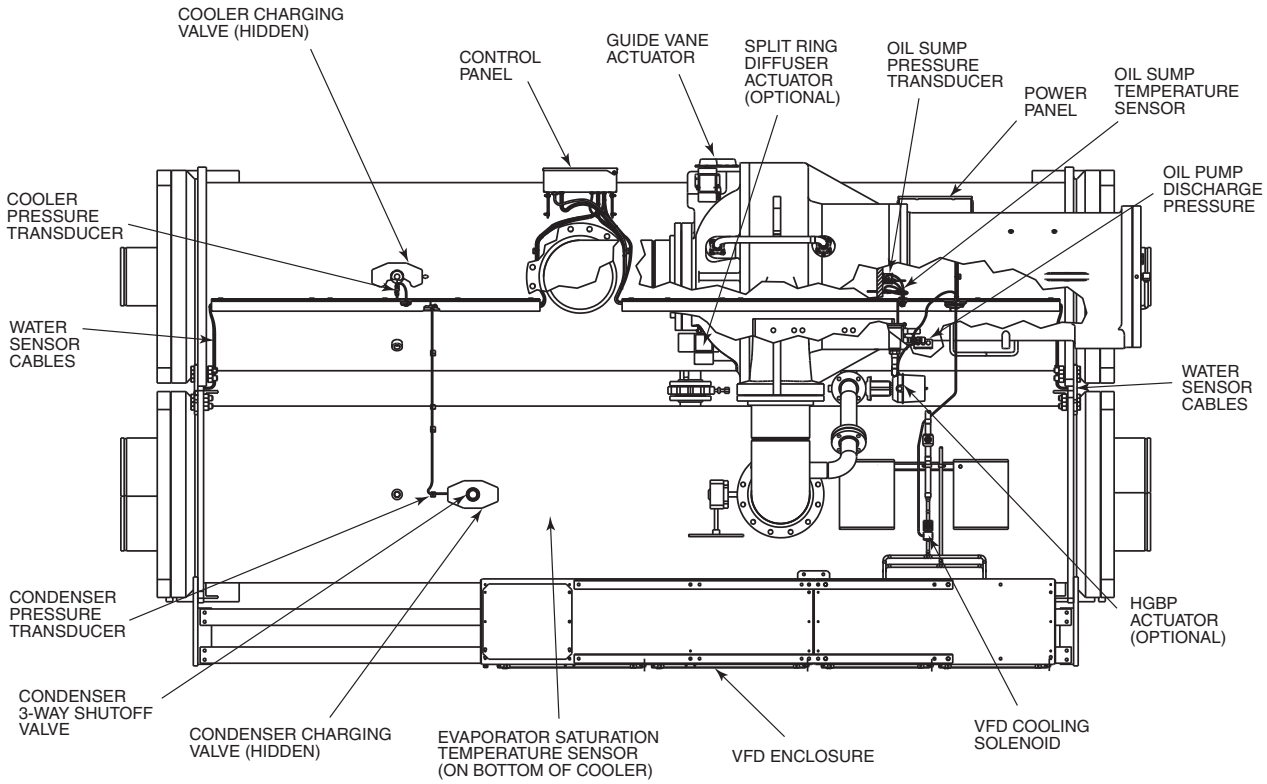


Fig. 12 — Chiller Controls and Sensor Locations

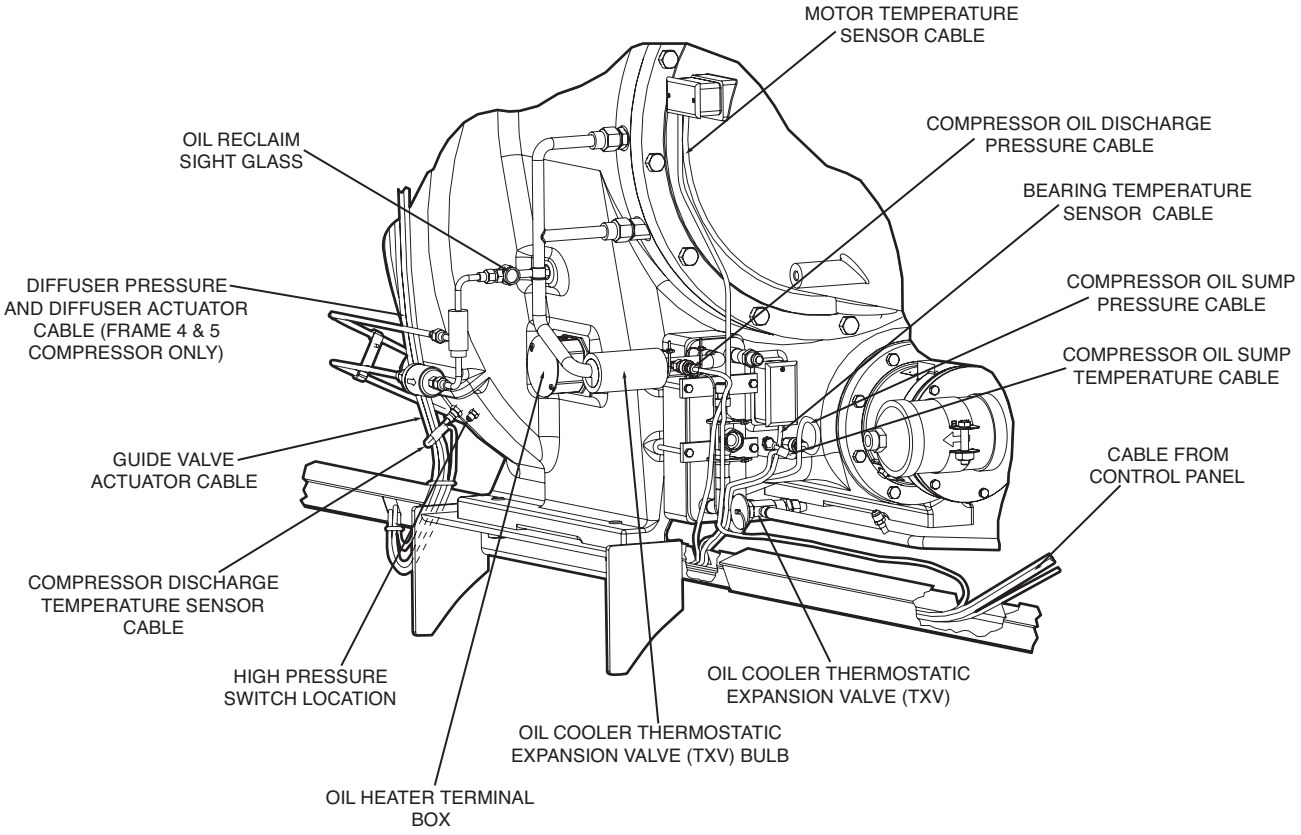


Fig. 13 — 19XRV Compressor Controls and Sensor Locations

INTERNATIONAL CHILLER VISUAL CONTROLLER (ICVC) — The ICVC is the "brain" of the PIC III system. This module contains all the operating software needed to control the chiller. The ICVC is mounted to the control panel (Fig. 14) and is the input center for all local chiller set points, schedules, configurable functions, and options. The ICVC has a stop button, an alarm light, four buttons for logic inputs, and a backlight display. The backlight will automatically turn off after 15 minutes of non-use. The functions of the four buttons or "softkeys" are menu driven and are shown on the display directly above the softkeys.

The viewing angle of the ICVC can be adjusted for optimum viewing. Remove the 2 bolts connecting the control panel to the brackets attached to the cooler. Place them in one of the holes to pivot the control panel forward to backward to change the viewing angle. To change the contrast of the display, access the adjustment on the back of the ICVC. See Fig. 14.

The ICVC features 4 factory programmed languages:

- English (default)
- Chinese
- Japanese
- Korean

NOTE: Pressing any one of the four softkey buttons will activate the backlight display **without** implementing a softkey function.

The ICVC may be identified by viewing the back of the plate on which the display is mounted. (Open the control panel door to view.) Note any of the following distinguishing features in Table 2.

Table 2 — Identification Features of the ICVC

CONTROLLER	COLOR OF PLATE	CEPL NO. (HARDWARE)	SOFTWARE	OTHER MARKINGS
ICVC	Metallic	CEPL 130445-03-R or 130445-04-R	CESR 131350-0X	"PIC III" Marking on back of green circuit board

CHILLER CONTROL MODULE (CCM) — This module is located in the control panel. The CCM provides the input and outputs necessary to control the chiller. This module monitors refrigerant pressure, entering and leaving water temperatures, and outputs control for the guide vane actuator, oil heaters, and oil pump. The CCM is the connection point for optional demand limit, chilled water reset, remote temperature reset, and motor kilowatt output.

OIL HEATER CONTACTOR (1C) — This contactor is located in the power panel (Fig. 15) and operates the heater at 115 v. It is controlled by the PIC III to maintain oil temperature during chiller shutdown. Refer to the control panel wiring schematic.

OIL PUMP CONTACTOR (2C) — This contactor is located in the power panel. It operates all 380 to 480-v oil pumps. The PIC III energizes the contactor to turn on the oil pump as necessary.

HOT GAS BYPASS CONTACTOR RELAY (3C) (OPTIONAL) — This relay, located in the power panel, controls the opening of the hot gas bypass valve. The PIC III energizes the relay during low load, high lift conditions.

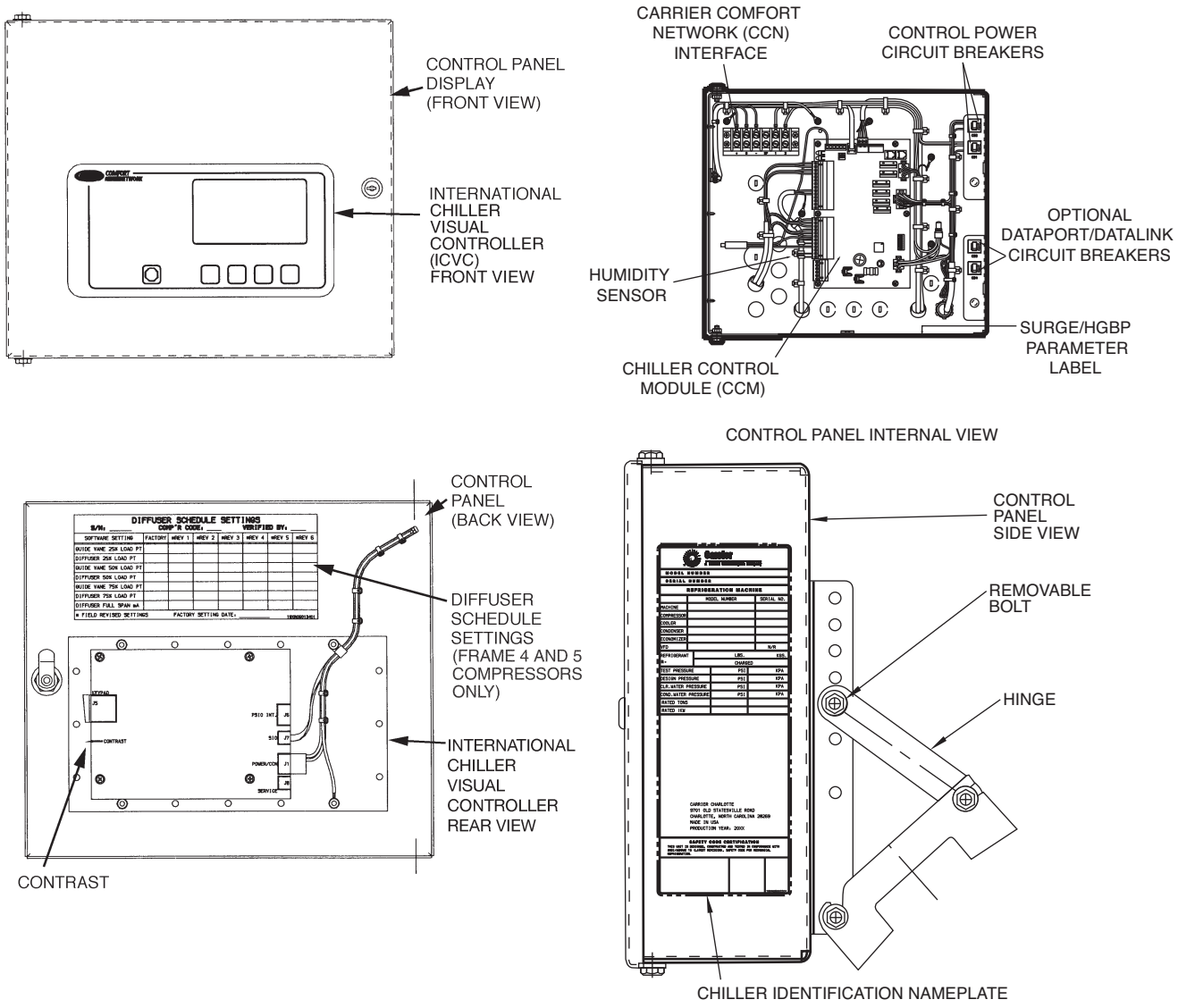


Fig. 14 — Control Panel

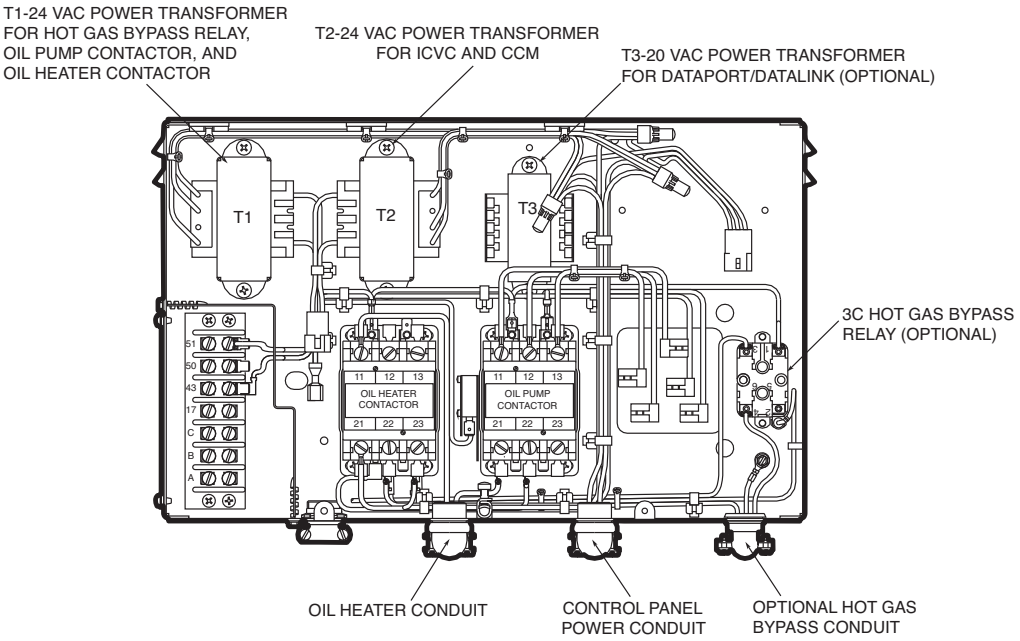


Fig. 15 — Power Panel

CONTROL TRANSFORMERS (T1, T2) — These transformers convert incoming control voltage to 24 vac power for the 3 power panel contactor relays, CCM, and ICVC.

OPTIONAL TRANSFORMER (T3) — This transformer provides 20 vac control power to DataPort™/DataLINK™ modules.

SENSORS — Two types of temperature sensors are used:

Figure 16 shows a typical temperature sensor for which sensor wells are used, in systems having an ICVC controller. For this type, the sensor cable cannot be separated from the sensor itself, but the sensor can be readily removed from the well without breaking into the fluid boundary.

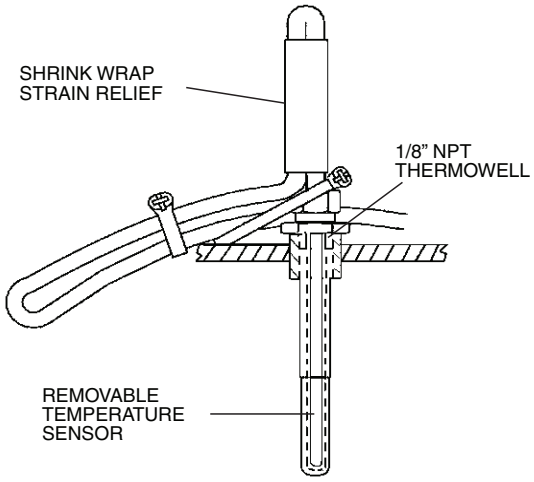


Fig. 16 — Temperature Sensor Used

The second type of temperature sensor is a thermistor, which is installed either in the motor windings or at the thrust bearing within the compressor. Both of these have redundant sensors such that if one fails, the other can be connected external to the machine. See Table 3 for a list of standard instrumentation sensors.

The PIC III control determines refrigerant temperature in the condenser and evaporator from pressure in those vessels, read from the corresponding pressure transducers. See Fig. 17. The pressure values are converted to the equivalent saturation temperatures for R-134a refrigerant. When the chiller is running, if the computed value for EVAPORATOR REFRIG TEMP is greater than, or within 0.6 F (0.33 C) of the *LEAVING CHILLED WATER* temperature, its value is displayed as 0.6 F (0.33 C) below *LEAVING CHILLED WATER* temperature. When the chiller is running, if the computed value for *CONDENSER REFRIG TEMP* is less than, or within 1.2 F (0.67 C) of the LEAVING COND WATER temperature, its value is displayed as 1.2 F (0.67 C) above LEAVING COND WATER temperature.

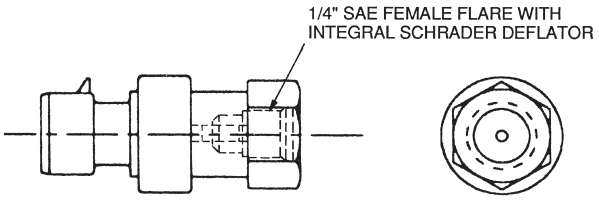


Fig. 17 — Control Sensors (Pressure Transducers, Typical)

Table 3 — Standard Instrumentation Sensors

TYPE	LOCATION MONITORED	REMARKS
TEMPERATURE	Entering chilled water	Cooler inlet nozzle
	Leaving chilled water	Cooler outlet nozzle
	Entering condenser water	Condenser inlet nozzle
	Leaving condenser water	Condenser outlet nozzle
	Evaporator saturation	Sensor well on bottom of evaporator
	Compressor discharge	Compressor volute
	Oil sump	Compressor oil sump
	Compressor thrust bearing	Redundant sensor provided
	Motor winding	Redundant sensor provided
PRESSURE	Evaporator	Relief valve tee
	Condenser	Relief valve tee
	Oil sump	Compressor oil sump
	Oil sump discharge	Oil pump discharge line
	Diffuser (Compressor internal)	Only in machines equipped with split ring diffusers
	Entering chilled water (Optional)	Cooler inlet nozzle
	Leaving chilled water (Optional)	Cooler outlet nozzle
	Entering condenser water (Optional)	Condenser inlet nozzle
	Leaving condenser water (Optional)	Condenser outlet nozzle
ANGULAR POSITION	Guide vane actuator	Potentiometer inside of actuator
	Split ring diffuser actuator (Optional)	Potentiometer inside of actuator only on machines equipped with split ring diffusers (split ring diffuser position not displayed on ICVC)
PRESSURE SWITCH	High condenser (discharge) pressure	Compressor volute, wired into the VFD control circuit
TEMPERATURE SWITCH	Oil pump motor winding temperature	Wired into the oil pump control circuit

A Refrigerant Saturation Temperature sensor (thermistor) is located in the base of the evaporator, sensing refrigerant temperature directly. Evaporator and condenser water side differential pressure transducers are not standard and are not required. The ICVC software uses the evaporator saturation refrigerant temperature in place of differential pressure flow detection to provide evaporator freeze protection.

Approach temperatures are shown in the HEAT_EX screen. *EVAPORATOR APPROACH* is defined as *LEAVING CHILLED WATER* temperature minus EVAP SATURATION TEMP (from the temperature sensor). *CONDENSER APPROACH* is defined as *CONDENSER REFRIG TEMP* (derived from condenser pressure) minus *LEAVING CONDENSER WATER* temperature. When chiller is running, the displayed value for either approach will not be less than 0.2 F (0.1 C). If either approach value exceeds the value configured in the SETUP1 screen, the corresponding Approach Alert message will be entered into the Alert History table.

FLOW DETECTION — Flow detection for the evaporator and condenser is a required condition for start-up and used in the freeze protection safety. Flow and no flow conditions are detected from a combination of several measurements. The usage of waterside differential pressure measurements is not standard or required.

Positive determination of flow on the evaporator side is made if the following conditions are true: (1) the EVAP SATURATION TEMP reads equal to or higher than 1° F (0.6 C) above the *EVAP REFRIG TRIPPOINT*, and (2) EVAP REFRIG TEMP (determined from the Evaporator Pressure sensor) is greater than the *EVAP REFRIG TRIPPOINT* plus 1° F. (If the unit is in Pumpdown or Lockout mode, conditions (1) and (2) are not required to establish flow.) On the condenser side, positive determination of flow is made if the following conditions are true: (1) the *CONDENSER PRESSURE* is less than 165 psig (1139 kPa), and (2) *CONDENSER PRESSURE* is less than the configured *COND PRESS OVERRIDE* threshold by more than 5 psi (34.5 kPa). In addition, if the waterside differential pressure measurement option is enabled, the waterside pressure differentials (cooler and condenser) must exceed their respective configured cutout thresholds.

A No Flow determination is made on the evaporator side if (1) the EVAP SATURATION TEMP reads lower than 1° F (0.6 C) below the *EVAP REFRIG TRIPPOINT*, or (2) EVAP REFRIG TEMP (determined from the Evaporator Pressure sensor) is less than the *EVAP REFRIG TRIPPOINT* and the *EVAPORATOR APPROACH* exceeds the configured *EVAP APPROACH ALERT* threshold. On the condenser side, a No Flow determination is also made if the *CONDENSER APPROACH* exceeds the configured *COND APPROACH ALERT* threshold and either (1) *CONDENSER PRESSURE* exceeds 165 psig (1139 kPa) or (2) *CONDENSER PRESSURE* exceeds the configured *COND PRESS OVERRIDE* threshold by more than 5 psi (34.5 kPa). In addition, if the water-side differential pressure measurement option is enabled, a differential below the configured *EVAP FLOW DELTA P CUTOUT* or *COND FLOW DELTA P CUTOUT* value is sufficient to establish No Flow in either heat exchanger.

If No Flow (for either cooler or condenser) has been determined, and subsequently conditions change such that neither conditions for Flow nor No Flow are all satisfied, the determination will remain No Flow.

In the standard ICVC setup, water-side differential pressure indication is disabled by default. The displays for *CHILLED WATER DELTA P* and *CONDENSER WATER DELTA P* in the HEAT_EX screen will show "*****". In order to enable the option and display a value, change *FLOW DELTA P DISPLAY* to ENABLE in the SETUP1 screen. Pairs of pressure transducers may be connected to the CCM at terminals J3 13-24 in place of the standard resistors and jumpers to determine water-side pressure differentials as in the standard ICVC configuration. (NOTE: If the *FLOW DELTA P DISPLAY* is enabled, but the standard CCM connection is retained, a differential value of approximately 28.5 psi (197 kPa) will always be displayed.)

If water-side differential pressure transducers are used, flow is detected from differential pressure between sensors (pressure transducers) located in water inlet and outlet nozzles, for each heat exchanger. The thresholds for flow determination (*EVAP FLOW DELTA P CUTOUT*, *COND FLOW DELTA P CUTOUT*) are configured in the SETUP1 screen. If the measured differential is less than the corresponding cutout value for 5 seconds, the determination is that flow is absent. If no flow is detected after *WATER FLOW VERIFY TIME* (configured in the SETUP1 screen) after the pump is commanded to start by the PIC, a shutdown will result, and the corresponding loss-of-flow alarm state 229 or 230) will be declared. If the measured differential exceeds the Flow Delta P cutout value, flow is considered to be present.

Alternatively, normally open flow switches may be used for flow indication. In this case, install an evaporator side flow switch in parallel with a 4300-ohm resistor between CCM terminals J3 17-18, replacing the jumper. See page 146. For a condenser side flow switch do the same between CCM terminals J3 23-24. If this type of flow switch circuit is used, it is important to perform a zero point calibration (with the flow switch open).

ICVC Operation and Menus (Fig. 18-24)

GENERAL

- The ICVC display automatically reverts to the default screen after 15 minutes if no softkey activity takes place and if the chiller is not in the pump down mode (Fig. 18).
- If a screen other than the default screen is displayed on the ICVC, the name of that screen is in the top line. See Fig. 19.
- The ICVC may be set to display either English or SI units. Use the ICVC configuration screen (accessed from the Service menu) to change the units. See the Service Operation section, page 60.

NOTE: The date format on the default screen is MM-DD-YY for English units and DD-MM-YY for SI metric units.

- Local Operation — In LOCAL mode, the PIC III accepts commands from the ICVC only and uses the local time occupancy schedule to determine chiller start and stop times. The PIC III can be placed in the local operating mode by pressing the LOCAL softkey. When RUN STATUS is READY, the chiller will attempt to start up.
- CCN Operation — In CCN mode, the PIC III accepts input from any CCN interface or module (with the proper authority) as well as from the local ICVC. The PIC III uses the CCN time occupancy schedule to determine start and stop times. The PIC III can be placed in the local operating mode by pressing the CCN softkey. When RUN STATUS is READY, the chiller will attempt to start up.
- OFF — The control is in OFF mode when neither the LOCAL nor CCN softkey cue is highlighted. Pressing the STOP key or an alarm will place the control in this mode. The PIC III control must be in this mode for certain operations, such as performing a Control Test or accessing VFD Configuration parameters.

ALARMS AND ALERTS — An alarm shuts down the compressor. An alert does not shut down the compressor, but it notifies the operator that an unusual condition has occurred. An alarm (*) or alert (!) is indicated on the STATUS screens on the far right field of the ICVC display screen.

Alarms are indicated when the ICVC alarm light (!) flashes. The primary alarm message is displayed on the default screen. An additional, secondary message and troubleshooting information are sent to the ALARM HISTORY table.

When an alarm is detected, the ICVC default screen will freeze (stop updating) at the time of alarm. The freeze enables the operator to view the chiller conditions at the time of alarm. The STATUS tables will show the updated information. Once all alarms have been cleared (by pressing the RESET softkey), the default ICVC screen will return to normal operation.

An alarm condition must be rectified before a RESET will be processed. However, an alert will clear automatically as soon as the associated condition is rectified.

ICVC MENU ITEMS — To perform any of the operations described below, the PIC III must be powered up and have successfully completed its self test. The self test takes place automatically, after power-up.

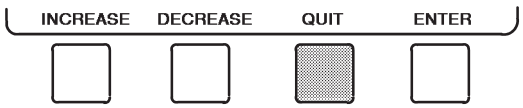
Press the MENU softkey to view the list of menu structures: STATUS, SCHEDULE, SETPOINT, and SERVICE. See Fig. 20.

- The STATUS menu allows viewing and limited calibration or modification of control points and sensors, relays and contacts, and the options board.
- The SCHEDULE menu allows viewing and modification of the local and CCN time schedules and Ice Build time schedules.
- The SETPOINT menu allows set point adjustments, such as the entering chilled water and leaving chilled water set points.
- The SERVICE menu can be used to view or modify information on the Alarm History, Control Test, Control Algorithm Status, Equipment Configuration, VFD Configuration data, Equipment Service, Time and Date, Attach to Network Device, Log Out of Network Device, and ICVC Configuration screens. See Fig. 21.

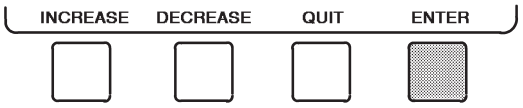
Press the softkey that corresponds to the menu structure to be viewed: STATUS, SCHEDULE, SETPOINT, or SERVICE. To view or change parameters within any of these menu structures, use the NEXT and PREVIOUS softkeys to scroll down to the desired item or table. Use the SELECT softkey to select that item. The softkey choices that appear next depend on the selected table or menu. The softkey choices and their functions are described below.

BASIC ICVC OPERATIONS (USING THE SOFTKEYS) — To perform any of the operations described below, the PIC III must be powered up and have successfully completed its self test.

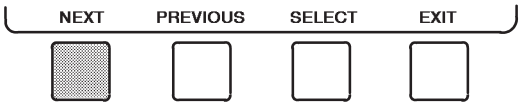
- Press QUIT to leave the selected decision or field without saving any changes.



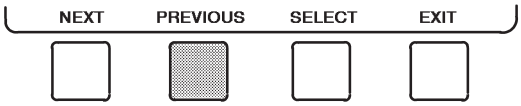
- Press ENTER to leave the selected decision or field and save changes.



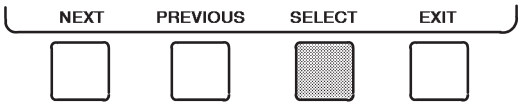
- Press NEXT to scroll the cursor bar down in order to highlight a point or to view more points below the current screen.



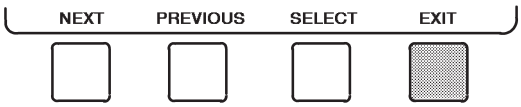
- Press PREVIOUS to scroll the cursor bar up in order to highlight a point or to view points above the current screen.



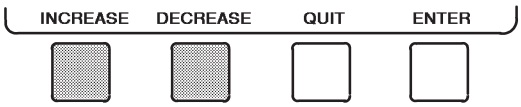
- Press SELECT to view the next screen level (high-lighted with the cursor bar), or to override (if allowable) the high-lighted point value.



- Press EXIT to return to the previous screen level.



- Press INCREASE or DECREASE to change the high-lighted point value.



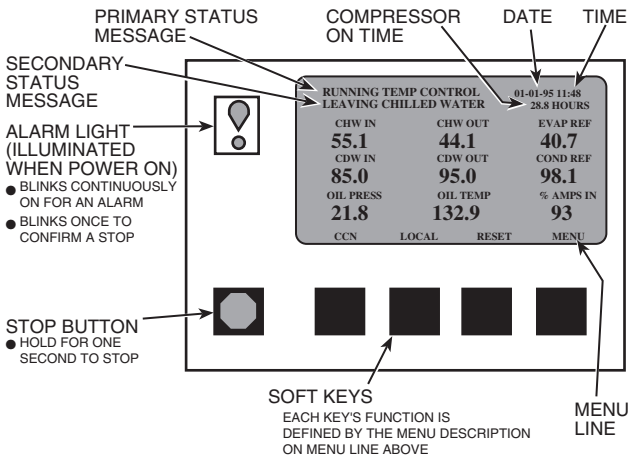


Fig. 18 — ICVC Default Screen

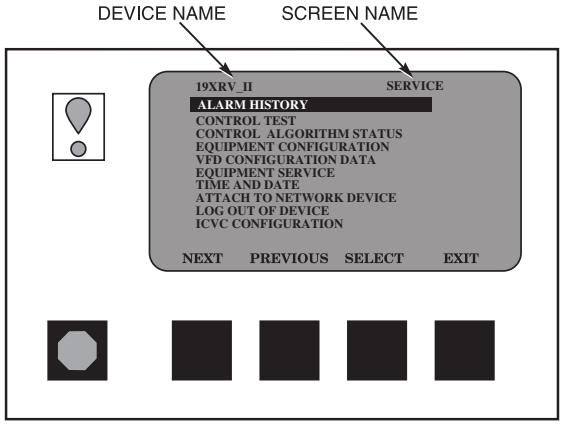


Fig. 19 — ICVC Service Screen

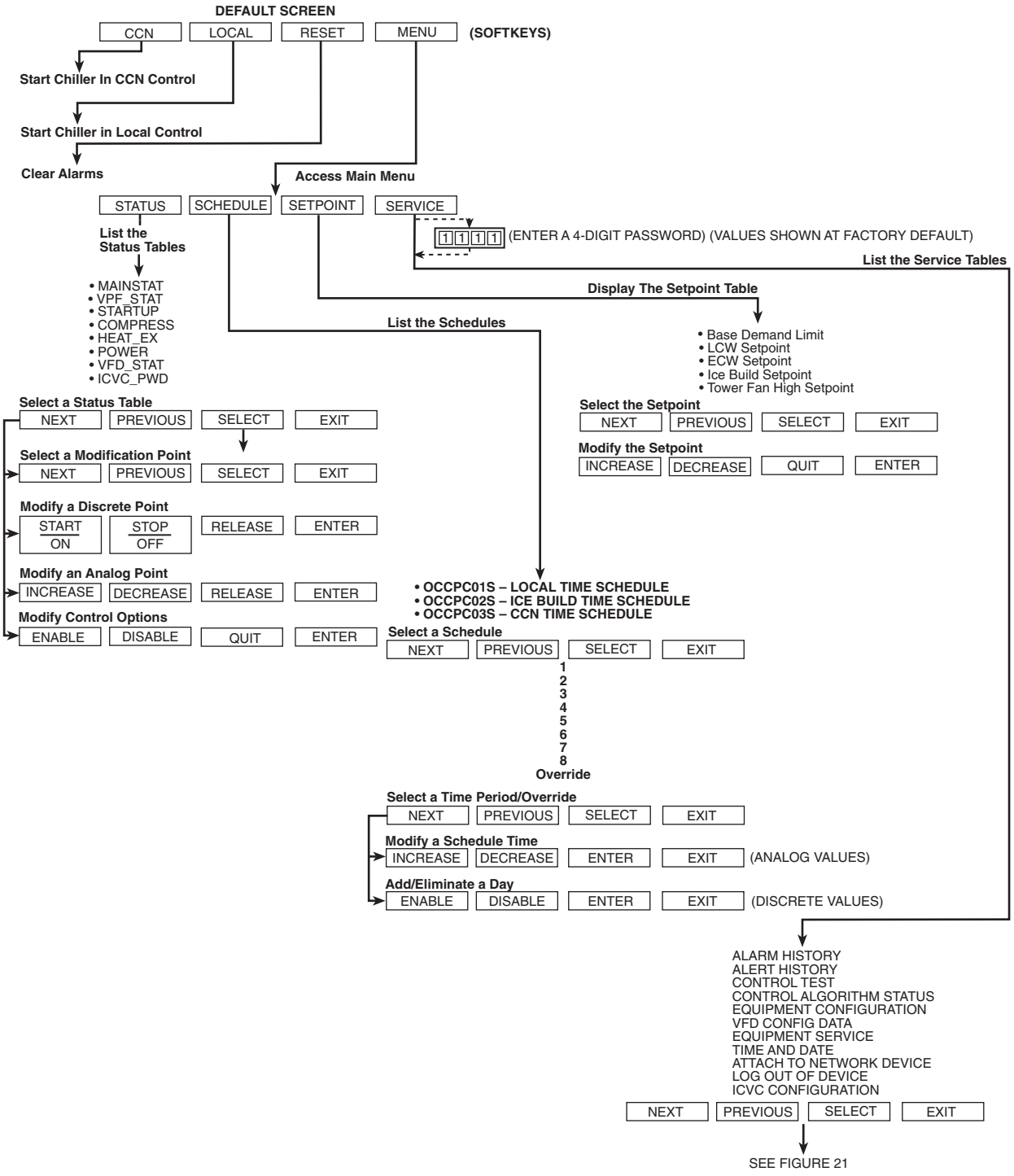


Fig. 20 — 19XRV Chiller Display Menu Structure (ICVC Version 9)

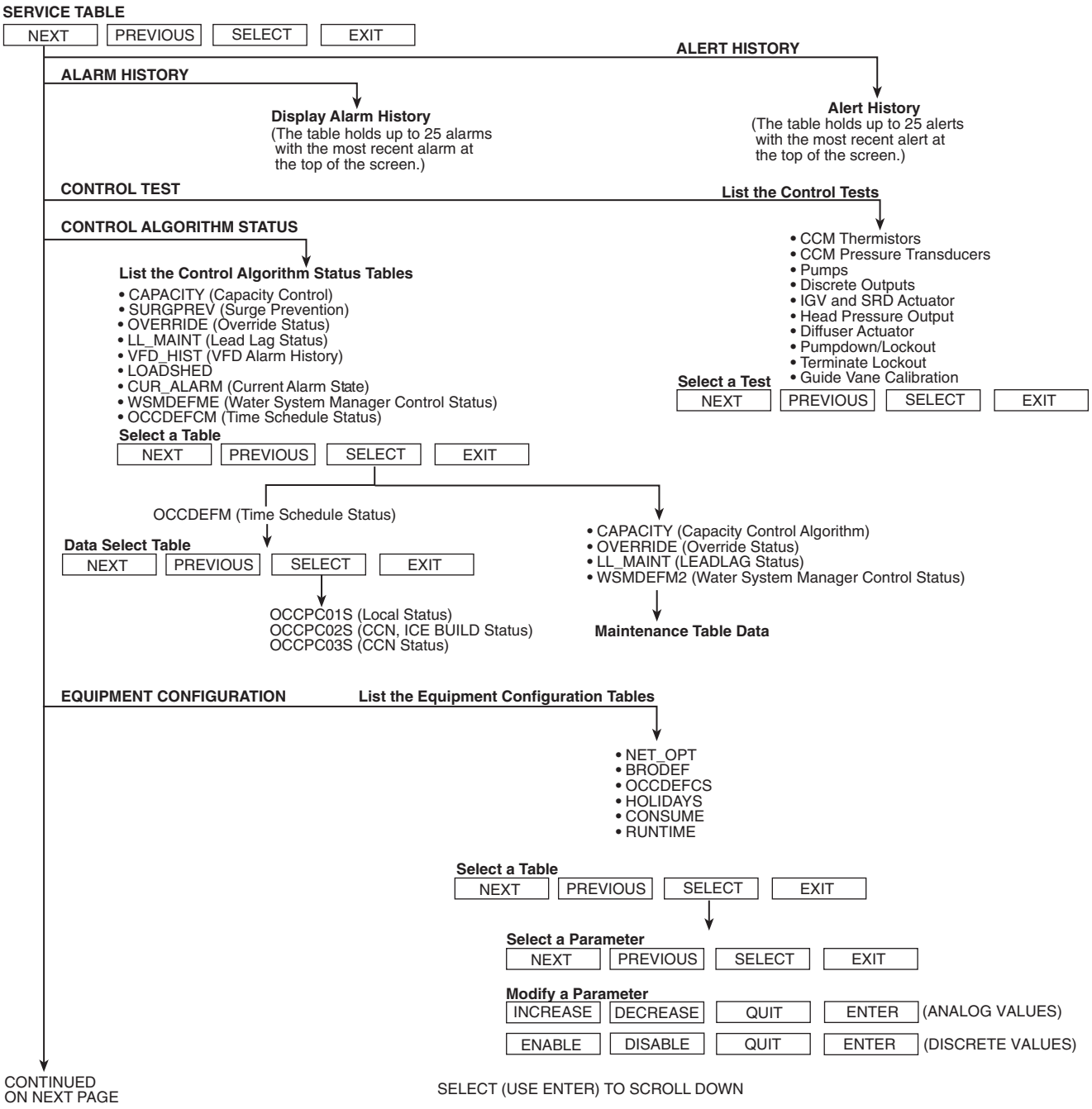


Fig. 21 — 19XRV Service Menu Structure (ICVC Version 9)

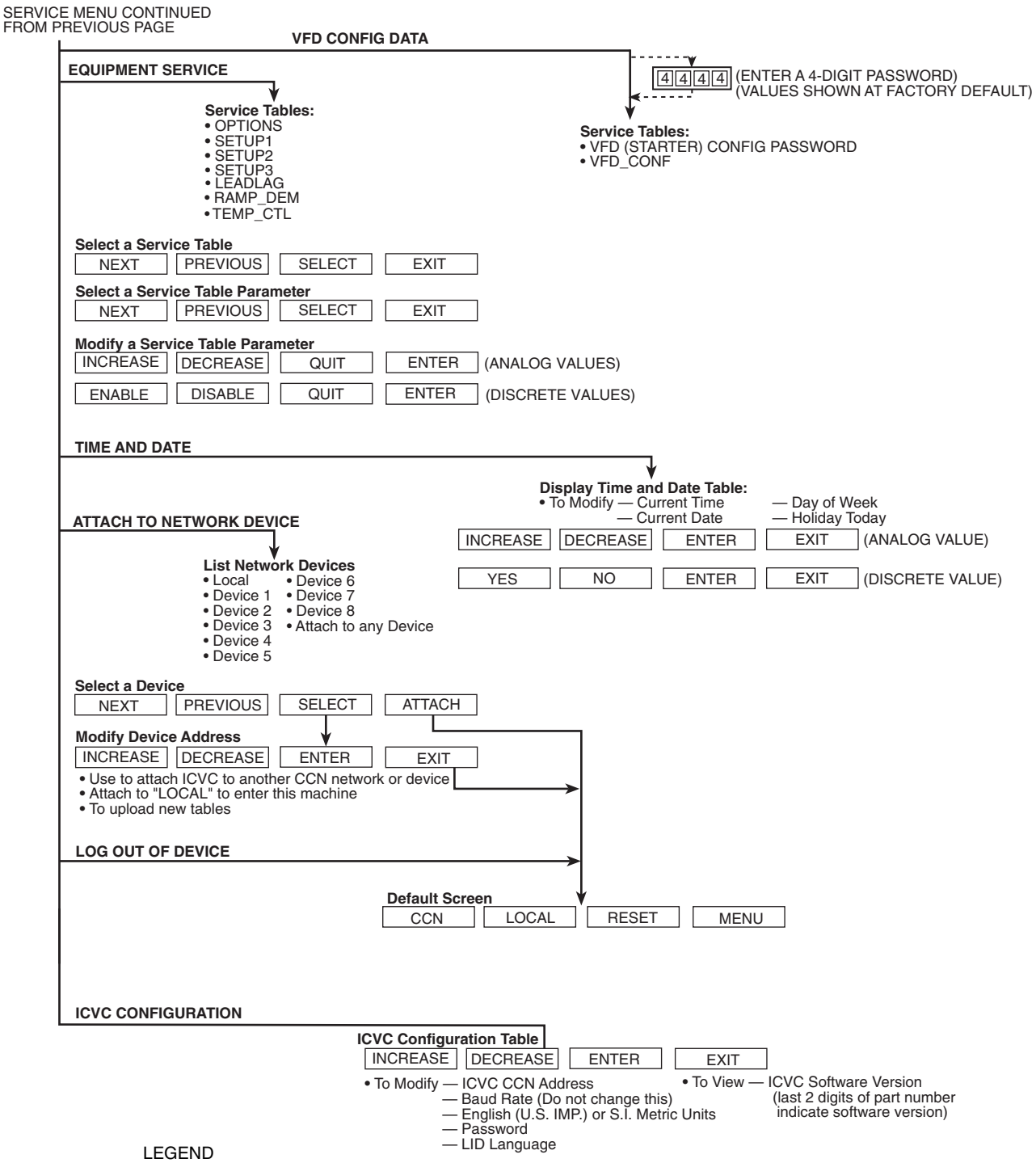
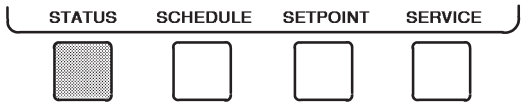


Fig. 21 — 19XRV Service Menu Structure (ICVC Version 9) (cont)

TO VIEW STATUS (FIG. 22) — The status table shows the actual value of overall chiller status such as *CONTROL MODE*, *RUN STATUS*, *AUTO CHILLED WATER RESET*, and *REMOTE RESET SENSOR*.

1. On the menu screen, press STATUS to view the list of point status tables.



2. Press NEXT or PREVIOUS to highlight the desired status table. The list of tables is:

   MAINSTAT — Overall chiller status

   VPF_STAT — Variable primary flow surge prevention algorithm status

   STARTUP — Status required to perform start-up of chiller

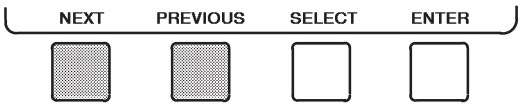
   COMPRESS — Status of sensors related to the compressor

   HEAT_EX — Status of sensors related to the heat exchangers

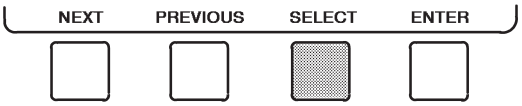
   POWER — Status of motor input power

   VFD_STAT — Status of VFD

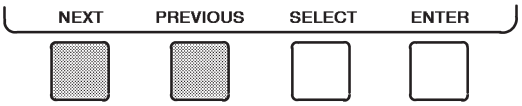
   ICVC_PWD — Service menu password forcing access screen



3. Press SELECT to view the desired point status table.



4. On the point status table, press NEXT or PREVIOUS until the desired point is displayed on the screen.



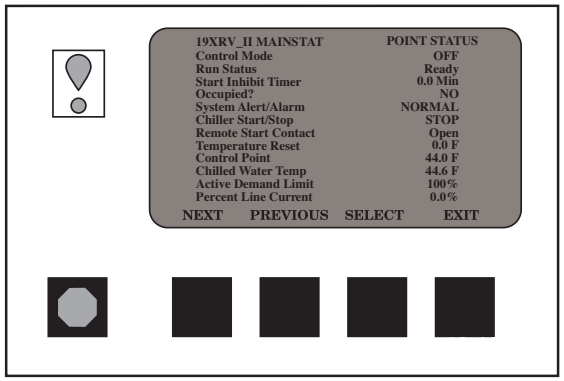
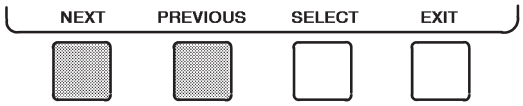


Fig. 22 — Example of Status Screen

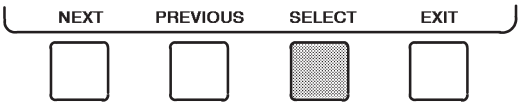
FORCING OPERATIONS

To Force (manually override) a Value or Status

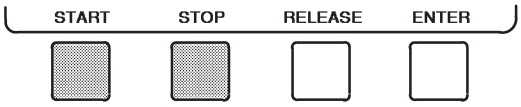
1. From any point status screen, press NEXT or PREVIOUS to highlight the desired value.



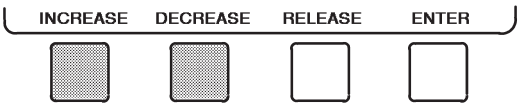
2. Press SELECT to select the highlighted value.



   For Discrete Points — Press START or STOP to select the desired state.



   For Analog Points — Press INCREASE or DECREASE to select the desired value.

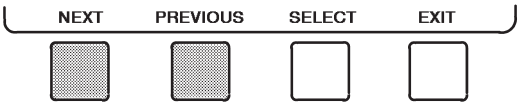


3. Press ENTER to register the new value.

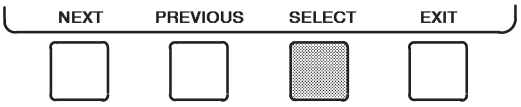
NOTE: When forcing or changing metric values, it is necessary to hold down the softkey for a few seconds in order to see a value change, especially on kilopascal values.

To Remove a Force

1. On the point status table press NEXT or PREVIOUS to highlight the desired value.



2. Press SELECT to access the highlighted value.

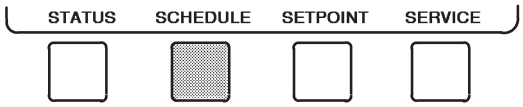


3. Press RELEASE to remove the force and return the point to the PIC III's automatic control.

Force Indication — A forced value is indicated by "SUPVSR," "SERVC," or "BEST" flashing next to the point value on the STATUS table.

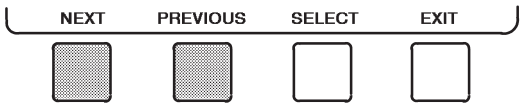
TIME SCHEDULE OPERATION (Fig. 23)

1. On the Menu screen, press SCHEDULE.

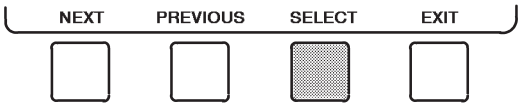


2. Press NEXT or PREVIOUS to highlight the desired schedule.

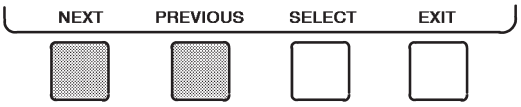
   OCCPC01S — LOCAL Time Schedule
   OCCPC02S — ICE BUILD Time Schedule
   OCCPC03S — CCN Time Schedule



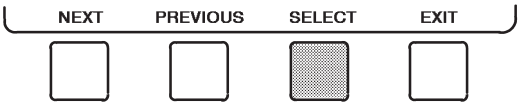
3. Press SELECT to view the desired time schedule.



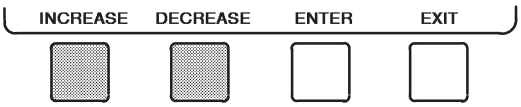
4. Press NEXT or PREVIOUS to highlight the desired period or override to change.



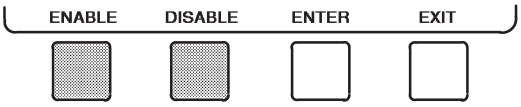
5. Press SELECT to access the highlighted PERIOD or OVERRIDE.



6. a. Press INCREASE or DECREASE to change the time values. OVERRIDE values are in one-hour increments, up to 4 hours.



   b. Press ENABLE to select days in the day-of-week fields. Press DISABLE to eliminate days from the period.



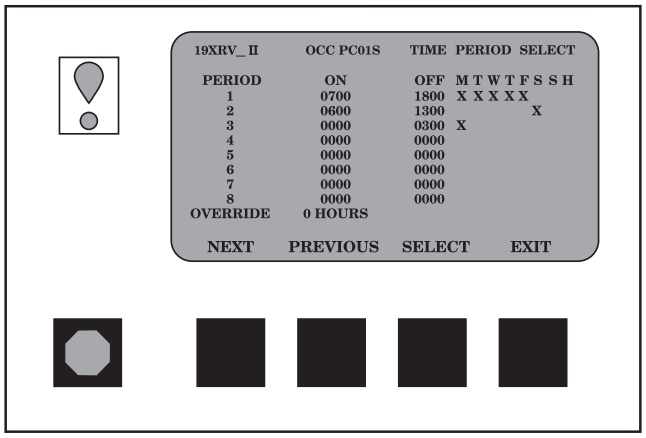
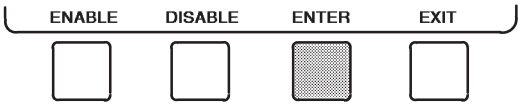
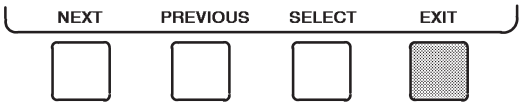


Fig. 23 — Example of Time Schedule Operation Screen

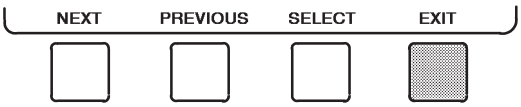
7. Press ENTER to register the values and to move horizontally (left to right) within a period.



8. Press EXIT to leave the PERIOD or OVERRIDE.



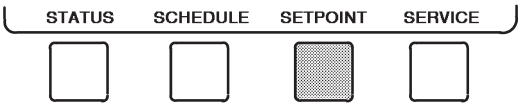
9. Either return to Step 4 to select another PERIOD or OVERRIDE, or press EXIT again to leave the current time schedule screen and save the changes.



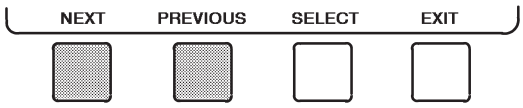
10. The Holiday Designation (HOLIDEF table) may be found in the Service Operation section, page 60. The month, day, and duration for the holiday must be assigned. The Broadcast function in the BRODEF table also must be enabled for holiday periods to function.

TO VIEW AND CHANGE SET POINTS (Fig. 24)

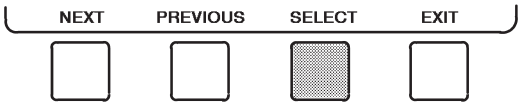
1. To view the SETPOINT table, from the MENU screen press SETPOINT.



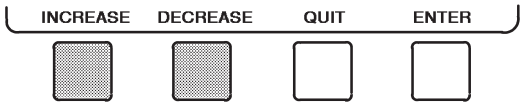
2. There are 5 set points on this screen: BASE DEMAND LIMIT, LCW SETPOINT (leaving chilled water set point), ECW SETPOINT (entering chilled water set point), ICE BUILD SETPOINT, and TOWER FAN HIGH SETPOINT. Only one of the chilled water set points can be active at one time. The set point that is active is determined from the SERVICE menu. See the Service Operation section, page 60. The ice build (ICE BUILD) function is also activated and configured from the SERVICE menu.
3. Press NEXT or PREVIOUS to highlight the desired set point entry.



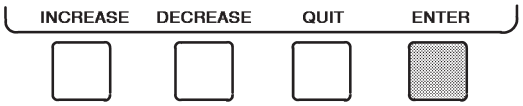
4. Press SELECT to modify the highlighted set point.



5. Press INCREASE or DECREASE to change the selected set point value.



6. Press ENTER to save the changes and return to the previous screen.



SERVICE OPERATION — To view the menu-driven programs available for Service Operation, see Service Operation section, page 60. For examples of ICVC display screens, see Table 4.

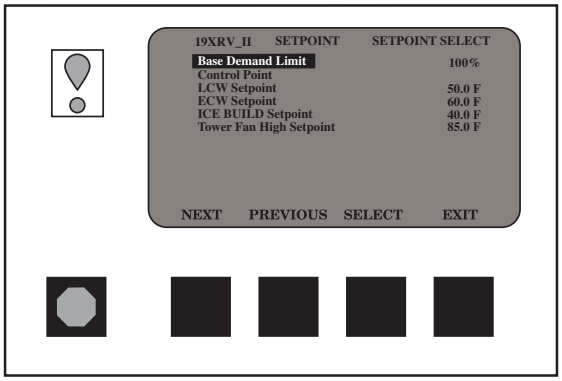


Fig. 24 — Example of Set Point Screen

Table 4 — ICVC Display Data

IMPORTANT: The following notes apply to all Table 4 examples.

1. The Display data shown applies to ICVC software version 9.
2. Only 12 lines of information appear on the chiller display screen at any one time. Press the NEXT or PREVIOUS softkey to highlight a point or to view items below or above the current screen. Double click the NEXT softkey to page forward; press the PREVIOUS softkey twice to page back.
3. To access the information shown in Examples 10 through 24, enter a 4-digit password after pressing the SERVICE softkey. If no softkeys are pressed for 15 minutes, the ICVC automatically logs off (to prevent unrestricted access to PIC III controls) and reverts to the default screen. If this happens, re-enter the password to access the tables shown in Examples 10 through 24.
4. Terms in the Description column of these tables are listed as they appear on the chiller display screen.
5. The ICVC may be configured in English or Metric (SI) units using the ICVC CONFIGURATION screen. See the Service Operation section, page 60, for instructions on making this change.
6. The items in the Reference Point Name column *do not appear on the chiller display screen*. They are data or variable names used in CCN or Building Supervisor (BS) software. They are listed in these tables as a convenience to the operator if it is necessary to cross reference CCN/BS documentation or use CCN/BS programs. For more information, see the 19XRV CCN literature.
7. Reference Point Names shown in these tables in all capital letters can be read by CCN and BS software. Of these capitalized names, those preceded by a dagger (†) can also be changed (that is, written to) by the CCN, BS, and the ICVC. Capitalized Reference Point Names preceded by two asterisks (**) can be changed only from the ICVC. Reference Point Names in lower case type can be viewed by CCN or BS only by viewing the whole table.
8. Alarms and Alerts: An asterisk (*) *in the far right field of a ICVC status screen* indicates that the chiller is in an alarm state; an exclamation point (!) in the far right field of the ICVC screen indicates an alert state. The * (or !) indicates that the value on that line has exceeded (or is approaching) a limit. For more information on alarms and alerts, see the Alarms and Alerts section, page 22.

LEGEND

CCN — Carrier Comfort Network®
CHW — Chilled Water
ECW — Entering Chilled Water
HGBP — Hot Gas Bypass
ICVC — International Chiller Visual Controller
LCW — Leaving Chilled Water
mA — Milliamps
P — Pressure
PIC III — Product Integrated Controls III
PWM — Pulse Width Modulated
SRD — Split Ring Diffuser
T — Temperature
VFD — Variable Frequency Drive
WSM — Water System Manager

EXAMPLE 1 — CHILLER DISPLAY DEFAULT SCREEN

The following data is displayed in the Default screen.

DESCRIPTION	STATUS	UNITS	REFERENCE POINT NAME (ALARM HISTORY)	DISPLAY
(PRIMARY MESSAGE)				
(SECONDARY MESSAGE)				
(DATE AND TIME)				
Compressor Ontime	0-500000.0	HOURS	C_HRS	
Entering Chilled Water	–40-245	DEG F	ECW	CHW IN
Leaving Chilled Water	–40-245	DEG F	LCW	CHW OUT
Evaporator Temperature	–40-245	DEG F	ERT	EVAP REF
Entering Condenser Water	–40-245	DEG F	ECDW	CDW IN
Leaving Condenser Water	–40-245	DEG F	LCDW	CDW OUT
Condenser Temperature	–40-245	DEG F	CRT	COND REF
Oil Pressure	0-420	PSI	OILPD	OILPRESS
Oil Sump Temp	–40-245	DEG F	OILT	OIL TEMP
Average Line Current	0-999	%	LNAMPS_P	%AMPS IN
	0-1		CCN	
	0-1		LOCAL	
	0-1		RESET	

NOTE: The last three entries are used to indicate operating mode to the PIC III. These values may be forced by the ICVC only.

Table 4 — ICVC Display Data (cont)

EXAMPLE 2 — MAINTSTAT DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **STATUS** (**MAINSTAT** will be highlighted).
3. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
Control Mode	NOTE 2	NOTE 2	MODE
Run Status	NOTE 3	NOTE 3	STATUS
Start Inhibit Timer	0-15	min	T_START
Occupied?	0/1	NO/YES	OCC
System Alert/Alarm	1-3	NOTE 4	SYS_ALM
***Chiller Start/Stop**	0/1	STOP/START	CHIL_S_S
***Remote Start Contact**	0/1	OPEN/CLOSE	REM_CON
Temperature Reset	–30-30	DEG F	T_RESET
***Control Point**	10-120	DEG F	LCW_STPT
Chilled Water Temp	–40-245	DEG F	CHW_TMP
***Active Demand Limit**	40-100	%	DEM_LIM
Percent Line Current	0-999	%	LNAMPS_P
Percent Line Kilowatts	0-999	%	LINEKW_P
Auto Demand Limit Input	4-20	mA	AUTO_DEM
Auto Chilled Water Reset	4-20	mA	AUTO_RES
Remote Reset Sensor	–40-245	DEG F	R_RESET
Total Compressor Starts	0-99999		c_starts
Starts in 12 Hours	0-8		STARTS
Compressor Ontime	0-500000.0	HOURS	c_hrs
***Service Ontime**	0-32767	HOURS	S_HRS
Ice Build Contact	0-1	OPEN/CLOSE	ICE_CON
Emergency Stop	0/1	ENABLE/EMSTOP	EMSTOP
Alarm Relay	0/1	NORMAL/ALARM	ALM

NOTES:

1. Numbers in parenthesis below, indicate the equivalent CCN index for BEST++ programming or BACnet Translator use.
2. Off (0), Local (1), CCN (2), Reset (3)
3. Timeout (0), Ready (1), Recycle (2), Startup (3), Running (4), Demand (5), Ramping (6), Tripout (7), Override (8), Tripout (9), Ctl Test (10), Lockout (11), Pumpdown (12), Prestart (13)
4. Normal (1), Alert (2), Alarm (3).
5. All variables with capital letter point names are available for

Table 4 — ICVC Display Data (cont)

EXAMPLE 3 — STARTUP DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **STATUS**.
3. Scroll down to highlight **STARTUP**.
4. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
Actual Guide Vane Pos	0-100	%	GV_ACT
****Chilled Water Pump**	0-1	OFF/ON	CHWP
Chilled Water Flow	0-1	NO/YES	CHW_FLOW
****Condenser Water Pump**	0-1	OFF/ON	CDP
Condenser Water Flow	0-1	NO/YES	CDW_FLOW
Oil Pump Relay	0-1	OFF/ON	OILPUMP
**** Oil Pump Delta P**	–6.7-200	PSI	OILPD
Oil Sump Temp	–40-245	DEG F	OILT
VFD Start	0/1	NO/YES	VFDSTART
Start Complete	0/1	FALSE/TRUE	START_OK
Stop Complete	0/1	FALSE/TRUE	STOP_OK
Target VFD Speed	0.0-100.0	%	VFD_OUT
Comp Motor RPM	0.0-300000.0	RPM	CPR_RPM
Comp Motor Frequency	0.0-10000.0	Hz	VFD_FREQ
****Tower Fan Relay Low**	0-1	OFF/ON	TFR_LOW
****Tower Fan Relay High**	0-1	OFF/ON	TFR_HIGH
Spare Safety Input	0-1	ALARM/ NORMAL	SAFETY
Shunt Trip Relay	0-1	OFF/ON	TRIPR
VFD Speed at Shutdown	0-100	%	VFD_SHUT
VFD Speed at Startup	0-100	%	VFD_STRT
GV Position at Shutdown	0-100	%	GV_SHUT
GV Target at Startup	0-100	%	GV_STRT
SRD Position at Shutdown	0-100	%	SRD_SHUT
SRD Position at Startup	0-100	%	SRD_STRT
ERT at Shutdown	–40-245	DEG F	ERT_SHUT
ERT at Startup	–40-245	DEG F	ERT_STRT
Capacity Recovery Active	0/1	NO/YES	CR_ACTIVE

NOTE: All variables with CAPITAL LETTER point names are available for CCN read operation. Those shown with (**) shall support write operations for the ICVC only.

EXAMPLE 4 — COMPRESS DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **STATUS**.
3. Scroll down to highlight **COMPRESS**.
4. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
Actual VFD Speed	0.0-100.0	%	VFD_ACT
Comp Motor RPM	NOTE 2	RPM	CPR_RPM
Comp Motor Frequency	NOTE 2	Hz	VFD_FREQ
****Target VFD Speed**	0.0-100.0	%	VFD_OUT
Actual Guide Vane Pos	0-100	%	GV_POS
Guide Vane Delta	0-100	%	GV_DELTA
****Target Guide Vane Pos**	0-100	%	GV_TRG
Oil Sump Temp	–40-245	DEG F	OILT
****Oil Pump Delta P**	–6.7-200	PSI	OILPD
Comp Discharge Temp	–40-245	DEG F	CMPD
Comp Thrust Lvg Oil Temp	–40-245	DEG F	MTRB_OIL
Comp Thrust Brg Reset	–40-245	DEG F	TB_RESET
Comp Thrust Brg Temp	–40-245	DEG F	MTRB
Comp Motor Winding Temp	–40-245	DEG F	MTRW
Spare Temperature 1	–40-245	DEG F	SPARE_T1
Spare Temperature 2	–40-245	DEG F	SPARE_T2
Oil Heater Relay	0/1	OFF/ON	OILHEAT
Diffuser Actuator	0-100	%	DIFF_ACT
SRD Rotating Stall	0-1	NO/YES	DIFFAULT
Surge Protection Counts	0-5		SPC
Active Delta Tsat	0-200	^F	CDW_DT
Surge Line Delta Tsat	0-200	^F	DELTA_TX
Surge Prevention Active?	0/1	NO/YES	SHG_ACT

NOTES:
1. All variables with CAPITAL LETTER point names are available for CCN read operation. Those shown with (**) shall support write operations for the ICVC only.
2. Limits not defined for status point.

Table 4 — ICVC Display Data (cont)

EXAMPLE 5 — HEAT_EX DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **STATUS**.
3. Scroll down to highlight **HEAT_EX**.
4. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
**Chilled Water Delta P	–6.7-420	PSI	CHWPD
Entering Chilled Water	–40-245	DEG F	ECW
Leaving Chilled Water	–40-245	DEG F	LCW
Chilled Water Delta T	–40-245	^ F	CHW_DT
Chill Water Pulldown/Min	–20-20	^ F	CHW_PULL
Calc Evap Sat Temp	–40-245	DEG F	ERT
**Evaporator Pressure	–6.7-420	PSI	ERP
Evap Refrig Liquid Temp	–40-245	DEG F	EST
Evaporator Approach	0-99	^ F	EVAP_APP
**Condenser Water Delta P	–6.7-420	PSI	CDWPD
Entering Condenser Water	–40-245	DEG F	ECDW
Leaving Condenser Water	–40-245	DEG F	LCDW
Condenser Refrig Temp	–40-245	DEG F	CRT
**Condenser Pressure	–6.7-420	PSI	CRP
Condenser Approach	0-99	^ F	COND_APP
VFD Coolant Flow	0.0-100.0	%	VFD_FOUT
Hot Gas Bypass Relay	0/1	OFF/ON	HGBYPASS
Surge Prevention Active?	0/1	NO/YES	SHG_ACT
Active Delta P	0-200	PSI	DP_A
Active Delta T	0-200	^ F	DT_A
Surge/HGBP Delta T	0-200	^ F	DT_C
Head Pressure Reference	0-100	%	HPR

NOTE: All variables with CAPITAL LETTER point names are available for CCN read operation. Those shown with (**) shall support write operations for the ICVC only.

Table 4 — ICVC Display Data (cont)

EXAMPLE 6 — POWER DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **STATUS**.
3. Scroll down to highlight **POWER**.
4. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
Percent Line Current	0.0-999.0	%	LNAMPS_P
Average Line Current	0.0-99999.0	AMPS	LNAMPS_A
Percent Line Voltage	0.0-999.0	%	LNVOLT_P
Average Line Voltage	0.0-99999.0	VOLTS	LNVOLT_A
Line Power Factor	0.00-2.00		LINE_PF
Line Kilowatts	0.0-99999.0	kW	LINE_KW
Percent Line Kilowatts	0.0-99999.0	%	LINEKW_P
Percent Load Current	0.0-99999.0	%	LDAMPS_P
Average Load Current	0.0-99999.0	AMPS	LDAMPS_A
Motor Power Factor	0.00-2.00		MOTOR_PF
Motor Kilowatts	0-99999	kW	MOTOR_KW
Percent Motor Kilowatts	0-99999	%	MOTORKWP
Motor Kilowatt Hours	0-99999	kWH	MOTORKWH
Demand Kilowatts	0-99999	kW	DEM_KW
Line Current Ph1(R)	0-99999	AMPS	LN_AMPS1
Line Current Ph2 (S)	0-99999	AMPS	LN_AMPS2
Line Current Ph3 (T)	0-99999	AMPS	LN_AMPS3
Load Current Ph1 (U)	0-99999	AMPS	LD_AMPS1
Load Current Ph2 (V)	0-99999	AMPS	LD_AMPS2
Load Current Ph3 (W)	0-99999	AMPS	LD_AMPS3
Line Voltage Ph1 (RS)	0-99999	VOLTS	LN_VOLT1
Line Voltage Ph2 (ST)	0-99999	VOLTS	LN_VOLT2
Line Voltage Ph3 (TR)	0-99999	VOLTS	LN_VOLT3
Ground Fault Current	0.0-999.0	AMPS	GF_AMPS
Line Frequency	0.0-99.0	Hz	LINEFREQ
Rectifier Overload	0.0-100.0	%	RECT_OV
Inverter Overload	0.0-100.0	%	INV_OV
Motor Overload	0.0-100.0	%	MOTOR_OV
Line Current Imbalance	0.0-100.0	%	LN_IMB_I
Motor Current Imbalance	0.0-100.0	%	MT_IMB_I
Line Voltage Imbalance	0.0-100.0	%	LN_IMB_V
Line Active Current	0-99999	AMPS	AMPS_ACT
Line Reactive Current	0-99999	AMPS	AMPS_RE
Line Active Voltage	0-99999	VOLTS	VOLT_ACT
Line Reactive Voltage	0-99999	VOLTS	VOLT_RE
DC Bus Voltage Reference	0-99999	VOLTS	BUS_REF
DC Bus Voltage	0-99999	VOLTS	BUS_VOLT
Flux Current	0-99999	AMPS	FLUXAMPS
Torque Current	0-99999	AMPS	TORQAMPS
Inverter Temperature	0.0-300.0	DEG F	INV_TEMP
Rectifier Temperature	0.0-300.0	DEG F	REC_TEMP
VFD Dewpoint	0.0-100.0	DEG F	VFDDEWPT
VFD Enclosure Temp	0.0-300.0	DEG F	VFD_ENCL
VFD Cold Plate Temp	0.0-300.0	DEG F	CP_TEMP
Humidity Sensor Input	0.0-5.0	VOLTS	HUMID_SR
Relative Humidity	0.0-100.0	%	HUMIDITY
VFD Coolant Flow	0.0-100.0	%	VFD_FOUT
Actual VFD Speed	0.0-100.0	%	VFD_ACT
Comp Motor RPM	NOTE 2	RPM	CPR_RPM
Comp Motor Frequency	NOTE 2	Hz	VFD_FREQ

NOTES:
1. All variables with CAPITAL LETTER point names are available for CCN read operation.
2. Limits not defined for status point.

Table 4 — ICVC Display Data (cont)

EXAMPLE 7 — VFD_STAT DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **STATUS**.
3. Scroll down to highlight **VFD_STAT**.
4. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
VFD Fault Code	0-223		VFD_FLT
Single Cycle Dropout	0/1	NORMAL/ALARM	CYCLE_1
Line Current Imbalance	0/1	NORMAL/ALARM	LINEIM_I
Line Voltage Imbalance	0/1	NORMAL/ALARM	LINEIM_V
Line Phase Reversal	0/1	NORMAL/ALARM	PH_REV
High Line Voltage	0/1	NORMAL/ALARM	HI_VOLT
Low Line Voltage	0/1	NORMAL/ALARM	LOW_VOLT
High DC Bus Voltage	0/1	NORMAL/ALARM	HI_DCBUS
Low DC Bus Voltage	0/1	NORMAL/ALARM	LO_DCBUS
Motor Current Imbalance	0/1	NORMAL/ALARM	MOTIM_I
Motor Overload	0/1	NORMAL/ALARM	MOTOR_OV
Rectifier Overcurrent	0/1	NORMAL/ALARM	RECT_OI
Rectifier Overtemp	0/1	NORMAL/ALARM	RECT_OT
Rectifier Power Fault	0/1	NORMAL/ALARM	RECT_PU
Inverter Overcurrent	0/1	NORMAL/ALARM	INV_OI
Inverter Overtemp	0/1	NORMAL/ALARM	INV_OT
Inverter Power Fault	0/1	NORMAL/ALARM	INV_PU
Ground Fault	0/1	NORMAL/ALARM	GRND_FLT
Frequency Fault	0/1	NORMAL/ALARM	FREQFLT
VFD Power On Reset	0/1	NORMAL/ALARM	VFD_POR
Start Complete	0/1	FALSE/TRUE	START_OK
Stop Complete	0/1	FALSE/TRUE	STOP_OK
Condenser High Pressure	0/1	NORMAL/ALARM	PRS_TRIP
Motor Amps Not Sensed	0/1	NORMAL/ALARM	NO_AMPS
Start Acceleration Fault	0/1	NORMAL/ALARM	ACCELFLT
Stop Fault	0/1	NORMAL/ALARM	AMPSTOP
VFD Start Inhibit	0/1	NORMAL/ALARM	STRT_INH
VFD Checksum Error	0/1	NORMAL/ALARM	CHECKSUM
VFD Comm Fault	0/1	NORMAL/ALARM	VFD_COMM
VFD Fault	0/1	NORMAL/ALARM	VFDFAULT
VFD Gateway Version #	0-255		VFG_VER
VFD Inverter Version #	0-1000		INV_VER
VFD Rectifier Version #	0-1000		REC_VER

NOTES:
1. All variables with CAPITAL LETTER point names are available for CCN Read operation only.
2. This table supports the service tool password disable access. It will only allow forcing with the service tool for a one-time bypass of both the Service menu and the VFD config data table. Exit from the Service menu reverts to normal password operation.

EXAMPLE 8 — ICVC_PWD DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **STATUS**.
3. Scroll down to highlight **ICVC_PWD**.
4. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
Disable Service Password	0-1	DSABLE/ENABLE	PSWD_DIS
****Remote Reset Option**	0-1	DSABLE/ENABLE	RESETOPT
Reset Alarm?	0-1	NO/YES	REMRESET
CCN Mode?	0-1	NO/YES	REM_CCN

**If the Remote Reset Option is set to a value of “1” at the ICVC, alarms may be reset and CCN mode may be reinstated remotely using Service Tool, Building Supervisor, or ComfortWORKS® controls.

NOTE: All variables with CAPITAL LETTER point names are available for CCN read operation. Those shown with (**) shall support write operations for the ICVC only.

To Disable Service Password, force that item to a value of “1” using Service Tool. Once this has been done, the Service menu and the VFD Config Data screens can be accessed without a password. This access is canceled the time the user exits the Service menu/screen.

EXAMPLE 9 — SETPOINT DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SETPOINT**.
3. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Base Demand Limit	40-100	%	DLM	100
Control Point				
LCW Setpoint	10-120	DEG F	lcw_sp	50.0
ECW Setpoint	15-120	DEG F	ecw_sp	60.0
Ice Build Setpoint	15-60	DEG F	ice_sp	40.0
Tower Fan High Setpoint	55-105	DEG F	TFH_SP	75

NOTE: All variables are available for CCN read operation; forcing shall not be supported on setpoint screens.

Table 4 — ICVC Display Data (cont)

EXAMPLE 10 — CAPACITY DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **CAPACITY**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
Entering Chilled Water	–40-245	DEG F	ECW
Leaving Chilled Water	–40-245	DEG F	LCW
Capacity Control			
Control Point	10-120	DEG F	ctrlpt
Control Point Error	–99-99	^F	cperr
ECW Delta T	–99-99	^F	ecwdt
ECW Reset	–99-99	^F	ecwres
LCW Reset	–99-99	^F	lcwres
Total Error + Resets	–99-99	^F	error
Guide Vane Delta	–2-2	%	gvd
Target Guide Vane Pos	0-100	%	GV_TRG
Actual Guide Vane Pos	0-100	%	GV_POS
Target VFD Speed	0-100	%	VFD_OUT
Actual VFD Speed	0-110	%	VFD_ACT
Comp Motor RPM	NOTE 2	RPM	CPR_RPM
Comp Motor Frequency	NOTE 2	Hz	VFD_FREQ
Demand Limit Inhibit	0.2-2.0	%	DEM_INH
Amps/kW Ramp	40-100	%	DMDLIM

NOTES:
1. All variables with CAPITAL LETTER point names are available for CCN read operation.
2. Limits not defined for status point.

EXAMPLE 11 — OVERRIDE DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **OVERRIDE**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
Comp Motor Winding Temp	–40-245	DEG F	MTRW
Comp Motor Temp Override	150-200	DEG F	MT_OVER
Condenser Pressure	0-420	PSI	CRP
Cond Press Override	90-180	PSI	CP_OVER
Evaporator Refrig Temp	–40-245	DEG F	ERT
Evap Ref Override Temp	2-45	DEG F	ERT_OVER
Comp Discharge Temp	–40-245	DEG F	CMPD
Comp Discharge Alert	125-200	DEG F	CD_ALERT
Comp Thrust Lvg Oil Temp	–40-245	DEG F	MTRD_OIL
Comp Thrust Brg Reset	–40-245	DEG F	TB_RESET
Comp Thrust Brg Temp	–40-245	DEG F	MTRB
Comp Thrust Brg Alert	165-185	DEG F	TB_ALERT
Comp Thrust Brg Trip	160-185	DEG F	TB_ALARM
Rectifier Temperature	0-300	DEG F	RECT_TEMP
Rectifier Temp Override	125.0-200.0	DEG F	REC_OVER
Inverter Temperature	0-300	DEG F	INV_TEMP
Inverter Temp Override	125-200	DEG F	INV_OVER
Actual Superheat	–20-99	^F	SUPRHEAT
Superheat Required	6-99	^F	SUPR_REQ
Condenser Refrig Temp	–40-245	DEG F	CRT

NOTE: All variables with CAPITAL LETTER point names are available for CCN read operation; forcing shall not be supported on maintenance screens.

Table 4 — ICVC Display Data (cont)

EXAMPLE 12 — SURGPREV DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **SURGPREV** .
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
Active Region	0-2		ACT_REG
Surge Prevention Active?	0/1	No/Yes	SHG_ACT
Actual Guide Vane Pos	0-100	%	GV_POS
Active Delta Tsat	0-150	^F	DTS_A
Surge Line Delta Tsat	0-150	^F	DTS_C
HGBP On Delta T	0.5-10.0	^F	HGBP_ON
HGBP Off Delta T	1.5-20.0	^F	HGBP_OFF
Guide Vane Delta	–2.0-2.0	%	GV_DELTA
Target Guide Vane Pos	0-100	%	GV_OUT
Target VFD Speed	0-100	%	VFD_TRG
Speed Change in Effect	0-5		SPD_CHG
VFD Speed Factor	0.000-1.000		VFD_SPD
Surge Counts	0-99		SC
Surge Protection Counts	0-4		SPC
Ramp Loading Active	0/1	No/Yes	RAMP_ACT
VFD Rampdown Active	0/1	No/Yes	VFD_RAMP
HGBP/VFD Active	0-2		HGBP_VFD
VFD Load Factor	0.00-1.20		VFD_RAT
Hot Gas Bypass Relay	0/1	Off/On	HGBYPASS
Surge Limit/HGBP Option	0-2		HGBP_OPT
Override Inhibit Active	0/1	No/Yes	VANE_INH
Override Decrease Active	0/1	No/Yes	VANE_DEC

NOTE: All variables with CAPITAL LETTER point names are available for CCN read operation; forcing shall not be supported on maintenance screens.

EXAMPLE 13 — LL_MAINT DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU** .
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **LL_MAINT.**
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
LeadLag Control			
LEADLAG: Configuration	NOTE 1		leadlag
Current Mode	NOTE 2		llmode
Load Balance Option	0/1	DSABLE/ENABLE	loadbal
LAG START Time	2-60	MIN	lagstart
LAG STOP Time	2-60	MIN	lagstop
Prestart Fault Time	2-30	MIN	preflt
PULLDOWN Time	0-30	MIN	pulltime
Pulldown: Delta T / Min	x.xx	^F	pull_dt
Satisfied?	0/1	NO/YES	pull_sat
LEAD CHILLER in Control	0/1	NO/YES	leadctrl
LAG CHILLER: Mode	NOTE 3		lagmode
Run Status	NOTE 4		lagstat
Start/Stop	NOTE 5		lag_s_s
Recovery Start Request	0/1	NO/YES	lag_rec
STANDBY CHILLER: Mode	NOTE 3		stdmode
Run Status	NOTE 4		stdstat
Start/Stop	NOTE 5		Std_s_s
Recovery Start Request	0/1	NO/YES	std_rec
Spare Temperature 1	–40-245	DEG F	SPARE_T1
Spare Temperature 2	–40-245	DEG F	SPARE_T2

NOTES:
1. DISABLE, LEAD, LAG, STANDBY, INVALID
2. DISABLE, LEAD, LAG, STANDBY, RECOVERY, CONFIG
3. Reset, Off, Local, CCN
4. Timeout, Ready, Recycle, Prestart, Startup, Ramping, Running, Demand, Override, Shutdown, Trippout, Pumpdown, Lockout, Ctl Test
5. Stop, Start, Retain
6. All variables with CAPITAL LETTER point names are available for CCN read operation; forcing shall not be supported on maintenance screens.

Table 4 — ICVC Display Data (cont)

EXAMPLE 14 — VFD_HIST DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **VFD_HIST**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
VFD FAULT HISTORY			
Values at Last Fault:			
Line Current Ph1(R)	0.0-99999.0	AMPS	LNAMPS1H
Line Current Ph2(S)	0.0-99999.0	AMPS	LNAMPS2H
Line Current Ph3(T)	0.0-99999.0	AMPS	LNAMPS3H
Load Current Ph1(U)	0.0-99999.0	AMPS	LDAMPS1H
Load Current Ph2(V)	0.0-99999.0	AMPS	LDAMPS2H
Load Current Ph3(W)	0.0-99999.0	AMPS	LDAMPS3H
Line Voltage Ph1(RS)	0.0-99999.0	VOLTS	LNVOLT1H
Line Voltage Ph2(ST)	0.0-99999.0	VOLTS	LNVOLT2H
Line Voltage Ph3(TR)	0.0-99999.0	VOLTS	LNVOLT3H
Ground Fault Current	0.0-999.0	AMPS	GF_AMPSH
Line Frequency	0.0-99.0	Hz	LINEFRQH
Line Power Factor	0.00-2.00		LINE_PFH
Line Current Imbalance	0.0-100.0	%	LN_IMBIH
Line Voltage Imbalance	0.0-100.0	%	LN_IMBVH
Motor Power Factor	0.00-2.00		MOTORPFH
Motor Current Imbalance	0.0-100.0	%	MT_IMBIH
Motor Overload	0.0-100.0	%	MOTOROVH
Line Active Current	0.0-99999.0	AMPS	AMPSACTH
Line Reactive Current	0.0-99999.0	AMPS	AMPS_REH
Line Active Voltage	0.0-99999.0	VOLTS	VOLTACTH
Line Reactive Voltage	0.0-99999.0	VOLTS	VOLT_REH
DC Bus Voltage	0.0-99999.0	VOLTS	BUSVOLTH
DC Bus Voltage Reference	0.0-99999.0	VOLTS	BUS_REFH
Flux Current	0.0-99999.0	AMPS	FLUXAMPH
Torque Current	0.0-99999.0	AMPS	TORQAMPH
Inverter Temperature	0.0-300.0	DEG F	INVTEMPH
Rectifier Temperature	0.0-300.0	DEG F	RECTEMPH
VFD Enclosure Temp	0.0-300.0	DEG F	VFDENCLH
VFD Cold Plate Temp	0.0-300.0	DEG F	CP_TEMPH
Actual VFD Speed	0.0-100.0	%	VFD_ACTH
Comp Motor RPM	NOTE 2	RPM	CPR_RPMH
Comp Motor Frequency	NOTE 2	Hz	VFDFREQH
Chiller Fault State	200-225		VFDSTATH
VFD Fault Code	200-225		VFD_FLTH

NOTES:
1. All variables with CAPITAL LETTER point names are available for CCN read operation; forcing shall not be supported on maintenance screens.
2. Limits not defined for status point.

EXAMPLE 15 — WSMDEFME DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **WSMDEFME**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT
WSM Active?	0/1	NO/YES	WSMSTAT
Chilled Water Temp	0.0-99.9	DEG F	CHWTEMP
Equipment Status	0/1	OFF/ON	CHWRST
Commanded State	XXXXXXXX	TEXT	CHWRENA
CHW setpt Reset Value	0.0-25.0	^F	CHWRVAL
Current CHW Set Point	0.0-99.9	DEG F	CHWSTPT

NOTE: All variables with CAPITAL LETTER point names are available for CCN read operation; forcing shall not be supported on maintenance screens.

Table 4 — ICVC Display Data (cont)

EXAMPLE 16 — NET_OPT DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT CONFIGURATION**.
4. Press **SELECT**.
5. Scroll down to highlight **NET_OPT**.
6. Press **SELECT**

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Loadshed Function				
Group Number	0-16		ldsgrp	0
Demand Limit Decrease	0-60	%	ldsdlta	20
Maximum Loadshed Time	0-480	MIN	maxshed	60
CCN Occupancy Config:				
Schedule Number	3-99		occ_num	3
Broadcast Option	0-1	DSABLE/ENABLE	occbrcst	DSABLE
Alarm Configuration				
Re-Alarm Time	0-1440	MIN	retime	30
Alarm Routing	xxxxxxxx		routing	10000000

NOTE: No variables are available for CCN read or write operation.

EXAMPLE 17 — VFD_CONF DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **VFD CONFIG DATA**.
4. Press **SELECT**.
5. Enter password (4444 Factory Default).
6. Scroll down to highlight **VFD_CONF**.
7. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Motor Nameplate Voltage	346-480	VOLTS	motor_nv	460
Compressor 100% Speed	45.0-62.0	Hz	comp_100	60.0
Line Freq=60 Hz? (No=50)	0/1	NO/YES	line_frq	YES
*** Rated Line Voltage**	346-600	VOLTS	vfd_volt	460
*** Rated Line Amps**	10-1500	AMPS	vfd_amps	200
*** Rated Line Kilowatts**	0-7200	kW	vfd_rlkw	100
*** Motor Rated Load KW**	0-7200	kW	mot_rlkw	100
*** Motor Rated Load Amps**	10-1500	AMPS	mot_rla	200
Motor Nameplate Amps	10-1500	AMPS	motorni	200
Motor Nameplate RPM	1500-3600		motorpm	3456
Motor Nameplate KW	0-5600	kW	motorkw	200
Inverter PWM Frequency (0=4 k Hz, 1=2 k Hz)	0/1		pwm_freq	1
Skip Frequency 1	0.0-102.0	Hz	skipfrq1	30
Skip Frequency 2	0.0-102.0	Hz	skipfrq2	30
Skip Frequency 3	0.0-102.0	Hz	skipfrq3	30
Skip Frequency Band	0.0-102.0	Hz	skipband	2
Line Voltage % Imbalance	1-10	%	v_unbal	10
Line Volt Imbalance Time	1-10	SEC	v_time	10
Line Current % Imbalance	5-40	%	lineim_i	40
Line Current Imbal Time	1-10	SEC	lineim_t	10
Motor Current % Imbalance	5-40	%	motim_i	40
Motor Current Imbal Time	1-10	SEC	motim_t	10
Increase Ramp Time	5-60	SEC	ramp_inc	30
Decrease Ramp Time	5-60	SEC	ramp_dec	30
Single Cycle Dropout	0/1	DSABLE/ENABLE	cycdrop	DSABLE

NOTE: Those parameters marked with a * shall not be downloaded to the VFD, but shall be used in other calculations and algorithms in the ICVC.

Table 4 — ICVC Display Data (cont)

EXAMPLE 18 — OPTIONS DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **OPTIONS**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Remote Contacts Option	0/1	DSABLE/ENABLE	MODES	DSABLE
Soft Stop Amps Threshold	40-100	%	STRTSTOP	100
Surge / Hot Gas Bypass				
Surge Limit/HGBP Option	0/1/2		srg_hgbp	0
Select: Surge=0, HGBP=1				
Low Load HGBP=2				
Minimum Load Point				
Surge/HGBP Delta Tsmin	0.0-150.0	^F	DTsatmin	45
Surge/HGBP IGVmin	0.0-110.0	%	GV_MIN	5.0
Full Load Point				
Surge/HGBP Delta Tsmax	0.0-150.0	^F	DTsatmax	70
Surge/HGBP IGVmax	0.0-110.0	%	GV_MAX	5.0
Surge Line Shape Factor	–1.000-0.000		shapefac	–0.040
Surge Line Speed Factor	0.00-3.00		VFD_POW	1.85
Surge Line High Offset	0.1-3.0		SP_HIGH	1.0
Surge/HGBP Deadband	0.5-3.0	^F	hbg_db	1
HGBP On Delta T	0.5-10.0	^F	hgb_ton	2.0
HGBP Off Delta T	0.5-10.0	^F	hgb_toff	4.0
Surge Protection				
Surge Delta% Amps	5-20	%	surge_a	10
Surge Time Period	7-10	MIN	surge_t	8
Ice Build Control				
Ice Build Option	0/1	DSABLE/ENABLE	ibopt	DSABLE
Ice Build Termination	0-2		ibterm	0
0=Temp, 1=Contact, 2=Both				
Ice Build Recycle	0/1	DSABLE/ENABLE	ibrecyc	DSABLE
Head Pressure Reference				
Delta P at 0% (4 mA)	20-85	PSI	HPDP0	20
Delta P at 100% (20 mA)	20-85	PSI	HPDP100	35
Minimum Output	0-100	%	HPDPMIN%	0

NOTE: No variables are available for CCN read or write operation.

Table 4 — ICVC Display Data (cont)

EXAMPLE 19 — SETUP1 DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **SETUP1**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Comp Motor Temp Override	150-200	DEG F	MT_OVER	200
Cond Press Override	90-165	PSI	CP_OVER	125
Rectifier Temp Override	155-170	DEG F	REC_OVER	160
Inverter Temp Override	155-170	DEG F	INV _OVER	160
Comp Discharge Alert	125-200	DEG F	CD_ALERT	200
Comp Thrust Brg Alert	165-185	DEG F	TB_ALERT	175
Comp Thrust Brg Trip	160-185	DEG F	TB_TRIP	185
Thrust Brg Reset Factor	1.0-3.0		TB_POWER	1.4
Chilled Medium	0/1	WATER/BRINE	MEDIUM	WATER
Chilled Water Deadband	0.5-2.0	^ F	CWDB	1.0
Evap Refrig Trippoint	0.0-40.0	DEG F	ERT_TRIP	33
Refrig Override Delta T	2.0-5.0	^ F	REF_OVER	3
Evap Approach Alert	0.5-30.0	^ F	EVAP_AL	5
Cond Approach Alert	0.5-16.7	^ F	COND_AL	6
Condenser Freeze Point	-20 - 35	DEG F	CDFREEZE	34
Flow Delta P Display	0-1	DSABLE/ENABLE	FLOWDISP	DSABLE
Evap Flow Delta P Cutout	0.5 - 50.0	PSI	EVAP_CUT	5.0
Cond Flow Delta P Cutout	0.5 - 50.0	PSI	COND_CUT	5.0
Cond Hi Flow Alarm Opt	0/1	DSABLE/ENABLE	COND_ALM	DSABLE
Cond Hi Flow Del P Limit	0.5 - 50.0	PSI	COND_VAL	50.0
Water Flow Verify Time	0.5-5	MIN	WFLOW_T	5
Oil Press Verify Time	15-300	SEC	OILPR_T	40
Recycle Control				
Restart Delta T	2.0-10.0	DEG F	rcycr_dt	5
Shutdown Delta T	0.5-4.0	DEG F	rcycs_dt	1
Spare Alert/Alarm Enable Disable=0, Lo=1/3,Hi=2/4				
Spare Temp #1 Enable	0-4		sp1_en	0
Spare Temp #1 Limit	-40-245	DEG F	sp1_lim	245
Spare Temp #2 Enable	0-4		sp2_en	0
Spare Temp #2 Limit	-40-245	DEG F	sp2_lim	245

NOTE: No variables are available for CCN read operation; forcing shall not be supported on service screens.

Table 4 — ICVC Display Data (cont)

EXAMPLE 20 — SETUP2 DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **SETUP2**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Capacity Control				
Proportional Inc Band	2-10		gv_inc	6.5
Proportional DEC Band	2-10		gv_dec	6.0
Proportional ECW Gain	1-3		gw_ecw	2
Guide Vane Travel Limit	30-100	%	gv_ctrl	80
Diffuser Control				
Diffuser Option	0/1	DSABLE/ENABLE	diff_opt	DSABLE
Guide Vane 25% Load Pt	0-78	%	gv_25	25
Diffuser 25% Load Point	0-100	%	df_25	0
Guide Vane 50% Load Pt	0-78	%	gv_50	50
Diffuser 50% Load Point	0-100	%	df_50	0
Guide Vane 75% Load Pt	0-78	%	gv_75	75
Diffuser 75% Load Point	0-100	%	df_75	0
Diffuser Full Span mA	15-22	mA	diff_ma	18
VFD Speed Control				
VFD Gain	0.10-1.50		vfd_gain	0.75
VFD Increase Step	1-5	%	vfd_step	2
VFD Minimum Speed	65-100	%	vfd_min	70
VFD Maximum Speed	90-100	%	vfd_max	100
VFD Start Speed	65-100	%	vfd_strt	100
VFD Surge Line Gain	2.0-3.5	%	vfd_slg	2.0
VFD Encl Temp Correction	-40.0-20.0	%	vfd_corr	0.0
VFD Alarm Reset	0/1	DSABLE/ENABLE	VFD_RST	ENABLE

NOTE: No variables are available for CCN read or write operation; forcing shall not be supported on service screens.

EXAMPLE 21 — SETUP3 DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **SETUP3**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Auto Restart Option	0/1	DSABLE/ENABLE	ASTART	DSABLE
Cap Recovery Timeout	0.0-0.5	Hours	CR_TIME	0.1
Gas Torque Factor	1.0-3.0		GT_FACT	1.2
Guide Vane/SRD Factor	0.70-1.00		GV_FACT	0.95

NOTE: No variables are available for CCN read or write operation; forcing shall not be supported on service screens.

Table 4 — ICVC Display Data (cont)

EXAMPLE 22 — LEADLAG DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **LEADLAG**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Lead Lag Control				
LEAD/LAG: Configuration	0-3		leadlag	0
DSABLE=0, Lead=1				
LAG=2, STANDBY=3				
Load Balance Option	0/1	DSABLE/ENABLE	loadbal	DSABLE
Common Sensor Option	0/1	DSABLE/ENABLE	commsens	DSABLE
LAG % Capacity	25-75	%	lag_per	50
LAG Address	1-236		lag_add	92
LAG START Timer	2-60	MIN	lagstart	10
LAG STOP Timer	2-60	MIN	lagstop	10
PRESTART FAULT Timer	2-30	MIN	preflt	5
PULLDOWN Timer	1-30	MIN	pulldown	2
STANDBY Chiller Option	0/1	DSABLE/ENABLE	stndopt	DSABLE
STANDBY % Capacity	25-75	%	stnd_per	50
STANDBY Address	1-236		stnd_add	93

NOTE: No variables are available for CCN read or write operation.

EXAMPLE 23 — RAMP_DEM DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **RAMP_DEM**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Pulldown Ramp Type:	0/1		ramps1ct	1
Select: Temp=0, Load=1				
Demand Limit and kW Ramp				
Demand Limit Source	0/1		dem_src	0
Select: Amps=0, kW=1				
Amps or Kw Ramp%/Min	5-20		kw_ramp	10
Demand Limit Prop Band	3-15	%	dem_app	10
Demand Limit At 20 mA	40-100	%	dem_20ma	40
20 mA Demand Limit Opt	0/1	DSABLE/ENABLE	dem_sel	DSABLE
VFD Overload Decrease	25-50	%	vfd_dec	30
VFD Overload Delta	3-15	%	vfd_delt	5
Demand Watts Interval	5-60	MIN	dw_int	15

NOTE: No variables are available for CCN read or write operation.

EXAMPLE 24 — TEMP_CTL DISPLAY SCREEN

To access this display from the **ICVC default** screen:

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **TEMP_CTL**.
6. Press **SELECT**.

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT
Control Point				
ECW Control Option	0/1	DSABLE/ENABLE	ecw_opt	DSABLE
Temp Pulldown Deg/Min	2-10	^F	tmp_ramp	3
Temperature Reset				
RESET TYPE 1				
Degrees Reset At 20 mA	–30- 30	^F	deg_20ma	10
RESET TYPE 2				
Remote Temp —> No Reset	–40-245	DEG F	res_rt1	85
Remote Temp —> Full Reset	–40-245	DEG F	res_rt2	65
Degrees Reset	–30-30	^F	deg_rt	10
RESET TYPE 3				
CHW Delta T —> No Reset	0-15	^F	restd_1	10
CHW Delta T —> Full Reset	0-15	^F	restd_2	0
Degrees Reset	–30-30	^F	deg_chw	5
Enable Reset Type	0-3		res_sel	0

PIC III System Functions

IMPORTANT: Words not part of paragraph headings and printed in all capital letters can be viewed on the ICVC (e.g., LOCAL, CCN, RUNNING, ALARM, etc.). Words printed *both* in all capital letters and italics can also be viewed on the ICVC and are parameters (*CONTROL MODE, TARGET GUIDE VANE POS*, etc.) with associated values (e.g., modes, temperatures, pressures, percentages, on, off, enable, disable, etc.). Words printed in all capital letters and in a box represent softkeys on the ICVC (e.g., ENTER and EXIT). See Table 4 for examples of the type of information that can appear on the ICVC screens. Figures 18-24 give an overview of ICVC operations and menus.

CAPACITY CONTROL — Generally the chiller adjusts capacity in response to deviation of leaving or entering chilled water temperature from *CONTROL POINT*. *CONTROL POINT* is based on the configured SETPOINT (in the SETPOINT screen: *LCW SETPOINT* or *ECW SETPOINT* or *ICE BUILD SETPOINT*), and *CONTROL POINT* is equal to this SETPOINT plus any active chilled water reset value. A reset value may originate from any of the three chilled water/brine reset options configured in the ICVC Service/Equipment Service/TEMP_CTL screen (see page 53) or from a CCN device. The default reset value is 0° F. *CONTROL POINT* may be viewed or manually overridden from the MAINSTAT screen.

Minor adjustments to the rate of capacity adjustment can be made by changing *PROPORTIONAL INC* (Increase) *BAND*, *PROPORTIONAL DEC* (Decrease) *BAND*, and *PROPORTIONAL ECW* (Entering Chilled Water) *GAIN* in the Service/Equipment Service/SETUP2 screen. Increasing the *PROPORTIONAL INC BAND* or *PROPORTIONAL DEC BAND*, or decreasing *PROPORTIONAL ECW GAIN* will reduce the amplitude of the capacity control response (within limits). See also Proportional Bands on page 45.

Factors and variables used in the capacity control determination are displayed in the Service/Control Algorithm Status/Capacity screen and in the Status/COMPR screen. Viewing this data will aid in troubleshooting and understanding current operation.

Variable Speed (VFD) Application — The PIC III controls the machine capacity by modulating both motor speed and inlet guide vanes in response to chilled water temperature deviation from the *CONTROL POINT* (see above). During operation, when the *CONTROL POINT* is not met within 1/3 of the width of the *CHILLED WATER DEADBAND*, the controller will calculate a *GUIDE VANE DELTA* which will effect a percentage change to either the guide vane position or *TARGET VFD SPEED*. Factors considered in the capacity control algorithm include: (1) the sign and magnitude of *GUIDE VANE DELTA* (based on deviation from *CONTROL POINT* adjusted for the error trends and *CHILLED WATER DEADBAND*), (2) *ACTUAL GUIDE VANE POS* (Position), (3) *ACTUAL VFD SPEED*, and (4) surge prevention mode. Generally the controller will maintain the highest inlet guide vane setting at the lowest speed to maximize efficiency while avoiding surge.

First, the calculation of *GUIDE VANE DELTA* is performed. If *GUIDE VANE DELTA* is positive, the response will be an IGV or VFD position increase (within limits). If *GUIDE VANE DELTA* is negative, the response will be an IGV or VFD position decrease (within limits). Next, the surge prevention mode is determined based on location of the present operating point on the *CHILLED WATER DELTA T*/*ACTIVE DELTA P* map relative the configured surge prevention line. This mode will either be Normal or Surge Prevention. The following table indicates which output is modulated first. When the first output reaches its limit (ACTUAL GUIDE VANE position reaches maximum), the second output is modulated. See Table 5.

Table 5 — Guide Vane Delta Modes

GUIDE VANE DELTA	NORMAL CONTROL MODE		SURGE PREVENTION MODE	
	IGV	VFD	IGV	VFD
From +0.2 to +2.0	Increase 1st	Increase when IGV = max	Increase only if VFD speed = max and if hot gas bypass is present and open	Increase 1st
From –0.2 to –2.0	Decrease when VFD speed = min	Decrease 1st	Decrease	—

Normal Control mode occurs when *ACTIVE DELTA T* > *SURGE/HGBP DELTA T*.

Surge Prevention Mode occurs when *ACTIVE DELTA T* ≤ *SURGE/HGBP DELTA T*.

The VFD GAIN parameter allows for additional adjustment of the VFD response. Increasing VFD GAIN will increase the rate of speed change.

Generally for the case of line voltage equaling motor voltage (460 volts), VFD output (motor) current is a few percent higher than line current at full speed (60 Hz). As drive speeds decrease from maximum, drive output voltage decreases linearly with output frequency, and motor current continues to increase relative to line current.

The *TARGET VFD SPEED, ACTUAL VFD SPEED* and the *VFD GAIN* can be viewed and modified in the CAPACITY display screen. The *TARGET VFD SPEED* can be manually overridden by the operator from the COMPRESS screen. The *VFD MINIMUM SPEED, VFD MAXIMUM SPEED, VFD GAIN* and *VFD INCREASE STEP* can be selected and modified in the SETUP2 display screen. *TARGET* and *ACTUAL VFD SPEED* can be viewed in the COMPRESS screen.

ECW CONTROL OPTION — If this option is enabled, the PIC III uses the *ENTERING CHILLED WATER* temperature to modulate the vanes instead of the *LEAVING CHILLED WATER* temperature. The *ECW CONTROL OPTION* may be viewed on the TEMP_CTL screen, which is accessed from the EQUIPMENT SERVICE screen.

CONTROL POINT DEADBAND — This is the tolerance range on the chilled water/brine temperature control point. If the water temperature goes outside the *CHILLED WATER DEADBAND*, the PIC III opens or closes the guide vanes until the temperature is within tolerance. The PIC III may be configured with a 0.5 to 2 F (0.3 to 1.1 C) deadband. *CHILLED WATER DEADBAND* may be viewed or modified on the SETUP1 screen, which is accessed from the EQUIPMENT SERVICE table.

For example, a 1° F (0.6° C) deadband setting controls the water temperature within ±0.5° F (0.3° C) of the control point. This may cause frequent guide vane movement if the chilled water load fluctuates frequently. A value of 1° F (0.6° C) is the default setting.

A deadband is a span of measurement in which a controller takes no action. In the PIC controls it is a temperature range centered on the *CONTROL POINT*. If the *LEAVING CHILLED WATER TEMP* falls within the *CHILLED WATER DEADBAND*, the guide vanes will not move.

The purpose of the deadband is to prevent slight fluctuations in *ENTERING CHILLED WATER TEMPERATURE* from keeping the guide vanes in constant movement.

Adjusting The Deadband — The default setting of the *CHILLED WATER DEADBAND*, is 1° F, which is 0.5° F above

and below the *CONTROL POINT*. The *CONTROL POINT* setting range is 0.5 to 2° F. If temperature control is satisfactory and the guide vanes are stable, do not change the setting.

When very close temperature control is required, as for some process applications, the deadband may be reduced.

When constant small load changes occur in a system and the vanes will not stabilize, increase the size of the deadband. The deadband must always be smaller than the allowable drift in leaving water temperature.

PROPORTIONAL BANDS — The proportional bands control how far the guide vanes will move in response to a specific change in leaving water temperature. Increasing the proportional band increases the amount that the water temperature must move away from the control point in order to move the guide vanes a specific amount. Decreasing the proportional band allows the vanes to move the same amount with a smaller change in water temperature.

If the proportional band is too large, the leaving water temperature will increase or decrease slowly enough that the temperature moves away from the control point by an unacceptable amount. A proportional band set too low will cause the leaving temperature to overshoot the control point and cause the guide vanes to "hunt."

The PIC controls have separate proportional bands for increasing and decreasing capacity. The *PROPORTIONAL INCREASE BAND* should be set as described above. The *PROPORTIONAL DECREASE BAND* should be set at a typically smaller value than the increasing band so that the guide vanes can close quickly enough on a sudden drop in load to prevent a low temperature safety trip.

Proportional Entering Chilled Water Gain — When Entering Chilled Water Control is enabled the controls are resetting the Leaving Chilled Water (LCW) control point every 10 seconds in order to keep the *ENTERING CHILLED WATER TEMP* at the *ENTERING CHILLED WATER (ECW) SETPOINT*.

The *ECW GAIN* affects the size of the *LCW CONTROL POINT* change in proportion to the difference between the *ECW SETPOINT* and ECW TEMPERATURE.

NOTE: Before enabling *the ENTERING CHILLED WATER CONTROL* and before tuning the *ECW GAIN*, the *LCW PROPORTIONAL BANDS* and *LCW DEADBAND* should be adjusted satisfactorily.

Increase the *ECW GAIN* if the *ENT CHILLED WATER TEMP* drifts away from the *ECW SETPOINT*. Reduce the *ECW GAIN* if the *ENT CHILLED WATER TEMP* swings above and below the *ECW SETPOINT*. Because the water must travel around the entire loop before the controls receive feedback on the effect of the *LCW CONTROL POINT*, the chilled water loop should be given the opportunity to stabilize before the gain is adjusted. The following example shows how the Entering Chilled Water Control works to move the vanes based on the rate of change of the *ENT CHILLED WATER TEMP* as well as the by the difference between *ENT CHILLED WATER TEMP* and *ECW SETPOINT*.

Effect of Proportional Entering Chilled Water Band (ECW Gain) (See Fig. 25)

Error = the contribution of the ECW control to the total error that inputs to the guide vane control. Positive error drives the vanes open. Negative error drives the vanes closed.

ECW set point = 47 F

ECW = Entering Chilled Water

ECW-10 = Entering Chilled Water 10 seconds previous

Example 1 — The first section of Fig. 25 shows the entering water dropping with a constant rate. The ECW algorithm is reducing its effort to open the guide vanes. After the entering water temperature drops below the set point the error drops below zero and thus is trying to close the vanes.

Example 2 — The second section shows the water temperature dropping but at a decreasing rate as shown by the reduction in the difference between ECW and ECW-10. The error value is leveling at zero but takes a dip because the entering water temperature drops below the set point.

Example 3 — The third section of Fig. 25 shows the entering chilled water temperature increasing. Again the error starts to level off or drop as the temperature change over 10 seconds becomes smaller.

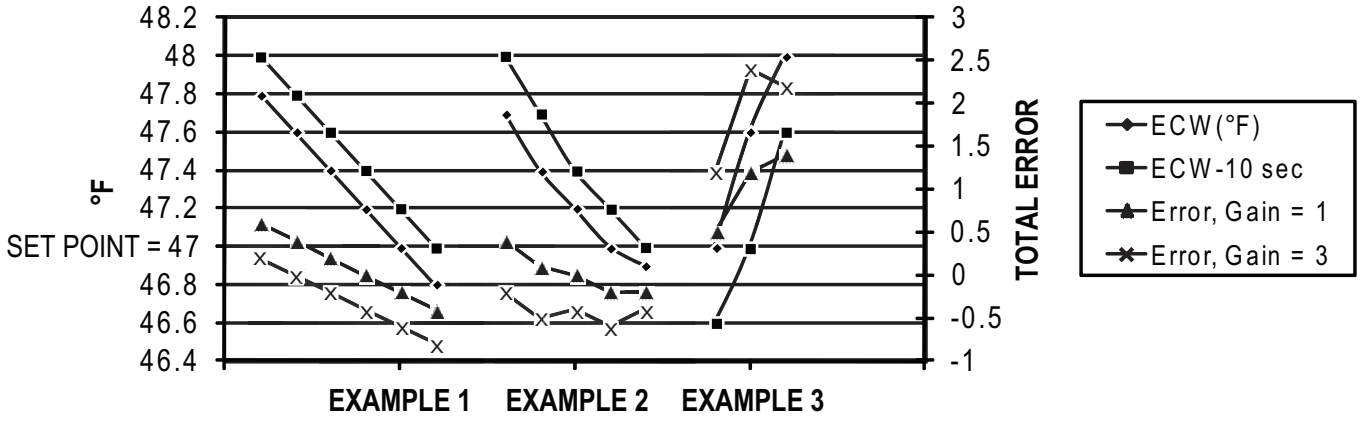


Fig. 25 — Transient Example of ECW Gain

DIFFUSER CONTROL — On all units with Frame 5 compressors and those Frame 4 compressors with the variable (split ring) diffuser option, the PIC III adjusts the diffuser actuator position (*DIFFUSER ACTUATOR* on the COMPRESS screen) based on the *ACTUAL GUIDE VANE POS*. This is done in accordance with a compressor build-specific "schedule" entered in the SETUP2 screen. The schedule consists of guide vane and diffuser positions for three points (designated as the 25%, 50%, and 75% Load Points). In order for the schedule to be valid, the guide vane values must be ascending and the diffuser values must be descending for the three points. Diffuser actuator output is controlled by a 4 to 20 mA output from CCM terminals J8-3(+) and J8-4(–). Figure 26 shows the relationship between diffuser-related parameters for a typical build.

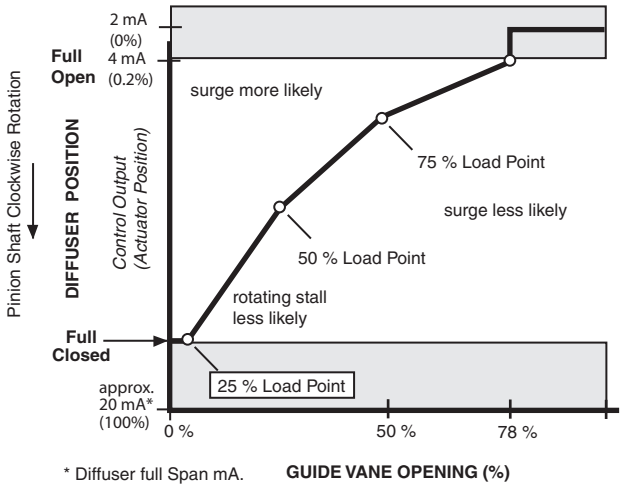


Fig. 26 — Diffuser Control

Diffuser control output is enabled whenever the *DIFFUSER OPTION* is enabled, whether the machine is running or not. As shown in Fig. 26, 0% output corresponds to a full open diffuser. The minimum closed position (25% Load Point value) will be at less than 100% for most diffusers (depending upon the model). This coordinated guide vane-diffuser operation may be tested in the Control Test selection "IGV & SRD Actuator." Note that the diffuser actuator should NOT be forced to a greater percent than the configured 25% Load Point (maximum) value. The diffuser opening can be incremented from fully open to completely closed. A 0% setting is fully open; a 100% setting is completely closed. To obtain the proper settings for Diffuser Control, contact a Carrier Engineering representative.

DEMAND LIMITING — The PIC III controls provide a feature for limiting *AVERAGE LINE CURRENT* or *LINE KILOWATTS* (demand) by limiting capacity via guide vane control. The limit applied is called *ACTIVE DEMAND LIMIT*, which is equal to a *BASE DEMAND LIMIT* value (set in the SETPOINTS Screen, page 29, default value 100%), or that determined by *AUTO DEMAND LIMIT INPUT* (an optional 4 to 20 mA input, described below). *ACTIVE DEMAND LIMIT* may also be forced to be different from *BASE DEMAND LIMIT* by manually overriding the value (forcing) from the MAINSTAT screen or writing a value via a CCN network device, or controlled by another chiller in Lead Lag operation (see page 56).

The demand limit may be based on either line current or kW, as indicated by *DEMAND LIMIT SOURCE* in the EQUIPMENT SERVICE/RAMP_DEM table. The default is 0, for demand limiting based on *AVERAGE LINE CURRENT* (percent of RATED LINE AMPS, as displayed on the default screen). Setting *DEMAND LIMIT SOURCE* to 1 makes demand limiting based on *PERCENT LINE KILOWATTS* (displayed in the MAINSTAT screen). *LINE KILOWATTS i*s measured by the VFD, and the *MOTOR RATED LOAD kW* value (100% rated kW) is set in the VFD_CONF table.

If the *DEMAND LIMIT SOURCE* (percent line current) exceeds the *ACTIVE DEMAND LIMIT* by 5% or less, increases in guide vane opening will be prevented. If the *DEMAND LIMIT SOURCE* (percent line current) exceeds the *ACTIVE DEMAND LIMIT* by more than 5%, the guide vanes will be forced to close. Also, as the *DEMAND LIMIT SOURCE* approaches the *ACTIVE DEMAND LIMIT* from a lower value, allowable capacity increases become increasingly more limited, beginning when the D*EMAND LIMIT SOURCE i*s within the *DEMAND LIMIT PROP BAND* (configurable in the RAMP_DEM table).

Demand Limit Control Option — The demand limit control option (*20 mA DEMAND LIMIT OPT*) is externally controlled by a 4 to 20 mA signal from an energy management system (EMS). The option is set up on the RAMP_DEM screen. When enabled, 4 mA will set *ACTIVE DEMAND LIMIT* to 100% of the *DEMAND LIMIT SOURCE* (regardless of the value of *BASE DEMAND LIMIT*), and 20 mA will set *ACTIVE DEMAND LIMIT* to the value configured as *20 mA DEMAND LIMIT OPT* in the RAMP_DEM table.

Wire the auto demand limit input to terminals J5-1 (–) and J5-2 (+) on the CCM. In order to use a 1 to 5 vdc input instead of 4 to 20 mA, install a 25-ohm resistor in series with the + lead at terminal J5-2. See Fig. 27.

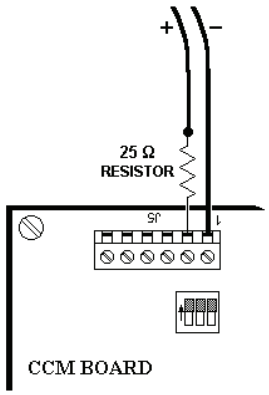


Fig. 27 — Auto Demand Limit Wiring (1 to 5 vdc)

A *DEMAND KILOWATTS* monitoring feature is also available. This feature provides a display of average demand (power) in kilowatts (in the POWER screen). This value is continuously updated and averaged over the preceding time interval specified as *DEMAND WATTS INTERVAL* in the SERVICE/EQUIPMENT SERVICE/RAMP_DEM screen.

CHILLER TIMERS AND STARTS COUNTER — The PIC III maintains two run time clocks: *COMPRESSOR ONTIME* and *SERVICE ONTIME*. *COMPRESSOR ONTIME* indicates the total lifetime compressor run hours. *SERVICE ONTIME* is a resettable timer that can be used to indicate the hours since the last service visit or any other event. A separate counter tallies compressor starts as *TOTAL COMPRESSOR STARTS*. All of these can be viewed on the MAINSTAT screen on the ICVC. Both ontime counters roll over to 0 at 500,000 hours. Manual changes to *SERVICE ONTIME* from the ICVC are permitted at any time. If the controller is replaced, one opportunity, before the first start-up with the new controller, is provided to set *COMPRESSOR ONTIME* and T*OTAL COMPRESSOR STARTS* to the last readings retained with the prior controller. The *SERVICE ONTIME* timer can register up to 32,767 hours before it rolls over to zero.

The chiller also maintains a start-to-start timer and a stop-to-start timer. These timers limit how soon the chiller

can be started. *START INHIBIT TIMER* is displayed on the MAINSTAT screen. See the Start-Up/Shutdown/Recycle Sequence section, page 64, for more information on this topic.

OCCUPANCY SCHEDULE — The chiller schedule, described in the Time Schedule Operation section (page 28), determines when the chiller can run. Each schedule consists of from 1 to 8 occupied or unoccupied time periods, set by the operator. The chiller can be started and run during an occupied time period (when *OCCUPIED?* is set to YES on the MAINSTAT display screen). It cannot be started or run during an unoccupied time period (when *OCCUPIED?* is set to NO on the MAINSTAT display screen). These time periods can be set for each day of the week and for holidays. The day begins with 0000 hours and ends with 2400 hours. The default setting for *OCCUPIED?* is YES, unless an unoccupied time period is in effect.

These schedules can be set up to follow a building's occupancy schedule, or the chiller can be set so to run 100% of the time, if the operator wishes. The schedules also can be bypassed by forcing the *CHILLER START/STOP* parameter on the MAINSTAT screen to START. For more information on forced starts, see Local Start-Up, page 61.

The schedules also can be overridden to keep the chiller in an occupied state for up to 4 hours, on a one time basis. See the Time Schedule Operation section, page 28.

Figure 23 shows a schedule for a typical office building with a 3-hour, off-peak, cool-down period from midnight to 3 a.m., following a weekend shutdown. Holiday periods are in an unoccupied state 24 hours per day. The building operates Monday through Friday, 7:00 a.m. to 6:00 p.m., and Saturdays from 6:00 a.m. to 1:00 p.m. This schedule also includes the Monday midnight to 3:00 a.m. weekend cool-down schedule.

NOTE: This schedule is for illustration only and is not intended to be a recommended schedule for chiller operation.

Whenever the chiller is in the LOCAL mode, it uses Occupancy Schedule 01 (OCCPC01S). When the chiller is in the ICE BUILD mode, it uses Occupancy Schedule 02 (OCCPC02S). When the chiller is in CCN mode, it uses Occupancy Schedule 03 (OCCPC03S).

The CCN SCHEDULE NUMBER is configured on the NET_OPT display screen, accessed from the EQUIPMENT CONFIGURATION table. See Table 4, Example 16. *SCHEDULE NUMBER* can be changed to any value from 03 to 99. If this number is changed on the NET_OPT screen, the operator must go to the ATTACH TO NETWORK DEVICE screen to upload new number into the SCHEDULE screen. See Fig. 21.

Safety Controls — The PIC III monitors all safety control inputs and, if required, shuts down the chiller or limits the guide vanes to protect the chiller from possible damage from any of the following conditions:

- high bearing temperature
- high motor winding temperature
- high discharge temperature
- low discharge superheat*
- low oil pressure
- low cooler refrigerant temperature/pressure
- condenser high pressure or low pressure
- inadequate water/brine cooler and condenser flow
- high, low, or loss of voltage
- ground fault
- voltage imbalance
- current imbalance
- excessive motor acceleration time
- lack of motor current signal
- excessive motor amps
- excessive compressor surge
- temperature and transducer faults
- VFD power faults
- VFD over temperature
- dew formation on the VFD cold plate

*Superheat is the difference between saturation temperature and sensible temperature. The high discharge temperature safety measures only sensible temperature.

VFD faults or optional protective devices within the VFD can shut down the chiller.

⚠ CAUTION

If compressor motor overload or a motor ground fault occurs, check the motor for grounded or open phases before attempting a restart.

If the PIC III control initiates a safety shutdown, it displays the reason for the shutdown (the fault) on the ICVC display screen along with a primary and secondary message, and blinks the alarm light on the control panel. The alarm is stored in memory and can be viewed on the ALARM HISTORY and VFD_HIST screens on the ICVC, along with a message for troubleshooting. If the safety shutdown was also initiated by a fault detected in the VFD, the conditions at the time of the fault will be stored in VFD_HIST.

To give more precise information or warnings on the chiller's operating condition, the operator can define alert limits on various monitored inputs in the SETUP1 screen. A partial list of protective safety and alert limits is provided in Table 6. A complete list of alarm and alert messages is provided in the Troubleshooting Guide section, page 93.

Shunt Trip (Option) — A main circuit breaker shunt trip may be provided on a VFD. Other VFDs are equipped with a "gate-kill" feature which disables the VFD output transistors providing the same emergency shutdown function as a circuit breaker shunt trip. Shunt trips can be imitated from either ICVC or the VFD.

When a shunt trip is provided, it is wired from a discreet output in the VFD which is activated by the ICVC or by logic in the VFD. The following conditions will initiate a shunt trip or Gate Kill:

- Motor locked rotor amps limit exceeded.
- VFD locked rotor amps rating exceeded.
- Ground fault or phase-to-phase current fault limit exceeded on the load side of the drive. The LiquiFlo™ 2 drive also has these safeties on the line side.
- Significant motor current detected more than 20 seconds after a shutdown or otherwise when the chiller is off.

Other drive-specific conditions or features may energize the shunt trip. The shunt trip feature can be tested using the Control Test feature.

Default Screen Freeze — When the chiller is in an alarm state, the default ICVC display "freezes," that is, it stops updating. The first line of the ICVC default screen displays a primary alarm message; the second line displays a secondary alarm message.

The ICVC default screen freezes to enable the operator to see the conditions of the chiller *at the time of the alarm*. If the value in alarm is one normally displayed on the default screen, it flashes between normal and reverse contrast. The ICVC default screen remains frozen until the condition that caused the alarm is remedied by the operator. Use ICVC display and alarm shutdown state record sheet (see CL-12) to record all values from default screen freeze.

Knowledge of the operating state of the chiller at the time an alarm occurs is useful when troubleshooting. Additional chiller information can be viewed on the status screens and the VFD_HIST screen. Troubleshooting information is recorded in the ALARM HISTORY table, which can be accessed from the SERVICE menu.

Table 6 — Protective Safety Limits and Control Settings

MONITORED PARAMETER	ALARM/ ALERT	LIMIT	COMMENTS
Temperature Sensors Out of Range	260-271, 140,141	.06 > Voltage Ratio > .98 or – 40 F > Temperature>245 F for 3 seconds	Preset Alarm, Voltage Ratio=Input Voltage/ Voltage Reference(5 Volts)
Pressure Transducers Out of Range	260-271	.06 > Voltage Ratio > .98 for 3 seconds	Preset Alarm, Voltage Ratio=Input Voltage/ Voltage Reference(5 Volts)
High Compressor Discharge Temperature	231	COMP DISCHARGE TEMP > 220 F (104.4 C)	Preset Alarm, Configure COMP DISCHARGE ALERT in SETUP1 screen
	167	COMP DISCHARGE TEMP > COMP DISCHARGE ALERT	Configure COMP DISCHARGE ALERT in SETUP1 screen
	103	COMP DISCHARGE TEMP > COMP DISCHARGE ALERT – 10 F (5.6 C)	Prestart Alert, Configure COMP DISCHARGE ALERT in SETUP1 screen
High Motor Temperature	233	COMP MOTOR WINDING TEMP > 220 F (104 C)	Preset Alarm, Configure COMP MOTOR TEMP OVERRIDE in SETUP1 screen
	102	COMP MOTOR WINDING TEMP > COMP MOTOR TEMP OVERRIDE – 10 F (5.6 C)	Prestart Alert, Configure COMP MOTOR TEMP OVERRIDE in SETUP1 screen
Compressor Thrust Bearing Temperature	101	COMP THRUST BRG TEMP > COMP THRUST BRG ALERT – 10 F (5.6 C)	Preset Alert, Configure COMP THRUST BRG ALERT in SETUP1 screen
	234	COMP THRUST BRG TEMP > COMP THRUST BRG TRIP	Preset Alarm
Low Evaporator Temperature (Freeze Protection)	243	Chiller in RECYCLE SHUTDOWN and EVAP TEMP< EVAP REFRIG TRIPPOINT + 1 F	Preset Alarm, configure EVAP REFRIG TRIPPOINT in SETUP1 screen
	232	EVAP REFRIG TEMP < 33 F (water) and EVAP APPROACH > EVAP APPROACH ALERT	Preset Alarm, Configure EVAP APPROACH ALERT in SETUP1 screen
		0° F (–17.8 C) < EVAP REFRIG TEMP < 40 F (4.4 C) (brine) and EVAP APPROACH > EVAP APPROACH ALERT	Configure EVAP REFRIG TRIP POINT and CHILLED MEDIUM in SETUP1 screen
	104	EVAPORATOR REFRIG TEMP < 33 F + REFRIG OVERRIDE DELTA T (water)	Prestart Alert, Configure REFRIG OVERRIDE DELTA T in SETUP1 screen
		EVAPORATOR REFRIG TEMP < EVAP REFRIG TRIPPOINT (brine)	Prestart Alert, Configure EVAP REFRIG TRIP-POINT and CHILLED MEDIUM in SETUP1 screen
Transducer Voltage Fault	239	5.5 VDC < Voltage Reference < 4.5 VDC	Preset Alarm
High Condenser Pressure — Control	235	CONDENSER PRESSURE > 165 PSI	Preset Alarm, Configure COND PRESS OVERRIDE in SETUP1 screen
Switch	207	High Pressure Switch Open (165 ± 5 PSIG) & VFD START = YES	Preset Alarm, Switch closes at 110 ± – PSIG
Prestart	106	CONDENSER PRESSURE > COND PRESS OVERRIDE – 20 PSI	Prestart Alert, Configure COND PRESS OVERRIDE in SETUP1 screen
		CONDENSER PRESSURE > 145 PSI	Prestart Alert
Low Condenser Pressure (Freeze Protection)	244	Chiller in PUMPDOWN mode and CONDENSER REFRIG TEMP < CONDENSER FREEZE POINT	Preset Alarm, Configure CONDENSER FREEZE POINT in SETUP1 screen.
	154	Energizes condenser pump relay if CONDENSER REFRIG TEMP < CONDENSER FREEZE POINT. De-energizes condenser pump relay when CONDENSER REFRIG TEMP > CONDENSER FREEZE POINT + 5 F (2.8 C) and ENTERING COND LIQUID > CONDENSER FREEZE POINT	Configure CONDENSER FREEZE POINT in SET-UP1 screen
Oil — Low Pressure	228	OIL PRESSURE DELTA P < 13 PSID and VFD START = TRUE	Preset Alarm
		OIL PRESSURE DELTA P < 18 PSID and startup complete after OIL PRESS VERIFY TIME elapsed	Preset Alarm, Configure OIL PRESS VERIFY TIME in SETUP1 screen
	142	OIL PRESSURE DELTA P < 18 PSID and startup complete	Preset Alert
Pressure Sensor Fault	227	OIL PRESSURE DELTA P > 4 PSI immediately before oil pump turned on	Preset Alarm
Low Temperature	105	OIL SUMP TEMP < 150 F and OIL SUMP TEMP < EVAP REFRIG TEMP + 50 F (27.8 C)	Prestart Alert
Line Voltage — High	211/145	Line voltage > approximately 528 V, limits are calculated by VFD	Preset Alarm/Alert
	108	PERCENT LINE VOLTAGE > Overvoltage threshold	Preset Prestart Alert
Low	212/146	DC BUS VOLTAGE < approximately 408 V, limits are calculated by a VFD	Preset Alarm/Alert
	107	PERCENT LINE VOLTAGE < Undervoltage threshold	Preset Prestart Alert
Imbalance	216	LINE VOLTAGE IMBALANCE > LINE VOLTAGE % IMBALANCE	Configure LINE VOLTAGE % IMBALANCE and LINE VOLT IMBALANCE TIME in VFD CONF screen
Line Current — Single Cycle Dropout	210/144	Line Voltage on 2 Phases < 50% for 1 Cycle	Preset Alarm
Imbalance	209/143	LINE CURRENT IMBALANCE>LINE CURRENT % IMBALANCE	Configure LINE CURRENT % IMBALANCE and LINE CURRENT IMBALANCE TIME in VFD_-CONF screen
Power — Line Frequency Out of Range	222	47 Hz < LINE FREQUENCY < 63 Hz	Preset Alarm
ICVC Power on Reset	214/148	Loss of control power to ICVC for excessive time period	Preset Alarm

Table 6 — Protective Limits and Control Settings (cont)

MONITORED PARAMETER	ALARM/ALERT	LIMIT	COMMENTS
Motor — Surge	238	> 5 surge events within SURGE TIME PERIOD and VFD SPEED > 90%	Preset Alarm, Configure SURGE DELTA% AMPS and SURGE TIME PERIOD in OPTIONS screen
	236	> 5 surge events within SURGE TIME PERIOD and VFD SPEED < 90%	Preset Alarm, Configure SURGE DELTA% AMPS and SURGE TIME PERIOD in OPTIONS screen
Current Imbalance	225	MOTOR CURRENT IMBALANCE > MOTOR CURRENT % IMBALANCE	Configure MOTOR CURRENT % IMBALANCE and MOTOR CURRENT IMBAL TIME in VFD_CONF screen
Overload Trip	217	Any LOAD CURRENT PHASE > 108% for Excessive Time Period	Preset Alarm, Configure MOTOR LOAD ACTIVE DEMAND LIMIT in MAINSTAT screen
Excessive Amps	208	PERCENT LOAD CURRENT > 110% for 30 sec.	Preset Alarm
Acceleration Fault	203	PERCENT LOAD CURRENT > 95% and VFDSTART = TRUE for 5 to 40 sec	Preset Alarm, PERCENT LOAD CURRENT = AVERAGE LOAD CURRENT/MOTOR RATED LOAD AMPS
Amps Not Sensed	202	PERCENT LOAD CURRENT < 5% for 3 seconds and VFD START=TRUE for 20 sec	Preset Alarm, PERCENT LOAD CURRENT = AVERAGE LOAD CURRENT/MOTOR RATED LOAD AMPS
Starts Limit Exceeded	100	More than 8 starts in 12 hours	Preset Prestart Alert
Low Chilled Water Flow	229	CHILLED LIQUID FLOW = FALSE after CHILLED WATER PUMP = ON & WATER FLOW VERIFY TIME elapsed	Optional Alarm, Configure WATER FLOW VERIFY TIME in SETUP1 screen
Low Cond Water Flow	230	COND WATER FLOW = FALSE after COND WATER PUMP = ON & WATER FLOW VERIFY TIME elapsed	Optional Alarm, Configure WATER FLOW VERIFY TIME in SETUP1 screen
High Approach — Evaporator	162	EVAPORATOR APPROACH > EVAP APPROACH ALERT and startup complete	Configure EVAP APPROACH ALERT in SETUP1 screen
Condenser	163	CONDENSER APPROACH > COND APPROACH ALERT and startup complete	Configure COND APPROACH ALERT in SETUP1 screen
VFD — High VFD Speed	245	ACTUAL VFD SPEED > VFD SPEED OUTPUT + 10%	Preset Alarm, Must be outside +10% threshold for 75 sec.
Failure to Stop	204	PERCENT LOAD CURRENT >15% and VFDSTART = NO for 20 sec	Preset Alarm, PERCENT LOAD CURRENT = AVERAGE LOAD CURRENT/MOTOR RATED LOAD AMPS
Rectifier — High Temperature	218	RECTIFIER TEMPERATURE limit exceeded	Preset Alarm, Configure RECTIFIER TEMP OVERRIDE in SETUP1 screen
	110	RECTIFIER TEMPERATURE > RECTIFIER TEMP OVERRIDE –20 F (11.1 C)	Prestart Alert, Configure RECTIFIER TEMP OVERRIDE in SETUP1 screen
Overcurrent	241	Rectifier current limit exceeded	Preset Alarm
Power Fault	200	IGBT current limit exceeded or a fault was detected in the rectifier	Preset Alarm
Inverter — High Temperature	219	INVERTER TEMPERATURE limit exceeded	Preset Alarm, Configure INVERTER TEMP OVERRIDE in SETUP1 screen
	111	INVERTER TEMPERATURE > INVERTER TEMP OVERRIDE –20 F (11.1 C)	Prestart Alert, Configure INVERTER TEMP OVERRIDE in SETUP1 screen
	286	Inverter current limit exceeded	Preset Alarm
Power Fault	201	IGBT current limit exceeded	Preset Alarm
Inductor — Overtemperature Switch	256	Inductor temperature limit exceeded	Preset Alarm, Temperature switch in reactor has opened
DC Bus Voltage — High	205/166	DC BUS VOLTAGE Limit Exceeded	Preset Alarm/Alert
Low	215	DC BUS VOLTAGE < 407 VDC at 400/480 V Line Side Voltage	Preset Alarm
Ground Fault	220	GROUND FAULT CURRENT > 7% of Drive Rated Amps Sensed	Preset Alarm
Optional Limits — Spare Temperature	158,159, 248,249	SPARE TEMPERATURE > SPARE TEMP LIMIT	Optional Alarm/Alert, Configure SPARE TEMP ENABLE and SPARE TEMP LIMIT in SETUP1 screen
Guide Vane Position	253	ACTUAL GUIDE VANE POS > 4% after 4 minutes of closing	Preset Alarm
		ACTUAL GUIDE VANE POSITION < .045 volts after startup complete	Preset Alarm
		ACTUAL GUIDE VANE POSITION > 3.15 volts after startup complete	Preset Alarm
		ACTUAL GUIDE VANE POSITION < –1% after startup complete	Preset Alarm
		ACTUAL GUIDE VANE POSITION > 103% after startup complete	Preset Alarm
Low Discharge Superheat	240	DISCHARGE SUPERHEAT < SUPERHEAT REQUIRED –3 F (1.7 C) for 60 seconds	Preset Alarm, DISCHARGE SUPERHEAT = COMP DISCHARGE TEMP – CONDENSER REFRIG TEMP
Humidity — Dew Prevention	255	VFD COOLANT FLOW = 0% and VFD COLD PLATE TEMPERATURE < Tdewpoint + 0.5 F (0.3 C) or VFD COOLANT FLOW = 0% and there is a Rectifier Overtemperature or Inverter Overtemperature Alarm	Preset Alarm
Sensor Fault	168	HUMIDITY SENSOR INPUT > 4.5 V or HUMIDITY SENSOR INPUT < 0.5 V	Preset Alert

To determine what caused the alarm, the operator should read both the primary and secondary default screen messages, as well as the alarm history. The primary message indicates the most recent alarm condition. The secondary message gives more detail on the alarm condition. Since there may be more than one alarm condition, another alarm message may appear after the first condition is cleared. Check the ALARM HISTORY screen for additional help in determining the reasons for the alarms. Once all existing alarms are cleared (by pressing the RESET softkey), the default ICVC display returns to normal operation.

Ramp Loading — The ramp loading control slows down the rate at which the compressor loads up. This control can prevent the compressor from loading up during the short period of time when the chiller is started and the chilled water loop has to be brought down to *CONTROL POINT*. This helps reduce electrical demand charges by slowly bringing the chilled water to *CONTROL POINT*. The total power draw during this period remains almost unchanged.

There are several methods of ramp loading with the PIC III. Ramp loading can be based on *LEAVING CHILLED WATER, ENTERING CHILLED WATER, PERCENT LINE CURENT,* or *PERCENT MOTOR KILOWATTS*. PULLDOWN RAMP TYPE is selected from the RAMP__DEM screen.

1. Temperature ramp loading *(TEMP PULLDOWN DEG/ MIN)* limits the degrees per minute rate at which either *LEAVING CHILLED WATER* or *ENTERING CHILLED WATER* temperature decreases. This rate is configured by the operator on the TEMP_CTL screen.

NOTE: If chiller control power has been off for 3 hours or more, the next start-up (only) will follow temperature ramp loading using the minimum rate regardless of the ramp loading method and rate which are configured in the screens. This is used to maximize oil reclaim during start-up.

2. Motor load ramp loading (AMPS OR KW RAMP %/ MIN) limits the rate at which the compressor motor current or compressor motor load increases. The *AMPS OR KW RAMP %/MIN* rate is configured by the operator on the RAMP_DEM screen in line current or motor kilowatts.

If kilowatts is selected for the *DEMAND LIMIT SOURCE*, the *MOTOR RATED LOAD KILOWATTS* must be entered in the VFD_CONF screen.

The *TEMP PULLDOWN DEG/MIN* may be viewed or modified on the TEMP_CTL screen which is accessed from the EQUIPMENT SERVICE screen. *PULLDOWN RAMP TYPE, DEMAND LIMIT SOURCE*, and *AMPS OR KW RAMP %/MIN* may be viewed or modified on RAMP_DEM screen.

Rampdown — The Rampdown control applies to VFD equipped chillers. At machine start-up the VFD speed is set to "Start Speed" which is the lower of *VFD MAXIMUM SPEED* or the configured value of *VFD START SPEED*. *VFD START SPEED* is configured on the SETUP2 screen. After Ramp Loading is complete the control begins to reduce the VFD speed. Speed reduction continues until the leaving water temperature is within the control point deadband and any condition is reached that would require the VFD speed to hold or increase. The chiller is then out of Rampdown and running in normal capacity control.

Capacity Override — Capacity overrides can prevent some safety shutdowns caused by exceeding the motor amperage limit, low evaporator temperature safety limit, high motor temperature safety limit, and high condenser pressure limit. In all cases, there are two stages of compressor capacity control applied by guide vane operation:

1. When the value of interest crosses the First Stage Set Point into the Override Region, the guide vanes are prevented from opening further, and the status line on the ICVC indicates the reason for the override. Normal capacity control operation is restored when the value crosses back over the First Stage Set point, leaving the Override Region. See Table 7.
2. When the value of interest is in the Override Region and further crosses the Second Stage Set Point, the guide vanes are closed until the value meets the Override Termination Condition. The PIC III controls resume normal capacity control operation after the override termination condition has been satisfied. (In the case of high discharge superheat, there is an intermediate stage.)

Whenever the motor current demand limit set point (*ACTIVE DEMAND LIMIT*) is reached, it activates a capacity override, again, with a 2-step process. Exceeding 110% of the rated load amps for more than 30 seconds will initiate a safety shutdown.

The high compressor lift (surge prevention) set point will cause a capacity override as well. When the surge prevention set point is reached, the controller normally will only prevent the guide vanes from opening. If so equipped, the hot gas bypass valve will open instead of holding the vanes. The hot gas bypass will only open if the compressor is at 100% speed. See the Surge Prevention Algorithm section, page 54.

High Discharge Temperature Control — If the *COMP DISCHARGE TEMP* increases above 160 F (71.1 C), the guide vanes are proportionally opened to increase gas flow through the compressor. If the *LEAVING CHILLED WATER* temperature decreases 5 F (2.8 C) below the control set point temperature, as a result of opening the guide vanes, the PIC III will bring the chiller into the recycle mode.

Compressor Bearing Temperature — The thrust bearing temperature (MTRB) is a calculated value which is the temperature of the oil leaving the bearing plus an internal increment calculated with the *THRUST BRG RESET FACTOR*. The Comp Thrust Bearing Reset is calculated using the rate of change of the oil leaving the bearing. If the oil temperature is stable the *COMP THRUST BRG TEMP* equals the *COMP THRUST LVG OIL TEMP*. As the oil temperature rises, the *COMP THRUST BRG RESET* is calculated to account for any lag between actual bearing temperature and the temperature of the leaving oil.

In the SETUP1 screen an adjustment called the *THRUST BRG RESET FACTOR* is an adjustment to the *COMP THRUST BRG TEMP* calculation. The default value is 1.4 and will normally be left at that value unless other wise advised by Carrier Service Engineering.

Oil Sump Temperature and Pump Control — The oil sump temperature is regulated by the PIC III, with the oil heater relay when the chiller is shut down.

As part of the pre-start checks executed by the controls, the oil sump temperature (*OIL SUMP TEMP*) is compared to the cooler refrigerant temperature (*EVAPORATOR REFRIG TEMP*) if the *OIL SUMP TEMP* is less than 150 F (65.6). If the difference between these 2 temperatures is 50 F (27.8 C) or less, the start-up will be delayed until either of these conditions is no longer true. Once this temperature criteria is satisfied, 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 (60.0 C) or the *OIL SUMP TEMP* is less than the *EVAP REFRIG TEMP* plus 53 F (29.4 C). The oil heater is turned off when the *OIL SUMP TEMP* is either:

- more than 152 F (66.7 C), or
- more than 142 F (61.1 C) and more than the *EVAP REFRIG TEMP* plus 55 F (30.6 C).

The oil heater is always off during start-up or when the compressor is running.

The oil pump is also energized during the time the oil is being heated (for 30 seconds at the end of every 30 minutes).

The oil pump will not operate if the *EVAPORATOR PRESSURE* is less than –5 psig (–34.5 kPa).

Oil Cooler — The oil must be cooled when the compressor is running. This is accomplished through a small, plate-type heat exchanger (also called the oil cooler) located behind the oil pump. The heat exchanger uses liquid condenser refrigerant as the cooling liquid. Refrigerant thermostatic expansion valves (TXVs) regulate refrigerant flow to control the oil temperature entering the bearings. The bulbs for the expansion valves are strapped to the oil supply line leaving the heat exchanger, and the valves are set to maintain 110 F (43 C).

NOTE: The TXVs are not adjustable. The oil sump temperature may be at a lower temperature during compressor operation.

Remote Start/Stop Controls — A remote device, such as a timeclock that uses a set of contacts, may be used to start and stop the chiller. However, the device should not be programmed to start and stop the chiller in excess of 2 or 3 times every 12 hours. If more than 8 starts in 12 hours (the *STARTS IN 12 HOURS* parameter on the MAINSTAT screen) occur, (not counting either recycle restarts or auto. restarts after power failure) an excessive starts alarm displays, preventing the chiller from starting. The operator must press the RESET softkey on the ICVC to override the starts counter and start the chiller. If the chiller records 12 starts (excluding recycle starts) in a sliding 12-hour period, it can be restarted only by pressing the RESET softkey followed by the LOCAL or CCN softkey. This ensures that, if the automatic system is malfunctioning, the chiller will not repeatedly cycle on and off. If the *AUTO RESTART OPTION* in the SETUP3 screen and the *REMOTE CONTACTS OPTION* are enabled, the REMOTE CONTACTS must be closed in order for the chiller to restart following a power failure. If the automatic restart after a power failure option (*AUTO RESTART OPTION* on the SETUP3 screen) is not activated when a power failure occurs, and if the remote contact is closed, the chiller will indicate an alarm because of the loss of voltage.

The contacts for remote start are wired into terminals 23 and 24 of the low voltage terminal strip in the VFD enclosure. See the certified drawings for further details on contact ratings. The contacts must have 24 vac dry contact rating.

Spare Safety and Spare Temperature Inputs — Normally closed (NC) discrete inputs for additional field-supplied safeties may be wired to the spare protective limits input channel in place of the factory-installed jumper on terminals 19 and 20 of the low voltage terminal strip. The opening of any contact will result in a safety shutdown and a display on the ICVC. Refer to the certified drawings for safety contact ratings.

Extra analog temperature sensors may also be added to the CCM module (SPARE TEMPERATURE #1 and SPARE TEMPERATURE #2) at terminals J4 25-26 and J4 27-28, respectively. The analog temperature sensors may be configured in the EQUIPMENT SERVICE/SETUP1 table to cause an alert (Enable value 1 or 2) or alarm (Enable value 3 or 4), or neither (Enable value 0). An alarm will shut down a running chiller, but an alert will not. The fault condition will be triggered when crossing a high limit (Enable value 2 or 4) or low limit (Enable value 1 or 3), configurable between –40 F to 245 F (–40 C to 118 C). The spare temperature sensors are readable on the CCN network. They also have specific uses as common temperature sensors in a Lead/Lag system. See page 55.

Alarm (Trip) Output Contacts — One set of alarm contacts is provided in the VFD. The contact ratings are provided in the certified drawings. The contacts are located on terminals 9 and 10 of the TB2 field wiring terminal strip in the VFD enclosure.

Table 7 — Capacity Overrides Table

OVERRIDE CONDITION	FIRST STAGE SET POINT			SECOND STAGE SET POINT	OVERRIDE TERMINATION
	VIEW/MODIFY ON ICVC SCREEN	OVERRIDE DEFAULT VALUE	CONFIGURABLE RANGE	VALUE	VALUE
High Condenser Pressure (COND PRESS OVERRIDE)	SETUP1	CONDENSER PRESSURE >125 psig (862 kPa)	90 to 165 psig (621 to 1138 kPa)	CONDENSER PRESSURE > COND PRESS OVERRIDE + 2.4 psig (16.5 kPA)	CONDENSER PRESSURE < CONDENSER PRESS OVERRIDE – 1 PSI (6.9 kPa)
High Motor Temperature (COMP MOTOR TEMP OVERRIDE)	SETUP1	COMP MOTOR WINDING TEMP > 200 F (93 C)	150 to 200 F (66 to 93 C)	COMP MOTOR WINDING TEMP > COMP MOTOR TEMP OVERRIDE + 10 F (5.6 C)	COMPR MOTOR WINDING TEMP < COMP MOTOR TEMP OVERRIDE – 2 F (1.1 C)
Low Evaporator Temperature (REFRIG OVERRIDE DELTA T)	SETUP1	EVAPORATOR REFRIG TEMP < EVAP REFRIG TRIPPOINT + 3 F (1.7 C)	2 to 5 F (1.1 to 2.8 C)	EVAPORATOR REFRIG TEMP < EVAP REF OVERRIDE TEMP - 1 F (.6 C) NOTE: EVAP REF OVERRIDE TEMP = EVAP REFRIG TRIPPOINT + REFRIG OVERRIDE DELTA T	EVAP REFRIG TEMP > EVAP REF OVERRIDE TEMP + 2 F (1.1 C)
High Compressor Lift (Surge Prevention) (Tsmin, IGVmin, Tsmax, IGVmax, Shapefac)	OPTIONS	Tsmain: 45 ^F IGVmin: 5% Tsmax: 70 ^F IGVmax: 100% shapefac: -0.04	0 to 150 ^F 0 to 110% 0 to 150 ^F 0 to 110% -1 to 0	None	Active∆Tsat < SurgeLine ∆Tsat + Deadband Setting
Manual Guide Vane Target (TARGET GUIDE VANE POS)	COMPRESS	Automatic	0 to 100%	None	Press RELEASE softkey after selecting TARGET GUIDE VANE POS
Manual Speed Control (TARGET VFD SPEED)	COMPRESS	Automatic	VFD MINIMUM SPEED to 100%	Forced TARGET VFD SPEED cannot override either a capacity inhibit or a capacity decrease command generated by the PIC III	Press RELEASE softkey after selecting TARGET VFD SPEED
Motor Load (ACTIVE DEMAND LIMIT)	MAINSTAT	Automatic	40 to 100%	ACTIVE DEMAND LIMIT > Set Point + 5%	ACTIVE DEMAND LIMIT < Set Point – 2%
Low Discharge Superheat	OVERRIDE	ACTUAL SUPERHEAT < SUPERHEAT REQUIRED for conditions	None	ACTUAL SUPERHEAT < SUPERHEAT REQUIRED – 1.25 F (0.7 C)	ACTUAL SUPERHEAT > SUPERHEAT REQUIRED + 1 F (0.56 C)
High Rectifier Temperature (RECTIFIER TEMP OVERRIDE)	SETUP1	RECTIFIER TEMPERATURE > 160 F (71 C)	155 to 170 F (68 to 77 C)	RECTIFIER TEMP > RECTIFIER TEMP OVERRIDE + 10 F (5.6 C)	RECTIFIER TEMP < RECTIFIER TEMP OVERRIDE – 5 F (2.8 C)
High Inverter Temperature (INVERTER TEMP OVERRIDE)	SETUP1	INVERTER TEMPERATURE > 160 F (71 C)	155 to 170 F (68 to 77 C)	INVERTER TEMP > INVERTER TEMP OVERRIDE + 10 F (5.6 C)	INVERTER TEMP < INVERTER TEMP OVERRIDE – 5 F (2.8 C)

Kilowatt Output — An output is available on the CCM module [Terminal J8-1 (+) and J8-2 (–)] to represent the power consumption of the chiller. The 4 to 20 mA signal generated by the CCM module can be wired to the building automation or energy management system to monitor the chiller's energy consumption. Output is 2 mA with the chiller off, and it varies linearly from 4 mA (representing 0% rated kilowatt consumption) to 20 mA (representing 100% *RATED LINE KILOWATTS*). The rated peak kilowatt consumption is configured by the user in the VFD_CONF display screen by setting the *RATED LINE KILOWATTS* from the machine electrical data nameplate.

Remote Reset of Alarms — A standard feature of the PIC III controls is the ability to reset a chiller in a shutdown alarm state from a remote location. If the condition which caused the alarm has cleared the chiller, the chiller can be placed back into a normal CCN operating mode when the *REMOTE RESET OPTION* (ICVC_PWD menu) is set to ENABLE. A variety of Carrier Comfort Network® software systems including ComfortVIEW™ or Network Service Tool™ can access the PIC III controls and reset the displayed alarm. Third party software from building automation systems (BAS) or energy management systems (EMS) can also access the PIC III controls through a Carrier DataLINK™ module and reset the fault displayed. Both methods would access the ICVC_PWD screen and force the *RESET ALARM?* point to YES to reset the fault condition. If the PIC III controls have determined that it is safe to start the chiller, the *CCN MODE?* point (ICVC_PWD screen) can be forced to YES to place the chiller back into normal CCN operating mode. The only exceptions are the following alarms that cannot be reset from a remote location: Alarm/Alert STATE 100, 200, 201, 204, 206, 217-220, 233, 234, 247, and 259. To view alarm codes, refer to Troubleshooting Guide, Checking Display Messages, page 93. After the alarm has been reset, the PIC III control will increment the *STARTS IN 12 HOURS* counter by one upon restart. If the limit of 8 starts in a 12-hour period is reached (Prestart/ Alert state 100), this must be reset at the local chiller control panel (ICVC).

Pump and Fan Control — The Carrier PIC controls are designed to control when cooler and condenser waterpumps and tower fans are turned on and off. This is accomplished through a series of relay contacts on the ISM within the starter or optional VFD, and interface terminals are provided at ISM terminal strip J9 (refer to the Carrier Installation Instructions and certified drawings). If primary control of water pumps and tower fans is provided by customer-installed devices, a parallel means for the Carrier controls to independently operate the pumps must also be provided to protect against freeze-up.

Condenser Pump Control — The chiller will monitor the *CONDENSER PRESSURE* and may turn on the condenser pump if the condenser pressure becomes too high while the compressor is shut down. The *COND PRESS OVERRIDE* parameter is used to determine this pressure point. *COND PRESS OVERRIDE* is found in the SETUP1 display screen, which is accessed from the EQUIPMENT SERVICE table. The default value is 125 psig (862 kPa).

If the *CONDENSER PRESSURE* is greater than or equal to the *COND PRESS OVERRIDE*, and the *ENTERING CONDENSER WATER* temperature is less than 115 F (46 C), the condenser pump will energize to try to decrease the pressure and Alert 151 will be generated. The pump will turn off when the condenser pressure is 3.5 psi (24.1 kPa) less than the pressure override and the *CONDENSER REFRIG TEMP* is within 3 F (1.7 C) of the *ENTERING CONDENSER WATER* temperature.

Condenser Freeze Prevention — This control algorithm helps prevent condenser tube freeze-up by energizing the condenser pump relay. The PIC III controls the pump and, by starting it, helps to prevent the water in the condenser from freezing. The PIC III can perform this function whenever the chiller is not running *except* when it is either actively in pumpdown or in pumpdown/lockout with the freeze prevention disabled.

When the chiller is off and *CONDENSER REFRIG TEMP* is less than the *CONDENSER FREEZE POINT*, the *CONDENSER WATER PUMP* will be energized (Alert State 154) However, if the chiller is in pump down, and when it entered pump down mode, the *CONDENSING REFRIG TEMP* was more than 5 F (2.7 C) above the CONDENSER FREEZE POINT, the same low temperature condition will generate Alarm State 244 and the CONDENSER WATER PUMP will be energized. In either case, the fault state will clear and the pump will turn off when the *CONDENSER REFRIG TEMP* is more than 5 F (2.7 C) above the *CONDENSER FREEZE POINT* and the entering condenser water temperature is greater than the *CONDENSER FREEZE POINT*. If the chiller is in Recycle Shutdown Mode when the condition occurs, the controls will transition to a non-recycle shutdown.

Evaporator Freeze Protection — When the *EVAPORATOR REFRIG TEMP* is less than the *EVAP REFRIG TRIPPOINT* plus the *REFRIG OVERRIDE DELTA T* (configurable from 2 to 5 F or 1.1 to 2.8 C), Alert State 122 will be displayed, and a capacity override will occur. (See Table 7.)

When the unit is running or in recycle, if the *EVAPORATOR REFRIG TEMP* is equal to or less than the *EVAP REFRIG TRIPPOINT* (33 F or 0.6 C for water, configurable for brine), Protective Limit Alarm State 232 will be displayed, the unit will shut down, and the CHILLED WATER PUMP will remain on. The alarm will be clearable when the leaving chilled water temperature rises 5°F (2.8°C) above the *CONTROL POINT*.

When the unit is off, if the *EVAPORATOR REFRIG TEMP* is less than the *EVAP REFRIG TRIPPOINT* plus 1° F (0.6 C), Alarm State 243 will be generated and the *CHILLED WATER PUMP* will be turned on. The alarm can be reset when the *EVAPORATOR REFRIG TEMP* rises 5 F (2.8 C) above the *EVAP REFRIG TRIPPOINT*.

Tower Fan Relay Low and High — Low condenser water temperature can cause the chiller to shut down when refrigerant temperature is low. The tower fan relays, located in the VFD, are controlled by the PIC III to energize and de-energizes as the pressure differential between cooler and condenser vessels changes. This prevents low condenser water temperature and maximizes chiller efficiency. The tower fan relay can only accomplish this if the relay has been added to the cooling tower temperature controller.

TOWER FAN RELAY LOW is turned on whenever the condenser water pump is running, flow is verified, and the difference between cooler and condenser pressure is more than 30 psid (207 kPad) for entering condenser water temperature greater than 65 F (18.3 C).

TOWER FAN RELAY LOW is turned off when the condenser pump is off, flow is stopped, or the *EVAP REFRIGERANT TEMP* is less than the *EVAP REF OVERRIDE TEMP* for *ENTERING CONDENSER WATER* temperature less than 62 F (16.7 C), or the difference between the *CONDENSER PRESSURE* and *EVAPORATOR PRESSURE* is less than 25 psid (172.4 kPad) for *ENTERING CONDENSER* water less than 80 F (27 C).

TOWER FAN RELAY HIGH is turned on whenever the condenser water pump is running, flow is verified and the difference between *EVAPORATOR PRESSURE* and *CONDENSER PRESSURE* is more than 35 psid (241.3 kPa) for *ENTERING COND WATER* temperature greater than the

TOWER FAN HIGH SETPOINT (SETPOINT menu, default 75 F [23.9 C]).

The *TOWER FAN RELAY HIGH* is turned off when the condenser pump is off, flow is stopped, or the *EVAPORATOR REFRIG TEMP* is less than the *EVAP REF OVERRIDE TEMP* and *ENTERING CONDENSER WATER* is less than 70 F (21.1 C), or the difference between *EVAPORATOR PRESSURE and CONDENSER PRESSURE* is less than 28 Psid (193 kPa), and *ENTERING CONDENSER WATER* temperature is less than *TOWER FAN HIGH SETPOINT* minus 3 F (–16.1 C).

The *TOWER FAN RELAY LOW* and *TOWER FAN RELAY HIGH* parameters are accessed from the STARTUP screen.

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. While the tower fan relay outputs described above are not a substitute for a complete condenser water control system, they can serve as useful inputs to such a system.

Auto. Restart After Power Failure — ICVC Software Version 9 — (Applies to chillers without uninterruptable power supply installed.) The Auto. Restart feature is enabled/disabled in the SETUP3 screen. Faults that will reset when Auto. Restart is enabled are single cycle dropout (if enabled); ICVC Power On Reset; line current imbalance; high line voltage; low line voltage; Power On Reset; low DC bus voltage; high DC bus voltage; SIO comm loss with gateway; comm loss between gateway and DPI board. With this feature enabled, these faults are treated as alerts instead of alarms, so start-up proceeds as soon as the condition is rectified. The 15-minute start-to-start and 1-minute start inhibit timers are both ignored during this type of start-up, and the STARTS IN 12 HOURS counter is not incremented.

The Auto. Restart feature allows the controls to make an express restart. When Auto. Restart is enabled, at the time of power up, if the chiller had been operating at the time of shutdown, the controls will immediately energize the CHILLED WATER PUMP output, wait 1 second, energize the CONDENSER WATER PUMP output, then wait 1 second to start to verify water flow. When flow is verified, and the chilled water temperature is calling for cooling, the guide vane is checked for closure. Because the unit has VFD, the guide vanes have no closure requirement. For units with split ring diffusers, the diffuser position is adjusted based on the GUIDE VANE / SRD FACTOR configured in the SETUP3 screen. The lower this factor, the more closed the SRD will be at restart.

The oil pump is then started, and when the oil pressure is confirmed, the controls wait 20 seconds to maintain pressure. At this point the compressor is commanded to start.

If the Auto. Restart after Power Failure feature is enabled, the chiller has a fast restart feature for any time the chiller starts. This feature will use the same times as when the chiller starts after a power failure, but will not use the modification to VFD speed or SRD (split ring diffuser) positioning.

Whenever power is restored, if power to the ICVC module has been off for more than 3 hours or the timeclock has been set for the first time, the compressor starts with the slowest temperature-based ramp load rate possible in order to minimize oil foaming. The oil pump is energized occasionally during the time the oil is being brought up to proper temperature in order to eliminate refrigerant that has migrated to the oil sump during the power failure. The pump turns on for 30 seconds at the end of every 30-minute period until the chiller is started.

When the VFD is started and ramping to speed, the VFD start speed is compensated for changes due to high gas torque levels. The GAS TORQUE FACTOR in SETUP3 is used to modify start speed. The higher the factor, the more the VFD is slowed during restart to help prevent VFD overload.

Fast Power Source Transfers — When the electrical system is being prepared to transfer power from generator power back to utility power or vice-versa, and the power transfer is an open transition type, and time to transfer is less than 5 seconds, the chiller should be stopped before the transfer occurs and restarted after the transfer has been completed. If the chiller is not stopped before the transfer occurs, alarms on the chiller can occur that must be manually reset, such as a circuit breaker trip.

To accomplish shutdown and restart automatically, a set of dry contacts should be opened 30 to 60 seconds before the transfer occurs, then closed after the transfer is complete to restart the chiller. The contacts must be wired to the Remote START/STOP contact in the starter or VFD (see the field wiring diagrams) and the Remote Start contact configuration must be enabled.

If power transfers take 5 seconds or longer, the chiller Auto. Restart after Power Failure feature (if enabled) will automatically restart the chiller.

Water/Brine Reset — It is recommended to enable Single Cycle Dropout in the VFD configuration for this type of operation. Chilled water capacity control is based on achieving and maintaining a *CONTROL POINT* temperature, which is the sum of the *LCW SET POINT* or *ECW SETPOINT* (from the SETPOINT screen) and a Water/Brine Reset value, if any. *CONTROL POINT* is limited to a minimum of 35 F (+1.7 C) for water, or 10 F (–12.2 C) for brine. Three types of chilled water or brine reset are available and can be viewed or modified on the TEMP_CTL screen, which is accessed from the EQUIPMENT SERVICE table.

The ICVC default screen indicates when the chilled water reset is active. *TEMPERATURE RESET* on the MAINSTAT screen indicates the amount of reset. The *CONTROL POINT* will be determined by adding the *TEMPERATURE RESET* to the SETPOINT.

To activate a reset type, access the TEMP_CTL screen and input all configuration information for that reset type. Then, input the reset type number (1, 2, or 3) in the *SELECT/ ENABLE RESET TYPE* input line.

RESET TYPE 1: 4 TO 20 MA (1 TO 5 VDC) TEMPERATURE RESET — Reset Type 1 is an "automatic" reset utilizing a 4 to 20 mA or 1 to 5 vdc analog input signal provided from any external sensor, controller, or other device which is appropriately configured. Reset Type 1 permits up to ±30 F (±16.7 C) of reset to the chilled water set point. Inputs are wired to terminals J5-3 (–) and J5-4 (+) on the CCM (for 4-20 mA input). In order to utilize a 1 to 5 vdc input, a 250-ohm resistor must be wired in series with the + input lead (J5-4). For either input type, SW2 DIP switches should be set in the ON (up) position. Inputs equivalent to less than 4 mA result in no reset, and inputs exceeding 20 mA are treated as 20 mA.

RESET TYPE 2: REMOTE TEMPERATURE RESET — Reset Type 2 is an automatic chilled water temperature reset based on a remote temperature sensor input signal. Reset type 2 permits ± 30 F (± 16 C) of automatic reset to the set point based on a temperature sensor wired to the CCM module (see wiring diagrams or certified drawings). The temperature sensor must be wired to terminal J4-13 and J4-14. To configure Reset Type 2, enter the temperature of the remote sensor at the point where no temperature reset will occur (*REMOTE TEMP –> NO RESET*). Next, enter the temperature at which the full amount of reset will occur (*REMOTE TEMP –> FULL RESET*). Then, enter the maximum amount of reset required to operate chiller (*DEGREES RESET*). Reset Type 2 can now be activated.

RESET TYPE 3 — Reset Type 3 is an automatic chilled water temperature reset based on cooler temperature difference. Reset Type 3 adds ± 30 F (± 16 C) based on the temperature difference between the *ENTERING CHILLED WATER* and *LEAVING CHILLED WATER* temperature.

To configure Reset Type 3, enter the chilled water temperature difference (the difference between entering and leaving chilled water) at which no temperature reset occurs (*CHW DELTA T –> NO RESET*). This chilled water temperature difference is usually the full design load temperature difference. Next, enter the difference in chilled water temperature at which the full amount of reset occurs (*CHW DELTA T –> FULL RESET*). Finally, enter the amount of reset (*DEGREES RESET*). Reset Type 3 can now be activated.

Surge Prevention — A surge condition occurs when the lift becomes so high that the gas flow across the impeller reverses. This condition can eventually cause chiller damage. The surge prevention algorithm notifies the operator that chiller operating conditions are marginal and to take action to help prevent chiller damage such as lowering entering condenser water temperature.

The surge prevention algorithm is an operator-configurable feature that can determine if lift conditions are too high for the compressor and then take corrective action. Lift is defined as the difference between the saturated temperature at the impeller eye and at the impeller discharge. The maximum lift a particular impeller wheel can perform varies with the gas flow across the impeller and the size of the wheel.

Variable Primary Flow Surge prevention is the current standard for both constant and variable primary flow chilled water systems. Variable Primary Flow Surge Prevention does not require a measurement of *COOLER DELTA T* and is thus unaffected by changes in flow. With Variable Primary Flow Surge Prevention there is no difference in field configuration between constant and variable flow water systems.

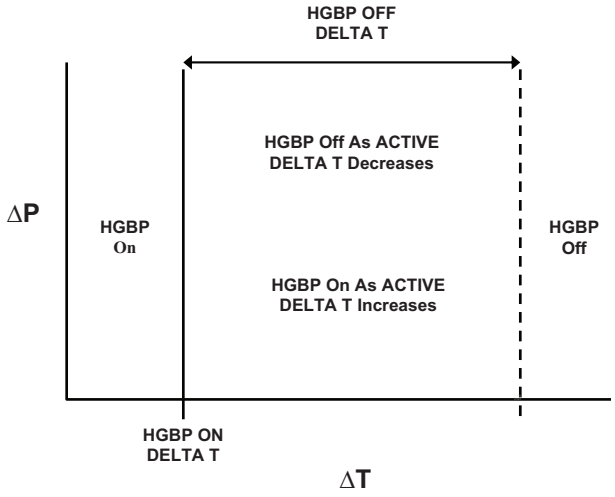
The controls calculate the conditions at which the compressor will surge based on operating conditions and configured values entered into the OPTIONS screen.

The configurations as used by the controls would plot out on a graph as a curved line. If the present operating conditions plot at or above this line, surge prevention is turned on.

The way in which surge prevention functions will differ with the presence or absence of hot gas bypass.

HGBP OPTION = 1 — The HGBP is only energized if a *SURGE PROTECTION COUNT* is registered, the *ACTIVE DELTA T STAT* falls below the *SURGE LINE DELTA T STAT* or the *VFD LOAD FACTOR* approaches 1.0 and it is not possible to increase VFD speed. The VFD speed cannot increase when the *VFD TARGET SPEED* is equal to *VFD MAXIMUM SPEED* or if the V*FD TARGET SPEED* is FORCED to a fixed value.

HGBP OPTION = 2 — This option energizes the *HOT GAS BYPASS RELAY* solely based on the *ACTIVE DELTA T* (actual temperature difference between the *LEAVING CHILLED WATER* and *ENTERING CHILLED WATER*). Evaluation of the *ACTIVE DELTA T* begins at the completion of ramp loading. The hot gas bypass valve is energized if the *ACTIVE DELTA T* is less than the *HGBP ON DELTA T*. The hot gas bypass relay will be turned off when the *ACTIVE DELTA T* is greater than or equal to the sum of *HGBP ON DELTA T* plus *HGBP OFF DELTA T* See Fig. 28. The *HGBP ON DELTA T* must be set to a value larger than the minimum delta T to which the chiller can unload.



LEGEND

ECW	—	Entering Chilled Water
HGBP	—	Hot Gas Bypass
LCW	—	Leaving Chilled Water

ΔP = (Condenser Pressure) – (Cooler Pressure)
ΔT = (ECW) – (LCW)

Fig. 28 — Hot Gas Bypass/Surge

Surge Prevention Algorithm — This is an operator configurable feature that can determine if lift conditions are too high for the compressor and then take corrective action. Lift is defined as the difference between the saturated temperature at the impeller eye and at the impeller discharge. The maximum lift a particular impeller wheel can perform varies with the gas flow through the impeller and the diameter of the impeller. With a VFD the lift capability and the position of the surge line also vary with *ACTUAL VFD SPEED*.

The surge line constructed from the guide vane position and the differential saturated refrigerant temperature between cooler and condenser is based on full load conditions and 100% compressor speed. As *ACTUAL VFD SPEED* is reduced, the *SURGE/HGBP DELTA Ts MAX* and *Ts MIN* values are automatically reduced so that the surge line duplicates the compressor lift capability at the reduced speed. If the actual operating point (lift vs. load) goes above the surge prevention line then the controls enter *SURGE PREVENTION* mode.

Changing the *SURGE LINE SHAPE FACTOR* and the *SURGE LINE SPEED FACTOR* adjusts the surge line for different speeds and mid lift conditions. See the section on Surge Prevention Configurations.

When the controls enter *SURGE PREVENTION* mode the first response is to increase *ACTUAL VFD SPEED* and increase the lift capability of the compressor while preventing the guide vanes from opening further. Should the compressor reach 100% *ACTUAL VFD SPEED* and still be in the surge prevention region, the controls will energize the HOT GAS BYPASS RELAY (if the *SURGE LIMIT/HGBP OPTION* is configured for Hot Gas Bypass).

If load decreases while the chiller is in *SURGE PREVENTION* mode the *ACTUAL GUIDE VANE POSITION* will close but the *ACTUAL VFD SPEED* will not decrease.

ACTIVE REGION as found on the SURGPREV screen is based on how far into the surge prevention area that the load point has moved. This is used to determine the size of the speed boost to the VFD.

NOTE: If upon ramp-up, a chiller with VFD tends to go to full speed before guide vanes open fully, it is an indication that the lift at low load is excessive, and the operating point moved directly into the surge prevention region. In this case, investigate the ability of the condenser cooling means (e.g., cooling tower) to provide cooling water in accordance with the design load/entering condenser water temperature schedule.

A surge condition occurs when the lift becomes so high the gas flow across the impeller reverses. This condition can eventually cause chiller damage. When enabled, the Surge Prevention Algorithm will adjust either the inlet guide vane (IGV) position or compressor speed to maintain the compressor at a safe distance from surge while maintaining machine efficiency. If the surge condition degrades then the algorithm will move aggressively away from surge. This condition can be identified when the *SURGE/HGBP ACTIVE?* on the HEAT_EX display screen displays a YES.

Surge Protection — The PIC III monitors surge, which results in a fluctuation on the compressor motor amperage. Each time the fluctuation in amperage exceeds an operator-specified limit (*SURGE DELTA % AMPS*) plus a load correction factor, both *SURGE COUNTS* are incremented by one and the VFD will increase in speed provided that it is not already operating at *VFD MAXIMUM SPEED* or that the *VFD TARGET SPEED* is forced. If the VFD cannot increase in speed because the VFD is already at maximum speed of the target speed is forced then the *SURGE PROTECTION COUNTS* are also incremented by one. If more than *4 SURGE PROTECTION COUNTS* occur within an operator-specified time (*SURGE TIME PERIOD*) and the *ACTUAL VFD SPEED* is greater than 90% then the PIC III declares an Excessive Compressor Surge Alarm (238) and the chiller is shut down. If more than four *SURGE PROTECTION COUNTS* occur within the S*URGE TIME PERIOD* and the *ACTUAL VFD SPEED* is less than 90% then the chiller is shut down on a Excessive Compressor Surge / Low Speed Alarm (236). Both *SURGE COUNTS* and *SURGE PROTECTION COUNTS* are decreased by one if no surges occur within the *SURGE TIME PERIOD*.

On chillers with VFDs, if a *SURGE COUNT* is registered and the *ACTUAL VFD SPEED* is less than the *VFD MAXIMUM SPEED*, then *TARGET VFD SPEED* will be increased by the amount configured in the *VFD INCREASE STEP* parameter. The VFD will not decrease in speed if *SURGE COUNTS* is greater than zero.

The threshold at which a current fluctuation is interpreted as a surge can be adjusted from the OPTIONS screen. The portion of the surge threshold attributable to current fluctuations can be changed by scrolling to the *SURGE DELTA % AMPS* parameter and adjusting it with the INCREASE or DECREASE softkeys. The default setting is 10%. The *SURGE TIME PERIOD* can be adjusted from the OPTIONS screen. Scroll to the *SURGE TIME PERIOD* parameter and use the INCREASE or DECREASE softkey to adjust the surge count time interval. The default setting is 8 minutes.

SURGE PROTECTION COUNTS are displayed in the COMPRESS screen. Both *SURGE PROTECTION COUNTS* and *SURGE COUNTS* are displayed in the SURGPREV screen.

Head Pressure Reference Output (See Fig. 29) — The PIC III control outputs a 4 to 20 mA signal for the configurable Delta P (*CONDENSER PRESSURE* minus *EVAPORATOR PRESSURE*) reference curve shown in Fig. 29. The *DELTA P AT 100%* (chiller at maximum load condition default at 35 psi), *DELTA P AT 0%* (chiller at minimum load condition default at 20 psi) and *MINIMUM OUTPUT* points are configurable in the EQUIPMENT SERVICE-OPTIONS table. When configuring this output ensure that minimum requirements for oil pressure and proper condenser FLASC orifice performance are maintained. The 4 to 20 mA output from VFD TB1 terminals 17 and 18 may be useful as a reference signal to control a tower bypass valve, tower speed control, condenser pump speed control, etc. Note that it is up to the site design engineering agent to integrate this analog output with any external system device(s) to produce the desired effect. Carrier does not make any claim that this output is directly usable to control any specific piece of equipment (that is, without further control elements or signal conditioning), although it may be.

The head pressure reference output will be on whenever the condenser pump is operating. It may also be manually operated in *CONTROLS TEST*. When the head pressure differential is less than the value entered for *DELTA P AT 0%*, the output will be maintained at 4 mA.

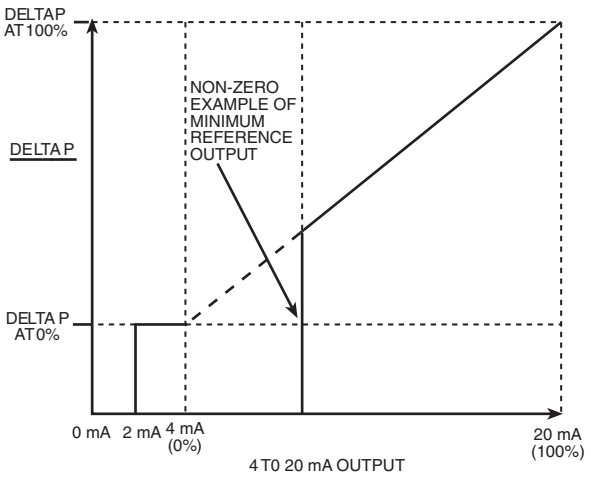


Fig. 29 — Head Pressure Reference Output

VFD Start-Up Speed Control — Immediately accelerating to a high VFD speed improves the ability of the compressor to compensate for some start-up environments that exceed condenser water design conditions. The 19XRV chillers initially accelerate to the *VFD START SPEED* as configured in the SETUP2 screen, and then gradually slow the compressor, if possible, while adjusting the guide vane position until a stable operating point with improved chiller efficiency is attained.

Following a start command, the PIC III controls internally set the *TARGET VFD SPEED* to the smaller of the *VFD MAXIMUM SPEED* or the *VFD START SPEED*. Provided that the chiller has sufficient capacity, the VFD will continue to run at the start-up speed during Ramp Loading until the chilled water temperature falls within the *CHILLED WATER DEADBAND* surrounding the set point. *RAMP LOADING ACTIVE* in the SURGPREV screen will indicate YES during Ramp Loading. The *GUIDE VANE DELTA* will be equal to zero when the chilled water temperature is in the *CHILLED WATER DEADBAND*. The VFD speed will then be ramped down at one half of the *VFD GAIN* rate until, surge conditions are encountered, the *VFD MINIMUM SPEED* is reached, the *ACTUAL GUIDE VANE POS* reaches the *GUIDE VANE TRAVEL LIMIT*, or the *TARGET VFD SPEED* is forced. V*FD RAMPDOWN ACTIVE* in the SURGPREV screen will indicate YES during the rampdown process. The VFD speed will be regulated by standard capacity control and surge prevention algorithms at the conclusion of the rampdown process.

Lead/Lag Control — The lead/lag control system automatically starts and stops a lag or second chiller in a 2-chiller water system. A third chiller can be added to the lead/lag

system as a standby chiller to start up in case the lead or lag chiller in the system has shut down during an alarm condition and additional cooling is required. Refer to Fig. 20 and 21 for menu, table, and screen selection information.

NOTE: The lead/lag function can be configured on the LEAD-LAG screen, which is accessed from the SERVICE menu and EQUIPMENT SERVICE table. See Table 4, Example 22. Lead/lag status during chiller operation can be viewed on the LL_MAINT display screen, which is accessed from the SERVICE menu and CONTROL ALGORITHM STATUS table. See Table 4, Example 13.

Lead/Lag System Requirements:
- all chillers in the system must have software capable of performing the lead/lag function
- water pumps MUST be energized from the PIC III controls
- water flows should be constant
- the CCN time schedules for all chillers must be identical

Operation Features:
- 2 chiller lead/lag
- addition of a third chiller for backup
- manual rotation of lead chiller
- load balancing (if configured)
- staggered restart of the chillers after a power failure
- chillers may be piped in parallel or in series chilled water flow

COMMON POINT SENSOR USAGE AND INSTALLATION — Lead/lag operation does not require a common chilled water point sensor. However, common point sensors (Spare Temp #1 and #2) may be added to the CCM module, if desired.

NOTE: If the common point sensor option is chosen on a chilled water system, each chiller should have its own common point sensor installed. Each chiller uses its own common point sensor for control when that chiller is designated as the lead chiller. The PIC III cannot read the value of common point sensors installed on the other chillers in the chilled water system.

If leaving chilled water control (*ECW CONTROL OPTION* is set to 0 [DSABLE] TEMP_CTL screen) and a common point sensor is desired (*COMMON SENSOR OPTION* in LEADLAG screen selected as 1) then the sensor is wired in Spare Temp #1 position on the CCM (terminals J4-25 and J4-26).

If the entering chilled water control option (*ECW CONTROL OPTION*) is enabled (configured in TEMP_CTL screen) and a common point sensor is desired (*COMMON SENSOR OPTION* in LEADLAG screen selected as 1) then the sensor is wired in Spare Temp #2 position on the CCM (terminals J4-27 and J4-28).

When installing chillers in series, either a common point sensor should be used (preferred), or the *LEAVING CHILLED WATER* sensor of the upstream chiller must be moved into the leaving chilled water pipe of the downstream chiller. In this application the *COMMON SENSOR OPTION* should only be enabled for the upstream chiller if that chiller is configured as the Lead.

If *ENTERING CHILLED WATER* control is required on chillers piped in series, either the common point return chilled water sensor should be used (preferred), or the *LEAVING CHILLED WATER* sensor of the downstream chiller must be relocated to the *LEAVING CHILLED WATER* pipe of the upstream chiller. In this application, the *COMMON SENSOR OPTION* should only be enabled for the downstream chiller if that chiller is configured as the lead. Note that *ENTERING CHILLED WATER* control is not recommended for chillers installed in series due to potential control stability problems.

To properly control the *LEAVING CHILLED WATER TEMPERATURE* when chillers are piped in parallel, the water flow through the shutdown chiller(s) should be isolated so that no water bypass around the operating chiller occurs. However, if water bypass around the operating chiller is unavoidable, a common point sensor in the mixed *LEAVING CHILLED WATER* piping should be provided and enabled for the Lead chiller.

CHILLER COMMUNICATION WIRING — Refer to the chiller's Installation Instructions, Carrier Comfort Network® Interface section for information on chiller communication wiring.

LEAD/LAG OPERATION — The PIC III not only has the ability to operate 2 chillers in lead/lag, but it can also start a designated standby chiller when either the lead or lag chiller is faulted and capacity requirements are not met. The lead/lag option only operates when the chillers are in CCN mode. If any other chiller configured for lead/lag is set to the LOCAL or OFF modes, it will be unavailable for lead/lag operation.

Lead/Lag Chiller Configuration and Operation
- A chiller is designated the lead chiller when its *LEADLAG: CONFIGURATION* value on the LEADLAG screen is set to "1."
- A chiller is designated the lag chiller when its *LEADLAG: CONFIGURATION* value is set to "2."
- A chiller is designated as a standby chiller when its *LEADLAG: CONFIGURATION* value is set to "3."
- A value of "0" disables the lead/lag designation of a chiller. This setting should also be used when "normal" operation without regard to lead/lag rules is desired (in LOCAL or CCN mode).

When configuring the LAG ADDRESS value on the LEADLAG screen of chiller "A" enter the address of the chiller on the system which will serve as lag when/if chiller "A" is configured as lead. For example, if you are configuring chiller A, enter the address for chiller B as the lag address. If you are configuring chiller B, enter the address for chiller A as the lag address. This makes it easier to rotate the lead and lag chillers. Note that only the lag and standby chiller addresses specified in the configured lead chiller's table are relevant at a given time.

If the address assignments in the *LAG ADDRESS* and *STANDBY ADDRESS* parameters conflict, the lead/lag function is disabled and an alert (!) message displays. For example, if the *LAG ADDRESS* matches the lead chiller's address, the lead/lag will be disabled and an alert (!) message displayed. The lead/lag maintenance screen (LL_MAINT) displays the message 'INVALID CONFIG' in the L*EADLAG: CONFIGURATION* and *CURRENT MODE* fields.

The lead chiller responds to normal start/stop controls such as the occupancy schedule, a forced start or stop, and remote start contact inputs. After completing start-up and ramp loading, the PIC III evaluates the need for additional capacity. If additional capacity is needed, the PIC III initiates the start-up of the chiller configured at the *LAG ADDRESS*. If the lag chiller is faulted (in alarm) or is in the OFF or LOCAL modes, the chiller at the *STANDBY ADDRESS* (if configured) is requested to start. After the second chiller is started and is running, the lead chiller monitors conditions and evaluates whether the capacity has been reduced enough for the lead chiller to sustain the system alone. If the capacity is reduced enough for the lead chiller to sustain the *CONTROL POINT* temperatures alone, then the operating lag chiller is stopped.

If the lead chiller is stopped in CCN mode for any reason other than an alarm (*) condition, the lag and standby chillers are also stopped. If the configured lead chiller stops for an alarm condition, the configured lag chiller takes the lead chiller's place as the lead chiller, and the standby chiller serves as the lag chiller.

The *PRESTART FAULT TIMER* provides a timeout if there is a prestart alert condition that prevents a chiller from starting

in a timely manner. If the configured lead chiller does not complete its start-up before the PRESTART FAULT TIMER (a user-configured value) elapses, then the lag chiller starts, and the lead chiller shuts down. The lead chiller then monitors the lag, acting as the lead, for a start request. The *PRESTART FAULT TIMER* parameter is on the LEADLAG screen, which is accessed from the EQUIPMENT SERVICE table of the SERVICE menu.

If the lag chiller does not achieve start-up before the *PRESTART FAULT TIMER* elapses, the lag chiller stops, and the standby chiller is requested to start, if configured and ready.

Standby Chiller Configuration and Operation — A chiller is designated as a standby chiller when its *LEADLAG: CONFIGURATION* value on the LEADLAG screen is set to "3." The standby chiller can operate as a replacement for the lag chiller only if one of the other two chillers is in an alarm (*) condition (as shown on the ICVC panel). If both lead and lag chillers are in an alarm (*) condition, the standby chiller defaults to operate in CCN mode and will operate based on its configured CCN occupancy schedule and remote contacts input.

Lag Chiller Start-Up Requirements — Before the lag chiller can be started, the following conditions must be met:

1. The lag chiller status indicates it is in CCN mode and is not in an alarm condition. If the current lag chiller is in an alarm condition, the standby chiller becomes the active lag chiller, if it is configured and available.
2. Lead chiller ramp loading must be complete.
3. The configured *LAG STOP TIMER* entry has elapsed. The *LAG STOP TIMER* starts when the lead chiller ramp loading is completed or when a lag chiller stops. The *LAG STOP TIMER* entry is on the LEADLAG screen.
4. Lead chiller *ACTIVE DEMAND LIMIT* (see the MAINSTAT screen) value must be greater than 95% of full load amps.
5. Lead chilled water temperature must be greater than the *CONTROL POINT* temperature (see the MAINSTAT screen) plus $^1/_2$ the *CHILLED WATER DEADBAND* temperature (see the SETUP1 screen).

   NOTE: The chilled water temperature sensor may be the leaving chilled water sensor, the return water sensor, the common supply water sensor, or the common return water sensor, depending on which options are configured and enabled.
6. Lead chiller temperature pulldown rate (*TEMP PULLDOWN DEG/MIN* on the TEMP_CTL screen) of the chilled water temperature is less than 0.5° F (0.27° C) per minute for a cumulative duration greater than the *PULLDOWN TIMER* setting in the LEAD/LAG screen.

When all the above requirements have been met, the lag chiller is commanded to a STARTUP mode (indicated by "CONTRL" flashing next to the *CHILLER START/STOP* parameter in the MAINSTAT screen). The PIC III control then monitors the lag chiller for a successful start. If the lag chiller fails to start, the standby chiller, if configured, is started.

Lead/Lag Pulldown Timer Operation — Some lead/lag chiller applications with large chilled liquid loop volumes must accommodate intermittent slugs of warm *ENTERING CHILLED WATER* for short time periods. This type of transient condition can result when a control valve rapidly opens to allow flow through a previously isolated branch or zone within the chilled liquid system. A *PULLDOWN TIMER* can be configured to delay starting the lag chiller so it does not excessively cycle on and off for short time periods when intermittent slugs of warm *ENTERING CHILLED WATER* pass through the chillers. A larger *PULLDOWN TIMER* entry gives the warm slug of water more time to pass through the chillers before the lag chiller can start.

The chiller *CONTROL POINT* can be configured to either *LEAVING CHILLED WATER* or *ENTERING CHILLED WATER* temperature. The PIC controls monitor the temperature pulldown rate of the CHILLED WATER and display the result as *CHILL WATER PULLDOWN/MIN* in the HEAT_EX screen. Samples of the CHILLED WATER temperature are taken once every 10 seconds and compared against the previous CHILLED WATER sample. A positive value of *CHILL WATER PULLDOWN/MIN* indicates that the CHILLED WATER temperature is decreasing between successive samples. If *CHILL WATER PULLDOWN/MIN* rate is a minimum of 0.5 degrees F per minute then the PULLDOWN: SATISFIED parameter in the LL_MAINT screen displays YES, otherwise, the PULLDOWN: SATISFIED parameter displays NO.

If the lead chiller is unable to achieve the *CONTROL POINT,* the lag chiller will not start unless the lead chiller is unable to maintain a *CHILL WATER PULLDOWN/MIN* rate of 0.5 degrees F per minute for a time period equal to the number of minutes entered in the *PULLDOWN TIMER* parameter. *PULLDOWN TIME* in the LL_MAINT screen displays the remaining delay left before the lag chiller is allowed to start based on the pulldown timer. *PULLDOWN TIME* will count down starting at the value entered in *PULLDOWN TIMER* under the following conditions:

Ramp Loading is Complete

AND

PULLDOWN: SATISFIED = NO

The lag chiller pulldown start condition is met when P*ULLDOWN TIME* lapses to 0.0 min.

If PULLDOWN: SATISFIED changes to YES as the *PULLDOWN TIME* is counting down to zero, the *PULLDOWN TIME* will start to count back up provided that the CHILLED WATER temperature has not fallen to less than the *CONTROL POINT* plus one half of the *CHILLED WATER DEADBAND*. The *PULLDOWN TIME* will start to count back down again should PULLDOWN: SATISFIED change back to NO. The *PULLDOWN TIME* will be immediately reset to the value entered in the *PULLDOWN TIMER* parameter if the CHILLED WATER temperature decreases to less than the *CONTROL POINT* plus $^1/_2$ of the *CHILLED WATER DEADBAND*.

Lag Chiller Shutdown Requirements — The following conditions must be met in order for the lag chiller to be stopped.

1. Lead chiller AVERAGE LINE CURRENT or *MOTOR PERCENT KILOWATTS* (on the MAINSTAT screen) is less than the lead chiller percent capacity.

   NOTE: Lead Chiller Percent Capacity = 115 – *LAG % CAPACITY*. The *LAG % CAPACITY* parameter is on the LEADLAG screen, which is accessed from the EQUIPMENT SERVICE table on the SERVICE menu.
2. The lead chiller chilled water temperature is less than the *CONTROL POINT* temperature (see the MAINSTAT screen) plus $^1/_2$ the *CHILLED WATER DEADBAND* temperature (see the SETUP1 screen).
3. The configured *LAG STOP TIMER* entry has elapsed. The *LAG STOP TIMER* starts when the lead chiller chilled water temperature is less than the chilled water CONTROL POINT plus $^1/_2$ of the *CHILLED WATER DEADBAND* and the lead chiller compressor motor load (*MOTOR PERCENT KILOWATT* or *AVERAGE LINE CURRENT* on the MAINSTAT screen) is less than the Lead Chiller Percent Capacity.

NOTE: Lead Chiller Percent Capacity = 115 – *LAG % CAPACITY*. The *LAG % CAPACITY* parameter is on the LEADLAG screen, which is accessed from the EQUIPMENT SERVICE table on the SERVICE menu.

FAULTED CHILLER OPERATION — If the lead chiller shuts down because of an alarm (*) condition, it stops

communicating to the lag and standby chillers. After 30 seconds, the lag chiller becomes the acting lead chiller and starts and stops the standby chiller, if necessary.

If the lag chiller goes into alarm when the lead chiller is also in alarm, the standby chiller reverts to a stand-alone CCN mode of operation.

If the lead chiller is in an alarm (*) condition (as shown on the ICVC panel), press the RESET softkey to clear the alarm. The chiller is placed in CCN mode. The lead chiller communicates and monitors the RUN STATUS of the lag and standby chillers. If both the lag and standby chillers are running, the lead chiller does not attempt to start and does not assume the role of lead chiller until either the lag or standby chiller shuts down. If only one chiller is running, the lead chiller waits for a start request from the operating chiller. When the configured lead chiller starts, it assumes its role as lead chiller.

If the lag chiller is the only chiller running when the lead chiller assumes its role as a lead chiller then the lag chiller will perform a *RECOVERY START REQUEST* (LL_MAINT screen). The lead chiller will start up when the following conditions are met.

1. Lag chiller ramp loading must be complete.
2. Lag *CHILLED WATER TEMP* (MAINSTAT screen) is greater than *CONTROL POINT* plus $^1/_2$ the *CHILLED WATER DEADBAND* temperature.
3. Lag chiller *ACTIVE DEMAND LIMIT* value must be greater than 95% of full load amps.
4. Lag chiller temperature pulldown rate (*TEMP PULLDOWN DEG/MIN*) of the chilled water temperature is less than 0.5 F (0.27 C) per minute.
5. The standby chiller is not running as a lag chiller.
6. The configured *LAG START TIMER* configured in the lag (acting lead) chiller has elapsed. The *LAG START TIMER* is started when the lag (acting lead) chiller's ramp loading is completed.

LOAD BALANCING — When the *LOAD BALANCE OPTION* (see LEADLAG screen) is enabled, the lead chiller sets the *ACTIVE DEMAND LIMIT* in the lag chiller to the lead chiller's compressor motor load value *MOTOR PERCENT KILOWATTS* or *AVERAGE LINE CURRENT* on the MAINSTAT screen). This value has limits of 40% to 100%. In addition, the *CONTROL POINT* for the lag chiller must be modified to a value of 3 F (1.67 C) less than the lead chiller's *CONTROL POINT* value. If the *LOAD BALANCE OPTION* is disabled, the *ACTIVE DEMAND LIMIT* and the *CONTROL POINT* are both forced to the same value as the lead chiller.

AUTO. RESTART AFTER POWER FAILURE — When an auto. restart condition occurs, each chiller may have a delay added to the start-up sequence, depending on its lead/lag configuration. The lead chiller does not have a delay. The lag chiller has a 45-second delay. The standby chiller has a 90-second delay. The delay time is added after the chiller water flow is verified. The PIC III ensures the guide vanes are closed. After the guide vane position is confirmed, the delay for lag and standby chillers occurs prior to energizing the oil pump. The normal start-up sequence then continues. The auto. restart delay sequence occurs whether the chiller is in CCN or LOCAL mode and is intended to stagger the compressor motor starts. Preventing the motors from starting simultaneously helps reduce the inrush demands on the building power system.

Ice Build Control — The selectable ice build mode permits use of the chiller to refreeze or control the temperature of an ice reservoir which may, for example, be used for thermal storage. This mode differs from water or brine chilling in that termination (indication that the need for cooling has been satisfied) is based on input(s) other than the temperature which is being controlled during operation.

NOTE: For ice build control to operate properly, the PIC III must be in CCN mode.

The PIC III can be configured for ice build operation.

- From the SERVICE menu, access the EQUIPMENT SERVICE table. From there, select the OPTIONS screen to enable or disable the *ICE BUILD OPTION*. See Table 4, Example 18.
- The *ICE BUILD SETPOINT* can be configured from the SETPOINT display, which is accessed from the PIC III main menu. See Table 4, Example 9.
- The ice build schedule can be viewed or modified from the SCHEDULE table. From this table, select the ice build schedule (OCCPC02S) screen. See Fig. 23 and the section on Time Schedule Operation, page 28, for more information on modifying chiller schedules.

The ice build time schedule defines the period(s) during which ice build is active if the ice build option is enabled. If the ice build time schedule overlaps other schedules, the ice build time schedule takes priority. During the ice build period, the *CONTROL POINT* is set to the *ICE BUILD SETPOINT* for temperature control. The *ICE BUILD RECYCLE* and *ICE BUILD TERMINATION* parameters, accessed from the OPTIONS screen, allow the chiller operator to recycle or terminate the ice build cycle. The ice build cycle can be configured to terminate when:

- the *ENTERING CHILLED WATER* temperature is less than the *ICE BUILD SETPOINT*. In this case, the operator sets the *ICE BUILD TERMINATION* parameter to 0 (the default setting) on the OPTIONS screen.
- the ICE BUILD CONTACTS input from an ice level indicator are opened. In this case, the operator sets the *ICE BUILD TERMINATION* parameter to 1 on the OPTIONS screen.
- the chilled water temperature is less than the *ICE BUILD SETPOINT* and the ICE BUILD CONTACTS input from an ice level indicator are open. In this case, the operator sets the *ICE BUILD TERMINATION* parameter to 2 on the OPTIONS screen.
- the end of the ice build time schedule (OCCPC02S) has been reached.

ICE BUILD INITIATION — The ice build time schedule (OCCPC02S) is the means for activating the ice build option. Ice Build is enabled if:

- a day of the week and a time period on the ice build time schedule are enabled. The SCHEDULE screen shows an X in the day field and ON/OFF times are designated for the day(s),
- *and* the *ICE BUILD OPTION* is enabled.

The following events take place (unless overridden by a higher authority CCN device).

- *CHILLER START/STO*P is forced to START.
- The *CONTROL POINT* is forced to the *ICE BUILD SETPOINT*.
- Any force (Auto) is removed from the *ACTIVE DEMAND LIMIT*.

NOTE: A parameter's value can be forced, that is, the value can be manually changed at the ICVC by an operator, changed from another CCN device, or changed by other algorithms in the PIC III control system.

NOTE: The Ice Build steps do not occur if the chiller is configured and operating as a lag or standby chiller for lead/lag operation and is actively being controlled by a lead chiller. The lead chiller communicates the *ICE BUILD SET POINT*, the desired *CHILLER START/STOP* state, and the *ACTIVE DEMAND LIMIT* to the lag or standby chiller as required for ice build, if configured to do so.

START-UP/RECYCLE OPERATION — If the chiller is not running when ice build activates, the PIC III checks the following conditions, based on the *ICE BUILD TERMINATION* value, to avoid starting the compressor unnecessarily:

- if *ICE BUILD TERMINATION* is set to the TEMP option and the *ENTERING CHILLED WATER* temperature is less than or equal to the *ICE BUILD SETPOINT*;
- if *ICE BUILD TERMINATION* is set to the CONTACTS option and the ICE BUILD CONTACT is open;
- if the *ICE BUILD TERMINATION* is set to the BOTH (temperature and contacts) option and the *ENTERING CHILLED WATER* temperature is less than or equal to the *ICE BUILD SETPOINT* and the ICE BUILD CONTACT is open.

The *ICE BUILD RECYCLE* on the OPTIONS screen determines whether or not the chiller will go into an ice build RECYCLE mode.

- If the *ICE BUILD RECYCLE* is set to DSABLE (disable), the PIC III reverts to normal (non-ice build) temperature control when the ice build function is terminated by satisfying one of the above conditions. Once ice build is terminated in this manner, it will not be re-initiated until the next ice build schedule period begins.
- If the *ICE BUILD RECYCLE* is set to ENABLE, the PIC III goes into an *ICE BUILD RECYCLE* mode, and the chilled water pump relay remains energized to keep the chilled water flowing when the compressor shuts down. If the temperature of the *LEAVING CHILLED WATER* later increases above the *ICE BUILD SETPOINT* plus half the *RECYCLE RESTART DELTA T* value, the compressor restarts, controlling the chilled water/brine temperature to the *ICE BUILD SETPOINT*.

TEMPERATURE CONTROL DURING ICE BUILD — During ice build, the capacity control algorithm shall use the *CONTROL POINT* minus 5 F (–2.8 C) for control of the *LEAVING CHILLED WATER* temperature. The *ECW CONTROL OPTION* and any temperature reset option shall be ignored, if enabled, during ice build. Also, the following control options will be ignored during ice build operation:

- *ECW CONTROL OPTION* and any temperature reset options (configured on TEMP_CTL screen).
- *20 mA DEMAND LIMIT OPT* (configured on RAMP_DEM screen).

TERMINATION OF ICE BUILD — The ice build function terminates under the following conditions:

1. Time Schedule — When the current time on the ice build time schedule (OCCPC02S) is *not* set as an ice build time period.
2. Entering Chilled Water Temperature — Ice build operation terminates, based on temperature, if the *ICE BUILD TERMINATION* parameter is set to 0 (TEMP), the *ENTERING CHILLED WATER* temperature is less than the *ICE BUILD SETPOINT*, and the *ICE BUILD RECYCLE* is set to DSABLE. If the *ICE BUILD RECYCLE OPTION* is set to ENABLE, a recycle shutdown occurs and recycle start-up depends on the *LEAVING CHILLED WATER* temperature being greater than the water/brine *CONTROL POINT* plus the *RESTART DELTA T* temperature.
3. Remote Contacts/Ice Level Input — Ice build operation terminates when the *ICE BUILD TERMINATION* parameter is set to 1 (CONTACTS) and the *ICE BUILD CONTACTS* are open and the *ICE BUILD RECYCLE* is set to DSABLE (0). In this case, the *ICE BUILD CONTACTS* provide ice level termination control. The contacts are used to stop the ice build function when a time period on the ice build schedule (OCCPC02S) *is* set for ice build operation. The remote contacts can still be opened and closed to start and stop the chiller when a specific time period on the ice build schedule is *not* set for ice build.
4. Entering Chilled Water Temperature and ICE BUILD Contacts — Ice Build operation terminates when the *ICE BUILD TERMINATION* parameter is set to 2 (BOTH) and the conditions described above in items 2 and 3 for *ENTERING CHILLED WATER* temperature and *ICE BUILD CONTACTS* have occurred.

NOTE: It is not possible to override the *CHILLER START/STOP, CONTROL POINT*, and *ACTIVE DEMAND LIMIT* variables from CCN devices (with a priority 4 or greater) during the ice build period. However, a CCN device can override these settings during 2-chiller lead/lag operation.

RETURN TO NON-ICE BUILD OPERATIONS — The ice build function forces the chiller to start, even if all other schedules indicate that the chiller should stop. When the ice build function terminates, the chiller returns to normal temperature control and start/stop schedule operation. The *CHILLER START/STOP* and *CONTROL POINT* return to normal operation. If the *CHILLER START/STOP* or *CONTROL POINT* has been forced (with a device of less than 4 priority) before the ice build function started, when the ice build function ends, the previous forces (of less than 4 priority) are not automatically restored.

Attach to Network Device Control — The Service menu includes the ATTACH TO NETWORK DEVICE screen. From this screen, the operator can:

- enter the time schedule number (if changed) for OCCPC03S, as defined in the NET_OPT screen
- attach the ICVC to any CCN device, if the chiller has been connected to a CCN network. This may include other PIC-controlled chillers.
- upgrade software

Figure 30 shows the ATTACH TO NETWORK DEVICE screen. The *LOCAL* parameter is always the ICVC module address of the chiller on which it is mounted. Whenever the controller identification of the ICVC changes, the change is reflected automatically in the BUS and ADDRESS columns for the local device. See Fig. 21. Default address for local device is BUS 0 ADDRESS 1.

When the ATTACH TO NETWORK DEVICE screen is accessed, information can not be read from the ICVC on any device until one of the devices listed on that screen is attached. The ICVC erases information about the module to which it was attached to make room for information on another device. Therefore, a CCN module must be attached when this screen is entered.

To attach any CCN device, highlight it using the SELECT softkey and press the ATTACH softkey. The message "UPLOADING TABLES, PLEASE WAIT" displays. The ICVC then uploads the highlighted device or module. If the module address cannot be found, the message "COMMUNICATION FAILURE" appears. The ICVC then reverts back to the ATTACH TO DEVICE screen. Try another device or check the address of the device that would not attach. The upload process time for each CCN module is different. In general, the uploading process takes 1 to 2 minutes. Before leaving the ATTACH TO NETWORK DEVICE screen, select the LOCAL device. Otherwise, the ICVC will be unable to display information on the local chiller.

ATTACHING TO OTHER CCN MODULES — If the chiller ICVC has been connected by CCN wiring to the CCN network or other PIC controlled chillers, the ICVC can be used to view or change parameters on the other controllers. Other PIC III chillers can be viewed and set points changed (if the other unit is in CCN control), if desired, from this particular ICVC module.

If the module number is not valid, the "COMMUNICATION FAILURE" message will show and a new address number must be entered or the wiring checked. If the module is communicating properly, the "UPLOAD IN PROGRESS" message will flash and the new module can now be viewed.

Whenever there is a question regarding which module on the ICVC is currently being shown, check the device name descriptor on the upper left hand corner of the ICVC screen. See Fig. 30.

When the CCN device has been viewed, the ATTACH TO NETWORK DEVICE table should be used to attach to the PIC that is on the chiller. Move to the ATTACH TO NETWORK DEVICE table (LOCAL should be highlighted) and press the ATTACH softkey to upload the LOCAL device. The ICVC for the 19XRV will be uploaded and default screen will display.

NOTE: The ICVC will not automatically reattach to the local module on the chiller. Press the ATTACH softkey to attach to the LOCAL device and view the chiller operation.

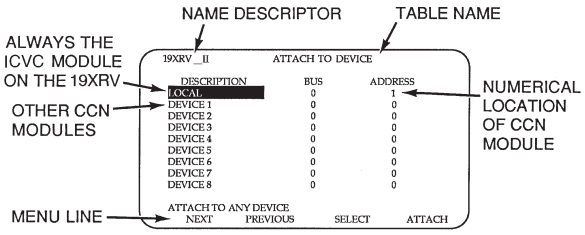
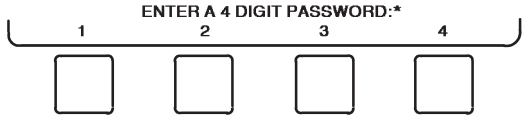


Fig. 30 — Example of Attach to Network Device Screen

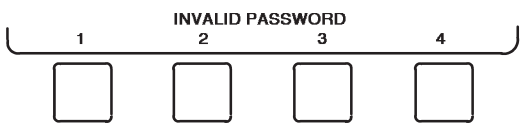
Service Operation — An overview of the tables and screens available for the SERVICE function is shown in Fig. 21.

TO ACCESS THE SERVICE SCREENS — When the SERVICE screens are accessed, a password must be entered.

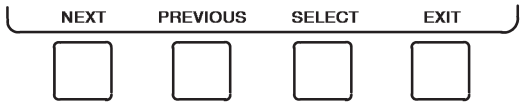
1. From the main MENU screen, press the SERVICE softkey. The softkeys now correspond to the numerals 1, 2, 3, 4.
2. Press the four digits of the password, one at a time. An asterisk (*) appears as each digit is entered.



NOTE: The initial factory-set password is 1-1-1-1. If the password is incorrect, an error message is displayed.



If this occurs, return to Step 1 and try to access the SERVICE screens again. If the password is correct, the softkey labels change to:



NOTE: The SERVICE screen password can be changed by entering the ICVC CONFIGURATION screen under SERVICE menu. The password is located at the bottom of the menu.

The ICVC screen displays the following list of available SERVICE screens:

- Alarm History
- Alert History
- Control Test
- Control Algorithm Status
- Equipment Configuration
- VFD Config Data
- Equipment Service
- Time and Date
- Attach to Network Device
- Log Out of Device
- ICVC Configuration

See Fig. 21 for additional screens and tables available from the SERVICE screens listed above. Use the EXIT softkey to return to the main MENU screen.

NOTE: To prevent unauthorized persons from accessing the ICVC service screens, the ICVC automatically signs off and password-protects itself if a key has not been pressed for 15 minutes. The sequence is as follows. Fifteen minutes after the last key is pressed, the default screen displays, the ICVC screen light goes out (analogous to a screen saver), and the ICVC logs out of the password-protected SERVICE menu. Other screen and menus, such as the STATUS screen can be accessed without the password by pressing the appropriate softkey.

TO LOG OUT OF NETWORK DEVICE — To access this screen and log out of a network device, from the default ICVC screen, press the MENU and SERVICE softkeys. Enter the password and, from the SERVICE menu, highlight LOG OUT OF NETWORK DEVICE and press the SELECT softkey. The ICVC default screen will now be displayed.

TIME BROADCAST ENABLE — The first displayed line, "Time Broadcast Enable," in the SERVICE/EQUIPMENT CONFIGURATION/BRODEF screen, is used to designate the local chiller as the sole time broadcaster on a CCN network (there may only be one). If there is no CCN network present and/or there is no designated time broadcaster on the network, current time and date, Daylight Saving Time (DST), and holidays as configured in the local chiller's control will be applied. If a network is present and one time broadcaster on the network has been enabled, current time and date, DST, and holiday schedules as configured in the controls of the designated time broadcaster will be applied to all CCN devices (including chillers) on the network.

HOLIDAY SCHEDULING (FIG. 31) — Up to 18 different holidays can be defined for special schedule consideration. There are two different screens to be configured. First, in the SERVICE/EQUIPMENT CONFIGURATION/HOLIDAYS screen, select the first unused holiday entry (HOLDY01S, for example). As shown in Fig. 26, enter a number for Start Month (1 = January, 2 = February, …, 12 = December), a number for Start Day (1 - 31), and Duration in days (0 - 99). By default there are no holidays set up. Second, in the occupancy Schedule tables, specify and enable (by setting "X" under the "H" column) run time period(s) which will apply to all holidays. (Refer to Fig. 23.) A run time period which is enabled for holidays may be applied to one or more non-holiday days of the week as well. This may be done for the local (table OCCPC01S), Ice Build (OCCPC02S), and/or CCN (OCCPC03S) schedule(s). If the chiller is on a CCN network, the active holiday definition will be that configured in the device designated at

the sole time broadcaster (if one is so enabled). See the TIME BROADCAST ENABLE section.

The broadcast function must be activated for the holidays configured on the HOLIDEF screen to work properly. Access the BRODEF screen from the EQUIPMENT CONFIGURATION table and select ENABLE to activate the function. Note that when the chiller is connected to a CCN Network, only one chiller or CCN device can be configured as the broadcast device. The controller that is configured as the broadcaster is the device responsible for transmitting holiday, time, and daylight-savings dates throughout the network.

To access the BRODEF screen, see the SERVICE menu structure, Fig. 21.

To view or change the holiday periods for up to 18 different holidays, perform the following operation:

1. At the Menu screen, press SERVICE to access the Service menu.
2. If not logged on, follow the instructions for Attach to Network Device or To Log Out. Once logged on, press NEXT until Equipment Configuration is highlighted.
3. Once Equipment Configuration is highlighted, press SELECT to access.
4. Press NEXT until HOLIDAYS is highlighted. This is the Holiday Definition table.
5. Press SELECT to enter the Data Table Select screen. This screen lists 18 holiday tables.
6. Press NEXT to highlight the holiday table that is to be viewed or changed. Each table is one holiday period, starting on a specific date, and lasting up to 99 days.
7. Press SELECT to access the holiday table. The Configuration Select table now shows the holiday start month and day, and how many days the holiday period will last.
8. Press NEXT or PREVIOUS to highlight the month, day, or duration.
9. Press SELECT to modify the month, day, or duration.
10. Press INCREASE or DECREASE to change the selected value.
11. Press ENTER to save the changes.
12. Press EXIT to return to the previous menu.

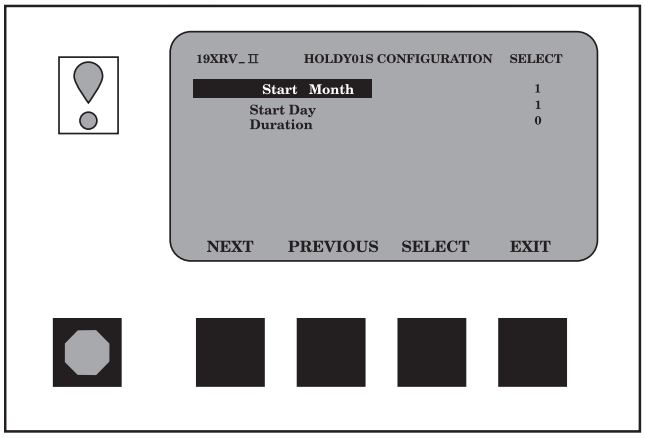


Fig. 31 — Example of Holiday Period Screen

DAYLIGHT SAVING TIME CONFIGURATION — The BRODEF table also defines Daylight Saving Time (DST) changes. This feature is by default enabled, and the settings should be reviewed and adjusted if desired. The following line-item entries are configurable for both DST "Start" and "Stop," and they are defined in Table 8.

To disable the Daylight Savings Time function simply enter 0 minutes for "Start Advance" and "Stop Back."

Table 8 — Daylight Saving Time Values

ITEM	DEFINITION
MONTH	1 = January, 2 = February, …, 12 = December.
DAY OF WEEK	1 = Monday,…, 7 = Sunday
WEEK	1 = first occurrence of selected Day of Week in the selected month, 2 = second occurrence of the selected Day, etc. This is not necessarily what one would conclude from looking at a standard calendar. For example, April 7, 2011, is Day 4 Week 1, but April 8, 2011, is Day 5 Week 2.
TIME	Time of day in 24-hour format when the time advance or set back will occur.
ADVANCE/BACK	"Advance" occurs first in the year, setting the time ahead by the specified number of minutes on the selected date. "Back" sets the time back by the specified amount (later in the year).

START-UP/SHUTDOWN/ RECYCLE SEQUENCE (FIG. 32)

Local Start-Up — The timing of a normal start-up will change when Auto-Restart After Power Failure is enabled. See the section on Auto-Restart After Power Failure. Local start-up (or a manual start-up) is initiated by pressing the LOCAL menu softkey on the default ICVC screen. Local start-up can proceed when the chiller schedule indicates that the CURRENT TIME and CURRENT DATE have been established as a run time and date, and after the internal timers have expired. The timers include a 15-minute start-to-start timer and a 1-minute stop-to-start timer, which together serve to prevent excessive cycling and abuse of the motor. The value of these timers is displayed as START INHIBIT TIMER and can be viewed on the MAINSTAT and DEFAULT screens. Both timers must expire before the chiller will start. If the timers have not expired, the RUN STATUS parameter on the MAINSTAT screen will read TIMEOUT. If Auto-Restart After Power Failure is enabled, the start to start timer is now a maximum of 10 seconds, and the stop to start timer is now a maximum of 10 seconds.

NOTE: The time schedule is said to be "occupied" if the *OCCUPIED ?* parameter on the MAINSTAT screen is set to YES. For more information on occupancy schedules, see the sections on Time Schedule Operation (page 28), Occupancy Schedule (page 47), and To Prevent Accidental Start-Up (page 81), and Fig. 23.

If the *OCCUPIED ?* parameter on the MAINSTAT screen is set to NO, the chiller can be forced to start as follows. From the default ICVC screen, press the MENU and STATUS softkeys. Scroll to highlight MAINSTAT. Press the SELECT softkey. Scroll to highlight *CHILLER START/STOP*. Press the START softkey to override the schedule and start the chiller.

NOTE: The chiller will continue to run until this forced start is released, regardless of the programmed schedule. To release the forced start, highlight *CHILLER START/STOP* from the MAINSTAT screen and press the RELEASE softkey. This

action returns the chiller to the start and stop times established by the schedule.

The chiller may also be started by overriding the time schedule. From the default screen, press the MENU and SCHEDULE softkeys. Scroll down and select the current schedule. Select OVERRIDE, and set the desired override time.

Another condition for start-up must be met for chillers that have the *REMOTE CONTACTS OPTION* on the EQUIPMENT SERVICE screen set to ENABLE. For these chillers, the *REMOTE START CONTACT* parameter on the MAINSTAT screen must be CLOSED. From the ICVC default screen, press the MENU and STATUS softkeys. Scroll to highlight MAINSTAT and press the SELECT softkey. Scroll down the MAINSTAT screen to highlight *REMOTE START CONTACT* and press the SELECT softkey. Then, press the CLOSE softkey. To end the override, select *REMOTE CONTACTS INPUT* and press the RELEASE softkey.

Once local start-up begins, the PIC III performs a series of pre-start tests to verify that all pre-start alerts and safeties are within the limits shown in Table 9. The *RUN STATUS* parameter on the MAINSTAT screen line now reads PRESTART. If a test is not successful, the start-up is delayed or aborted. If the tests are successful, the CHILLED WATER PUMP relay energizes, and the RUN STATUS line now reads STARTUP. See Table 9.

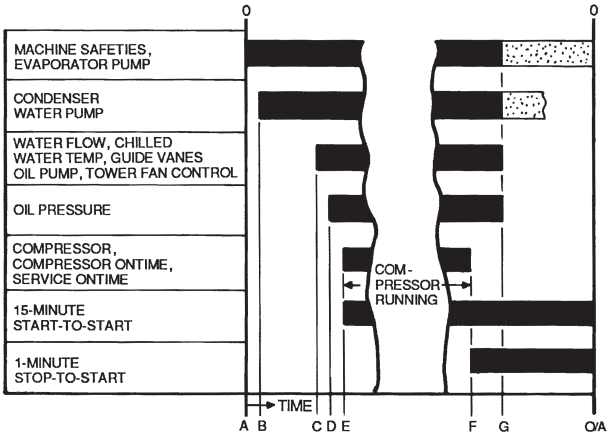
Five seconds later, the CONDENSER WATER PUMP relay energizes. Thirty seconds later, the PIC III monitors the chilled water and condenser water flow devices and waits until the *WATER FLOW VERIFY TIME* (operator-configured, default 5 minutes) expires to confirm flow. After flow is verified, the chilled 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 III turns off the CONDENSER WATER PUMP relay and goes into a RECYCLE mode.

NOTE: The 19XRV units are not available with factory-installed chilled water or condenser water flow devices (available as an accessory for use with the CCM control board).

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 or if Auto-Restart is not enabled, the start-up is delayed until the PIC III closes the vanes. If the vanes are closed or if Auto-Restart is enabled, and the oil pump pressure is less than 4 psi (28 kPa), the oil pump relay energizes. The PIC III then waits until the oil pressure (*OIL PRESS VERIFY TIME*, operator-configured, default of 40 seconds) reaches a maximum of 18 psi (124 kPa). After oil pressure is verified, the PIC III waits 40 seconds, and the VFD 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 III aborting the start and displaying the applicable pre-start mode of failure on the ICVC default screen. A pre-start failure does not advance the *STARTS IN 12 HOURS* counter. Any failure after the VFD has energized results in a safety shutdown, advances the starts in 12 hours counter by one, and displays the applicable shutdown status on the ICVC display. The minimum time to complete the entire prestart sequence is approximately 185 seconds if Auto-Restart is not enabled.



A — START INITIATED: Pre-start checks are made; evaporator pump started. When Auto-Restart After Power Failure is enabled, a faster timing sequence is used.

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 deenergized (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).

Fig. 32 — Control Timing Sequence When Auto-Restart Is Not Enabled

Shutdown Sequence — Chiller shutdown begins if any of the following occurs:

- the STOP button is pressed for at least one second (the alarm light blinks once to confirm the stop command)
- a recycle condition is present (see Chilled Water Recycle Mode section)
- the time schedule has gone into unoccupied mode
- the chiller protective limit has been reached and chiller is in alarm
- the start/stop status is overridden to stop from the CCN network or the ICVC

When a stop signal occurs, the shutdown sequence first stops the compressor by deactivating the VFD output to the motor. A status message of "SHUTDOWN IN PROGRESS, COMPRESSOR DEENERGIZED" is displayed, and the compressor ontime and service ontime stop. The guide vanes are then brought to the closed position. The oil pump relay and the chilled water/brine pump relay shut down 60 seconds after the compressor stops. The condenser water pump shuts down at the same time if the *ENTERING CONDENSER WATER* temperature is greater than or equal to 115 F (46.1 C) and the *CONDENSER REFRIG TEMP* is greater than the *CONDENSER FREEZE POINT* plus 5 F (–15.0 C). The stop-to-start timer now begins to count down. If the start-to-start timer value is still greater than the value of the start-to-stop timer, then this time displays on the ICVC.

Table 9 — Prestart Checks

QUANTITY CHECKED	REQUIREMENT	ALERT STATE IF FALSE
STARTS IN 12 HOURS	< 8 (not counting recycle restarts or auto restarts after power failure) ALERT is cleared once RESET is pressed.	100
COMP THRUST BRG TEMP	[COMP THRUST BRG TRIP] setting < [COMP THRUST BRG ALERT] setting (SETUP1)	101
COMP MOTOR WINDING TEMP	< [COMP MOTOR TEMP OVERRIDE] –10 F (5.6 C)	102
COMP DISCHARGE TEMP	< [COMP DISCHARGE ALERT] –10 F (5.6 C)	103
EVAPORATOR REFRIG TEMP	> [EVAP REFRIG TRIPPOINT] + [REFRIG OVERRIDE DELTA T]	104
OIL SUMP TEMP	> 150 F (65.5 C) and > [EVAPORATOR REFRIG TEMP] + 50 F (27.8 C)	105
CONDENSER PRESSURE	< [COND PRESS OVERRIDE] –20 PSI (138 kPa) and < 145 psi (1000 kPa)	106
PERCENT LINE VOLTAGE	> [Undervoltage Threshold]	107
PERCENT LINE VOLTAGE	> [Overvoltage Threshold]	108
ACTUAL GUIDE VANE POS	Controls test guide vane calibration must be performed	109
RECTIFIER TEMPERATURE	< RECTIFIER TEMP OVERRIDE – 20 F (11.1° C)	110
INVERTER TEMPERATURE	< INVERTER TEMP OVERRIDE – 20 F (11.1° C)	111

Certain conditions that occur during shutdown can change this sequence.

- If the AVERAGE LINE CURRENT is greater than 5% after shutdown, the oil pump and chilled water pump remain energized and the alarm is displayed.
- The condenser pump shuts down when the *CONDENSER PRESSURE* is less than the *COND PRESS OVERRIDE* threshold minus 3.5 psi (24.1 kPa) and the *CONDENSER REFRIG TEMP* is less than or equal to the *ENTERING CONDENSER WATER* temperature plus 3 F (–1.6 C).
- If the chiller shuts down due to low refrigerant temperature, the chilled water pump continues to run until the *LEAVING CHILLED WATER* temperature is greater than the *CONTROL POINT* temperature, plus 5 F (2.8 C).

Automatic Soft Stop Amps Threshold — The soft stop amps threshold feature closes the guide vanes of the compressor automatically if a non-recycle, non-alarm stop signal occurs before the compressor motor is deenergized.

Any time the compressor is directed to STOP (except in the cases of a fault or recycle shutdown), the guide vanes are directed to close, and the compressor shuts off when any of the following is true:

- AVERAGE LINE CURRENT (%) drops below the SOFT STOP AMPS THRESHOLD
- ACTUAL GUIDE VANE POSITION drops below 4%
- 4 minutes have elapsed
- the STOP button is pressed twice

If the chiller enters an alarm state or if the compressor enters a RECYCLE mode, the compressor deenergizes immediately.

To activate the soft stop amps threshold feature, scroll to the bottom of OPTIONS screen on the ICVC. Use the INCREASE or DECREASE softkey to set the *SOFT STOP AMPS THRESHOLD* parameter to the percent of amps at which the motor will shut down. The default setting is 100% amps (no soft stop). The range is 40 to 100%.

When the soft stop amps threshold feature is being applied, a status message, "SHUTDOWN IN PROGRESS, COMPRESSOR UNLOADING" displays on the ICVC.

The soft stop amps threshold function can be terminated and the compressor motor deenergized immediately by pressing the STOP button twice.

Chilled Water Recycle Mode — The chiller may cycle off and wait until the load increases to restart when the compressor is running in a lightly loaded condition. This cycling is normal and is known as "recycle." A recycle shutdown is initiated when any of the following conditions are true:

- *LEAVING CHILLED WATER* temperature (or *ENTERING CHILLED WATER* temperature, if the *ECW CONTROL OPTION* is enabled) is more than 5 F (2.8 C) below the *CONTROL POINT*.
- *LEAVING CHILLED WATER* temperature (or *ENTERING CHILLED WATER* temperature, if the *ECW CONTROL OPTION* is enabled) is below the *CONTROL POINT*, and the chilled water temperature difference is less than the *(RECYCLE CONTROL) SHUTDOWN DELTA T* (configured in the EQUIPMENT SERVICE/SETUP1 table).
- the *LEAVING CHILLED WATER* temperature is within 3 F (1.7 C) of the *EVAP REFRIG TRIPPOINT*.

NOTE: Recycle shutdown will not occur if the CONTROL POINT has been modified (e.g., by a chilled water reset input) within the previous 5 minutes of operation.

Also, chilled water recycle logic does not apply to Ice Build operation (refer to page 58).

When the chiller is in RECYCLE mode, the chilled water pump relay remains energized so the chilled water temperature can be monitored for increasing load. The recycle control uses *RESTART DELTA T* to check when the compressor should be restarted. This is an operator-configured function which defaults to 5 F (2.8 C). This value can be viewed or modified on the SETUP1 table. The compressor will restart when the chiller is:

- in LCW CONTROL and the *LEAVING CHILLED WATER* temperature is greater than the *CONTROL POINT* plus the *(RECYCLE CONTROL) RESTART DELTA T*.
- in *ECW CONTROL* and the *ENTERING CHILLED WATER* temperature is greater than the *CONTROL POINT* plus the *(RECYCLE CONTROL) RESTART DELTA T*.

Once these conditions are met, the compressor initiates a start-up with a normal start-up sequence.

An alert condition may be generated if 5 or more recycle start-ups occur in less than 4 hours. Excessive recycling can reduce chiller life; therefore, compressor recycling due to extremely low loads should be reduced.

To reduce compressor recycling, use the time schedule to shut the chiller down during known low load operation period, or increase the chiller load by running the fan systems. If the hot gas bypass is installed, adjust the values to ensure that hot gas is energized during light load conditions. Increase the *(RECYCLE CONTROL) RESTART DELTA T* on the SETUP1 table to lengthen the time between restarts.

The chiller should not be operated below design minimum load without a hot gas bypass installed.

Safety Shutdown — A safety shutdown is identical to a manual shutdown with the exception that, during a safety shutdown, the ICVC displays the reason for the shutdown, the alarm light blinks continuously, and the spare alarm contacts are energized.

After a safety shutdown, the RESET softkey must be pressed to clear the alarm. If the alarm condition is still present, the alarm light continues to blink. Once the alarm is cleared, the operator must press the CCN or LOCAL softkeys to restart the chiller.

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
- pumpout unit instructions

Equipment Required

- mechanic's tools (refrigeration) including T30 torx
- True RMS digital multimeter with clamp-on current probe or True RMS digital clamp-on meter rated for at least 480 vac or 700 vdc
- electronic leak detector
- absolute pressure manometer or wet-bulb vacuum indicator (Fig. 33)
- 500-v insulation tester (megohmmeter) for compressor motors with nameplate voltage of 600 v or less, or a 5000-v insulation tester for compressor motor rated above 600 v

Using the Optional Storage Tank and Pumpout System — Refer to Positive Pressure Chillers with Storage Tanks section, page 84 for pumpout system preparation, refrigerant transfer, and chiller evacuation.

Remove Shipping Packaging — Remove any packaging material from the control panel, power panel, guide vane actuator, motor cooling and oil reclaim solenoids, motor and bearing temperature sensor covers, and the VFD.

Open Oil Circuit Valves — Check to ensure the oil filter isolation valves (Fig. 6 and 7) are open by removing the valve cap and checking the valve stem.

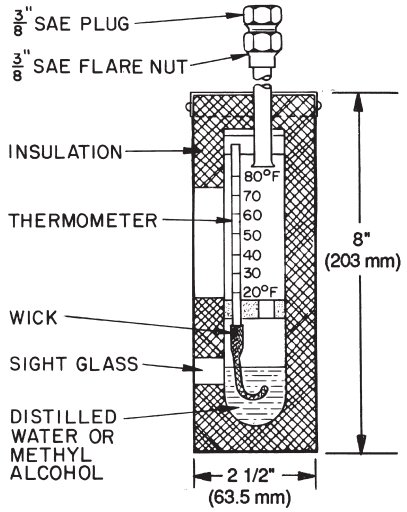


Fig. 33 — Typical Wet-Bulb Type Vacuum Indicator

Oil Charge — The oil charge for the 19XRV compressor depends on the compressor Frame size:

- Frame 2 compressor — 8 gal (30 L)
- Frame 3 compressor — 8 gal (30 L)
- Frame 4 compressor — 10 gal (37.8 L)
- Frame 4 compressor with split ring diffuser option — 12 gal (45 L)
- Frame 5 compressor — 18 gal (67.8 L)
- Frame E compressor — 18 gal (67.8 L)

The chiller is shipped with oil in the compressor. When the sump is full, the oil level should be no higher than the middle of the upper sight glass, and minimum level is the bottom of the lower sight glass (Fig. 2 and 3). If oil is added, it must meet Carrier's specification for centrifugal compressor use as described in the Oil Specification section. Charge the oil through the oil charging valve located near the bottom of the transmission housing (Fig. 2 and 3). 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.

Tighten All Gasketed Joints and Guide Vane Shaft Packing — Gaskets and packing normally relax by the time the chiller arrives at the jobsite. Tighten all gasketed joints and the guide vane shaft packing to ensure a leak-tight chiller. 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

Refer to Table 10 for bolt torque requirements.

Check Chiller Tightness — Figure 34 outlines the proper sequence and procedures for leak testing.

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

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

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 10 — Bolt Torque Requirements, Foot Pounds

BOLT SIZE (IN.)	SAE 2, A307 GR A HEX HEAD NO MARKS LOW CARBON STEEL		SAE 5, SA449 SOCKET HEAD OR HEX WITH 3 RADIAL LINES MEDIUM CARBON STEEL		SAE 8, SA354 GR BD HEX HEAD WITH 6 RADIAL LINES 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

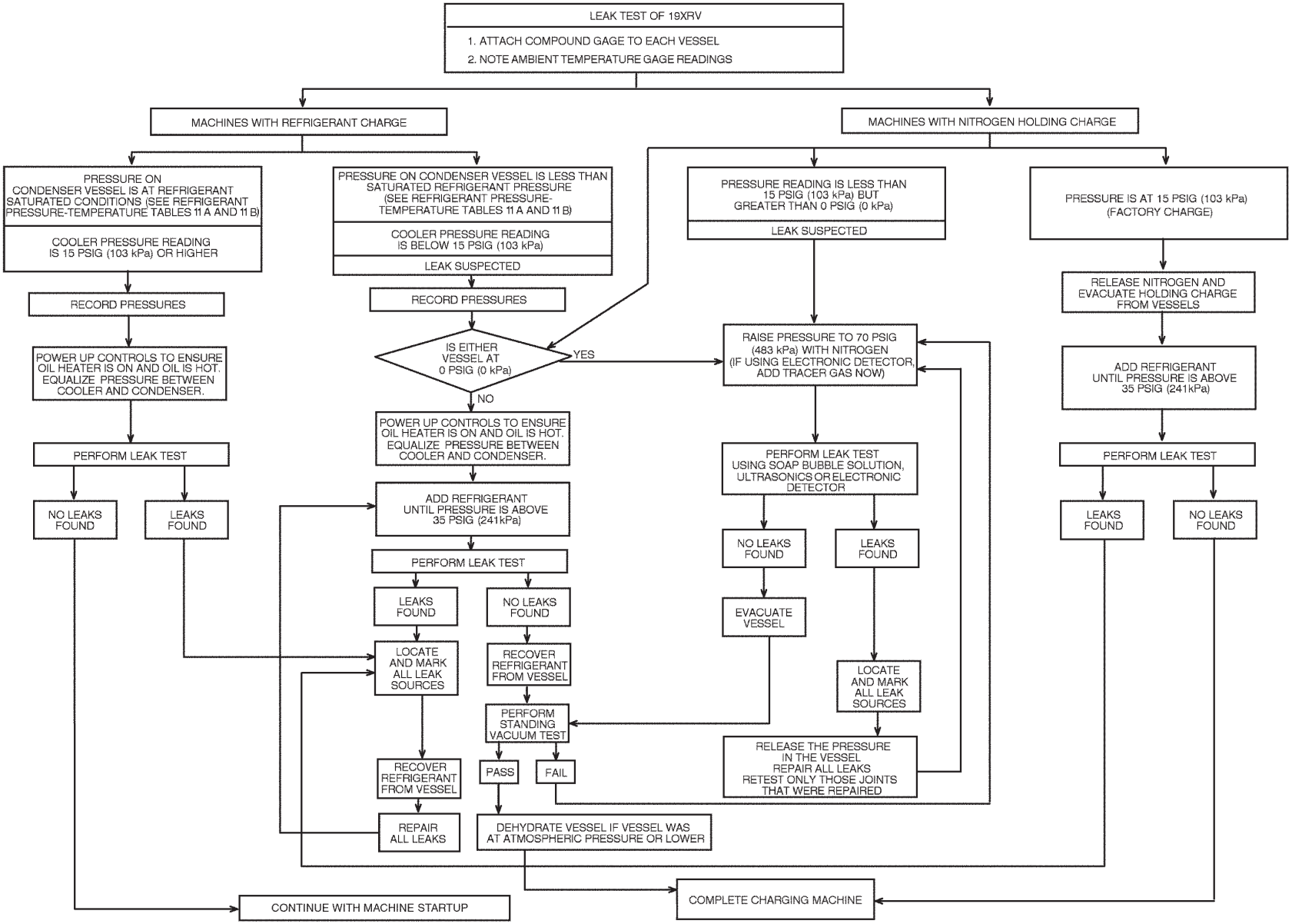


Fig. 34 — 19XRV Leak Test Procedures

Refrigerant Tracer — Carrier recommends the use of an environmentally acceptable refrigerant tracer for leak testing with an electronic detector or halide torch.

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.

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. See Fig. 34 for an outline of the leak test procedure. Refer to Fig. 35 and 36 during pumpout procedures and Tables 11A and 11B 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 the pumpout procedures in the Transfer Refrigerant from Storage Tank Vessel to Chiller section, page 85.

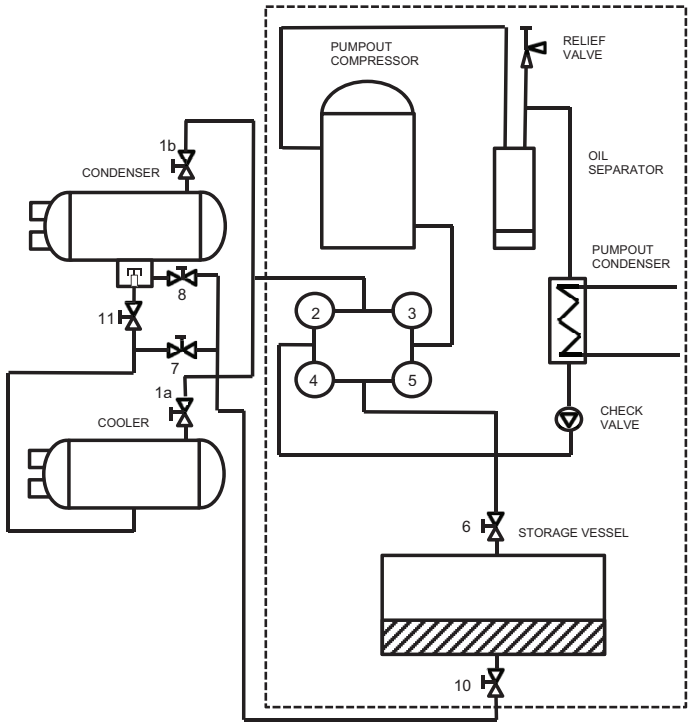
⚠ WARNING

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

   c. Leak test chiller as outlined in Steps 3-9.
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-h).
   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 70.
   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. Proceed with the test for small leaks (Steps 3-9).
3. Check the chiller carefully with an electronic leak detector, halide torch, 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 pumpout storage tank to the chiller (see Transfer Refrigerant from Storage Tank Vessel to Chiller section, page 85). Retest for leaks.
6. If no leak is found after a retest:
   a. Transfer the refrigerant to the pumpout 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. Charge the chiller with refrigerant (see Transfer Refrigerant from Storage Tank Vessel to Chiller section, page 85).
7. If a leak is found after a retest, pump the refrigerant back into the pumpout storage tank or, if isolation valves are present, pump the refrigerant into non-leaking vessel (see Pumpout and Refrigerant Transfer Procedures section).
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 wet bulb indicator. Dial gages cannot indicate the small amount of acceptable leakage during a short period of time.

1. Attach an absolute pressure manometer or wet bulb indicator to the chiller.
2. Evacuate the vessel (see Pumpout and Refrigerant Transfer Procedures section, page 84) to at least 18 in. Hg vac, ref 30-in. bar (41 kPa), 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. a. If the leakage rate is less than 0.05 in. Hg (0.17 kPa) in 24 hours, the chiller is sufficiently tight.
   b. If the leakage rate exceeds 0.05 in. Hg (0.17 kPa) in 24 hours, re-pressurize the vessel and test for leaks. If refrigerant is available in the other vessel, pressurize by following Steps 1 and 2 of Return Chiller To Normal Operating Conditions section, page 87. 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.



NOTE: Maintain at least 2 ft (610 mm) clearance around storage tank for service and operation work.

Fig. 35 — Typical Optional Pumpout System Piping Schematic with Storage Tank

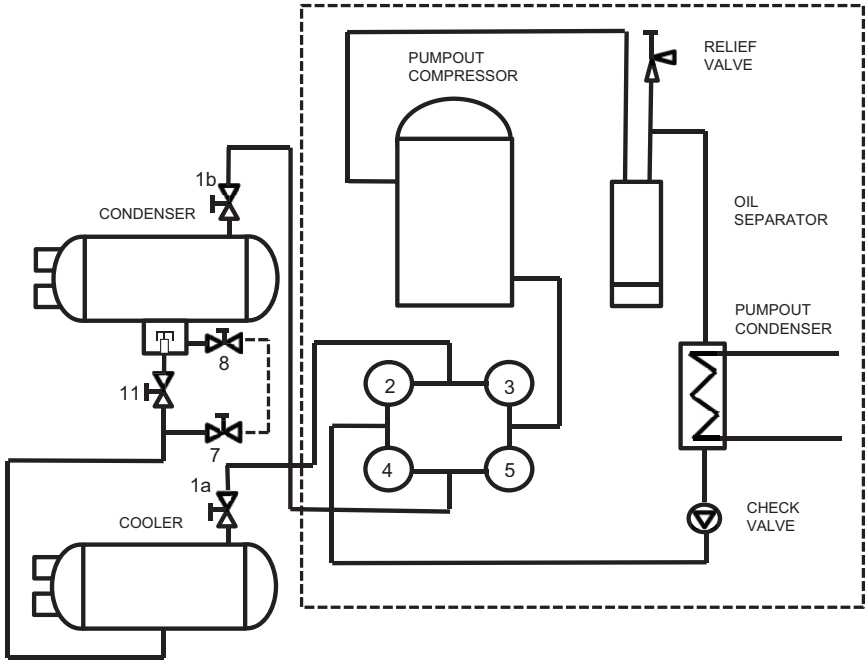


Fig. 36 — Typical Optional Pumpout System Piping Schematic without Storage Tank

Table 11A — HFC-134a Pressure — Temperature (F)

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

Table 11B — HFC-134a Pressure — Temperature (C)

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

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

⚠ CAUTION

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

Dehydration can be done at room temperatures. Using a cold trap (Fig. 37) may substantially reduce the time required to complete the dehydration. The higher the room temperature, the faster dehydration takes place. At low room temperatures, a very deep vacuum is required to boil off any moisture. If low ambient temperatures are involved, contact a qualified service representative for the dehydration techniques required.

Perform dehydration as follows:

1. Connect a high capacity vacuum pump (5 cfm [.002 m^3/s] or larger is recommended) to the refrigerant charging valve (Fig. 2 and 3). 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 wet bulb vacuum indicator to measure the vacuum. Open the shutoff valve to the vacuum indicator only when taking a reading. Leave the valve open for 3 minutes to allow the indicator vacuum to equalize with the chiller 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 29.8 in. Hg vac, ref 30 in. bar. (0.1 psia) (–100.61 kPa) or a vacuum indicator reads 35 F (1.7 C). Operate the pump an additional 2 hours.

   Do not apply a greater vacuum than 29.82 in. Hg vac (757.4 mm Hg) or go below 33 F (.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. Evacuate the vessel or chiller with the vacuum pump.

Inspect Water Piping — Refer to piping diagrams provided in the certified drawings. 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 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.

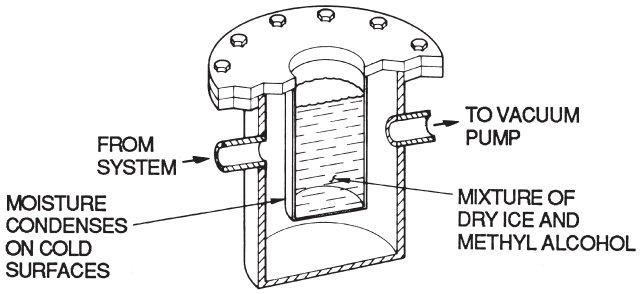


Fig. 37 — Dehydration Cold Trap

Check 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. See Fig. 35 and 36.

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 19XRV relief valves are set to relieve at the 185 psig (1275 kPa) chiller design pressure.

Identify the VFD — The LiquiFlo™ 2.0 AC drive is a PWM (Pulse Width Modulated), liquid-cooled drive that provides vector and general purpose regulation for a wide range of applications. Identify the drive from the Drive Part Number on the drive nameplate (Fig. 38) and the model number matrix in (Fig. 39).

NOTE: This publication provides start-up and service information for the LiquiFlo™ 2.0 (LF2) VFDs. For information on Std Tier VFDs, refer to associated Start-Up and Service Instructions for the Rockwell PowerFlex 755 VFD or the Eaton LCX 9000 VFD.

The VFD is designed to operate in the following environmental conditions:

CONDITION	SPECIFICATION
AMBIENT TEMPERATURE (OUTSIDE NEMA 1 ENCLOSURE)	32 to 122 F (0 to 50 C)
STORAGE TEMPERATURE (AMBIENT)	-40 to 149 F (-40 to 65 C)
HUMIDITY	5% to 95% (non-condensing)

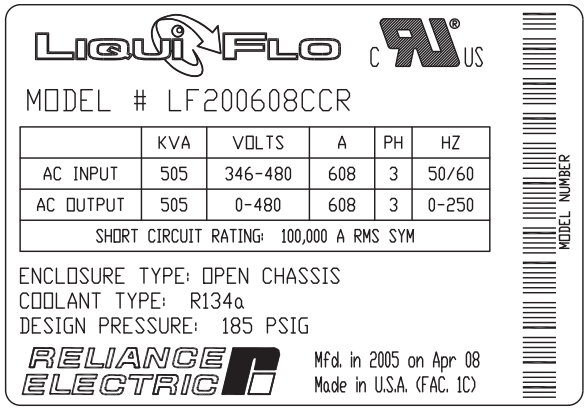


Fig. 38 — VFD Nameplate

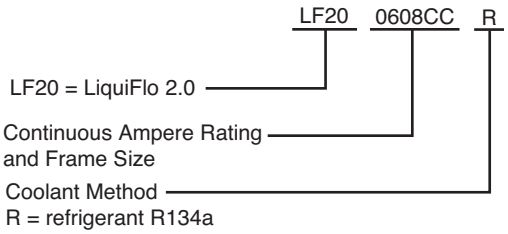


Fig. 39 — Identifying the Drive Model Number

IDENTIFYING THE DRIVE BY PART NUMBER — Each AC drive can be identified by its assembly number. See Fig. 38. This number appears on the shipping label and on the drive nameplate. LiquiFlo™ 2.0 AC power module can be identified by its model number. See Fig. 39. This number appears on the shipping label and on the power module's nameplate. Power ratings are provided in Table 12.

⚠ WARNING

BE AWARE that certain automatic start arrangements can engage the VFD. Open the disconnect ahead of the 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 VFD front panel may not de-energize all internal circuits. Open all internal and remote disconnects before servicing the VFD. Failure to do so could result in serious personal injury or death from electric shock.

Input Power Wiring — All wiring should be installed in conformance with applicable local, national, and international codes. Use grommets, when hubs are not provided, to guard against wire chafing.

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

1. Turn off, lockout, and tag the input power to the drive.
2. Remove the input wiring panel and drill the required number of openings in the top of the drive enclosure. Take care that metal chips do not enter the enclosure.
3. Wire the AC input power leads by routing them through the openings to the main input circuit breaker.

⚠ 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.

4. Connect the three-phase AC input power leads (per job specification) to the appropriate input terminals of the circuit breaker.
5. Tighten the AC input power terminals to the proper torque as specified on the input circuit breaker.

Checking the Installation — 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.
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.

Table 12 — Drive Assembly and Power Module Ratings

PART NUMBER	FRAME SIZE	ENCLOSURE RATING	NAMEPLATE INPUT VOLTAGE (V)	MAX INPUT CURRENT (AMPS)	MAX OUTPUT CURRENT AT 4 KHZ* (AMPS)
19XVA2AA_____	2AA	NEMA 1	380 TO 460	442	442
19XVA2CC_____	2CC			608	608
19XVA4CC_____	4CC			1169	1169

*110% output current capability for 1 minute. 150% output current capability for 5 sec.

Inspect Wiring

⚠ WARNING

Do not check the voltage supply without proper equipment and precautions. Serious personal 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. Connect a voltmeter across the power wires to the VFD and measure the phase to phase and phase to ground voltage. Compare this reading to the voltage rating on the compressor and VFD nameplates.
3. Compare the ampere rating on the VFD enclosure nameplate to the rating on the compressor nameplate.
4. The VFD must be wired to components and terminals required for PIC III refrigeration control. Check line side power and for control components shown on the Certified Prints. The VFD must share control of cooler and condenser liquid pumps and cooling tower fans.
5. Check the phase to phase and phase to ground line voltage to the VFD, power panel, and optional pumpout compressor. Compare voltages against nameplate values.
6. Ensure that fused disconnects or circuit breakers have been supplied to the VFD and optional pumpout unit.
7. Ensure all electrical equipment and controls are properly grounded in accordance with the 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 on the high and low voltage terminal blocks in the VFD enclosure below the control panel.
10. Inspect the power panel and VFD enclosure to ensure that the contractor has used the knockouts to feed the wires into the back of the enclosures. Wiring into the top of the enclosures can allow debris to fall into the enclosures. Clean and inspect the interior of the power panel and VFD enclosure if this has occurred.

⚠ WARNING

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

Ground Fault Troubleshooting — Follow this procedure only if ground faults are declared by the chiller controls. Test the chiller compressor motor and its power lead insulation resistance with a 500-v insulation tester such as a megohmmeter.

1. Open the VFD main disconnect switch and follow lockout/tagout rules.

⚠ CAUTION

The motor leads must be disconnected from the VFD before an insulation test is performed. The voltage generated from the tester can damage the VFD.

2. With the tester connected to the motor leads, take 10-second and 60-second megohm readings as follows:

   Tie terminals 1, 2, and 3 together and test between the group and ground.
3. 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 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.

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

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it. The negative pins must be wired to the negative pins. The signal ground pins must be wired to the signal ground pins. 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*, 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 CCN communication bus to a system element, a color code system for the entire network is recommended to simplify installation and checkout. The following color code is recommended:

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	CCN TERMINAL CONNECTION	ICVC PLUG J1 PIN NO.
+	Red	RED (+)	1
GROUND	White	WHITE (G)	2
–	Black	BLACK (–)	3

Power Up the Controls and Check the Oil Heater — Ensure that an oil level is visible in the compressor before energizing the controls. A circuit breaker in the VFD energizes the oil heater and the control circuit. When first powered, the ICVC should display the default screen within a short period of time.

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 III and is powered through a contactor in the power panel. A separate circuit breaker powers the heater 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. The oil heater relay status (*OIL HEATER RELAY*) can be viewed on the COMPRESS table on the ICVC. Oil sump temperature can be viewed on the ICVC default screen.

*Teflon is a registered trademark of Dupont.

SOFTWARE VERSION — The software part number is labeled on the backside of the ICVC module. The software version also appears on the ICVC configuration screen as the last two digits of the software part number.

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.

As the 19XRV unit is configured, all configuration settings should be written down. A log, such as the one shown on pages CL-1 to CL-12, provides a list for configuration values.

Input the Design Set Points — Access the ICVC set point screen and view/modify the BASE DEMAND LIMIT set point, and either the LCW SETPOINT or the ECW SETPOINT. The PIC III can control a set point to either the leaving or entering chilled water. This control method is set in the EQUIPMENT SERVICE (TEMP_CTL) table.

Input the Local Occupied Schedule (OCCPC01S) — Access the schedule OCCPC01S screen on the ICVC 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.

For more information about how to set up a time schedule, see the Controls section, page 18.

The CCN Occupied Schedule (OCCPC03S) should be configured if a CCN system is being installed or if a secondary time schedule is needed.

NOTE: The default CCN Occupied Schedule OCCPC03S is configured to be unoccupied.

Input Service Configurations — The following configurations require the ICVC screen to be in the SERVICE portion of the menu.

- password
- input time and date
- ICVC configuration
- job site parameters
- service parameters
- equipment configuration
- automated control test

PASSWORD — When accessing the SERVICE tables, a password must be entered. All ICVC are initially set for a password of 1-1-1-1 in the ICVC CONFIGURATION SCREEN.

INPUT TIME AND DATE — Access the TIME AND DATE table on the SERVICE menu. Input the present time of day, date, and day of the week. The *HOLIDAY* parameter should only be configured to YES if the present day is a holiday.

NOTE: Because a schedule is integral to the chiller control sequence, the chiller will not start until the time and date have been set.

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

CHANGE ICVC CONFIGURATION IF NECESSARY — From the SERVICE table, access the ICVC CONFIGURATION screen. From there, view or modify the ICVC CCN address, change to English or SI units, and change the password. If there is more than one chiller at the jobsite, change the ICVC address on each chiller so that each chiller has its own address. Note and record the new address. Change the screen to SI units as required, and change the password if desired.

TO CHANGE THE PASSWORD — The password may be changed from the ICVC CONFIGURATION screen.

1. Press the MENU and SERVICE softkeys. Enter the current password and highlight ICVC CONFIGURATION. Press the SELECT softkey. Only the last 5 entries on the ICVC CONFIG screen can be changed: *BUS NUMBER, ADDRESS, BAUD RATE, US IMP/METRIC*, and *PASSWORD*.
2. Use the ENTER softkey to scroll to *PASSWORD*. The first digit of the password is highlighted on the screen.
3. To change the digit, press the INCREASE or DECREASE softkey. When the desired digit is seen, press the ENTER softkey.
4. The next digit is highlighted. Change it, and the third and fourth digits in the same way the first was changed.
5. After the last digit is changed, the ICVC goes to the *BUS NUMBER* parameter. Press the EXIT softkey to leave that screen and return to the SERVICE menu.

⚠ CAUTION

Be sure to remember the password. Retain a copy for future reference. Without the password, access to the SERVICE menu will not be possible unless the ICVC_PSWD menu on the STATUS screen is accessed by a Carrier representative.

TO CHANGE THE ICVC DISPLAY FROM ENGLISH TO METRIC UNITS — By default, the ICVC displays information in English units. To change to metric units, access the ICVC CONFIGURATION screen:

1. Press the MENU and SERVICE softkeys. Enter the password and highlight ICVC CONFIGURATION. Press the SELECT softkey.
2. Use the ENTER softkey to scroll to *US IMP/METRIC*.
3. Press the softkey that corresponds to the units desired for display on the ICVC (e.g., US or METRIC).

CHANGE LANGUAGE — By default, the ICVC displays information in English. To change to another Language, access the ICVC CONFIGURATION screen:

1. Press the MENU and SERVICE softkeys. Enter the password and highlight ICVC CONFIGURATION. Press the SELECT softkey.
2. Use the ENTER softkey to scroll to *LID LANGUAGE*.
3. Press the INCREASE or DECREASE softkey until the desired language is displayed. Press ENTER to confirm desired language.

MODIFY CONTROLLER IDENTIFICATION IF NECESSARY — The ICVC module *ADDRESS* can be changed from the ICVC CONFIGURATION screen. Change this address for each chiller if there is more than one chiller at the jobsite. Write the new address on the ICVC module for future reference.

INPUT JOB SITE PARAMETERS — See Table 13.

Table 13 — Job Site Parameters

PARAMETER	TABLE
Motor Nameplate Voltage	VFD_CONF - from chiller information nameplate
Compressor 100% Speed	VFD_CONF - from chiller information nameplate
Line Freq=60 Hz? (No=50)	VFD_CONF - from chiller information nameplate
Rated Line Voltage	VFD_CONF - from chiller information nameplate
Rated Line Amps	VFD_CONF - from chiller information nameplate
Rated Line Kilowatts	VFD_CONF - from chiller information nameplate
Motor Rated Load KW	VFD_CONF - from chiller information nameplate
Motor Rated Load Amps	VFD_CONF - from chiller information nameplate
Motor Nameplate Amps	VFD_CONF - from chiller information nameplate
Motor Nameplate RPM	VFD_CONF - from chiller information nameplate
Motor Nameplate KW	VFD_CONF - from chiller information nameplate
Surge Limit/HGBP Option	OPTIONS - Enter 1 or 2 if HGBP is installed. Enter 0 otherwise.
Minimum Load Points (Tsmin, IGVmin)	OPTIONS - Per Chiller Requisition (Tsmin, IGVmin) per job data - See Modify Load Points section. Refer to table located in the control panel.
FULL (Maximum) load points (TsMax, IGVmax)	OPTIONS - Per Chiller Requisition (Tsmax, IGVmax) per job data - See Modify Load Points section. Refer to table located in the control panel.
Surge Line Shape Factor	OPTIONS - Per Chiller Requisition. Refer to table located in the control panel.
Chilled Medium	SETUP1 - Enter Water or Brine
Evaporator Refrigerant trippoint	SETUP1 - Usually 3 F (1.7 C) below design refrigerant temperature
***Evaporator Flow Delta P cutout**	SETUP1 - Per Chiller Requisition if available or enter 50% of design pressure drop
Condenser Flow Delta P cutout	SETUP1 - Per Chiller Requisition if available or enter 50% of design pressure drop
High Condenser Water Delta P	Enter the maximum value for the condenser water pressure drop if chiller is connected to a condenser water manifold system. Otherwise leave at default.
Diffuser Option (compressors with Split Ring Diffusers)	SETUP2 - ENABLE for 4 and 5 frame compressors with Split Ring Diffusers. See table in control panel for values.
Diffuser Full Span mA (Compressors with Split Ring Diffusers)	SETUP2 - Enter diffuser actuator full span mA value for 4 and 5 frame compressors with Split Ring Diffusers. See label on side of diffuser actuator for values.

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

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

INPUT EQUIPMENT SERVICE PARAMETERS IF NECESSARY — The EQUIPMENT SERVICE table has six service tables.

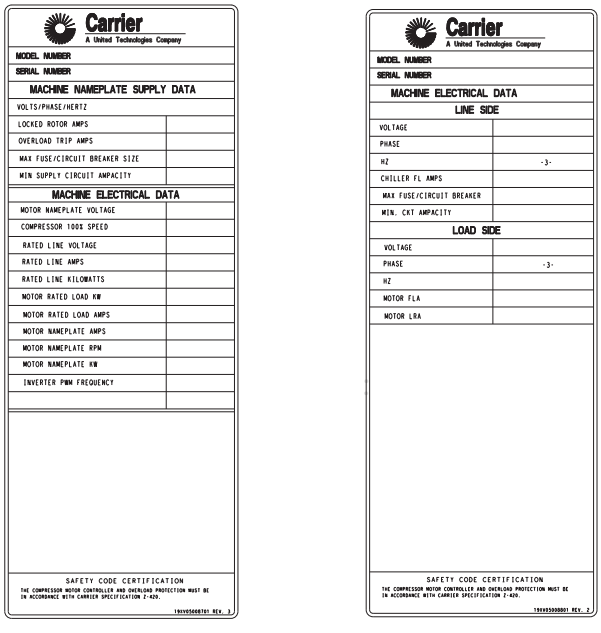
VERIFY VFD CONFIGURATION AND CHANGE PARAMETERS IF NECESSARY (Fig. 40)

IMPORTANT: The VFD controller has been factory configured for use and communications to the International Chiller Visual Controller (ICVC). 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 ICVC.

VFD CHILLER FIELD SET UP AND VERIFICATION

Label Locations — Verify that the following labels have been installed properly and match the chiller requisition:

- Surge Parameters — Located inside the control panel. See Fig. 14.
- Refrigeration Machine Nameplate — Located on the right side of the control panel. See Fig. 14.
- External Machine Electrical Data Nameplate — Located on the right side of the VFD as viewed from its front. See Fig. 40.
- Internal Machine Electrical Data Nameplate — Located on the inside of the left VFD enclosure door. See Fig. 40.
- Record all nameplate information on the Initial Start-up Checklist at the end of this manual.



INTERNAL EXTERNAL

Fig. 40 — Machine Electrical Data Nameplate

Check VFD_CONFIG TABLE — Enter the VFD_CONF screen on the ICVC by entering the following screen sequence when the chiller is not running:

- MENU
- SERVICE
- Password (default 1111)
- VFD CONFIG DATA
- Password (default 4444)
- VFD_CONF

Confirm that the following parameters in the VFD_CONF screen match the values on the Internal Machine Electrical Data Nameplate:

- Motor Nameplate Voltage — Voltage required to run at motor rating.
- Compressor 100% Speed — Compressor speed required to run at chiller design point.
- Rated Line Voltage — Nominal line voltage selected for the job site.
- Rated Line Amps — Line current required for the chiller to run at the design point.
- Rated Line Kilowatts — Line power required for the chiller to run at the design point.
- Motor Rated Load kW — Power consumed by the motor when running at the chiller design point.
- Motor Rated Load Amps — Motor current required for the chiller to run at the design point.
- Motor Nameplate Amps — Motor nameplate full load amps.
- Motor Nameplate RPM — Rated speed of the motor when running at motor nameplate rated frequency, rated current, and rated voltage.
- Motor Nameplate kW — Motor nameplate rated power.
- Inverter PWM Frequency — Sets the carrier frequency for the pulse width modulation output.

NOTE: Other parameters on these screens are normally left at the default settings; however, they may be changed by the operator as required. The voltage and current imbalance level and imbalance persistence time on the VFD_CONF table can be adjusted to increase or decrease the sensitivity of these fault conditions. Increasing time or persistence decreases sensitivity. Decreasing time or persistence increases sensitivity to the fault condition.

NOTE: Some of the parameters can be changed only when the drive is stopped.

⚠ WARNING

It is the operator's responsibility to distribute access to the ICVC passwords. Carrier is not responsible for unauthorized access violations within the operator's organization. Failure to observe this warning could result in bodily injury.

SURGE PREVENTION CONFIGURATIONS — Surge Prevention Configurations are defined as follows:

- Surge/HGBP Delta Tsmin is the minimum difference between cooler and condenser saturation temperatures. (See Fig. 41.)
- Surge/HGBP IGVmin is the lowest position of the guide vanes that affects Surge prevention. This is not likely to require adjustment at the jobsite other than to ensure that it matches the value supplied with the machine selection.

These values produce the minimum load point of the Surge Prevention line:

- Surge/HGBP Delta Tsmax is the maximum difference between cooler and condenser saturation temperatures. (See Fig. 42.)
- Surge/HGBP IGVmax is the highest position of the guide vanes that affects Surge prevention. This is not likely to require adjustment at the jobsite other than to ensure that it matches the value supplied with the machine selection.

NOTE: The preceding two values produce the full load point of the surge prevention line.

- Surge Line Shape Factor determines the curvature of the line mainly in the low load zone. (See Fig. 43.)
- Surge Line Speed Factor determines how much the surge line moves to accommodate lower compressor speed. As compressor speed drops the ΔT values on the surge prevention line decrease. Increasing the Speed Factor causes Surge Prevention to activate sooner as the compressor speed drops. (See Fig. 44.)
- Surge Line High Offset determines the ΔT increase beyond the surge prevention line where the high stage of Surge Prevention takes effect. The high stage produces larger RPM increase steps. This is not likely to require adjustment at the jobsite other than to ensure that it matches the value supplied with the machine selection
- Surge/HGBP Deadband controls the amount the *ACTIVE DELTA TSAT* must drop below the Surge Prevention to de-activate Surge Prevention.

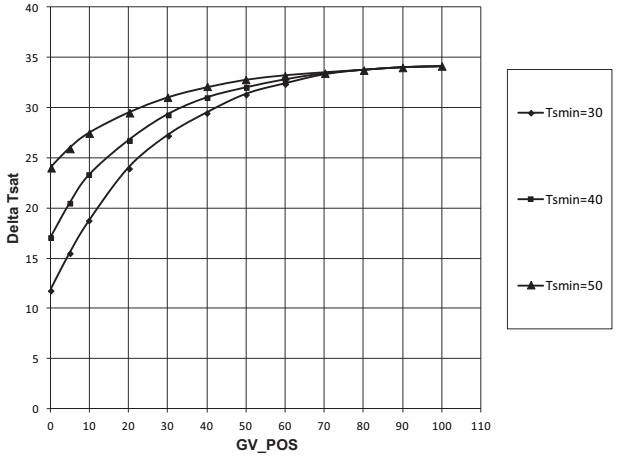


Fig. 41 — Effect of SURGE/HGBP DELTA TSMIN on Surge Prevention

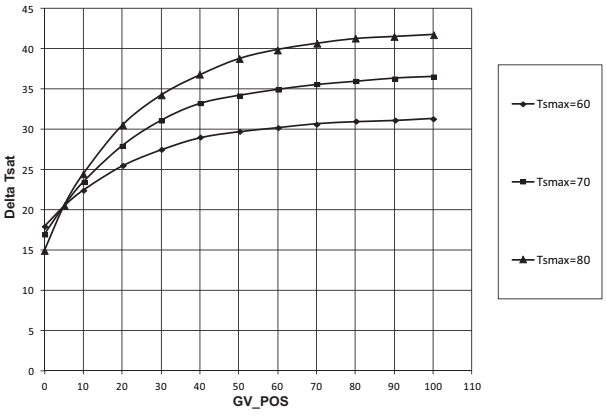


Fig. 42 — Effect of SURGE/HGBP DELTA TSMAX on Surge Prevention

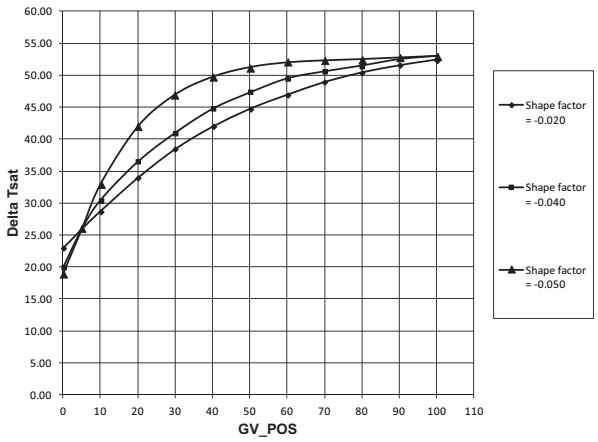


Fig. 43 — Effect of SURGE LINE SHAPE FACTOR on Surge Prevention

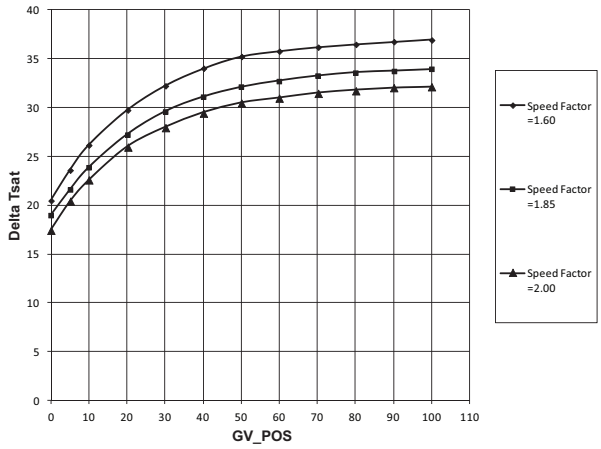


Fig. 44 — Effect of SURGE LINE SPEED FACTOR on Surge Prevention

Fine Tuning VPF Surge Prevention — Figures 41-44 show how the parameters defined below will affect the configured surge line.

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

and

3. *PERCENT LINE CURRENT* < 100%

then the surge line is probably too conservative.

Note the following parameters from ICVC when maximum *AVERAGE LINE CURRENT* achieved:

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

The *ACTIVE DELTA Tsat* and the *SURGE LINE DELTA TSAT* can be monitored on the VPF_STAT screen. When DELTA TSAT exceeds *SURGE LINE DELTA TSAT* surge prevention will occur.

If ACTUAL GUIDE VANE POSITION is less than 30%, then increase *SURGE/HGBP DELTA TSMIN* in steps of 2º F until one of the three conditions listed above no longer applies. Do not change *SURGE/HGBP DELTA TSMAX*.

If ACTUAL GUIDE VANE POSITION is greater than 60%, then increase *SURGE/HGBP DELTA TSMAX* in steps of 2º F 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/HGBP DELTA TSMIN* in steps of 2º F.
2. Increase *SURGE/HGBP DELTA TSMAX* in steps of 2º F.
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 2 degree increase.

If surge is encountered then the surge line is probably too optimistic or high. Note following parameters from ICVC 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/HGBP DELTA TSMIN* in 1° F steps up to 5 times. Monitor chiller for surge.
2. If ACTUAL GUIDE VANE POSITION is still less than 30 and step 1 failed, then 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/HGBP DELTA TSMAX* by 1°F Steps up to 5 times. Monitor chiller for surge.
4. If ACTUAL GUIDE VANE POSITION is greater than 60% and Step 3 failed to eliminate surge, then set *SURGE/HGBP DELTA TSMAX* to 5° F below the value specified by Chiller Builder (ECAT). Increase the value of the *SURGE LINE SHAPE FACTOR* in steps of 0.01 up to 2 times. For example, if surge is encountered when the *SURGE LINE SHAPE FACTOR* is –0.06, increase the *SURGE LINE SHAPE FACTOR* to –0.05. If this does not solve the problem, go to Step 5, even if ACTUAL GUIDE VANE POSITION is greater than 60%.
5. If ACTUAL GUIDE VANE POSITION is greater than 30% but less than 60% or if Step 2 failed (with ACTUAL GUIDE VANE POSITION less than 30) or if Step 4 failed (with ACTUAL GUIDE VANE POSITION

greater than 60), then perform this step. Do not change *SURGE LINE SHAPE FACTOR* from the value specified by Chiller Builder (ECAT). Reset *SURGE/HGBP DELTA TSMIN* and *SURGE/HGBP DELTA TSMAX* to the value specified by Chiller Builder (ECAT). Decrease *SURGE/HGBP DELTA TSMIN* and *SURGE/HGBP DELTA TSMAX* in steps of 1° F up to 5 times. Monitor chiller for surge.

CONFIGURE DIFFUSER CONTROL IF NECESSARY — If the compressor is equipped with a variable diffuser, (size 4 or 5 compressor) access the SETUP2 screen. Scroll to *DIFFUSER CONTROL* and press the ENABLE softkey. Compare the diffuser and guide vane values (*GUIDE VANE 25% LOAD PT, GUIDE VANE 50% LOAD PT, GUIDE VANE 75% LOAD PT, DIFFUSER 25% LOAD POINT, DIFFUSER 50% LOAD POINT, DIFFUSER 75% LOAD POINT*) to the values located on the label inside the control panel above the ICVC. See Fig. 14.

Compressors with variable diffuser control have actuators tested and stamped with the milliamp (mA) value that results in 100% actuator rotation. This value is configured on the SETUP2 screen. It is labeled *DIFFUSER FULL SPAN mA*.

Further adjustments can be made if response to surge prevention or protection is not functioning as desired. *VFD GAIN* and *VFD INCREASE STEP* can be adjusted to allow for more aggressive changes in speed when surge prevention or protection is active.

MODIFY EQUIPMENT CONFIGURATION IF NECESSARY — The EQUIPMENT SERVICE table has screens to select, view, or modify parameters. Carrier's certified drawings have the configuration values required for the jobsite. Modify these values only if requested.

EQUIPMENT SERVICE Screen Modifications — Change the values on these screens according to specific job data. See the certified drawings for the correct values. Modifications can include:

- Chilled water reset *(CHW SETPT RESET VALUE)*
- Entering chilled water control *(ECW CONTROL OPTION)*
- 4 to 20 mA demand limit (DEMAND LIMIT AT 20 mA)
- AUTO RESTART OPTION (Enable/Disable)
- REMOTE CONTACT OPTION (Enable/Disable)

Owner-Modified CCN Tables — The following EQUIPMENT CONFIGURATION screens are described for reference only.

OCCDEFCS — The OCCDEFCS screen contains the Local and CCN time schedules, which can be modified here or on the SCHEDULE screen as described previously.

HOLIDAYS — From the HOLIDAYS screen, the days of the year that holidays are in effect can be configured. See the holiday paragraphs in the Controls section for more details.

BRODEF — The BRODEF screen defines the start and end of daylight savings time. By default this feature is enabled. Enter the dates for the start and end of daylight savings if required for your location. Note that for Day of Week, 1 represents Monday. Start Week and Stop Week refer to the instance of the selected Day of Week during the selected month and year. To disable the feature, change "Start Advance" and "Stop Back" times to 0 (minutes). In the BRODEF table the user may also identify a chiller as the time broadcaster for a CCN network. There should be only one device on a CCN network which is designated as the Time Broadcaster.

ALARM ROUTING — This is in the table SERVICE/ EQUIPMENT CONFIGURATION/NET_OPT under the heading Alarm Configuration. Alarm Routing consists of an 8-bit binary number. Only bits 1, 2, and 4 (counting from the left, first) are used. The others do not matter. The bits can be set by any device which can access and change configuration tables. If any of these 3 bits is set to 1, the controller (ICVC, for example) will broadcast any alarms which occur.

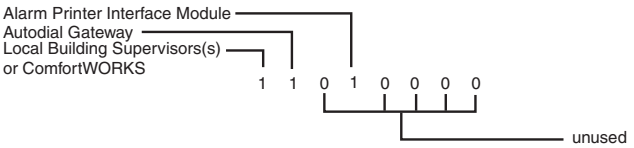
- first bit = 1 indicates that the alarm should be read and processed by a "front end" device, such as a ComfortWORKS® device.
- second bit = 1 indicates that the alarm should be read and processed by a TeLINK™ or Autodial Gateway module.
- fourth bit = 1 indicates that the alarm should be read and processed by an alarm printer interface (an optional module), ServiceLink™, or DataLINK™ modules.

The Re-Alarm time is a time period after which, if a preexisting and previously broadcast alarm has not been cleared, it will be rebroadcast on the CCN network. See Fig. 45.

Other Tables — The CONSUME, NET_OPT, and RUNTIME screens contain parameters used with a CCN system. See the applicable CCN manual for more information on these screens. These tables can only be defined from a CCN Building Supervisor.

ALARM CONTROL
ALARM ROUTING

This decision determines which CCN system elements will receive and process alarms sent by the CSM. Input for the decision consists of eight digits, each of which can be set to either *0* or *1*. Setting a digit to *1* specifies that alarms will be sent to the system element that corresponds to that digit. Setting all digits to 0 disables alarm processing. Digits in this decision correspond to CCN system elements in the following manner:



NOTE: If your CCN does not contain ComfortWORKS® controls or a Building Supervisor, Autodial Gateway, or APIM to serve as an alarm acknowledger, set all digits in this decision to *0* in order to prevent unnecessary activity on the CCN Communication Bus.

Allowable Entries	00000000 to 11111111 0 = Disabled, 1 = Enabled
Default Value	10000000

Fig. 45 — Alarm Control and Alarm Routing

Perform a Control Test — Check the safety controls status by performing an automated control test. Access the CONTROL TEST table and select a test to be performed function. See Table 14.

The Automated Control 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 Nameplate value. The compressor can be put in OFF mode by pressing the STOP push button on the ICVC. 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: Enter guide vane calibration to calibrate guide vane actuator feedback potentiometer input on CCM (Plug J4 upper terminals 9 and 10).

NOTE: If during the control 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 control test is finished or the EXIT softkey is pressed, the test stops, and the CONTROL TEST menu displays. If a specific automated test procedure is not completed, access the particular control test to test the function when ready. The CONTROL TEST menu is described in Table 14.

Table 14 — Control Test Menu Functions

TESTS TO BE PERFORMED	DEVICES TESTED
1. CCM Thermistors	Entering Chilled Water Leaving Chilled Water Entering Condenser Water Leaving Condenser Water Evap Refrig Liquid Temp Comp Discharge Temp Comp Thrust Brg Temp Oil Sump Temp Comp Motor Winding Temp Spare Temperature 1 Spare Temperature 2 Remote Reset Sensor
2. CCM Pressure Transducers	Evaporator Pressure Condenser Pressure Oil Pump Delta P SRD Delta P SRD Rotating Stall Chilled Water Delta P Condenser Water Delta P Transducer Voltage Ref Humidity Sensor Input Relative Humidity
3. Pumps	Oil Pump — Confirm Pressure Chilled Water — Confirm Flow and Delta P Condenser Water — Confirm Delta P
4. Discrete Outputs	Oil Heater Relay Hot Gas Bypass Relay Tower Fan Relay Low Tower Fan Relay High VFD Coolant Solenoid Alarm Relay Shunt Trip Relay
5. IGV & SRD Actuator	Open/Close If present, split ring diffuser will operate in coordination with the guide vanes per configured schedule.
6. Head Pressure Output	Increase/Decrease 4-20 mA output
7. Diffuser Actuator*	Open/Close (independent of guide vanes)
8. Pumpdown Lockout	When using pumpdown/lockout, observe freeze up precautions when removing charge: Instructs operator which valves to close and when. Starts chilled water and condenser water pumps and requests flow confirmation. Monitors Evaporator pressure Condenser pressure Evaporator temperature during pumpout procedures Turns pumps off after pumpdown. Locks out compressor.
9. Terminate Lockout	Starts pumps and monitors flows. Instructs operator which valves to open and when. Monitors Evaporator pressure Condenser pressure Evaporator temperature during charging process Terminates compressor lockout.
10. Guide Vane Calibration	Automatic, displays guide vane position signal voltage. This test is required before first start-up with new Actuator or Controller.

*Diffuser tests function only on size 4 and 5 compressor with diffuser control enabled.

NOTE: During any of the tests, an out-of-range reading will have an asterisk (*) next to the reading and a message will be displayed if diffuser control is enabled.

PRESSURE TRANSDUCER CALIBRATION — The transducers measuring single pressure values (such as condenser and evaporator pressure) are calibrated individually, while a pair of transducers measuring a pressure differential (*OIL PUMP DELTA P*, *CONDENSER WATER DELTA P*, *CHILLED WATER DELTA P*) are calibrated together as a differential. In units with ICVC controllers, transducers for sensing water side flow are not provided as standard. These readings can be viewed and calibrated from the COMPRESS and HEAT_EX screens on the ICVC controller.

Each transducer or transducer pair can be calibrated at two points: zero (0 psig or 0 kPa) and "high end" (between 25 and 250 psig, or between 173 and 1724 kPa). It is not usually necessary to calibrate at initial start-up. However, at high altitude locations, recalibration may be necessary to ensure the proper refrigerant temperature-pressure relationship.

Zero Point Calibration — Shut down the compressor, and cooler and condenser pumps. There must be no water flow through the heat exchangers, but these systems must be filled. For differential pairs, leave the transducers installed. For single value transducers, disconnect the transducer's electrical cable, remove the sensor from its Schrader fitting, then reconnect the cable.

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 the zero point without removal.

Access the HEAT_EX or COMPRESS screen under the STATUS menu, and view the particular transducer reading. (OIL PUMP DELTA P is in the COMPRESS screen; all others are in HEAT_EX.) If the displayed reading is not 0 psi (0 kPa), press the SELECT key to highlight the associated line in the display, then the ENTER key. (For zero point calibration, the INCREASE and DECREASE keys have no effect.) The value should change to 0.0.

If the ICVC fails to accept the zero point calibration, the value will not change to 0.0 and the display will show "Higher Force In Effect." This indicates that the sensor voltage is out of the acceptable range. For each single value transducer there are 3 terminals at the CCM: 0 vdc (low), "sensor" voltage, and 5.00 vdc (high). With a base supply voltage of 5.00 volts, the acceptable range of voltage taken between the low and sensor terminals for zero point calibration is 0.40 to 0.55 v. For each transducer differential pair there are two 3-terminal sets at the CCM. With a base supply voltage of 5.00 volts, the acceptable range of voltage taken between the sensor terminal for the high end transducer (water inlet or oil pump discharge) and the sensor terminal for the low end transducer (water outlet or oil sump) for zero point calibration is –0.065 to +0.085 v. If this occurs with a differential pair, one possible remedy is to swap the high end (e.g., inlet) and low end (e.g., outlet) transducers. In most cases this puts the sensor voltage within the acceptable range.

High End Calibration — High end calibration can be performed between 25 and 250 psig (173 and 1724 kPa), comparing the pressure readings in the ICVC display to an accurate refrigeration gage. While it normally will have a negligible effect, it may improve transducer accuracy over the full pressure range. High end calibration is not recommended for transducer differential pairs. Pressure can be provided by attaching a regulated 250 psig (1724 kPa) pressure source, such as from a nitrogen cylinder, to the transducer.

Access the HEAT_EX screen under the STATUS menu, and the CONDENSER PRESSURE or EVAPORATOR PRESSURE to the reference pressure gage. To change the displayed reading, press the SELECT key to highlight the associated line in the display, then the INCREASE or DECREASE key to set the new value, then the ENTER key. Generally, the value can be changed to any value within ±15% of a nominal value.

NOTE: Prior calibrations may have shifted the present pre-calibration value from the center of this range. In this case, the limit of acceptable new values will be less than 15% in one direction.

If the ICVC fails to accept the high end calibration, the value will not change and the display will show "Higher Force In Effect." This indicates that the sensor voltage is out of the acceptable range for the entered value. If this occurs with a differential pair, one possible remedy is to swap the high end (inlet) and low end (outlet) transducers. In most cases this puts the sensor voltage within the acceptable range.

Each transducer is supplied with 5 vdc power from the CCM. Pressure transducer readings are derived from voltage ratio, not absolute voltage, which compensates for any reference voltage variation. If this power supply fails, a transducer voltage reference alarm is generated. If transducer readings are suspected of being faulty, check the supply voltage, measured between the high and low (first and third) terminals of any transducer 3 terminal connection at the CCM. This is also displayed in CONTROL TEST under CCM PRESSURE TRANSDUCERS.

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 84 and 92, for details on the transfer of refrigerant, oil specifications, etc.

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 Troubleshooting Guide section.

Charge Refrigerant into Chiller

⚠ CAUTION

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

⚠ CAUTION

Always operate the condenser and chilled water pumps during charging operations to prevent freeze-ups. Damage could result to equipment if condenser and chilled water pumps are not operated during pumpdown or charging.

The standard 19XRV chiller is shipped with the refrigerant already charged in the vessels. However, the 19XRV 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 in the 19XRV chiller after service work or during the initial chiller start-up, *do not use the discharge isolation valve to equalize.* Either the motor cooling isolation valve or a charging hose (connected between the refrigerant charging valves on top of the cooler and condenser) should be used as the equalization valve. Damage to the float valve could result.

To equalize the pressure differential on a 19XRV chiller with the refrigerant isolated in one of the heat exchangers, use the terminate lockout function of the CONTROL TEST on the SERVICE 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 19XRV chiller without a pumpout unit.

1. Access terminate lockout function on the CONTROL TEST screen.
2. IMPORTANT: Turn on the chilled water and condenser water pumps to prevent freezing.
3. Slowly open the motor cooling isolation valve. The chiller's cooler and condenser pressures will gradually equalize. This process takes approximately 15 minutes.
4. 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. 35 and 36, 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, which could result in serious personal injury.

CHILLER EQUALIZATION WITH PUMPOUT UNIT — The following steps describe how to equalize refrigerant pressure on an isolated 19XRV chiller using the pumpout unit.

1. Access the terminate lockout function on the CONTROL TEST screen.
2. IMPORTANT: Turn on the chilled water and condenser water pumps to prevent freezing.
3. Open valve 4 on the pumpout unit and open valves 1a and 1b on the chiller cooler and condenser, Fig. 35 and 36. Slowly open valve 2 on the pumpout unit to equalize the pressure. This process takes approximately 15 minutes.
4. Once the pressures have equalized, the discharge isolation valve, cooler isolation valve, optional hot gas bypass isolation valve, and the refrigerant isolation valve can be opened. Close valves 1a and 1b, and all pumpout unit valves.

The full refrigerant charge on the 19XRV 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. See the Physical Data section.

⚠ CAUTION

Ensure that the condenser and chilled water pumps are operating whenever charging, transferring, or removing refrigerant from the chiller. Failure to do so could result in serious personal injury or equipment damage.

Use the CONTROL TEST 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. 35 and 36, 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 (141 kPa) for HFC-134a. After the chiller is beyond this pressure the refrigerant should be charged as a liquid until all the recommended refrigerant charge has been added. The charging valve (Fig. 35 and 36, valve 1a or 1b) can be used to charge liquid to the cooler or condenser. Do not charge liquid through the liquid line service valve.

TRIMMING REFRIGERANT CHARGE — The 19XRV unit is shipped with the correct charge for the design duty of the chiller. On most 19XRV chillers the design LTD (Leaving Temperature Difference) between the leaving chilled water temperature and the cooler refrigerant temperature is so low that the traditional method of trimming the charge to achieve a minimum LTD is not practical. In the case where leaks have been found and corrected and the LTD is greater than about 4 F (2.2 C) above design, add refrigerant until the full load design LTD is approached, and then charge for proper oil return at low load. (A high cooler LTD can also be caused by dirty tubes, water box division plate bypass, a partially closed liquid isolation valve, or a sticking float valve.)

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.

The preferred location at which refrigerant should be added directly into the chiller is through the service valve at the top of the condenser. If that valve is not accessible due to presence of an attached pumpdown unit which does not have a storage tank, add charge through the valve connected to the side of the condenser drain float sump. Adding charge through the drain valve at the base of the chiller (off the liquid line) is NOT recommended.

The full refrigerant charge on the 19XRV 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. See the Physical Data section.

INITIAL START-UP

IMPORTANT: The Reliance VFD warranty will be void if the VFD is not started by a technician who has completed Reliance LiquiFlo™ Tier 1 Training and whose name is registered with Reliance.

Preparation — Before starting the chiller, verify:

1. Power is on to the VFD, oil pump relay, 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 refrigerant temperature plus 50 F (28 C).
6. Valves in the evaporator and condenser water circuits are open.

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

⚠ CAUTION

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

7. Access the CONTROL TEST screen. Scroll down on the *TERMINATE LOCKOUT* option. Press the SELECT (to enable the chiller to start) and answer YES to reset unit to operating mode. The chiller is locked out at the factory in order to prevent accidental start-up.

Check Motor Rotation

1. Engage the control power circuit breaker (CB2) located inside the left hand side of the VFD enclosure.
2. Finally close the main motor disconnect (CB1) on the front of the VFD enclosure.
3. The VFD checks for proper phase rotation as soon as power is applied to the VFD and the PIC III controls power up. The controls do not permit a start if the phase rotation is not correct.
4. An alarm message will appear on the ICVC if the phase rotation is incorrect. If this occurs, reverse any 2 of the 3 incoming power leads to the VFD and reapply power. The motor is now ready for a rotation check.
5. After the default screen status message states 'Ready to Start' press the LOCAL softkey. The PIC III control performs start-up checks.
6. When the VFD is energized and the motor begins to turn, check for clockwise motor rotation. See Fig. 46.

⚠ CAUTION

Do not check motor rotation during coastdown. Rotation may have reversed during equalization of vessel pressures.

CORRECT MOTOR ROTATION
IS CLOCKWISE WHEN VIEWED
THROUGH MOTOR SIGHT GLASS

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

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

Fig. 46 — Correct Motor Rotation

Check Oil Pressure and Compressor Stop

1. When the motor is at full speed, note the OIL PRESSURE reading on the ICVC default screen. Normal 19XRV oil pressure readings are between 18 and 30 psid (124 to 207 kPad). The oil pressure should be between 18 and 40 psid (124 to 276 kPad) on Frame 3 compressors equipped with rolling element bearings.
2. Press the Stop button and listen for any unusual sounds from the compressor as it coasts to a stop.

To Prevent Accidental Start-Up — A chiller STOP override setting may be entered to prevent accidental start-up during service or whenever necessary. Access the MAINSTAT screen and using the NEXT or PREVIOUS softkeys, highlight the *CHILLER START/STOP* parameter. Override the current START value by pressing the SELECT softkey. Press the STOP softkey followed by the ENTER softkey. The word SUPVSR! displays on the ICVC indicating the override is in place.

To restart the chiller, the STOP override setting must be removed. Access the MAINSTAT screen and using NEXT or PREVIOUS softkeys highlight *CHILLER START/STOP*. The 3 softkeys that appear represent 3 choices:

- START — forces the chiller ON
- STOP — forces the chiller OFF
- RELEASE — puts the chiller under remote or schedule control

To return the chiller to normal control, press the RELEASE softkey followed by the ENTER softkey. For more information, see Local Start-Up, page 61.

The default ICVC screen message line indicates which command is in effect.

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

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

COOLER-CONDENSER — Economizer (if present), float chamber, relief valves, refrigerant charging valve, temperature sensor locations, pressure transducer locations, Schrader fittings, waterboxes and tubes, and vents and drains.

OPTIONAL PUMPOUT STORAGE TANK AND PUMPOUT SYSTEM — Transfer valves and pumpout system, refrigerant charging and pumpdown procedure, and relief devices.

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

MOTOR COMPRESSOR LUBRICATION SYSTEM — Oil pump, cooler filter, oil heater, oil charge and specification, operating and shutdown oil level, temperature and pressure, and oil charging connections.

CONTROL SYSTEM — CCN and LOCAL start, reset, menu, softkey functions, ICVC operation, occupancy schedule, set points, safety controls, and auxiliary and optional controls.

AUXILIARY EQUIPMENT — 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 III functions.

Prepare the Chiller for Start-Up — Follow the steps described in the Initial Start-Up section, page 80.

To Start the Chiller

1. Start the water pumps, if they are not automatic.
2. On the ICVC default screen, press the LOCAL or CCN softkey 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 61.

Check the Running System — After the compressor starts, the operator should monitor the ICVC display and observe the parameters for normal operating conditions:

1. The oil reservoir temperature should be above 120 F (49 C) during shutdown.
2. The bearing oil temperature accessed on the COMPRESS table should be 120 to 165 F (49 to 74 C) for compressors using journal bearings, and up to 175 F (79 C) for Frame 3, Frame 4, Frame 5, and Frame E compressors equipped 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* the chiller until corrected.
3. The oil level should be visible anywhere in one of the two sight glasses. Foaming oil is acceptable as long as the oil pressure and temperature are within limits.

4. The OIL PRESSURE should be between 18 and 30 psid (124 to 207 kPad) differential, as seen on the ICVC default screen. Typically the reading will be 18 to 25 psid (124 to 172 kPad) at initial start-up. Typical values may be up to 10 psid (69 kPad) higher for Frame 3, Frame 4, Frame 5, and Frame E compressors equipped with rolling element bearings.
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 to 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 IkW, 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 EQUIPMENT SERVICE screen, RAMP_DEM table (Table 4, Example 23).
9. The economizer (if installed) has two sight glasses that look into the float chamber. When operating, the top sight glass is empty and the bottom sight glass is full.

To Stop the Chiller

1. The occupancy schedule starts and stops the chiller automatically once the time schedule is configured.
2. By pressing the STOP button for one second, the alarm light blinks once to confirm the button has been pressed. The compressor will then follow the normal shutdown sequence as described in the Shutdown Sequence, Start-Up/Shutdown/Recycle Sequence section, page 61. The chiller will not restart until the CCN or LOCAL softkey is pressed. 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.

Do not *restart the chiller* until the problem is diagnosed and corrected.

After Limited Shutdown — No special preparations should be necessary. Follow the regular preliminary checks and starting procedures.

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

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

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

After Extended Shutdown — Ensure the water system drains are closed. It may be advisable to flush the water circuits to remove any soft rust which 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 ICVC default screen 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 64.

Recharge the chiller by transferring refrigerant from the pumpout storage tank (if supplied). Follow the Pumpout and Refrigerant Transfer Procedures section, page 84. Observe freeze-up precautions.

Carefully make all regular preliminary and running system checks. Perform a Control Test before start-up. If the compressor oil level appears abnormally high, the oil may have absorbed refrigerant. Ensure that the oil temperature is above 140 F (60 C) or above the cooler refrigerant temperature 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. The PIC III controls have a low limit tower fan output that can be used to assist in this control (terminals 5 and 6 on the TB2 hazardous voltage field wiring terminal strip).

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. Access the COMPRESS screen on the ICVC and scroll down to highlight *TARGET GUIDE VANE POS*. To control the position, use the INCREASE or DECREASE softkey to adjust to the percentage of guide vane opening that is desired. Zero percent is fully closed; 100% is fully open. To release the guide vanes to automatic control, press the RELEASE softkey.

Similarly, the *TARGET VFD SPEED* can be manually set in the COMPRESS screen. The target value is still limited to be between configured *VFD MINIMUM SPEED* and *VFD MAXIMUM SPEED*. Once speed is manually set in this manner, capacity control changes are directed to modulate the guide vanes.

NOTE: Manual control mode overrides the configured pulldown ramp rate during start-up and permits the guide vanes to open at a faster rate. The PIC III controls will close the guide vanes if the motor current exceeds the *ACTIVE DEMAND LIMIT* or capacity override limits. The guide vanes will also close if the chilled water temperature falls below the *CONTROL POINT*. For descriptions of capacity overrides and set points, see the Controls section.

Refrigeration Log — A refrigeration log (as shown in Fig. 47) 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. 47. Automatic recording of PIC III data is possible by using CCN devices such as the Data Collection module and a Building Supervisor. Contact your Carrier representative for more information.

REFRIGERATION LOG CARRIER 19XRV HERMETIC CENTRIFUGAL REFRIGERATION MACHINE

Plant ______________MODEL NO. ______________SERIAL NO. ______________MOTOR RLA ______________

DATE ______	COOLER							CONDENSER							COMPRESSOR				VFD							OPERATOR INITIALS	REMARKS
TIME	REFRIGERANT		WATER					REFRIGERANT		WATER					THRUST BEARING TEMP	OIL			AVERAGE LINE CURRENT	AVERAGE LINE VOLTAGE	LINE KILOWATTS	AVERAGE LOAD CURRENT	INVERTER TEMP	RECTIFIER TEMP	VFD COOLANT FLOW		
	PRESS.	TEMP	PRESSURE			TEMP		PRESS.	TEMP	PRESSURE			TEMP			PRESSURE	SUMP TEMP	LEVEL									
			IN	OUT	GPM	IN	OUT			IN	OUT	GPM	IN	OUT													

Fig. 47 — Refrigeration Log

PUMPOUT AND REFRIGERANT TRANSFER PROCEDURES

Preparation — The 19XRV 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 evacuations.

⚠ 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.

⚠ WARNING

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 personal injury.

⚠ CAUTION

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

Operating the Optional Pumpout Unit — 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 92. The pumpout unit control wiring schematic is detailed in Fig. 48.

To read refrigerant pressures during pumpout or leak testing:

1. The ICVC 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 (Fig. 12) by removing the pressure transducer.
2. To determine pumpout storage tank pressure, a 30 in. Hg vacuum -0-400 psi (-101-0-2769 kPa) gage is attached to the storage tank.
3. Refer to Fig. 35, 36, and 49 for valve locations and numbers.

⚠ CAUTION

Transfer, addition, or removal of refrigerant in spring-isolated chillers may place severe stress on 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 35 and 36 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.

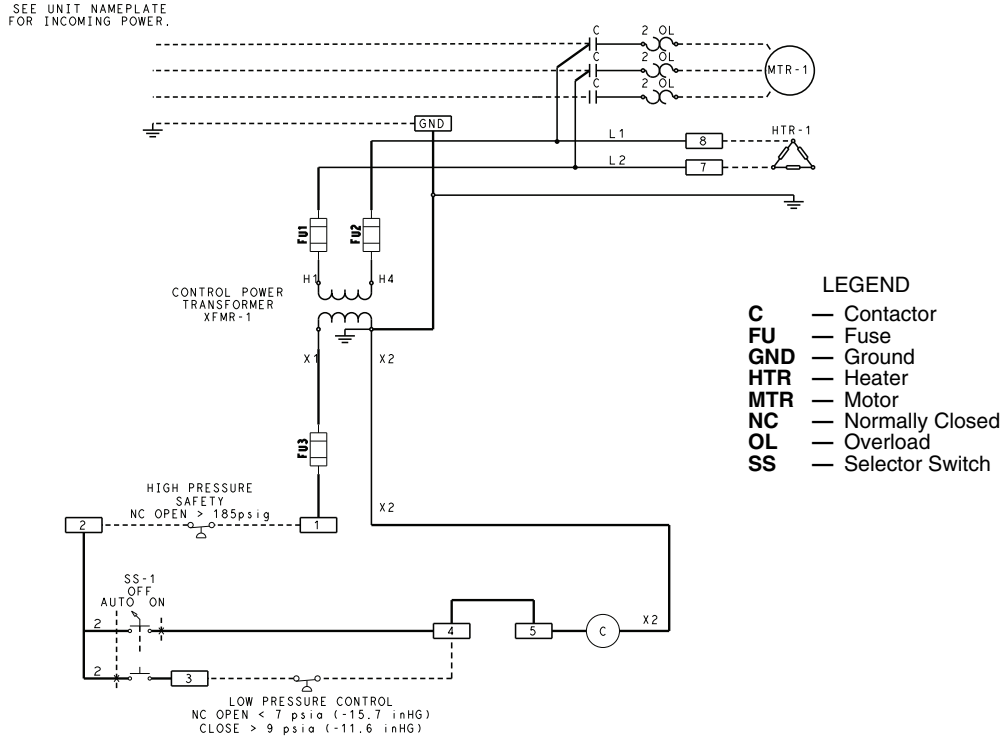


Fig. 48 — Pumpout Unit Wiring Schematic

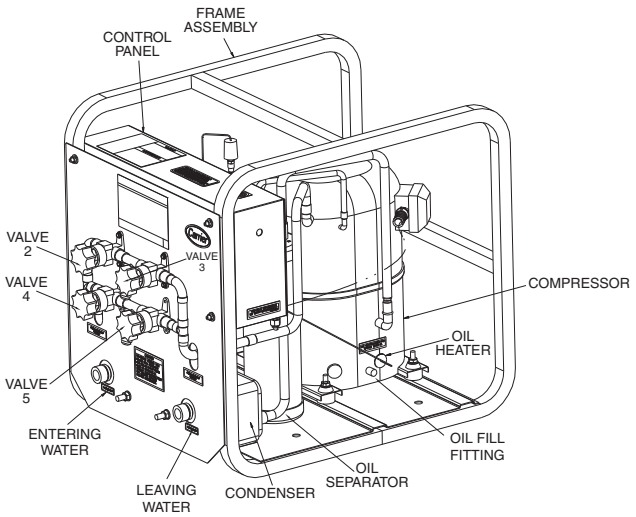


Fig. 49 — Pumpout Unit

Transfer Refrigerant from Storage Tank Vessel to Chiller

⚠ WARNING

During transfer of refrigerant into and out of the 19XR,XRV 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, establishing water flow (assumes vacuum condition in chiller system).
   b. Close pumpout and storage tank valves 2, 4, 5, 7, 8, 10 (if present open isolation valve 11 and other isolation valves between cooler and condenser). Open storage tank valves 6; open chiller valves 1A and 1B.

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION			C		C	C		C	C	C	

   c. Gradually open valve 5 to slowly increase chiller pressure to 35 psig (241 kPa) to reduce the potential of tube freeze up.
   d. Open valve 5 fully after the chiller pressure reaches 35 psig (241 kPa) or greater. Let chiller pressure reach 40 psig (276 kPa), then chiller water pumps can be turned off. Fully close valve 5.

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION			C		C	C		C	C	C	

   e. Open valve 8 and 10 to let higher pressure in the recovery tank push liquid refrigerant into the condenser float chamber and heat exchangers until the refrigerant pressure equalizes between the recovery tank and chiller.

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION			C		C	C		C			

2. Push liquid to chiller, them remove remaining vapor from storage tank:
   a. To prepare for liquid, push open valve 4.

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION			C			C		C			

   b. Ensure pumpout condenser water is off, then turn on the pumpout compressor in manual mode to push liquid to chiller. Monitor the storage tank level until tank is empty of liquid refrigerant.
   c. Close charging valves 8 and 10.
   d. Turn off the pumpout compressor.
   e. To prepare for removal of remaining refrigerant vapor in storage tank, close pumpout valves 3 and 4 and open valves 2 and 5.

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION				C	C			C	C	C	

   f. Turn on pumpout condenser water.
   g. Run pumpout unit in auto until the vacuum switch is satisfied. This occurs approximately at 15 in. Hg vacuum (48 kPa absolute or 7 psia), removing the residual refrigerant vapor from the recovery tank and condensing to a liquid in the chiller. Close valves 1A, 1B, 2, 5, 6.

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION	C	C	C	C	C	C	C	C	C	C	

   h. Turn off pumpout condenser water.

Transfer Refrigerant from Chiller to Storage Tank Vessel

1. Equalize refrigerant pressure.
   a. Dehydrate the refrigerant storage vessel, and connected hoses/piping so there are no non-condensables mixed with the refrigerant.
   b. Locate valves as identified below:

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION			C		C	C		C	C	C	

   c. Slowly open valve 5 until the refrigerant pressure reaches 35 psig (241 kPa) in the storage tank, followed by valves 7 and 10 to allow liquid refrigerant to drain by gravity.

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION			C		C				C		

2. Push remaining liquid, followed by refrigerant vapor removal from chiller.
   a. To prepare for liquid push, turn off the pumpout condenser water. Place valves in the following positions:

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION				C	C				C		

   b. Run the pumpout compressor in manual until all liquid is pushed out of the chiller (approximately 45 minutes). Close valves 2, 5, 7, and 10, then stop compressor.

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION			C	C	C	C		C	C	C	

   c. Turn on pumpout condenser water.
   d. Open valves 3 and 4, and place valves in the following positions:

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION			C			C		C	C	C	

   e. Run the pumpout compressor until the chiller pressure reaches 35 psig (241 kPa), followed by turning off the pumpout compressor. Warm chiller condenser water will boil off any entrapped liquid refrigerant, and chiller pressure will rise.

f. When chiller pressure rises to 40 psig (276 kPa), turn on the pumpout compressor until the pressure reaches 35 psig (241 kPa) again; then turn off the pumpout compressor. Repeat this process until the chiller pressure no longer rises.

g. Start the chiller water pumps (condenser and cooler), establishing water flow. At this point, turn on the pumpout compressor in auto until the vacuum switch is satisfied. This occurs at approximately 15 in. Hg vacuum (48 kPa absolute or 7 psia).

h. Close valves.

VALVE	1A	1B	2	3	4	5	6	7	8	10	11
CONDITION	C	C	C	C	C	C	C	C	C	C	

i. Turn off the pumpout condenser water.

CHILLERS WITH ISOLATION VALVES — The valves referred to in the following instructions are shown in Fig. 35 and 36. The cooler/condenser vessels can be used for refrigerant isolation for certain service conditions when the isolation valve package is specified.

Transfer Refrigerant from Cooler to Condenser

a. Turn off chiller water pumps and pumpout condenser water supply (if applicable). It is assumed that the starting point is as shown in the following table and that pressures in both vessels are above 35 psig (241 kPa).

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION	C	C	C	C	C	C	C	C	C

b. Keeping valves 7 and 8 closed, install charging hose from liquid line charging valve 7 to valve 8 on the condenser float chamber. Evacuate or purge hose of non-condensables. Note that this creates a flow path between cooler and condenser that bypasses the linear float, reducing the potential for damage during refrigerant transfer.

c. Open valves 1A, 1B, 2, 5, and 8.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION				C	C		C		C

d. Turn on pumpout compressor, generating a refrigerant pressure differential of 10 to 20 psi (69 to 138 kPa) to push liquid out of the chiller cooler vessel.

e. Slowly open valve 7 to allow liquid transfer. Rapid opening of valve 7 can result in float valve damage.

f. When all liquid has been pushed into the chiller condenser vessel, close valve 8.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION				C	C			C	C

g. Turn off the pumpout compressor.

h. Close pumpout valves 2 and 5 while opening valve 3 and 4 to prepare for removal of remaining refrigerant vapor in cooler vessel.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION			C			C		C	C

i. Turn on pumpout condenser water.

j. Turn on pumpout compressor. Turn on the chiller water pump to establish water flow when the cooler refrigerant pressure is 35 psig (241 kPa). **The water pumps have to be in operation whenever the refrigerant pressure is equal to or less than 35 psig (241 kPa) to reduce the potential of tube damage.**

k. Run the pumpout compressor until the cooler pressure reaches 35 psig (241 kPa), then turn off the pumpout compressor. Warm chiller cooler water will boil off any entrapped liquid refrigerant, and chiller pressure will rise. Repeat this process until the chiller pressure no longer rises.

l. Run pumpout unit in auto until the vacuum switch is satisfied; this occurs at approximately 15 in. Hg vacuum (48 kPa absolute or 7 psia). Close valve 1A.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION	C		C			C		C	C

m. Monitor that cooler pressure does not rise (if it does, then repeat previous step).

n. With service valve 1A closed, shut down pumpout compressor (if still running).

o. Close remaining valves.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION	C	C	C	C	C	C	C	C	C

p. Remove charging hose between 7 and 8 (evacuate prior to removal).

q. Turn off pumpout condenser water.

r. Turn off chiller water pumps, and lockout chiller compressor.

Transfer Refrigerant from Condenser to Cooler

a. Turn off chiller water pumps and pumpout condenser water supply (if applicable). It is assumed that the starting point is as shown in the following table and that pressures in both vessels are above 35 psig (241 kPa).

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION	C	C	C	C	C	C	C	C	C

b. Set valves as shown below to allow the refrigerant to equalize:

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION			C			C	C	C	C

c. Turn on pumpout compressor, and develop a 10 to 20 psi (69 to 138 kPa) refrigerant differential pressure between the vessels.

d. Partially open valve 11 while maintaining a refrigerant pressure differential to push liquid refrigerant out of the chiller condenser to the cooler.

e. When all liquid is out of the chiller condenser, close valve 11 and any other isolation valves on the chiller.

f. Turn off the pumpout compressor.

g. Close pumpout valves 3 and 4 while opening valve 2 and 5 to prepare for removal of remaining refrigerant vapor in condenser vessel.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION				C	C		C	C	C

h. Turn on pumpout condenser water.

i. Turn on pumpout compressor.

j. Turn on the chiller water pumps, establishing water flow when the condenser refrigerant pressure is 35 psig (241 kPa). **The water pumps have to be in operation whenever the refrigerant pressure is**

equal to or less than 35 psig (241 kPa) to reduce the potential of tube damage.

k. Run the pumpout compressor until the condenser refrigerant pressure reaches 35 psig (241 kPa) then turn off the pumpout compressor. Warm condenser water will boil off any entrapped liquid refrigerant, and chiller pressure will rise. Repeat this process until the chiller pressure no longer rises.

l. Run pumpout unit in auto until the vacuum switch is satisfied; this occurs at approximately 15 in. Hg vacuum (48 kPa absolute or 7 psia). Close valve 1B.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION		C		C	C		C	C	C

m. Monitor that condenser pressure does not rise (if it does, then repeat previous step).

n. With service valve 1B closed, shut down pumpout compressor (if still running).

o. Close remaining valves.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION	C	C	C	C	C	C	C	C	C

p. Turn off pumpout condenser water.

q. Turn off chiller water pumps, and lock out chiller compressor.

Return Chiller to Normal Operating Conditions

1. Vapor Pressure Equalization:
   a. Ensure that the chiller vessel that was exposed to ambient has been evacuated. Final vacuum prior to charging with refrigerant should in all cases be 29.9 in. Hg (500 microns, 0.07 kPa [abs]) or less.
   b. Turn on chiller water pumps.
   c. Open valves 1A, 1B, and 2.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION				C	C	C	C	C	C

   d. Slowly open valve 4, gradually increasing pressure in the evacuated vessel to 35 psig (241 kPa).
   e. Leak test to ensure chiller vessel integrity.
   f. Open valve 4 fully for cooler and condenser pressure equalization (vapor equalization).

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION				C		C	C	C	C

   g. Close valves 1A, 1B, 2, and 4.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION	C	C	C	C	C	C	C	C	C

2. Liquid equalization:
   a. If refrigerant is stored in cooler, install a charging hose between valves 7 and 8, and open both the valves and any other isolation valves (except valve 11) for liquid to drain into the condenser while bypassing the linear float valve. If refrigerant is stored in the condenser, keep valve 11 and any other isolation valves open for liquid drain.

VALVE	1A	1B	2	3	4	5	7	8	11
CONDITION (CHARGE IN COOLER)	C	C	C	C	C	C			C
CONDITION (CHARGE IN CONDENSER)	C	C	C	C	C	C	C	C	

   b. If valves 7 and 8 were used to bypass the linear float valve, once the liquid transfer is complete, close these valves, and slowly open valve 11.
   c. 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.
2. Equalize the refrigerant pressure.
   a. Turn on chiller water pumps and monitor chiller pressures.
   b. Close pumpout and storage tank valves 2, 4, 5, and 10, and close chiller charging valve 7; open chiller isolation valve 11 and any other chiller isolation valves, if present.
   c. Open pumpout and storage tank valves 3 and 6; open chiller valves 1a and 1b.

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

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

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

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

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

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

GENERAL MAINTENANCE

Refrigerant Properties — The standard refrigerant for the 19XRV chiller is HFC-134a. At normal atmospheric pressure, HFC-134a refrigerant will boil at –14 F (–25 C) and must, therefore, be kept in pressurized containers or storage tanks. The refrigerant is practically odorless when mixed with air and is noncombustible at atmospheric pressure. Read the Material Safety Data Sheet and the latest ASHRAE Safety Guide for Mechanical Refrigeration to learn more about safe handling of this refrigerant.

⚠DANGER

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

Adding Refrigerant — Follow the procedures described in Trim Refrigerant Charge section, page 88.

⚠ CAUTION

Always use the compressor pumpdown function in the Control Test table to turn on the cooler pump and lock out the compressor when transferring refrigerant. Liquid refrigerant may flash into a gas and cause water in the heater exchanger tubes to freeze when the chiller pressure is below 35 psig (241 kPa) for HFC-134a, resulting in equipment damage.

Removing Refrigerant — If the optional pumpout system is used, the 19XRV refrigerant charge may be transferred to a pumpout storage tank or to the chiller condenser or cooler vessels. Follow the procedures in the Pumpout and Refrigerant Transfer Procedures section when transferring refrigerant from one vessel to another.

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 88.

Refrigerant Leak Testing — Because HFC-134a refrigerant is above atmospheric pressure at room temperature, leak testing can be performed with refrigerant in the chiller. Use an electronic halide 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 to perform a leak test.

⚠ WARNING

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

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 section (pages 67 and 70) in the Before Initial Start-Up section.

Checking Guide Vane Linkage — When the chiller is off, the guide vanes are closed and the actuator mechanism is in the position shown in Fig. 50. Slack in the guide vane actuator's drive chain can only be removed with the guide vane actuator fully closed and the chiller shut down. Complete the following steps to adjust chain tension and position:

1. Remove the two set screws in the guide vane actuator sprocket.
2. Loosen the guide vane actuator's holddown bolts.
3. Pull the guide vane actuator away from the suction housing along the slotted holes in the actuator bracket.
4. 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 re-seated. (Remember: Spot-drill and tighten the first set screw before spot-drilling for the second set screw.)

Trim Refrigerant Charge — To remove any excess refrigerant, follow the procedure in Transfer Refrigerant from Chiller to Pumpout Storage Tank Vessel section, page 85.

Refer to the Trimming Refrigerant Charge section on page 80.

WEEKLY MAINTENANCE

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

If the level goes below the lower sight glass, check the oil reclaim system for proper operation. If additional oil is required, add it through the oil drain charging valve (Fig. 2 and 3). A pump is required when adding oil against refrigerant pressure. The oil charge for the 19XRV compressor depends on the compressor Frame size:

- Frame 2 compressor — 8 gal (30 L)
- Frame 3 compressor — 8 gal (30 L)
- Frame 4 compressor — 10 gal (37.8 L)
- Frame 4 compressor with split ring diffuser — 12 gal (45 L)
- Frame 5 compressor — 18 gal (67.8 L)
- Frame E compressor — 18 gal (67.8 L)

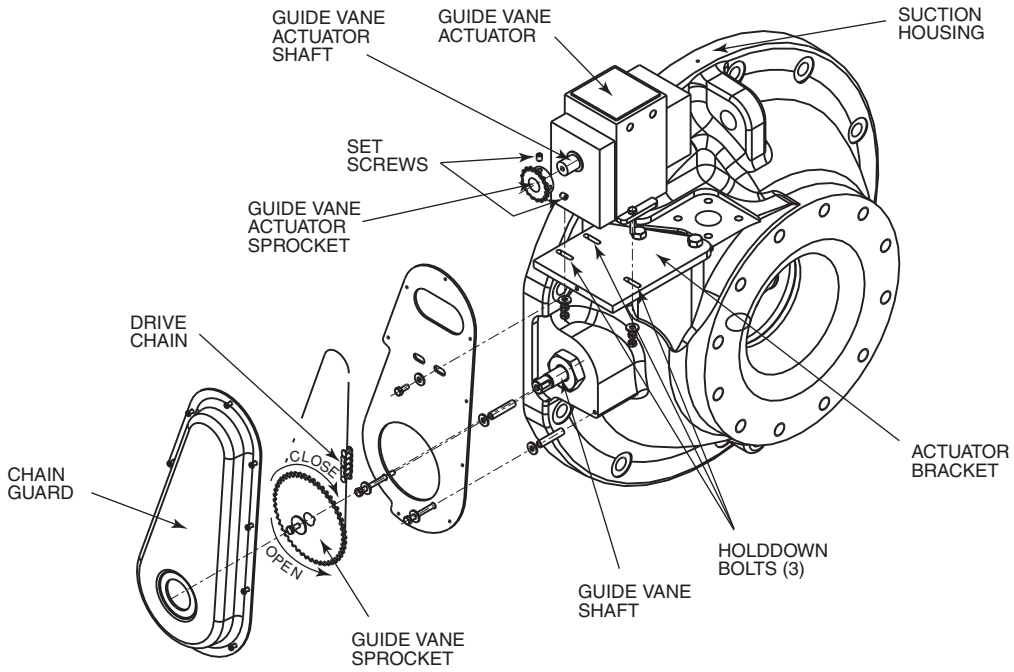


Fig. 50 — Guide Vane Actuator Linkage

The added oil *must* meet Carrier specifications for the 19XRV. Refer to Changing Oil Filter and Oil Changes sections on pages 89 and 90. 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 III to maintain oil temperature (see the Controls section) when the compressor is off. The ICVC COMPRESS screen displays whether the heater is energized or not. The heater is energized if the *OIL HEATER RELAY* parameter reads ON. If the PIC III 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 III does not permit compressor start-up if the oil temperature is too low. The PIC III continues with start-up only after the temperature is within allowable limits.

SCHEDULED MAINTENANCE

Establish a regular maintenance schedule based on 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 ICVC will display a *SERVICE ONTIME* value on the MAINSTAT 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 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 for control checks and adjustments.

⚠ CAUTION

Ensure power to the VFD is off when cleaning and tightening connections inside the VFD enclosure. Failure to disconnect power could result in electrocution.

Check Safety and Operating Controls Monthly — Check values of monitored parameters (see Table 6 for safety control settings). To ensure chiller protection, the Automated Control Test should be performed at least once per month (with machine in OFF mode). See Table 14 for Control Test functions.

Changing Oil Filter — Change the oil filter on a yearly basis or when the chiller is opened for repairs. The 19XRV chiller has an isolatable oil filter so that the filter may be changed with the refrigerant remaining in the chiller. Early 19XRV compressors were designed with the oil filter housing attached to the oil pump. The following procedure applies to later 19XRV compressors which have the oil filter separate from the oil pump.

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 located behind power panel on top of oil pump assembly.
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 Schraeder 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).

⚠ CAUTION

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 the following Carrier specifications:

Oil Type for units using R-134a . . . . . .Inhibited polyolester-based synthetic compressor oil formatted for use with HFC, gear-driven, hermetic compressors.

ISO Viscosity Grade 68

The polyolester-based oil (P/N: PP23BZ103) may be ordered from a 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.

TO CHANGE THE OIL

1. Transfer the refrigerant into the chiller condenser vessel (for isolatable vessels) or to a pumpout storage tank.
2. Mark the existing oil level.
3. Open the control and oil heater circuit breaker.
4. When the chiller pressure is 5 psig (34 kPa) or less, drain the oil reservoir by opening the oil charging valve (Fig. 2 and 3). 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 III 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 previous oil level's mark (Step 2).

Refrigerant Filter — A refrigerant filter/drier, located on the refrigerant cooling line to the motor, should be changed once every five years when the machine is opened for service. This filter does not contain dessicant for moisture removal, so changing it will not change the moisture indicator status. Change the filter by closing the filter isolation valves (see Fig. 4 and 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.

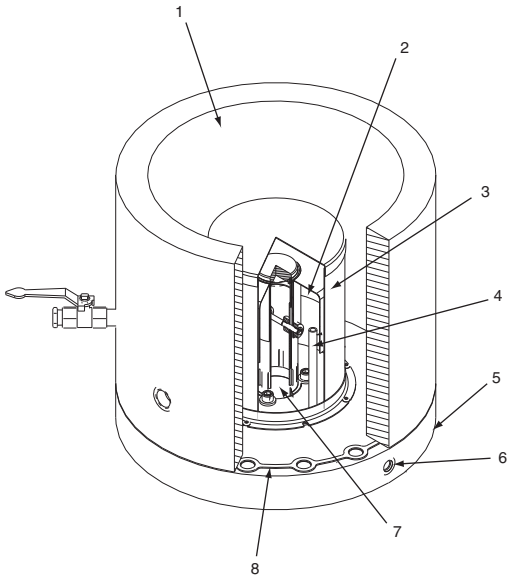
Oil Reclaim Filter — The oil reclaim system has a strainer on the eductor suction line, a strainer on the discharge pressure line, and a filter on the cooler scavenging line. Replace the filter once every 5 years or when the machine is opened for service. This filter does not contain dessicant for moisture 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.

VFD Refrigerant Strainer — 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).

Inspect Refrigerant Float System — Perform this inspection every 5 years or when the condenser is opened for service.

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.

See Fig. 51 for a view of the float valve design. Inspect the orientation of the float slide pin. It must be pointed toward the bubbler tube for proper operation.



LEGEND

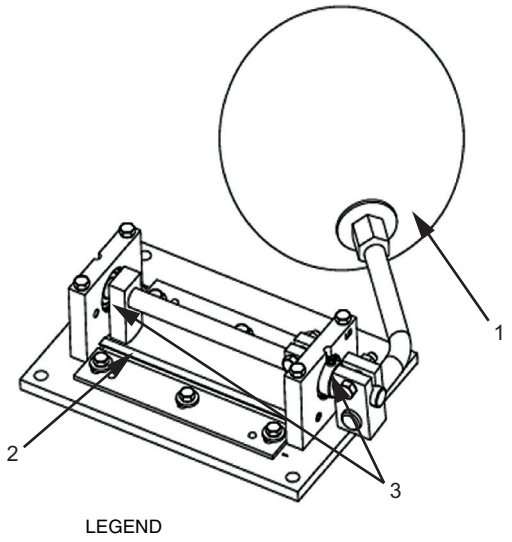
1 — Refrigerant Inlet from FLASC Chamber
2 — Linear Float Assembly
3 — Float Screen
4 — Bubbler Line
5 — Float Cover
6 — Bubbler Line Connection
7 — Refrigerant Outlet to Cooler
8 — Gasket

Fig. 51 — 19XRV Float Valve Design

ECONOMIZER FLOAT SYSTEM (TWO-STAGE COMPRESSORS) — 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. 52 for float detail. Inspect the float every five years. Clean the chamber and the float valve assembly. Be sure that the float moves freely and the ball bearings that the float moves on are clean.

ECONOMIZER DAMPER VALVE (TWO-STAGE COMPRESSORS) — The damper valve should be inspected every 5 years or when the condenser is opened for service. With the refrigerant transferred, remove the spring housing from the valve (Fig. 53). The valve spring will exert 50 lb force upward.

Check the valve and linkage for free travel and loose parts. Clean the assembly thoroughly. Replace the valve packing and the housing o-ring if necessary.



LEGEND

1 — Float Ball
2 — Refrigerant Exit
3 — Bearings

Fig. 52 — Economizer Float System (Two-Stage Compressor Chiller)

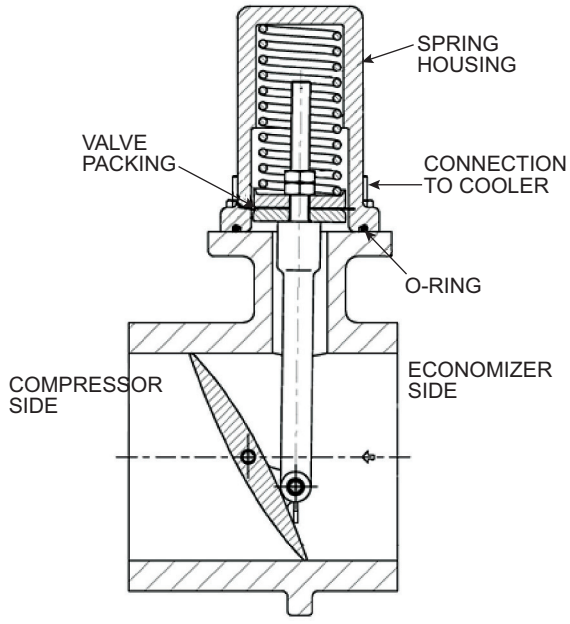


Fig. 53 — Economizer Damper Valve (Two-Stage Compressor Chiller)

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

As a minimum, the following maintenance is required.

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

Compressor Bearing and Gear Maintenance —

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

Excessive bearing wear can sometimes be detected through increased vibration or increased bearing temperature. Gears, babbitted journal, and thrust bearings should be examined approximately every five years for signs of wear based on the results of the annual oil analysis. 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. Rolling element bearings (Frame 3, Frame 4, Frame 5, and Frame E compressor high speed shaft only) cannot be field inspected; excessive vibration is the primary sign of wear or damage. If either symptom appears, contact an experienced and responsible service organization for assistance.

Inspect the Heat Exchanger Tubes and Flow Devices

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

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

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

During the tube cleaning process, use brushes specially designed to avoid scraping and scratching the tube wall.

Contact a Carrier representative to obtain these brushes. Do not use wire brushes.

⚠ CAUTION

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

Water Leaks — The refrigerant moisture indicator on the refrigerant motor cooling line (Fig. 2 and 3) 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. See Chiller Dehydration section, page 70.

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 VFD

⚠ CAUTION

The motor leads must be disconnected from the VFD before an insulation test is performed. The voltage generated from the tester can damage the VFD or drive components.

⚠ WARNING

Before working on any VFD, shut off the chiller, open and tag all disconnects supplying power to the VFD. After disconnecting input power to a VFD and before touching any internal components, wait five minutes for the DC bus capacitors to discharge, then check the voltage with a voltmeter. Failure to observe this precaution could result in severe bodily injury or death.

⚠ WARNING

The disconnect on the VFD front panel does not de-energizes all internal circuits. Open all internal and remote disconnects before servicing the VFD.

⚠ WARNING

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

Periodically vacuum or blow off accumulated debris on internal VFD enclosure components with a high-velocity, low-pressure blower.

Power connections on newly installed VFDs may relax and loosen after a month of operation. Turn power off and re-tighten. 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, the diffuser pressure transducer (only for compressors equipped with split ring diffusers), and the optional waterside pressure transducer pairs (consisting of 4 flow devices: 2 cooler, 2 condenser).

Note the evaporator and condenser pressure readings on the HEAT_EX screen on the ICVC (*EVAPORATOR PRESSURE* and *CONDENSER PRESSURE*). Attach an accurate set of refrigeration gages to the cooler and condenser Schrader fittings. Compare the two readings. If there is a difference in readings, the transducer can be calibrated as described in the Troubleshooting Guide section. Oil differential pressure (*OIL PUMP DELTA P* on the COMPRESS screen) should be zero whenever the compressor is off.

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. 54) — 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.

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.

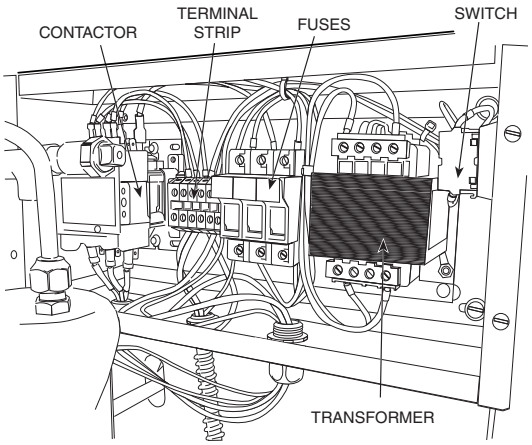


Fig. 54 — Pumpout Control Box (Interior)

TROUBLESHOOTING GUIDE (TABLES 15-18B)

Overview — The PIC III has many features to help the operator and technician troubleshoot a 19XRV chiller.

- The ICVC shows the chiller's actual operating conditions and can be viewed while the unit is running.
- The ICVC default screen freezes when an alarm occurs. The freeze enables the operator to view the chiller conditions at the time of alarm. The STATUS screens continue to show current information. Once all alarms have been cleared (by correcting the problems and pressing the RESET softkey), the ICVC default screen returns to normal operation.
- The CONTROL ALGORITHM STATUS screens (which include the CAPACITY, OVERRIDE, LL_MAINT, VFD_HIST, LOADSHED, CUR_ALARM, WSM-DEFME, and OCCDEFCM 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. See Table 15.
- The control test feature facilitates the proper operation and test of temperature sensors, pressure transducers, the guide vane actuator, 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 ICVC shows the temperatures and pressures required during these operations.
- From other SERVICE tables, the operator/technician can access configured items, such as chilled water resets, override set points, etc.
- If an operating fault is detected, an alarm message is generated and displayed on the ICVC default screen. A more detailed message — along with a diagnostic message — is also stored into the ALARM HISTORY and ALERT HISTORY tables.
- Review the ALERT HISTORY table to view other less critical events and abnormal conditions which may have occurred. Compare timing of relevant alerts and alarms.

Checking Display Messages — The first area to check when troubleshooting the 19XRV is the ICVC display. If the alarm light is flashing, check the primary and secondary message lines on the ICVC default screen (Fig. 18). These messages will indicate where the fault is occurring. These messages contain the alarm message with a specified code. For a complete list of possible alarm and alert messages, see Table 16. This code or state appears with each alarm and alert message. The ALARM and ALERT HISTORY tables on the ICVC SERVICE menu also contains a message to further expand on the fault description. For a complete list of VFD Fault Code Descriptions and corrective actions, see Table 17.

NOTE: The date format in these tables is MM/DD/YY.

If the alarm light starts to flash while accessing a menu screen, press the EXIT softkey to return to the default screen to read the alarm message. The STATUS screen can also be accessed to determine where an alarm exists.

A "C" to the right of a parameter's value means that there is a communications fault on that channel.

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 Table 18A or 18B.

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 Table 18A or 18B. 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. Table 18A or 18B lists 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. Check the sensor wire at the sensor for 5 vdc if the control is powered on.

⚠ CAUTION

Relieve all refrigerant pressure or drain the water before replacing temperature sensors or thermowells threaded into the refrigerant pressure boundary. Failure to do so could result in personal injury and equipment damage.

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 (.25 C) graduations. The sensor in question should be accurate to within 2 F (1.2 C).

See Fig. 12 for sensor locations. The sensors are immersed directly in the refrigerant or water circuits. The wiring at each sensor is easily disconnected by unlatching the connector. These connectors allow only one-way connection to the sensor. When installing a new sensor, apply a pipe sealant or thread sealant to the sensor threads.

DUAL TEMPERATURE SENSORS — For servicing convenience, there are 2 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.

Checking Pressure Transducers — There are 6 factory-installed pressure transducers, with inputs available for optional cooler and condenser waterside differential pressure transducers. The ICVC software will display a default reading of 26 psi during start-up and operation. An additional transducer, factory installed in the bottom of the cooler barrel, will read as EVAPORATOR SATURATION TEMP on the HEAT_EX

DISPLAY screen. This provides additional protection against a loss of water flow condition.

These pressure transducers can be calibrated if necessary. It is not usually necessary to calibrate at initial start-up. However, at high altitude locations, it is necessary to calibrate the transducers to ensure the proper refrigerant temperature/pressure relationship. Each transducer is supplied with 5 vdc power from the CCM. 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 ±.5 v displayed in CONTROL TEST under CCM PRESSURE TRANSDUCERS. If the TRANSDUCER VOLTAGE REF is correct, the transducer should be recalibrated or replaced.

Also check that inputs on CCM J5-1 through J5-6 have not been grounded and are not receiving anything other than a 4 to 20 mA signal.

COOLER CONDENSER PRESSURE TRANSDUCER AND OPTIONAL WATERSIDE FLOW DEVICE 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 HEAT_EX screen on the ICVC. 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). 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 HEAT_EX screen and view the particular transducer reading (the *EVAPORATOR PRESSURE* or *CONDENSER PRESSURE* parameter on the HEAT_EX screen). To calibrate oil pressure or liquidside flow device, view the particular reading (*CHILLED WATER DELTA P* and *CONDENSER WATER DELTA P* on the HEAT_EX screen, and *OIL PUMP DELTA P* on the COMPRESS screen). It should read 0 psi (0 kPa). If the reading is not 0 psi (0 kPa), but within ± 5 psi (35 kPa), the value may be set to zero by pressing the SELECT softkey while the appropriate transducer parameter is highlighted on the ICVC screen. Then press the ENTER softkey. The value will now go to zero. No high end calibration is necessary for *OIL PRESSURE DELTA P* or flow devices.

   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 TRANSDUCER VOLTAGE REF supply voltage signal (displayed in *CONTROL TEST* menu in the PRESSURE TRANSDUCERS screen) or measure across the positive (+ red) and negative (– black) leads of the transducer. For example, the condenser transducer voltage reference is measured at CCM terminals J2-4 and J2-6, the condenser transducer voltage input. The input to reference voltage ratio must be between 0.80 and 0.11 for the software to allow calibration. Pressurize the transducer until the ratio is within range. Then attempt calibration again.

4. A high pressure point can also be calibrated between 25 and 250 psig (172.4 and 1723.7 kPa) by attaching a regulated 250 psig (1724 kPa) pressure (usually from a nitrogen cylinder). The high pressure point can be calibrated by accessing the appropriate transducer parameter on the HEAT_EX screen, highlighting the parameter, pressing the SELECT softkey, and then using the INCREASE or DECREASE softkeys to adjust the value to the exact pressure on the refrigerant gage. Press the ENTER softkey to finish the calibration. Pressures at high altitude locations must be compensated for, so the chiller temperature/pressure relationship is correct.

The PIC III 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.

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 an uncontrolled loss of refrigerant and possible injury to personnel.

Control Algorithms Checkout Procedure —

One of the tables on the ICVC SERVICE menu is CONTROL ALGORITHM STATUS. The maintenance screens may be viewed from the CONTROL ALGORITHM STATUS table to see how a particular control algorithm is operating.

These maintenance screens show different tables that are very useful in helping to determine how the control temperature is calculated and guide vane positioned and also for observing the reactions from load changes, control point overrides, hot gas bypass, surge prevention, etc. See Table 15.

Table 15 — Control Algorithm Status Tables

TABLE	EXPANDED NAME	DESCRIPTION
CAPACITY	Capacity Control	This table shows all values used to calculate the chilled water/brine control point.
OVERRIDE	Override Status	Details of all chilled water control override values.
SURGPREV	Surge Prevention Status	Displays all information used or supplied by the surge prevention algorithm.
LL_MAINT	LEAD/LAG Status	Indicates LEAD/LAG operation status.
OCCDEFCM	Time Schedules Status	The Local and CCN occupied schedules are displayed here to help the operator quickly determine whether the schedule is in the “occupied” mode or not.
WSMDEFME	Water System Manager Status	The water system manager is a CCN module that can turn on the chiller and change the chilled water control point. This screen indicates the status of this system.
VFD_HIST	VFD Alarm History	Displays VFD values at last fault.
LOADSHED	Loadshed Status	Displays Loadshed (Demand Limit) status.
CUR_ALARM	Current Alarm Status	Displays current chiller alarms.
HEAT_EX*	Surge and HGBP Status	The surge and hot gas bypass control algorithm status is viewed from this screen. All values related to this control are displayed.

*The HEAT_EX screen is under the STATUS menu.

Control Test — The Control Test feature can check all the thermistor temperature sensors, pressure transducers, pumps and their associated flow devices, the guide vane actuator, and other control outputs such as tower fans, VFD cooling solenoid, shunt trip relay, oil heaters, alarm relay, and hot gas bypass. 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. The Pumpdown/Lockout feature 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.

Table 16 — Alarm and Alert Messages

A. MANUAL STOP

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
MANUALLY STOPPED — PRESS	CCN OR LOCAL TO START	PIC III in OFF mode, press CCN or LOCAL softkey to start unit.
TERMINATE PUMPDOWN MODE	TO SELECT CCN OR LOCAL	Enter the CONTROL TEST table and select TERMINATE LOCKOUT to unlock compressor.
SHUTDOWN IN PROGRESS	COMPRESSOR UNLOADING	Chiller unloading before shutdown due to soft/stop feature.
SHUTDOWN IN PROGRESS	COMPRESSOR DEENERGIZED	Chiller compressor is being commanded to stop. Water pumps are deenergized within one minute.
ICE BUILD	OPERATION COMPLETE	Chiller shutdown from Ice Build operation.
SHUTDOWN IN PROGRESS	RECYCLE RESTART PENDING	Chilled water temperature below recycle set point. Cooling load is less than chiller minimum capacity.

B. READY TO START

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
READY TO START IN XX MIN	UNOCCUPIED MODE	Time schedule for PIC III is unoccupied. Chillers will start only when occupied. Check OCCPCnnS and Holidays screens.
READY TO START IN XX MIN	REMOTE CONTACT OPEN	Remote contacts are open. Close contacts to start.
READY TO START IN XX MIN	STOP COMMAND IN EFFECT	Chiller START/STOP on MAINSTAT manually forced to stop. Release SUPERVISOR force to start.
READY TO START IN XX MIN	OCCUPIED MODE	Chiller timer counting down. Unit ready to start.
READY TO START IN XX MIN	REMOTE CONTACT CLOSED	Chiller timer countdown complete. Unit will proceed to start. Remote contact Enabled and Closed.
READY TO START IN XX MIN	START COMMAND IN EFFECT	Chiller START/STOP on MAINSTAT manually forced to start. Release SUPERVISOR force to start under normal control.
READY TO START IN XX MIN	RECYCLE RESTART PENDING	Chiller is recycle mode.
READY TO START	UNOCCUPIED MODE	Time schedule for PIC III is unoccupied in OCCPC01S screen. Chiller will start when state changes to occupied. Make sure the time and date are correct in the TIME AND DATE screen.
READY TO START	REMOTE CONTACT OPEN	Remote contacts have stopped the chiller. Close contacts to start.
READY TO START	STOP COMMAND IN EFFECT	Chiller START/STOP on MAINSTAT manually forced to stop. Release SUPERVISOR force to start.
READY TO START	OCCUPIED MODE	Chiller timers countdown is complete. Unit will proceed to start.
READY TO START	REMOTE CONTACT CLOSED	Chiller timer counting down. Unit ready to start.
READY TO START	START COMMAND IN EFFECT	Chiller START/STOP on MAINSTAT has been manually forced to start. Chiller will start regardless of time schedule or remote contact status.
STARTUP INHIBITED	LOADSHED IN EFFECT	CCN loadshed module commanding chiller to stop.

C. IN RECYCLE SHUTDOWN

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
RECYCLE RESTART PENDING	OCCUPIED MODE	Unit in recycle mode, chilled water temperature is not sufficiently above Setpoint to start.
RECYCLE RESTART PENDING	REMOTE CONTACT CLOSED	Unit in recycle mode, chilled water temperature is not sufficiently above Setpoint to start.
RECYCLE RESTART PENDING	START COMMAND IN EFFECT	Chiller START/STOP on MAINSTAT manually forced to start, chilled water temperature is not sufficiently above Setpoint to start.
RECYCLE RESTART PENDING	ICE BUILD MODE	Chiller in ICE BUILD mode. Chilled water temperature is satisfied for ICE BUILD conditions.

LEGEND TO TABLES 16A-16J

CCN — Carrier Comfort Network®
CCM — Chiller Control Module
DPI — Drive Peripheral Interface
ICVC — International Chiller Visual Control
PIC III — Product Integrated Controls III
TXV — Thermostatic Expansion Valve
VFD — Variable Frequency Drive
VFG — Variable Frequency (Drive) Gateway

Table 16 — Alarm and Alert Messages (cont)

D. PRE-START ALERTS: These alerts only delay start-up. When alert is corrected, the start-up will continue. No reset is necessary.

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
100	**PRESTART ALERT**	STARTS LIMIT EXCEEDED	100→Excessive compressor starts (8 in 12 hours).	Depress the RESET softkey if additional start is required. Reassess start-up requirements.
101	**PRESTART ALERT**	HIGH BEARING TEMPERATURE	101→Comp Thrust Brg Temp [VALUE] exceeded limit of [LIMIT]*.	Check oil heater for proper operation. Check for low oil level, partially closed oil supply valves, clogged oil filters. Check the sensor wiring and accuracy. Check Comp Thrust Brg Alert setting in SETUP1 screen.
102	**PRESTART ALERT**	HIGH MOTOR TEMPERATURE	102→Comp Motor Winding Temp [VALUE] exceeded limit of [LIMIT]*.	Check motor sensors for wiring and accuracy. Check motor cooling line for proper operation, or restrictions. Check for excessive starts within a short time span. Check Comp Motor Temperature Override setting in SETUP1 screen.
103	**PRESTART ALERT**	HIGH DISCHARGE TEMP	103→Comp Discharge Temp [VALUE] exceeded limit of [LIMIT]*.	Allow discharge sensor to cool. Check sensor wiring and accuracy. Check for excessive starts. Check Comp Discharge Alert setting in SETUP1 screen.
104	**PRESTART ALERT**	LOW REFRIGERANT TEMP	104→Evaporator Refrig Temp [VALUE] exceeded limit of [LIMIT]*.	Check transducer wiring and accuracy. Check for low chilled fluid supply temperatures. Check refrigerant charge. Check Refrig Override Delta T in SETUP1 screen.
105	**PRESTART ALERT**	LOW OIL TEMPERATURE	105→Oil Sump Temp [VALUE] exceeded limit of [LIMIT]*.	Check oil heater contactor/relay and power. Check oil level and oil pump operation.
106	**PRESTART ALERT**	HIGH CONDENSER PRESSURE	106→Condenser Pressure [VALUE] exceeded limit of [LIMIT]*.	Check transducer wiring and accuracy. Check for high condenser water temperatures. Check high condenser pressure switch wiring.
107	**PRESTART ALERT**	LOW LINE VOLTAGE	107→Percent Line Voltage [VALUE] exceeded limit of [LIMIT]*.	Check voltage supply. Check voltage transformers and switch gear. Consult power utility if voltage is low.
108	**PRESTART ALERT**	HIGH LINE VOLTAGE	108→Percent Line Voltage [VALUE] exceeded limit of [LIMIT]*.	Check voltage supply. Check power transformers. Consult power utility if voltage is high.
109	**PRESTART ALERT**	GUIDE VANE CALIBRATION	109→Actual Guide Vane Pos Calibration Required Before Startup.	Press STOP button on ICVC and perform Guide Vane Calibration in Controls Test screen. Check guide vane actuator feedback potentiometer.
110	**PRESTART ALERT**	HIGH RECTIFIER TEMP	110→Rectifier Temperature [VALUE] exceeded limit of [LIMIT]*.	Check that VFD refrigerant isolation valves are open. Check VFD refrigerant cooling solenoid and refrigerant strainer. Check for proper VFD cooling fan operation and blockage.
111	**PRESTART ALERT**	HIGH INVERTER TEMP	111→Inverter Temperature [VALUE] exceeded limit of [LIMIT]*.	Check that VFD refrigerant isolation valves are open. Check VFD refrigerant cooling solenoid and refrigerant strainer. Check for proper VFD cooling fan operation and blockage.

*[LIMIT] is shown on the ICVC as temperature, pressure, voltage, etc., predefined or selected by the operator as an override or an alert. [VALUE] is the actual pressure, temperature, voltage, etc., at which the control tripped.

E. START-UP IN PROGRESS

PRIMARY MESSAGE	SECONDARY MESSAGE	CAUSE/REMEDY
STARTUP IN PROGRESS	OCCUPIED MODE	Chiller is starting. Time schedule is Occupied.
STARTUP IN PROGRESS	REMOTE CONTACT CLOSED	Chiller is starting. Remote contacts are Enabled and Closed.
STARTUP IN PROGRESS	START COMMAND IN EFFECT	Chiller is starting. Chiller START/STOP in MAINSTAT manually forced to start.
AUTORESTART IN PROGRESS	OCCUPIED MODE	Chiller is starting after power failure. Time schedule is Occupied.
AUTORESTART IN PROGRESS	REMOTE CONTACT CLOSED	Chiller is starting after power failure. Remote contacts are Enabled and Closed.
AUTORESTART IN PROGRESS	START COMMAND IN EFFECT	Chiller is starting after power failure. Chiller START/STOP on MAINSTAT screen manually forced to start.

Table 16 — Alarm and Alert Messages (cont)

F. NORMAL RUN

PRIMARY MESSAGE	SECONDARY MESSAGE	CAUSE/REMEDY
RUNNING — RESET ACTIVE	BY 4-20 mA SIGNAL	Auto chilled water reset active based on external input.
RUNNING — RESET ACTIVE	REMOTE TEMP SENSOR	Auto chilled water reset active based on external input.
RUNNING — RESET ACTIVE	CHW TEMP DIFFERENCE	Auto chilled water reset active based on CHW Delta T in TEMP_CTL screen.
RUNNING — TEMP CONTROL	LEAVING CHILLED WATER	Default method of temperature control.
RUNNING — TEMP CONTROL	ENTERING CHILLED WATER	Entering Chilled Water control enabled in TEMP_CTL screen.
RUNNING — TEMP CONTROL	TEMPERATURE RAMP LOADING	Ramp Loading in effect. Use RAMP_DEM screen to modify.
RUNNING — DEMAND LIMITED	BY DEMAND RAMP LOADING	Ramp Loading in effect. Use RAMP_DEM screen to modify.
RUNNING — DEMAND LIMITED	BY LOCAL DEMAND SETPOINT	Demand limit set point is less than actual demand.
RUNNING — DEMAND LIMITED	BY 4-20 mA SIGNAL	Demand limit is active based on external auto demand limit option.
RUNNING — DEMAND LIMITED	BY CCN SIGNAL	Demand limit is active based on control limit signal from CCN.
RUNNING — DEMAND LIMITED	BY LOADSHED/REDLINE	Demand limit is active based on LOADSHED screen set-up.
RUNNING — TEMP CONTROL	HOT GAS BYPASS	Hot gas bypass valve is energized (open). See Surge prevention description.
RUNNING — DEMAND LIMITED	BY LOCAL SIGNAL	Active demand limit manually overridden on MAINSTAT table.
RUNNING — TEMP CONTROL	ICE BUILD MODE	Chiller is running under Ice Build temperature control.
RUNNING — DEMAND LIMITED	MOTOR LOAD CURRENT	Chiller has reached 100% of Load Current Rating during normal operation.
RUNNING — DEMAND LIMITED	VFD LINE CURRENT	Chiller has reached 100% of Line Current Rating during normal operation.
RUNNING — TEMP CONTROL	IN VFD RAMPDOWN	Post-start-up, speed reducing, and guide vanes opening to reach normal operating state.

G. NORMAL RUN WITH OVERRIDES

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
120	**RUN CAPACITY LIMITED**	HIGH CONDENSER PRESSURE	120→Condenser Pressure [VALUE] exceeded limit of [LIMIT]*.	Check condenser water pump operation. Check for high condenser water temperatures or low flow rate. Verify that isolation valves are open. Check Cond Press Override setting in SETUP1.
121	**RUN CAPACITY LIMITED**	HIGH MOTOR TEMPERATURE	121→Comp Motor Winding Temp [VALUE] exceeded limit of [LIMIT]*.	Check for closed valves or restriction in motor cooling lines. Check for closed refrigerant isolation valves. Check Comp Motor Temp Override setting in SETUP1.
122	**RUN CAPACITY LIMITED**	LOW EVAP REFRIG TEMP	122→Evaporator Refrig Temp [VALUE] exceeded limit of [LIMIT]*.	Check refrigerant charge. Check that optional cooler liquid line isolation valve is fully open. Check for excessive condenser flow or low chilled water flow. Check for low entering cooler temperature. Check that condenser inlet and outlet water nozzles are piped correctly. Check for waterbox division plate gasket bypass.
123	**RUN CAPACITY LIMITED**	HIGH COMPRESSOR LIFT	123→Surge Prevention Override: Lift Too High For Compressor	Check for high condenser water temperature or low suction temperature. Check for high Evaporator or Condenser approaches. Check surge prevention parameters in OPTIONS screen.
124	**RUN CAPACITY LIMITED**	MANUAL GUIDE VANE TARGET	124→Run Capacity Limited: Manual Guide Vane Target.	Target Guide Vane Position has been forced in the COMPRESS screen. Select and RELEASE force to return to normal (automatic) operation.
125	**RUN CAPACITY LIMITED**	LOW DISCHARGE SUPERHEAT	No Alert message.	Check for oil loss or excess refrigerant charge. Verify that the valves in the oil reclaim lines are open.
126	**RUN CAPACITY LIMITED**	HIGH RECTIFIER TEMP	126→Rectifier Temperature [VALUE] exceeded limit of [LIMIT]*.	Check Rectifier Temp Override in SETUP1 screen. Check that VFD refrigerant isolation valves are open. Check VFD refrigerant cooling solenoid. Check for proper VFD cooling fan operation and blockage.
127	**RUN CAPACITY LIMITED**	MANUAL SPEED CONTROL	No Alert message.	Chiller is not in automatic temperature control.
128	**RUN CAPACITY LIMITED**	HIGH INVERTER TEMP	128→Inverter Temperature [VALUE] exceeded limit of [LIMIT]*.	Check Inverter Temp Override in SETUP1 screen. Check that VFD refrigerant isolation valves are open. Check VFD refrigerant cooling solenoid. Check for proper VFD cooling fan operation and blockage.

*[LIMIT] is shown on the ICVC as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. [VALUE] is the actual pressure, temperature, voltage, etc., at which the control tripped.

Table 16 — Alarm and Alert Messages (cont)

H. OUT-OF-RANGE SENSOR

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
260	**SENSOR FAULT**	LEAVING CHILLED WATER	260→Sensor Fault: Check Leaving Chilled Water Sensor.	Check sensor resistance or voltage drop. Check for proper wiring. Check for disconnected or shorted wiring.
261	**SENSOR FAULT**	ENTERING CHILLED WATER	261→Sensor Fault: Check Entering Chilled Water Sensor.	Check sensor resistance or voltage drop. Check for proper wiring. Check for disconnected or shorted wiring.
262	**SENSOR FAULT**	CONDENSER PRESSURE	262→Sensor Fault: Check Condenser Pressure Sensor.	Check sensor wiring. Check for disconnected or shorted wiring. Check for condensation in transducer connector.
263	**SENSOR FAULT**	EVAPORATOR PRESSURE	263→Sensor Fault: Check Evaporator Pressure Sensor.	Check sensor wiring. Check for disconnected or shorted wiring. Check for condensation in transducer connector.
264	**SENSOR FAULT**	COMPRESSOR BEARING TEMP	264→Sensor Fault: Check Comp Thrust Brg Temp Sensor.	Check sensor resistance or voltage drop. Check for proper wiring. Check for disconnected or shorted wiring.
265	**SENSOR FAULT**	COMPRESSOR MOTOR TEMP	265→Sensor Fault: Check Comp Motor Winding Temp Sensor.	Check sensor resistance or voltage drop. Check for proper wiring. Check for disconnected or shorted wiring.
266	**SENSOR FAULT**	COMP DISCHARGE TEMP	266→Sensor Fault: Check Comp Discharge Temp Sensor.	Check sensor resistance or voltage drop. Check for proper wiring. Check for disconnected or shorted wiring.
267	**SENSOR FAULT**	OIL SUMP TEMP	267→Sensor Fault: Check Oil Sump Temp Sensor.	Check sensor resistance or voltage drop. Check for proper wiring. Check for disconnected or shorted wiring.
268	**SENSOR FAULT**	COMP OIL PRESS DIFF	268→Sensor Fault: Check Oil Pump Delta P Sensor.	Check sensor resistance or voltage drop. Check for proper wiring. Check for disconnected or shorted wiring.
269	**SENSOR FAULT**	CHILLED WATER FLOW	269→Sensor Fault: Check Chilled Water Delta P Sensor.	Check sensor wiring and accuracy. Check for disconnected or shorted wiring. If pressure transducers are not installed, check for presence of resistors and jumpers on lower CCM terminal block J3.
270	**SENSOR FAULT**	COND WATER FLOW	270→Sensor Fault: Check Cond Water Delta P Sensor.	Check sensor wiring and accuracy. Check for disconnected or shorted wiring. If pressure transducers are not installed, check for presence of resistors and jumpers on lower CCM terminal block J3.
271	**SENSOR FAULT**	EVAP SATURATION TEMP	271→Sensor Fault: Check Evap Saturation Temp Sensor.	Check sensor resistance or voltage drop. Check for proper wiring. Check for disconnected or shorted wiring.

Table 16 — Alarm and Alert Messages (cont)

I. CHILLER PROTECTIVE LIMIT FAULTS

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
200	**PROTECTIVE LIMIT**	RECTIFIER POWER FAULT	200→Rectifier Power Fault: Check VFD Status.	Malfunction within VFD Power Module. Call Carrier Service.
201	**PROTECTIVE LIMIT**	INVERTER POWER FAULT	201→Inverter Power Fault: Check VFD Status.	Malfunction within VFD Power Module. Call Carrier Service.
202	**PROTECTIVE LIMIT**	MOTOR AMPS NOT SENSED	202→Motor Amps Not Sensed — Average Load Current [VALUE].	Check main circuit breaker for trip. Increase Current % Imbalance in VFD_CONF screen.
203	**FAILURE TO START**	MOTOR ACCELERATION FAULT	203→Motor Acceleration Fault — Average Load Current [VALUE].	Check that inlet guide vanes are fully closed at start-up. Check Motor Rated Load Amps in VFD_CONF screen. Reduce unit pressure if possible.
204	**FAILURE TO STOP**	VFD SHUTDOWN FAULT	204→VFD Shutdown Fault: Check Inverter Power Unit.	VFD Circuit Board malfunction. Call Carrier Service.
205	**PROTECTIVE LIMIT**	HIGH DC BUS VOLTAGE	205→High DC Bus Voltage: [VALUE] exceeded limit of [LIMIT]*.	Verify phase to phase and phase to ground line voltage. Monitor AC line for high transient voltage conditions. VFD Circuit Board malfunction. Call Carrier Service.
206	**PROTECTIVE LIMIT**	VFD FAULT	206→VFD Fault Code: [VALUE]; Check VFD Fault Code List.	See VFD Fault Code description and corrective action.
207	**PROTECTIVE LIMIT**	HIGH CONDENSER PRESSURE	207→High Cond Pressure trip. [VALUE] exceeded Switch Trippoint.	Check Compressor Discharge High Pressure switch wiring and accuracy. Check for high condenser water temperatures, low water flow, fouled tubes. Check for division plate/gasket bypass. Check for noncondensables in refrigerant.
208	**PROTECTIVE LIMIT**	EXCESSIVE MOTOR AMPS	208→Percent Load Current [VALUE] exceeded limit of [LIMIT]*.	Check Motor Rated Load Amps in VFD_CONF screen. Percent Load Current > 110%. Check Motor Rated Load Amps setting.
209	**PROTECTIVE LIMIT**	LINE CURRENT IMBALANCE	209→Line Current Imbalance: Check VFD Fault History for Values.	Check phase to phase and phase to ground power distribution bus voltage. Check Line Current % Imbalance in VFD_CONF screen. Consult power company.
210	**PROTECTIVE LIMIT**	LINE VOLTAGE DROP-OUT	210→Single Cycle Line Voltage Dropout.	Temporary loss of voltage. Disable Single Cycle Dropout in VFD_CONF screen.
211	**PROTECTIVE LIMIT**	HIGH LINE VOLTAGE	211→High Percent Line Voltage [VALUE].	Check phase to phase and phase to ground distribution bus voltage. Consult power company.
212	**PROTECTIVE LIMIT**	LOW LINE VOLTAGE	212→Low Percent Line Voltage [VALUE].	Check phase to phase and phase to ground distribution bus voltage. Consult power company.
213	**PROTECTIVE LIMIT**	VFD MODULE RESET	213→VFD Module Power-On Reset When Running.	Temporary loss of VFD control voltage. Check VFD control power breaker, transformer and fuses.
214	**PROTECTIVE LIMIT**	POWER LOSS	214→Control Power Loss When Running.	Check phase to phase and phase to ground distribution bus voltage. Check VFD fuses. Check 24 vac power supply to ICVC. Consult power company.
215	**PROTECTIVE LIMIT**	LOW DC BUS VOLTAGE	215→Low DC Bus Voltage: [VALUE] exceeded limit of [LIMIT]*.	Verify phase-to-phase and phase-to-ground line voltage. VFD Circuit Board malfunction. Call Carrier Service.
216	**PROTECTIVE LIMIT**	LINE VOLTAGE IMBALANCE	216→Line Voltage Imbalance. Check VFD Fault History for Values.	Check phase-to-phase and phase-to-ground distribution bus voltage. Increase Line Voltage % Imbalance in VFD_CONF screen.
217	**PROTECTIVE LIMIT**	MOTOR OVERLOAD TRIP	217→Motor Overload Trip; Check VFD configurations.	Any phase current > 106% RLA. Can result from significant load side current imbalance when running at full load. Check entering condenser water temperature and water flow rate. Check Motor Rated Load Amps in VFD_CONF screen.
218	**PROTECTIVE LIMIT**	VFD RECTIFIER OVERTEMP	218→VFD Rectifier Temp Exceeded: Check Cooling and VFD Config.	Check that VFD refrigerant isolation valves are open. Check VFD refrigerant cooling solenoid and refrigerant strainer. Check for proper VFD cooling fan operation and blockage.
219	**PROTECTIVE LIMIT**	VFD INVERTER OVERTEMP	219→VFD Inverter Temp Exceeded: Check Cooling and VFD Config.	Check that VFD refrigerant isolation valves are open. Check VFD refrigerant cooling solenoid and refrigerant strainer. Check for proper VFD cooling fan operation and blockage.

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Table 16 — Alarm and Alert Messaged (cont)

I. CHILLER PROTECTIVE LIMIT FAULTS (cont)

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
220	**PROTECTIVE LIMIT**	GROUND FAULT	220→Ground Fault Trip; Check Motor and Current Sensors.	Check for condensation on motor terminals. Check motor power leads for phase to phase or phase to ground shorts. Disconnect motor from VFD and megger motor. Call Carrier Service.
221	**PROTECTIVE LIMIT**	UNUSED	221→UNUSED	
222	**PROTECTIVE LIMIT**	LINE FREQUENCY TRIP	222→Line Frequency — [VALUE] exceeded limit of [LIMIT]; Check Power Supply.	If operating from a generator, check generator size and speed. Check utility power supply.
223	**LOSS OF COMMUNICATION**	WITH VFD GATEWAY MODULE	223→Loss of SIO Comm with VFD Gateway: Check VFG Module and Power.	Check VFD communication wiring and connectors on VFD Gateway and DPI board. Check for compatibility between ICVC and Gateway software.
224	**PROTECTIVE LIMIT**	VFD COMMUNICATIONS FAULT	224→Loss of DPI Comm with VFD Gateway: Check VFG to VFD Comm.	Check VFD communication wiring and connectors. Check status lights on DPI Communications Interface Board. Call Carrier Service.
225	**PROTECTIVE LIMIT**	MOTOR CURRENT IMBALANCE	225→Motor Current Imbalance: Check VFD Fault History for Values.	Check Motor Current % Imbalance in VFD_CONF screen.
226	**PROTECTIVE LIMIT**	LINE PHASE REVERSAL	226→Line Phase Reversal: Check Line Phases.	Reverse connections of any two line conductors to circuit breaker.
227	**PROTECTIVE LIMIT**	OIL PRESS SENSOR FAULT	227→Oil Pressure Delta P [VALUE] (Pump Off): Check Pump/Transducers.	Check transducer wiring and accuracy. Check power supply to pump. Check pump operation. Check transducer calibration.
228	**PROTECTIVE LIMIT**	LOW OIL PRESSURE	228→Low Operating Oil Pressure [VALUE]: Check Oil Pump and Filter.	Check transducer wiring and accuracy. Check power supply to pump. Check pump operation. Check oil level. Check for partially closed service valves. Check oil filters. Check for foaming oil at start-up. Check transducer calibration.
229	**PROTECTIVE LIMIT**	LOW CHILLED WATER FLOW	229→Low Chilled Water Flow; Check Switch/Delta P Config & Calibration.	Perform pump control test. Check optional transducer calibration and wiring. Check Evaporator Refrigerant Temperature sensor. Check chilled water valves. Check for evaporator saturation temperature < 34 F if not in Pumpdown Lockout mode. Place unit in Pumpdown mode before removing charge.
230	**PROTECTIVE LIMIT**	LOW CONDENSER WATER FLOW	230→Low Condenser Water Flow; Check Switch/Delta P Config & Calibration.	Perform pump control test. Check optional transducer calibration and wiring. Check condenser water valves. Check for condenser pressure > 130 PSIG.
231	**PROTECTIVE LIMIT**	HIGH DISCHARGE TEMP	231→Comp Discharge Temp [VALUE] Exceeded Limit of [LIMIT]*.	Check for closed compressor discharge isolation valve. Check if chiller was operating in surge. Check sensor resistance or voltage drop. Check for proper wiring. Check for proper condenser flow and temperature. Check compressor discharge isolation valve. Check for proper inlet guide vane and optional diffuser actuator operation.
232	**PROTECTIVE LIMIT**	LOW REFRIGERANT TEMP	232→Evaporator Refrig Temp [VALUE] exceeded limit of [LIMIT]*.	Check for proper refrigerant charge. Check float valve operation. Check for closed condenser liquid line isolation valve. If problem occurs at high load, check for low condenser pressure which causes inadequate FLASC orifice differential pressure. Check for proper water flow and temperature. Confirm that condenser water enters bottom row of condenser tubes first. Check Evaporator Refrigerant Temperature sensor. Check for division plate gasket bypass. Check for fouled tubes.

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Table 16 — Alarm and Alert Messages (cont)

I. CHILLER PROTECTIVE LIMIT FAULTS (cont)

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
233	**PROTECTIVE LIMIT**	HIGH MOTOR TEMPERATURE	233→Comp Motor Winding Temp [VALUE] exceeded limit of [LIMIT]*.	Check motor sensors wiring and accuracy. Check motor cooling line and spray nozzle for proper operation, or restrictions. Check for excessive starts within a short time span.
234	**PROTECTIVE LIMIT**	HIGH BEARING TEMPERATURE	234→Comp Thrust Brg Temp [VALUE] exceeded limit of [LIMIT]*.	Check oil heater for proper operation. Check for low oil level, partially closed oil supply valves, or clogged oil filter. Check oil cooler refrigerant thermal expansion valves. Confirm that TXV bulb is secured in place and insulated. Check for sensor wiring and accuracy. This fault can result from extended operation at low load with low water flow to the evaporator or condenser.
235	**PROTECTIVE LIMIT**	HIGH CONDENSER PRESSURE	235→Condenser Pressure [VALUE] exceeded limit of [LIMIT]*.	Check for high condenser water temperatures, low water flow, fouled tubes. Check for division plate/gasket bypass. Check for noncondensables. Check transducer wiring and accuracy.
236	**PROTECTIVE LIMIT**	COMPRESS SURGE/ LOW SPEED	236→Compressor Surge: Check condenser water temp and flow.	Check for high condenser water temperatures, low water flow, fouled tubes. Check for division plate/gasket bypass. Check for noncondensables. Check surge prevention parameters in OPTIONS screen. Increase VFD Increase Step in SETUP2. Check VFD Minimum Speed in SETUP2 screen.
237	**PROTECTIVE LIMIT**	SPARE SAFETY DEVICE	237→Spare Safety Device.	Spare safety input has tripped or factory installed jumper is not present on Terminal Block 1 (TB1).
238	**PROTECTIVE LIMIT**	EXCESSIVE COMPR SURGE	238→Compressor Surge: Check condenser water temp and flow.	Check for high condenser water temperatures, low water flow, fouled tubes. Check for division plate/gasket bypass. Check for noncondensables. Check surge prevention parameters in OPTIONS screen. Check cooling tower control settings and performance to design/selection temperatures across the entire operating range of the chiller. Check cooler approach and water flow.
239	**PROTECTIVE LIMIT**	TRANSDUCER VOLTAGE FAULT	239→Transducer Voltage Ref [VALUE] exceeded limit of [LIMIT]*.	Check that CCM transducer voltage reference is between 4.5 v and 5.5 v. Check that pressure transducers are not shorted to ground. This fault is normally declared the first time an ICVC is powered up if it was downloaded with software when it was not connected to a CCM. Call Carrier Service.
240	**PROTECTIVE LIMIT**	LOW DISCHARGE SUPERHEAT	240→Check for Oil in Or Overcharge of Refrigerant.	Check for oil loss or excessive refrigerant. If oil level is low, refrigerant charge may be too low resulting in ineffective oil reclaim. Excessive refrigerant charge may cause liquid carryover into compressor. Check calibration of evaporator pressure and condenser pressure sensors. Check calibration of compressor discharge temperature sensor.
241	**PROTECTIVE LIMIT**	RECTIFIER OVERCURRENT	241→Rectifier Overcurrent Fault: Check VFD Status.	Check for high water temperatures or changes in water flow rates.
242	**LOSS OF COMMUNICATION**	WITH CCM MODULE	242→Loss of Communication With CCM, Check Comm. Connectors.	Check wiring and control power to CCM. Confirm that all CCM SW1 switches are in the “OFF” position.
243	**POTENTIAL FREEZE-UP**	EVAP PRESS/TEMP TOO LOW	243→Evaporator Refrig Temp [VALUE] exceeded limit of [LIMIT]*.	Check for proper refrigerant charge. Check float valve operation. Check for proper fluid flow and temperature. Confirm that condenser water enters bottom row of condenser tubes first. Check Evaporator Refrigerant Temperature sensor. Check for division plate gasket bypass. Check for fouled tubes.
244	**POTENTIAL FREEZE-UP**	COND PRESS/TEMP TOO LOW	244→Condenser Refrig Temp [VALUE] exceeded limit of [LIMIT]*.	Condenser water too cold or chiller shut down with brine below 32 F in cooler so equalization temperature in chiller approached 32 F. Check condenser pressure transducer. Check refrigerant charge.

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Table 16 — Alarm and Alert Messages (cont)

I. CHILLER PROTECTIVE LIMIT FAULTS (cont)

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
245	**PROTECTIVE LIMIT**	HIGH VFD SPEED	245→Actual VFD Speed exceeded limit of Target VFD Speed + 10%.	Actual VFD Speed on COMPRESS screen must not exceed Target VFD Speed by more than 10%.
246	**PROTECTIVE LIMIT**	INVALID DIFFUSER CONFIG.	246→Diffuser Control Invalid Configuration: Check SETUP2 Entries.	Check 25%, 50%, and 75% Guide Vane and Diffuser Load Point entries in SETUP2 screen.
247	**PROTECTIVE LIMIT**	DIFFUSER POSITION FAULT	247→Diffuser Position Fault: Check Guide Vane/Diffuser Actuator.	Confirm that Diffuser Option in SETUP 2 screen has not been Enabled if compressor does not have a split ring diffuser. May indicate rotating stall condition. Check rotating stall transducer wiring accuracy and sealing. Check diffuser schedule and guide vane schedule in SETUP2 screen. Check for proper operation of diffuser and inlet guide vane actuators including inlet guide vane calibration. Check diffuser actuator coupling for rotational slip. Check RC snubber on CCM J4-23 and J4-24. Check 4.3k ohm resistor between CCM terminals J3-7 and J3-8. Check for electrical noise in CCM Diffuser Pressure wiring. Do not continue to operate compressor except for diagnostic purposes.
248	**PROTECTIVE LIMIT**	SPARE TEMPERATURE #1	248→Spare Temperature #1 [VALUE] exceeded limit of [LIMIT]*.	Check Spare Temperature Enable and Spare Temperature Limit in SETUP1 Screen.
249	**PROTECTIVE LIMIT**	SPARE TEMPERATURE #2	249→Spare Temperature #2 [VALUE] exceeded limit of [LIMIT]*.	Check Spare Temperature Enable and Spare Temperature Limit in SETUP1 Screen.
250	**UNUSED**	UNUSED	250→Unused State.	
251	**PROTECTIVE LIMIT**	VFD CONFIG CONFLICT	251→VFD Config Conflict (VFD Uploaded): Verify to Reset Alarm.	The VFD_CONF table in the Gateway does not match that which is in the ICVC. This is a normal fault if an ICVC has been uploaded with software when it was not attached to the CCM. Enter VFD_CONF screen and then exit VFD_CONF screen by pressing EXIT then CANCEL. Re-enter the VFD_CONF screen, press EXIT then SAVE. Parameters stored in the Gateway will be uploaded into the ICVC. Confirm valid settings in VFD_CONF screen.
252	**PROTECTIVE LIMIT**	VFD CONFIG CONFLICT	252→VFD Config Conflict (VFD Downloaded): Verify to Reset Alarm.	The VFD_CONF table in the Gateway does not match that which is in the ICVC.
253	**PROTECTIVE LIMIT**	GUIDE VANE CALIBRATION	253→Guide Vane Fault [VALUE]. Check Calibration.	Enter CONTROL TEST and execute Guide Vane Calibration. Check CCM guide vane feedback terminals J4-9 and J4-10. Check guide vane feedback potentiometer. Alarm before start indicates guide vane opening is not less than 4%. Alarm running indicates guide vane position is < -1% or > 103%, or feedback voltage is < .045 or > 3.15 VDC.
254	**PROTECTIVE LIMIT**	VFD CHECKSUM ERROR	254→Checksum Error: Press Reset to Restore Configuration.	Actual VFD checksum does not match calculated value.
255	**PROTECTIVE LIMIT**	VFD DEW PREVENTION	255→Dew Prevention - Coolant Too Cold. Check Solenoid & Cond T.	VFD COLDPLATE TEMP is too close to dew point based on VFD ENCLOSURE TEMP and RELATIVE HUMIDITY in POWER screen. Check for moisture in VFD enclosure. Check Humidity Sensor in CONTROLS TEST. Check for contamination on CCM J3-7 and J3-9 Humidity Sensor. Check that VFD refrigerant cooling modulating valve is closing.
256	**PROTECTIVE LIMIT**	INDUCTOR OVERTEMP	256→Inductor Overtemp Trip - Check Temp Switch and Cooling Fans.	Check for cooling fan air flow obstructions.
257	**PROTECTIVE LIMIT**	VFD START INHIBIT	257→VFD Start Inhibit: Check VFD Diagnostic Parameters 212/214.	The VFD Start Inhibit is derived from the Alarm bit being set in the VFD. The conditions causing the alarm must be corrected in the VFD to enable subsequent starts and operation. See VFD parameters 212/214.
258	**UNUSED STATE**	UNUSED	258→Unused.	

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Table 16 — Alarm and Alert Messages (cont)

I. CHILLER PROTECTIVE LIMIT FAULTS (cont)

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
259	**PROTECTIVE LIMIT**	CCN OVERRIDE STOP	259→CCN Emergency/ Override Stop.	CCN has signaled the chiller to stop.This fault must be manually reset from the default screen of the ICVC.
282	**PROTECTIVE LIMIT**	INVALID VFD CONFIG	282→Line Frequency [VALUE] Exceeded Configuration Range.	LINE FREQUENCY in POWER screen must be maintained between 45-52 Hz if LINE FREQ=60Hz? is set to NO(50 Hz). LINE FREQUENCY must be maintained between 55-62 Hz if LINE FREQ=60Hz? is set to YES (60 Hz). Check 2C AUX/HPR Gate Kill circuit.
283	**PROTECTIVE LIMIT**	INVALID VFD CONFIG	283→Compressor 100% Speed Config Ranges: 50=Hz 45-52; 60 Hz=55-62.	COMPRESSOR 100% SPEED in VFD_CONF screen must be set between 45-52 Hz if LINE FREQ=60Hz? is set to NO (50 Hz). COMPRESSOR 100% SPEED must be set between 55-62 Hz if LINE FREQ=60Hz? is set to YES (60 Hz).
284	**VFD GATEWAY**	COMPATIBILITY CONFLICT	284→VFD Gateway Compatibility Conflict: Check VFG/VFD Versions.	VFD Gateway and VFD software versions are not compatible. Call Carrier Service.
285	**VFD GATEWAY**	COMPATIBILITY CONFLICT	285→VFD Gateway Compatibility Conflict: Check VFG/ ICVC Versions.	VFD Gateway and ICVC software versions are not compatible. Call Carrier Service.
286	**PROTECTIVE LIMIT**	INVERTER OVERCURRENT	286→Inverter Overcurrent Fault: Check VFD Status.	Check for high entering water temperature or low condenser water flow. Check current settings in VFD_CONF screen.

*[LIMIT] is shown on the ICVC as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. [VALUE] is the actual pressure, temperature, voltage, etc., at which the control tripped.

J. CHILLER ALERTS

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
140	**SENSOR ALERT**	LEAVING COND WATER TEMP	140→Sensor Fault: Check Leaving Cond Water Sensor.	Check sensor resistance or voltage drop. Check for proper wiring.
141	**SENSOR ALERT**	ENTERING COND WATER TEMP	141→Sensor Fault: Check Entering Cond Water Sensor.	Check sensor resistance or voltage drop. Check for proper wiring.
142	**LOW OIL PRESSURE ALERT**	CHECK OIL FILTER	142→Low Oil Pressure Alert. Check Oil Filter.	Check for partially or closed shut-off valves. Check oil filter. Check oil pump and power supply. Check oil level. Check for foaming oil at start-up. Check transducer wiring and accuracy.
143	**AUTORESTART PENDING**	LINE CURRENT IMBALANCE	143→Line Current Imbalance: Check VFD Fault History for Values.	Power loss has been detected in any phase. Chiller automatically restarting.
144	**AUTORESTART PENDING**	LINE VOLTAGE DROP OUT	144→Single Cycle Line Voltage Dropout.	A drop in line voltage has been detected within 2 voltage cycles. Chiller automatically restarting if Auto Restart is enabled in SETUP3 screen.
145	**AUTORESTART PENDING**	HIGH LINE VOLTAGE	145→High Percent Line Voltage [VALUE].	Check phase to phase and phase to ground line power.
146	**AUTORESTART PENDING**	LOW LINE VOLTAGE	146→Low Percent Line Voltage [VALUE].	Check phase to phase and phase to ground line power.
147	**AUTORESTART PENDING**	VFD MODULE RESET	147→VFD Module Power-On Reset When Running.	VFD Module has detected a hardware fault due to electrical noise, power loss or software and has reset. Chiller automatically restarting. Check for power loss and sources of electromagnetic interference.
148	**AUTORESTART PENDING**	POWER LOSS	148→Control Power-Loss When Running.	Check 24 vac control power supply to ICVC.
149	**MACHINE ALERT**	HIGH COND WATER FLOW	149→High Flow: Condenser Water Delta P [VALUE] Exceeded Limit of [LIMIT]*.	COND HI FLOW ALARM OPT is disabled and CONDENSER WATER DELTA P has exceeded configured limit. Check FLOW DELTA P DISPLAY and COND HI FLOW DEL P LIMIT in SETUP1 screen. Check optional condenser water pressure transducer wiring and accuracy. Confirm that 5 V reference signal is available between CCM J3-19 and J3-21 and J3-22 and J3-24. Check for disconnected, grounded, or shorted wiring. If pressure transducers are not installed, check for presence of resistors and jumpers CCM terminals J3-19 through J3-24. See Chiller Controls Schematic if flow switches are used.
150	**SENSOR ALERT**	HIGH BEARING TEMPERATURE	150→Comp Thrust Brg Temp [VALUE] exceeded limit of [LIMIT]*.	Check sensor resistance or voltage drop. Check for proper wiring. Check for partially closed service valves. Check oil cooler TXV. Check oil level and oil temperature.

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Table 16 — Alarm and Alert Messages (cont)

J. CHILLER ALERTS (cont)

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
151	**CONDENSER PRESSURE ALERT**	PUMP RELAY ENERGIZED	151→High Condenser Pressure [VALUE]: Pump Energized to Reduce Pressure.	Check sensor wiring and accuracy. Check condenser flow and water temperature. Check for fouled tubes. This alarm is not caused by the High Pressure Switch.
152	**RECYCLE ALERT**	EXCESSIVE RECYCLE STARTS	152→Excessive recycle starts.	Chiller load is too low to keep compressor on line and there has been more than 5 starts in 4 hours. Increase chiller load, adjust hot gas bypass, increase RECYCLE RESTART DELTA T from SETUP1 Screen.
153	**no message: ALERT only**	no message; ALERT only	153→Lead/Lag Disabled-Config: Duplicate Chiller Address.	Illegal chiller address configuration in Lead/Lag screen. Both chillers require a different address.
154	**POTENTIAL FREEZE-UP**	COND PRESS/TEMP TOO LOW	154→Condenser freeze up prevention.	The condenser pressure transducer is reading a pressure that could freeze the condenser tubes. Check for condenser refrigerant leaks. Check fluid temperature. Check sensor wiring and accuracy. Place the chiller in PUMPDOWN mode if the vessel is evacuated.
155	**OPTION SENSOR FAULT**	REMOTE RESET SENSOR	155→Sensor Fault/Option Disabled: Remote Reset Sensor.	Check sensor resistance or voltage drop. Check for proper wiring to CCM connector J4.
156	**OPTION SENSOR FAULT**	AUTO CHILLED WATER RESET	156→Sensor Fault/Option Disabled: Auto Chilled Water Reset.	Check sensor resistance or voltage drop. Check for proper wiring to CCM connector J5.
157	**OPTION SENSOR FAULT**	AUTO DEMAND LIMIT INPUT	157→Sensor Fault/Option Disabled: Auto Demand Limit Input.	Check sensor resistance or voltage drop. Check for proper wiring to CCM connector J5.
158	**SENSOR ALERT**	SPARE TEMPERATURE #1	158→Spare Temperature 1 [VALUE] exceeded limit of [LIMIT]*.	Check sensor resistance or voltage drop. Check for proper wiring to CCM connector J4. Check Spare Temp #1 Limit in SETUP1 screen.
159	**SENSOR ALERT**	SPARE TEMPERATURE #2	159→Spare Temperature 2 [VALUE] exceeded limit of [LIMIT]*.	Check sensor resistance or voltage drop. Check for proper wiring to CCM connector J4. Check Spare Temp #2 Limit in SETUP1 screen.
161	**LOSS OF COMMUNICATION**	WITH WSM	161→WSM Cool Source — Loss of Communication.	Check settings in WSMDEFME screen. Check CCN communications link with WSM (Water System Manager) Module. Check Supervisory Part of WSM.
162	**SENSOR ALERT**	EVAPORATOR APPROACH	162→Evaporator Approach [VALUE] Exceeded Limit of [LIMIT]*.	Check that refrigerant charge level is adequate, waterbox division plate gaskets are sealing, evaporator tubes are not fouled and that oil reclaim system is working. Check sensor resistance or voltage drop. Check for proper wiring. Check Evap Approach Alert setting in SETUP1 screen.
163	**SENSOR ALERT**	CONDENSER APPROACH	163→Condenser Approach [VALUE] Exceeded Limit of [LIMIT]*.	Check sensors resistance or voltage drop. Check for proper wiring. Check Cond Approach Alert setting in SETUP1 screen. Check for noncondensable gas in the condenser. Check that the condenser tubes are not fouled.
164	**VFD SPEED ALERT**	LOW VFD SPEED	164→Actual VFD Speed exceeded limit of Target VFD Speed –10%.	Actual VFD Speed on COMPRESS screen must be at least 90% of Target VFD Speed.
165	**AUTORESTART PENDING**	LOW DC BUS VOLTAGE	165→Low DC Bus Voltage: [VALUE] Exceeded Limit of [LIMIT]*.	Verify phase to phase and phase to ground line voltage.
166	**AUTORESTART PENDING**	HIGH DC BUS VOLTAGE	166→High DC Bus Voltage: [VALUE] Exceeded Limit of [LIMIT]*.	Verify phase to phase and phase to ground line voltage. Monitor AC line for high transient voltage conditions.

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Table 16 — Alarm and Alert Messages (cont)

J. CHILLER ALERTS (cont)

ICVC FAULT STATE	PRIMARY MESSAGE	SECONDARY MESSAGE	PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
167	**SYSTEM ALERT**	HIGH DISCHARGE TEMP	167→Comp Discharge Temp [VALUE] exceeded limit of [LIMIT]*.	Check sensor resistance or voltage drop. Check for proper wiring. Check for excessive starts. Check Comp Discharge Alert setting in SETUP1 screen.
168	**SENSOR ALERT**	HUMIDITY SENSOR INPUT	168→Sensor Fault: Check Humidity Sensor Input Sensor.	Check humidity sensor wiring on CCM connectors J3 and J5. CCM switch SW2-1 must be in “OFF” position. Check Humidity Sensor Input in Controls Test.
169	**AUTORESTART PENDING**	VFD COMMUNICATIONS FAULT	169→Loss of SIO Comm with VFD Gateway; Check VFG Module and Power.	The communication between the VFD Gateway and the CCM board is not occurring. Check wiring at CCM, in the power panel (Terminals A,B,C). Check wiring from Power panel to VFD.
170	**AUTORESTART PENDING**	VFD COMMUNICATIONS FAULT	170→Loss of DPI Comm with VFD Gateway; Check VFG to VFD Comm.	The communication between the VFD Gateway and the DPI is not occurring. Check ribbon cable between the two components, power to the DPI card.

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Table 17 — Fault Code Descriptions and Corrective Actions

Fault Type indicates if the fault is:
1 — Auto-resettable
2 — Non-resettable
3 — User-configurable
4 — Normal Fault

VFD FAULT CODE	FAULT TYPE	DESCRIPTION	ACTION	ICVC FAULT STATE
2	Auxiliary Input 1	Input is open.	Check remote wiring.	206
3	Power Loss 1, 3	DC bus voltage remained below 85% of nominal for longer than Power Loss Time (185). Enable/disable with Fault Config 1 (238).	Monitor the incoming AC line for low voltage or line power interruption.	215
4	UnderVoltage 1, 3	DC bus voltage fell below the minimum value of 407V DC at 400/480V input Enable/disable with Fault Config 1 (233).	Monitor the incoming AC line for low voltage or power interruption.	215
5	OverVoltage 1	DC bus voltage exceeded maximum value.	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install dynamic brake option.	205
7	Motor Overload 1, 3	Internal electronic overload trip. Enable/disable with Fault Config 1 (238).	An excessive motor load exists. Reduce load so drive output current does not exceed the current set by Motor NP FLA (42).	217
8	Invtr Base Temp 1	Base temperature exceeded limit.	Check for proper temperature and flow rate of coolant.	219
9	Invtr IGBT Temp 1	Output transistors have exceeded their maximum operating temperature.	Check for proper temperature and flow rate of coolant.	219
12	HW OverCurrent 1	The drive output current has exceeded the hardware current limit.	Check programming. Check for excess load, improper DC boost setting, DC brake volts set too high or other causes of excess current.	286
13	Ground Fault 1	A current path to earth ground in excess of 7% of drive rated amps has been detected at one or more of the drive output terminals.	Check the motor and external wiring to the drive output terminals for a grounded condition.	220
24	Decel Inhibit 3	The drive is not following a commanded deceleration because it is attempting to limit bus voltage.	a. Verify input voltage is within drive specified limits. b. Verify system ground impedance follows proper grounding techniques. c. Disable bus regulation and/or add dynamic brake resistor and/or extend deceleration time.	204
25	OverSpeed Limit 1	Functions such as slip compensation or bus regulation have attempted to add an output frequency adjustment greater than that programmed in Overspeed Limit (83).	Remove excessive load or overhauling conditions or increase Overspeed Limit (83).	206
29	Analog In Loss 1, 3	An analog input is configured to fault on signal loss. A signal loss has occurred. Configure with Anlg In 1, 2 Loss (324, 327).	a. Check parameters. b. Check for broken/loose connections at inputs.	206
33	Auto Rstrt Tries 3	Drive unsuccessfully attempted to reset a fault and resume running for the programmed number of Auto Rstrt Tries (174). Enable/disable with Fault Config 1 (238).	Correct the cause of the fault and manually clear.	206
35	Current FBK Lost 4	The magnitude of motor current feedback was less than 5% of the configured Motor Nameplate Amps for the time configured in the Motor Imbalance Time. Detection of this fault is disabled when the Motor Imbalance Time is set to the maximum value of 10.0 seconds.	Verify connection of current feedback device and motor terminals. If fault repeats replace current feedback devices and/or power supply.	206
36	SW OverCurrent 1	The drive output current has exceeded the software current.	Check for excess load, improper DC boost setting. DC brake volts set too high.	286
37	Motor I Imbalance	Phase current displayed in Imbalance Display (221) > percentage set in Imbalance Limit (49) for time set in Imbalance Time (50).	Clear fault.	225

LEGEND

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NOTE: Reliance parameter numbers are indicated by ( ).

Table 17 — Fault Code Descriptions and Corrective Actions (cont)

Fault Type indicates if the fault is:
1 — Auto-resettable
2 — Non-resettable
3 — User-configurable
4 — Normal Fault

VFD FAULT CODE	FAULT TYPE	DESCRIPTION	ACTION	ICVC FAULT STATE
38	Phase U to Grnd	A phase-to-ground fault has been detected between the drive and motor in this phase.	a. Check the wiring between the drive and motor. b. Check motor for grounded phase. c. Replace drive.	220
39	Phase V to Grnd			
40	Phase W to Grnd			
41	Phase UV Short	Excessive current has been detected between these two output terminals.	a. Check the motor and drive output terminal wiring for a shorted condition. b. Replace drive.	246
42	Phase VW Short			
43	Phase UW Short			
48	Params Defaulted	The drive was commanded to write default values to EPROM.	a. Clear the fault or cycle power to the drive. b. Program the drive parameters as needed.	206
63	Shear Pin 3	Programmed Current Lmt Val (148) has been exceeded. Enabled/disable with Fault Config 1 (238).	Check load requirements and Current Lmt Val (148) setting.	206
64	Drive OverLoad	Drive rating of 110% for 1 minute or 150% for 3 seconds has been exceeded.	Reduce load or extend Accel Time (140).	286
70	HW Fault 4	Inverter section of power structure hardware detected an unexpected fault during power stage diagnostics.	a. Cycle power. b. Call Carrier service.	206
71- 75	Port 1-5 Net Loss	The network card connected to DPI port stopped communicating. The fault code indicates the offending port number (71 = port 1, 72 = port 2, etc.).	a. Check communication board for proper connection to external network. b. Check external wiring to module on port.	206
76	Peripheral Fault at DPI Port 6			206
77	IR Volts Range	The drive autotuning default is Calculate, and the value calculated for IR Drop Volts is not in the range of acceptable values.	Re-enter motor nameplate data.	206
78	FluxAmpsRef Rang	The value for flux amps determined by the autotune procedure exceeds the programmed Motor NP FLA (42).	a. Reprogram Motor NP FLA (42) with the correct motor nameplate value. b. Repeat Autotune (61).	206
79	Excessive Load	Motor did not come up to speed in the allotted time.	a. Uncouple load from motor. b. Repeat Autotune (61).	206
80	AutoTune Aborted	The autotune procedure was canceled by the user.	Restart procedure.	206
81- 85	Port 1-5 DPI Loss	DPI port stopped communicating. An attached peripheral with control capabilities via Logic Source Sel (89) (or OIM control) was removed. The fault code indicates the offending port number (81 = port 1, etc.).	a. If module was not intentionally disconnected, check wiring to the port. Replace wiring, port expander, modules, Main Control board or complete drive as required. b. Check OIM connection.	206
87	Ixo Voltage Range	Ixo voltage calculated from motor nameplate data is too high.	Re-enter motor nameplate data.	206
100	Parameter Chksum 2	The checksum read from the board does not match the checksum calculated.	a. Press reset. b. Reload user set if used.	206
101	UserSet1 Chksum 2	The checksum read from the user set does not match the checksum calculated.	Press reset.	206
102	UserSet2 Chksum 2			
103	UserSet3 Chksum 2			
104	Pwr Brd Chksum1	The checksum read from the EPROM does not match the checksum calculated from the EPROM data.	Clear the fault or cycle power to the drive.	206
105	Pwr Brd Chksum2	The checksum read from the board does not match the checksum calculated.	a. Cycle power to the drive. b. If problem persists, replace drive.	206

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Table 17 — Fault Code Descriptions and Corrective Actions (cont)

Fault Type indicates if the fault is:
1 — Auto-resettable
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4 — Normal Fault

VFD FAULT CODE	FAULT TYPE	DESCRIPTION	ACTION	ICVC FAULT STATE
106	Incompat MCB-PB 2	Drive rating information stored on the power board is incompatible with the Main Control board.	Load compatible version files into drive.	206
107	Replaced MCB-PB 2	Main Control board was replaced and parameters were not programmed.	a. Press reset. b. Reprogram parameters.	206
120	I/O Board Mismatch 4	Incorrect I/O board identified.	Restore I/O board to original configuration, or, if new configuration is desired, reset fault.	206
121	I/O Board Comm Loss 2	Loss of communication to I/O board.	Cycle power.	206
122	I/O Board Fail	Board failure.	a. Cycle power. b. If fault repeats, replace I/O board.	206
200 **201** **202**	Inverter Dsat U, V, W	High current was detected in an IGBT.	a. Check for loose connection in IGBT wire harness. b. Check IGBTs. c. Check precharge resistors and fuses. d. Check precharge contactor.	201
203 **204** **205**	Inverter OverCurrent U, V, W	High current was detected in an IGBT.	a. Verify proper motor data is entered. b. Reduce current limit.	286
206	Inverter Unused Bit 4	Inverter section of power structure hardware reported unexpected fault.	Check wiring harness.	206
207	Invtr Gate Kill	Inverter gate kill contact is open.	Close gate kill contact.	207, 235
208 **209** **210**	Rectifier Dsat R, S, T	High current was detected in an IGBT.	a. Check for loose connection in IGBT wire harness. b. Check IGBTs.	200
211 **212** **213**	Rectifier IOC R, S, T	Rectifier overcurrent.	a. Verify proper motor data is entered. b. Reduce current limit.	241
214	Reactor Temp	Temperature switch in reactor opened.	Check for proper temperature and fan operation.	206
215	Rectifier HW Unused 4	Rectifier section of power structure hardware reported unexpected fault.	Check wiring harness.	206
216	Rectifier Ground Fault	Excessive ground current measured.	Check for grounded input wiring.	220
217	Rectifier Base Temp	Excessive rectifier temperature measured.	Check for proper temperature and flow rate of coolant.	218
218	Rectifier IGBT Temp	Excessive calculated IGBT temperature.	Check for proper temperature and flow rate of coolant.	218
219	Rectifier IT Overload	Short-term current rating of rectifier exceeded.	Low input voltage can result in increased current load. Provide proper input voltage to the drive.	212
220	Rectifier I2T Overload	Long-term current rating of rectifier exceeded.	Low input voltage can result in increased current load. Provide proper input voltage to the drive.	212
221	Ride Thru Abort	Input power loss timed out.	a. Verify input power and connections. b. Check Line Sync board. c. Check AC Line I/O board.	210
222	High AC Line	Input line voltage is too high.	Reduce input voltage to meet specification of 480 ±10%.	211
223	Low DC Bus	The bus voltage is too low.	Verify proper input voltage.	215
224	Rctfr Over Volt	The bus voltage is too high.	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install dynamic brake option.	205

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NOTE: Reliance parameter numbers are indicated by ( ).

Table 17 — Fault Code Descriptions and Corrective Actions (cont)

Fault Type indicates if the fault is:
1 — Auto-resettable
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VFD FAULT CODE	FAULT TYPE	DESCRIPTION	ACTION	ICVC FAULT STATE
225	Input Amp Imbalance	Input phase current imbalance exceeded limits.	Check for loose connection in input power wiring.	209
226	Input Volt Imbalance	Input voltage imbalance exceeded limits.	Check for problem in input power distribution.	216
227	AC Line Lost	Input power Lost.	a. Verify proper input voltage. b. Check line sync board and fuse. c. Check AC line I/O board. d. Verify connection between boards.	210
228	Line Frequency	Line frequency not in the range of 47-63 Hz.	Verify connection between AC Line Sync and AC Line I/O boards.	222
229	Rectifier Checksum	The checksum read from the board does not match the checksum calculated.	a. Restore defaults. b. Reload user set if used.	206
230	Inverter HW Unknown 4	Inverter section of power structure hardware reported unexpected fault.	Check wiring harness.	206
231	Rectifier HW Unknown 4	Rectifier portion of power structure hardware reported unexpected fault.	Check wiring harness.	206
232	Rctfr Not OK	A fault was detected in the rectifier other than one specifically decoded.	Look at rectifier parameter 243 to see fault code.	200
233	Precharge closed	Precharge was closed when it should be open.	a. Check AUX contacts on precharge. b. Check input bit 0 in rectifier parameter 216 to view status of input. c. Check wiring. d. Check precharge resistors and fuses.	206
234	Precharge open	Precharge was open when it should be closed.	a. Check AUX contacts on precharge. b. Check input bit 0 in rectifier parameter 216 to view status of input. c. Check wiring. d. Check precharge resistors and fuses.	206
235	Rctfr Pwr Board	Drive rating information stored on the power board is incompatible with the Main Control board. The checksum read from the board does not match the checksum calculated.	a. Load compatible version files into drive. b. Cycle power to the drive. c. If problem persists, replace drive.	206
236	Rctfr I/O Board	Loss of communication to I/O board. Board failure.	a. Cycle power. b. If fault repeats, replace I/O board.	206
237	Not At Voltage 4	The rectifier did not regulate to the desired bus voltage within the defined time.	Replace rectifier power board and/or rectifier control board.	206
238	Rectified Not Log In 4	Rectifier took too long to connect to inverter.	a. Check the cabling between the communications interface and the two control boards. b. Connect one DPI device at a time to see if one of the DPI devices is causing the problem. c. Replace the communications interface. d. Replace the rectifier control board.	206
239	Power Phased ACB 4	Input power is phased ACB rather than ABC.	Switch two of the input power phases.	206

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Table 18A — Thermistor Temperature (F) vs. Resistance/Voltage Drop

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

Table 18B — Thermistor Temperature (C) vs. Resistance/Voltage Drop

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

Control Modules

⚠ CAUTION

Turn controller power off before servicing controls. This ensures safety and prevents damage to the controller.

The ICVC and CCM modules perform continuous diagnostic evaluations of the hardware to determine its condition. Proper operation of all modules is indicated by LEDs (light-emitting diodes) located on the circuit board of the ICVC and CCM.

There is one green LED located on the CCM board, and one red LED located on the ICVC and CCM boards respectively.

RED LED (LABELED AS STAT) — If the red LED:

- Blinks continuously at a 2-second interval, the module is operating properly
- Is lit continuously, there is most likely a hardware fault that requires replacing the module
- Is off continuously, the power should be checked
- Blinks 3 times per second, a software error has been discovered and the module must be replaced

If there is no input power, check the fuses and circuit breaker. If the fuse is good, check for a shorted secondary of the transformer or, if power is present to the module, replace the module.

GREED LED (LABELED AS COM) — These LEDs indicate the communication status between different parts of the controller and the network modules and should blink continuously.

Notes on Module Operation

1. The chiller operator monitors and modifies configurations in the microprocessor by using the 4 softkeys and the ICVC. Communications between the ICVC and the CCM is accomplished through the SIO (Sensor Input/ Output) bus, which is a phone cable. The communication between the CCM and VFD is accomplished through the sensor bus, which is a 3-wire cable.
2. If a green LED is on continuously, check the communication wiring. If a green LED is off, check the red LED operation. If the red LED is normal, check the module address switches (SW1). See Fig. 55 and 56. Confirm all switches are in OFF position.

   All system operating intelligence resides in the ICVC. Some safety shutdown logic resides in the Gateway in case communications are lost between the VFD and ICVC. Outputs are controlled by the CCM and VFD as well.
3. Power is supplied to the modules within the control panel via the 24-vac T1 and T2 transformers. The transformers are located within the power panel.

   In the power panel, T1 supplies power to the compressor oil heater, and optional hot gas bypass, and T2 supplies power to both the ICVC and CCM.

   T3 provides 24-v power to the optional DataPort™ or DataLINK™ modules.

   Power is connected to Plug J1 on each module.

Chiller Control Module (CCM) (Fig. 56)

INPUTS — Each input channel has 2 or 3 terminals. Refer to individual chiller wiring diagrams for the correct terminal numbers for a specific application.

OUTPUTS — Output is 24 vac. There are 2 terminals per output. Refer to the chiller wiring diagram for a specific application for the correct terminal numbers.

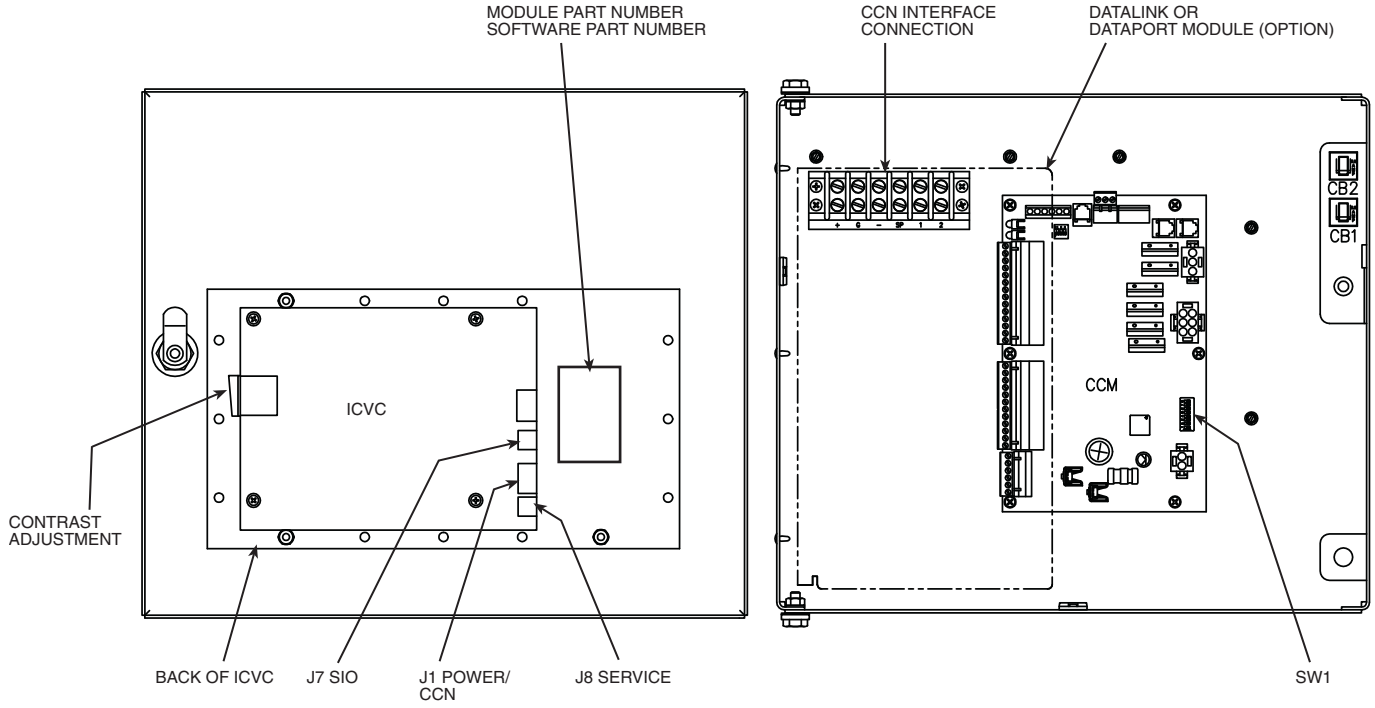


Fig. 55 — Rear of ICVC (International Chiller Visual Controller)

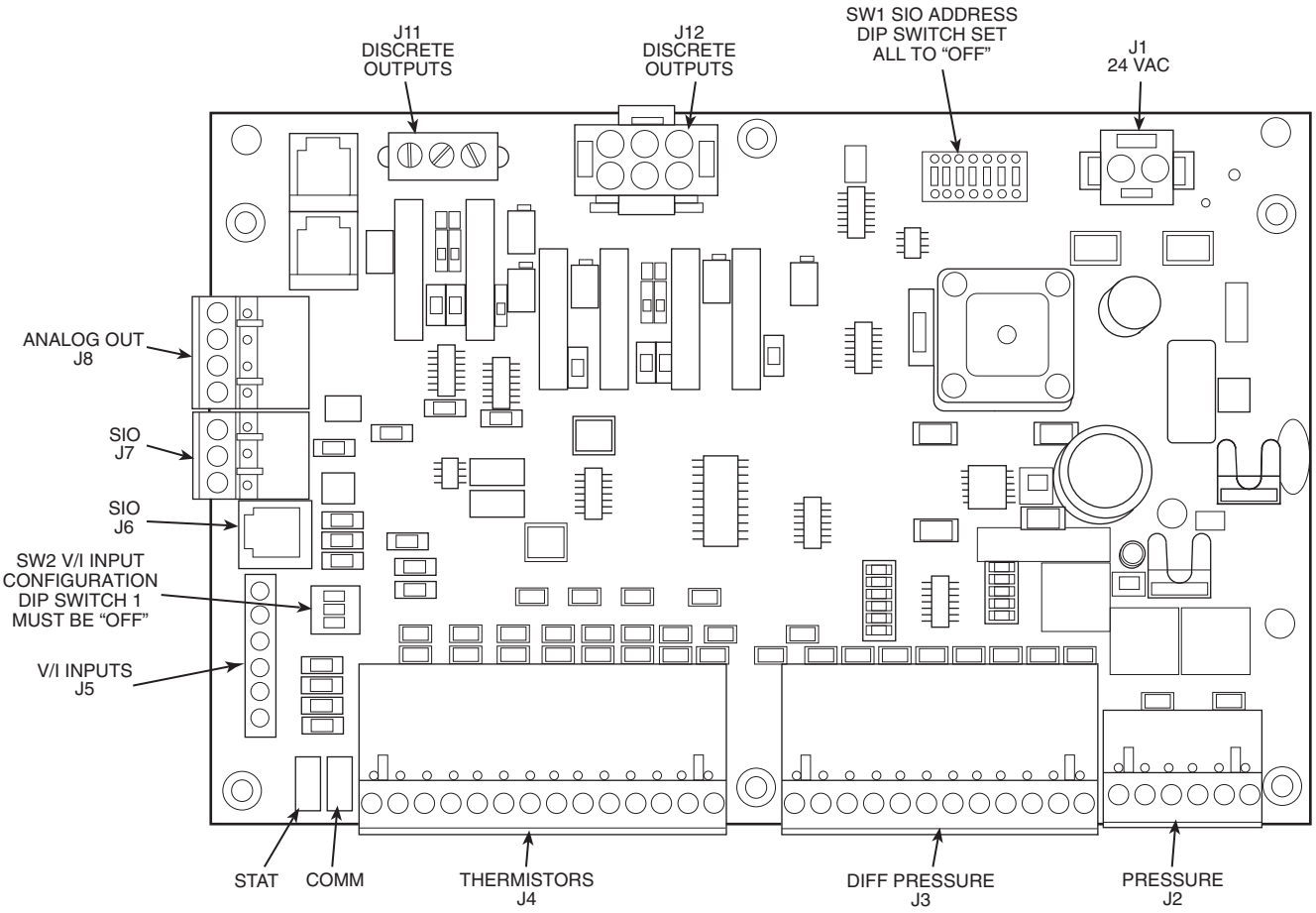


Fig. 56 — Chiller Control Module (CCM)

Replacing Defective Processor Modules — The module replacement part number is printed on a small label on the rear of the ICVC module. The chiller model and serial numbers are printed on the chiller nameplate located on an exterior corner post. The proper software is factory-installed by Carrier in the replacement module. When ordering a replacement chiller visual control (ICVC) module, specify the complete replacement part number, full chiller model number, and chiller serial number. The installer must configure the new module to the original chiller data. Follow the procedures described in the Software Configuration section on page 73.

⚠ WARNING

Electrical shock can cause personal injury. Disconnect all electrical power before servicing.

INSTALLATION

1. Verify the existing ICVC module is defective by using the procedure described in the Troubleshooting Guide section, page 93, and the Control Modules section, page 113. Do not select the ATTACH TO NETWORK DEVICE table if the ICVC indicates a communication failure.
2. Data regarding the ICVC configuration should have been recorded and saved. This data must be reconfigured into the new ICVC. If this data is not available, follow the procedures described in the Software Configuration section, page 73. If the module to be replaced is functional, configurations may also be copied manually. The data sheets on pages CL-4 and CL-11 are provided for this purpose. Default values are shown so that only deviations from these need to be recorded.

   If a CCN Building Supervisor or Service Tool is available, the module configuration should have already been uploaded into memory. When the new module is installed, the configuration can be downloaded from the computer.

   Any communication wires from other chillers or CCN modules should be disconnected to prevent the new ICVC module from uploading incorrect run hours into memory.
3. Record values for the *TOTAL COMPRESSOR STARTS*, *SERVICE ONTIME* and the *COMPRESSOR ONTIME* from the MAINSTAT screen on the ICVC.
4. Power off the controls.
5. Remove the old ICVC.
6. Install the new ICVC module. Turn the control power back on.
7. The ICVC now automatically attaches to the local network device.
8. Set the current time and date in the SERVICE/TIME AND DATE screen. Set the CCN Bus and Address in the SERVICE / ICVC CONFIGURATION screen. Press the alarm RESET softkey (from the default screen). Upload via Service Tool or manually reenter all non-default configuration values. (Refer to pages CL-4 through CL-11.) If the correct VFD Configuration values are displayed in the VFD_CONF table when that table is viewed, simply press EXIT then SAVE to reload all of them. Use Service Tool or manually reenter *TOTAL COMPRESSOR STARTS*, *SERVICE ONTIME* and

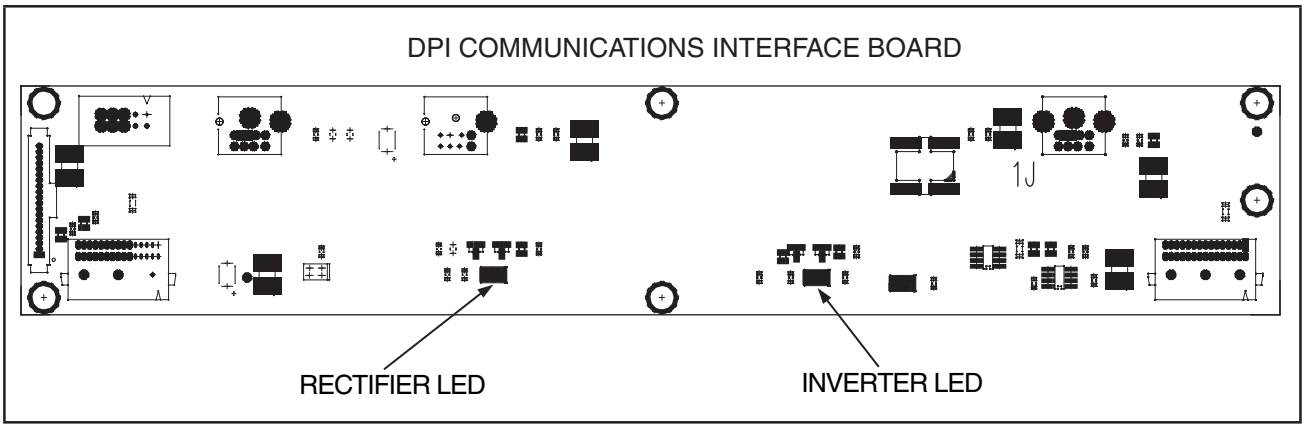
COMPRESSOR ONTIME. If forced using Service Tool, release the force on *SERVICE ONTIME* after the desired value has been set.

9. Perform the guide vane calibration procedure (in Control Test). Check and recalibrate pressure transducer readings. Check that the *CURRENT TIME* and *DATE* in the *TIME AND DATE* screen are correct.

DPI Communications Interface Board Status LEDs — The VFD status can be determined from the status LEDs on the DPI Communications Interface Board shown in Fig. 57. The DPI Board is mounted on the front of the VFD power module in a vertical orientation.

Gateway Status LEDs — The RS485 VFD Gateway provides a communication link between the CCM and ICVC SIO bus to the VFD Drive Peripheral Interface (DPI) board. The SIO bus communicates with the Gateway through VFD connector A32. See Fig. 58.

The Gateway has four status indicators on the top side of the module.



INVERTER STATUS LIGHT

COLOR	STATE	DESCRIPTION
GREEN	Flashing	Drive ready, but not running and no faults are present.
	Steady	Drive running, no faults are present.
YELLOW	Flashing	The drive is not ready. A VFD start inhibit is in effect. Normal condition when chiller not running because the ICVC has issued a stop command.
	Steady	An alarm condition exits. Check VFD FAULT CODE in ICVC VFD_STAT screen.
RED	Flashing	A fault has occurred. Check VFD FAULT CODE in ICVC VFD_STAT screen.
	Steady	A non-resettable fault has occurred. Check VFD FAULT CODE in ICVC VFD_STAT screen.
RED INVERTER GREEN RECTIFIER	Steady	VFD Gate Kill circuit has opened because the compressor high pressure switch has opened.

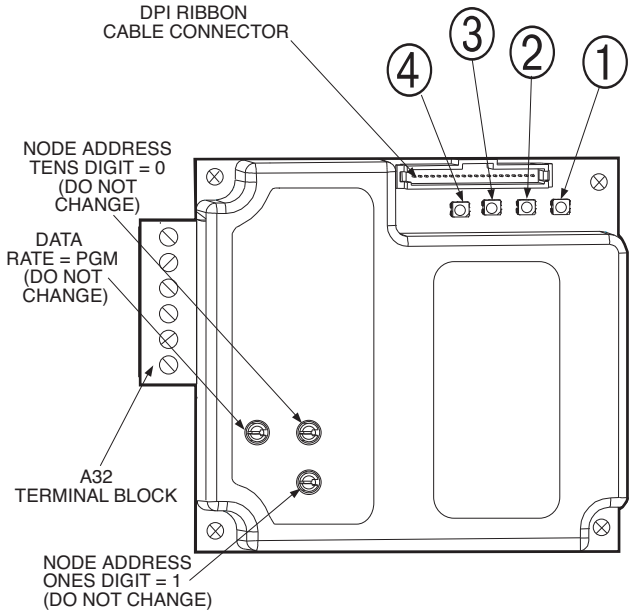
RECTIFIER STATUS LIGHT

COLOR	STATE	DESCRIPTION
GREEN	Flashing	Rectifier ready, but not running and no faults are present.
	Steady	Rectifier running, no faults are present.
YELLOW	Flashing	Rectifier is not ready. A VFD start inhibit is in effect. This is a normal state if the inverter is not running and/or the precharge contacts are open.
	Steady	Rectifier alarm condition exits. Check VFD FAULT CODE in ICVC VFD_STAT screen.
RED	Flashing	Rectifier fault has occurred. Check VFD FAULT CODE in ICVC VFD_STAT screen.
	Steady	A non-resettable fault has occurred. Check VFD FAULT CODE in ICVC VFD_STAT screen.
RED INVERTER GREEN RECTIFIER	Steady	VFD Gate Kill circuit has opened because the compressor high pressure switch has opened.

INVERTER AND RECTIFIER CONTROL BOARD FAILURE STATUS LIGHT PATTERNS

COLOR	DESCRIPTION
RED/GREEN ALTERNATING	Control board application firmware may be corrupt. Call Carrier Service.
YELLOW/GREEN/RED REPEATING PATTERN	Control board RAM failure or control board firmware may be corrupt. Call Carrier Service.

Fig. 57 — DPI Communications Interface Board Status LEDs



NUMBER	STATUS INDICATOR	DESCRIPTION
1	DRIVE	DPI Connection Status
2	MS	Module Status
3	NET A	Serial Communication Status
4	NET B	Serial Communication Traffic Status

NOTE: If all status indicators are off, the Gateway is not receiving power.

Fig. 58 — Gateway Status LEDs

DRIVE STATUS INDICATOR — The DRIVE status indicator is on the right side of the Gateway. See Table 19.

Table 19 — DRIVE Status Indicator

STATE	CAUSE	CORRECTIVE ACTION
OFF	The Gateway is not powered or is not connected properly to the drive.	• Securely connect the Gateway to the drive using the DPI ribbon cable. • Apply power to the drive.
FLASHING RED	The Gateway is not receiving a ping message from the drive.	• Verify that cables are securely connected. • Cycle power to the drive.
SOLID RED	The drive has refused an I/O connection from the Gateway.	IMPORTANT: Cycle power after making the following correction: • Verify that all DPI cables on the drive are securely connected and not damaged. Replace cables if necessary.
ORANGE	The Gateway is connected to a product that does not support Rockwell Automation DPI communications.	• Check wires leading to the A32 terminal block. • Check that A32 terminal block is fully engaged.
FLASHING GREEN	The Gateway is establishing an I/O connection to the drive or the I/O has been disabled.	Normal behavior.
SOLID GREEN	The Gateway is properly connected and is communicating with the drive.	No action required.

MS STATUS INDICATOR — The MS status indicator is the second LED from the right of the Gateway. See Table 20.

Table 20 — MS Status Indicator: State Definitions

STATE	CAUSE	CORRECTIVE ACTION
OFF	The Gateway is not powered.	• Securely connect the Gateway to the drive using the ribbon cable. • Apply power to the drive.
FLASHING RED	Recoverable Fault Condition	Cycle power to the drive. If cycling power does not correct the problem, the firmware may need to be flashed into the module.
SOLID RED	The module has failed the hardware test.	• Cycle power to the drive • Replace the Gateway
FLASHING GREEN	The Gateway is operational. No I/O data is being transferred.	Normal behavior during SIO configuration initialization process.
SOLID GREEN	The Gateway is operational and transferring I/O data.	No action required.

NET A STATUS INDICATOR — The NET A status indicator is the third LED from the right of the Gateway. See Table 21.

Table 21 — NET A Status Indicator: State Definitions

STATE	CAUSE	CORRECTIVE ACTION
OFF	The module is not powered or is not properly connected to the network. First incoming network command not yet recognized.	• Securely connect the Gateway ribbon cable to the drive DPI board. • Attach the RS485 cable in Gateway to the connector. • Apply power to the drive.
FLASHING RED	Network has timed out.	Cycle power to the drive.
SOLID RED	The Gateway has detected an error that has made it incapable of communication on the network.	Check node address and data rate switch positions on the front of the Gateway. Cycle power to the drive.
FLASHING GREEN	Online to network, but not producing or consuming I/O information.	No action required. The LED will turn solid green when communication resumes.
SOLID GREEN	The module is properly connected and communicating on the network.	No action required.

NET B STATUS INDICATOR — The NETB status indicator is the left LED on the Gateway. See Table 22.

Table 22 — NET B Status Indicator: State Definitions

STATE	CAUSE	CORRECTIVE ACTION
OFF	Gateway not receiving data over the network.	• Check wires leading to A32 terminal block. • Check that A32 terminal block is fully engaged.
SOLID OR BLINKING GREEN	Gateway is transmitting data.	No action required.

End of Life and Equipment Disposal — This equipment has an average design life span of 25 years and is constructed primarily of steel and copper. Content of control panels includes but is not limited to common electrical components such as fuses, starters, circuit breakers, wire, and printed circuit boards.

Prior to retiring of equipment it will be necessary to remove all fluids such as water, refrigerant, and oil using the current industry guidelines for recovery and disposal.

Physical Data — Tables 23A-30 and Fig. 59-71 provide additional information on component weights, compressor fits and clearances, physical and electrical data, and wiring schematics for the operator's convenience during troubleshooting.

NOTE: This publication provides start-up and service information for the LiquiFlo™ 2.0 (LF2) VFDs. For information on Std Tier VFDs, refer to associated Start-Up and Service Instructions for the Rockwell PowerFlex 755 VFD or the Eaton LCX 9000 VFD.

⚠WARNING

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

⚠CAUTION

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

Table 23A — 19XRV Heat Exchanger Data — Drive End Entering Cooler Water

CODE†	ENGLISH						METRIC (SI)					
	DRY RIGGING WEIGHT (LB)*		MACHINE CHARGE				DRY RIGGING WEIGHT (KG)*		MACHINE CHARGE			
	COOLER ONLY	CONDENSER ONLY	REFRIGERANT WEIGHT (LB)		WATER WEIGHT (LB)		COOLER ONLY	CONDENSER ONLY	REFRIGERANT WEIGHT (KG)		WATER WEIGHT (KG)	
			COOLER	CONDENSER	COOLER	CONDENSER			COOLER	CONDENSER	COOLER	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

*Rigging weights are for standard tubes of standard wall thickness (0.025-in. [0.635 mm] wall).

†Heat exchanger frame sizes 2 through 6 available on single-stage chillers only.

NOTES:

1. Cooler includes the control panel (ICVC), suction elbow, and $^1/_2$ the distribution piping weight.
2. Condenser includes float valve and sump, discharge elbow, and $^1/_2$ the distribution piping weight.
3. For special tubes refer to the 19XR/XRV Computer Selection Program.
4. All weights for standard 2-pass NIH (nozzle-in-head) design.
5. For “E” compressor, add 1054 lb (478 kg) steel weight and 283 lb (128 kg) refrigerant weight for economizer assembly.

Table 23A — 19XRV Heat Exchanger Data — Drive End Entering Cooler Water (cont)

CODE†	ENGLISH						METRIC (SI)					
	DRY RIGGING WEIGHT (LB)*		MACHINE CHARGE				DRY RIGGING WEIGHT (KG)*		MACHINE CHARGE			
	COOLER ONLY	CONDENSER ONLY	REFRIGERANT WEIGHT (LB)		WATER WEIGHT (LB)		COOLER ONLY	CONDENSER ONLY	REFRIGERANT WEIGHT (KG)		WATER WEIGHT (KG)	
			COOLER	CONDENSER	COOLER	CONDENSER			COOLER	CONDENSER	COOLER	CONDENSER
6K	5716	—	760	—	1291	—	2595	—	345	—	586	—
6L	5804	—	797	—	1341	—	2635	—	362	—	609	—
6M	5894	—	828	—	1399	—	2676	—	376	—	635	—
6P	5768	—	725	—	1338	—	2619	—	329	—	607	—
6Q	5852	—	764	—	1385	—	2657	—	347	—	629	—
6R	5938	—	798	—	1439	—	2696	—	362	—	653	—
6T	6230	—	863	—	1405	—	2828	—	392	—	638	—
6U	6330	—	905	—	1462	—	2874	—	411	—	664	—
6V	6433	—	941	—	1528	—	2921	—	427	—	694	—
6X	6293	—	823	—	1459	—	2857	—	374	—	662	—
6Y	6388	—	868	—	1512	—	2900	—	394	—	686	—
6Z	6487	—	906	—	1574	—	2945	—	411	—	715	—
70	9942	10786	1409	840	2008	2225	4514	4897	640	381	912	1010
71	10330	11211	1539	840	2164	2389	4690	5090	699	381	982	1085
72	10632	11622	1646	840	2286	2548	4827	5276	747	381	1038	1157
73	10715	11737	1622	840	2328	2604	4865	5329	736	381	1057	1182
74	10790	11775	1584	840	2366	2622	4899	5346	719	381	1074	1190
75	10840	11859	1599	950	2183	2431	4921	5384	726	431	991	1104
76	11289	12345	1747	950	2361	2619	5125	5605	793	431	1072	1189
77	11638	12814	1869	950	2501	2801	5284	5818	849	431	1135	1272
78	11738	12949	1849	950	2548	2864	5329	5879	839	431	1157	1300
79	11828	12994	1806	950	2592	2885	5370	5899	820	431	1177	1310
7K	8728	—	1047	—	1948	—	3963	—	475	—	884	—
7L	8959	—	1132	—	2094	—	4067	—	514	—	951	—
7M	9161	—	1214	—	2229	—	4159	—	551	—	1012	—
7P	8792	—	1002	—	2010	—	3992	—	455	—	913	—
7Q	9023	—	1087	—	2156	—	4096	—	493	—	979	—
7R	9229	—	1167	—	2295	—	4190	—	530	—	1042	—
7T	9431	—	1194	—	2115	—	4282	—	542	—	960	—
7U	9698	—	1292	—	2282	—	4403	—	587	—	1036	—
7V	9932	—	1403	—	2436	—	4509	—	637	—	1106	—
7X	9510	—	1142	—	2185	—	4318	—	518	—	992	—
7Y	9777	—	1240	—	2352	—	4439	—	563	—	1068	—
7Z	10016	—	1347	—	2511	—	4547	—	612	—	1140	—
80	12664	12753	1700	836	2726	2977	5749	5790	772	380	1238	1352
81	12998	13149	1812	836	2863	3143	5901	5970	823	380	1300	1427
82	13347	13545	1928	836	3005	3309	6060	6149	875	380	1364	1502
83	13437	13872	1877	836	3053	3476	6100	6298	852	380	1386	1578
84	13523	14217	1840	836	3099	3651	6139	6455	835	380	1407	1658
85	13804	14008	1927	945	2951	3238	6267	6360	875	429	1340	1470
86	14191	14465	2054	945	3108	3428	6443	6567	933	429	1411	1556
87	14597	14923	2186	945	3271	3618	6627	6775	992	429	1485	1643
88	14705	15311	2142	945	3325	3608	6676	6951	972	429	1510	1638
89	14808	15721	2099	945	3378	4009	6723	7137	953	429	1534	1820
8K	11153	—	1385	—	2760	—	5063	—	629	—	1253	—
8L	11400	—	1484	—	2926	—	5176	—	674	—	1328	—
8M	11650	—	1589	—	3088	—	5289	—	721	—	1402	—
8P	11219	—	1334	—	2830	—	5093	—	606	—	1285	—
8Q	11470	—	1430	—	2999	—	5207	—	649	—	1362	—
8R	11719	—	1535	—	3161	—	5320	—	697	—	1435	—
8T	12069	—	1580	—	2991	—	5479	—	717	—	1358	—
8U	12357	—	1694	—	3180	—	5610	—	769	—	1444	—
8V	12645	—	1814	—	3365	—	5741	—	824	—	1528	—
8X	12152	—	1522	—	3070	—	5517	—	691	—	1394	—
8Y	12444	—	1632	—	3264	—	5650	—	741	—	1482	—
8Z	12733	—	1752	—	3448	—	5781	—	795	—	1565	—

*Rigging weights are for standard tubes of standard wall thickness (0.025-in. [0.635 mm] wall).

†Heat exchanger frame sizes 2 through 6 available on single-stage chillers only.

NOTES:

1. Cooler includes the control panel (ICVC), suction elbow, and $^1/_2$ the distribution piping weight.
2. Condenser includes float valve and sump, discharge elbow, and $^1/_2$ the distribution piping weight.
3. For special tubes refer to the 19XR/XRV Computer Selection Program.
4. All weights for standard 2-pass NIH (nozzle-in-head) design.
5. For "E" compressor, add 1054 lb (478 kg) steel weight and 283 lb (128 kg) refrigerant weight for economizer assembly.

Table 23B — 19XRV Heat Exchanger Data — Compressor End Entering Cooler Water

CODE†	ENGLISH						METRIC (SI)					
	DRY RIGGING WEIGHT (LB)*		MACHINE CHARGE				DRY RIGGING WEIGHT (KG)*		MACHINE CHARGE			
	COOLER ONLY	CONDENSER ONLY	REFRIGERANT WEIGHT (LB)		WATER WEIGHT (LB)		COOLER ONLY	CONDENSER ONLY	REFRIGERANT WEIGHT (KG)		WATER WEIGHT (KG)	
			COOLER	CONDENSER	COOLER	CONDENSER			COOLER	CONDENSER	COOLER	CONDENSER
20	3407	3373	345	225	402	398	1545	1530	156	102	182	181
21	3555	3540	385	225	456	462	1613	1606	175	102	207	210
22	3711	3704	435	225	514	526	1683	1680	197	102	233	239
30	4071	3694	350	260	464	464	1847	1676	159	118	210	210
31	4253	3899	420	260	531	543	1929	1769	191	118	241	246
32	4445	4100	490	260	601	621	2016	1860	222	118	273	282
35	4343	4606	400	310	511	513	1970	2089	181	141	232	233
36	4551	4840	480	310	587	603	2064	2195	218	141	266	274
37	4769	5069	550	310	667	692	2163	2299	249	141	303	314
40	4908	5039	560	338	863	915	2226	2286	254	153	391	415
41	5078	5232	630	338	930	995	2303	2373	286	153	422	451
42	5226	5424	690	338	990	1074	2370	2460	313	153	449	487
45	5363	5602	640	383	938	998	2433	2541	290	174	425	453
46	5559	5824	720	383	1014	1088	2522	2642	327	174	460	494
47	5730	6044	790	383	1083	1179	2599	2742	358	174	491	535
50	5713	6090	750	446	1101	1225	2591	2762	340	202	499	556
51	5940	6283	840	446	1192	1304	2694	2850	381	202	541	591
52	6083	6464	900	446	1248	1379	2759	2932	408	202	566	626
53	6141	6529	900	446	1277	1409	2788	2964	408	202	580	640
54	6192	6591	900	446	1302	1439	2811	2992	408	202	591	653
55	6257	6785	870	509	1201	1339	2838	3078	395	231	545	607
56	6517	7007	940	509	1304	1429	2956	3178	426	231	591	648
57	6682	7215	980	509	1369	1514	3031	3273	445	231	621	687
58	6751	7291	980	509	1401	1550	3065	3310	445	231	636	704
59	6811	7363	980	509	1430	1583	3092	3343	445	231	649	719
5A	5124	—	500	—	1023	—	2324	—	227	—	464	—
5B	5177	—	520	—	1050	—	2348	—	236	—	476	—
5C	5243	—	550	—	1079	—	2378	—	249	—	489	—
5F	5577	—	550	—	1113	—	2530	—	249	—	505	—
5G	5640	—	570	—	1143	—	2558	—	259	—	518	—
5H	5716	—	600	—	1176	—	2593	—	272	—	533	—
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	940	479	1400	1521	3048	3068	426	217	635	690
61	6895	6949	980	479	1470	1597	3128	3152	445	217	667	724
62	7038	7130	1020	479	1527	1671	3192	3234	463	217	693	758
63	7103	7199	1020	479	1559	1704	3225	3268	463	217	708	773
64	7161	7264	1020	479	1587	1735	3251	3298	463	217	720	788
65	7392	7682	1020	542	1530	1667	3353	3484	463	246	694	756
66	7594	7894	1060	542	1610	1753	3445	3581	481	246	730	795
67	7759	8102	1090	542	1674	1838	3519	3675	494	246	759	834
68	7836	8182	1090	542	1711	1875	3558	3715	494	246	777	851
69	7905	8258	1090	542	1743	1911	3589	3749	494	246	791	868

*Rigging weights are for standard tubes of standard wall thickness (0.025-in. [0.635 mm] wall).

†Heat exchanger frame sizes 2 through 6 available on single-stage chillers only.

NOTES:

1. Cooler includes the control panel (ICVC), suction elbow, and $^1/_2$ the distribution piping weight.
2. Condenser includes float valve and sump, discharge elbow, and $^1/_2$ the distribution piping weight.
3. For special tubes refer to the 19XR/XRV Computer Selection Program.
4. All weights for standard 2-pass NIH (nozzle-in-head) design.
5. For “E” compressor, add 1054 lb (478 kg) steel weight and 283 lb (128 kg) refrigerant weight for economizer assembly.

Table 23B — 19XRV Heat Exchanger Data — Compressor End Entering Cooler Water (cont)

CODE†	ENGLISH						METRIC (SI)					
	DRY RIGGING WEIGHT (LB)*		MACHINE CHARGE				DRY RIGGING WEIGHT (KG)*		MACHINE CHARGE			
	COOLER ONLY	CONDENSER ONLY	REFRIGERANT WEIGHT (LB)		WATER WEIGHT (LB)		COOLER ONLY	CONDENSER ONLY	REFRIGERANT WEIGHT (KG)		WATER WEIGHT (KG)	
			COOLER	CONDENSER	COOLER	CONDENSER			COOLER	CONDENSER	COOLER	CONDENSER
6K	5716	—	760	—	1291	—	2595	—	345	—	586	—
6L	5804	—	797	—	1341	—	2635	—	362	—	609	—
6M	5894	—	828	—	1399	—	2676	—	376	—	635	—
6P	5768	—	725	—	1338	—	2619	—	329	—	607	—
6Q	5852	—	764	—	1385	—	2657	—	347	—	629	—
6R	5938	—	798	—	1439	—	2696	—	362	—	653	—
6T	6230	—	863	—	1405	—	2828	—	392	—	638	—
6U	6330	—	905	—	1462	—	2874	—	411	—	664	—
6V	6433	—	941	—	1528	—	2921	—	427	—	694	—
6X	6293	—	823	—	1459	—	2857	—	374	—	662	—
6Y	6388	—	868	—	1512	—	2900	—	394	—	686	—
6Z	6487	—	906	—	1574	—	2945	—	411	—	715	—
70	9942	10786	1220	840	2008	2225	4510	4893	553	381	911	1009
71	10330	11211	1340	840	2164	2389	4686	5085	608	381	982	1084
72	10632	11622	1440	840	2286	2548	4823	5278	653	381	1037	1156
73	10715	11737	1440	840	2328	2604	4865	5329	654	381	1057	1182
74	10790	11775	1440	840	2366	2622	4899	5346	654	381	1074	1190
75	10840	11859	1365	950	2183	2431	4917	5379	619	431	990	1103
76	11289	12345	1505	950	2361	2619	5121	5600	683	431	1071	1188
77	11638	12814	1625	950	2501	2801	5279	5812	737	431	1134	1271
78	11738	12949	1625	950	2548	2864	5329	5879	738	431	1157	1300
79	11828	12994	1625	950	2592	2885	5370	5899	738	431	1177	1310
7K	8728	—	1047	—	1948	—	3963	—	475	—	884	—
7L	8959	—	1132	—	2094	—	4067	—	514	—	951	—
7M	9161	—	1214	—	2229	—	4159	—	551	—	1012	—
7P	8792	—	1002	—	2010	—	3992	—	455	—	913	—
7Q	9023	—	1087	—	2156	—	4096	—	493	—	979	—
7R	9229	—	1167	—	2295	—	4190	—	530	—	1042	—
7T	9431	—	1194	—	2115	—	4282	—	542	—	960	—
7U	9698	—	1292	—	2282	—	4403	—	587	—	1036	—
7V	9932	—	1403	—	2436	—	4509	—	637	—	1106	—
7X	9510	—	1142	—	2185	—	4318	—	518	—	992	—
7Y	9777	—	1240	—	2352	—	4439	—	563	—	1068	—
7Z	10016	—	1347	—	2511	—	4547	—	612	—	1140	—
80	12664	12753	1500	836	2726	2977	5744	5785	680	379	1236	1350
81	12998	13149	1620	836	2863	3143	5896	5964	735	379	1299	1426
82	13347	13545	1730	836	3005	3309	6054	6144	785	379	1363	1501
83	13437	13872	1730	836	3053	3476	6100	6298	785	379	1386	1578
84	13523	14217	1730	836	3099	3651	6139	6455	785	379	1407	1658
85	13804	14008	1690	945	2951	3238	6261	6354	767	429	1339	1469
86	14191	14465	1820	945	3108	3428	6437	6561	826	429	1410	1555
87	14597	14923	1940	945	3271	3618	6621	6769	880	429	1484	1641
88	14705	15311	1940	945	3325	3808	6676	6951	881	429	1510	1729
89	14808	15721	1940	945	3378	4009	6723	7137	881	429	1534	1820
8K	11153	—	1385	—	2760	—	5063	—	629	—	1253	—
8L	11400	—	1484	—	2926	—	5176	—	674	—	1328	—
8M	11650	—	1589	—	3088	—	5289	—	721	—	1402	—
8P	11219	—	1334	—	2830	—	5093	—	606	—	1285	—
8Q	11470	—	1430	—	2999	—	5207	—	649	—	1362	—
8R	11719	—	1535	—	3161	—	5320	—	697	—	1435	—
8T	12069	—	1580	—	2991	—	5479	—	717	—	1358	—
8U	12357	—	1694	—	3180	—	5610	—	769	—	1444	—
8V	12645	—	1814	—	3365	—	5741	—	824	—	1528	—
8X	12152	—	1522	—	3070	—	5517	—	691	—	1394	—
8Y	12444	—	1632	—	3264	—	5650	—	741	—	1482	—
8Z	12733	—	1752	—	3448	—	5781	—	795	—	1565	—

*Rigging weights are for standard tubes of standard wall thickness (0.025-in. [0.635 mm] wall).

†Heat exchanger frame sizes 2 through 6 available on single-stage chillers only.

NOTES:

1. Cooler includes the control panel (ICVC), suction elbow, and $^1/_2$ the distribution piping weight.
2. Condenser includes float valve and sump, discharge elbow, and $^1/_2$ the distribution piping weight.
3. For special tubes refer to the 19XR/XRV Computer Selection Program.
4. All weights for standard 2-pass NIH (nozzle-in-head) design.

Table 24 — 19XRV Additional Data for Marine Waterboxes*

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		365	365	42	42		166	166	159	159
FRAME 3, 1 AND 3 PASS		730	—	84	—		331	—	318	—
FRAME 3, 2 PASS		365	365	42	42		166	166	159	159
FRAME 4, 1 AND 3 PASS		1888	—	109	—		856	—	412	—
FRAME 4, 2 PASS		944	989	54	54		428	449	205	205
FRAME 5, 1 AND 3 PASS		2445	—	122	—		1109	—	462	—
FRAME 5, 2 PASS		1223	1195	61	60		555	542	231	226
FRAME 6, 1 AND 3 PASS		2860	—	139	—		1297	—	524	—
FRAME 6, 2 PASS		1430	1443	69	69		649	655	262	262
FRAME 7, 1 AND 3 PASS		3970	—	309	—		1801	—	1170	—
FRAME 7, 2 PASS		1720	1561	155	123		780	708	585	465
FRAME 8, 1 AND 3 PASS		5048	—	364	—		2290	—	1376	—
FRAME 8, 2 PASS		2182	1751	182	141		990	794	688	532
FRAME 2, 1 AND 3 PASS	300	860	—	84	—	2068	390	—	318	—
FRAME 2, 2 PASS		430	430	42	42		195	195	159	159
FRAME 3, 1 AND 3 PASS		860	—	84	—		390	—	318	—
FRAME 3, 2 PASS		430	430	42	42		195	195	159	159
FRAME 4, 1 AND 3 PASS		2162	—	109	—		981	—	412	—
FRAME 4, 2 PASS		1552	1641	47	47		704	744	178	178
FRAME 5, 1 AND 3 PASS		2655	—	122	—		1204	—	462	—
FRAME 5, 2 PASS		1965	1909	53	50		891	866	199	190
FRAME 6, 1 AND 3 PASS		3330	—	139	—		1510	—	524	—
FRAME 6, 2 PASS		2425	2451	58	58		1100	1112	218	218
FRAME 7, 1 AND 3 PASS		5294	—	309	—		2401	—	1170	—
FRAME 7, 2 PASS		4140	4652	146	94		1878	2110	553	356
FRAME 8, 1 AND 3 PASS		6222	—	364	—		2822	—	1376	—
FRAME 8, 2 PASS		4952	4559	161	94		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 25 — 19XRV Compressor Component Weights

COMPONENT	FRAME 2 COMPRESSOR WEIGHT		FRAME 3 COMPRESSOR WEIGHT		FRAME 4 COMPRESSOR WEIGHT (WITHOUT SPLIT RING DIFFUSER)		FRAME 4 COMPRESSOR WEIGHT (WITH SPLIT RING DIFFUSER)		FRAME 5 COMPRESSOR WEIGHT		FRAME E COMPRESSOR WEIGHT	
	LB	KG	LB	KG	LB	KG	LB	KG	LB	KG	LB	KG
SUCTION ELBOW	116	53	185	84	239	108	239	108	407	185	377	171
DISCHARGE ELBOW	100	45	125	57	157	71	157	71	325	147	427	194
TRANSMISSION*	320	145	400	181	656	298	656	298	1000	454	961	436
SUCTION HOUSING	370	168	400	181	585	265	810	367	1200	544	531	241
IMPELLER SHROUD	35	16	79	36	126	57	200	91	500	227	N/A	N/A
COMPRESSOR BASE	1260	572	1565	710	1589	721	2020	916	3700	1678	2491	1130
DIFFUSER	35	16	67	30	130	59	130	59	350	159	N/A	N/A
OIL PUMP	125	57	150	68	150	68	150	68	185	84	125	57
HIGH SPEED SHAFT ASSEMBLY	15	7	12	5	30	14	30	14	65	29	94	43
IMPELLER†	5	2	8	4	15	7	15	7	50	23	10 (avg)	5 (avg)
INTAKE WALL	—	—	—	—	—	—	—	—	—	—	89	40
DISCHARGE WALL	—	—	—	—	—	—	—	—	—	—	85	39
DIAPHRAGM	—	—	—	—	—	—	—	—	—	—	87	39
MISCELLANEOUS (Incl. Low Speed Gear)	135	61	135	61	144	65	200	91	235	107	390	177
TOTAL COMPRESSOR WEIGHT (Less Motor and Elbows)	2300	1043	2816	1277	3425	1553	4211	1910	7285	3304	4853	2201

*Transmission weight does not include rotor, shaft, and gear.
†For two-stage compressors (Frame E) there are two impellers. Weight listed is for each one.

NOTE: The weights indicated do not include motor, stator, rotor, low speed shaft, motor case, motor end cover, or any other related components. See Tables 26A-26E.

Table 26A — 19XRV Compressor and Motor Weights* — Standard and High-Efficiency Motors — Compressor Frame Size 2†

MOTOR CODE	ENGLISH						SI					
		60 HZ		50 HZ				60 HZ		50 HZ		
	COMPRESSOR WEIGHT** (LB)	STATOR WEIGHT† † (LB)	ROTOR WEIGHT (LB)	STATOR WEIGHT† † (LB)	ROTOR WEIGHT (LB)	END BELL COVER WEIGHT (LB)	COMPRESSOR WEIGHT** (KG)	STATOR WEIGHT† † (KG)	ROTOR WEIGHT (KG)	STATOR WEIGHT† † (KG)	ROTOR WEIGHT (KG)	END BELL COVER WEIGHT (KG)
STANDARD-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 V)												
BDS	2300	900	190	915	205	185	1043	408	86	415	93	84
BES	2300	915	200	965	220	185	1043	415	91	438	100	84
BFS	2300	975	215	1000	230	185	1043	442	98	454	104	84
BGS	2300	1000	230	1060	250	185	1043	454	104	481	113	84
BHS	2300	1030	240	1105	265	185	1043	467	109	501	120	84
BJS	2300	1105	265	—	—	185	1043	501	120	—	—	84
HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 V)												
BDH	2300	1030	240	1030	240	185	1043	467	109	467	109	84
BEH	2300	1070	250	1070	250	185	1043	485	113	485	113	84
BFH	2300	1120	265	1120	265	185	1043	508	120	508	120	84
BGH	2300	1175	290	1175	290	185	1043	533	132	533	132	84
BHH	2300	1175	290	1175	290	185	1043	533	132	533	132	84
BJH	2300	1175	290	—	—	185	1043	533	132	—	—	84
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 in Fig. 1.

**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 26B — 19XRV 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)	
STANDARD-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 V)												
CBS	2816	1146	219	1188	236	274	1277	520	99	539	107	124
CCS	2816	1171	227	1196	242	274	1277	531	103	542	110	124
CDS	2816	1198	237	1258	255	274	1277	543	108	571	116	124
CES	2816	1207	240	1272	258	274	1277	547	109	577	117	124
CLS	2816	1247	249	1328	273	274	1277	566	113	602	124	124
CMS	2816	1270	257	1353	278	274	1277	576	117	614	126	124
CNS	2816	1321	266	1386	282	274	1277	599	121	629	128	124
CPS	2816	1334	269	1401	287	274	1277	605	122	635	130	124
CQS	2816	1353	276	1408	290	274	1277	614	125	639	132	124
CRS	2816	1259	321	—	—	274	1277	571	146	—	—	124
CRS (380V)	2816	1328	346	—	—	274	1277	602	157	—	—	124
HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 V)												
CBH	2816	1235	239	1290	254	274	1277	560	108	585	115	124
CCH	2816	1260	249	1295	259	274	1277	572	113	587	117	124
CDH	2816	1286	258	1358	273	274	1277	583	117	616	124	124
CEH	2816	1305	265	1377	279	274	1277	592	120	625	127	124
CLH	2816	1324	271	1435	292	274	1277	601	123	651	132	124
CMH	2816	1347	275	1455	298	274	1277	611	125	660	135	124
CNH	2816	1358	278	1467	301	274	1277	616	126	665	137	124
CPH	2816	1401	290	1479	304	274	1277	635	132	671	138	124
CQH	2816	1455	304	1479	304	274	1277	670	138	671	138	124
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 in Fig. 1.

**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 26B — 19XRV Compressor and Motor Weights* — Standard and High-Efficiency Motors — Compressor Frame Size 3† (cont)

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 / MEDIUM VOLTAGE (2400-4160 V)												
CBH	2816	1114	242	1156	255	274	1277	505	110	524	116	124
CCH	2816	1129	247	1163	257	274	1277	512	112	528	117	124
CDH	2816	1155	253	1190	263	274	1277	524	115	540	119	124
CEH	2816	1175	263	1236	276	274	1277	533	119	561	125	124
CLH	2816	1242	280	1305	296	274	1277	563	127	592	134	124
CMH	2816	1321	303	1305	296	274	1277	599	137	592	134	124
CNH	2816	1369	316	1386	316	274	1277	621	143	629	143	124
CPH	2816	1411	329	1386	316	274	1277	640	149	629	143	124
CQH	2816	1411	329	1428	329	274	1277	640	149	648	149	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 in Fig. 1.
**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 26C — 19XRV Compressor and Motor Weights* — Standard and 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)	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)	
STANDARD-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 V)												
DBS	3425 / 4211	1570	324	1725	347	236	1554 / 1910	712	147	782	157	107
DCS	3425 / 4211	1580	326	1737	352	236	1554 / 1910	717	148	788	160	107
DDS	3425 / 4211	1595	329	1749	357	236	1554 / 1910	723	149	793	162	107
DES	3425 / 4211	1685	345	1762	365	236	1554 / 1910	764	156	799	166	107
DFS	3425 / 4211	1690	348	1801	372	236	1554 / 1910	767	158	817	169	107
DGS	3425 / 4211	1692	352	1858	386	236	1554 / 1910	767	160	843	175	107
DHS	3425 / 4211	1774	366	1904	398	236	1554 / 1910	805	166	864	181	107
DJS	3425 / 4211	—	—	2020	401	318	1554 / 1910	—	—	916	182	142
STANDARD-EFFICIENCY MOTORS / MEDIUM VOLTAGE (2400-4160 V)												
DBS	3425 / 4211	1524	296	1637	327	236	1554 / 1910	691	134	743	148	107
DCS	3425 / 4211	1569	307	1685	354	236	1554 / 1910	712	139	764	161	107
DDS	3425 / 4211	1588	313	1713	357	236	1554 / 1910	720	142	777	162	107
DES	3425 / 4211	1613	324	1746	360	236	1554 / 1910	732	147	792	163	107
DFS	3425 / 4211	1675	347	1811	381	236	1554 / 1910	760	157	821	173	107
DGS	3425 / 4211	1704	355	1998	422	236 (60 Hz) 318 (50 Hz)	1554 / 1910	773	161	906	191	107 (60 Hz) 142 (50 Hz)
DHS	3425 / 4211	1737	361	2056	443	236 (60 Hz) 318 (50 Hz)	1554 / 1910	788	164	933	201	107 (60 Hz) 142 (50 Hz)
DJS	3425 / 4211	1769	365	2101	464	236 (60 Hz) 318 (50 Hz)	1554 / 1910	802	166	953	210	107 (60 Hz) 142 (50 Hz)
STANDARD-EFFICIENCY MOTORS / MEDIUM VOLTAGE (6300-6900 V)												
DDS	3425 / 4211	1919	423	2069	458	318	1554 / 1910	870	192	938	208	142
DES	3425 / 4211	1939	428	2089	463	318	1554 / 1910	880	194	947	210	142
DFS	3425 / 4211	1989	448	2139	478	318	1554 / 1910	902	203	970	217	142
DGS	3425 / 4211	2054	473	—	—	318	1554 / 1910	932	215	—	—	142
DHS	3425 / 4211	2099	488	—	—	318	1554 / 1910	952	221	—	—	142
DJS	3425 / 4211	2159	508	—	—	318	1554 / 1910	979	230	—	—	142
HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 V)												
DBH	3425 / 4211	1773	406	1827	406	318	1554 / 1910	804	184	829	184	142
DCH	3425 / 4211	1827	406	1827	414	318	1554 / 1910	829	184	829	188	142
DDH	3425 / 4211	1827	414	1881	422	318	1554 / 1910	829	188	853	191	142
DEH	3425 / 4211	1881	422	1881	422	318	1554 / 1910	853	191	853	191	142
DFH	3425 / 4211	1881	439	1963	439	318	1554 / 1910	853	199	890	199	142
DGH	3425 / 4211	1963	455	1963	455	318	1554 / 1910	890	206	890	206	142
DHH	3425 / 4211	1963	455	2050	463	318	1554 / 1910	890	206	930	210	142
DJH	3425 / 4211	—	—	2050	471	318	1554 / 1910	—	—	930	213	142
DKH	3425 / 4211	2050	471	—	—	318	1554 / 1910	930	214	—	—	142

*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 in Fig. 1.
**Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only. For high lift compressors, contact Carrier Chiller Marketing for weights. For compressor frame size 4, two compressor weights are shown. The second value, 4211 lb (1910 kg), represents the weight when the compressor is equipped with a Split Ring Diffuser (SRD).
††Stator weight includes the stator and shell.

Table 26C — 19XRV Compressor and Motor Weights* — Standard and High-Efficiency Motors — Compressor Frame Size 4† (cont)

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 (200-575V)												
LBH	3425 / 4211	1873	364	1939	389	318	1554 / 1910	850	165	880	176	144
LCH	3425 / 4211	1939	389	2023	406	318	1554 / 1910	880	176	918	184	144
LDH	3425 / 4211	2023	406	2043	417	318	1554 / 1910	918	184	927	189	144
LEH	3425 / 4211	2043	417	2096	434	318	1554 / 1910	927	189	951	197	144
LFH	3425 / 4211	2096	434	2133	444	318	1554 / 1910	951	197	968	201	144
LGH	3425 / 4211	2133	444	2199	458	318	1554 / 1910	968	201	997	208	144
LHH	3425 / 4211	2199	458	2066	437	318	1554 / 1910	997	208	937	198	144
HIGH-EFFICIENCY MOTORS / MEDIUM VOLTAGE (2400-4160V)												
DBH	3425 / 4211	1950	405	1950	405	318	1554 / 1910	885	184	885	184	144
DCH	3425 / 4211	1950	405	2025	429	318	1554 / 1910	885	184	919	195	144
DDH	3425 / 4211	1950	405	2025	429	318	1554 / 1910	885	184	919	195	144
DEH	3425 / 4211	2025	429	2100	452	318	1554 / 1910	919	195	953	205	144
DFH	3425 / 4211	2025	429	2100	452	318	1554 / 1910	919	195	953	205	144
DGH	3425 / 4211	2100	452	2200	480	318	1554 / 1910	953	205	998	218	144
DHH	3425 / 4211	2100	452	2320	575	318	1554 / 1910	953	205	1052	261	144
DJH	3425 / 4211	2100	452	2320	587	318	1554 / 1910	953	205	1052	266	144
DKH	3425 / 4211	2320	587	—	—	318	1554 / 1910	1052	266	—	—	144
HIGH-EFFICIENCY MOTORS / MEDIUM VOLTAGE (6300-6900V)												
DDH	3425 / 4211	2150	536	2250	546	318	1554 / 1910	975	243	1021	248	144
DEH	3425 / 4211	2150	550	2250	550	318	1554 / 1910	975	249	1021	249	144
DFH	3425 / 4211	2250	575	2380	567	318	1554 / 1910	1021	261	1080	261	144
DGH	3425 / 4211	2250	599	2380	599	318	1554 / 1910	1021	272	1080	272	144
DHH	3425 / 4211	2380	604	2380	604	318	1554 / 1910	1080	274	1080	274	144
DJH	3425 / 4211	2380	614	2380	614	318	1554 / 1910	1080	279	1080	279	144
DKH	3425 / 4211	2380	614	—	—	318	1554 / 1910	1080	279	—	—	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 in Fig. 1.

**Compressor aerodynamic component weight only, motor weight not included. Applicable to standard compressors only. For high lift compressors, contact Carrier Chiller Marketing for weights. For compressor frame size 4, two compressor weights are shown. The second value, 4211 lb (1910 kg), represents the weight when the compressor is equipped with a Split Ring Diffuser (SRD).

††Stator weight includes the stator and shell.

Table 26D — 19XRV Compressor and Motor Weights* — Standard and 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)	
STANDARD-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 V)												
EHS	7285	2843	741	2943	775	414	3304	1290	336	1335	352	188
EJS	7285	2826	741	2943	775	414	3304	1281	336	1335	352	188
EKS	7285	2943	775	2997	810	414	3304	1335	352	1359	367	188
ELS	7285	2932	775	2997	810	414	3304	1330	352	1359	367	188
EMS	7285	2986	810	3096	862	414	3304	1354	367	1404	391	188
ENS	7285	2986	810	3203	914	414	3304	1354	367	1453	415	188
EPS	7285	2986	810	3203	914	414	3304	1354	367	1453	415	188
EQS	7285	3013	621	—	—	414	3304	1367	282	—	—	188
STANDARD-EFFICIENCY MOTORS / MEDIUM VOLTAGE (2400-4160 V)												
EHS	7285	2744	706	2818	741	414	3304	1245	320	1278	336	188
EJS	7285	2816	741	2892	775	414	3304	1277	336	1312	352	188
EKS	7285	2816	741	2930	775	414	3304	1277	336	1329	352	188
ELS	7285	2808	741	3005	810	414	3304	1274	336	1363	367	188
EMS	7285	2892	775	3005	810	414	3304	1322	352	1363	367	188
ENS	7285	2997	775	3143	879	414	3304	1359	352	1426	399	188
EPS	7285	2967	810	3144	879	414	3304	1346	367	1426	399	188
EQS	7285	3081	872	—	—	414	3304	1398	396	—	—	188
STANDARD-EFFICIENCY MOTORS / MEDIUM VOLTAGE (6300-6900 V)												
EHS	7285	2773	735	2845	769	414	3304	1258	333	1290	349	188
EJS	7285	2855	769	2855	769	414	3304	1295	349	1295	349	188
EKS	7285	2919	803	2919	803	414	3304	1324	364	1324	364	188
ELS	7285	2908	803	3058	871	414	3304	1319	364	1387	395	188
EMS	7285	3029	854	3068	871	414	3304	1374	387	1392	395	188
ENS	7285	3023	854	3281	974	414	3304	1371	387	1488	442	188
EPS	7285	3068	871	3288	974	414	3304	1392	395	1491	442	188
HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (200-575 V)												
EHH	7285	2939	776	2995	810	414	3304	1333	352	1359	367	188
EJH	7285	2944	776	3002	810	414	3304	1335	352	1362	367	188
EKH	7285	2992	810	3110	862	414	3304	1357	367	1411	391	188
ELH	7285	2299	810	3099	862	414	3304	1043	367	1406	391	188
EMH	7285	2965	810	3210	914	414	3304	1345	367	1456	415	188
ENH	7285	3015	855	3293	974	414	3304	1368	388	1494	442	188
EPH	7285	3029	855	3289	974	414	3304	1374	388	1492	442	188
EQH	7285	3162	664	—	—	414	3304	1434	301	—	—	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 in Fig. 1.

**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 26D — 19XRV Compressor and Motor Weights* — Standard and High-Efficiency Motors — Compressor Frame Size 5† (cont)

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)												
EHH	7285	2939	776	2997	810	414	3304	1333	352	1359	367	188
EJH	7285	2999	810	3108	862	414	3304	1360	367	1410	391	188
EKH	7285	2988	810	3102	862	414	3304	1355	367	1407	391	188
ELH	7285	2981	810	3065	872	414	3304	1352	367	1390	396	188
EMH	7285	3031	855	3077	872	414	3304	1375	388	1396	396	188
ENH	7285	3075	872	3260	974	414	3304	1395	396	1479	442	188
EPH	7285	3081	872	3298	974	414	3304	1398	396	1496	442	188
EQH	7285	3195	657	—	—	414	3304	1449	298	—	—	188
HIGH-EFFICIENCY MOTORS / MEDIUM VOLTAGE (6300-6900 V)												
EHH	7285	2998	810	3097	862	414	3304	1360	367	1405	391	188
EJH	7285	3029	855	3100	862	414	3304	1374	388	1406	391	188
EKH	7285	3049	855	3064	872	414	3304	1383	388	1390	396	188
ELH	7285	3068	872	3060	872	414	3304	1390	396	1388	396	188
EMH	7285	—	—	3072	872	414	3304	—	—	1393	396	188
ENH	7285	3075	872	3260	974	414	3304	1395	396	1479	442	188
EPH	7285	3081	872	3288	974	414	3304	1398	396	1491	442	188
EQH	7285	3195	657	—	—	414	3304	1449	298	—	—	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 in Fig. 1.

**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 26E — 19XRV 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** (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)	
STANDARD-EFFICIENCY MOTORS / LOW VOLTAGE (380-575 V)												
6H	4853	2843	741	2943	775	414	2201	1290	336	1335	352	188
6J	4853	2826	741	2943	775	414	2201	1281	336	1335	352	188
6K	4853	2943	775	2997	810	414	2201	1335	352	1359	367	188
6L	4853	2932	775	2997	810	414	2201	1330	352	1359	367	188
6M	4853	2986	810	3096	862	414	2201	1354	367	1404	391	188
6N	4853	2986	810	3203	914	414	2201	1354	367	1453	415	188
6P	4853	2986	810	3203	914	414	2201	1354	367	1453	415	188
STANDARD-EFFICIENCY MOTORS / MEDIUM VOLTAGE (2400-4160 V)												
6H	4853	2744	706	2818	741	414	2201	1245	320	1278	336	188
6J	4853	2816	741	2892	775	414	2201	1277	336	1312	352	188
6K	4853	2816	741	2930	775	414	2201	1277	336	1329	352	188
6L	4853	2808	741	3005	810	414	2201	1274	336	1363	367	188
6M	4853	2892	775	3005	810	414	2201	1322	352	1363	367	188
6N	4853	2997	775	3143	879	414	2201	1359	352	1426	399	188
6P	4853	2967	810	3144	879	414	2201	1346	367	1426	399	188
6Q	4853	3081	872	—	—	414	2201	1398	396	—	—	188
HIGH-EFFICIENCY MOTORS / LOW VOLTAGE (380-460 V)												
EH	4853	2939	776	2995	810	414	2201	1333	352	1359	367	188
EJ	4853	2944	776	3002	810	414	2201	1335	352	1362	367	188
EK	4853	2992	810	3110	862	414	2201	1357	367	1411	391	188
EL	4853	2299	810	3099	862	414	2201	1043	367	1406	391	188
EM	4853	2965	810	3210	914	414	2201	1345	367	1456	415	188
EN	4853	3015	855	3293	974	414	2201	1368	388	1494	442	188
EP	4853	3029	855	3289	974	414	2201	1374	388	1492	442	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 in Fig. 1.

**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 26E — 19XRV Compressor and Motor Weights*— Standard and High-Efficiency Motors — Compressor Frame Size E† (cont)

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 (400-460 V)												
MB	4853	2795	645	2856	665	414	2201	1268	293	1295	302	188
MC	4853	2873	672	2925	693	414	2201	1303	305	1327	314	188
MD	4853	2906	684	3013	724	414	2201	1318	310	1367	328	188
ME	4853	2956	704	3071	737	414	2201	1341	319	1392	334	188
MF	4853	3034	724	3153	791	414	2201	1376	328	1430	359	188
MG	4853	3071	737	—	—	414	2201	1393	334	—	—	188
HIGH-EFFICIENCY MOTORS / MEDIUM VOLTAGE (2400-4160 V)												
EH	4853	2939	776	2997	810	414	2201	1333	352	1359	367	188
EJ	4853	2999	810	3108	862	414	2201	1360	367	1410	391	188
EK	4853	2988	810	3102	862	414	2201	1355	367	1407	391	188
EL	4853	2981	810	3065	872	414	2201	1352	367	1390	396	188
EM	4853	3031	855	3077	872	414	2201	1375	388	1396	396	188
EN	4853	3075	872	3260	974	414	2201	1395	396	1479	442	188
EP	4853	3081	872	3298	974	414	2201	1398	396	1496	442	188
HIGH-EFFICIENCY MOTORS / MEDIUM VOLTAGE (6300-6900 V)												
EH	4853	2998	810	3097	862	414	2201	1360	367	1405	391	188
EJ	4853	3029	855	3100	862	414	2201	1374	388	1406	391	188
EK	4853	3049	855	3064	872	414	2201	1383	388	1390	396	188
EL	4853	3068	872	3060	872	414	2201	1390	396	1388	396	188
EM	4853	—	—	3072	872	414	2201	—	—	1393	396	188
EN	4853	3075	872	3260	974	414	2201	1395	396	1479	442	188
EP	4853	3081	872	3288	974	414	2201	1398	396	1491	442	188
HIGH-EFFICIENCY MOTORS / HIGH VOLTAGE (10000-11000 V)												
MD	4853	—	—	3956	678	414	2201	—	—	1794	308	188
MF	4853	—	—	4062	719	414	2201	—	—	1842	326	188
MH	4853	3820	657	—	—	414	2201	1733	298	—	—	188
HIGH-EFFICIENCY MOTORS / HIGH VOLTAGE (13800 V)												
MH	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 in Fig. 1.

**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 27A — 19XRV Waterbox Cover Weights — English (lb)

WATERBOX DESCRIPTION	COOLER			
	FRAME 2		FRAME 3	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 150 psig	287	318	287	318
NIH, 2 Pass Cover, 150 psig	287	340	287	340
NIH, 3 Pass Cover, 150 psig	294	310	294	310
MWB End Cover, 150 psig	315	315	315	315
NIH/MWB Return Cover, 150 psig	243	243	243	243
NIH, 1 Pass Cover, 300 psig	411	486	411	486
NIH, 2 Pass Cover, 300 psig	411	518	411	518
NIH, 3 Pass Cover, 300 psig	433	468	433	468
NIH Plain End Cover, 300 psig	291	291	291	291
MWB End Cover, 300 psig	619	619	619	619
MWB Return Cover, 300 psig	445	445	445	445

WATERBOX DESCRIPTION	CONDENSER			
	FRAME 2		FRAME 3	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 150 psig	260	297	260	297
NIH, 2 Pass Cover, 150 psig	265	318	265	318
NIH, 3 Pass Cover, 150 psig	272	288	272	288
MWB End Cover, 150 psig	234	234	234	234
NIH/MWB Return Cover, 150 psig	225	225	225	225
NIH, 1 Pass Cover, 300 psig	379	454	379	454
NIH, 2 Pass Cover, 300 psig	379	486	379	486
NIH, 3 Pass Cover, 300 psig	401	436	401	436
NIH Plain End Cover, 300 psig	270	270	270	270
MWB End Cover, 300 psig	474	474	474	474
MWB Return Cover, 300 psig	359	359	359	359

LEGEND

NIH — Nozzle-in-Head
MWB — Marine Waterbox

NOTE: Weight for NIH 2-pass cover, 150 psig, is included in the heat exchanger weights shown in Tables 23A and 23B.

Table 27A — 19XRV Waterbox Cover Weights — English (lb) (cont)

WATERBOX DESCRIPTION	COOLER					
	FRAME 4		FRAME 5		FRAME 6	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 150 psig	148	185	168	229	187	223
NIH, 2 Pass Cover, 150 psig	202	256	224	276	257	330
NIH, 3 Pass Cover, 150 psig	473	489	617	634	765	791
MWB End Cover, 150 psig	317	317	393	393	487	487
MWB Return Cover, 150 psig	138	138	154	154	172	172
NIH, 1 Pass Cover, 300 psig	633	709	764	839	978	1053
NIH, 2 Pass Cover, 300 psig	626	689	761	867	927	1078
NIH, 3 Pass Cover, 300 psig	660	694	795	830	997	1050
NIH/MWB End Cover, 300 psig	522	522	658	658	834	834

WATERBOX DESCRIPTION	CONDENSER					
	FRAME 4		FRAME 5		FRAME 6	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 150 psig	148	185	168	229	187	223
NIH, 2 Pass Cover, 150 psig	191	245	224	298	245	330
NIH, 3 Pass Cover, 150 psig	503	519	629	655	772	843
MWB End Cover and Bolt-on End Cover, 150 psig	317	317	393	393	487	487
NIH/MWB Return Cover, 150 psig	138	138	154	154	172	172
NIH, 1 Pass Cover, 300 psig	633	709	764	839	978	1053
NIH, 2 Pass Cover, 300 psig	622	729	727	878	923	1074
NIH, 3 Pass Cover, 300 psig	655	689	785	838	995	1049
NIH/MWB End Cover, 300 psig	522	522	658	658	834	834

LEGEND

NIH — Nozzle-in-Head
MWB — Marine Waterbox

NOTE: Weight for NIH 2-pass cover, 150 psig, is included in the heat exchanger weights shown in Tables 23A and 23B.

Table 27A — 19XRV Waterbox Cover Weights — English (lb) (cont)

WATERBOX DESCRIPTION	COOLER			
	FRAME 7		FRAME 8	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 150 psig	329	441	417	494
NIH, 2 Pass Cover, 150 psig	426	541	540	693
NIH, 3 Pass Cover, 150 psig	1250	1291	1629	1687
MWB End Cover, 150 psig	844	844	1125	1125
NIH/MWB Return Cover, 150 psig	315	315	404	404
NIH, 1 Pass Cover, 300 psig	1712	1883	2359	2523
NIH, 2 Pass Cover, 300 psig	1662	1908	2369	2599
NIH, 3 Pass Cover, 300 psig	1724	1807	2353	2516
NIH/MWB End Cover, 300 psig	1378	1378	1951	1951

WATERBOX DESCRIPTION	CONDENSER			
	FRAME 7		FRAME 8	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 150 psig	329	441	417	494
NIH, 2 Pass Cover, 150 psig	404	520	508	662
NIH, 3 Pass Cover, 150 psig	1222	1280	1469	1527
MWB End Cover, 150 psig	781	781	1007	1007
Bolt-on MWB End Cover, 150 psig	700	700	1307	1307
NIH/MWB Return Cover, 150 psig	315	315	404	404
NIH, 1 Pass Cover, 300 psig	1690	1851	1986	2151
NIH, 2 Pass Cover, 300 psig	1628	1862	1893	2222
NIH, 3 Pass Cover, 300 psig	1714	1831	1993	2112
NIH/MWB End Cover, 300 psig	1276	1276	1675	1675

LEGEND

NIH — Nozzle-in-Head
MWB — Marine Waterbox

NOTE: Weight for NIH 2-pass cover, 150 psig, is included in the heat exchanger weights shown in Tables 23A and 23B.

Table 27B — 19XRV Waterbox Cover Weights — SI (kg)

WATERBOX DESCRIPTION	COOLER			
	FRAME 2		FRAME 3	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 1034 kPa	130	144	130	144
NIH, 2 Pass Cover, 1034 kPa	130	154	130	154
NIH, 3 Pass Cover, 1034 kPa	133	141	133	141
MWB End Cover, 1034 kPa	143	143	143	143
MWB Return Cover, 1034 kPa	110	110	110	110
NIH, 1 Pass Cover, 2068 kPa	186	220	186	220
NIH, 2 Pass Cover, 2068 kPa	186	235	186	235
NIH, 3 Pass Cover, 2068 kPa	196	212	196	212
NIH Plain End Cover, 2068 kPa	132	132	132	132
MWB End Cover, 2068 kPa	281	281	281	281
MWB Return Cover, 2068 kPa	202	202	202	202

WATERBOX DESCRIPTION	CONDENSER			
	FRAME 2		FRAME 3	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 1034 kPa	118	135	118	135
NIH, 2 Pass Cover, 1034 kPa	120	144	120	144
NIH, 3 Pass Cover, 1034 kPa	123	131	123	131
MWB End Cover, 1034 kPa	106	106	106	106
MWB Return Cover, 1034 kPa	102	102	102	102
NIH, 1 Pass Cover, 2068 kPa	172	206	172	206
NIH, 2 Pass Cover, 2068 kPa	172	220	172	220
NIH, 3 Pass Cover, 2068 kPa	182	198	182	198
NIH Plain End Cover, 2068 kPa	122	122	122	122
MWB End Cover, 2068 kPa	215	215	215	215
MWB Return Cover, 2068 kPa	163	163	163	163

LEGEND

NIH — Nozzle-in-Head
MWB — Marine Waterbox

NOTE: Weight for NIH 2-pass cover, 1034 kPa, is included in the heat exchanger weights shown in Tables 23A and 23B.

Table 27B — 19XR Waterbox Cover Weights — SI (kg) (cont)

WATERBOX DESCRIPTION	COOLER					
	FRAME 4		FRAME 5		FRAME 6	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 1034 kPa	67	84	76	104	85	101
NIH, 2 Pass Cover, 1034 kPa	92	116	102	125	117	150
NIH, 3 Pass Cover, 1034 kPa	215	222	280	288	347	359
MWB End Cover, 1034 kPa	144	144	178	178	221	221
NIH/MWB Return Cover, 1034 kPa	63	63	70	70	78	78
NIH, 1 Pass Cover, 2068 kPa	287	322	347	381	444	478
NIH, 2 Pass Cover, 2068 kPa	284	313	345	394	420	489
NIH, 3 Pass Cover, 2068 kPa	299	315	361	376	452	476
NIH/MWB End Cover, 2068 kPa	237	237	298	298	378	378

WATERBOX DESCRIPTION	CONDENSER					
	FRAME 4		FRAME 5		FRAME 6	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 1034 kPa	67	84	76	104	85	101
NIH, 2 Pass Cover, 1034 kPa	87	111	102	135	111	150
NIH, 3 Pass Cover, 1034 kPa	228	235	285	297	350	382
MWB End Cover and Bolt-on End Cover, 1034 kPa	144	144	178	178	221	221
NIH/MWB Return Cover, 1034 kPa	63	63	70	70	78	78
NIH, 1 Pass Cover, 2068 kPa	287	322	347	381	444	478
NIH, 2 Pass Cover, 2068 kPa	282	331	330	393	419	487
NIH, 3 Pass Cover, 2068 kPa	297	313	356	376	451	476
NIH/MWB End Cover, 2068 kPa	237	237	298	298	378	378

LEGEND

NIH — Nozzle-in-Head
MWB — Marine Waterbox

NOTE: Weight for NIH 2-pass cover, 1034 kPa, is included in the heat exchanger weights shown in Tables 23A and 23B.

Table 27B — 19XR Waterbox Cover Weights — SI (kg) (cont)

WATERBOX DESCRIPTION	COOLER			
	FRAME 7		FRAME 8	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 1034 kPa	149	200	189	224
NIH, 2 Pass Cover, 1034 kPa	193	245	245	314
NIH, 3 Pass Cover, 1034 kPa	567	586	739	765
MWB End Cover, 1034 kPa	383	383	510	510
NIH/MWB Return Cover, 1034 kPa	143	143	183	183
NIH, 1 Pass Cover, 2068 kPa	777	854	1070	1144
NIH, 2 Pass Cover, 2068 kPa	754	865	1075	1179
NIH, 3 Pass Cover, 2068 kPa	782	820	1067	1141
NIH/MWB End Cover, 2068 kPa	625	625	885	885

WATERBOX DESCRIPTION	CONDENSER			
	FRAME 7		FRAME 8	
	STANDARD NOZZLES	FLANGED	STANDARD NOZZLES	FLANGED
NIH, 1 Pass Cover, 1034 kPa	149	200	189	224
NIH, 2 Pass Cover, 1034 kPa	183	236	230	300
NIH, 3 Pass Cover, 1034 kPa	554	580	666	693
MWB End Cover, 1034 kPa	354	354	457	457
Bolt-on MWB End Cover, 1034 kPa	318	318	593	593
NIH/MWB Return Cover, 1034 kPa	143	143	183	183
NIH, 1 Pass Cover, 2068 kPa	767	840	901	976
NIH, 2 Pass Cover, 2068 kPa	738	845	859	1008
NIH, 3 Pass Cover, 2068 kPa	777	831	904	958
NIH/MWB End Cover, 2068 kPa	579	579	760	760

LEGEND

NIH — Nozzle-in-Head
MWB — Marine Waterbox

NOTE: Weight for NIH 2-pass cover, 1034 kPa, is included in the heat exchanger weights shown in Tables 23A and 23B.

Table 28 — 19XRV Component Weights

COMPONENT	FRAME 2 COMPRESSOR*		FRAME 3 COMPRESSOR*		FRAME 4 COMPRESSOR*		FRAME 5 COMPRESSOR*		FRAME E COMPRESSOR*	
	LB	KG	LB	KG	LB	KG	LB	KG	LB	KG
SUCTION ELBOW	116	53	185	84	239	108	407	185	645	293
DISCHARGE ELBOW	100	45	125	57	157	71	325	147	290	132
CONTROL PANEL†	34	15	34	15	34	15	34	15	34	15
OPTIONAL COOLER INLET ISOLATION VALVE	8	4	13	6	20	9	24	11	24	11
OPTIONAL DISCHARGE ISOLATION VALVE	26	12	46	21	74	34	108	49	93	42
STD TIER VFD — 380, 400, AND 460-V (230, 335, 445 A)	650	295	650	295	—	—	—	—	—	—
STD TIER VFD — 380, 400, AND 460-V (485, 550 A)	—	—	1035	469	1035	469	—	—	—	—
STD TIER VFD — 380, 400, AND 460-V (605, 680 A)	—	—	1600	726	1600	726	—	—	—	—
STD TIER VFD — 380, 400, AND 460-V (765 A)	—	—	—	—	1600	726	—	—	—	—
STD TIER VFD — 380, 400, AND 460-V (855, 960, 1070 A)	—	—	—	—	1600	726	1600	726	1600	726
STD TIER VFD — 380, 400, AND 460-V (1275 A)	—	—	—	—	3000	1361	3000	1361	3000	1361
STD TIER VFD — 380, 400, AND 460-V (1530 A)	—	—	—	—	—	—	3000	1361	3000	1361
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
LIQUIFLO 2 VFD — 380, 400, AND 460-V (1200 A)	—	—	—	—	2850	1293	2850	1293	2850	1293
LIQUIFLO 2 VFD — 575-V (390 A)	2200	998	2200	998	—	—	—	—	—	—
VFD SHELF	—	—	—	—	1049	476	1049	476	1049	476

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

NOTE: VFD sizes are available on select heat exchanger models; consult the 19XR,XRV Computer Selection program.

Table 29 — Optional Pumpout Electrical Data

PUMPOUT UNIT	VOLTS-PH-HZ	MAX RLA	LRA
19XR04026501	208/230-3-60	15.8	105
19XR04026501	208/230-3-50	15.8	105
19XR04026502	460-3-60	7.8	52
19XR04026503	400-3-50	7.8	52

LEGEND

LRA — Locked Rotor Amps
RLA — Rated Load Amps

Table 30 — Motor Voltage Code

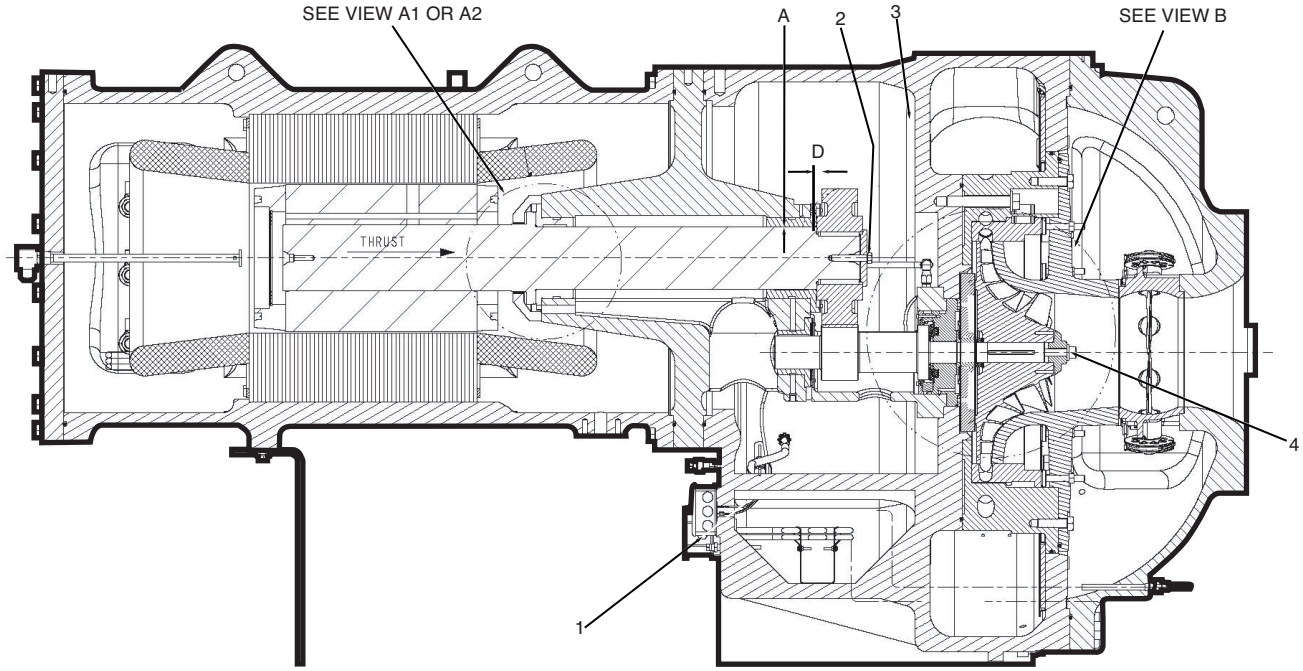
MOTOR VOLTAGE CODE		
CODE	VOLTS	FREQUENCY
60	200	60
61	230	60
62	380	60
63	416	60
64	460	60
65	575	60
66	2400	60
67	3300	60
68	4160	60
69	6900	60
6A	11000	60
6B	10000	60
6C	13800	60
50	230	50
51	346	50
52	400	50
53	3000	50
54	3300	50
55	6300	50
5A	10000	50
5B	11000	50

19XRV 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.

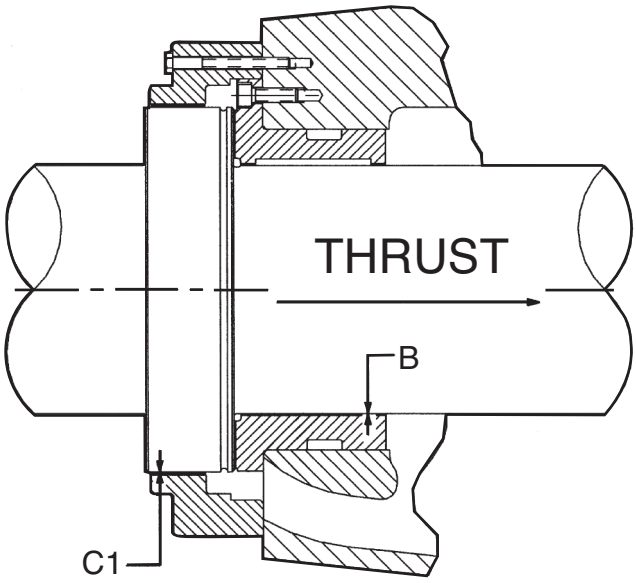
NOTES:
1. All clearances for cylindrical surfaces are diametrical.
2. Dimensions shown are with rotors in the thrust position.
3. Frame 3 rolling element style high speed shaft and bearing assembly cannot be pulled from impeller end. The transmission assembly must be removed from the compressor casting (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.



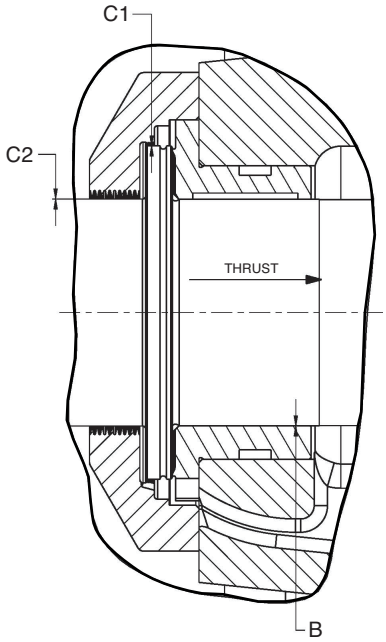
COMPRESSOR, TRANSMISSION AREA (FRAME 5 COMPRESSOR SHOWN)
1) OIL HEATER RETAINING NUT (NOT SHOWN)
2) BULL GEAR RETAINING BOLT
3) DEMISTER BOLTS (NOT SHOWN)
4) IMPELLER BOLT

COMPRESSOR, TRANSMISSION AREA (FRAME 5 COMPRESSOR SHOWN)

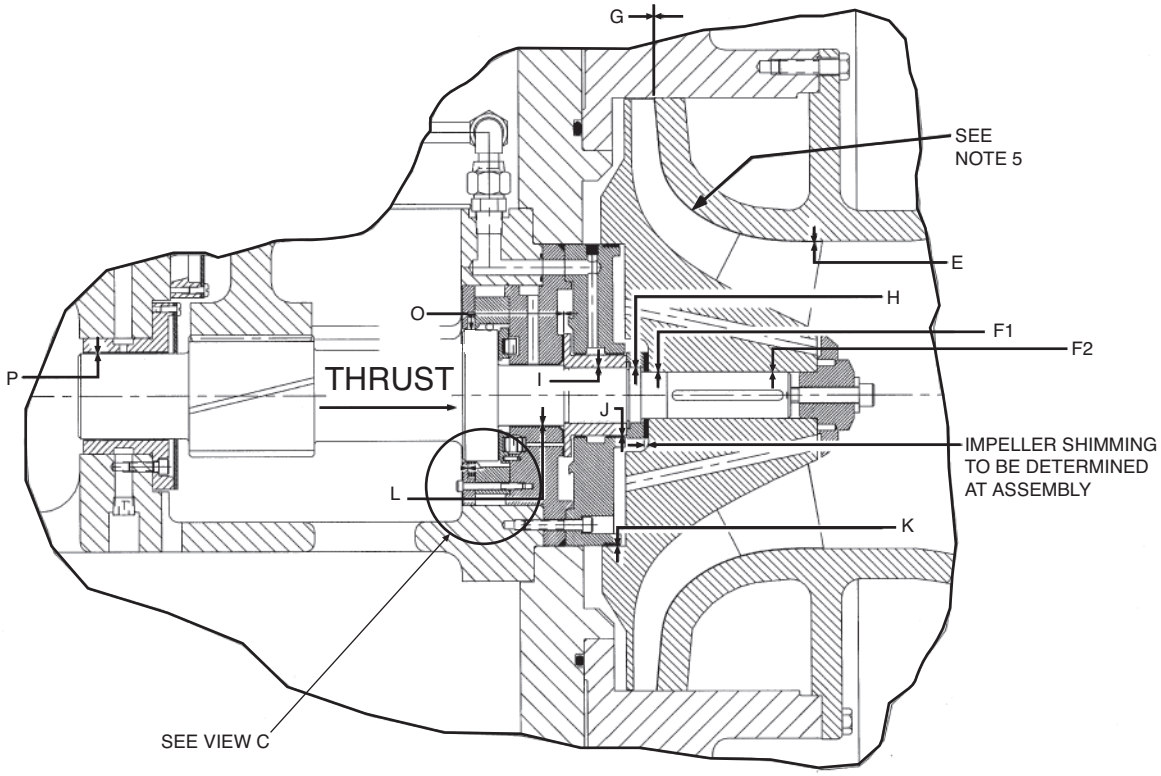
Fig. 59 — Compressor Fits and Clearances — Single-Stage Compressors



VIEW A1
LOW SPEED SHAFT THRUST DISK
FRAME 2 COMPRESSORS

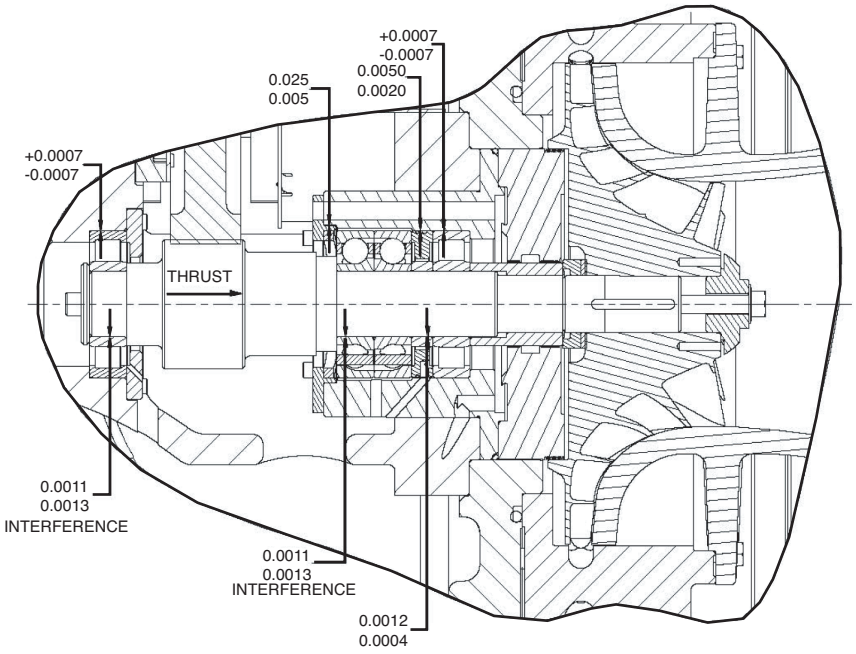


VIEW A2
LOW SPEED SHAFT THRUST DISK
FRAME 3, 4, AND 5 COMPRESSORS

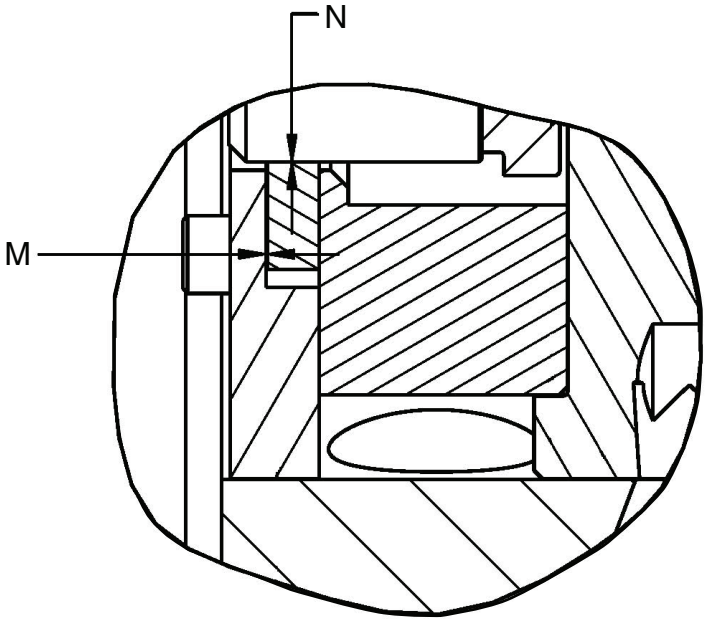


VIEW B — HIGH SPEED SHAFT, ORIGINAL DESIGN (OIL FILM BEARINGS) AND IMPELLER SECTION

Fig. 59 — Compressor Fits and Clearances — Single-Stage Compressors (cont)



VIEW B — HIGH SPEED SHAFT WITH ROLLING ELEMENT BEARINGS

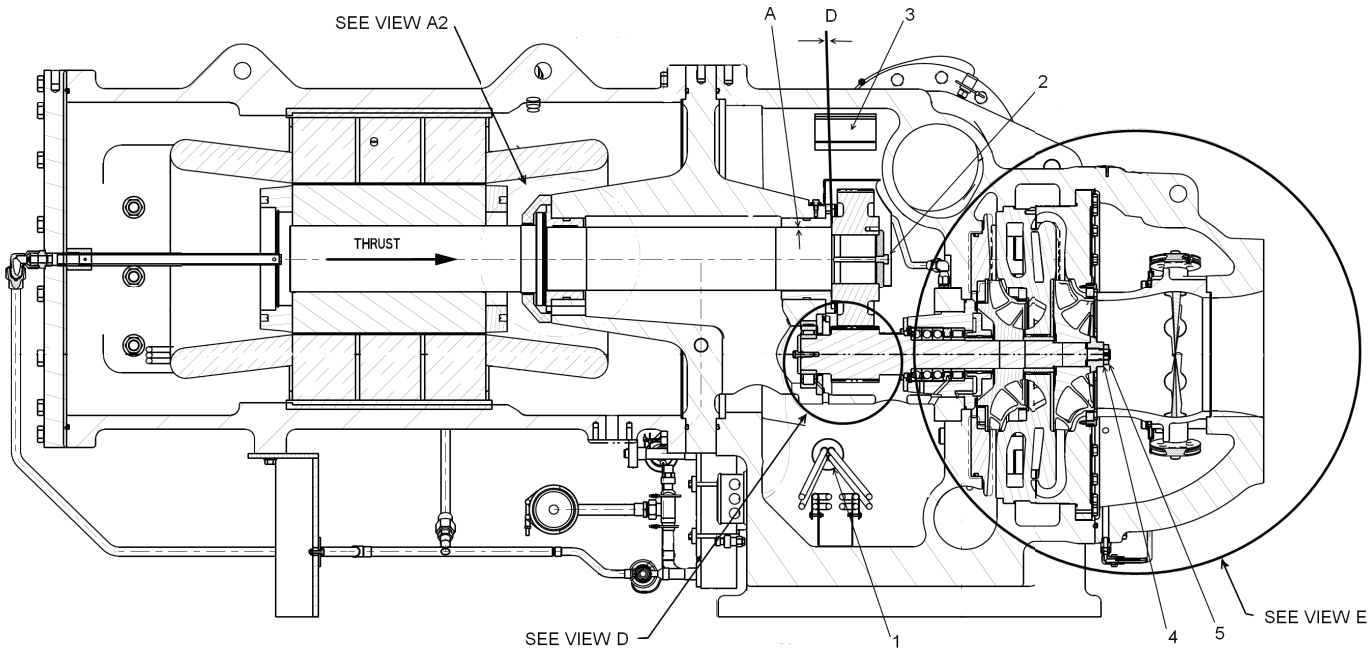


VIEW C — HIGH SPEED SHAFT RING SEAL

Fig. 59 — Compressor Fits and Clearances — Single-Stage Compressors (cont)

19XRV COMPRESSOR FRAME E FITS AND CLEARANCES

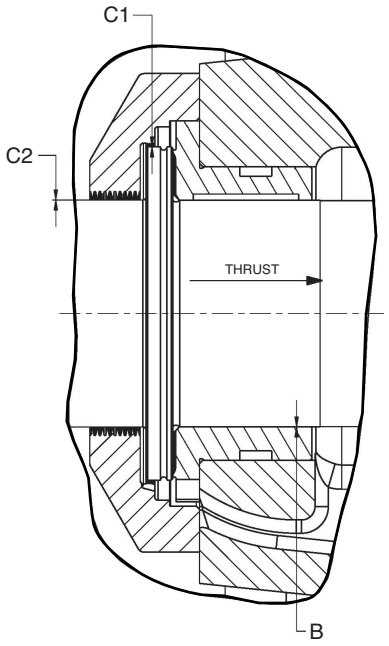
ITEM	COMPRESSOR	FRAME E
	CODE	E31-E69
	DESCRIPTION	ROLLIING ELEMENT BEARINGS
A	Low Speed Journal - Gear End	.0069/.0059
B	Low Speed Journal - Motor End	.0065/.0059
C1	Low Speed labyrinth to thrust Disk	N/A
C2	Labyrinth to Low Speed Shaft	.013/.009
D	Low Speed Shaft thrust Float	.20/.008



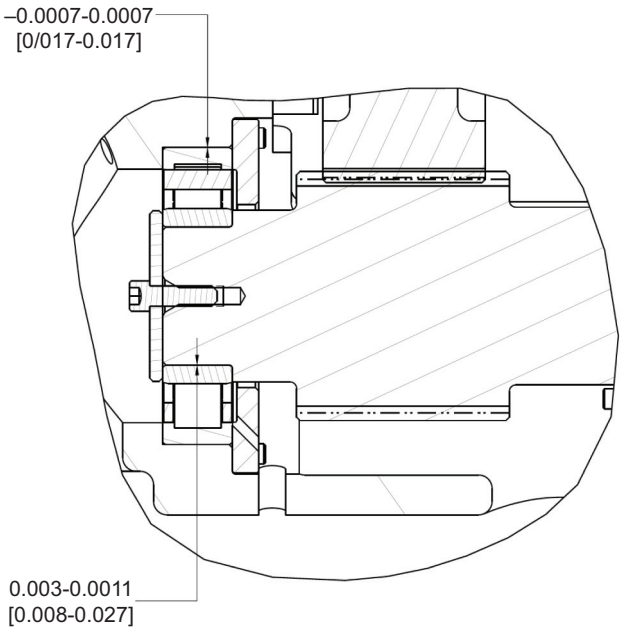
LEGEND

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)

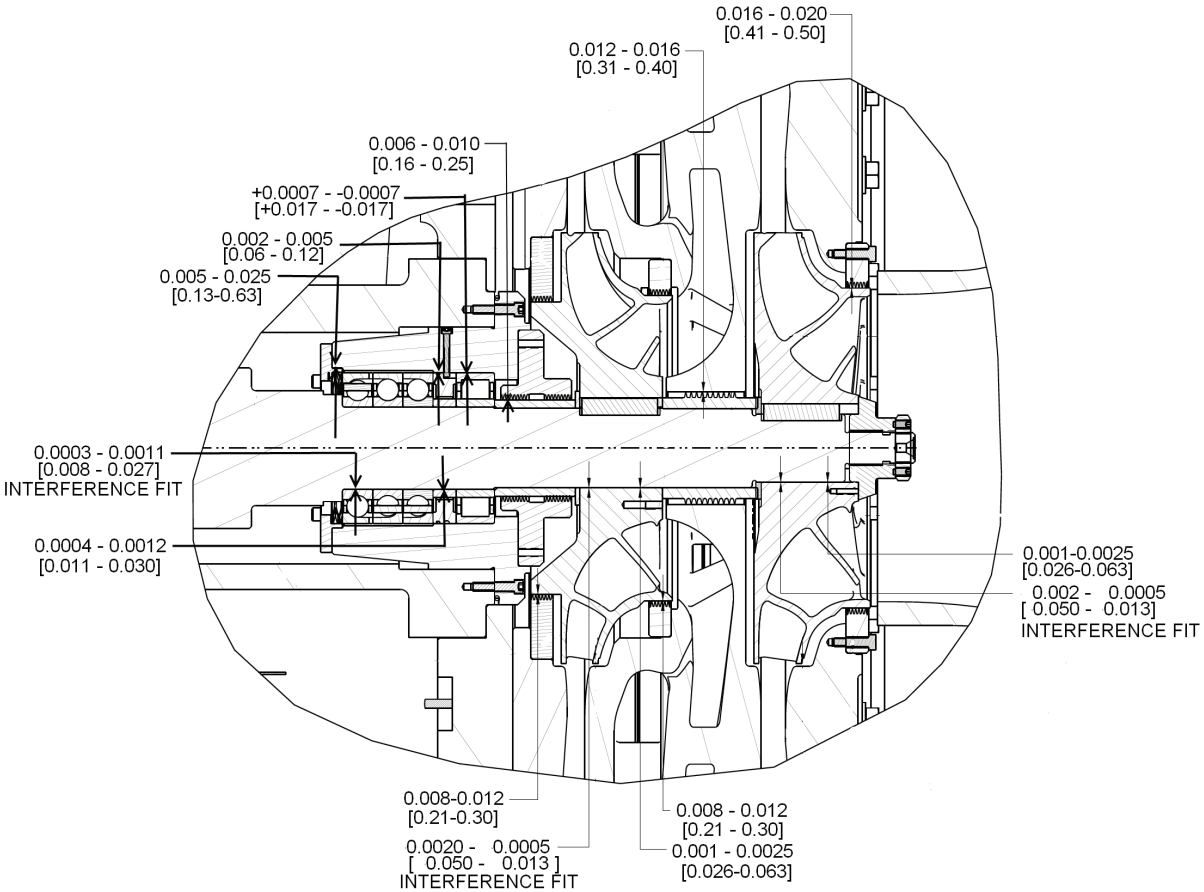
Fig. 60 — Compressor Fits and Clearances — Two-Stage Compressors



VIEW A2
LOW SPEED SHAFT THRUST DISK

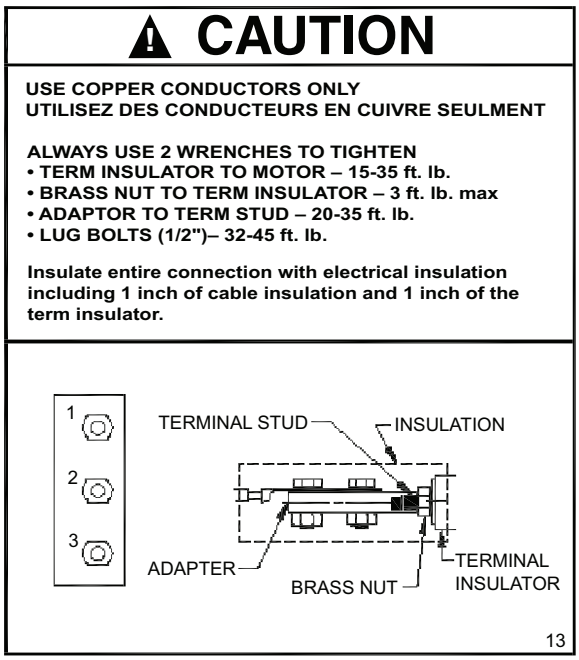


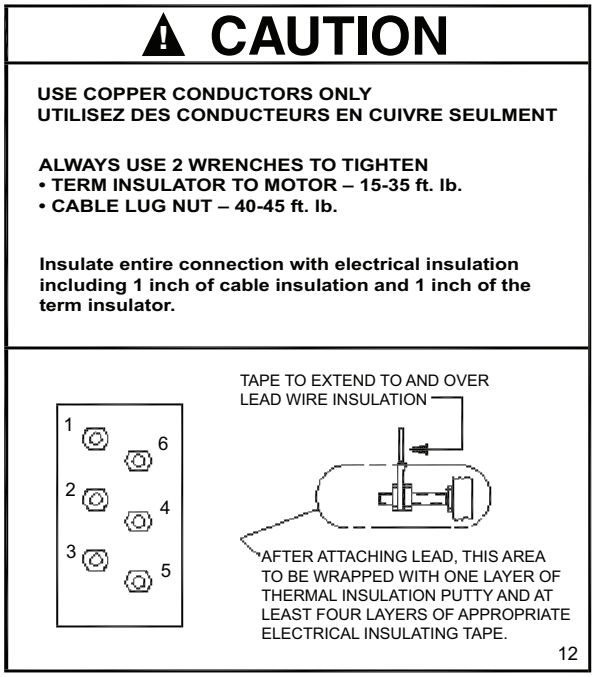
VIEW D
REAR, HIGH SPEED SHAFT BEARING



VIEW E

Fig. 60 — Compressor Fits and Clearances — Two-Stage Compressors (cont)





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 E

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

Fig. 61 — Compressor Assembly Torques — Single and Two-Stage Compressors

LEGEND FOR FIG. 62-68

AUX — Auxiliary
CB — Circuit Breaker
CCM — Chiller Control Module
CCN — Carrier Comfort Network®
COM — Common
COMM — Communications
DL/DP — Data Link/Data Port
GND — Chassis Ground
GV — Inlet Guide Vane
GVA — Guide Vane Actuator
HGBP — Hot Gas Bypass
HPS — High Pressure Switch
ICVC — International Chiller Visual Controller
J — Junction
NTC — Negative Temperature Coefficient
RHS — Relative Humidity Sensor
T — Transformer
TB — Terminal Block
UPC — Universal Protocol Converter
VFD — Variable Frequency Drive

1C — Compressor Oil Heater Contactor
2C — Oil Pump Contactor
3C — Hot Gas Bypass Relay

Field Control Wiring

Field Power Wiring


Factory Wiring


Shielded Cable

Male/Female Connector


Terminal Block Connection


Wire Splice or Junction


Component Terminal


Thermistor


Transducer


Potentiometer


Pressure Switch


Compr Oil Pump Terminal


Cartridge Fuse


Resistor


Chassis Ground

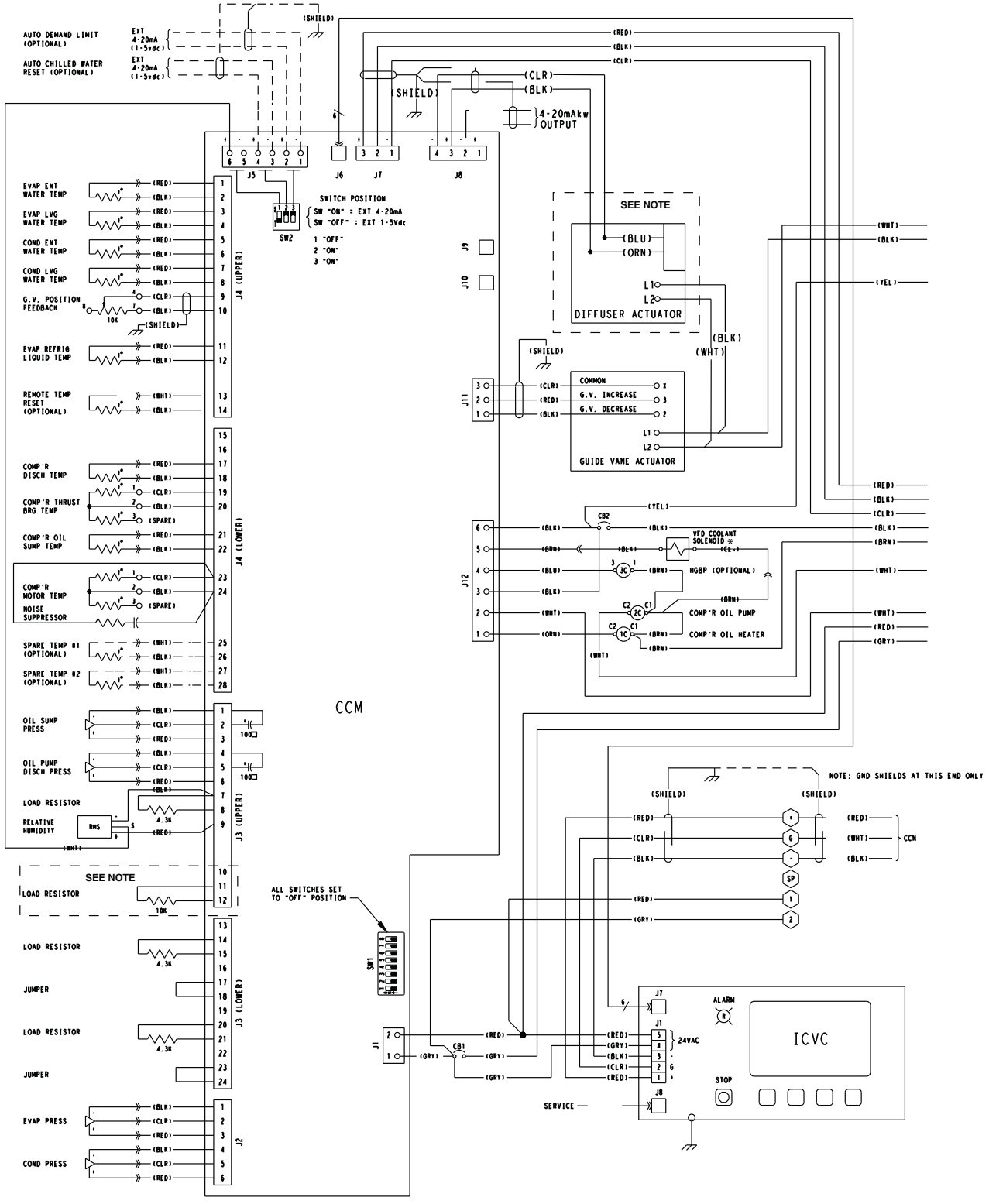

Temperature Switch


Common Potential


VFD Terminal

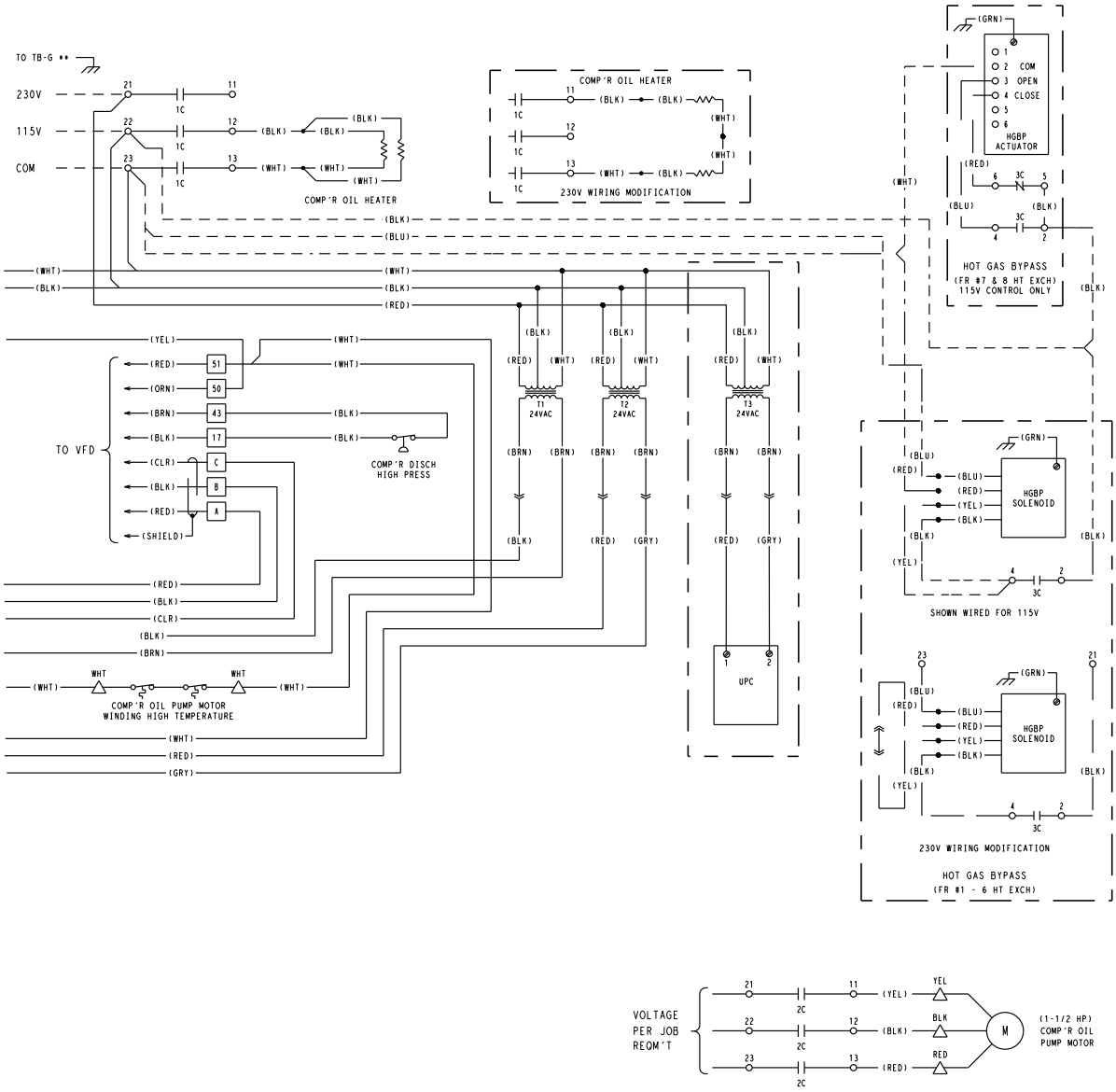

Transformer


Capacitor



NOTE:
On all units with Frame 5 compressors and Frame 4 compressors with the variable (split ring) diffuser option, a diffuser actuator is added and the resistor on J3 (upper) board, terminals 11 and 12, are replaced with a transducer connected to terminals 10, 11, and 12.

Fig. 62 — Typical Electronic PIC III Control Panel Wiring Schematic



* Standard on LF2 drive; optional on machines equipped with other VFDs.

Fig. 62 — Typical Electronic PIC III Control Panel Wiring Schematic (cont)

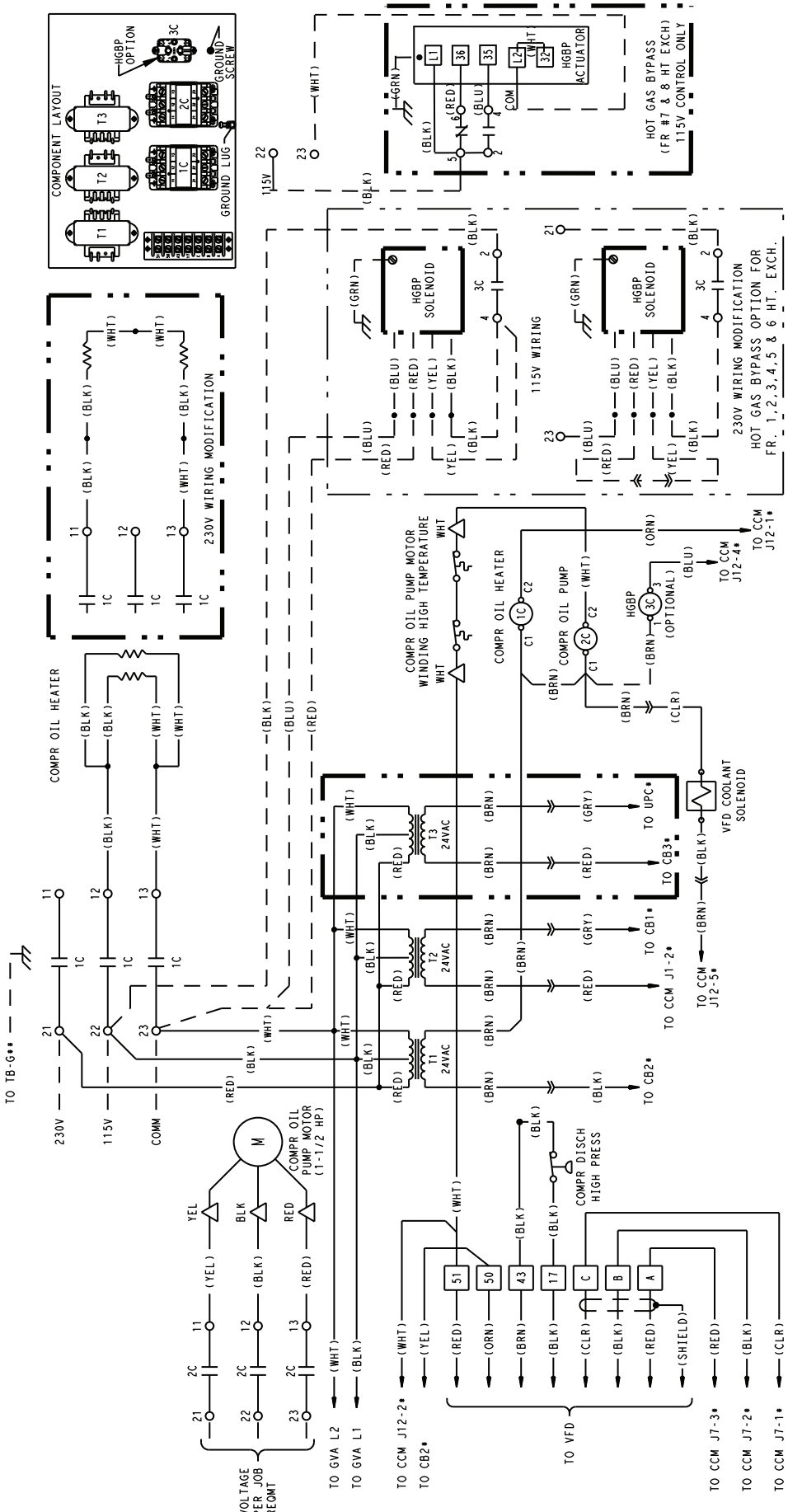


Fig. 63 — Power Panel Wiring Schematic

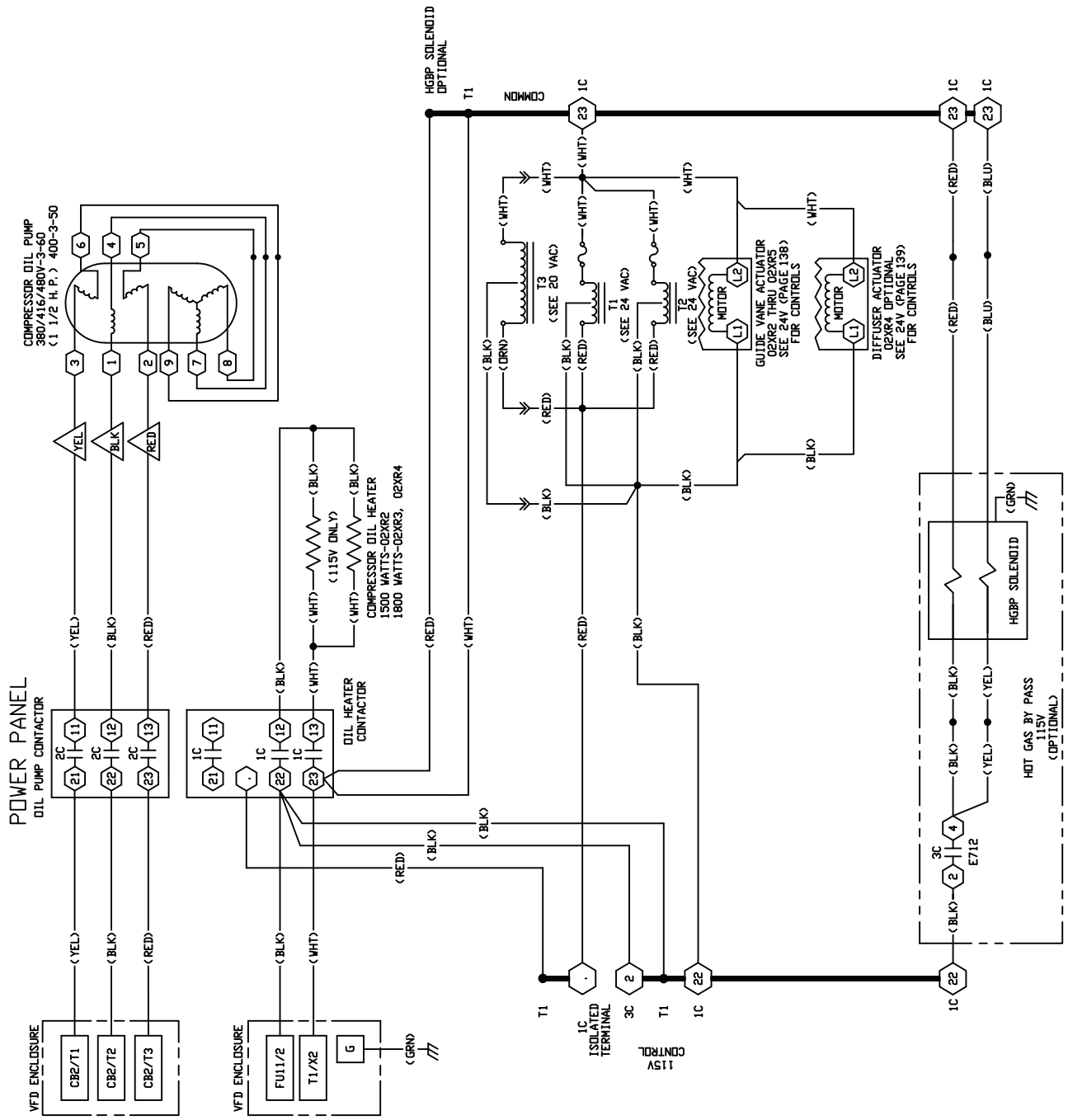


Fig. 64 — 19XRV 442A and 608A Chiller Control Schematic

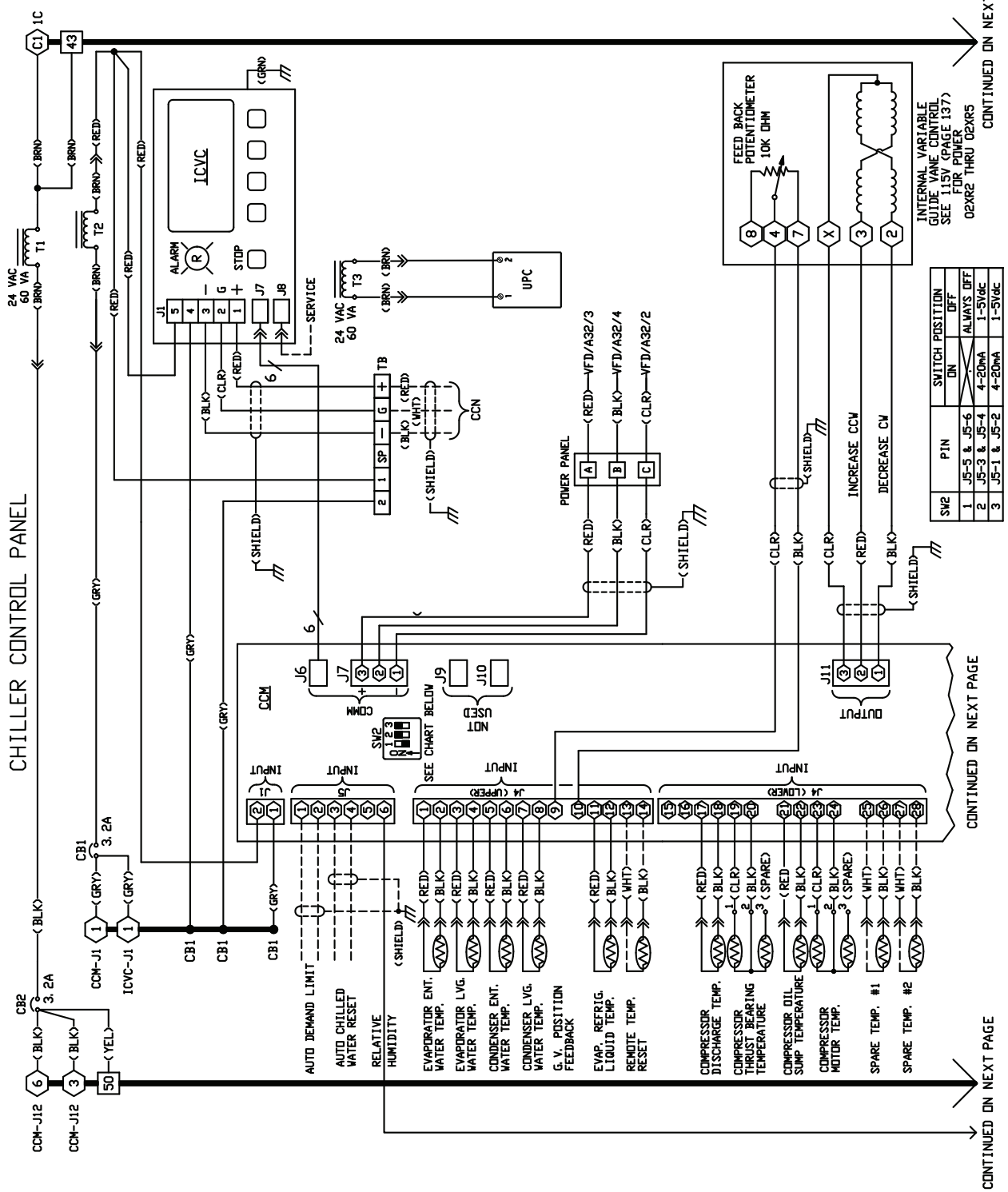


Fig. 64 — 19XRV 442A and 608A Chiller Control Schematic (cont)

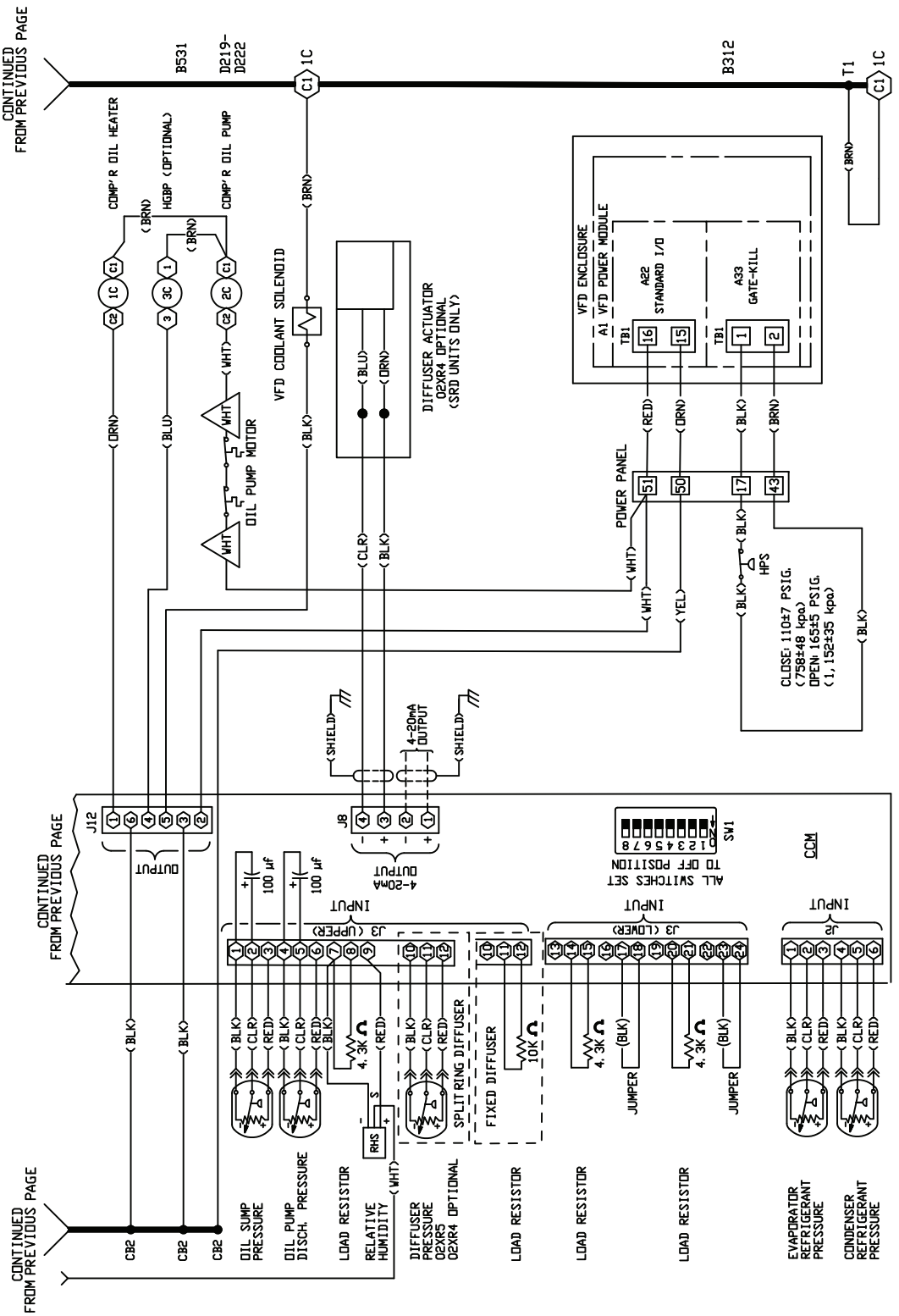


Fig. 64 — 19XRV 442A and 608A Chiller Control Schematic (cont)

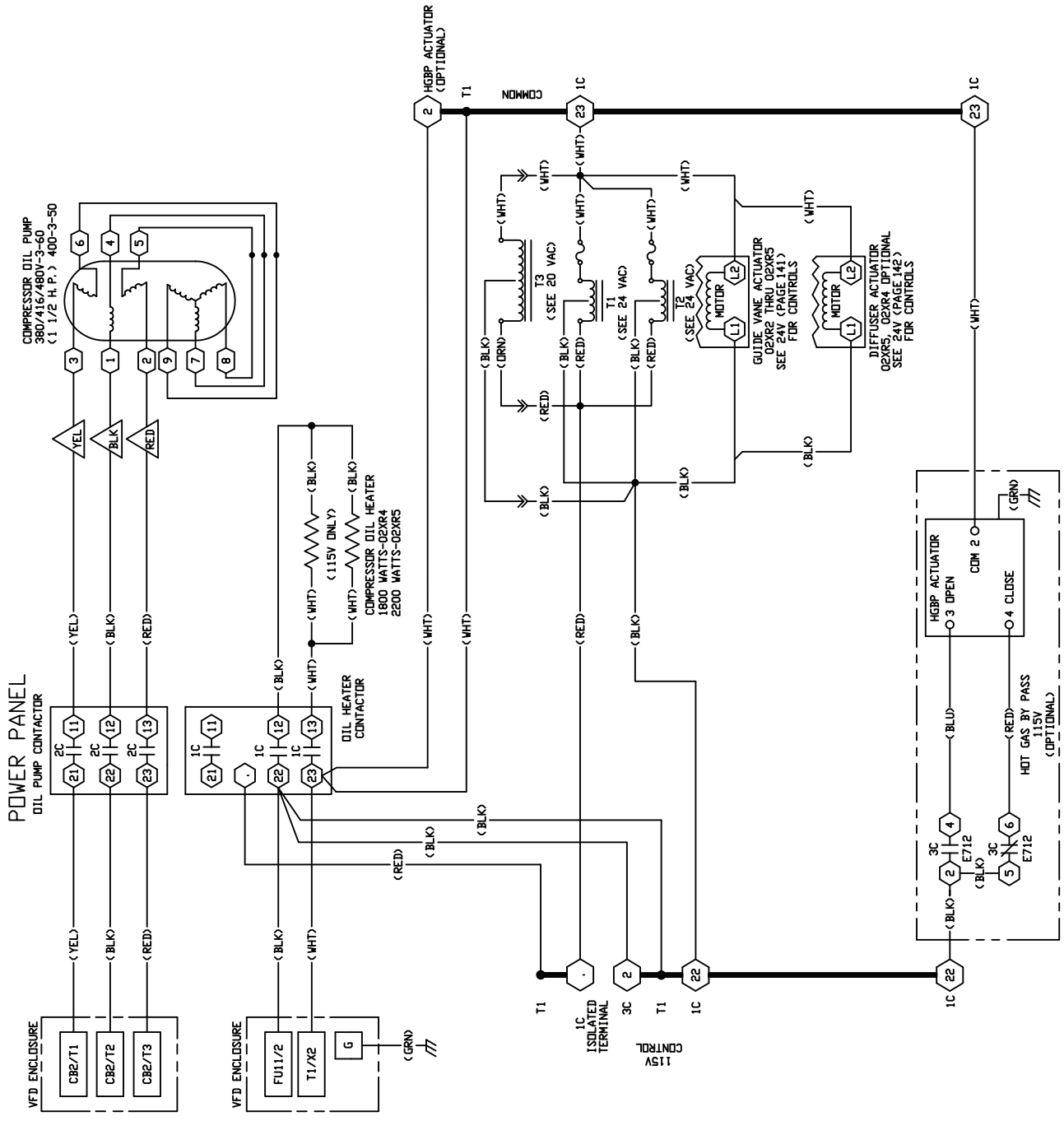


Fig. 65 — 19XRV 900A and 1200A Chiller Control Schematic

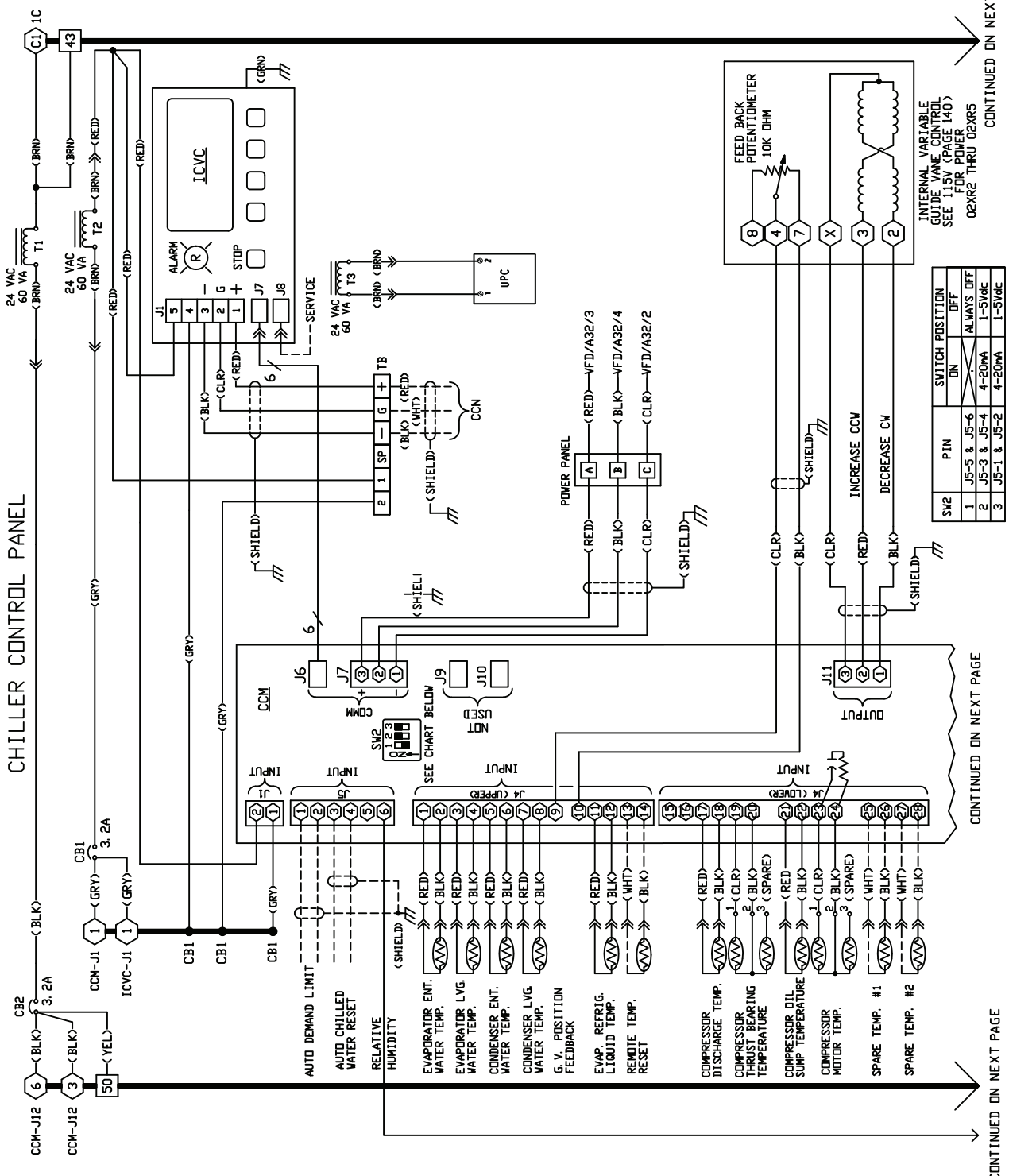


Fig. 65 — 19XRV 900A and 1200A Chiller Control Schematic (cont)

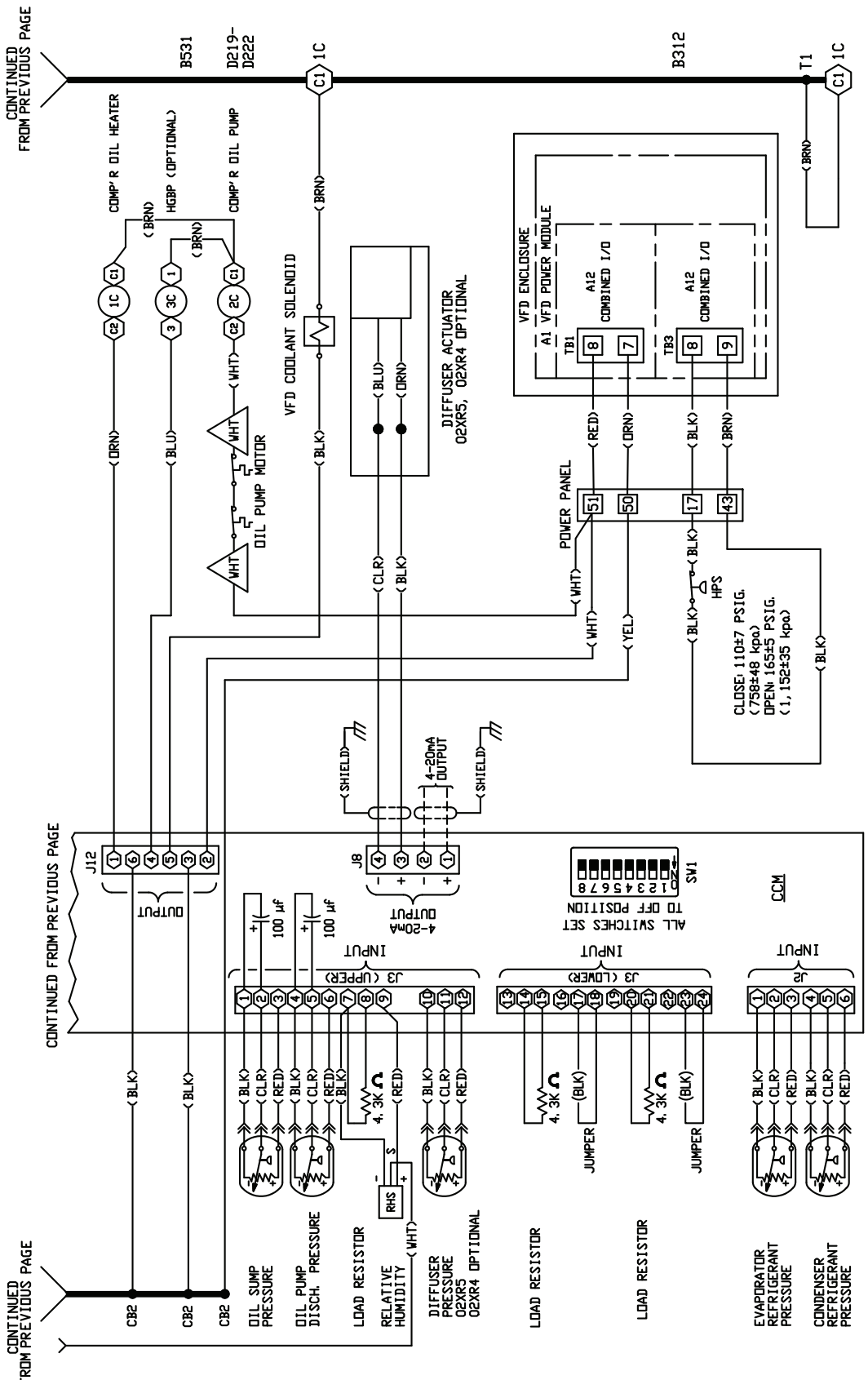


Fig. 65 — 19XRV 900A and 1200A Chiller Control Schematic (cont)

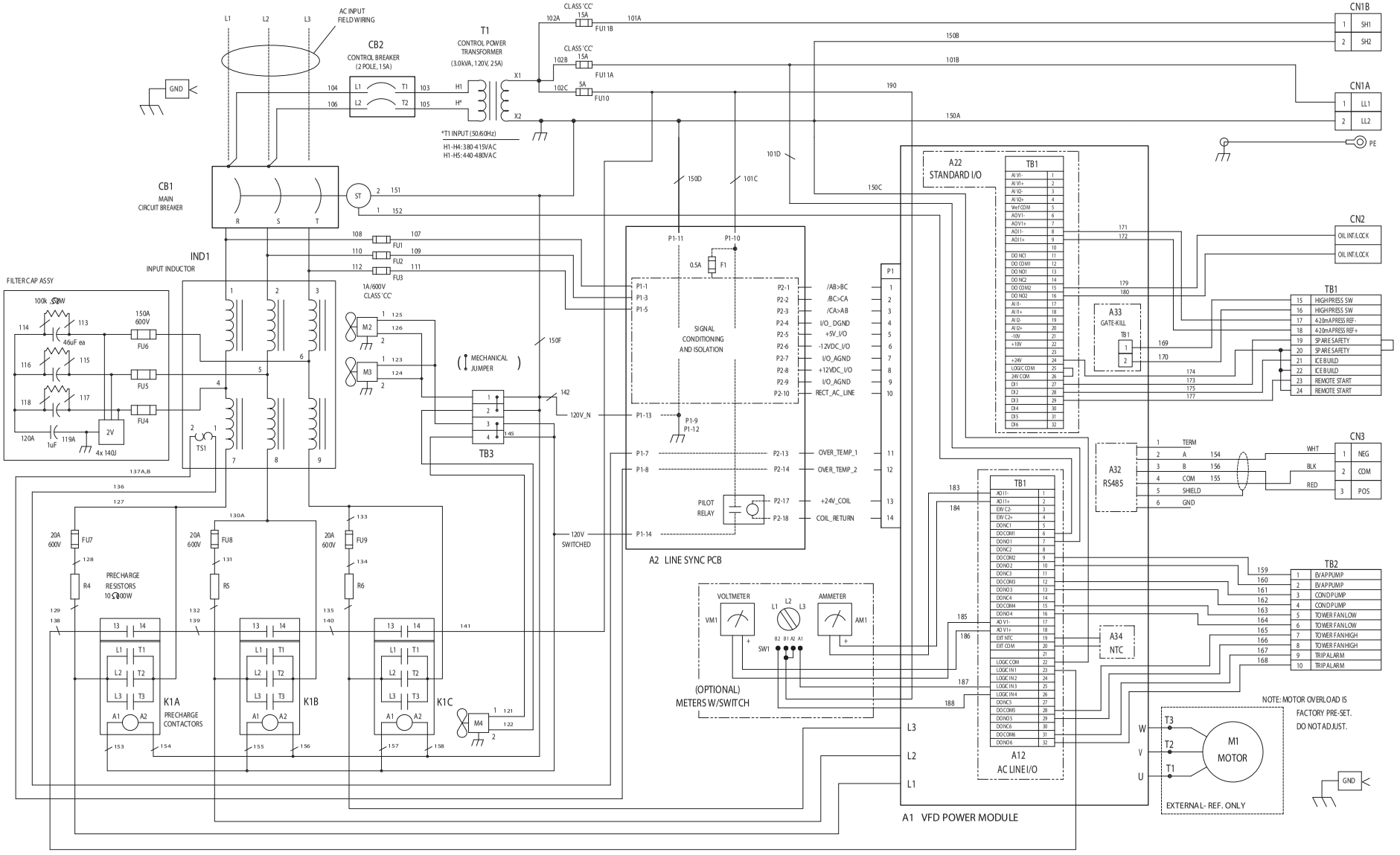


Fig. 66 — 19XRV 442A and 608A Chiller VFD Schematic

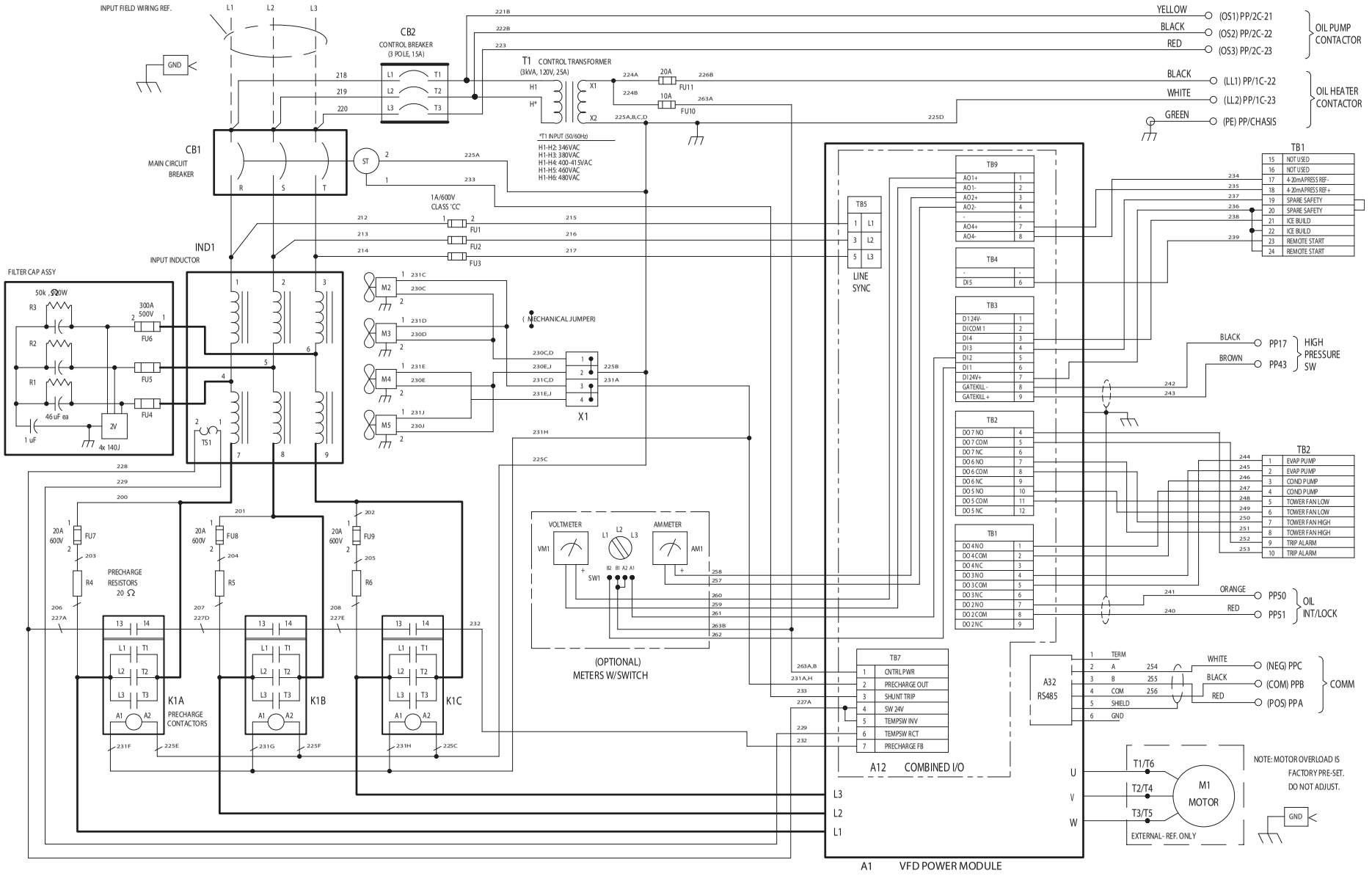


Fig. 67 — 19XRV 900A and 1200A Chiller VFD Schematic

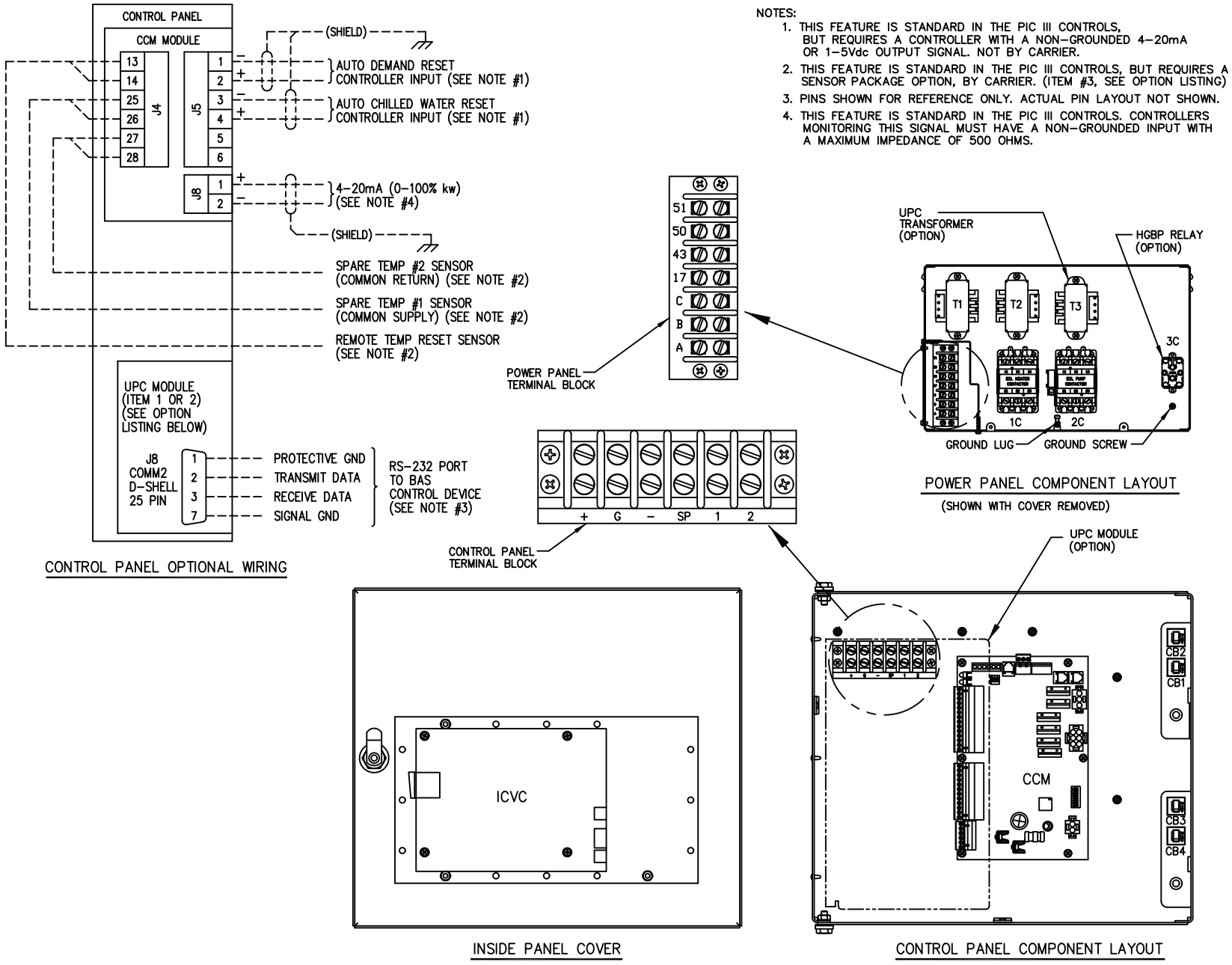
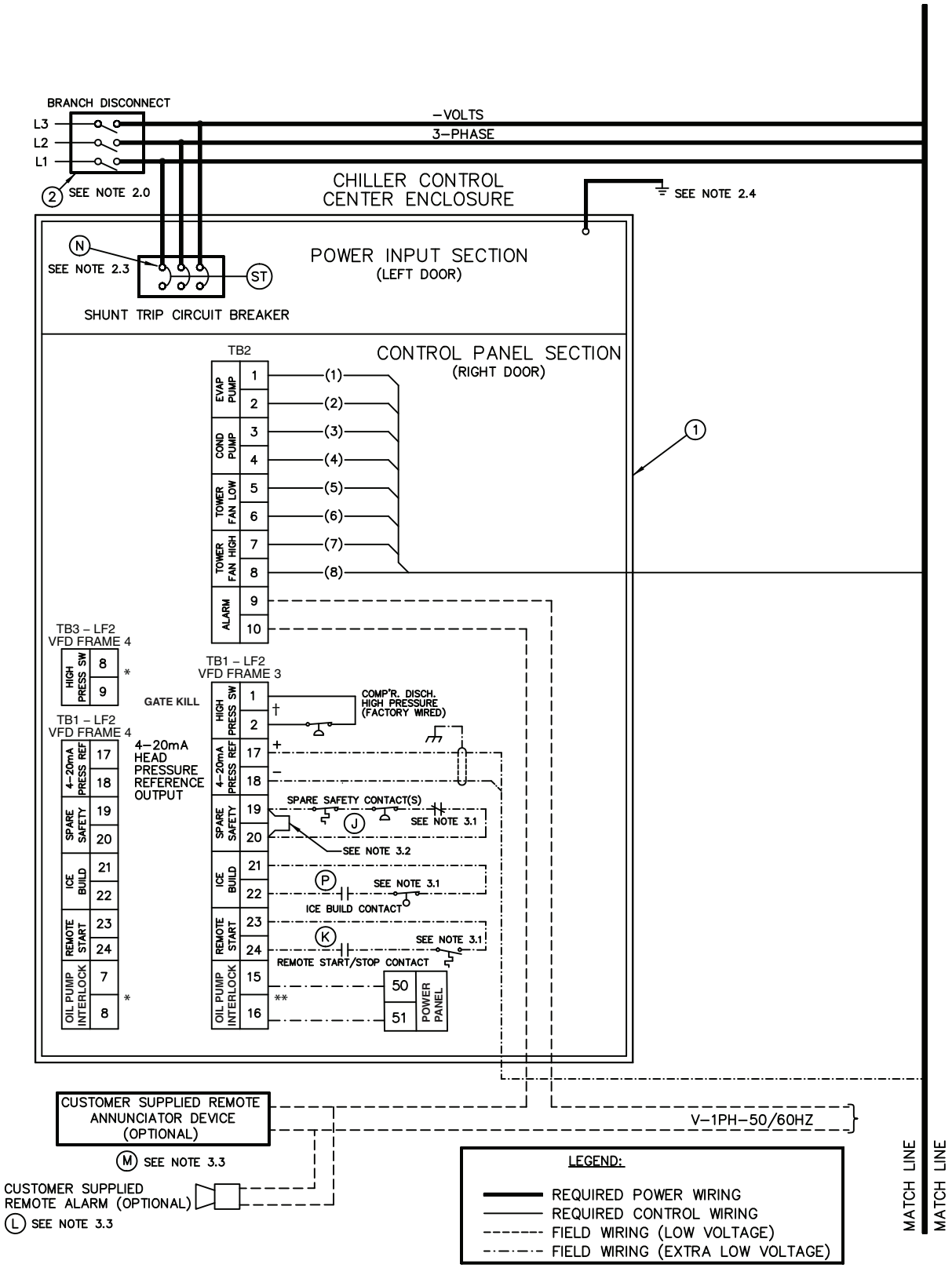


Fig. 68 — 19XRV Chiller Control Panel Component Layout



* Located on A12 card, other terminals on field terminal strip.
† Located on A33 card, other terminals on field terminal strip.
** Located on A22 card, other terminals on field terminal strip.

Fig. 69 — 19XRV Field Wiring — LiquiFlo™ 2 VFD

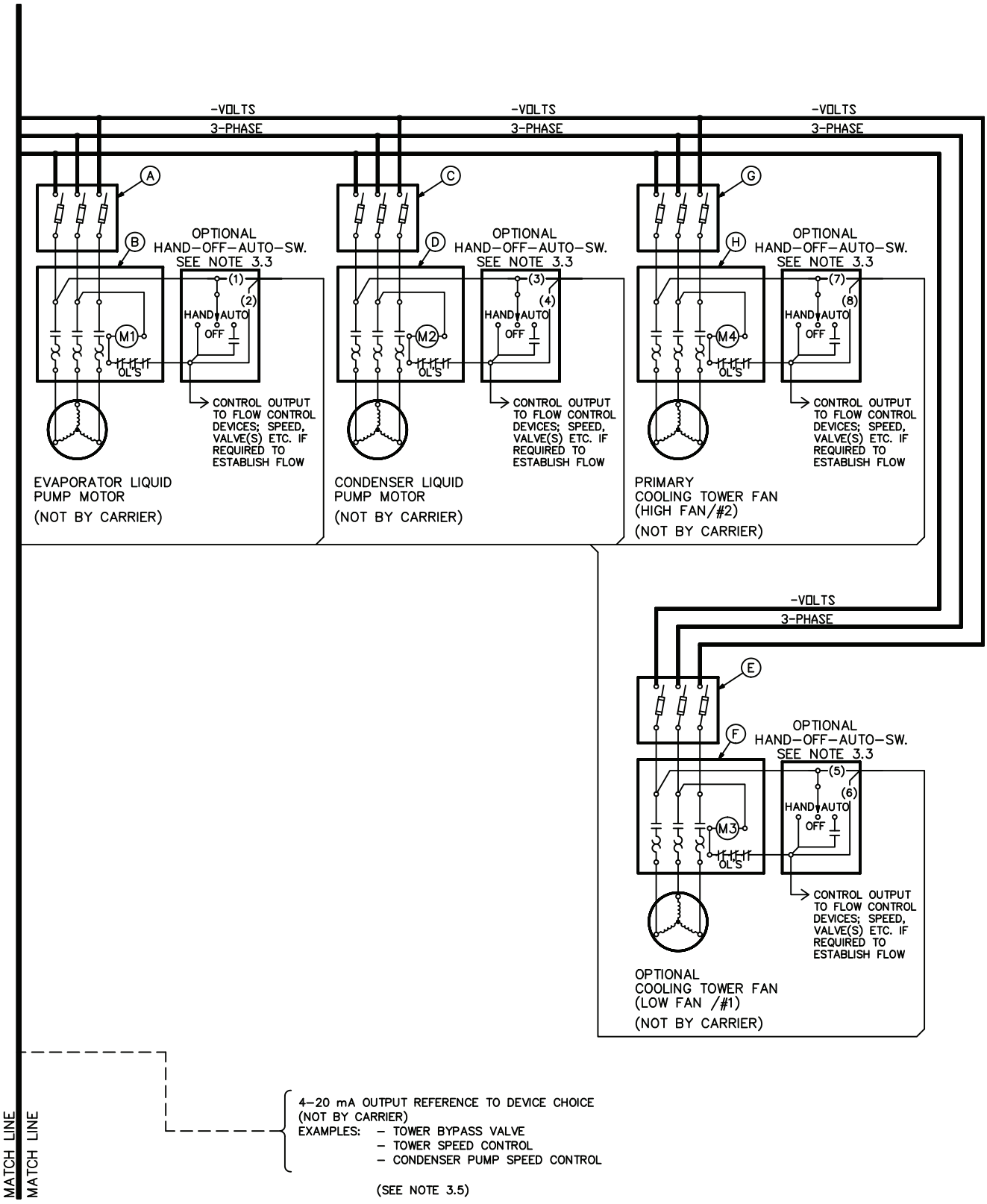


Fig. 69 — 19XRV Field Wiring — LiquiFlo™ 2 VFD (cont)

LEGEND FOR FIG. 69

REFERENCE NUMBER	DESCRIPTION
1	3 Phase Under/Over Voltage Protection (Line Side)
	Phase Loss/Imbalance/Reversal Protection (Line Side)
	Frequency Shift Protection (Line Side)
	Over Current Protection (Line and Load Side)
	Phase to Ground Fault Protection (Line and Load Side)
	3 Phase Amps (Chiller Display Line and Load Side)
	3 Phase Volts (Chiller Display Line Side)
	4-20mA kW Transducer Output (Line Side) From Chiller Control Module (CCM)
	kW Hours/Demand kW (Chiller Display Line Side)
	kW Metering (Chiller Display Line and Load Side)
	Control Power Transformer (3 KVA)
	Controls and Oil Heater Disconnect
	3 Phase Analog Volts/Amps Meter Package (Option)
2	System Feeder (Short Circuit, Ground Fault and Protection)
A	Evaporator Liquid Pump Starter Disconnect
B	Evaporator Liquid Pump Motor Starter
C	Condenser Liquid Pump Starter Disconnect
D	Condenser Liquid Pump Motor Starter
E	Cooling Tower Fan Starter Disconnect (Low Fan/#1)
F	Cooling Tower Fan Starter (Low Fan/#1)
G	Cooling Tower Fan Starter Disconnect (High Fan/#2)
H	Cooling Tower Fan Starter (High Fan/#2)
J	Spare Safety Devices [NC] See Note 3.1
K	Remote Start/Stop Device [NO] See Note 3.1
L	Remote Alarm See Note 3.3
M	Remote Annunciator See Note 3.3
N	Line Side Lug Adapters See Note 2.3
P	Ice Build Start/Terminate Device See Note 3.1

NOTES FOR FIG. 69

I. General

1.0 Variable Frequency Drive (VFD) shall be designed and manufactured in accordance with Carrier engineering requirement Z-420.
1.1 All field-supplied conductors and devices must be compliant, and be installed in compliance with all applicable codes and job specifications.
1.2 The routing of field-installed conduit and conductors and the location of field-installed devices must not interfere with equipment access or the reading, adjusting or servicing of any component.
1.3 Equipment installation and all starting and control devices must comply with details in equipment submittal drawings and literature.
1.4 Contacts and switches are shown in the position they would assume with the circuit deenergized and the chiller shutdown.
1.5 Warning — Do not use aluminum conductors.
1.6 Warning — Remove panel above VFD main circuit breaker before drilling. Do not drill into any other VFD cabinet panels.

II. Power Wiring To VFD

2.0 Provide a means of disconnecting branch feeder power to VFD. Provide short circuit protection and interrupt capacity for branch feeder in compliance with all applicable codes.
2.1 Metal conduit must be used for the power wires, from VFD to branch feeder.
2.2 Line side power conductor rating must meet VFD nameplate voltage and chiller full load amps (minimum circuit ampacity).
2.3 Lug adapters may be required if installation conditions dictate that conductors be sized beyond the minimum ampacity required. Circuit breaker lugs will accommodate the quantity (#) and size cables (per phase) as follows.

VFD MAX INPUT AMPS	STANDARD 65KAIC LUG CAPACITY (PER PHASE)		OPTIONAL 100KAIC LUG CAPACITY (PER PHASE)	
	NO. OF CONDUCTORS	CONDUCTOR RANGE	NO. OF CONDUCTORS	CONDUCTOR RANGE
442A	3	2/0 — 400MCM	3	2/0 — 400MCM
608A	3	2/0 — 400MCM	3	2/0 — 400MCM
900A	4	1/0 — 750MCM	4	1/0 — 750MCM
1200A	4	1/0 — 750MCM	4	1/0 — 750MCM

If larger lugs are required, they can be purchased from the manufacturer of the circuit breaker.
2.4 Compressor motor and controls must be grounded by using equipment grounding lug provided inside unit-mounted VFD enclosure.

III. Control Wiring

3.0 Field-supplied control conductors to be at least 18 AWG (American Wire Gage) or larger.
3.1 Ice build start/terminate device contacts, remote start/stop device contacts and spare safety device contacts (devices not supplied by Carrier) must have 24 vac rating. Max current is 60 mA, nominal current is 10 mA. Switches with gold-plated bifurcated contacts are recommended.
3.2 Remove jumper wire between TB1-19 and TB1-20 before connecting auxiliary safeties between these terminals.
3.3 Each integrated contact output can control loads (VA) for evaporator pump, condenser pump, tower fan low, tower fan high and alarm annunciator devices rated 5 amps at 115 vac and up to 3 amps at 250 vac.

⚠ WARNING

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

Do not use control transformers in the VFD enclosure or power panel as the power source for external or field-supplied contactor coils, actuator motors or any other loads.
3.4 Do not route control wiring carrying 30 v or less within a conduit which has wires carrying 50 v or higher or along side wires carrying 50 v or higher.
3.5 Spare 4 to 20 mA output signal is designed for controllers with a non-grounded 4 to 20 mA input signal and a maximum input impedance of 500 ohms.

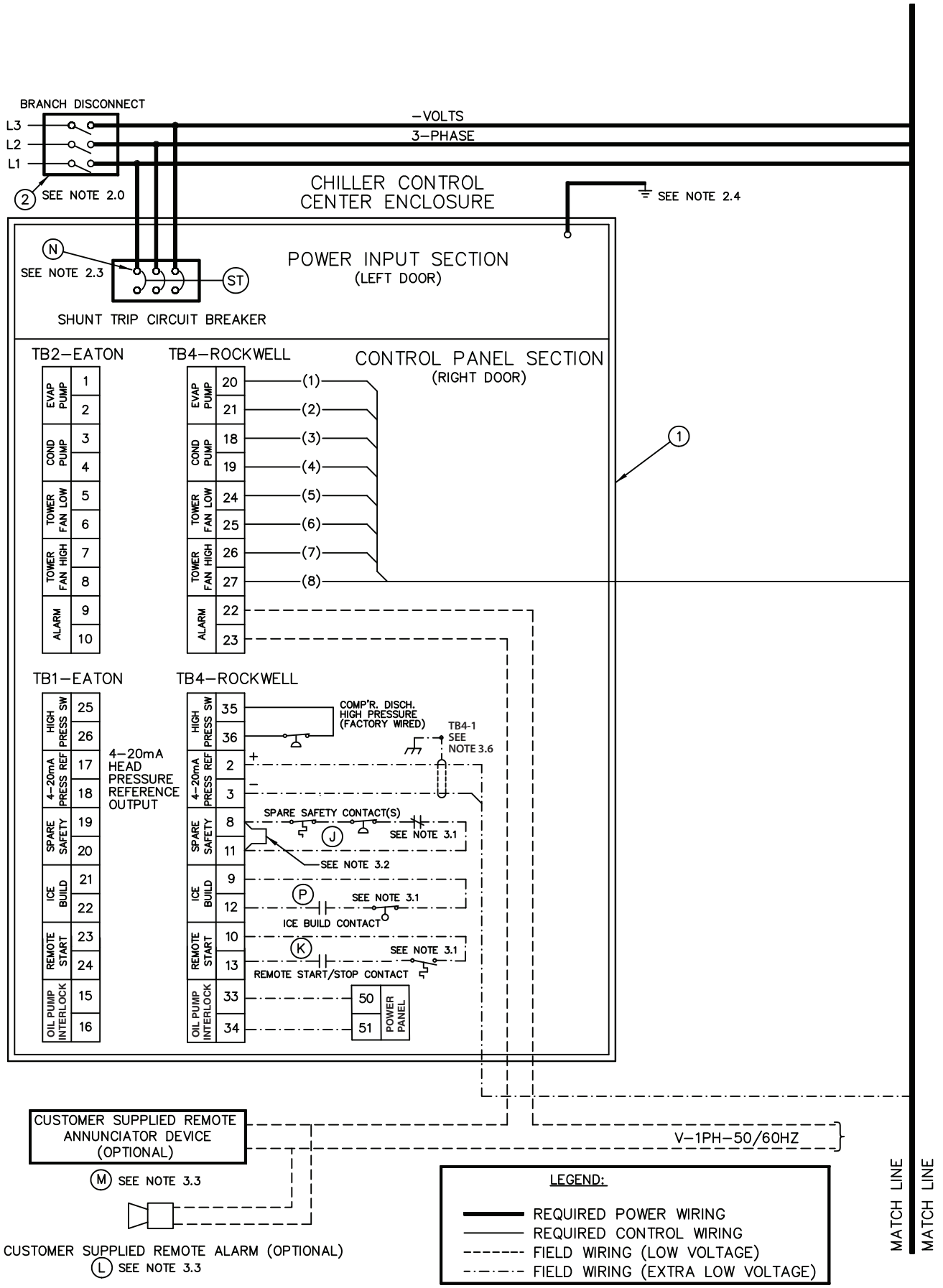


Fig. 70 — 19XRV Field Wiring — Standard Tier VFD

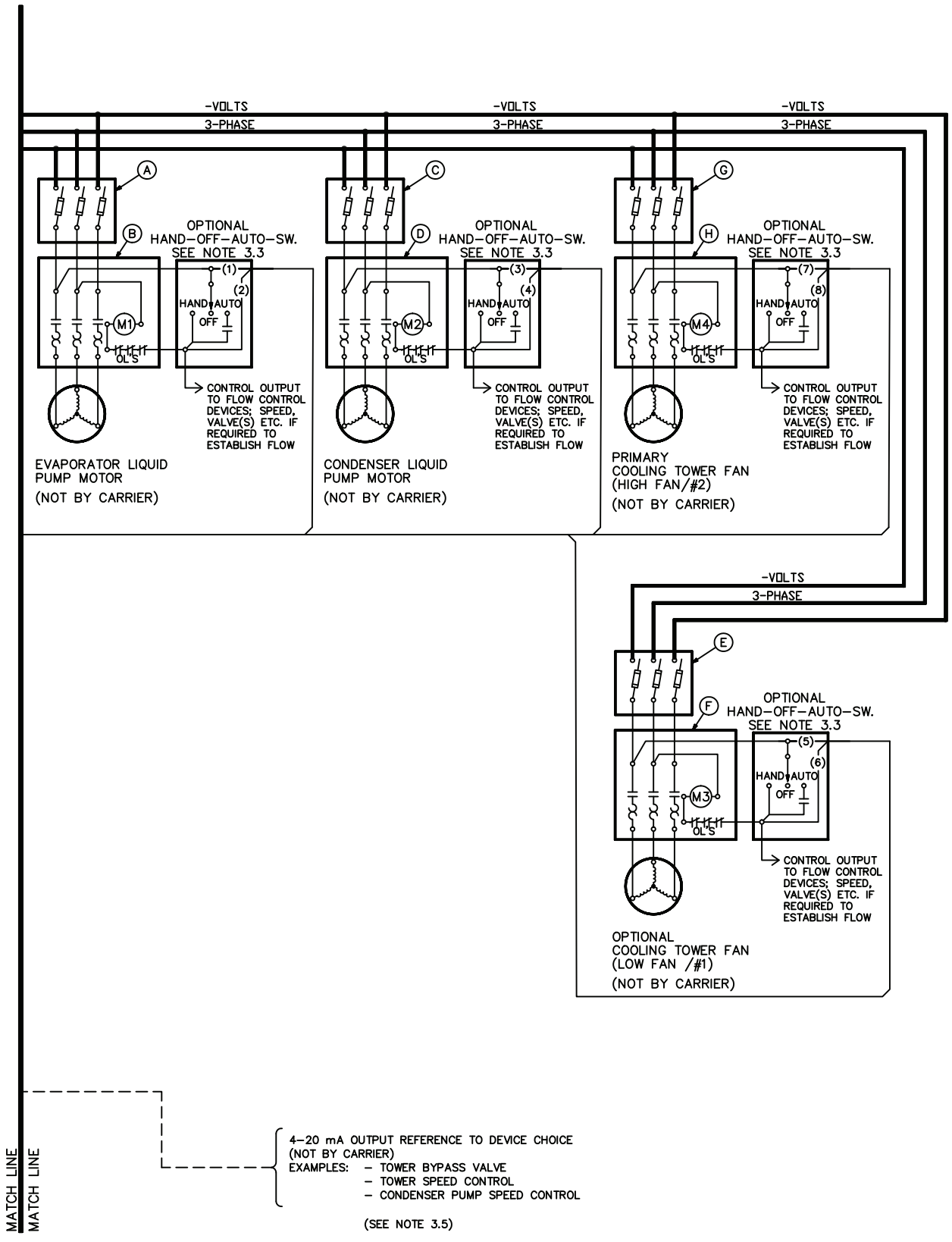


Fig. 70 — 19XRV Field Wiring — Standard Tier VFD (cont)

LEGEND FOR FIG. 70

REFERENCE NUMBER	EXPLANATION
1	3 Phase Under/Over Voltage (Line Side)
	Phase Loss/Imbalance/Reversal (Line Side)
	Frequency Shift Protection (Line Side)
	Over Current Protection (Line and Load Side)
	Phase to Ground Fault Protection (Line and Load Side)
	3 Phase Amps (Chiller Display Line and Load Side)
	3 Phase Volts (Chiller Display Line Side)
	4-20mA kW Transducer Output (Line Side) from Chiller Control Module (CCM)
	kW Hours/Demand kW (Chiller Display Line Side)
	kW Metering (Chiller Display Line and Load Side)
	Control Power Transformer (3KVA)
	Controls and Oil Heater Disconnect
	3 Phase Analog Volts/Amps Meter Package (Option)
2	System Feeder (Short Circuit, Ground Fault and Protection)
A	Evaporator Liquid Pump Starter Disconnect
B	Evaporator Liquid Pump Motor Starter
C	Condenser Liquid Pump Starter Disconnect
D	Condenser Liquid Pump Motor Starter
E	Cooling Tower Fan Starter Disconnect (Low Fan/#1)
F	Cooling Tower Fan Starter (Low Fan/#1)
G	Cooling Tower Fan Starter Disconnect (High Fan/#2)
H	Cooling Tower Fan Starter (High Fan/#2)
J	Spare Safety Devices [NC] See Note 3.1
K	Remote Start/Stop Device [NO] See Note 3.1
L	Remote Alarm See Note 3.3
M	Remote Annunciator See Note 3.3
N	Line Side Lug Adapters See Note 2.3
P	Ice Build Start/Terminate Device See Note 3.1

NOTES FOR FIG. 70

I. General

1.0 Variable Frequency Drive (VFD) shall be designed and manufactured in accordance with Carrier engineering requirement Z-420.
1.1 All field-supplied conductors and devices must be compliant, and be installed in compliance with all applicable codes and job specifications.
1.2 The routing of field-installed conduit and conductors and the location of field-installed devices must not interfere with equipment access or the reading, adjusting or servicing of any component.
1.3 Equipment installation and all starting and control devices must comply with details in equipment submittal drawings and literature.
1.4 Contacts and switches are shown in the position they would assume with the circuit deenergized and the chiller shutdown.
1.5 Warning — Do not use aluminum conductors.
1.6 Warning — Remove panel above VFD main circuit breaker before drilling. Do not drill into any other VFD cabinet panels.
1.7 All field-installed wiring is field-supplied.

II. Power Wiring To VFD

2.0 Provide a means of disconnecting branch feeder power to VFD. Provide short circuit protection and interrupt capacity for branch feeder in compliance with all applicable codes.
2.1 Metal conduit must be used for the power wires, from VFD to branch feeder.
2.2 Line side power conductor rating must meet VFD nameplate voltage and chiller full load amps (minimum circuit ampacity).
2.3 Lug adapters may be required if installation conditions dictate that conductors be sized beyond the minimum ampacity required. Circuit breaker lugs will accommodate the quantity (#) and size cables (per phase) as follows.

VFD MAX INPUT AMPS	STANDARD 65K AIC LUG CAPACITY (PER PHASE)		OPTIONAL 100K AIC LUG CAPACITY (PER PHASE)	
	NO. OF CONDUCTORS	CONDUCTOR RANGE	NO. OF CONDUCTORS	CONDUCTOR RANGE
445A	3	2/0 — 400MCM	3	2/0 — 400MCM
960A	4	4/0 — 500MCM	4	4/0 — 500MCM
1275A	4	500 — 1000MCM	4	500 — 1000MCM
1530A	6	2 — 600MCM	6	2 — 600MCM

If larger lugs are required, they can be purchased from the manufacturer of the circuit breaker. For larger lugs, refer to PPS HH83RZ015 and PPS HH87LZ500.

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

III. Control Wiring

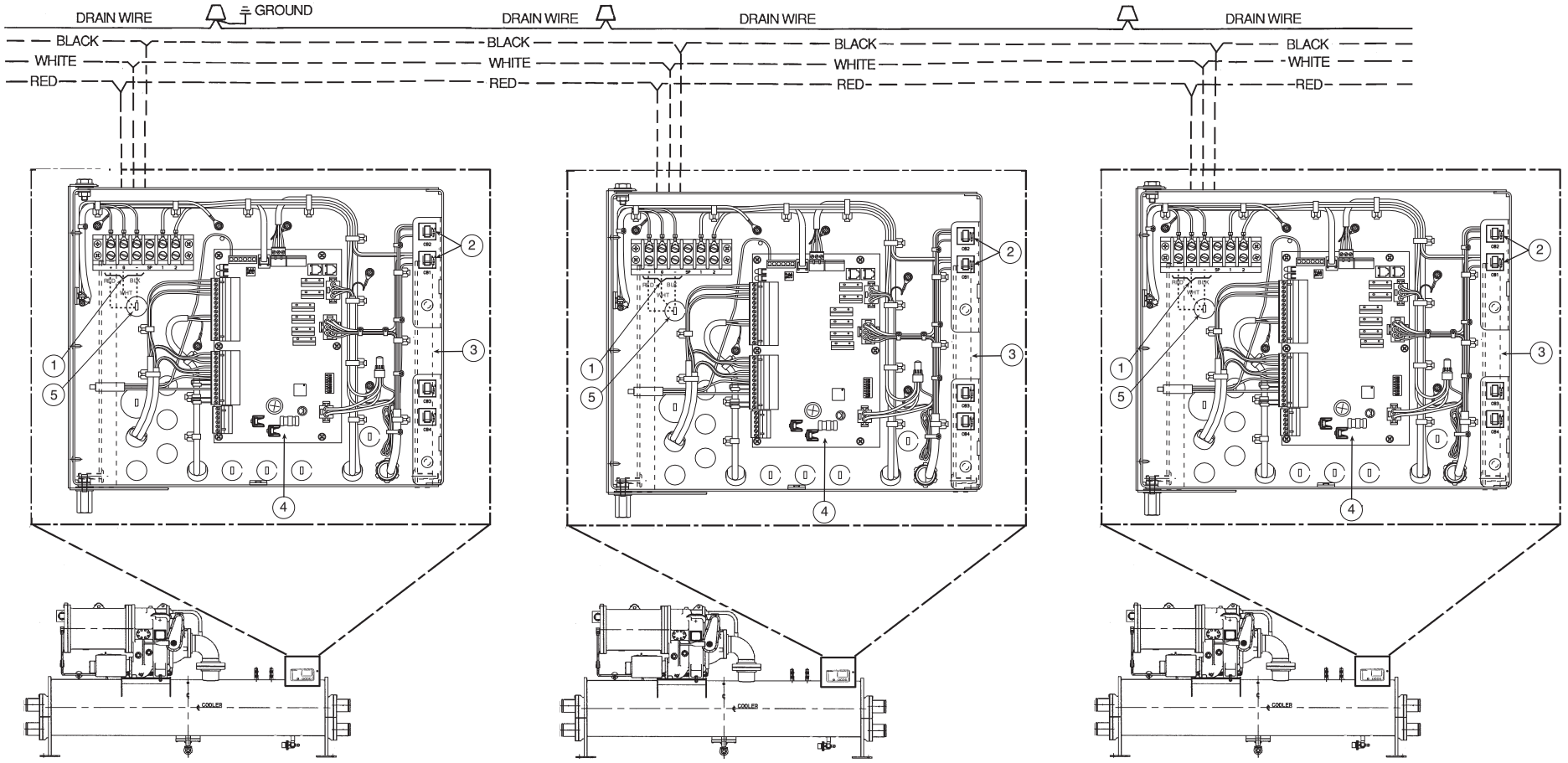
3.0 Field-supplied control conductors to be at least 18 AWG (American Wire Gage) or larger.
3.1 Ice build start/terminate device contacts, remote start/stop device contacts and spare safety device contacts (devices not supplied by Carrier) must have 24 vac rating. Max current is 60 mA, nominal current is 10 mA. Switches with gold-plated bifurcated contacts are recommended.
3.2 Remove jumper wire between TB1-19 and TB1-20 before connecting auxiliary safeties between these terminals.
3.3 Each integrated contact output can control loads (VA) for evaporator pump, condenser pump, tower fan low, tower fan high and alarm annunciator devices rated 5 amps at 115 vac and up to 3 amps at 250 vac.

⚠ CAUTION

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

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

3.4 Do not route control wiring carrying 30 v or less within a conduit which has wires carrying 50 v or higher or along side wires carrying 50 v or higher.
3.5 Spare 4-20 mA output signal is designed for controllers with a non-grounded 4-20 mA input signal and a maximum input impedance of 500 ohms.



19XRV CHILLERS

LEGEND

1 — Carrier Comfort Network® (CCN) Interface
2 — Circuit Breakers
3 — Control Panel Internal View
4 — Chiller Control Module (CCM)
5 — CCN Conduit Knockout
——— Factory Wiring
– – – – Field Wiring

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

Fig. 71 — CCN Communication Wiring for Multiple Chillers (Typical)

APPENDIX A — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
20mA Demand Limit Opt	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	x
Active Delta P	STATUS		HEAT_EX	
Active Delta T	STATUS		HEAT_EX	
Active Delta Tsat	STATUS		COMPRESS	
Active Delta Tsat	SERVICE	CONTROL ALGORITHM STATUS	SURGEPREV	
Active Demand Limit	STATUS		MAINSTAT	X
Active Region	SERVICE	CONTROL ALGORITHM STATUS	SURGEPREV	
Actual Guide Vane Pos	STATUS		STARTUP	
Actual Guide Vane Pos	STATUS		COMPRESS	
Actual Guide Vane Pos	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Actual Guide Vane Pos	SERVICE	CONTROL ALGORITHM STATUS	SURGEPREV	
Actual Superheat	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Actual VFD Speed	STATUS		COMPRESS	
Actual VFD Speed	STATUS		POWER	
Actual VFD Speed	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Actual VFD Speed	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Address	SERVICE		ICVC_CONFIGURATION	X
Alarm Relay	STATUS		MAINSTAT	
Alarm Routing	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
Amps or KW Ramp %/Min	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
Amps/KW Ramp	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Auto Chilled Water Reset	STATUS		MAINSTAT	
Auto Demand Limit Input	STATUS		MAINSTAT	
Auto Restart Option	SERVICE	EQUIPMENT SERVICE	SETUP3	X
Average Line Current	STATUS		POWER	
Average Line Voltage	STATUS		POWER	
Average Load Current	STATUS		POWER	
Base Demand Limit	SETPOINT		SETPOINT	X
Baud Rate	SERVICE		ICVC_CONFIGURATION	X
Broadcast Option	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
Bus Number	SERVICE		ICVC_CONFIGURATION	X
Calc Evap Sat Temp	STATUS		HEAT_EX	
Calc Evap Sat Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
CCN Mode?	STATUS		ICVC_PWD	
Chill Water Pulldown/Min	STATUS		HEAT_EX	
Chilled Medium	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Chilled Water Deadband	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Chilled Water Delta P	STATUS		HEAT_EX	X
Chilled Water Delta T	STATUS		HEAT_EX	
Chilled Water Flow	STATUS		STARTUP	
Chilled Water Pump	STATUS		STARTUP	X
Chilled Water Temp	STATUS		MAINSTAT	
Chilled Water Temp	SERVICE	CONTROL ALGORITHM STATUS	WSMDEFME	
Chiller Fault State	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Chiller Start/Stop	STATUS		MAINSTAT	X
CHW Delta T→Full Reset	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
CHW Delta T→No Reset	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
CHW Setpt Reset Value	SERVICE	CONTROL ALGORITHM STATUS	WSMDEFME	
Commanded State	SERVICE	CONTROL ALGORITHM STATUS	WSMDEFME	
Common Sensor Option	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
Comp Discharge Alert	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Discharge Alert	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Comp Discharge Temp	STATUS		COMPRESS	
Comp Discharge Temp	STATUS	CONTROL ALGORITHM STATUS	OVERRIDE	

APPENDIX A — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Comp Motor Frequency	STATUS		STARTUP	
Comp Motor Frequency	STATUS		COMPRESS	
Comp Motor Frequency	STATUS		POWER	
Comp Motor Frequency	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Comp Motor Frequency	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Comp Motor RPM	STATUS		STARTUP	
Comp Motor RPM	STATUS		COMPRESS	
Comp Motor RPM	STATUS		POWER	
Comp Motor RPM	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Comp Motor RPM	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Comp Motor Temp Override	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Motor Temp Override	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Comp Motor Winding Temp	STATUS		COMPRESS	
Comp Motor Winding Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Thrust Brg Alert	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Thrust Brg Alert	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Comp Thrust Brg Reset	STATUS		COMPRESS	
Comp Thrust Brg Reset	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Thrust Brg Temp	STATUS		COMPRESS	
Comp Thrust Brg Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Thrust Brg Trip	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Thrust Brg Trip	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Comp Thrust Lvg Oil Temp	STATUS		COMPRESS	
Comp Thrust Lvg Oil Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Compressor Ontime	STATUS		MAINSTAT	
Cond Approach Alert	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Cond Flow Delta P Cutout	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Cond Hi Flow Alarm Option	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Cond Hi Flow Delta P Limit	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Cond Press Override	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Cond Press Override	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Condenser Approach	STATUS		HEAT_EX	
Condenser Freeze Point	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Condenser High Pressure	STATUS		VFD_STAT	
Condenser Pressure	STATUS		HEAT_EX	
Condenser Pressure	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Condenser Refrig Temp	STATUS		HEAT_EX	
Condenser Refrig Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Condenser Water Delta P	STATUS		HEAT_EX	X
Condenser Water Flow	STATUS		STARTUP	
Condenser Water Pump	STATUS		STARTUP	X
Control Mode	STATUS		MAINSTAT	
Control Point	SETPOINT		SETPOINT	X
Control Point	STATUS		MAINSTAT	x
Control Point	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Control Point Error	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Current CHW Setpoint	SERVICE	CONTROL ALGORITHM STATUS	WSMDEFME	
Current Mode	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
DC Bus Voltage	STATUS		POWER	
DC Bus Voltage	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
DC Bus Voltage Reference	STATUS		POWER	
DC Bus Voltage Reference	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Degrees Reset	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
Degrees Reset At 20 mA	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X

APPENDIX A — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Delta P at 0% (4 mA)	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Delta P at 100% (20 mA)	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Demand Kilowatts	STATUS		POWER	
Demand Limit and kW Ramp	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
Demand Limit At 20 mA	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
Demand Limit Decrease	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
Demand Limit Inhibit	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Demand Limit Prop Band	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
Demand Limit Source	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
Demand Watts Interval	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
Description	SERVICE		ICVC CONFIGURATION	
Device Name	SERVICE		ICVC CONFIGURATION	
Diffuser 25% Load Point	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Diffuser 50% Load Point	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Diffuser 75% Load Point	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Diffuser Actuator	STATUS		COMPRESS	
Diffuser Full Span mA	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Diffuser Option	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Disable Service Password	SERVICE		ICVC_PWD	
ECW Control Option	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
ECW Delta T	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
ECW Reset	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
ECW Setpoint	SETPOINT		SETPOINT	X
Emergency Stop	STATUS		MAINSTAT	X
Enable Reset Type	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
Entering Chilled Water	STATUS		HEAT_EX	
Entering Chilled Water	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Entering Condenser Water	STATUS		HEAT_EX	
Equipment Status	SERVICE	CONTROL ALGORITHM STATUS	WSMDEFME	
Evap Approach Alert	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Evap Flow Delta P Cutout	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Evap Refrig Liquid Temp	STATUS		HEAT_EX	
Evap Refrig Trippoint	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Evap Sat Overide Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Evaporator Approach	STATUS		HEAT_EX	
Evaporator Pressure	STATUS		HEAT_EX	X
Flow Delta P Display	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Flux Current	STATUS		POWER	
Flux Current	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Frequency Fault	STATUS		VFD_STAT	
Gas Torque Factor	SERVICE	EQUIPMENT SERVICE	SETUP3	X
Ground Fault	STATUS		VFD_STAT	
Ground Fault Current	STATUS		POWER	
Ground Fault Current	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Group Number	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
Guide Vane 25% Load Pt	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Guide Vane 50% Load Pt	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Guide Vane 75% Load Pt	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Guide Vane Delta	STATUS		COMPRESS	
Guide Vane Delta	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Guide Vane Delta	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Guide Vane Travel Limit	SERVICE	EQUIPMENT SERVICE	SETUP2	X
GV Position at Shutdown	STATUS		STARTUP	
GV Target at Startup	STATUS		STARTUP	

APPENDIX A — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Head Pressure Reference	STATUS		HEAT_EX	
HGBP Off Delta T	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
HGBP Off Delta T	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
HGBP On Delta T	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
HGBP On Delta T	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
HGBP/VFD Active	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
High DC Bus Voltage	STATUS		VFD_STAT	
High Line Voltage	STATUS		VFD_STAT	
Hot Gas Bypass Relay	STATUS		HEAT_EX	
Hot Gas Bypass Relay	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Humidity Sensor Input	STATUS		POWER	
Ice Build Contact	STATUS		MAINSTAT	
Ice Build Option	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Ice Build Recycle	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Ice Build Setpoint	SETPOINT		SETPOINT	X
Ice Build Termination	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Inverter Overcurrent	STATUS		VFD_STAT	
Inverter Overload	STATUS		POWER	
Inverter Overtemp	STATUS		VFD_STAT	
Inverter Power Fault	STATUS		VFD_STAT	
Inverter Temp Override	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Inverter Temp Override	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Inverter Temperature	STATUS		POWER	
Inverter Temperature	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Inverter Temperature	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
LAG % Capacity	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
LAG Address	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
LAG CHILLER: Mode	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
LAG Start Time	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
LAG START Timer	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
LAG Stop Time	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
LAG STOP Timer	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
LCW Reset	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
LCW Setpoint	SETPOINT		SETPOINT	X
LEAD CHILLER in Control	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Lead Lag Control	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
LEAD/LAG: Configuration	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
LEAD/LAG: Configuration	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
Leaving Chilled Water	STATUS		HEAT_EX	
Leaving Chilled Water	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Leaving Condenser Water	STATUS		HEAT_EX	
LID Language	SERVICE		ICVC CONFIGURATION	X
Line Active Current	STATUS		POWER	
Line Active Current	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Active Voltage	STATUS		POWER	
Line Active Voltage	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Current Imbalance	STATUS		POWER	
Line Current Imbalance	STATUS		VFD_STAT	
Line Current Imbalance	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Current Ph1 (R)	STATUS		POWER	
Line Current Ph1 (R)	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Current Ph2 (S)	STATUS		POWER	
Line Current Ph2 (S)	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Current Ph3 (T)	STATUS		POWER	
Line Current Ph3 (T)	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	

APPENDIX A — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Line Frequency	STATUS		POWER	
Line Frequency	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Kilowatts	STATUS		POWER	
Line Phase Reversal	STATUS		VFD_STAT	
Line Power Factor	STATUS		POWER	
Line Power Factor	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Reactive Current	STATUS		POWER	
Line Reactive Current	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Reactive Voltage	STATUS		POWER	
Line Reactive Voltage	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Voltage Imbalance	STATUS		POWER	
Line Voltage Imbalance	STATUS		VFD_STAT	
Line Voltage Imbalance	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Voltage Ph1 (RS)	STATUS		POWER	
Line Voltage Ph1 (RS)	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Voltage Ph2 (ST)	STATUS		POWER	
Line Voltage Ph2 (ST)	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Line Voltage Ph3 (TR)	STATUS		POWER	
Line Voltage Ph3 (TR)	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Load Balance Option	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Load Balance Option	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
Load Current Ph1 (U)	STATUS		POWER	
Load Current Ph1 (U)	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Load Current Ph2 (V)	STATUS		POWER	
Load Current Ph2 (V)	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Load Current Ph3 (W)	STATUS		POWER	
Load Current Ph3 (W)	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Loadshed	SERVICE	CONTROL ALGORITHM STATUS	LOADSHED	
Loadshed Function	SERVICE	CONTROL ALGORITHM STATUS	LOADSHED	
Loadshed Timer	SERVICE	CONTROL ALGORITHM STATUS	LOADSHED	
Low DC Bus Voltage	STATUS		VFD_STAT	
Low Line Voltage	STATUS		VFD_STAT	
Max GV Position	SERVICE	EQUIPMENT SERVICE	SETUP3	X
Maximum Loadshed Time	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
Minimum Output	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Model Number	SERVICE		ICVC CONFIGURATION	
Motor Amps Not Sensed	STATUS		VFD_STAT	
Motor Current Imbalance	STATUS		POWER	
Motor Current Imbalance	STATUS		VFD_STAT	
Motor Current Imbalance	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Motor Kilowatt Hours	STATUS		POWER	
Motor Kilowatts	STATUS		POWER	
Motor Overload	STATUS		POWER	
Motor Overload	STATUS		VFD_STAT	
Motor Overload	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Motor Power Factor	STATUS		POWER	
Motor Power Factor	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Occupied?	STATUS		MAINSTAT	
Oil Heater Relay	STATUS		COMPRESS	
Oil Press Verify Time	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Oil Pump Delta P	STATUS		COMPRESS	X
Oil Pump Delta P	STATUS		STARTUP	X
Oil Pump Relay	STATUS		STARTUP	
Oil Sump Temp	STATUS		COMPRESS	
Oil Sump Temp	STATUS		STARTUP	

APPENDIX A — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Override Decrease Active	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Override Inhibit Active	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Password	SERVICE		ICVC CONFIGURATION	X
Percent Line Current	STATUS		MAINSTAT	
Percent Line Current	STATUS		POWER	
Percent Line Kilowatts	STATUS		MAINSTAT	
Percent Line Kilowatts	STATUS		POWER	
Percent Line Voltage	STATUS		POWER	
Percent Load Current	STATUS		POWER	
Percent Motor Kilowatts	STATUS		POWER	
PRESTART FAULT Time	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
PRESTART FAULT Timer	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
Proportional Dec Band	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Proportional ECW Gain	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Proportional Inc Band	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Pulldown: Delta T / Min	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Pulldown Ramp Type:	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
Pulldown Time	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Pulldown Timer	SERVICE	EQUIPMENT CONFIGURATION	LEADLAG	X
Ramp Loading Active	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Re-alarm Time	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
Recovery Start Request	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Rectifier Overcurrent	STATUS		VFD_STAT	
Rectifier Overload	STATUS		POWER	
Rectifier Overtemp	STATUS		VFD_STAT	
Rectifier Power Fault	STATUS		VFD_STAT	
Rectifier Temp Override	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Rectifier Temp Override	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Rectifier Temperature	STATUS		POWER	
Rectifier Temperature	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Rectifier Temperature	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Redline	SERVICE	CONTROL ALGORITHM STATUS	LOADSHED	
Reference Number	SERVICE		ICVC CONFIGURATION	
Refrig Override Delta T	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Relative Humidity	STATUS		POWER	
Remote Contacts Option	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Remote Reset Option	STATUS		ICVC_PWD	X
Remote Reset Sensor	STATUS		MAINSTAT	
Remote Start Contact	STATUS		MAINSTAT	X
Remote Temp→Full Reset	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
Remote Temp→No Reset	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
Reset Alarm?	STATUS		ICVC_PWD	
Restart Delta T	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Run Status	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Run Status	STATUS		MAINSTAT	
Satisfied?	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Schedule Number	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
Serial Number	SERVICE		ICVC CONFIGURATION	
Service Ontime	STATUS		MAINSTAT	X
Shunt Trip Relay	STATUS		STARTUP	
Shutdown Delta T	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Single Cycle Dropout	STATUS		VFD_STAT	
Soft Stop Amps Threshold	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Software Part Number	SERVICE		ICVC CONFIGURATION	

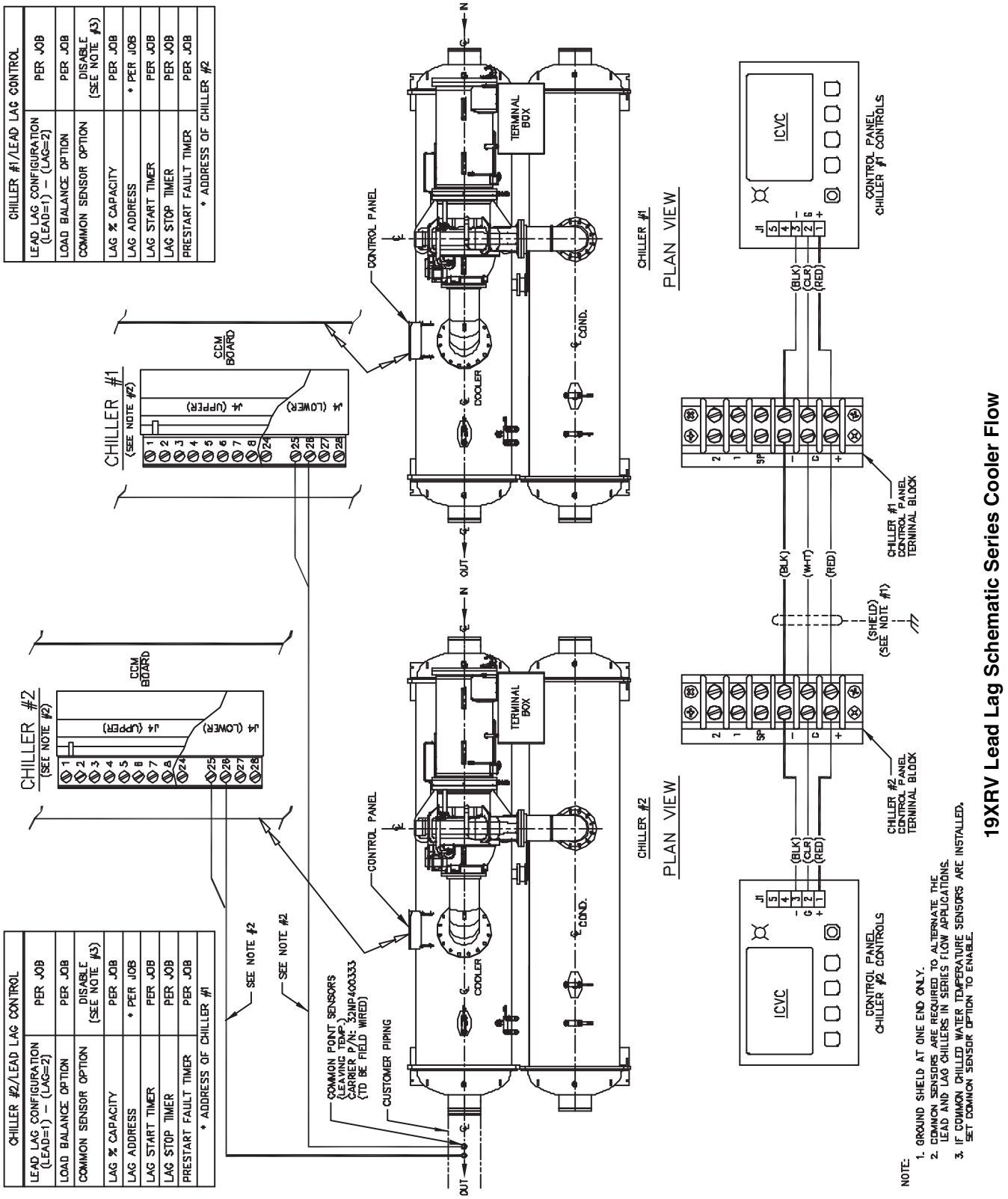
APPENDIX A — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Spare Alert/Alarm Enable	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Spare Safety Input	STATUS		STARTUP	
Spare Temp #1 Enable	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Spare Temp #1 Limit	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Spare Temp #2 Enable	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Spare Temp #2 Limit	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Spare Temperature 1	STATUS		COMPRESS	
Spare Temperature 1	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Spare Temperature 2	STATUS		COMPRESS	
Spare Temperature 2	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Speed Change In Effect	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
SRD Position at Shutdown	STATUS		STARTUP	
SRD Position at Startup	STATUS		STARTUP	
SRD Rotating Stall	STATUS		COMPRESS	
STANDBY % Capacity	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
STANDBY Address	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
STANDBY Chiller Option	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
STANDBY CHILLER: Mode	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Start Acceleration Fault	STATUS		VFD_STAT	
Start Complete	STATUS		STARTUP	
Start Inhibit Timer	STATUS		MAINSTAT	
Starts In 12 Hours	STATUS		MAINSTAT	
Start/Stop	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Stop Complete	STATUS		STARTUP	
Stop Complete	STATUS		VFD_STAT	
Stop Fault	STATUS		VFD_STAT	
Superheat Required	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Surge Counts	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Surge Delta % Amps	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge / HGBP Deadband	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge / HGBP Delta T	STATUS	EQUIPMENT SERVICE	HEAT_EX	
Surge / HGBP Delta Ts max	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge / HGBP Delta Ts min	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge / HGBP IGV max	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge / HGBP IGV min	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge Limit/HGBP Option	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Surge Limit/HGBP Option	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge Line Delta Tsat	STATUS		COMPRESS	
Surge Line Delta Tsat	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Surge Line High Offset	STATUS	EQUIPMENT SERVICE	OPTIONS	X
Surge Line Shape Factor	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge Line Speed Factor	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge Prevention Active	STATUS		HEAT_EX	
Surge Prevention Active	STATUS		VPF_STAT	
Surge Prevention Active?	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Surge Protection Counts	STATUS		COMPRESS	
Surge Protection Counts	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Surge Time Period	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
System Alert/Alarm	STATUS		MAINSTAT	
Target Guide Vane Pos	STATUS		COMPRESS	X
Target Guide Vane Pos	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Target Guide Vane Pos	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
Target VFD Speed	STATUS		STARTUP	
Target VFD Speed	STATUS		COMPRESS	X
Target VFD Speed	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Target VFD Speed	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	

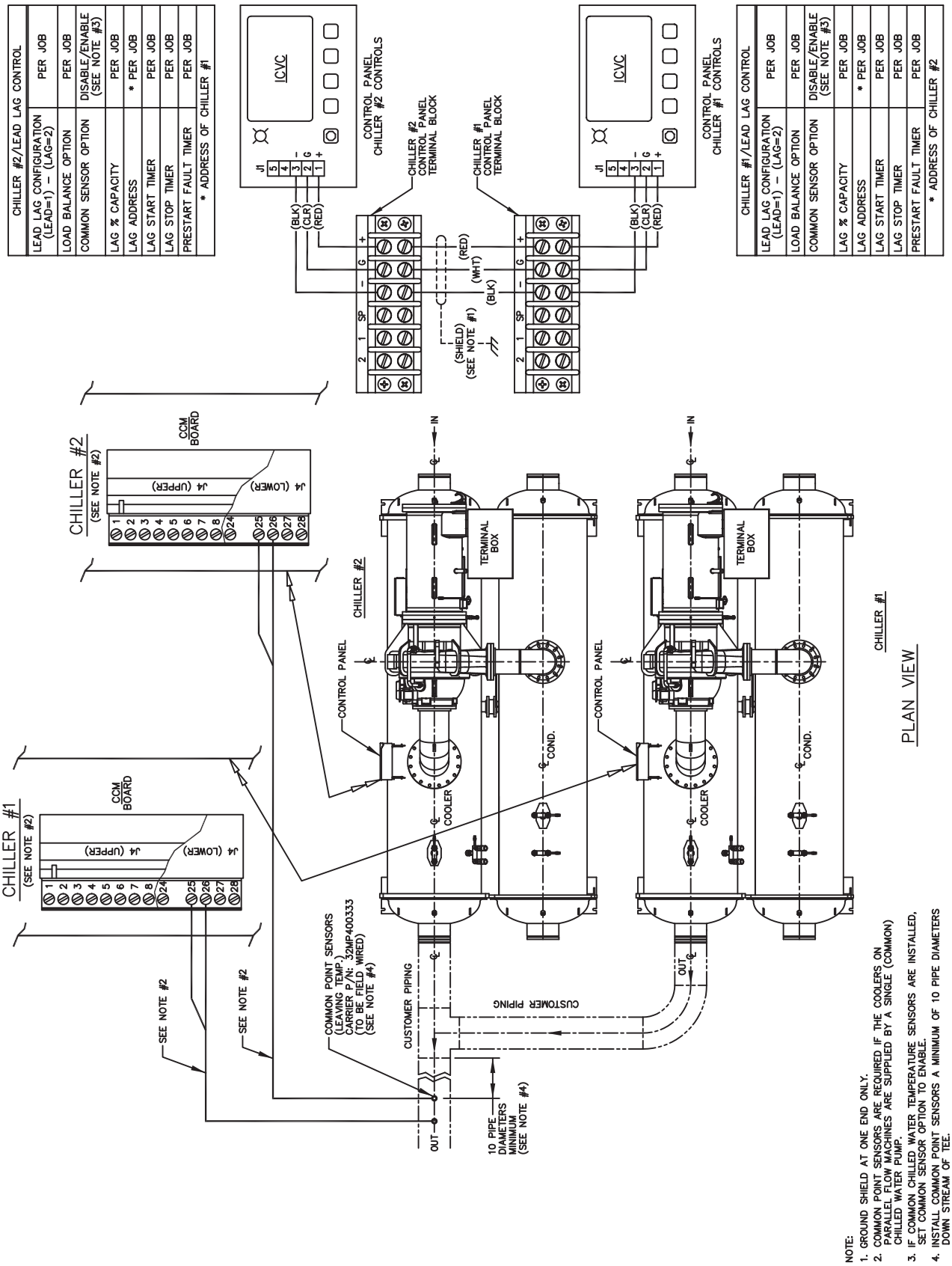
APPENDIX A — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Temp Pulldown Deg/Min.	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
Temperature Reset	STATUS		MAINSTAT	
Thrust Brg Reset Factor	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Total Error + Resets	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Torque Current	STATUS		POWER	
Torque Current	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Total Compressor Starts	STATUS		MAINSTAT	
Tower Fan High Setpoint	SETPOINT		SETPOINT	X
Tower Fan Relay High	STATUS		STARTUP	X
Tower Fan Relay Low	STATUS		STARTUP	X
US Imp / Metric	SERVICE		ICVC CONFIGURATION	X
VFD Alarm Reset	SERVICE	EQUIPMENT SERVICE	SETUP2	X
VFD Checksum Error	STATUS		VFD_STAT	
VFD Cold Plate Temp	STATUS		POWER	
VFD Cold Plate Temp	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
VFD Comm Fault	STATUS		VFD_STAT	
VFD Coolant Flow	STATUS		HEAT_EX	
VFD Coolant Flow	STATUS		POWER	
VFD Dewpoint	STATUS		POWER	
VFD Dewpoint	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
VFD Encl Temp Correction	SERVICE	EQUIPMENT SERVICE	SETUP2	X
VFD Enclosure Temp	STATUS		POWER	
VFD Enclosure Temp	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
VFD Fault	STATUS		VFD_STAT	
VFD Fault Code	STATUS		VFD_STAT	
VFD Fault Code	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
VFD Gain	SERVICE	EQUIPMENT SERVICE	SETUP2	X
VFD Gateway Version #	STATUS		VFD_STAT	
VFD Increase Step	SERVICE	EQUIPMENT SERVICE	SETUP2	X
VFD Inverter Version #	STATUS		VFD_STAT	
VFD Load Factor	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
VFD Maximum Speed	SERVICE	EQUIPMENT SERVICE	SETUP2	X
VFD Minimum Speed	SERVICE	EQUIPMENT SERVICE	SETUP2	X
VFD Overload Decrease	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
VFD Overload Delta	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
VFD Power On Reset	STATUS		VFD_STAT	
VFD Rampdown Active	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
VFD Rectifier Version #	STATUS		VFD_STAT	
VFD Speed at Shutdown	STATUS		STARTUP	
VFD Speed at Startup	STATUS		STARTUP	
VFD Speed Factor	SERVICE	CONTROL ALGORITHM STATUS	SURGPREV	
VFD Start	STATUS		STARTUP	
VFD Start Inhibit	STATUS		VFD_STAT	
VFD Start Speed	SERVICE	EQUIPMENT SERVICE	SETUP2	X
VFD Surge Line Gain	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Water Flow Verify Time	SERVICE	EQUIPMENT SERVICE	SETUP1	X
WSM Active?	SERVICE	CONTROL ALGORITHM STATUS	WSMDEFME	

APPENDIX B — LEAD/LAG WIRING



19XRV Lead Lag Schematic Series Cooler Flow



19XRV Lead Lag Schematic Parallel Cooler Flow

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

APPENDIX C — MAINTENANCE SUMMARY AND LOG SHEETS

19XRV Maintenance Interval Requirements

WEEKLY			
COMPRESSOR	Check Oil Level.	**CONTROLS**	Review ICVC 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. 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**	None.
EVERY 3-5 YEARS			
COMPRESSOR	None.	**CONTROLS**	None.
COOLER	Perform eddy current test.	**STARTER**	None.
CONDENSER	Inspect float valve and strainer. Perform eddy current test.	**OIL RECLAIM**	None.
EVERY 5 YEARS			
COMPRESSOR	Change oil charge (if required based on oil analysis or if oil analysis has not been performed). Inspect compressor shafts and bearings (every 5-10 years).	**CONTROLS**	None.
COOLER	None.	**STARTER**	None.
CONDENSER	None.	**OIL RECLAIM**	Inspect oil sump strainer. Inspect oil sump heater.
		ECONOMIZER	Inspect float valve and damper valve.
SEASONAL SHUTDOWN			
COMPRESSOR	None.	**CONTROLS**	Do not disconnect control power.
COOLER	Isolate and drain waterbox. Remove waterbox cover from one end. Use compressed air to clear tubes.	**STARTER**	None.
CONDENSER	Isolate and drain waterbox. Remove waterbox cover from one end. Use compressed air to clear tubes.	**OIL RECLAIM**	None.

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

APPENDIX C — MAINTENANCE SUMMARY AND LOG SHEETS (cont)

19XRV Weekly Maintenance Log

Plant ____________________________Machine Serial No. _________________________________

Machine Model No. ________________Refrigerant Type ___________________________________

DATE	OIL LEVEL	CHECK ALARMS / FAULTS	OPERATOR INITIALS	REMARKS

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)

19XRV 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												
	Inspect Inlet Bearing Oil Orifice	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												
ECONOMIZER	Leak Test	yes/no												
	Inspect Float Valve	yes/no												
	inspect Damper Valve	yes/no												
STARTER	General Tightening and Cleaning Connections	yes/no												
	Change VFD Refrigerant Strainer	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)

19XRV 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.

APPENDIX D — BACNET COMMUNICATION OPTION

The following section is used to configure the UPC Open controller which is used when the BACnet* communication option is selected. The UPC Open controller is mounted in a separate enclosure below the main control box.

TO ADDRESS THE UPC OPEN CONTROLLER — The user must give the UPC Open controller an address that is unique on the BACnet network. Perform the following procedure to assign an address:

1. If the UPC Open controller is powered, pull the screw terminal connector from the controller's power terminals labeled Gnd and HOT. The controller reads the address each time power is applied to it.
2. Using the rotary switches (see Fig. A and B), set the controller's address. Set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit.

As an example in Fig. B, if the controller's address is 25, point the arrow on the Tens (10's) switch to 2 and the arrow on the Ones (1's) switch to 5.

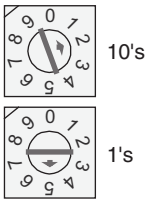


Fig. B — Address Rotary Switches

BACNET DEVICE INSTANCE ADDRESS — The UPC Open controller also has a BACnet Device Instance address. This Device Instance MUST be unique for the complete BACnet system in which the UPC Open controller is installed. The Device Instance is auto generated by default and is derived by adding the MAC address to the end of the Network Number. The Network Number of a new UPC Open controller is 16101, but it can be changed using i-Vu® Tools or BACview† device. By default, a MAC address of 20 will result in a Device Instance of 16101 + 20 which would be a Device Instance of 1610120.

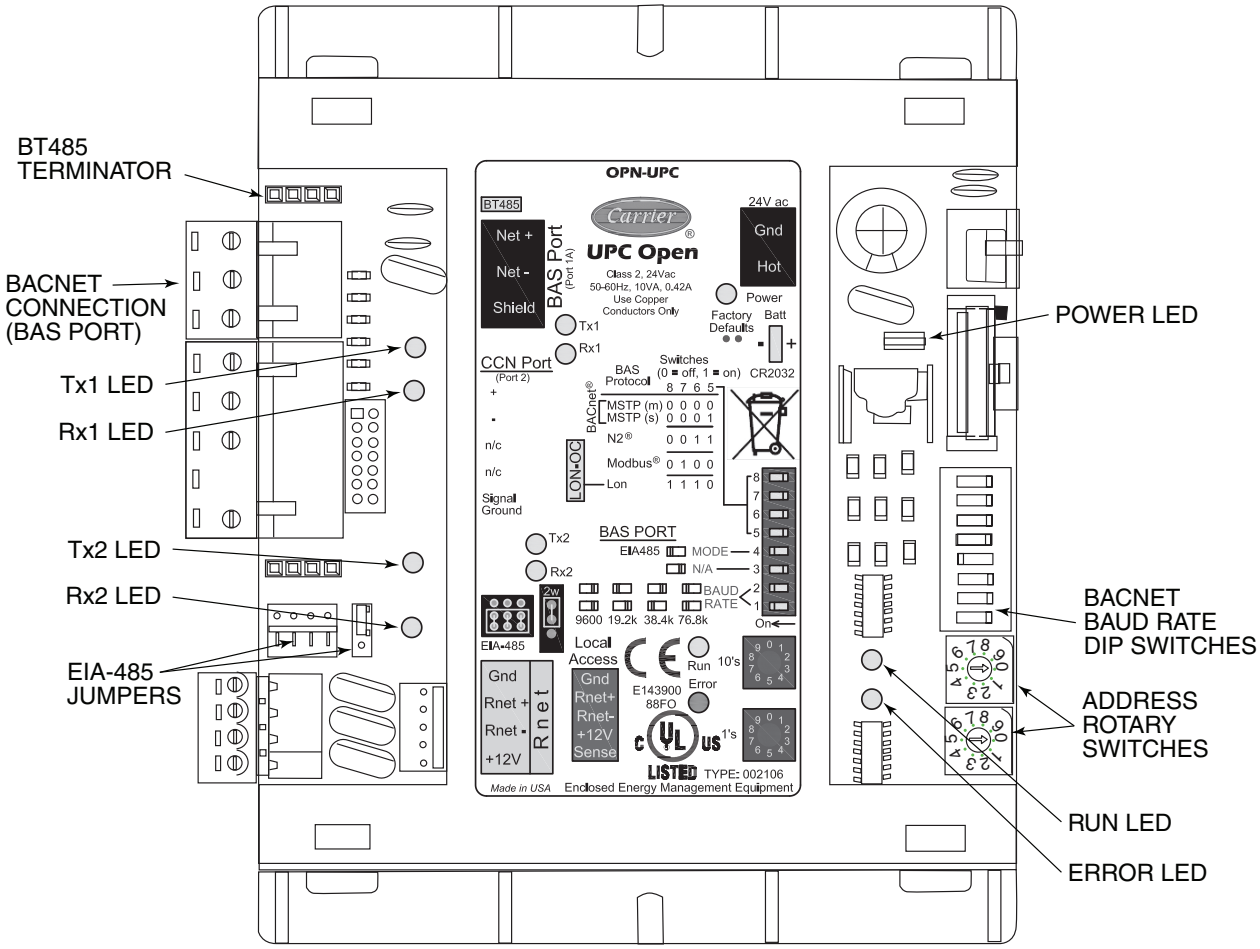


Fig. A — UPC Open Controller

*BACnet is a registered trademark of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers).
†BACview is a registered trademark of Automated Logic Corporation.

CONFIGURING THE BAS PORT FOR BACNET MS/TP — Use the same baud rate and communication settings for all controllers on the network segment. The UPC Open controller is fixed at 8 data bits, No Parity, and 1 Stop bit for this protocol's communications.

If the UPC Open controller has been wired for power, pull the screw terminal connector from the controller's power terminals labeled Gnd and HOT. The controller reads the DIP Switches and jumpers each time power is applied to it.

Set the BAS Port DIP switch DS3 to "enable." Set the BAS Port DIP switch DS4 to "E1-485." Set the BMS Protocol DIP switches DS8 through DS5 to "MSTP." See Table A.

Table A — SW3 Protocol Switch Settings for MS/TP

DS8	DS7	DS6	DS5	DS4	DS3
Off	Off	Off	Off	On	Off

Verify that the EIA-485 jumpers below the CCN Port are set to EIA-485 and 2W.

The example in Fig. C shows the BAS Port DIP Switches set for 76.8k (Carrier default) and MS/TP.

Set the BAS Port DIP Switches DS2 and DS1 for the appropriate communications speed of the MS/TP network (9600, 19.2k, 38.4k, or 76.8k bps). See Fig. C and Table B.

Table B — Baud Selection Table

BAUD RATE	DS2	DS1
9,600	Off	Off
19,200	On	Off
38,400	Off	On
76,800	On	On

WIRING THE UPC OPEN CONTROLLER TO THE MS/TP NETWORK — The UPC Open controller communicates using BACnet on an MS/TP network segment communications at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps.

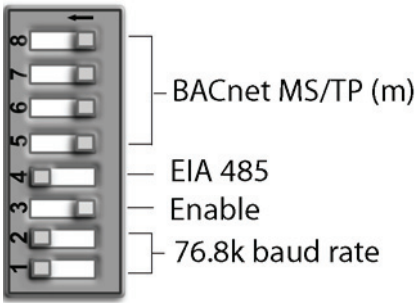


Fig. C — DIP Switches

Wire the controllers on an MS/TP network segment in a daisy-chain configuration. Wire specifications for the cable are 22 AWG (American Wire Gage) or 24 AWG, low-capacitance, twisted, stranded, shielded copper wire. The maximum length is 2000 ft.

Install a BT485 terminator on the first and last controller on a network segment to add bias and prevent signal distortions due to echoing. See Fig. A, D, and E.

To wire the UPC Open controller to the BAS network:

1. Pull the screw terminal connector from the controller's BAS Port.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the BAS port's screw terminals labeled Net +, Net -, and Shield.

NOTE: Use the same polarity throughout the network segment.

4. Insert the power screw terminal connector into the UPC Open controller's power terminals if they are not currently connected.
5. Verify communication with the network by viewing a module status report. To perform a module status report using the BACview keypad/display unit, press and hold the "FN" key then press the "." Key.

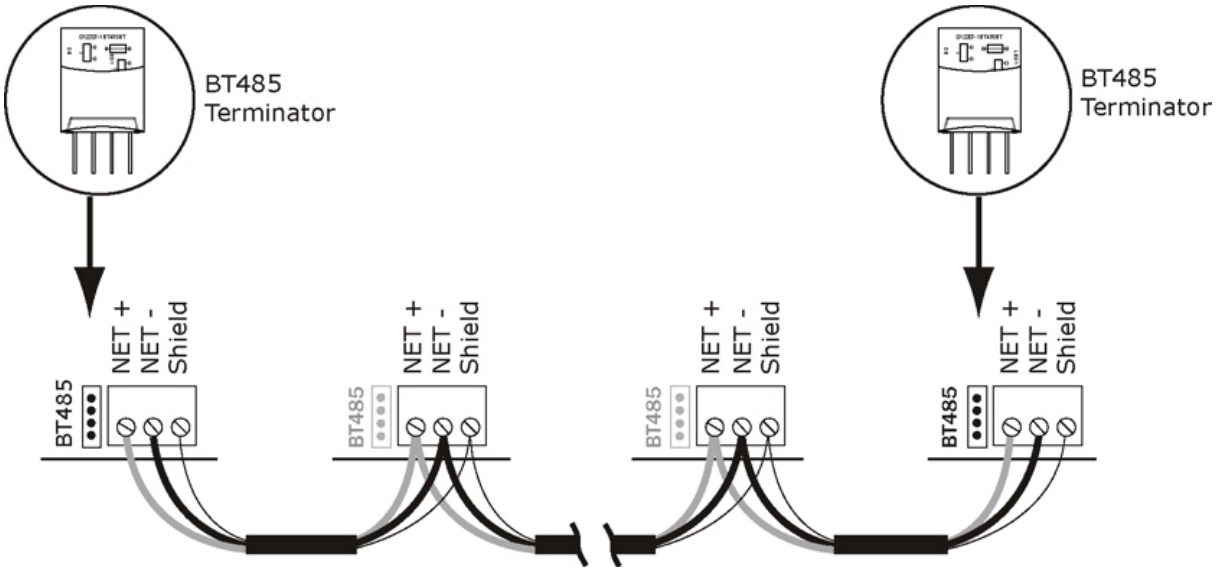


Fig. D — Network Wiring

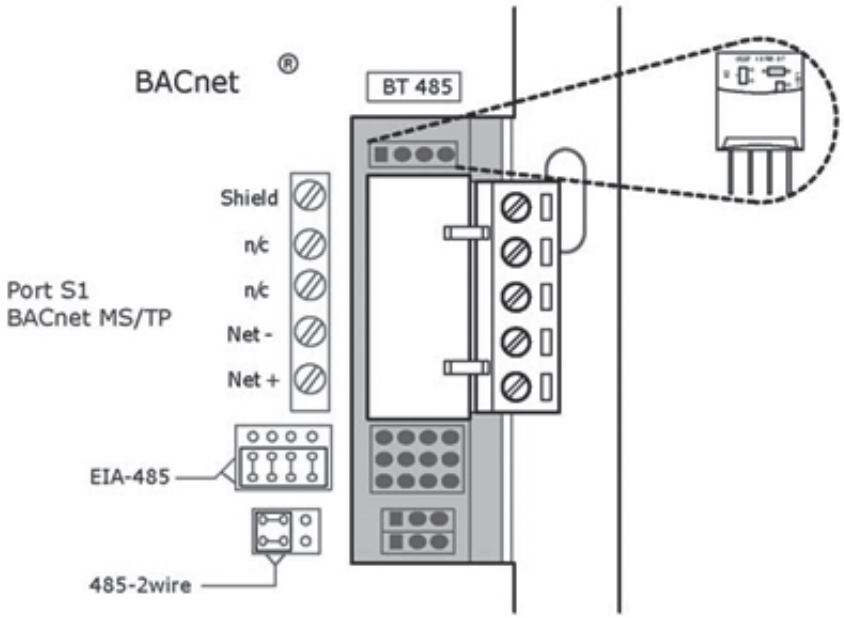


Fig. E — BT485 Terminator Installation

To install a BT485 terminator, push the BT485 terminator on to the BT485 connector located near the BACnet connector.

NOTE: The BT485 terminator has no polarity associated with it.

To order a BT485 terminator, consult Commercial Products i-Vu® Open Control System Master Prices.

MS/TP WIRING RECOMMENDATIONS — Recommendations are shown in Tables C and D. The wire jacket and UL temperature rating specifications list two acceptable alternatives. The Halar* specification has a higher temperature rating and a tougher outer jacket than the SmokeGard† specification, and it is appropriate for use in applications where the user is concerned about abrasion. The Halar jacket is also less likely to crack in extremely low temperatures.

NOTE: Use the specified type of wire and cable for maximum signal integrity.

Table C — MS/TP Wiring Recommendations

SPECIFICATION	RECOMMMENDATION
CABLE	Single twisted pair, low capacitance, CL2P, 22 AWG (7x30), TC foam FEP, plenum rated cable
CONDUCTOR	22 or 24 AWG stranded copper (tin plated)
INSULATION	Foamed FEP 0.015 in. (0.381 mm) wall 0.060 in. (1.524 mm) O.D.
COLOR CODE	Black/White
TWIST LAY	2 in. (50.8 mm) lay on pair 6 twists/foot (20 twists/meter) nominal
SHIELDING	Aluminum/Mylar shield with 24 AWG TC drain wire
JACKET	SmokeGard Jacket (SmokeGard PVC) 0.021 in. (0.5334 mm) wall 0.175 in. (4.445 mm) O.D. Halar Jacket (E-CTFE) 0.010 in. (0.254 mm) wall 0.144 in. (3.6576 mm) O.D.
DC RESISTANCE	15.2 Ohms/1000 feet (50 Ohms/km) nominal
CAPACITANCE	12.5 pF/ft (41 pF/meter) nominal conductor to conductor
CHARACTERISTIC IMPEDANCE	100 Ohms nominal
WEIGHT	12 lb/1000 feet (17.9 kg/km)
UL TEMPERATURE RATING	SmokeGard 167°F (75°C) Halar -40 to 302°F (-40 to 150°C)
VOLTAGE	300 Vac, power limited
LISTING	UL: NEC CL2P, or better

LEGEND

AWG — American Wire Gage
CL2P — Class 2 Plenum Cable
DC — Direct Current
FEP — Fluorinated Ethylene Polymer
NEC — National Electrical Code
O.D. — Outside Diameter
TC — Tinned Copper
UL — Underwriters Laboratories

*Halar is a registered trademark of Solvay Plastics.
†SmokeGard is a trademark of AlphaGary-Mexichem Corp.

Table D — Open System Wiring Specifications and Recommended Vendors

WIRING SPECIFICATIONS		RECOMMENDED VENDORS AND PART NUMBERS			
WIRE TYPE	DESCRIPTION	CONNECT AIR INTERNATIONAL	BELDEN	RMCORP	CONTRACTORS WIRE AND CABLE
MS/TP NETWORK (RS-485)	22 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. See MS/TP Installation Guide for specifications.	W221P-22227	—	25160PV	CLP0520LC
	24 AWG, single twisted shielded pair, low capacitance, CL2P, TC foam FEP, plenum rated. See MS/TP Installation Guide for specifications.	W241P-2000F	82841	25120-OR	—
RNET	4 conductor, unshielded, CMP, 18 AWG, plenum rated.	W184C-2099BLB	6302UE	21450	CLP0442

LEGEND

AWG — American Wire Gage
CL2P — Class 2 Plenum Cable
CMP — Communications Plenum Rated
FEP — Fluorinated Ethylene Polymer
TC — Tinned Copper

LOCAL ACCESS TO THE UPC OPEN CONTROLLER — The user can use a BACview6 handheld keypad display unit or the Virtual BACview software as a local user interface to an Open controller. These items let the user access the controller network information. These are accessory items and do not come with the UPC Open controller.

The BACview6 unit connects to the local access port on the UPC Open controller. See Fig. F. The BACview software must be running on a laptop computer that is connected to the local access port on the UPC Open controller. The laptop will require an additional USB link cable for connection.

See the *BACview Installation and User Guide* for instructions on connecting and using the BACview6 device.

To order a BACview6 Handheld (BV6H), consult Commercial Products i-Vu® Open Control System Master Prices.

CONFIGURING THE UPC OPEN CONTROLLER'S PROPERTIES — The UPC Open device and *Comfort*Link control must be set to the same CCN Address (Element) number and CCN Bus number. The factory default settings for CCN Element and CCN Bus number are 1 and 0 respectively.

If modifications to the default Element and Bus number are required, both the *Comfort*Link™ and UPC Open configurations must be changed.

The following configurations are used to set the CCN Address and Bus number in the *Comfort*Link control. These configurations can be changed using the scrolling marquee display or accessory Navigator™ handheld device.

Configuration→CCN→CCN.A (CCN Address)

Configuration→CCN→CCN.B (CCN Bus Number)

The following configurations are used to set the CCN Address and Bus Number in the UPC Open controller. These configurations can be changed using the accessory BACview6 display.

Navigation: BACview→CCN
Home: Element Comm Stat
Element: 1
Bus: 0

TROUBLESHOOTING — If there are problems wiring or addressing the UPC Open controller, contact Carrier Technical Support.

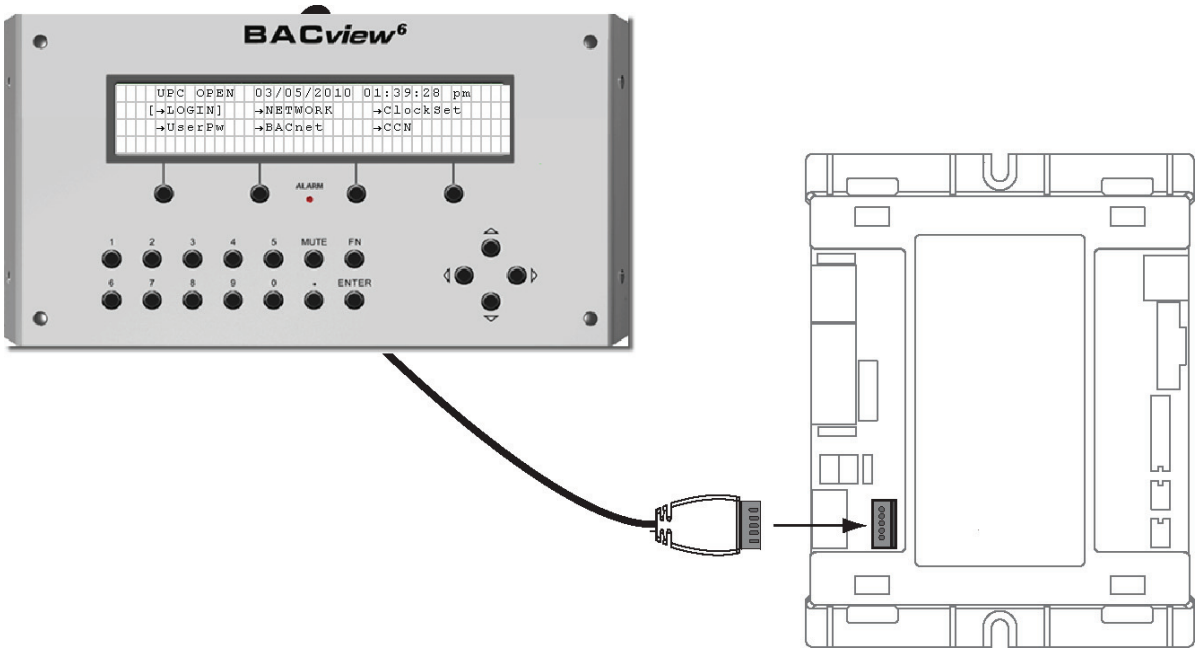


Fig. F — BACview6 Device Connection

COMMUNICATION LEDS — The LEDs indicate if the controller is communicating with the devices on the network. See Tables E and F. The LEDs should reflect communication traffic based on the baud rate set. The higher the baud rate the more solid the LEDs become. See Fig. A for location of LEDs on UPC Open module.

REPLACING THE UPC OPEN BATTERY — The UPC Open controller's 10-year lithium CR2032 battery provides a minimum of 10,000 hours of data retention during power outages.

IMPORTANT: Power must be **ON** to the UPC Open when replacing the battery, or the date, time, and trend data will be lost.

Remove the battery from the controller, making note of the battery's polarity. Insert the new battery, matching the battery's polarity with the polarity indicated on the UPC Open controller.

NETWORK POINTS LIST — The points list for the controller is shown in Table G.

Table E — LED Status Indicators

LED	STATUS
POWER	Lights when power is being supplied to the controller. The UPC Open controller is protected by internal solid-state polyswitches on the incoming power and network connections. These polyswitches are not replaceable and will reset themselves if the condition that caused the fault returns to normal.
RX	Lights when the controller receives data from the network segment; there is an Rx LED for Ports 1 and 2.
TX	Lights when the controller transmits data to the network segment; there is an Tx LED for Ports 1 and 2.
RUN	Lights based on controller status. See Table F.
ERROR	Lights based on controller status. See Table F.

Table F — Run and Error LEDs Controller and Network Status Indication

RUN LED	ERROR LED	STATUS
2 flashes per second	Off	Normal
2 flashes per second	2 flashes, alternating with **Run** LED	Five minute auto-restart delay after system error
2 flashes per second	3 flashes, then off	Controller has just been formatted
2 flashes per second	1 flash per second	Controller is alone on the network
2 flashes per second	On	Exec halted after frequent system errors or control programs halted
5 flashes per second	On	Exec start-up aborted, Boot is running
5 flashes per second	Off	Firmware transfer in progress, Boot is running
7 flashes per second	7 flashes per second, alternating with **Run** LED	Ten second recovery period after brownout
14 flashes per second	14 flashes per second, alternating with **Run** LED	Brownout

Table G — Network Points List

POINT DESCRIPTION	CCN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
1st Current Alarm State	ALARM_01	R		N/A	0-270	AV:4	alarm_01_1
Active Demand Limit	DEM_LIM	R/W	%	N/A	40 to 100	AV:6	dem_lim_1
Actual Guide Vane Position	GV_POS	R	%	N/A	0 to 100	AV:7	gv_pos_1
Actual VFD Speed	VFD_ACT	R	%	N/A	0 to 110	AV:11	vfd_act_1
Calc Evap Sat Temp	EAT	R	°F	N/A	-40 to 245	AV:13	ert_1
Chilled Water Deadband	CWDB	R	^F	1.0	0.5 to 2.0	AV:14	cwdb_1
Chilled Water Delta P	CHWPD	R	^F	N/A	-6.7 to 420	AV:15	chwpd_1
Chilled Water Delta T	CHW_DT	R	^F	N/A	-40 to 245	AV:16	chw_dt_1
Chilled Water Pump	CHLP	R	N/A	OFF	OFF/ON	BV:4	chlp_1
Chilled Water Temp	CHW_TMP	R	°F	N/A	-40 to 245	AV:17	chw_tmp_1
Chiller Start/Stop	CHIL_S_S	R/W	N/A	STOP	STOP/START	BV:5	chil_s_s_1
Comp Discharge Temp	CMPD	R	°F	N/A	-40 to 245	AV:18	cmpd_1
Comp Motor Winding Temp	MTRW	R	°F	N/A	-40 to 245	AV:19	mtrw_1
Comp Thrust Brg Temp	MTRB	R	°F	N/A	-40 to 245	AV:20	mtrb_1
Cond Water Flow	CDW_FLOW	R	N/A	NO	NO/YES	BV:6	cdw_flow_1
Cond Water Pump	CDP	R	N/A	OFF	OFF/ON	BV:7	cdp_1
Condenser Pressure	CRP	R	PSI	N/A	-6.7 to 420	AV:21	crp_1
Condenser Refrig Temp	CRT	R	°F	N/A	-40 to 245	AV:22	crt_1
Condenser Water Delta P	CDWPD	R	PSI	N/A	-6.7 to 420	AV:23	cdwpd_1
Control Point	LCW_STPT	R/W	°F	N/A	10 to 120	AV:24	lcw_stpt_1
Current CHW Setpoint	CHWSTPT	R	°F	N/A	0.00 to 99.9	AV:25	chwstpt_1
Demand Level 1	N/A	R	%	N/A	0 to 100	AV:1	dmv_lvl_1_perct_1
Demand Level 2	N/A	R	%	N/A	0 to 100	AV:2	dmv_lvl_2_perct_1
Demand Level 3	N/A	R	%	N/A	0 to 100	AV:3	dmv_lvl_3_perct_1
Element Comm Status	N/A	R	N/A	N/A	No Comm/Normal	BV:2999	element_stat_1
Element Communications Alarm	N/A	R	N/A	N/A	Inactive/Active	BV:20	comm_lost_alm_1
Emergency Stop	EMSTOP	R	N/A	ENABLE	ENABLE/ EMSTOP	BV:8	emstop_1
Entering Chilled Water	ECW	R	°F	N/A	-40 to 245	AV:26	ecw_1
Entering Condenser Water	ECDW	R	°F	N/A	-40 to 245	AV:27	ecdw_1
Equipment Alarm	N/A	R	N/A	N/A	Comm Normal Comm Lost	BV:1	element_alarm_1
Evaporator Pressure	ERP	R	PSI	N/A	-6.7 to 420	AV:28	erp_1
Evaporator Refrigerant Temp	ERT	R	°F	N/A	-40 to 245	AV:13	ert_1
Leaving Chilled Water - Prime Variable	LCW	R	°F	N/A	-40 to 245	AV:31	lcw_1
Leaving Condenser Water	LCDW	R	°F	N/A	-40 to 245	AV:32	lcdw_1
Line Active Current	AMPS_ACT	R	A	N/A	0.0 to 99999.0	AV:8	amps_act_1
Line Active Voltage	VOLT_ACT	R	V	N/A	0.0 to 99999.0	AV:9	volt_act_1
Line Frequency	LINEFREQ	R	Hz	N/A	0 to 99	AV:30	linefreq_1
Line Power Factor	LINE_PF	R		N/A	0.00 to 2.00	AV:34	line_pf_1
Local Schedule	N/A	R	N/A	N/A	No Comm/Normal	BV:2	schedule_1
Occupied?	OCC	R	N/A	NO	NO/YES	BV:10	occ_1
Oil Sump Temperature	OILT	R	°F	N/A	-40 to 245	AV:33	oilt_1
Remote Start Contact	REM_CON	R/W	N/A	OPEN	OPEN/CLOSE	BV:11	rem_con_1
Run Status	STATUS	R	N/A	N/A	0=Timeout, 1=Ready, 2=Recyle, 3=Startup, 4=Running, 5=Demand, 6=Ramping, 7=Autorest, 8=Override, 9=Tripout, 10=Control Test, 11=Lockout, 12=Pumpdown, 13=Prestart	AV:35	status_1

LEGEND

CHW — Chilled Water
R — Read
VFD — Variable Frequency Drive
W — Write

Table G — Network Points List (cont)

POINT DESCRIPTION	CCN POINT NAME	READ/ WRITE	UNITS	DEFAULT VALUE	RANGE	BACNET OBJECT ID	BACNET OBJECT NAME
Service Ontime	S_HRS	R/W	hr	N/A	0 to 32767	AV:36	s_hrs_1
Surge Line Delta T	DELTA_TX	R	°F	N/A	0 to 200	AV:38	delta_tx_1
System Alert/Alarm	SYS_ALM	R	N/A	N/A	1=Normal, 2=Alert, 3=Alarm	AV:40	sys_alm_1
System Cooling Demand Level	N/A	R	N/A	N/A	N/A	AV:9006	cool_demand_level_1
System Demand Limiting	N/A	R	N/A	N/A	OFF/ON	BV:3	dem_lmt_act_1
Target Guide Vane Position	GV_TRG	R	%	N/A	0 to 100	AV:41	gv_trg_1
Target VFD Speed	VFD_OUT	R	%	N/A	0 to 100	AV:42	vfd_out_1
Tower Fan Relay High	TFR_HIGH	R	N/A	OFF	OFF/ON	BV:13	tfr_high_1
Tower Fan Relay Low	TFR_LOW	R	N/A	OFF	OFF/ON	BV:14	tfr_low_1
User Defined Analog 1	N/A	R	N/A	N/A	N/A	AV:2901	user_analog_1_1
User Defined Analog 2	N/A	R	N/A	N/A	N/A	AV:2902	user_analog_2_1
User Defined Analog 3	N/A	R	N/A	N/A	N/A	AV:2903	user_analog_3_1
User Defined Analog 4	N/A	R	N/A	N/A	N/A	AV:2904	user_analog_4_1
User Defined Analog 5	N/A	R	N/A	N/A	N/A	AV:2905	user_analog_5_1
User Defined Binary 1	N/A	R	N/A	N/A	N/A	BV:2911	user_binary_1_1
User Defined Binary 2	N/A	R	N/A	N/A	N/A	BV:2912	user_binary_2_1
User Defined Binary 3	N/A	R	N/A	N/A	N/A	BV:2913	user_binary_3_1
User Defined Binary 4	N/A	R	N/A	N/A	N/A	BV:2914	user_binary_4_1
User Defined Binary 5	N/A	R	N/A	N/A	N/A	BV:2915	user_binary_5_1

LEGEND

CHW — Chilled Water
R — Read
VFD — Variable Frequency Drive
W — Write

INDEX

INITIAL START-UP CHECKLIST
FOR 19XRV 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 (kW)	BRINE	FLOW RATE	TEMPERATURE IN	TEMPERATURE OUT	PRESSURE DROP	PASS	SUCTION TEMPERATURE	CONDENSER TEMPERATURE
COOLER									******
CONDENSER								******	

CHILLER LINE SIDE: Volts _____ FLA _____ OLTA _____
OIL PUMP: Volts _____ RLA _____ OLTA _____

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: VFD _____ Oil Pump _____ Controls/Oil Heater _____

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

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

VFD Manufacturer _____ VFD Nameplate I.D. Number _____

VFD Serial Number _____ VFD Nameplate Input Rating _____

Mfd in _____ on _____

FIELD-INSTALLED VFDs ONLY:

Check continuity T1 to T1, etc. (Motor to VFD, disconnect motor leads T1, T2, T3.) Do not megger 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:	____	____	____	____	____	____

CONTROLS: SAFETY, OPERATING, ETC.

Perform Controls Test (Yes/No) _____

PIC III CAUTION

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

Yes ____

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

	Condenser Water Pump	Yes ☐	No ☐
	Chilled Water Pump	Yes ☐	No ☐
RUN MACHINE:	Do these safeties shut down machine?		
	Condenser Water Flow	Yes ☐	No ☐
	Chilled Water Flow	Yes ☐	No ☐
	Pump Interlocks	Yes ☐	No ☐

INITIAL START:

Line Up All Valves in Accordance With Instruction Manual: _____

Start Water Pumps and Establish Water Flow _____

Oil Level OK and Oil Temperature OK _____ Check Oil Pump Rotation-Pressure _____

Check Compressor Motor Rotation (Motor End Sight Glass) and Record: Clockwise _____

Restart Compressor, Bring Up To Speed. Shut Down. Any Abnormal Coastdown Noise? Yes* ☐ No ☐

*If yes, determine cause.

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START MACHINE AND OPERATE. COMPLETE THE FOLLOWING:

A: Trim charge and record under Charge Refrigerant Into Chiller section on page 79.
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.
F: Register LiquiFlo2 VFD start-up at www.automation.rockwell.com/complete1/warp.
G: Return a copy of this checklist to the local Carrier Service office.

SIGNATURES:

CARRIER TECHNICIAN _____

DATE _____

CUSTOMER REPRESENTATIVE _____

DATE _____

19XRV PIC III SETPOINT TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Base Demand Limit	40 to 100	%	100	
LCW Setpoint	10 to 120 (-12.2 to 48.9)	DEG F (C)	50.0 (10)	
ECW Setpoint	15 to 120 (-9.4 to 48.9)	DEG F (C)	60.0 (15.6)	
Ice Build Setpoint	15 to 60 (-9.4 to 15.6)	DEG F (C)	40.0 (4.4)	
Tower Fan High Setpoint	55 to 105 (13 to 41)	DEG F (C)	75 (24)	

Upload all control configuration tables via service tool? Yes ☐ No ☐

ICVC Software Part Number (See ICVC Configuration Screen): _____

ICVC Controller Identification (See ICVC Configuration Screen): BUS: _____ CCN ADDRESS: _____

VFD Gateway Version Number (See VFD_STAT Screen): _____

VFD Inverter Version Number (See VFD_STAT Screen): _____

VFD Rectifier Version Number (See VFD_STAT Screen): _____

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19XRV PIC III LOCAL TIME SCHEDULE CONFIGURATION SHEET OCCPC01S

	Day Flag								Occupied Time					Unoccupied Time			
	M	T	W	T	F	S	S	H									
Period 1:																	
Period 2:																	
Period 3:																	
Period 4:																	
Period 5:																	
Period 6:																	
Period 7:																	
Period 8:																	

NOTE: Default setting is OCCUPIED 24 hours/day.

ICE BUILD 19XRV PIC III TIME SCHEDULE CONFIGURATION SHEET OCCPC02S

	Day Flag								Occupied Time					Unoccupied Time			
	M	T	W	T	F	S	S	H									
Period 1:																	
Period 2:																	
Period 3:																	
Period 4:																	
Period 5:																	
Period 6:																	
Period 7:																	
Period 8:																	

NOTE: Default setting is UNOCCUPIED 24 hours/day.

19XRV PIC III CCN TIME SCHEDULE CONFIGURATION SHEET OCCPC03S

	Day Flag								Occupied Time					Unoccupied Time			
	M	T	W	T	F	S	S	H									
Period 1:																	
Period 2:																	
Period 3:																	
Period 4:																	
Period 5:																	
Period 6:																	
Period 7:																	
Period 8:																	

NOTE: Default setting is OCCUPIED 24 hours/day.

19XRV PIC III VFD_CONF TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	POINT	VALUE
Motor Nameplate Voltage	346 to 480	VOLTS	460	motor_nv	
Compressor 100% Speed	45.0 to 62.0	Hz	60.0	comp_100	
Line Freq=60 Hz? (No=50)	0/1	NO/YES	YES	line_frq	
*** Rated Line Voltage**	346 to 600	VOLTS	460	vfd_volt	
*** Rated Line Amps**	10 to 1500	AMPS	200	vfd_amps	
*** Rated Line Kilowatts**	0 to 7200	kW	100	vfd_rlkw	
*** Motor Rated Load KW**	0 to 7200	kW	100	mot_rlkw	
*** Motor Rated Load Amps**	10 to 1500	AMPS	200	mot_rla	
Motor Nameplate Amps	10 to 1500	AMPS	200	motorni	
Motor Nameplate RPM	1500 to 3600		3456	motorpm	
Motor Nameplate KW	0 to 5600	kW	200	motorkw	
Inverter PWM Frequency (0=4 k Hz, 1=2 k Hz)	0/1		1	pwm_freq	
Skip Frequency 1	0.0 to 102.0	Hz	30.0	skipfrq1	
Skip Frequency 2	0.0 to 102.0	Hz	30.0	skipfrq2	
Skip Frequency 3	0.0 to 102.0	Hz	30.0	skipfrq3	
Skip Frequency Band	0.0 to 102.0	Hz	2.0	skipband	
Line Voltage % Imbalance	1 to 10	%	10	v_unbal	
Line Volt Imbalance Time	1 to 10	SEC	10	v_time	
Line Current % Imbalance	5 to 40	%	40	lineim_i	
Line Current Imbal Time	1 to 10	SEC	10	lineim_t	
Motor Current % Imbalance	5 to 40	%	40	motim_i	
Motor Current Imbal Time	1 to 10	SEC	10	motim_t	
Increase Ramp Time	5 to 60	SEC	30	ramp_inc	
Decrease Ramp Time	5 to 60	SEC	30	ramp_dec	
Single Cycle Dropout	0/1	DSABLE/ ENABLE	DSABLE	cycdrop	

NOTE: Those parameters marked with a * shall not be downloaded to the VFD, but shall be used in other calculations and algorithms in the ICVC.

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

19XRV PIC III OPTIONS TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	POINT	DEFAULT	VALUE
Remote Contacts Option	0/1	DSABLE/ENABLE	MODES	DSABLE	
Soft Stop Amps Threshold	40 to 100	%	STRTSTOP	100	
Surge / Hot Gas Bypass					
Surge Limit/HGBP Option	0/1/2		srg_hgbp	0	
Select: Surge=0, HGBP=1					
Low Load HGBP=2					
Minimum Load Point					
Surge/HGBP Delta Tsmin	0.0 to 150.0 (0.0 to 83.3)	ˆF (ˆC)	DTsatmin	45 (25.0)	
Surge/HGBP IGVmin	0.0 to 110.0	%	GV_MIN	5.0	
Full Load Point					
Surge/HGBP Delta Tsmax	0.0 to 150.0 (0.0 to 83.3)	ˆF (ˆC)	DTsatmAX	70 (38.9)	
Surge/HGBP IGVmax	0.0 to 110.0	%	GV_MAX	5.0	
Surge Line Shape Factor	–1.000 to 0.000		shapefac	–0.040	
Surge Line Speed Factor	0.00 to 3.00		VFD_POW	1.85	
Surge Line High Offset	0.1 to 3.0 (0.1 to 1.7)	ˆF (ˆC)	SP_HIGH	1.0 (0.6)	
Surge/HGBP Deadband	0.5 to 3 (0.3 to 1.7)	ˆF (ˆC)	hgb_db	1.0 (0.6)	
HGBP On Delta T	0.5 to 10.0 (0.3 to 5.6)	ˆF (ˆC)	Hgb_ton	2.0 (1.1)	
HGBP Off Delta T	0.5 to 10.0 (0.3 to 5.6)	ˆF (ˆC)	Hgb_toff	4.0 (2.2)	
Surge Protection					
Surge Delta% Amps	5 to 20	%	surge_a	10	
Surge Time Period	7 to 10	MIN	surge_t	8	
Ice Build Control					
Ice Build Option	0/1	DSABLE/ENABLE	ibopt	DSABLE	
Ice Build Termination	0 to 2		ibterm	0	
0=Temp, 1=Contacts, 2=Both					
Ice Build Recycle	0/1	DSABLE/ENABLE	ibrecyc	DSABLE	
Head Pressure Reference					
Delta P at 0% (4mA)	20 to 85 (138 to 586)	PSI (kPa)	HPDP0	20 (138)	
Delta P at 100% (20mA)	20 to 85 (138 to 586)	PSI (kPa)	HPDP100	35 (241)	
Minimum Output	0 to 100	%	HPDPMIN%	0	

19XRV PIC III SETUP1 TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	POINT	DEFAULT	VALUE
Comp Motor Temp Override	150 to 200 (66 to 93)	DEG F (DEG C)	MT_OVER	200 (93)	
Cond Press Override	90 to 165 (621 to 1138)	PSI (kPa)	CP_OVER	125 (862)	
Rectifier Temp Override	155 to 170 (68 to 77)	DEG F (DEG C)	REC_OVER	160 (71)	
Inverter Temp Override	155 to 170 (68 to 77)	DEG F (DEG C)	INV _OVER	160 (71)	
Comp Discharge Alert	125 to 200 (52 to 93)	DEG F (DEG C)	CD_ALERT	200 (93)	
Comp Thrust Brg Alert	165 to 185 (74 to 85)	DEG F (DEG C)	TB_ALERT	175 (79)	
Comp Thrust Brg Trip	160 to 185 (71 to 85)	DEG F (DEG C)	TB_TRIP	185 (85)	
Thrust Brg Reset Factor	1.0 to 3.0		TB_POWER	1.4	
Chilled Medium	0/1	WATER/BRINE	MEDIUM	WATER	
Chilled Water Deadband	.5 to 2.0 (0.3 to 1.1)	˚F (˚C)	CWDB	1.0 (0.6)	
Evap Refrig Trippoint	0.0 to 40.0 (–17.8 to 4.4)	DEG F (DEG C)	ERT_TRIP	33.0 (0.6)	
Refrig Override Delta T	2.0 to 5.0 (1.1 to 2.8)	˚F (˚C)	REF_OVER	3.0 (1.7)	
Evap Approach Alert	0.5 to 30.0 (0.3 to 16.7)	˚F (˚C)	EVAP_AL	5.0 (2.8)	
Cond Approach Alert	0.5 to 30.0 (0.3 to 16.7)	˚F (˚C)	COND_AL	6.0 (3.3)	
Condenser Freeze Point	–20 to 35 (–28.9 to 1.7)	DEG F (DEG C)	CDFREEZE	34 (1.1)	
Flow Delta P Display	0/1	DSABLE/ENABLE	FLOWDISP	DSABLE	
Evap Flow Delta P Cutout	0.5 to 50.0 (3.4 to 344.8)	PSI (kPa)	EVAP_CUT	5.0 (34.5)	
Cond Flow Delta P Cutout	0.5 to 50.0 (3.4 to 344.8)	PSI (kPa)	COND_CUT	5.0 (34.5)	
Cond Hi Flow Del P Limit	0.5 to 50.0 (3.4 to 344.8)	PSI (kPa)	COND_ALM	50.0 (344.8)	
Cond Hi Flow Alarm Opt	0/1	DSABLE/ENABLE	COND_VAL	DSABLE	
Water Flow Verify Time	0.5 to 5	MIN	WFLOW_T	5	
Oil Press Verify Time	15 to 300	SEC	OILPR_T	40	
Recycle Control					
Restart Delta T	2.0 to 10.0 (1.1 to 5.6)	DEG F (DEG C)	rcycr_dt	5.0 (2.8)	
Shutdown Delta T	0.5 to 4.0 (0.3 to 2.2)	DEG F (DEG C)	rcycs_dt	1.0 (.0.6)	
Spare Alert/Alarm Enable Disable=0, Lo=1/3, Hi=2/4					
Spare Temp #1 Enable	0 to 4		sp1_en	0	
Spare Temp #1 Limit	–40 to 245 (–40 to 118)	DEG F (DEG C)	sp1_lim	245 (118)	
Spare Temp #2 Enable	0 to 4		sp2_en	0	
Spare Temp #2 Limit	–40 to 245 (–40 to 118)	DEG F (DEG C)	sp2_lim	245 (118)	

NOTE: No variables are available for CCN read operation. Forcing shall not be supported on service screens.

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19XRV PIC III SETUP2 TABLE CONFIGURATION SHEET

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT	VALUE
Capacity Control					
Proportional Inc Band	2 to 10		gv_inc	6.5	
Proportional DEC Band	2 to 10		gv_dec	6.0	
Proportional ECW Gain	1 to 3		gv_ecw	2.0	
Guide Vane Travel Limit	30 to 100	%	GV_CTRL	80	
Diffuser Control					
Diffuser Option	0/1	DSABLE/ENABLE	diff_opt	DSABLE	
Guide Vane 25% Load Pt	0 to 78	%	gv_25	25	
Diffuser 25% Load Point	0 to 100	%	df_25	0	
Guide Vane 50% Load Pt	0 to 78	%	gv_50	50	
Diffuser 50% Load Point	0 to 100	%	df_50	0	
Guide Vane 75% Load Pt	0 to 78	%	gv_75	75	
Diffuser 75% Load Point	0 to 100	%	df_75	0	
Diffuser Full Span mA	15 to 22	mA	diff_ma	18	
VFD Speed Control					
VFD Gain	0.1 to 1.50		vfd_gain	0.75	
VFD Increase Step	1 to 5	%	vfd_step	2	
VFD Minimum Speed	65 to 100	%	vfd_min	70	
VFD Maximum Speed	90 to 100	%	vfd_max	100	
VFD Start Speed	65 to 100	%	vfd_strt	100	
VFD Surge Line Gain	2.0 to 3.5	%	vfd_slg	2.0	
VFD Encl Temp Correction	-40 to 20.0	%	vfd_corr	0.0	
VFD Alarm Reset	0/1	DSABLE/ENABLE	VFD_RST	ENABLE	

19XRV PIC III SETUP3 TABLE CONFIGURATION SHEET

DESCRIPTION	STATUS	UNITS	POINT	DEFAULT	VALUE
Auto Restart Option	0/1	DSABLE/ENABLE	ASTART	DSABLE	
Cap Recovery Timeout	0 to 0.5	Hours	CR_TIME	0.1	
Gas Torque Factor	1.0 to 3.0		GT_FACT	1.2	
Guide Vane/SRD Factor	0.70 to 1.00		GV_FACT	0.95	

NOTE: No variables are available for CCN read operation. Forcing shall not be supported on service screens.

19XRV PIC III LEADLAG TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	POINT	DEFAULT	VALUE
Lead Lag Control					
LEAD/LAG: Configuration DSABLE=0, LEAD=1, LAG=2, STANDBY=3	0 to 3		leadlag	0	
Load Balance Option	0/1	DSABLE/ENABLE	loadbal	DSABLE	
Common Sensor Option	0/1	DSABLE/ENABLE	commsens	DSABLE	
LAG% Capacity	25 to 75	%	lag_per	50	
LAG Address	1 to 236		lag_add	92	
LAG START Timer	2 to 60	MIN	lagstart	10	
LAG STOP Timer	2 to 60	MIN	lagstop	10	
PRESTART FAULT Timer	2 to 30	MIN	preflt	5	
PULLDOWN Timer	1 to 30	MIN	pulldown	2	
STANDBY Chiller Option	0/1	DSABLE/ENABLE	stndopt	DSABLE	
STANDBY% Capacity	25 to 75	%	stnd_per	50	
STANDBY Address	1 to 236		stnd_add	93	

19XRV PIC III RAMP_DEM TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	POINT	DEFAULT	VALUE
Pulldown Ramp Type: Select: Temp=0, Load=1	0/1		ramps1ct	1	
Demand Limit and kW Ramp					
Demand Limit Source Select: Amps=0, kW=1	0/1		dem_src	0	
Amps or kW Load Ramp% Min	5 to 20		kw_ramp	10	
Demand Limit Prop Band	3 to 15	%	dem_app	10	
Demand Limit At 20 mA	40 to 100	%	dem_20ma	40	
20 mA Demand Limit Opt	0/1	DSABLE/ ENABLE	dem_sel	DSABLE	
VFD Overload Decrease	25 to 50	%	vfd_dec	30	
VFD Overload Delta	3 to 15	%	vfd_delt	5	
Demand Watts Interval	5 to 60	MIN	dw_int	15	

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19XRV PIC III TEMP_CTL TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	POINT	DEFAULT	VALUE
Control Point					
ECW Control Option	0/1	DSABLE/ ENABLE	ecw_opt	DSABLE	
Temp Pulldown Deg/Min	2 to 10 (1.1 to 5.6)	˚F (˚C)	tmp_ramp	3 (1.7)	
Temperature Reset					
RESET TYPE 1					
Degrees Reset At 20 mA	–30 to 30 (–17 to 17)	˚F (˚C)	deg_20ma	10 (6)	
RESET TYPE 2					
Remote Temp → No Reset	–40 to 245 (–40 to 118)	DEG F (DEG C)	res_rt1	85 (29)	
Remote Temp → Full Reset	–40 to 245 (–40 to 118)	DEG F (DEG C)	res_rt2	65 (18)	
Degrees Reset	–30 to 30 (–17 to 17)	˚F (˚C)	deg_rt	10 (6)	
RESET TYPE 3					
CHW Delta T → No Reset	0 to 15 (0 to 8)	˚F (˚C)	restd_1	10 (6)	
CHW Delta T → Full Reset	0 to 15 (0 to 8)	˚F (˚C)	restd_2	0 (0)	
Degrees Reset	–30 to 30 (–17 to 17)	˚F (˚C)	deg_chw	5 (3)	
Enable Reset Type	0 to 3		res_sel	0	

BROADCAST (BRODEF) CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Time Broadcast Enable	DSABLE/ENABLE		DSABLE	
Daylight Savings				
Start Month	1 to 12		4	
Start Day of Week	1 to 7		7	
Start Week	1 to 5		1	
Start Time	00:00 to 24:00	HH:MM	02:00	
Start Advance	0 to 360	MIN	0	
Stop Month	1 to 12		10	
Stop Day of Week	1 to 7		7	
Stop Week	1 to 5		5	
Stop Time	00:00 to 24:00		02:00	
Stop Back	0 to 360	MIN	0	

ICVC 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 %IN**

COMMUNICATION MESSAGE _____

CCN LOCAL RESET MENU

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