19XRV
Hermetic Centrifugal Liquid Chillers
with PIC III Controls
50/60 Hz
HFC-134a

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

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, Refrigeration, 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.

THERE IS A RISK OF INJURY OR DEATH by electrocution. High voltage may be present on the motor leads even though the motor is not running. Open the power supply disconnect before touching motor leads or terminals.

⚠ WARNING

DO NOT WELD OR FLAMECUT any refrigerant line or vessel until all refrigerant (*liquid and vapor*) has been removed from chiller. Traces of vapor should be displaced with dry air or nitrogen and the work area should be well ventilated. *Refrigerant in contact with an open flame produces toxic gases*.

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, VFD, 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.

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 devices, 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

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 VFD, TOWER FAN, OR PUMPS. Open the disconnect *ahead* of the VFD, 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.

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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 the VFD enclosure.

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 Subpart J of Part 15 of FCC Rules, 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
TXV — Thermostatic Expansion Valve
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 and 2)

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

System Components — The components include the cooler and condenser heat exchangers in separate vessels, compressor-motor, lubrication package, control panel, 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.

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

- registers cooler, condenser, and lubricating system pressures
- shows chiller operating condition and alarm shutdown conditions
- records the total chiller operating hours
- sequences chiller start, stop, and recycle under microprocessor control
- displays 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.

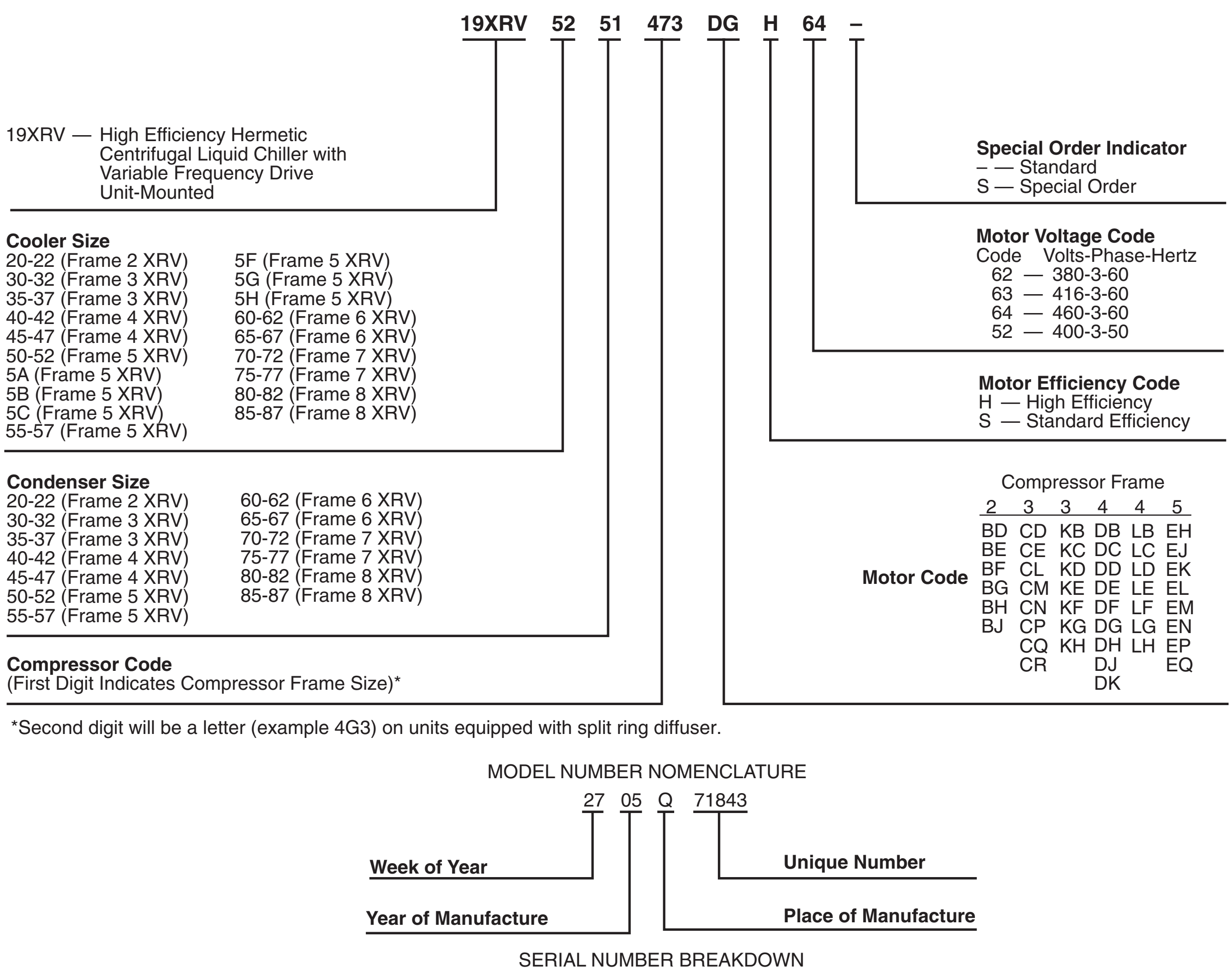
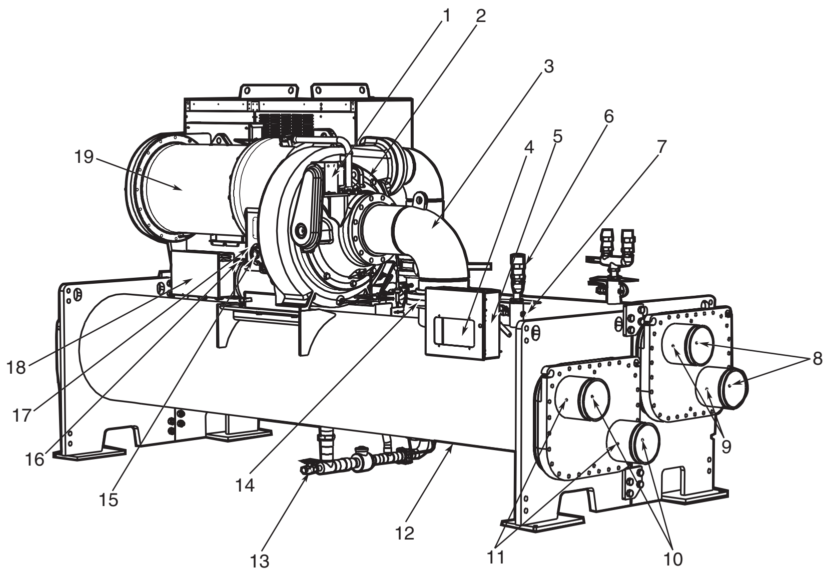


Fig. 1 — 19XRV Identification

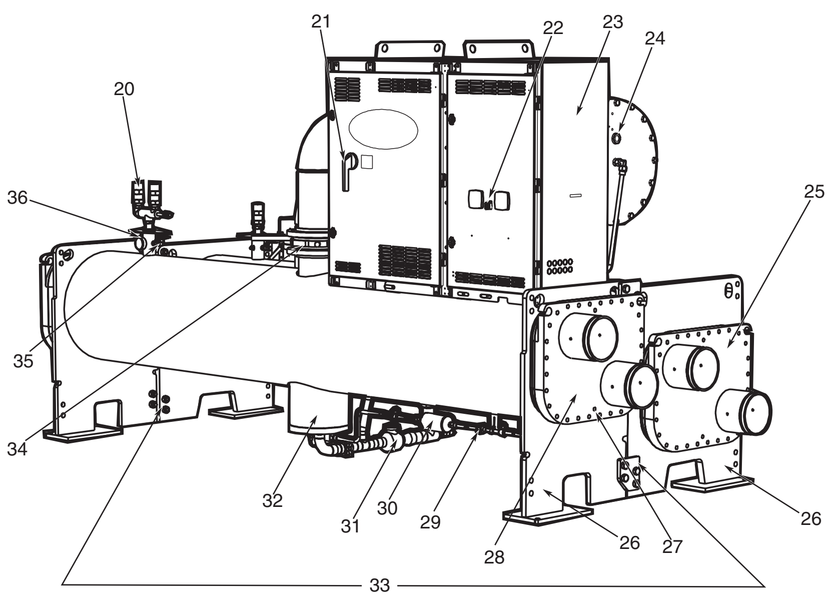
FRONT VIEW



LEGEND

1 — Guide Vane Actuator
2 — Split Ring Diffuser Actuator (Optional)
3 — Suction Elbow
4 — International Chiller Visual Control (ICVC)
5 — Chiller Identification Nameplate
6 — Cooler, Auto Reset Relief Valves
7 — Cooler Pressure Transducer
8 — Condenser In/Out Temperature Thermistors
9 — Condenser Waterflow Device (Optional ICVC Inputs available)
10 — Cooler Waterflow Device (Optional ICVC Inputs available)
11 — Cooler In/Out Temperature Thermistors
12 — Evaporator Saturation Temperature Sensor (Hidden)
13 — Liquid Line Service Valve
14 — Typical Flange Connection
15 — Oil Level Sight Glasses
16 — Refrigerant Oil Cooler (Hidden)
17 — Oil Drain/Charging Valve (Hidden)
18 — Power Panel
19 — Compressor Motor Housing

REAR VIEW



LEGEND

20 — Condenser Auto. Reset Relief Valves
21 — VFD Circuit Breaker
22 — VFD Meter Package (Optional)
23 — Unit-Mounted VFD
24 — Motor Sight Glass
25 — Cooler Waterbox Cover
26 — ASME Nameplate (One Hidden)
27 — Typical Waterbox Drain Port
28 — Condenser Waterbox Cover
29 — Refrigerant Moisture/Flow Indicator
30 — Refrigerant Filter/Drier
31 — Liquid Line Isolation Valve (Optional)
32 — Linear Float Valve Chamber
33 — Tubesheet Mounting Brackets
34 — Discharge Isolation Valve (Optional)
35 — Refrigerant Charging Valve
36 — Condenser Pressure Transducer (Hidden)

Fig. 2 — Typical 19XRV Components

REFRIGERATION CYCLE

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

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

Relatively cool (typically 65 to 90 F [18 to 32 C]) water flowing into the condenser tubes removes heat from the refrigerant and the vapor condenses to liquid.

The liquid refrigerant passes through orifices into the FLASC (Flash Subcooler) chamber (Fig. 3). Since the FLASC chamber is at a lower pressure, part of the liquid refrigerant flashes to vapor, thereby cooling the remaining liquid. The FLASC vapor is recondensed on the tubes which are cooled by entering condenser water. The liquid drains into a float chamber between the FLASC chamber and cooler. Here, a 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.

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. 3). 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.

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 imbedded 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. 3). The expansion valve bulbs control oil temperature to the bearings. The refrigerant leaving the oil cooler heat exchanger returns to the chiller cooler.

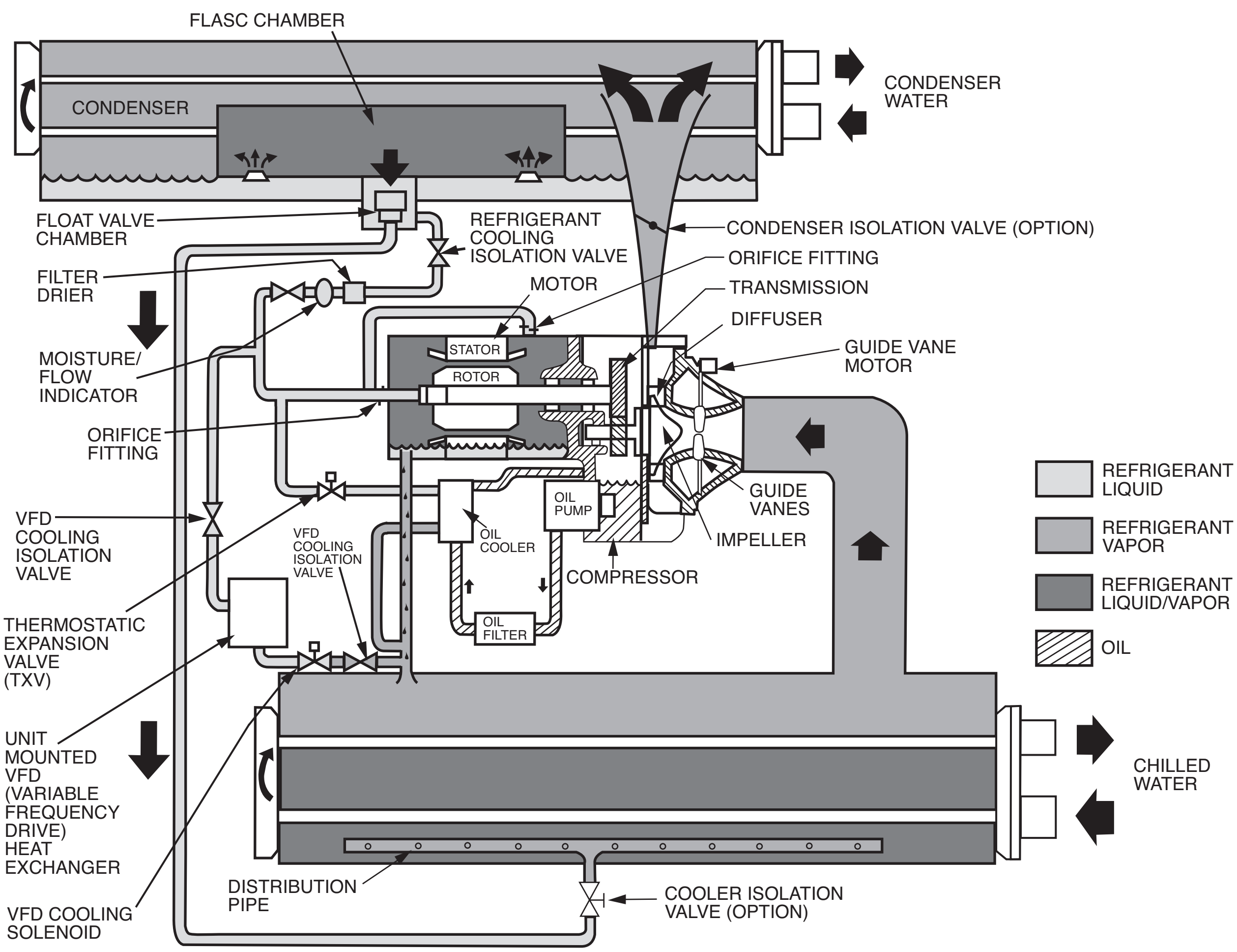


Fig. 3 — Refrigerant Motor Cooling and Oil Cooling Cycles

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. 3).

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 a solenoid valve at the exit of the VFD heat exchanger to regulate the flow of refrigerant. 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. 4).

Details — Oil is charged into the lubrication system through a hand valve. Two sight glasses in the oil reservoir permit oil level observation. Normal oil level is between the middle of the upper sight glass and the top of the lower sight glass when the compressor is shut down. The oil level should be visible in at least one of the 2 sight glasses during operation. Oil sump temperature is displayed on the 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 77 to 81, 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 42). 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 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.

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. 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.

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 most 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 compressors built since mid-2001, 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.

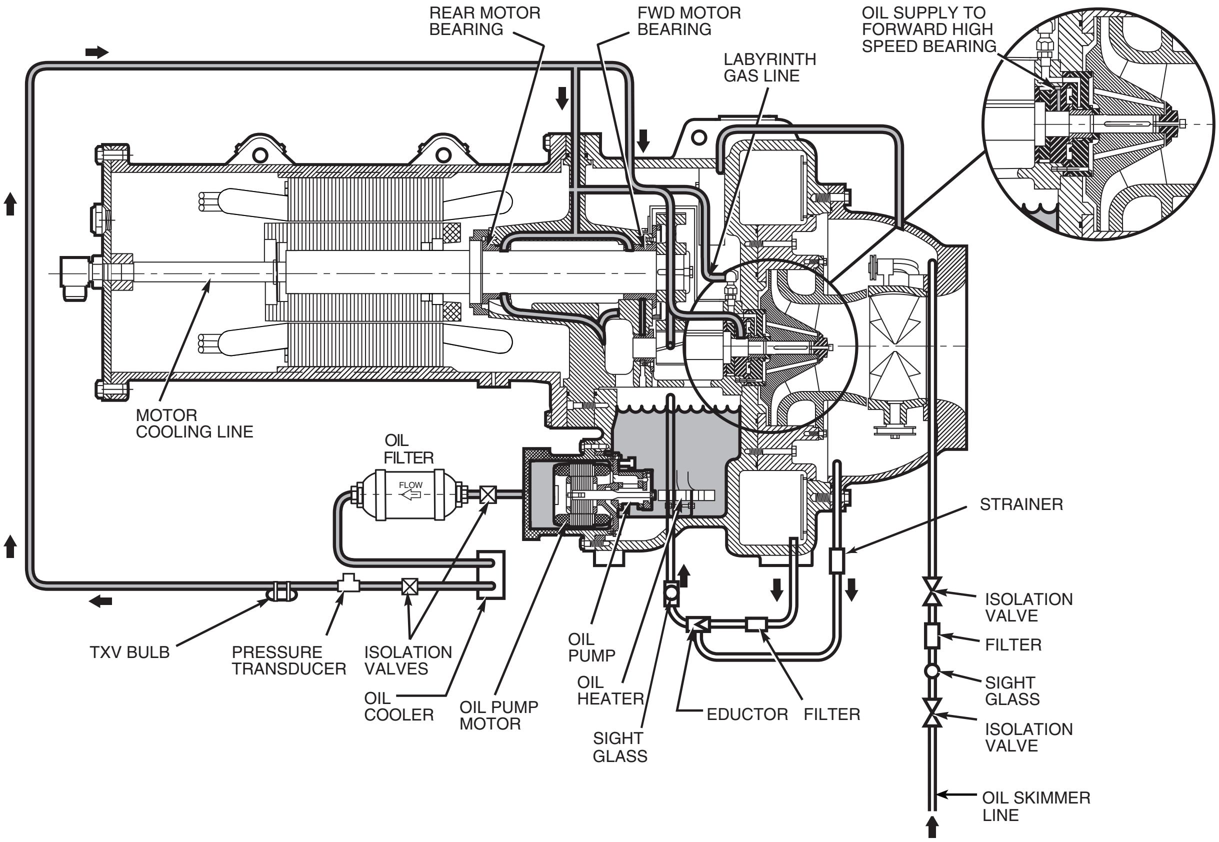


Fig. 4 — Lubrication System

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.

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.

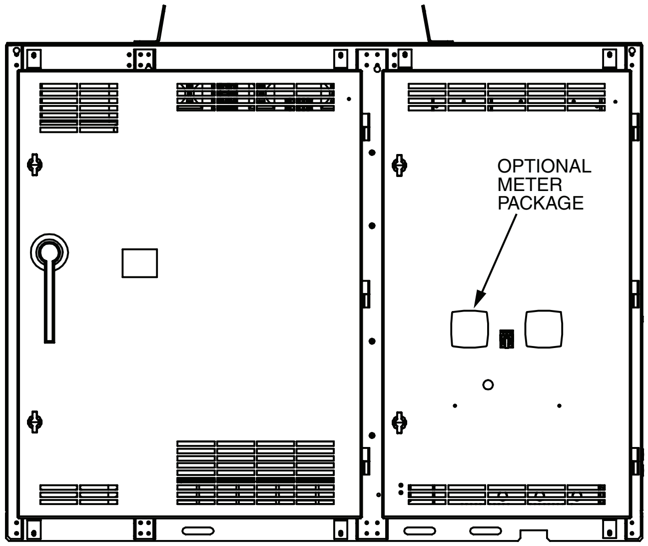
Circuit breaker CB2 supplies 115-v power to the oil pump control panel, oil heater, and portions of the VFD controls.

⚠ 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. 5-7. 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 14 and 82.

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

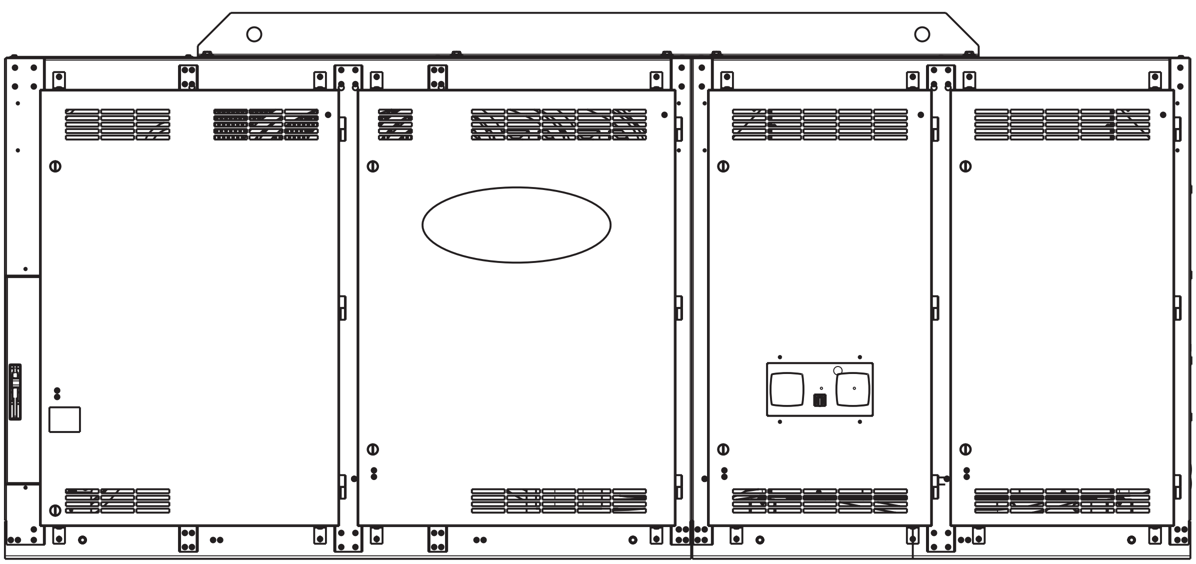
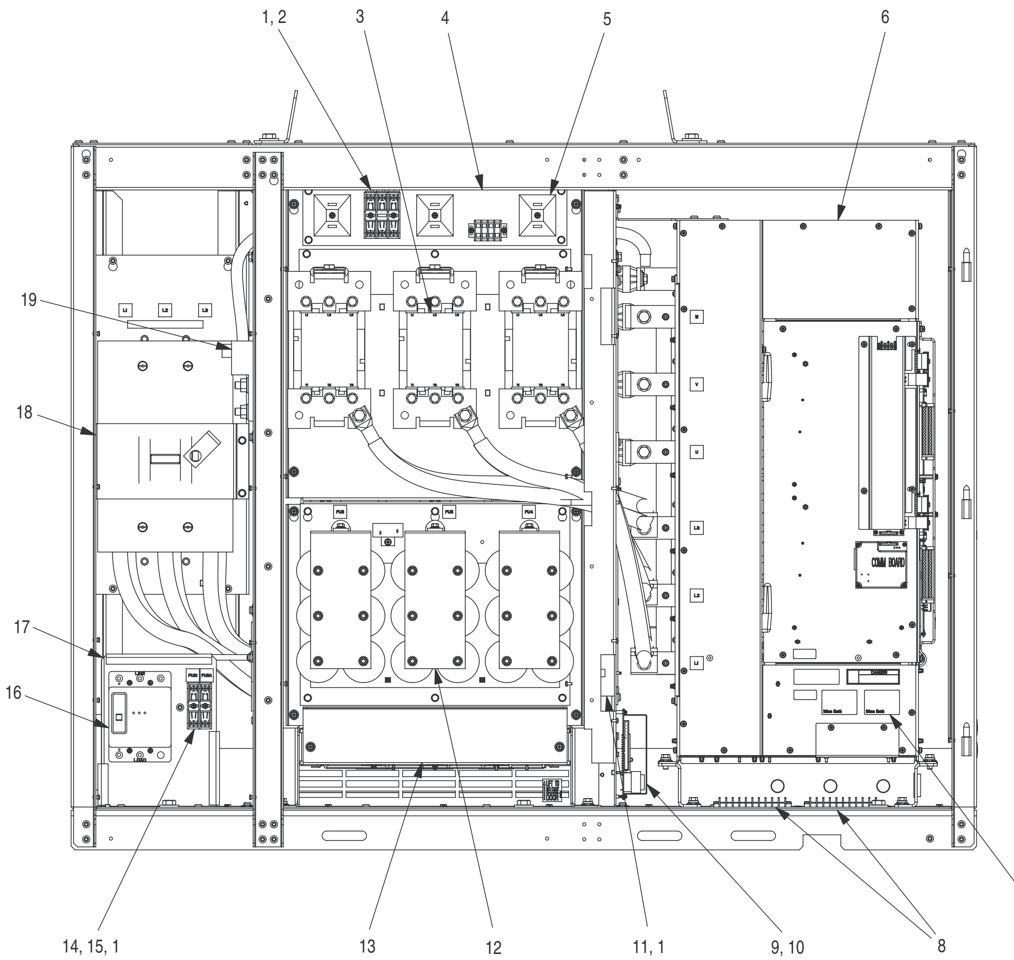
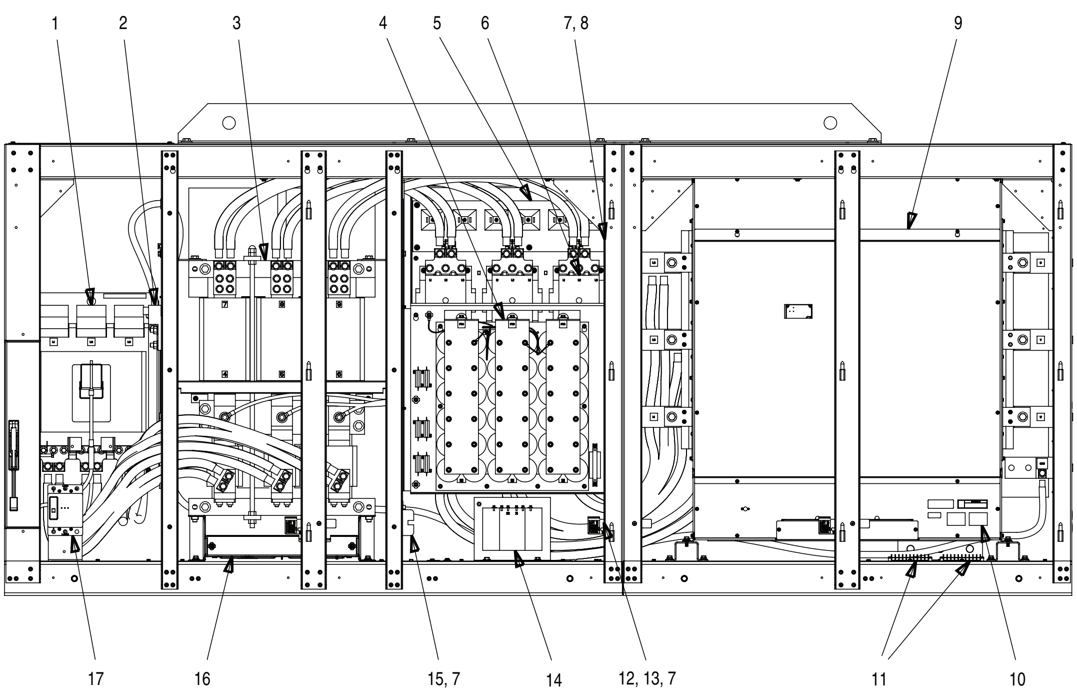

1169A VFD

Fig. 5 — 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 Namplate
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

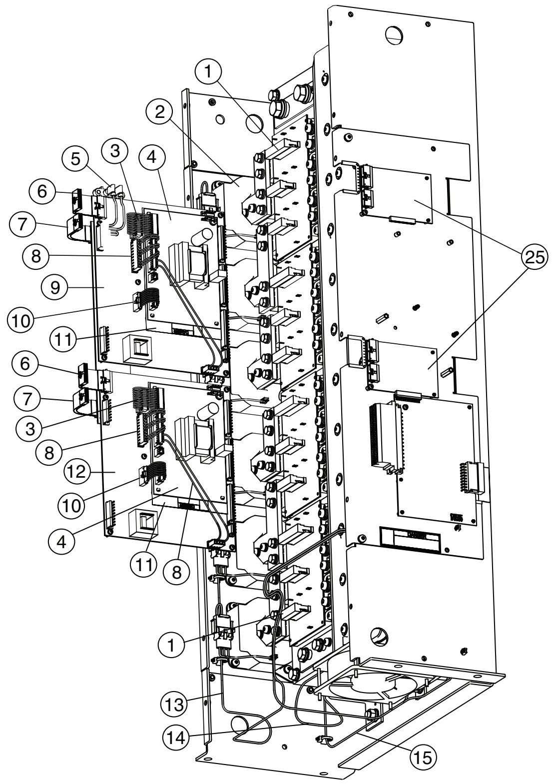
442A AND 608A VFDs



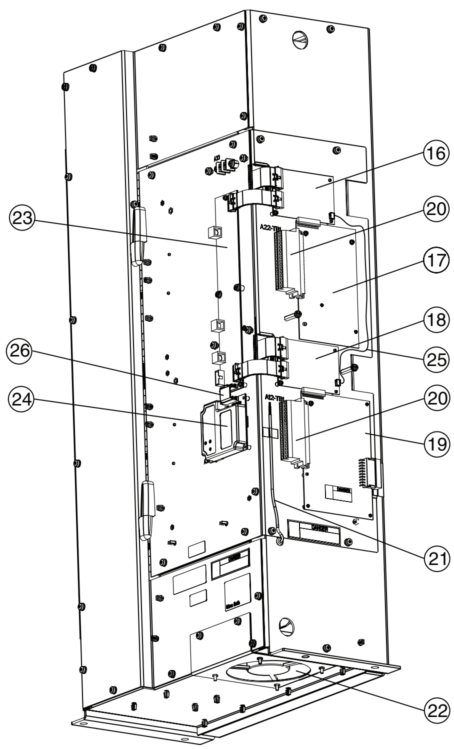
1 — Circuit Breaker, 600V
2 — Lug, Ground, 2-600 MCM
3 — Input Conductor Assembly
4 — Capacitor Bank Assembly
5 — Pre-Charge Resistor Assembly
6 — AC Contactor (3) — Pre-Charge
7 — Fuse Block, 30A, 600V, Class CC
8 — Fuse, Class CC, 600V, 20A (3)
9 — Power Module Assembly
10 — Power Module Namplate
11 — 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

1169A VFD

Fig. 6 — Variable Frequency Drive (VFD) Internal



Door Open



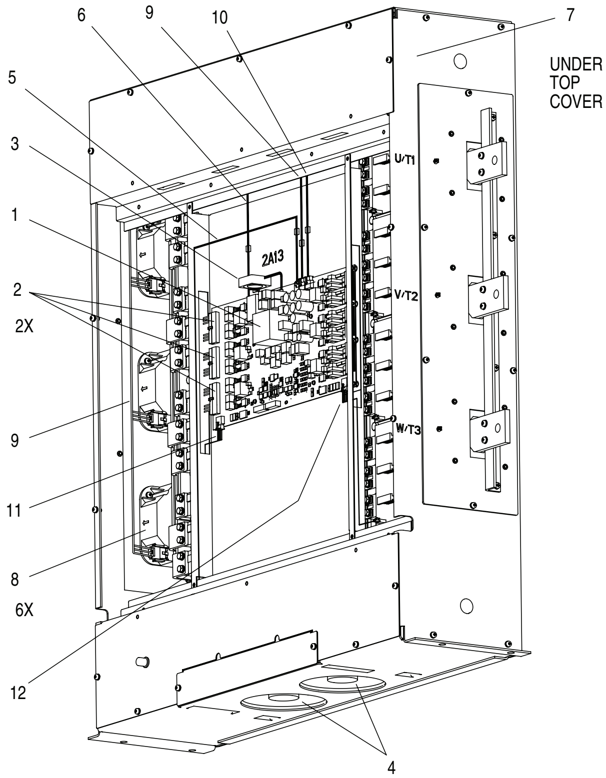
Door Closed

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

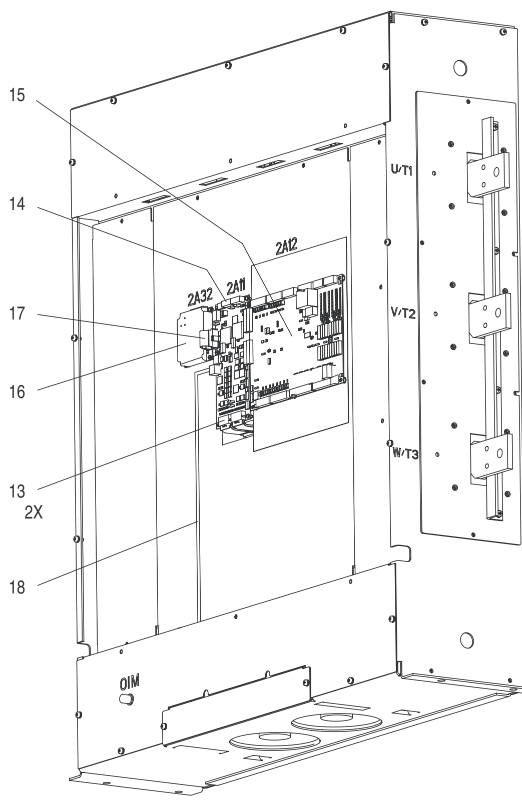
*The inverter control assembly (item 16) and rectifier control assembly (item 18) are physically similar but are loaded with different software. These boards are NOT interchangeable.

442A AND 608A VFDs

Fig. 7 — Power Module Components



Door Open



Door Closed

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

1169A VFD

Fig. 7 — Power Module Components (cont)

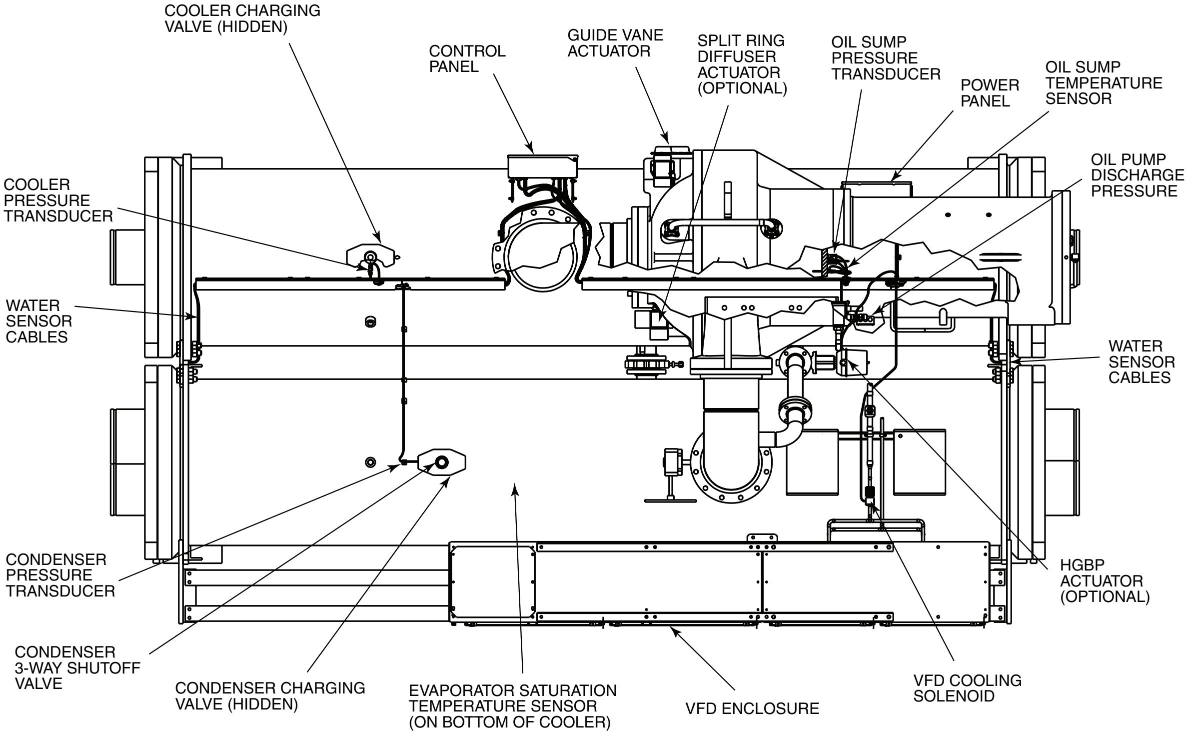


Fig. 8 — Chiller Controls and Sensor Locations

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 hermetic centrifugal liquid chiller contains a microprocessor-based control panel that monitors and controls all operations of the chiller. See Fig. 8 and 9. 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. 8.
Pressure Transducers	See Fig. 8.

*See Fig. 5-11.

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. 10) 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. 10.

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 130445-02	CESR 131350-0X	“PIC III” Marking on back of green circuit board

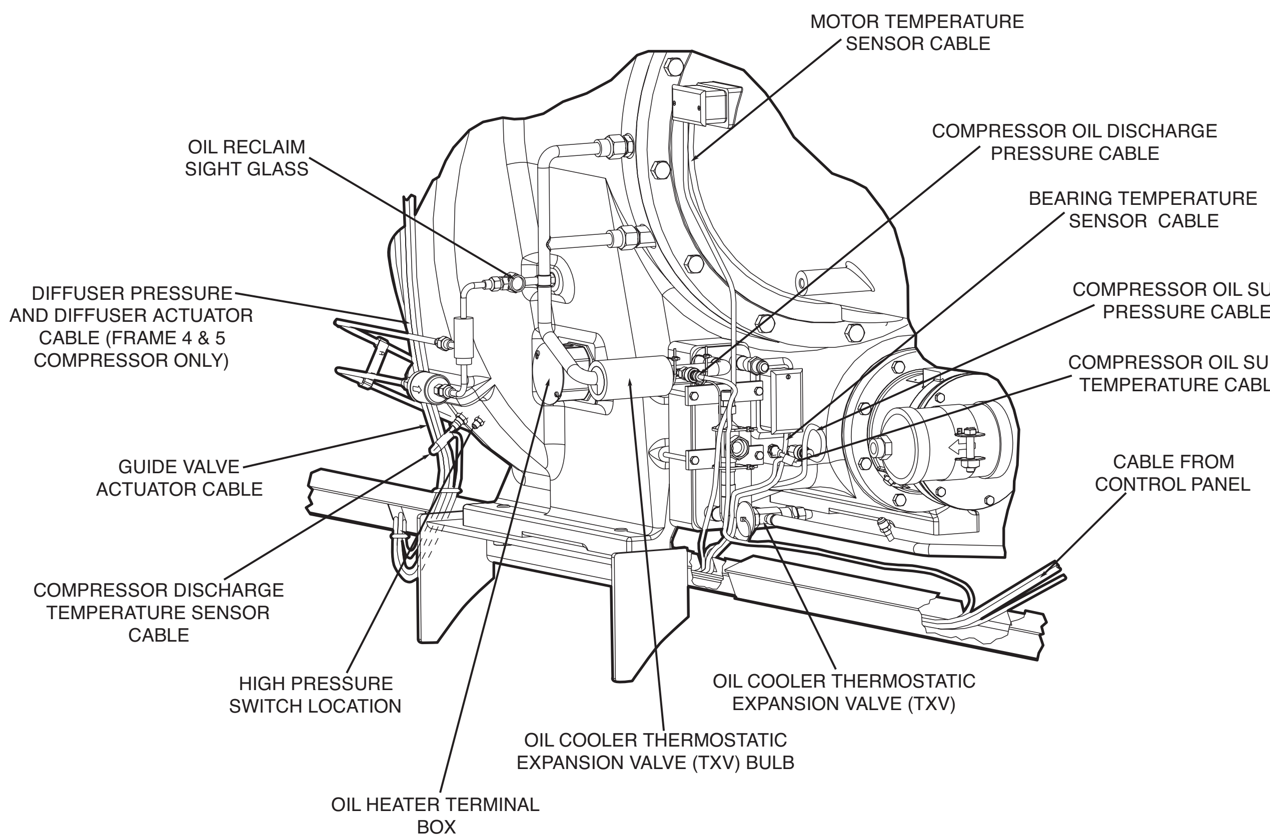


Fig. 9 — 19XRV Compressor Controls and Sensor Locations

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. 11) 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.

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 12 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.

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. 13. 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.

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

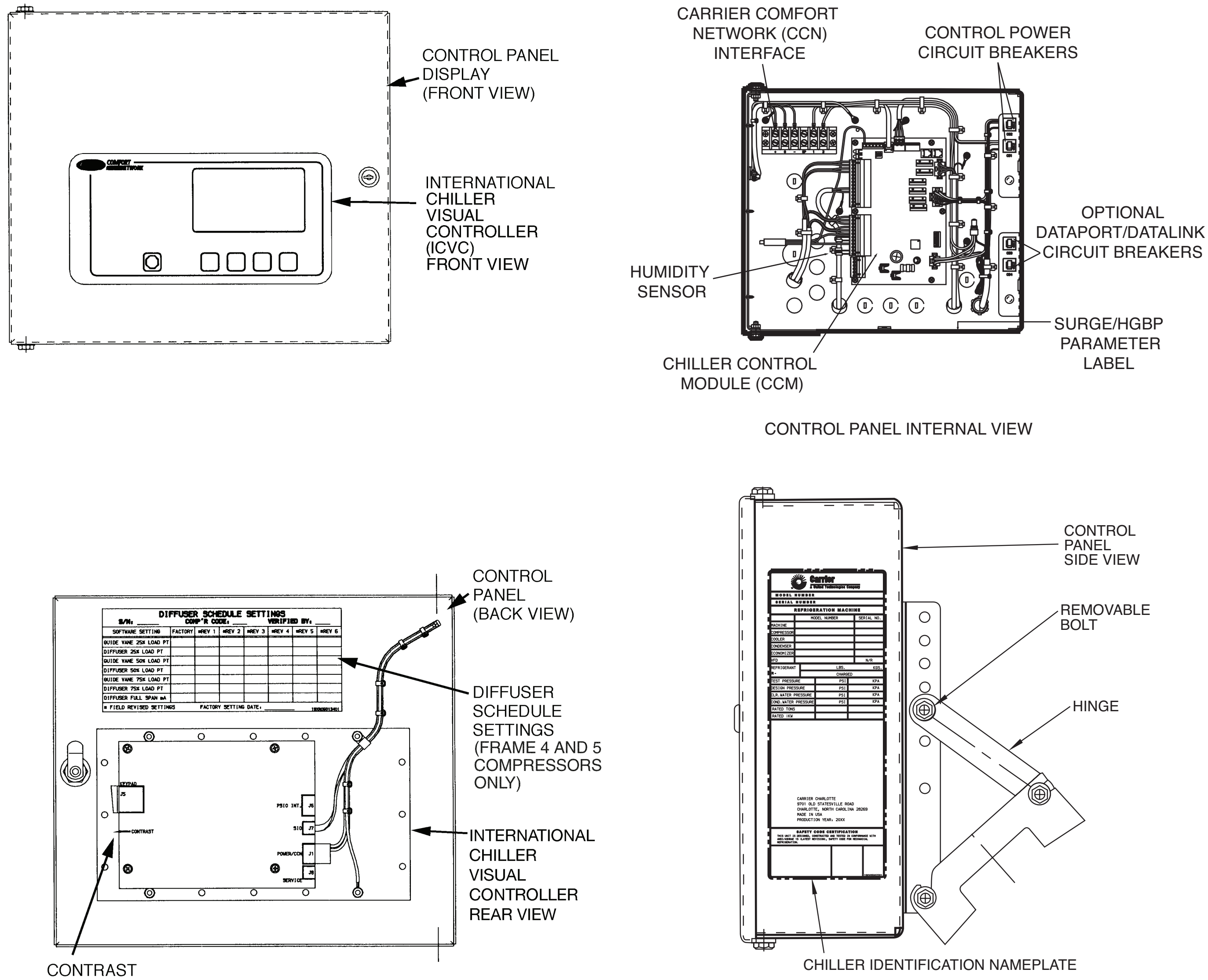


Fig. 10 — Control Panel

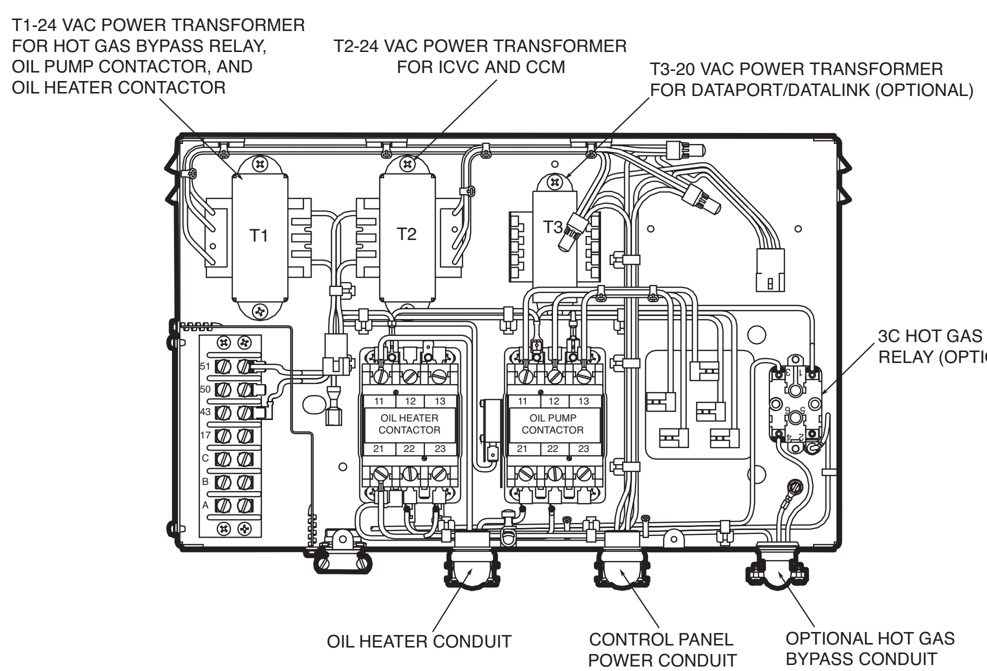


Fig. 11 — Power Panel

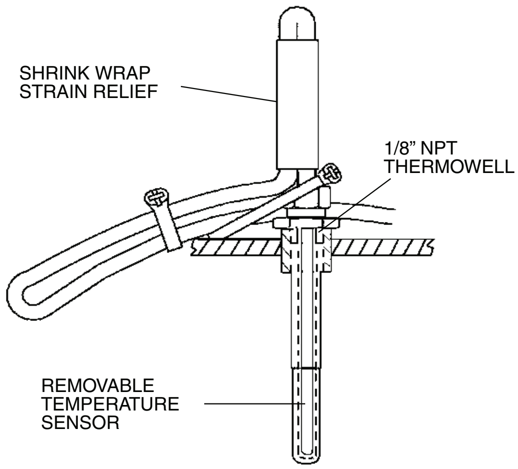


Fig. 12 — Temperature Sensor Used With Thermal Well

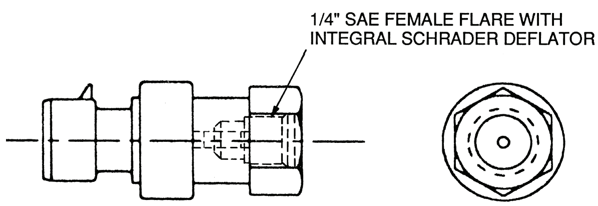


Fig. 13 — Control Sensors (Pressure Transducers, Typical)

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 the 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 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. (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 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, waterside 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 waterside 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 (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 4.3k ohm resistor between CCM terminals J3 17-18, replacing the jumper. See page 120. 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. 14-20)

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. 14).
- 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. 15.
- 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 51.

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. 16.

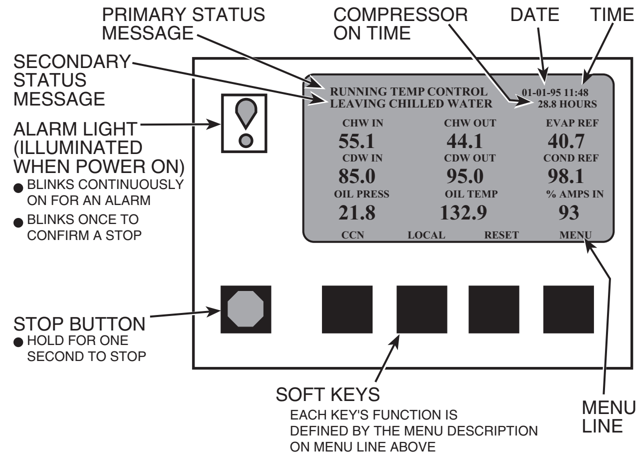


Fig. 14 — ICVC Default Screen

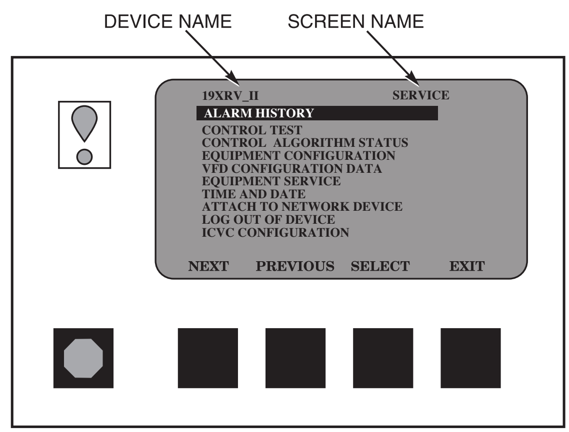


Fig. 15 — ICVC Service Screen

- 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. 17.

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 on page 23.

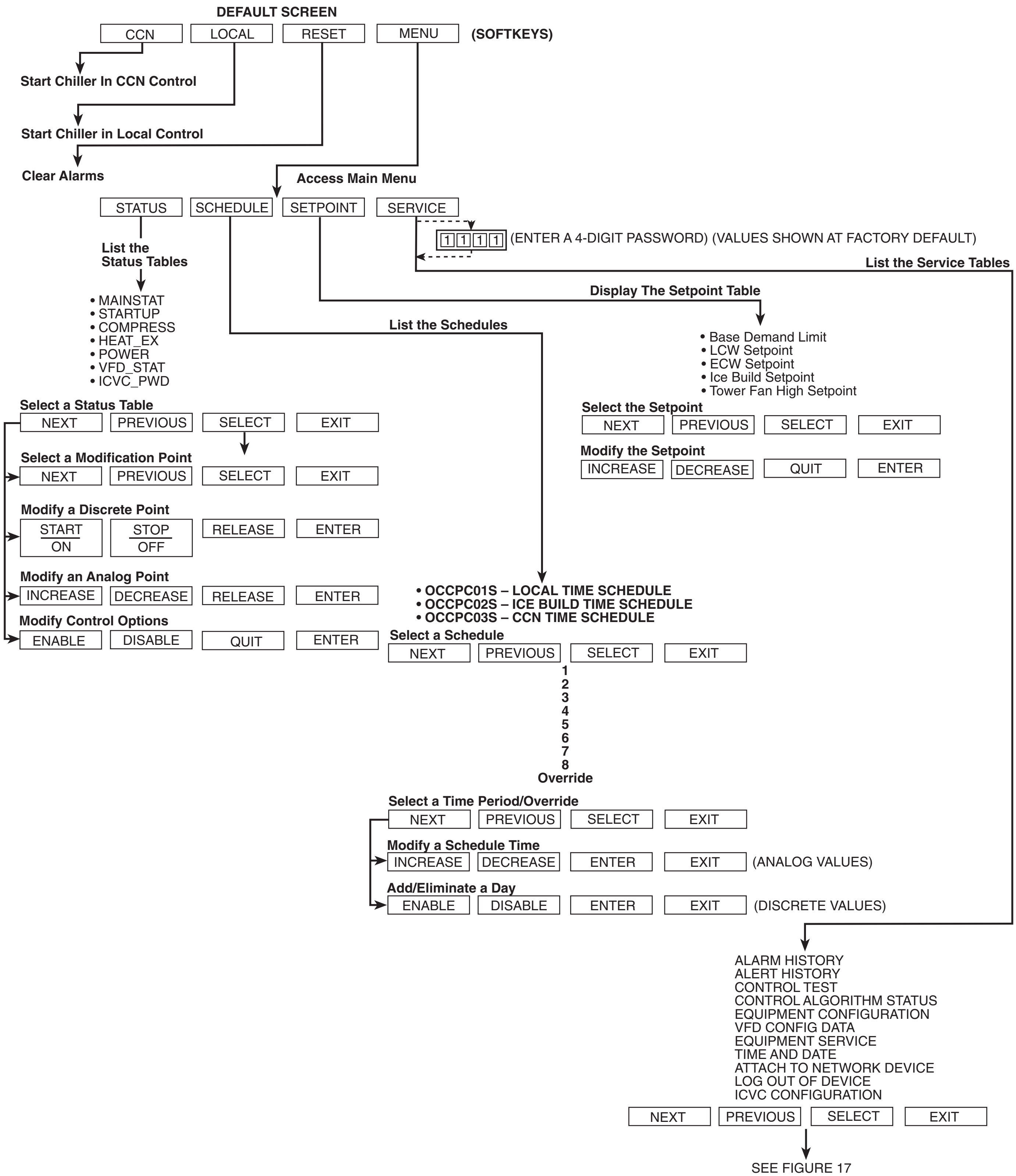


Fig. 16 — 19XRV Chiller Display Menu Structure (ICVC)

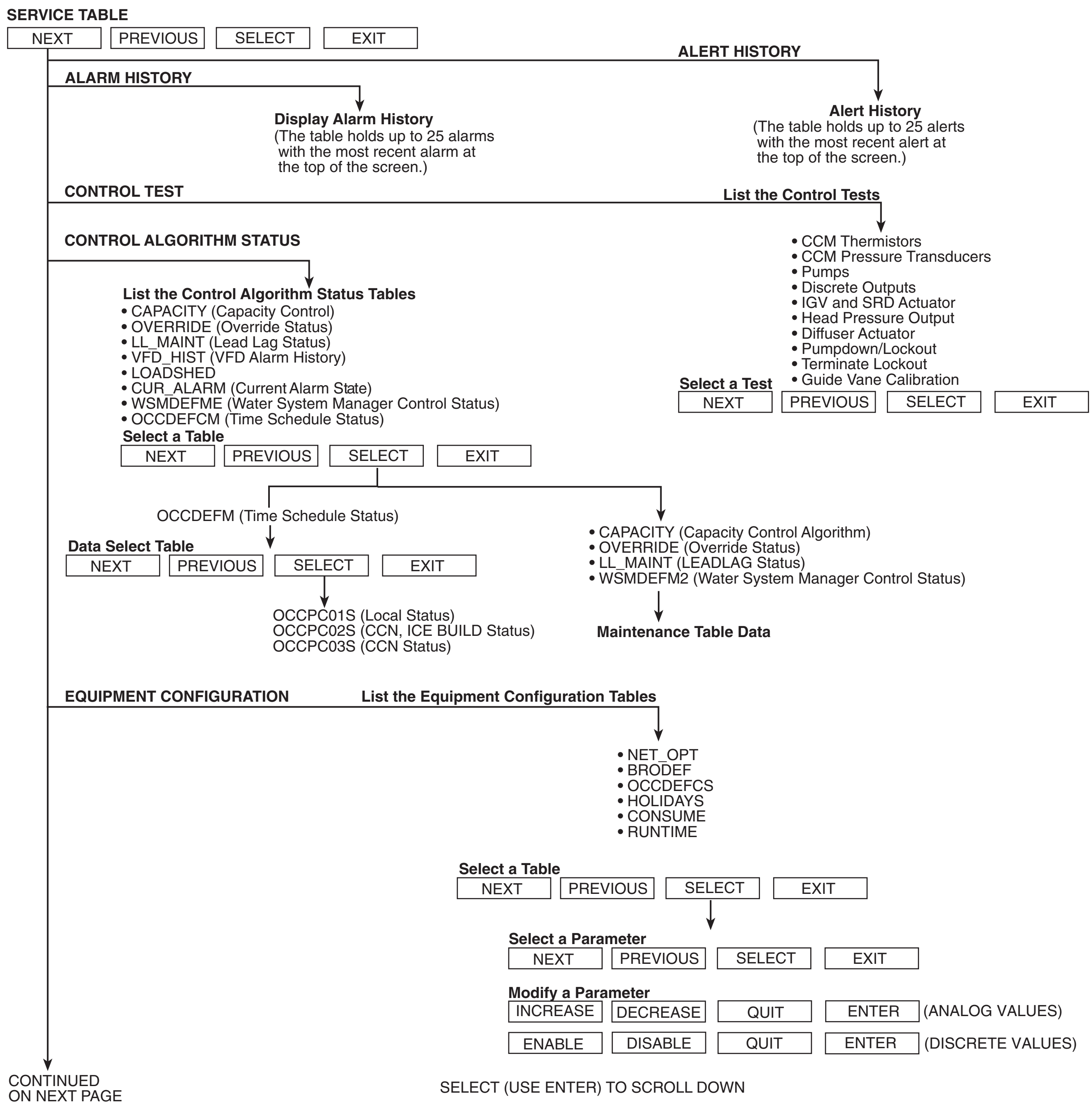
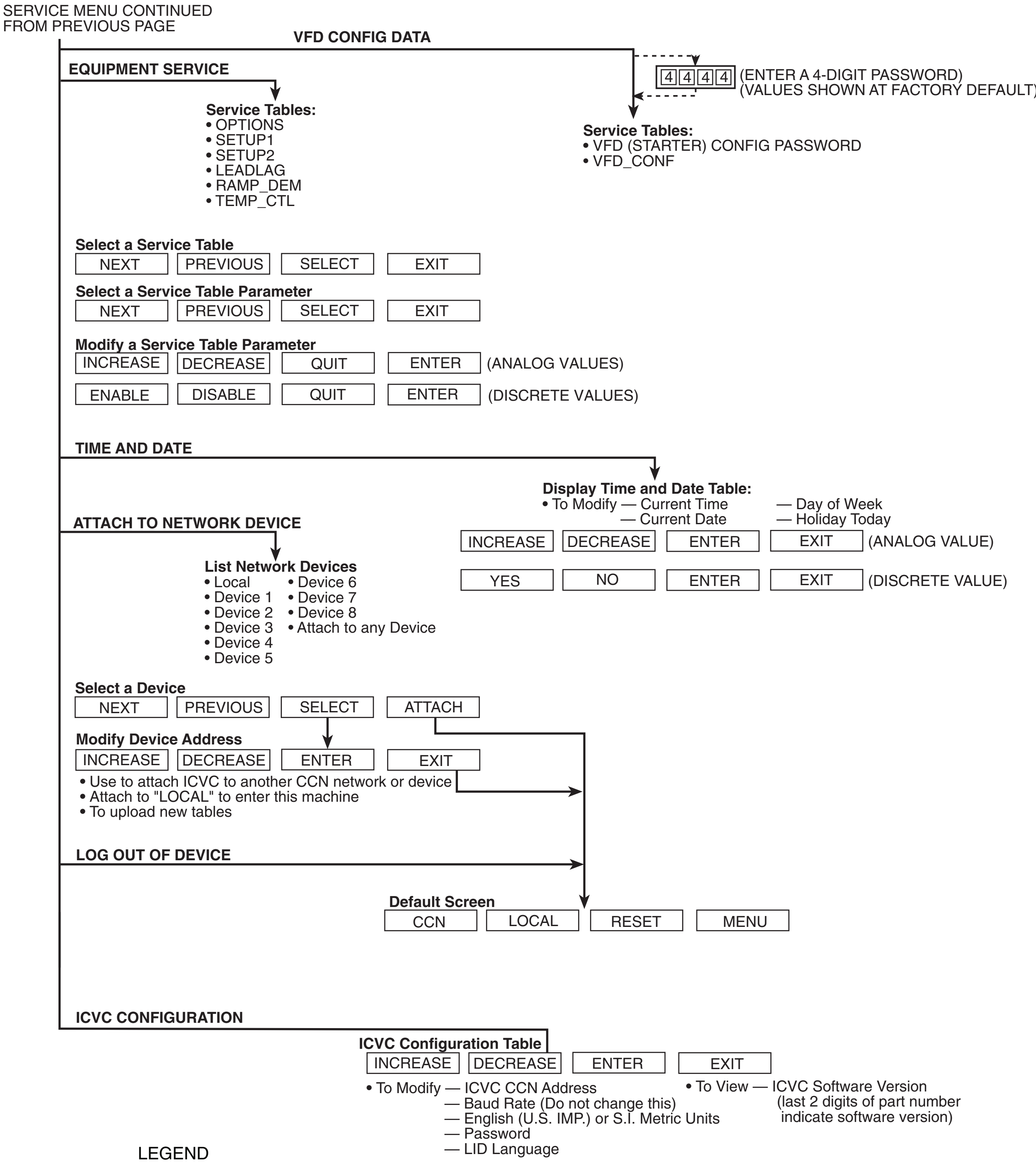


Fig. 17 — 19XRV Service Menu Structure



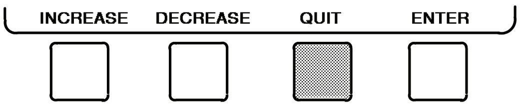
LEGEND

CCN — Carrier Comfort Network®
ICVC — International Chiller Visual Controller
PIC III — Product Integrated Control III
VFD — Variable Frequency Drive

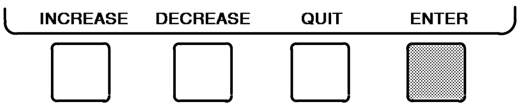
Fig. 17 — 19XRV Service Menu Structure (cont)

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.

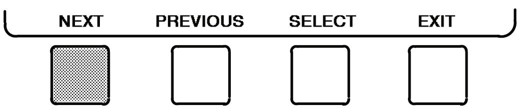
- Press QUIT to leave the selected decision or field without saving any changes.



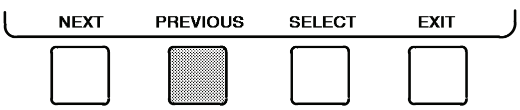
- Press ENTER to leave the selected decision or field and save changes.



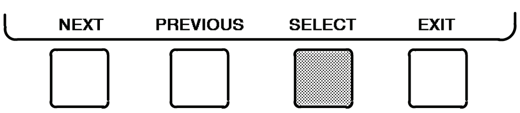
- Press NEXT to scroll the cursor bar down in order to highlight a point or to view more points below the current screen.



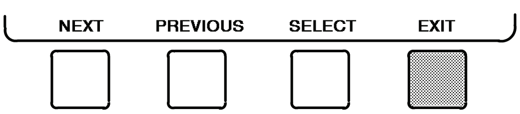
- Press PREVIOUS to scroll the cursor bar up in order to highlight a point or to view points above the current screen.



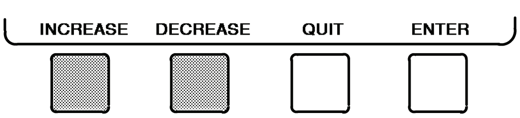
- Press SELECT to view the next screen level (highlighted with the cursor bar), or to override (if allowable) the highlighted point value.



- Press EXIT to return to the previous screen level.

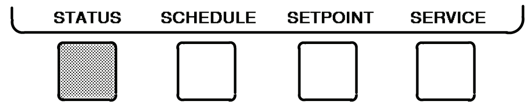


- Press INCREASE or DECREASE to change the highlighted point value.

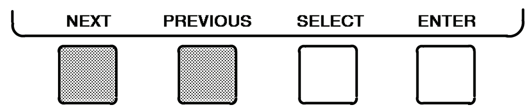


TO VIEW STATUS (Fig. 18) — The status table shows the actual value of overall chiller status such as CONTROL MODE, RUN STATUS, AUTO CHILLED WATER RESET, and REMOTE RESET SENSOR.

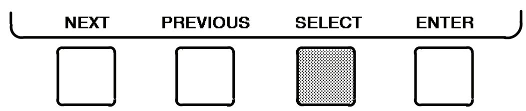
1. On the menu screen, press STATUS to view the list of point status tables.



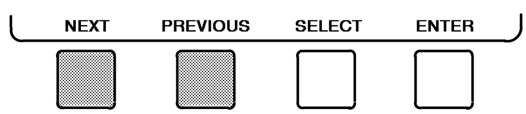
2. Press NEXT or PREVIOUS to highlight the desired status table. The list of tables is:
   - MAINSTAT — Overall chiller status
   - STARTUP — Status required to perform start-up of chiller
   - COMPRESS — Status of sensors related to the compressor
   - HEAT_EX — Status of sensors related to the heat 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.



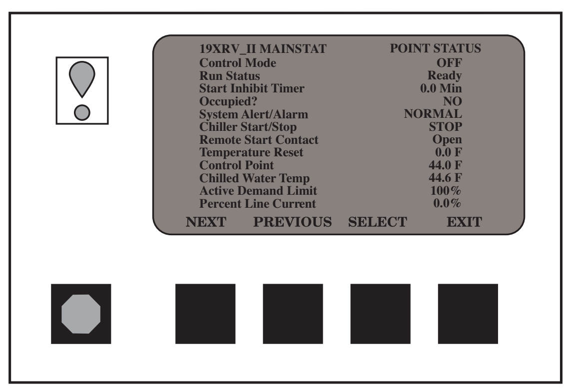
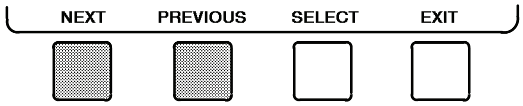


Fig. 18 — Example of Status Screen

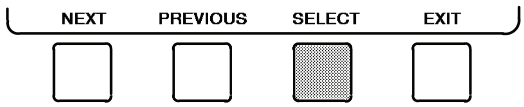
FORCING OPERATIONS

To Force (manually override) a Value or Status

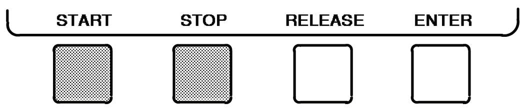
1. From any point status screen, press NEXT or PREVIOUS to highlight the desired value.



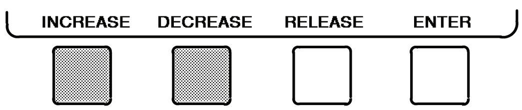
2. Press SELECT to select the highlighted value.



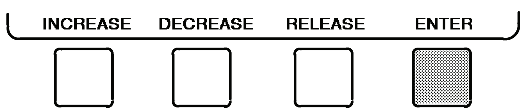
For Discrete Points — Press START or STOP to select the desired state.



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



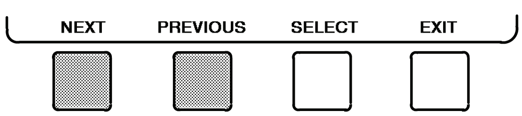
3. Press ENTER to register the new value.



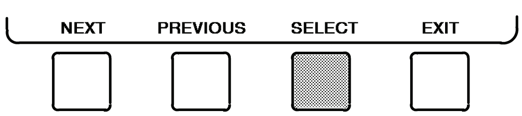
NOTE: When forcing or changing metric values, it is necessary to hold down the softkey for a few seconds in order to see a value change, especially on kilopascal values.

To Remove a Force

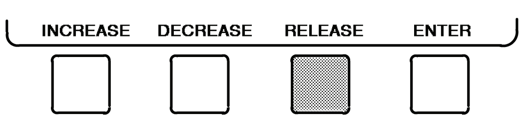
1. On the point status table press NEXT or PREVIOUS to highlight the desired value.



2. Press SELECT to access the highlighted value.



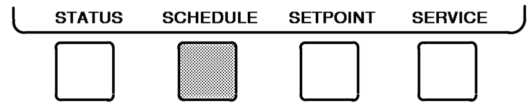
3. Press RELEASE to remove the force and return the point to the PIC III's automatic control.



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

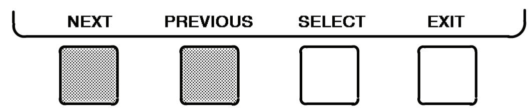
TIME SCHEDULE OPERATION (Fig. 19)

1. On the Menu screen, press SCHEDULE.

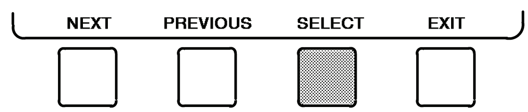


2. Press NEXT or PREVIOUS to highlight the desired schedule.

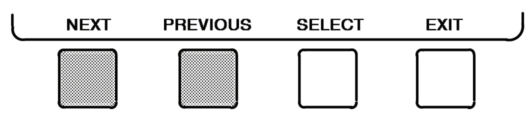
   OCCPC01S — LOCAL Time Schedule
   OCCPC02S — ICE BUILD Time Schedule
   OCCPC03S — CCN Time Schedule



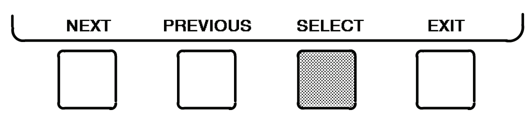
3. Press SELECT to view the desired time schedule.



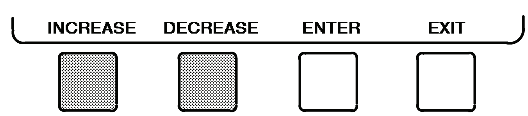
4. Press NEXT or PREVIOUS to highlight the desired period or override to change.



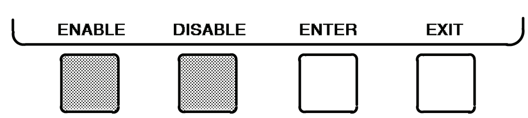
5. Press SELECT to access the highlighted PERIOD or OVERRIDE.



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.



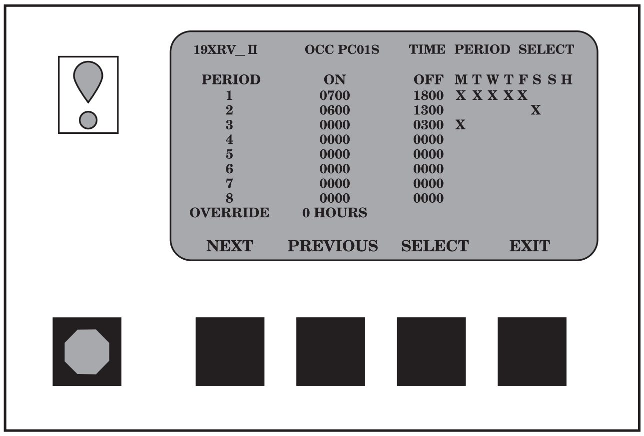
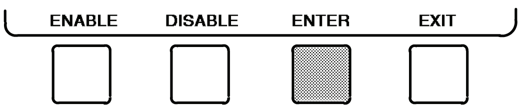
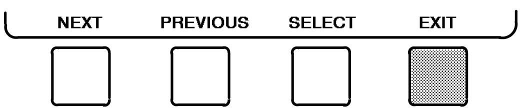


Fig. 19 — Example of Time Schedule Operation Screen

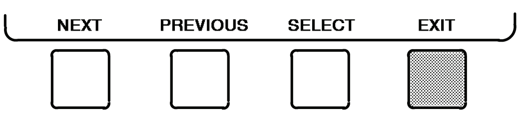
7. Press ENTER to register the values and to move horizontally (left to right) within a period.



8. Press EXIT to leave the PERIOD or OVERRIDE.



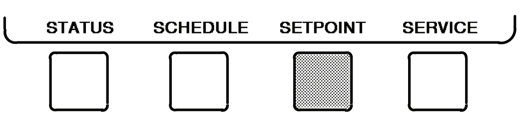
9. Either return to Step 4 to select another PERIOD or OVERRIDE, or press EXIT again to leave the current time schedule screen and save the changes.



10. The Holiday Designation (HOLIDEF table) may be found in the Service Operation section, page 51. 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.

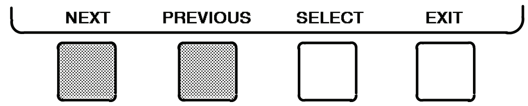
TO VIEW AND CHANGE SET POINTS (Fig. 20)

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

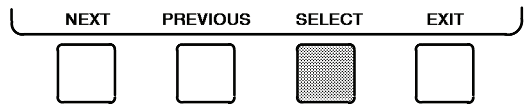


2. There are 5 set points on this screen: BASE DEMAND LIMIT, LCW SETPOINT (leaving chilled water set point), ECW SETPOINT (entering chilled water set point), ICE BUILD SETPOINT, and TOWER FAN HIGH SETPOINT. Only one of the chilled water set points can be active at one time. The set point that is active is determined from the SERVICE menu. See the Service Operation section, page 51. The ice build (ICE BUILD) function is also activated and configured from the SERVICE menu.

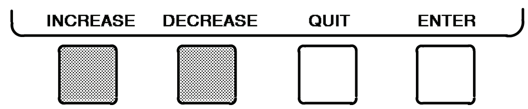
3. Press NEXT or PREVIOUS to highlight the desired set point entry.



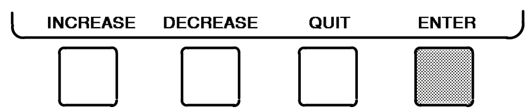
4. Press SELECT to modify the highlighted set point.



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 51. For examples of ICVC display screens, see Table 4.

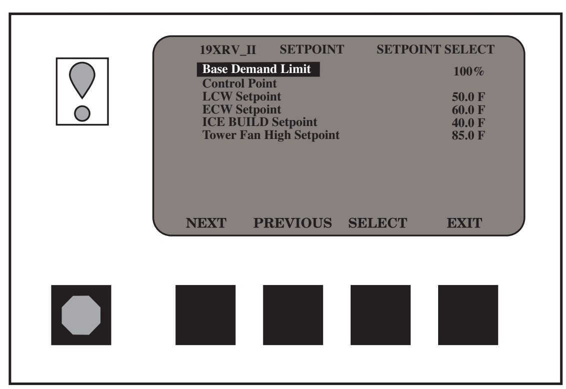


Fig. 20 — Example of Set Point Screen

Table 4 — ICVC Display Data

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

1. 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.
2. To access the information shown in Examples 10 through 22, 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 22.
3. Terms in the Description column of these tables are listed as they appear on the chiller display screen.
4. The ICVC may be configured in English or Metric (SI) units using the ICVC CONFIGURATION screen. See the Service Operation section, page 51, for instructions on making this change.
5. 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.
6. 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.
7. 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 19.

LEGEND

CCN — Carrier Comfort Network®
CHW — Chilled Water
CHWR — Chilled Water Return
CHWS — Chilled Water Supply
CT — Current Transformer
ECW — Entering Chilled Water
HGBP — Hot Gas Bypass
ICVC — International Chiller Visual Controller
LCW — Leaving Chilled Water
LRA — Locked Rotor Amps
mA — Milliamps
P — Pressure
PIC III — Product Integrated Controls III
SS — Solid State
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	%	AMPS_%	AMPS%
	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	NOTE 4	NOTE 4	SYS_ALM
***Chiller Start/Stop**	0/1	STOP/START	CHIL_S_S
***Remote Start Contact**	0/1	OPEN/CLOSE	REMCON
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	AUTODEM
Auto Chilled Water Reset	4-20	mA	AUTORES
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

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 (0), Alert (1), Alarm (2).
5. All variables with capital letter point names are available for CCN read operation. Those shown with (*) support write operations for all CCN devices.

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_POS
****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	OILR
****Oil Pump Delta P**	–6.7-200	^PSI	OILPD
Oil Sump Temp	–6.7-200	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
****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

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 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
****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 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
Surge Protection Counts	0-5		SPC

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 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
Evaporator Refrig Temp	–40-245	DEG F	ERT
****Evaporator Pressure**	–6.7-420	PSI	ERP
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 / HGBP 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
Evaporator Saturation Temp	–40-245	DEG F	EST

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 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

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

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

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 cancelled the time the user exits the Service menu/screen.

**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.

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
Demand Limit Inhibit	0.2-2.0	%	DEM_INH
Amps/kW Ramp	40-100	%	DMDLIM

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

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 Brg Temp	–40-245	DEG F	MTRB
Comp Thrust Brg Alert	165-185	DEG F	tb_alert
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 — 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: 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.

EXAMPLE 13 — 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
Chiller Fault State	200-225		VFDSTATH
VFD Fault Code	200-225		VFD_FLTH

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 14 — 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.

EXAMPLE 15 — 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.

Table 4 — ICVC Display Data (cont)

EXAMPLE 16 — 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**	346-480	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	100
Motor Nameplate RPM	1500-3600		motorpm	3456
Motor Nameplate KW	0-5600	kW	motorkw	100
Inverter PWM Frequency (0=4 k Hz, 1=2 k Hz)	0/1		pwm_freq	0
Skip Frequency 1	0.0-102.0	Hz	skipfrq1	102.0
Skip Frequency 2	0.0-102.0	Hz	skipfrq2	102.0
Skip Frequency 3	0.0-102.0	Hz	skipfrq3	102.0
Skip Frequency Band	0.0-102.0	Hz	skipband	0.0
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.

EXAMPLE 17 — 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
Auto Restart Option	0/1	DSABLE/ENABLE	astart	DSABLE
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		srg_hgbp	0
Select: Surge=0, HGBP=1				
Min. Load Point (T1,P1)				
Surge/HGBP Delta T1	0.5-20	^F	hgb_dt1	1.5
Surge/HGBP Delta P1	30-170	PSI	hgb_dp1	50
Full Load Point (T2,P2)				
Surge/HGBP Delta T2	0.5-20	^F	hgb_dt2	10
Surge/HGBP Delta P2	50-170	PSI	hgb_dp2	85
Surge/HGBP Deadband	0.5-3	^F	hgb_db	1
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=Contacts, 2=Both				
Ice Build Recycle	0/1	DSABLE/ENABLE	ibrecyc	DSABLE
Head Pressure Reference				
Delta P at 0% (4mA)	20-85	PSI	HPDPO	25
Delta P at 100% (20mA)	20-85	PSI	HPDP100	50
Minimum Output	0-100	%	HPDPMIN%	0

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

Table 4 — ICVC Display Data (cont)

EXAMPLE 18 — 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
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	0.5-15	^ F	EVAP_AL	5
Cond Approach Alert	0.5-15	^ 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
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.

EXAMPLE 19 — 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 Band	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	0.1-1.5		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

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 20 — 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
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 21 — 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
Demand Watts Interval	5-60	MIN	dw_int	15

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

EXAMPLE 22 — 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 14-20 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 SET POINT or ECW SET POINT or ICE BUILD SET POINT), 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 45) 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 and Gain on page 38.

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 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.

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 POSITION. 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 21 shows the relationship between diffuser-related parameters for a typical build.

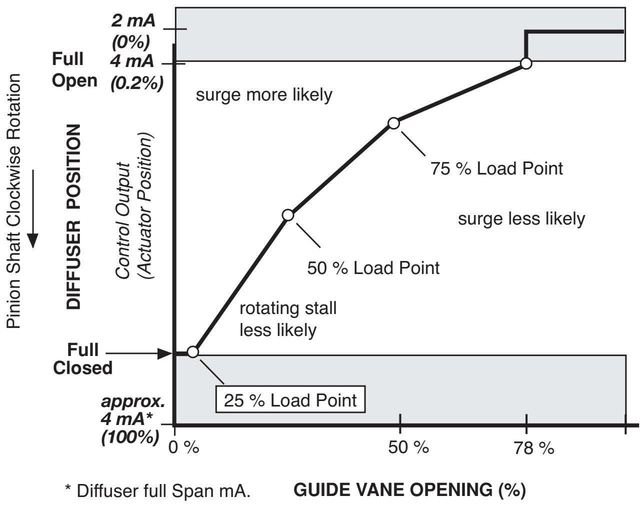


Fig. 21 — Diffuser Control

Diffuser control output is enabled whenever the DIFFUSER OPTION is enabled, whether the machine is running or not. As shown in Fig. 21, 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.

PROPORTIONAL BANDS AND GAIN — Proportional band is the rate at which capacity control (including guide vane position and, if applicable, VFD speed) is adjusted in proportion to how far the chilled water/brine temperature is from the CONTROL POINT. Proportional gain determines how quickly capacity control reacts to how quickly the temperature is moving from the *CONTROL POINT*. The proportional bands and gain may be viewed or modified from the SETUP2 screen, which is accessed from the EQUIPMENT SERVICE table.

<u>The Proportional Band</u> — There are two response modes, one for temperature response above the control point, the other for the response below the control point.

The temperature response above the control point is called the *PROPORTIONAL INC BAND*, and it can slow or quicken capacity control response to chilled water/brine temperatures above the *CHILLED WATER DEADBAND*. The *PROPORTIONAL INC BAN*D can be adjusted from a setting of 2 to 10; the default setting is 6.5.

The response below the control point is called the *PROPORTIONAL DEC BAND*, and it can slow or quicken the capacity control response to chilled water temperature below the deadband plus the control point. The *PROPORTIONAL DEC BAND* can be adjusted on the ICVC from a setting of 2 to 10. The default setting is 6.0.

NOTE: Increasing either of these settings causes the capacity control to respond more slowly than at a lower setting.

The *PROPORTIONAL ECW GAIN* can be adjusted on the ICVC display for values of 1, 2, or 3; the default setting is 2. Increase this setting to increase guide vane response to a change in entering chilled water temperature.

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 25, 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 47).

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 is 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 DEMAND LIMIT SOURCE is within the DEMAND LIMIT PROP BAND (configurable in the RAMP_DEM table).

<u>Demand Limit Control Option</u> — 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 “20MA 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.

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 startup with the new controller, is provided to set COMPRESSOR ONTIME and TOTAL 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 53, for more information on this topic.

OCCUPANCY SCHEDULE — The chiller schedule, described in the Time Schedule Operation section (page 24), 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 53.

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 24.

Figure 19 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 15. *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 the new number into the SCHEDULE screen. See Fig. 17.

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 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 82.

Shunt Trip — The function of the shunt trip on the PIC III is to act as a safety trip. The shunt trip is wired from the standard I/O board to a VFD circuit breaker. If the PIC III tries to shut down the compressor using a normal shutdown procedure but is unsuccessful for 20 seconds, the shunt trip output is energized and causes the circuit breaker to trip off. If ground fault protection has been applied to the VFD, the ground fault trip also energizes the shunt trip to trip the circuit breaker. Protective devices in the starter can also energize the shunt trip. The shunt trip feature can be tested using the Control Test feature in the DISCRETE OUTPUTS CONTROL TEST screen. When the VFD circuit breaker is tripped, there will be a loss of communication with the gateway (223) alarm.

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 record sheet (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.

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.

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 > 185 F (85 C)	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. Deenergizes 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 SETUP1 screen
Oil — Low Pressure	228	OIL PRESSURE DELTA P < 13 PSID and VFD START = TRUE	Preset Alarm
Low Pressure		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
Low Pressure	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
High	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
Low	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
Surge	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

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 the RAMP_DEM screen.

Capacity Override (Table 7) — 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 45.

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.

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.

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/HGBP DELTA T,P)	OPTIONS	Min T1: 1.5 F (0.8 C) Min P1: 50 psid (345 kPa) Max T2: 10 F (5.6 C) Max P2: 85 psid (586 kPad)	0.5 - 2.0 F (0.3 - 1.1 C) 30 - 170 psid (207 - 1172 kPad) 0.5 - 20 F (0.3 - 11.1 C) 50 - 170 psid (345 - 1172 kPad)	None	ACTIVE DELTA T > SURGE/ HGBP DELTA T + SURGE/HGBP DEADBAND
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)

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 OPTIONS 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 OPTIONS 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 47.

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.

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 82. 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).

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 deenergize 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.

⚠ CAUTION

The tower fan relay control is not a substitute for a condenser water temperature control. When used with a water temperature control system, the tower fan relay control can be used to help prevent low condenser water temperatures.

Auto. Restart After Power Failure — This option may be enabled or disabled and may be viewed or modified on the OPTIONS screen, which is accessed from the EQUIPMENT CONFIGURATION table. If the *AUTO RESTART OPTION* is enabled, the chiller will start up automatically after a power failure has occurred, generating one of the following faults: single cycle dropout (if enabled), line current imbalance, high line voltage, low line voltage, low DC bus voltage, high DC bus voltage, VFD power on reset, and ICVC power on reset (alerts 143-148, 165, and 166). 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 and 1-minute start inhibit timers are ignored during this type of start-up, and the STARTS IN 12 HOURS counter is not incremented.

When power is restored after the power failure and if the compressor had been running, the oil pump will energize for one minute before energizing the cooler pump. *AUTO RESTART* will then continue like a normal start-up.

If power to the ICVC module has been off for more than 3 hours or the timeclock has been set for the first time, start the compressor with the slowest TEMP PULLDOWN DEG/MIN 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.

Water/Brine Reset — 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 the 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 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 pressure 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.

The lift capability (surge line) of a variable speed compressor shifts upward as speed increases. Consequently, the line which serves as the surge prevention threshold is made to shift upward in a similar fashion as speed is increased. If the operating point goes above the surge prevention line as adjusted for the current operating speed, then surge prevention actions are taken. Note that the line constructed from SURGE/HGBP DELTA T1, SURGE/HGBP DELTA P1, SURGE/HGBP DELTA T2, and SURGE/HGBP DELTA P2 values is applied to the full speed condition only. These surge characteristics are factory set based on the original selection, with the values printed on a label affixed to the bottom interior face of the control panel. Since operating conditions may affect the surge prevention algorithm, some field adjustments may be necessary.

A chiller equipped with a VFD can adjust inlet guide position or compressor speed to avoid surge (if not already at COMPRESSOR 100% SPEED). Thus, the primary response to entering the surge prevention region or incurring an actual surge event (see the Surge Protection section) is to increase compressor speed. This moves the compressor’s surge line and the control's model of the surge prevention line up. Guide vanes are not permitted to open further when surge prevention is on. Once speed has been increased to maximum, if still operating in the surge prevention region, and if the Hot Gas Bypass option is installed, the hot gas bypass valve will open. When in Surge Prevention mode, with a command to decrease capacity the guide vanes will close but speed will not decrease.

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 *ACTUAL GUIDE VANE POSITION* or *ACTUAL VFD 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.

The surge prevention algorithm first determines if corrective action is necessary. The algorithm checks two sets of operator-configured data points, the lower surge point *(MIN. LOAD POINT [T1,P1])* and the upper surge point *(FULL LOAD POINT [T2,P2])*. The surge characteristics vary between different chiller configurations and operating conditions.

The surge prevention algorithm function and settings are graphically displayed on Fig. 22 and 23. The two sets of load points on the graph (default settings are shown) describe a line the algorithm uses to determine the maximum lift of the compressor for the design maximum operating speed. When the actual differential pressure between the cooler and condenser (delta P) and the temperature difference between the entering and leaving chilled water (delta T) are above the line on the graph (as defined by the *MIN LOAD POINTS* and *FULL LOAD POINTS*), the algorithm operates in Surge Prevention mode. This is determined when the *ACTIVE DELTA T* is less than *SURGE/HGBP DELTA T* minus the *SURGE/HGBP DEADBAND.*

When in Surge Prevention mode, with a command to increase capacity, the VFD speed will increase until *VFD MAXIMUM SPEED* is reached. At *VFD MAXIMUM SPEED*, when Capacity still needs to increase, the inlet guide vanes (IGV) open. When in Surge Prevention mode, with a command to decrease capacity, the IGVs will close. The optional hot gas bypass will open in surge prevention mode only if the *TARGET VFD SPEED* is at the *VFD MAXIMUM SPEED.*

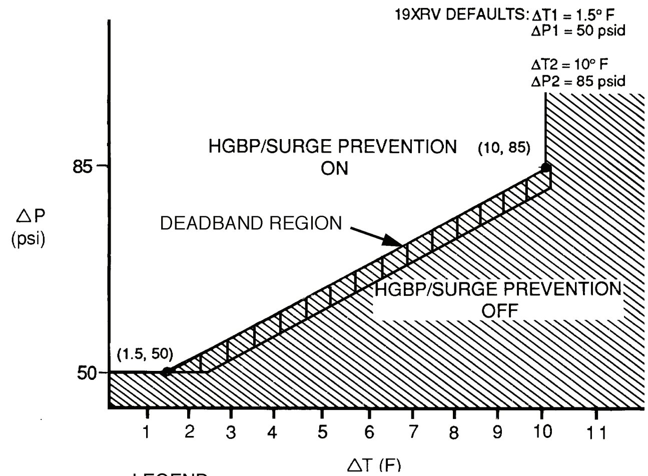
Surge Protection — The PIC III monitors surge, which is detected as a fluctuation in compressor motor amperage. Each time the fluctuation exceeds an operator-specified limit, the PIC III registers a surge protection count. The current fluctuation threshold that triggers a surge protection count is equal to the sum of *SURGE DELTA % AMPS* plus the *CHILLED WATER DELTA T.* If more than 5 surges occur within an operator-specified time *(SURGE TIME PERIOD)*, the PIC III initiates a surge protection shutdown of the chiller. The *SURGE PROTECTION COUNTS* remain displayed in the *COMPRESS* screen until the alarm is reset, at which time they are re-zeroed.

If a surge count is registered and if *ACTUAL VFD SPEED* is less than *VFD MAXIMUM SPEED* then motor speed will be increased by the configured VFD INCREASE STEP. While the *SURGE PROTECTION COUNTS* are > 0, a speed decrease will not be honored.

The portion of the surge count threshold attributable to current can be adjusted from the OPTIONS screen (see Table 4). Scroll down to the *SURGE DELTA % AMPS* parameter, and use the INCREASE or DECREASE softkey to adjust the percent current fluctuation. The default setting is 10% amps.

The *SURGE TIME PERIOD* can also be adjusted from the OPTIONS screen. Scroll to the *SURGE TIME PERIOD* parameter, and use the INCREASE or DECREASE softkey to adjust the amount of time. The default setting is 8 minutes.

Access the display screen (COMPRESS) to monitor the surge count (*SURGE PROTECTION COUNTS*).

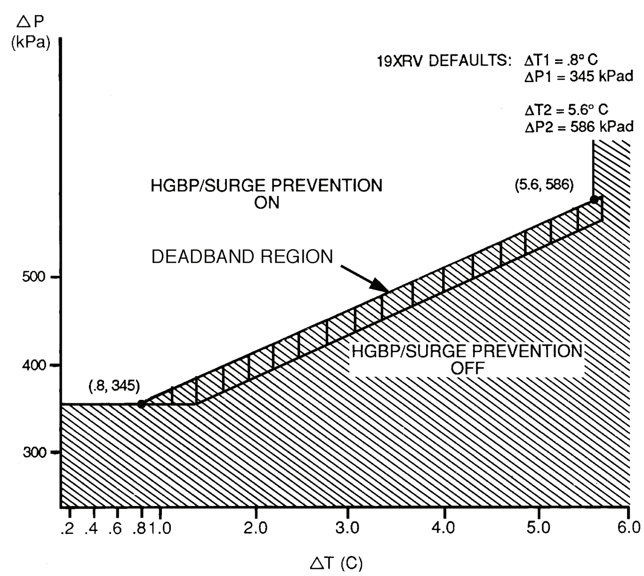


LEGEND

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

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

Fig. 22 — 19XRV Hot Gas Bypass/Surge Prevention with Default English Settings



LEGEND

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

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

Fig. 23 — 19XRV Hot Gas Bypass/Surge Prevention with Default Metric Settings

Head Pressure Reference Output (See Fig. 24) — 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. 24. The *DELTA P AT 100%* (chiller at maximum load condition default at 50 psi), *DELTA P AT 0%* (chiller at minimum load condition default at 25 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.

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. 17 and 18 for menu, table, and screen selection information.

NOTE: The lead/lag function can be configured on the LEADLAG screen, which is accessed from the SERVICE menu and EQUIPMENT SERVICE table. See Table 4, Example 20. 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 12.

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

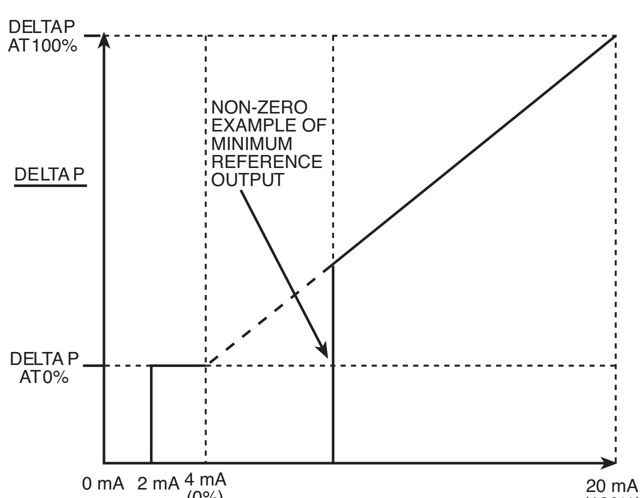


Fig. 24 — Head Pressure Reference Output

- 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. Lead chiller ramp loading must be complete.
2. 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.
3. Lead chiller *ACTIVE DEMAND LIMIT* (see the MAINSTAT screen) value must be greater than 95% of full load amps.
4. 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 sustained period of 100 seconds.
5. 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.
6. The configured *LAG START TIMER* entry has elapsed. The *LAG START TIMER* starts when the lead chiller ramp loading is completed. The *LAG START TIMER* entry is on the LEADLAG screen, which is accessed from the EQUIPMENT SERVICE table of the SERVICE menu.

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.

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 17.
- 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. 19 and the section on Time Schedule Operation, page 24, 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/STOP* 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 reinitiated 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 25 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. 18. 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. 25.

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.

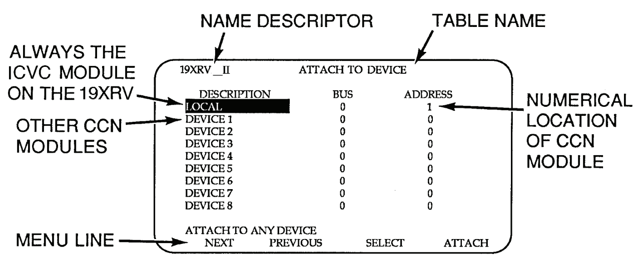
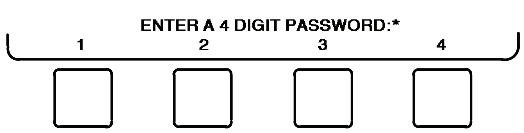


Fig. 25 — Example of Attach to Network Device Screen

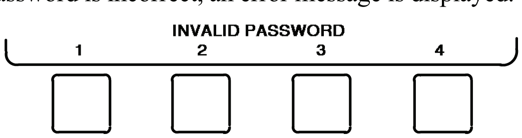
Service Operation — An overview of the tables and screens available for the SERVICE function is shown in Fig. 18.

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

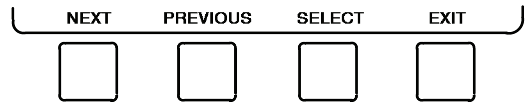
1. From the main MENU screen, press the SERVICE softkey. The softkeys now correspond to the numerals 1, 2, 3, 4.
2. Press the four digits of the password, one at a time. An asterisk (*) appears as each digit is entered.



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. 18 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. 26) — 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. 19.) 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. 18.

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.

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 14, 2003, is Day 1 Week 2, but April 15, 2003, is Day 2 Week 3.
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).

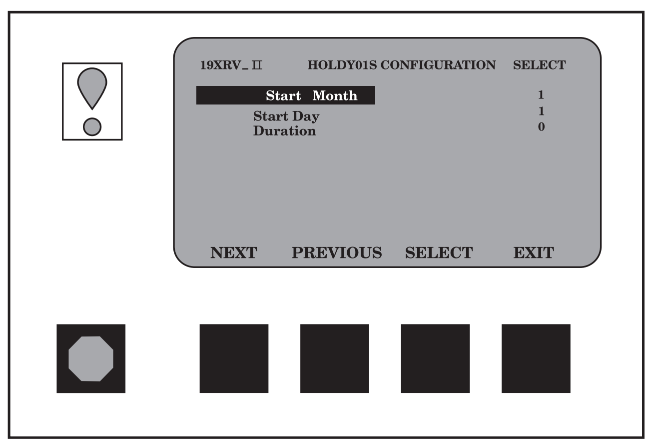


Fig. 26 — Example of Holiday Period Screen

START-UP/SHUTDOWN/ RECYCLE SEQUENCE (Fig. 27)

Local Start-Up — 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.

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 24), Occupancy Schedule (page 39), and To Prevent Accidental Start-Up (page 70), and Fig. 19.

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 7. 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).

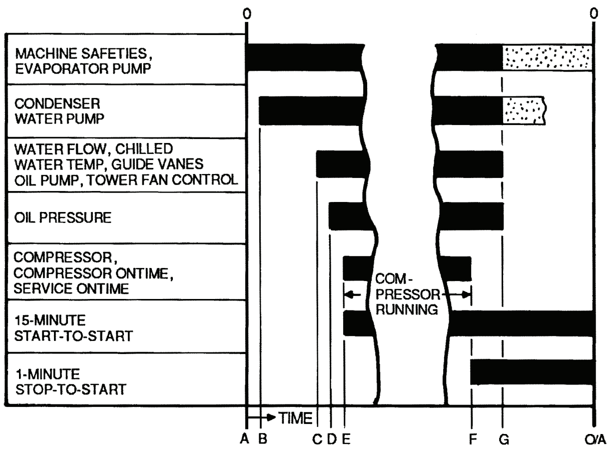
If the water/brine temperature is high enough, the start-up sequence continues and checks the guide vane position. If the guide vanes are more than 4% open, the start-up is delayed until the PIC III closes the vanes. If the vanes are closed and the oil pump pressure is less than 4 psi (28 kPa), the oil 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.

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 ALERT] –10° F (5.6° C)	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) or <[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



A — START INITIATED: Pre-start checks are made; evaporator pump started.

B — Condenser water pump started (5 seconds after A).

C — Water flows verified (30 seconds to 5 minutes maximum after B). Chilled water temperatures checked against control point. Guide vanes checked for closure. Oil pump started; tower fan control enabled.

D — Oil pressure verified (15 seconds minimum, 300 seconds maximum after C).

E — Compressor motor starts; compressor ontime and service ontime start, 15-minute inhibit timer starts (10 seconds after D), total compressor starts advances by one, and the number of starts over a 12-hour period advances by one.

F — SHUTDOWN INITIATED — Compressor motor stops; compressor ontime and service ontime stop, and 1-minute inhibit timer starts.

G — Oil pump and evaporator pumps 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. 27 — Control Sequence

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.

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 49).

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. 28)
- 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 Chillers with Storage Tanks section, page 74 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.

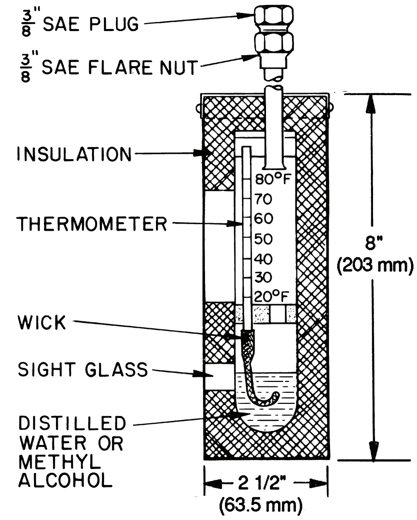


Fig. 28 — Typical Wet-Bulb Type Vacuum Indicator

Open Oil Circuit Valves — Check to ensure the oil filter isolation valves (Fig. 4) are open by removing the valve cap and checking the valve stem.

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)

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

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

Check Chiller Tightness — Figure 29 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.

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.

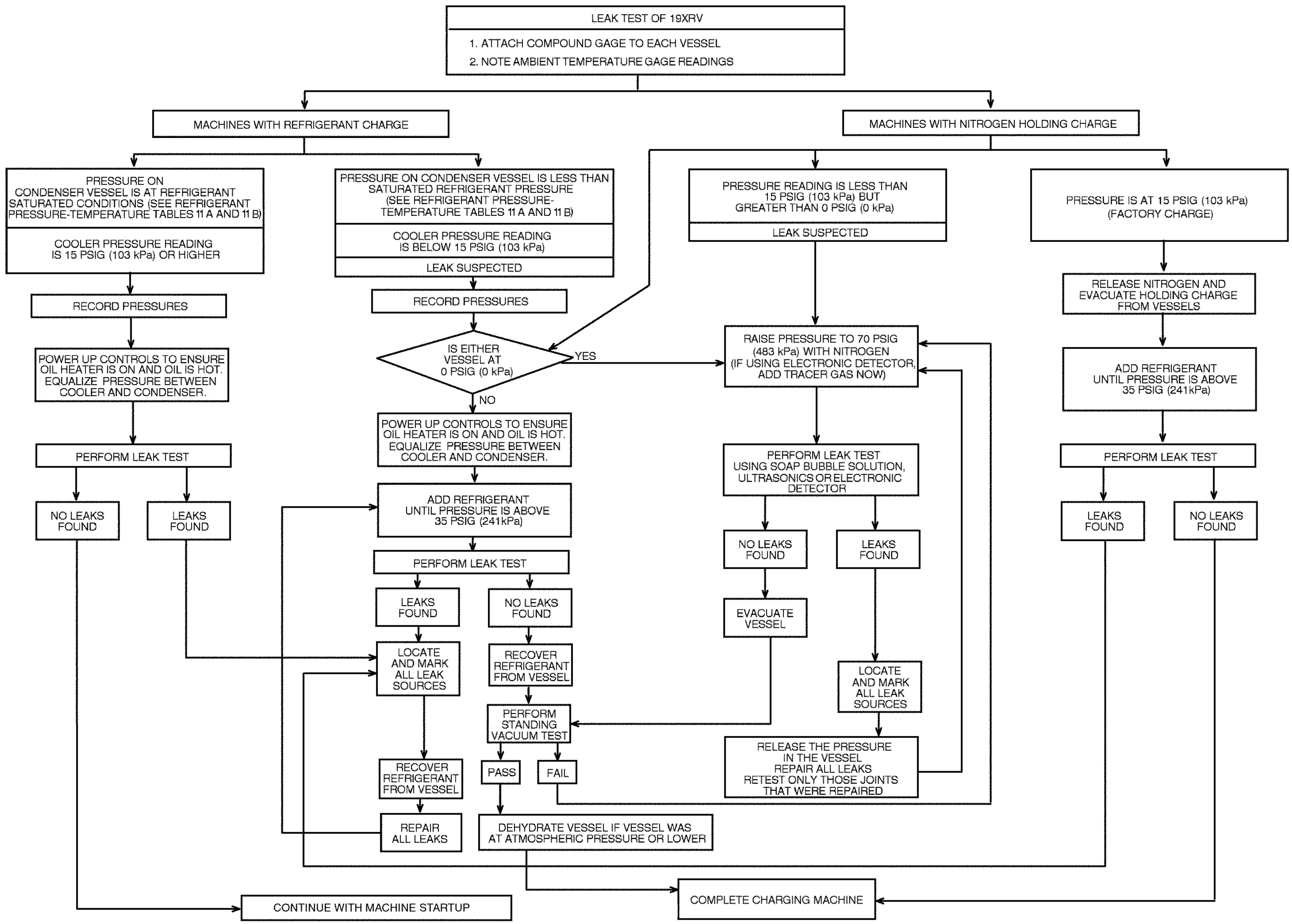


Fig. 29 — 19XRV Leak Test Procedures

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. 29 for an outline of the leak test procedure. Refer to Fig. 30 and 31 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 Pumpout Storage Tank to Chiller section, Steps 1a - e, page 75.

> **⚠ 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 61.
   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 Pumpout Storage Tank to Chiller section, page 75). 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 Pumpout Storage Tank to Chiller section, page 75).
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 the 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 74) 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, repressurize the vessel and test for leaks. If refrigerant is available in the other vessel, pressurize by following Steps 2-10 of Return Chiller To Normal Operating Conditions section, page 76. 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.

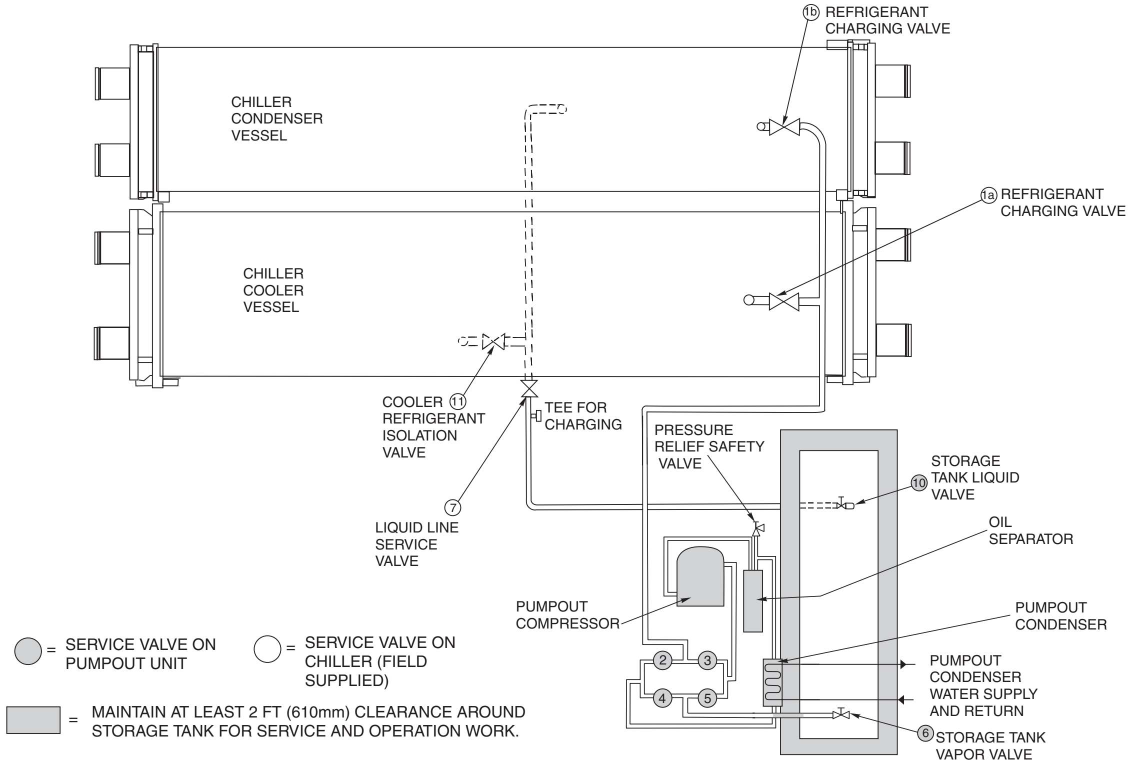


Fig. 30 — Typical Optional Pumpout System Piping Schematic with Storage Tank

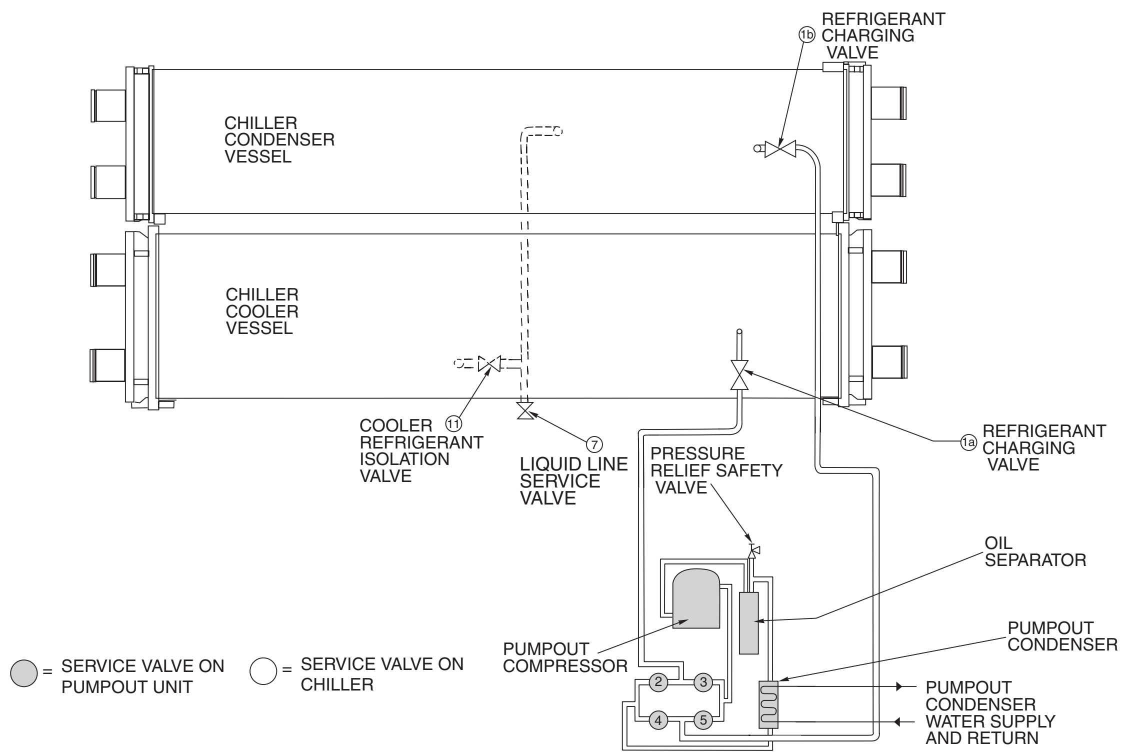


Fig. 31 — Typical Optional Pumpout System Piping Schematic without Storage Tank

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. 32) may substantially reduce the time required to complete the dehydration. The higher the room temperature, the faster dehydration takes place. At low room temperatures, a very deep vacuum is required to boil off any moisture. If low ambient temperatures are involved, contact a qualified service representative for the dehydration techniques required.

Perform dehydration as follows:

1. Connect a high capacity vacuum pump (5 cfm [.002 m^3/s] or larger is recommended) to the refrigerant charging valve (Fig. 2). Tubing from the pump to the chiller should be as short in length and as large in diameter as possible to provide least resistance to gas flow.
2. Use an absolute pressure manometer or a 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.

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.

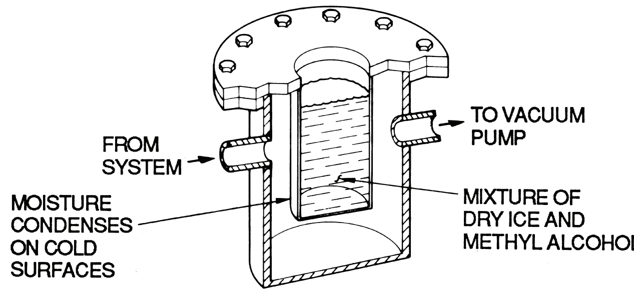


Fig. 32 — Dehydration Cold Trap

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.

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. 30 and 31.

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's nameplate (Fig. 33) and the model number matrix in (Fig. 34).

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)

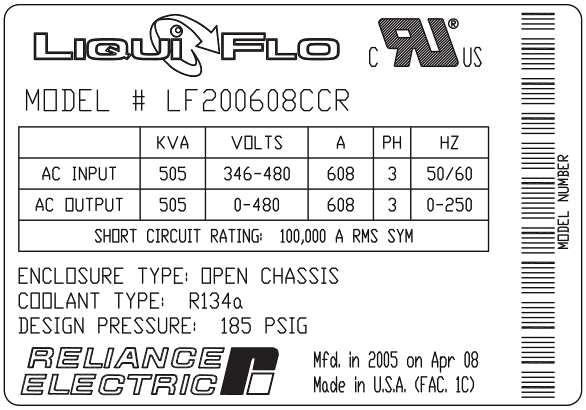


Fig. 33 — VFD Nameplate

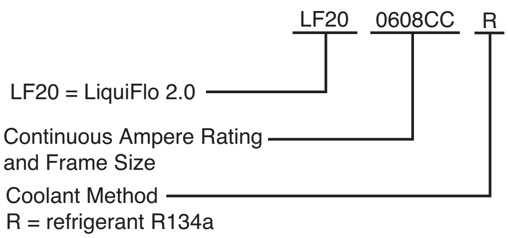


Fig. 34 — Identifying the Drive Model Number

IDENTIFYING THE DRIVE BY PART NUMBER — Each AC drive can be identified by its assembly number. See Fig. 33. This number appears on the shipping label and on the drive's nameplate. LiquiFlo™ 2.0 AC power module can be identified by its model number. See Fig. 34. 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 deenergize 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.

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 14.

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

VERIFY VFD CONFIGURATION AND CHANGE PARAMETERS IF NECESSARY (Fig. 35)

> 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:

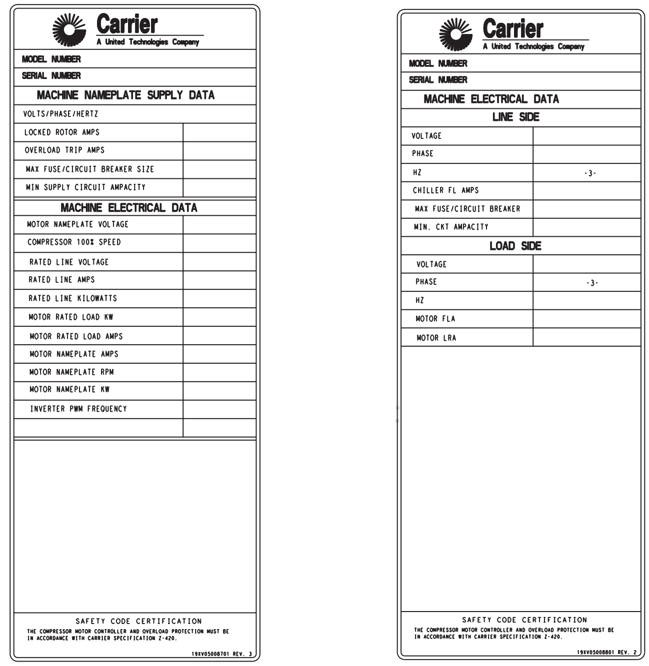
- Surge Parameters — Located inside the control panel. See Fig. 10.
- Refrigeration Machine Nameplate — Located on the right side of the control panel. See Fig. 10.
- External Machine Electrical Data Nameplate — Located on the right side of the VFD as viewed from its front. See Fig. 35.
- Internal Machine Electrical Data Nameplate — Located on the inside of the left VFD enclosure door. See Fig. 35.
- Record all nameplate information on the Initial Start-up Checklist at the end of this manual.

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.



INTERNAL EXTERNAL

Fig. 35 — Machine Electrical Data Nameplate

- 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.

See the Initial Start-Up Checklist section for VFD Job Specific Configuration table. For job specific parameters see the Machine Electrical Data Nameplate inside of the VFD enclosure door. See Fig. 35.

Modify Minimum and Maximum Load Points (ΔT1/P1; ΔT2/P2) If Necessary — These pairs of chiller load points, located on the OPTIONS screen, determine when to limit guide vane travel or open the hot gas bypass valve when surge prevention is needed. These points should be set based on individual chiller operating conditions. SET SURGE LIMIT/HGBP OPTION to 0 if the chiller is not equipped with an optional hot gas bypass. Set SURGE LIMIT/HGBP OPTION to 1 if a hot gas bypass has been installed.

A label that lists the configuration values of the controls is located on the inside of the unit's control panel. These values are based upon the original selection of the chiller. Jobsite conditions may require a slight modification to these parameters.

If, after configuring a value for these points, surge prevention is operating too soon or too late for conditions, these parameters should be changed by the operator.

An example of such a configuration is shown below.

Refrigerant: HCFC-134a

Estimated Minimum Load Conditions:

44 F (6.7 C) LCW
45.5 F (7.5 C) ECW
43 F (6.1 C) Suction Temperature
70 F (21.1 C) Condensing Temperature

Estimated Maximum Load Conditions:

44 F (6.7 C) LCW
54 F (12.2 C) ECW
42 F (5.6 C) Suction Temperature
98 F (36.7 C) Condensing Temperature

Calculate Maximum Load — To calculate the maximum load points, use the design load condition data. If the chiller full load cooler temperature difference is more than 15 F (8.3 C), estimate the refrigerant suction and condensing temperatures at this difference. Use the proper saturated pressure and temperature for the particular refrigerant used.

Suction Temperature:
42 F (5.6 C) = 37 psig (255 kPa) saturated refrigerant pressure (HFC-134a)

Condensing Temperature:
98 F (36.7 C) = 120 psig (1827 kPa) saturated refrigerant pressure (HFC-134a)

Maximum Load ΔT2:
54 – 44 = 10º F (12.2 – 6.7 = 5.5º C)

Maximum Load ΔP2:
120 – 37 = 83 psid (827 – 255 = 572 kPad)

To avoid unnecessary surge prevention, add about 10 psid (70 kPad) to ΔP2 from these conditions:

ΔT2 = 10º F (5.5º C)
ΔP2 = 93 psid (642 kPad)

Calculate Minimum Load — To calculate the minimum load conditions, estimate the temperature difference the cooler will have at 10% load, then estimate what the suction and condensing temperatures will be at this point. Use the proper saturated pressure and temperature for the particular refrigerant used.

Suction Temperature:
43 F (6.1 C) = 38 psig (262 kPa) saturated refrigerant pressure (HFC-134a)

Condensing Temperature:
70 F (21.1 C) = 71 psig (490 kPa) saturated refrigerant pressure (HFC-134a)

Minimum Load ΔT1 (at 20% Load): 2 F (1.1 C)

Minimum Load ΔP1:
71 – 38 = 33 psid (490 – 262 = 228 kPad)

Again, to avoid unnecessary surge prevention, add 20 psid (140 kPad) at ΔP1 from these conditions:
ΔT1 = 2 F (1.1 C)
ΔP1 = 53 psid (368 kPad)

If surge prevention occurs too soon or too late:

LOAD	SURGE PREVENTION OCCURS TOO SOON	SURGE PREVENTION OCCURS TOO LATE
At low loads (<50%)	Increase P1 by 2 psid (14 kPad)	Decrease P1 by 2 psid (14 kPad)
At high loads (>50%)	Increase P2 by 2 psid (14 kPad)	Decrease P2 by 2 psid (14 kPad)

If variable evaporator flow is employed, changes to ΔT1 are required proportional to the reduction in flow rate.

The differential pressure (ΔP) and temperature (ΔT) can be monitored during chiller operation by viewing *ACTIVE DELTA P* and *ACTIVE DELTA T* (HEAT_EX screen). Comparing *SURGE/HGBP DELTA T* to *ACTIVE DELTA T* will determine when the SURGE PREVENTION function will occur. The smaller the difference between the *SURGE/HGBP DELTA T* and the *ACTIVE DELTA T* values, the closer to surge prevention.

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.

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. 10.

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*.

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.

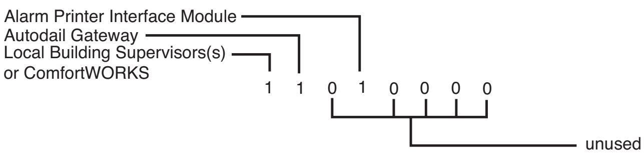
- first bit = 1 indicates that the alarm should be read and processed by a "front end" device, such as a ComfortWORKS® device.
- second bit = 1 indicates that the alarm should be read and processed by a TeLINK™ or Autodial Gateway module.
- fourth bit = 1 indicates that the alarm should be read and processed 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. 36.

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. 36 — 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 13.

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).

Table 13 — 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 Saturation 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 Chilled Water Delta 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 startup 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.

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 13.

PRESSURE TRANSDUCER CALIBRATION — 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 74 and 81, 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. 30 and 31, 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. 30 and 31. 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 will vary with chiller components and design conditions, as indicated on the job data specifications. An approximate charge may be determined by adding the condenser charge to the cooler charge as listed in Table 14.

⚠ 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. 30 and 31, 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. 30 and 31, 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.

Table 14 lists the 19XRV chiller refrigerant charges for each cooler and condenser code. Total refrigerant charge is the sum of the cooler and condenser charge.

Table 14 — Refrigerant (HFC-134a) Charge

COOLER CODE	REFRIGERANT CHARGE		CONDENSER CODE	REFRIGERANT CHARGE	
	lb	kg		lb	kg
20	345	156	**20**	225	102
21	385	175	**21**	225	102
22	435	197	**22**	225	102
30	350	159	**30**	260	118
31	420	191	**31**	260	118
32	490	222	**32**	260	118
35	400	181	**35**	310	141
36	480	218	**36**	310	141
37	550	249	**37**	310	141
40	560	254	**40**	280	127
41	630	286	**41**	280	127
42	690	313	**42**	280	127
45	640	290	**45**	330	150
46	720	327	**46**	330	150
47	790	358	**47**	330	150
50	750	340	**50**	400	181
51	840	381	**51**	400	181
52	900	408	**52**	400	181
55	870	395	**55**	490	222
56	940	426	**56**	490	222
57	980	445	**57**	490	222
60	940	426	**60**	420	190
61	980	445	**61**	420	190
62	1020	463	**62**	420	190
65	1020	463	**65**	510	231
66	1060	481	**66**	510	231
67	1090	494	**67**	510	231
70	1220	553	**70**	780	354
71	1340	608	**71**	780	354
72	1440	653	**72**	780	354
75	1365	619	**75**	925	420
76	1505	683	**76**	925	420
77	1625	737	**77**	925	420
80	1500	680	**80**	720	327
81	1620	735	**81**	720	327
82	1730	785	**82**	720	327
85	1690	767	**85**	860	390
86	1820	826	**86**	860	390
87	1940	880	**87**	860	390

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. 37.

⚠ CAUTION

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

Check Oil Pressure and Compressor Stop

1. When the motor is at full speed, note the 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 53.

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

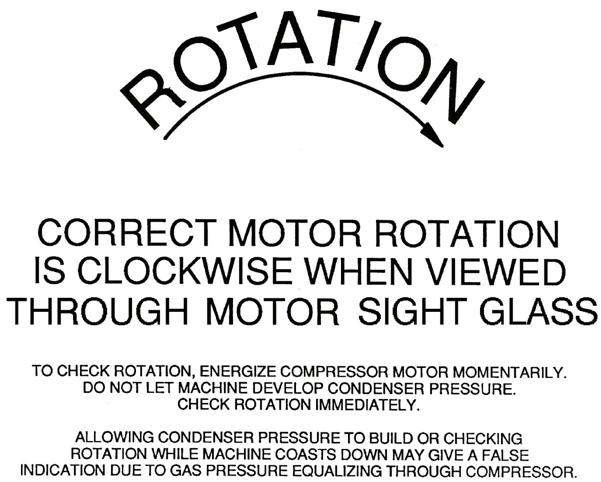


Fig. 37 — Correct Motor Rotation

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 — 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 70.

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 53.

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 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 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 60 and 80 psig (410 and 550 kPa), with temperature ranging between 34 and 45 F (1 and 8 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 21).

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 53. 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.

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 56.

Recharge the chiller by transferring refrigerant from the pumpout storage tank (if supplied). Follow the Pumpout and Refrigerant Transfer Procedures section, page 74. 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. 38) 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. 38. Automatic recording of PIC III data is possible by using CCN devices such as the Data Collection module and a Building Supervisor. Contact a 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. 38 — 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 81. The pumpout unit control wiring schematic is detailed in Fig. 39.

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. 8) 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. 30, 31, and 40 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 8 and 9 show the locations of the valves.

> **⚠ WARNING**
>
> 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.

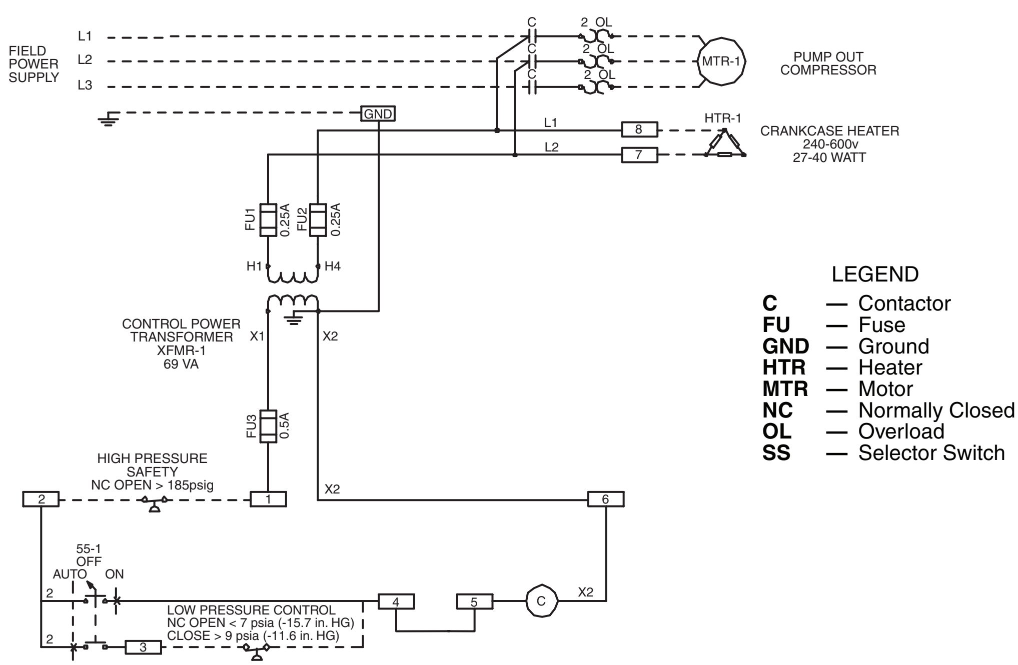


Fig. 39 — Pumpout Unit Wiring Schematic

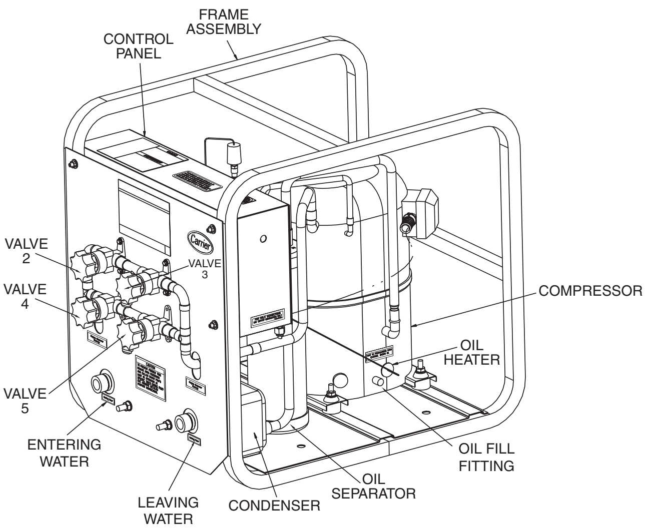


Fig. 40 — Pumpout Unit

Transfer Refrigerant from Pumpout Storage Tank to Chiller

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

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

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION			C		C	C		C	C	

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

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION			C		C					

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

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION				C	C			C	C	

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

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION	C	C	C	C	C	C	C	C	C	

   k. Turn off pumpout condenser water.

Transfer the Refrigerant from Chiller to Pumpout Storage Tank

1. Equalize refrigerant pressure.
   a. Valve positions:

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION			C		C	C		C	C	

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

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION			C		C					

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

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION				C	C					

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

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION				C	C			C	C	

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

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION			C			C		C	C	

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

f. Close valves 1a, 1b, 3, 4, and 6.

VALVE	1a	1b	2	3	4	5	6	7	10	11
CONDITION	C	C	C	C	C	C	C	C	C	

g. Turn off the pumpout condenser water.

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

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

CHILLERS WITH ISOLATION VALVES — The valves referred to in the following instructions are shown in Fig. 31 and 40. Valve 7 remains closed.

Transfer All Refrigerant to Chiller Condenser Vessel

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

VALVE	1a	1b	2	3	4	5	11
CONDITION				C	C		

   c. Equalize the refrigerant in the chiller cooler and condenser.
   d. Turn off chiller water pumps and pumpout condenser water supply.
   e. Turn on pumpout compressor to push liquid out of the chiller cooler vessel.
   f. When all liquid has been pushed into the chiller condenser vessel, close the cooler refrigerant isolation valve (11).
   g. Turn on the chiller water pumps.
   h. Turn off the pumpout compressor.
2. Evacuate gas from chiller cooler vessel.
   a. Close liquid line service valves 2 and 5; open valves 3 and 4.

VALVE	1a	1b	2	3	4	5	11
CONDITION			C			C	C

   b. Turn on pumpout condenser water.
   c. Run pumpout compressor until the chiller cooler vessel pressure reaches 18 in. Hg vacuum (41 kPa absolute). Monitor pressures on the chiller control panel and on refrigerant gages.

      This operation can be done in Automatic or On mode. In Automatic mode, the compressor will stop automatically at approximately 15 in. Hg vacuum (51 kPa absolute).
   d. Close valve 1a.
   e. Turn off pumpout compressor.
   f. Close valves 1b, 3, and 4.

VALVE	1a	1b	2	3	4	5	11
CONDITION	C	C	C	C	C	C	C

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

Transfer All Refrigerant to Chiller Cooler Vessel

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

VALVE	1a	1b	2	3	4	5	11
CONDITION				C	C		

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

VALVE	1a	1b	2	3	4	5	11
CONDITION				C	C		C

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

VALVE	1a	1b	2	3	4	5	11
CONDITION	C	C	C	C	C	C	C

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

Return Refrigerant to Normal Operating Conditions

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

VALVE	1a	1b	2	3	4	5	11
CONDITION			C		C	C	C

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

VALVE	1a	1b	2	3	4	5	11
CONDITION			C		C		C

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

VALVE	1a	1b	2	3	4	5	11
CONDITION	C	C	C	C	C	C	

9. Turn off chiller water pumps.

DISTILLING THE REFRIGERANT

1. Transfer the refrigerant from the chiller to the pumpout storage tank as described in the Transfer the Refrigerant from Chiller to Pumpout Storage Tank section.
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 78.

⚠ 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 78.

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 totalling 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

HFC-134a refrigerant 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 58 and 61) 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. 41. 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 section, Steps 1a and b, page 75.

Refer to the Trimming Refrigerant Charge section on page 69.

WEEKLY MAINTENANCE

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

If the level goes below the lower sight glass, check the oil reclaim system for proper operation. If additional oil is required, add it through the oil drain charging valve (Fig. 2). A pump is required when adding oil against refrigerant pressure. The oil charge for the 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)

The added oil *must* meet Carrier specifications for the 19XRV. Refer to Changing Oil Filter and Oil Changes section on page 79. 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.

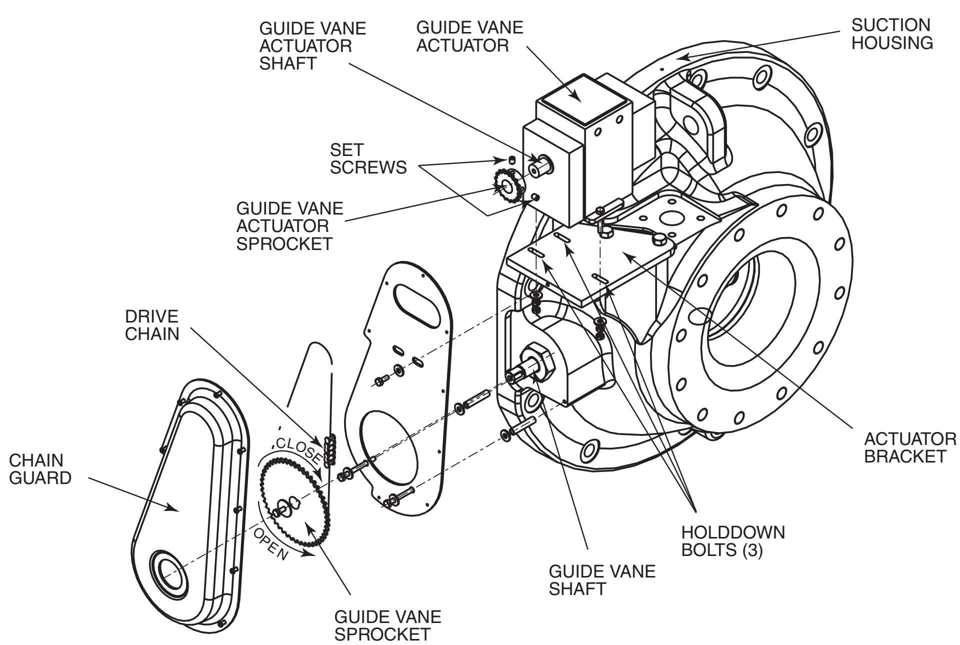


Fig. 41 — Guide Vane Actuator Linkage

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 13 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 changing the oil after the first year of operation and every three to five years thereafter as a minimum in addition to a yearly oil analysis. However, if a continuous oil monitoring system is functioning and a yearly oil analysis is performed, the time between oil changes can be extended.

TO CHANGE THE OIL

1. Transfer the refrigerant into the chiller condenser vessel (for isolatable vessels) or to a pumpout storage tank.
2. Mark the existing oil level.
3. Open the control and oil heater circuit breaker.
4. When the chiller pressure is 5 psig (34 kPa) or less, drain the oil reservoir by opening the oil charging valve (Fig. 2). Slowly open the valve against refrigerant pressure.
5. Change the oil filter at this time. See Changing Oil Filter section.
6. Change the refrigerant filter at this time, see the next section, Refrigerant Filter.
7. Charge the chiller with oil. Charge until the oil level is equal to the oil level marked in Step 2. Turn on the power to the oil heater and let the PIC 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 a year or more often if filter condition indicates a need for more frequent replacement. Change the filter by closing the filter isolation valves (see Fig. 4) 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 per year or more often if filter condition indicates a need for more frequent replacement. 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 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. 42 for a view of the float valve design. For linear float valve designs, inspect the orientation of the float slide pin. It must be pointed toward the bubbler tube for proper operation.

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.

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 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.

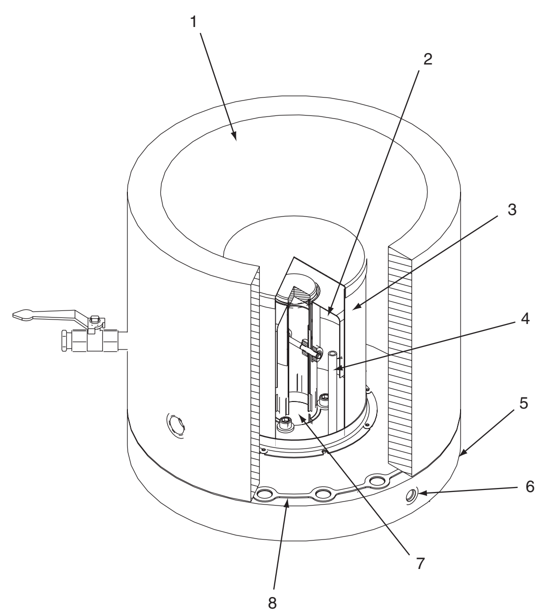
⚠ CAUTION

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) 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 61.



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. 42 — 19XRV Float Valve Design

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 sever bodily injury or death.

> **⚠ WARNING**
>
> The disconnect on the VFD front panel does not deenergize 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 retighten. Recheck annually thereafter.

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

Recalibrate Pressure Transducers — Once a year, the pressure transducers should be checked against a pressure gage reading. Check all eight transducers: the 2 oil differential pressure transducers, the condenser pressure transducer, the cooler pressure transducer, 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. 43) — 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.

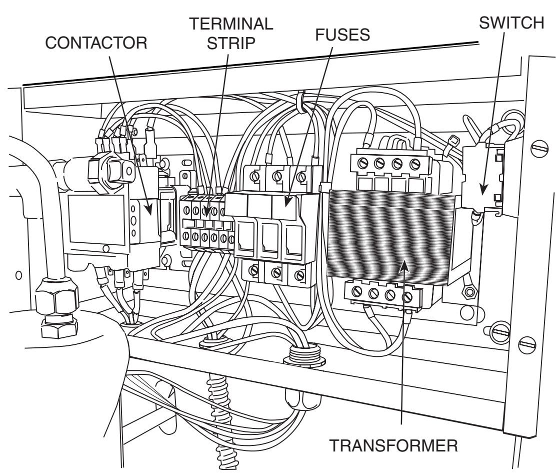


Fig. 43 — Pumpout Control Box (Interior)

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, WSMDEFME, 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. 14). 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. 8 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.
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.

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

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.

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.

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.

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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 DROPOUT	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.

*[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 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.

*[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)

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 OPTIONS 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	**SENSOR ALERT**	HIGH DISCHARGE TEMP	149→Comp Discharge Temp [VALUE] Exceeded Limit of [LIMIT]*.	Check sensor resistance or voltage drop. Check for proper wiring. Check for proper inlet guide vane and optional diffuser actuator operation. Check for proper condenser flow and temperature. Check for high lift or low load. Check for fouled tubes or noncondensables in the chiller.
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.

*[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)

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.
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.

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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

DPI — Drive Peripheral Interface
EPROM — Erasable, Programmable, Read-Only
FLA — Full Load Amps
IGBT — Insulated Gate Bipolar Transistor
I/O — Inputs/Outputs
NP — Nameplate

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
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:
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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 temperatured 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:
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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.	Load compatible version files into drive. a. Cycle power to the drive. b. If problem persists, replace drive.	206
236	Rctfr I/O Board	Loss of communication to I/O board. Board failure.	Cycle power. 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)
–25	4.700	97,706
–24	4.690	94,549
–23	4.680	91,474
–22	4.670	88,480
–21	4.659	85,568
–20	4.648	82,737
–19	4.637	79,988
–18	4.625	77,320
–17	4.613	74,734
–16	4.601	72,229
–15	4.588	69,806
–14	4.576	67,465
–13	4.562	65,205
–12	4.549	63,027
–11	4.535	60,930
–10	4.521	58,915
–9	4.507	56,981
–8	4.492	55,129
–7	4.477	53,358
–6	4.461	51,669
–5	4.446	50,062
–4	4.429	48,536
–3	4.413	47,007
–2	4.396	45,528
–1	4.379	44,098
0	4.361	42,715
1	4.344	41,380
2	4.325	40,089
3	4.307	38,843
4	4.288	37,639
5	4.269	36,476
6	4.249	35,354
7	4.229	34,270
8	4.209	33,224
9	4.188	32,214
10	4.167	31,239
11	4.145	30,298
12	4.123	29,389
13	4.101	28,511
14	4.079	27,663
15	4.056	26,844
16	4.033	26,052
17	4.009	25,285
18	3.985	24,544
19	3.960	23,826
20	3.936	23,130
21	3.911	22,455
22	3.886	21,800
23	3.861	21,163
24	3.835	20,556
25	3.808	19,967
26	3.782	19,396
27	3.755	18,843
28	3.727	18,307
29	3.700	17,787
30	3.672	17,284
31	3.644	16,797
32	3.617	16,325
33	3.588	15,868
34	3.559	15,426
35	3.530	14,997
36	3.501	14,582
37	3.471	14,181
38	3.442	13,791
39	3.412	13,415
40	3.382	13,050
41	3.353	12,696
42	3.322	12,353
43	3.291	12,021
44	3.260	11,699
45	3.229	11,386
46	3.198	11,082
47	3.167	10,787
48	3.135	10,500
49	3.104	10,221
50	3.074	9,949
51	3.042	9,689
52	3.010	9,436
53	2.978	9,190
54	2.946	8,951
55	2.914	8,719
56	2.882	8,494
57	2.850	8,275
58	2.819	8,062
59	2.788	7,855
60	2.756	7,655
61	2.724	7,460
62	2.692	7,271
63	2.660	7,088
64	2.628	6,909
65	2.596	6,736

TEMPERATURE (F)	PIC III VOLTAGE DROP (V)	RESISTANCE (Ohms)
66	2.565	6,568
67	2.533	6,405
68	2.503	6,246
69	2.472	6,092
70	2.440	5,942
71	2.409	5,796
72	2.378	5,655
73	2.347	5,517
74	2.317	5,382
75	2.287	5,252
76	2.256	5,124
77	2.227	5,000
78	2.197	4,880
79	2.167	4,764
80	2.137	4,650
81	2.108	4,539
82	2.079	4,432
83	2.050	4,327
84	2.021	4,225
85	1.993	4,125
86	1.965	4,028
87	1.937	3,934
88	1.909	3,843
89	1.881	3,753
90	1.854	3,667
91	1.827	3,582
92	1.800	3,500
93	1.773	3,420
94	1.747	3,342
95	1.721	3,266
96	1.695	3,192
97	1.670	3,120
98	1.644	3,049
99	1.619	2,981
100	1.595	2,914
101	1.570	2,849
102	1.546	2,786
103	1.523	2,724
104	1.499	2,663
105	1.476	2,605
106	1.453	2,547
107	1.430	2,492
108	1.408	2,437
109	1.386	2,384
110	1.364	2,332
111	1.343	2,282
112	1.321	2,232
113	1.300	2,184
114	1.279	2,137
115	1.259	2,092
116	1.239	2,047
117	1.219	2,003
118	1.200	1,961
119	1.180	1,920
120	1.161	1,879
121	1.143	1,840
122	1.124	1,801
123	1.106	1,764
124	1.088	1,727
125	1.070	1,691
126	1.053	1,656
127	1.036	1,622
128	1.019	1,589
129	1.002	1,556
130	0.986	1,524
131	0.969	1,493
132	0.953	1,463
133	0.938	1,433
134	0.922	1,404
135	0.907	1,376
136	0.893	1,348
137	0.878	1,321
138	0.864	1,295
139	0.849	1,269
140	0.835	1,244
141	0.821	1,219
142	0.808	1,195
143	0.795	1,172
144	0.782	1,149
145	0.769	1,126
146	0.756	1,104
147	0.744	1,083
148	0.731	1,062
149	0.719	1,041
150	0.707	1,021
151	0.696	1,002
152	0.684	983
153	0.673	964
154	0.662	945
155	0.651	928
156	0.640	910

TEMPERATURE (F)	PIC III VOLTAGE DROP (V)	RESISTANCE (Ohms)
157	0.630	893
158	0.619	876
159	0.609	859
160	0.599	843
161	0.589	827
162	0.579	812
163	0.570	797
164	0.561	782
165	0.551	768
166	0.542	753
167	0.533	740
168	0.524	726
169	0.516	713
170	0.508	700
171	0.499	687
172	0.491	675
173	0.484	663
174	0.476	651
175	0.468	639
176	0.460	628
177	0.453	616
178	0.445	605
179	0.438	595
180	0.431	584
181	0.424	574
182	0.418	564
183	0.411	554
184	0.404	544
185	0.398	535
186	0.392	526
187	0.385	516
188	0.379	508
189	0.373	499
190	0.367	490
191	0.361	482
192	0.356	474
193	0.350	466
194	0.344	458
195	0.339	450
196	0.333	442
197	0.328	435
198	0.323	428
199	0.318	421
200	0.313	414
201	0.308	407
202	0.304	400
203	0.299	393
204	0.294	387
205	0.290	381
206	0.285	374
207	0.281	368
208	0.277	362
209	0.272	356
210	0.268	351
211	0.264	345
212	0.260	339
213	0.256	334
214	0.252	329
215	0.248	323
216	0.245	318
217	0.241	313
218	0.237	308
219	0.234	303
220	0.230	299
221	0.227	294
222	0.224	289
223	0.220	285
224	0.217	280
225	0.214	276
226	0.211	272
227	0.208	267
228	0.205	263
229	0.203	259
230	0.198	255
231	0.195	251
232	0.192	248
233	0.190	244
234	0.187	240
235	0.184	236
236	0.182	233
237	0.179	229
238	0.176	226
239	0.174	223
240	0.172	219
241	0.169	216
242	0.167	213
243	0.164	210
244	0.162	207
245	0.160	204
246	0.158	201
247	0.155	198
248	0.153	195

Table 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. 44 and 45. 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. 45)

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.

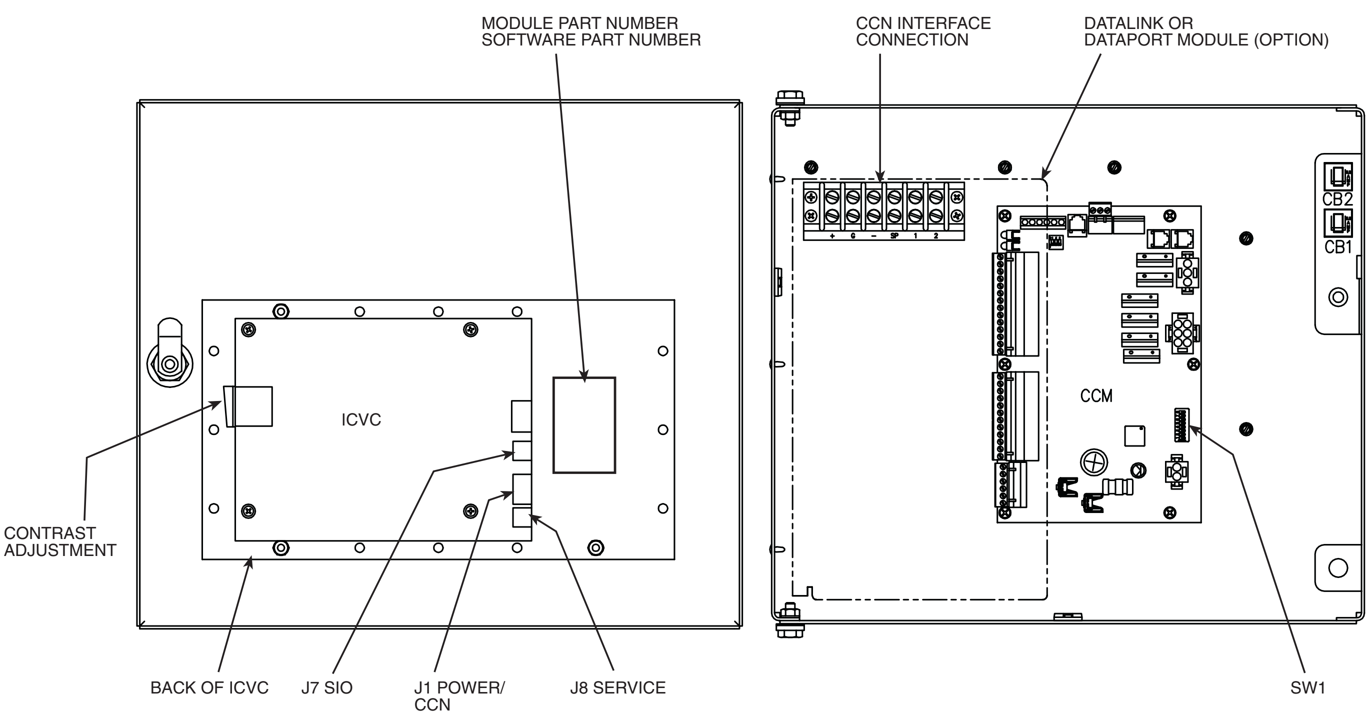


Fig. 44 — Rear of ICVC (International Chiller Visual Controller)

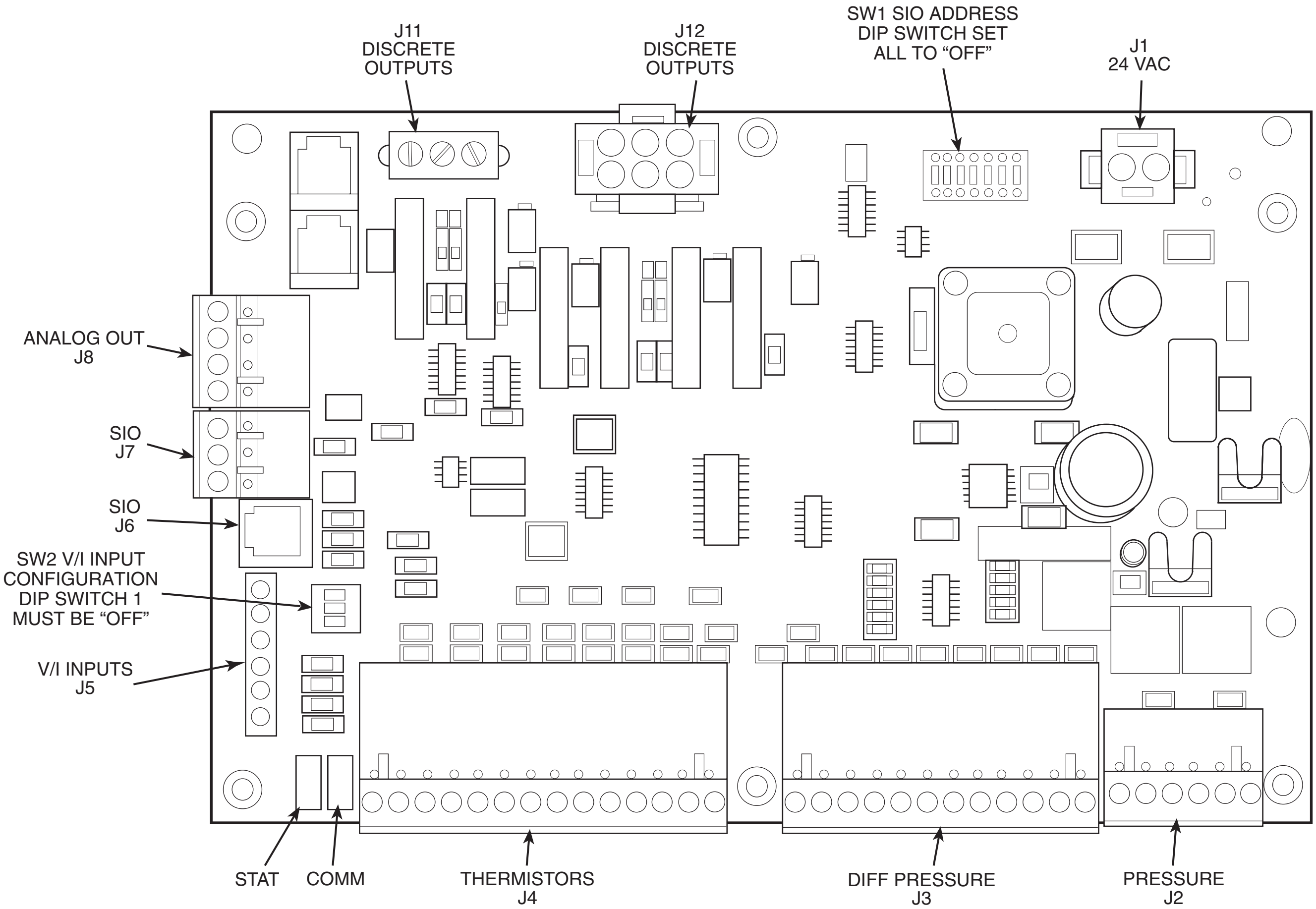


Fig. 45 — Chiller Control Module (CCM)

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 64.

> **⚠ CAUTION**
>
> 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 82, and the Control Modules section, page 100. 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. If the module to be replaced is functional, configurations may also be copied manually. The data sheets on pages CL-3 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-3 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,

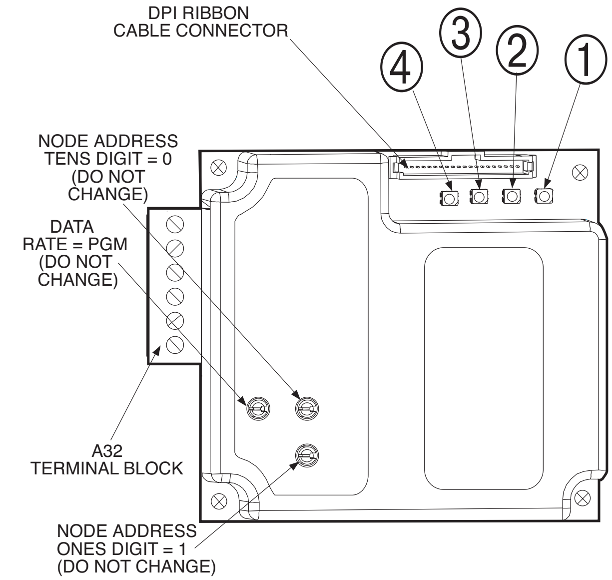
release the force on *SERVICE ONTIME* after the desired value has been set.

9. Perform the guide vane calibration procedure (in Control Test). Check and recalibrate pressure transducer readings (refer to page 68). Check that the *CURRENT TIME* and *DATE* in the *TIME AND DATE* screen are correct.

<u>DPI Communications Interface Board Status LEDs</u> — VFD status can be determined from the status LEDs on the DPI Communications Interface Board shown in Fig. 46. 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. 47.

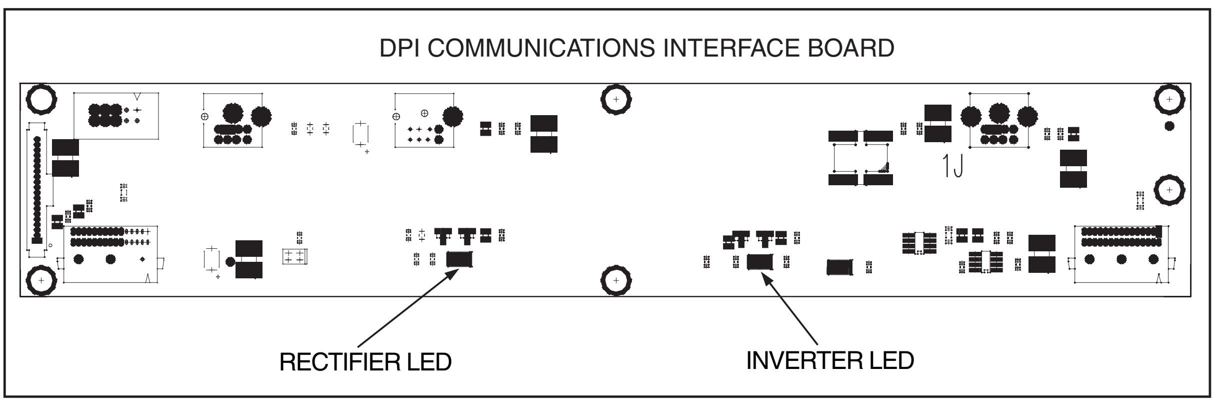
The Gateway has four status indicators on the top side of the module.



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. 47 — Gateway Status LEDs



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. 46 — DPI Communications Interface Board 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.

Physical Data — Tables 23A-31 and Fig. 48-58 provide additional information on component weights, compressor fits and clearances, physical and electrical data, and wiring schematics for the operator's convenience during troubleshooting.

⚠ 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 — Heat Exchanger Data (English)

SIZE	NUMBER OF TUBES		ENGLISH					
			Dry (Rigging) Weight (lb)		Chiller Charge			
					Refrigerant Weight (lb)		Water Volume (gal)	
	Cooler	Condenser	Cooler Only	Condenser Only	Cooler	Condenser	Cooler	Condenser
20	200	218	3,407	3,373	345	225	48	48
21	240	266	3,555	3,540	385	225	55	55
22	282	315	3,711	3,704	435	225	62	63
30	200	218	4,071	3,694	350	260	56	56
31	240	267	4,253	3,899	420	260	64	65
32	280	315	4,445	4,100	490	260	72	74
35	200	218	4,343	4,606	400	310	61	62
36	240	267	4,551	4,840	480	310	70	72
37	280	315	4,769	5,069	550	310	80	83
40	324	370	4,908	5,039	560	280	104	110
41	364	417	5,078	5,232	630	280	112	119
42	400	463	5,226	5,424	690	280	119	129
45	324	370	5,363	5,602	640	330	112	120
46	364	417	5,559	5,824	720	330	122	130
47	400	463	5,730	6,044	790	330	130	141
50	431	509	5,713	6,090	750	400	132	147
51	485	556	5,940	6,283	840	400	143	156
52	519	602	6,083	6,464	900	400	150	165
5A	225	—	5,124	—	500	—	123	—
5B	241	—	5,177	—	520	—	126	—
5C	258	—	5,243	—	550	—	129	—
55	431	509	6,257	6,785	870	490	144	161
56	485	556	6,517	7,007	940	490	156	171
57	519	602	6,682	7,215	980	490	164	182
5F	225	—	5,577	—	550	—	133	—
5G	241	—	5,640	—	570	—	137	—
5H	258	—	5,716	—	600	—	141	—
60	557	648	6,719	6,764	940	420	168	182
61	599	695	6,895	6,949	980	420	176	191
62	633	741	7,038	7,130	1020	420	183	200
65	557	648	7,392	7,682	1020	510	183	200
66	599	695	7,594	7,894	1060	510	193	210
67	633	741	7,759	8,102	1090	510	201	220
70	644	781	9,942	10,782	1220	780	241	267
71	726	870	10,330	11,211	1340	780	259	286
72	790	956	10,632	11,612	1440	780	274	305
75	644	781	10,840	11,854	1365	925	262	291
76	726	870	11,289	12,345	1505	925	283	314
77	790	956	11,638	12,803	1625	925	300	335
80	829	990	12,664	12,753	1500	720	327	357
81	901	1080	12,998	13,149	1620	720	343	377
82	976	1170	13,347	13,545	1730	720	360	397
85	829	990	13,804	14,008	1690	860	354	388
86	901	1080	14,191	14,465	1820	860	373	411
87	976	1170	14,597	14,923	1940	860	392	434

NOTES:
1. Cooler data: based on a cooler with standard wall tubing, 2-pass, 150 psig, nozzle-in-head waterbox with victaulic grooves. Weight includes suction elbow, control panel, and distribution piping. Weight does not include compressor.
2. Condenser data: based on a condenser with standard wall tubing, 2-pass, 150 psig, nozzle-in-head waterbox with victaulic grooves. Weight includes the float valve, discharge elbow, and distribution piping. Weight does not include unit-mounted VFD, isolation valves, and pumpout unit.

Table 23B — Heat Exchanger Data (SI)

SIZE	NUMBER OF TUBES		SI					
			Dry (Rigging) Weight (kg)		Chiller Charge			
					Refrigerant Weight (kg)		Water Volume (L)	
	Cooler	Condenser	Cooler Only	Condenser Only	Cooler	Condenser	Cooler	Condenser
20	200	218	1545	1530	156	102	182	182
21	240	266	1613	1606	175	102	208	208
22	282	315	1683	1680	197	102	235	238
30	200	218	1847	1676	159	118	212	212
31	240	266	1929	1769	191	118	242	246
32	282	315	2016	1860	222	118	273	280
35	200	218	1970	2089	181	141	231	235
36	240	266	2064	2195	218	141	265	273
37	282	315	2163	2299	249	141	303	314
40	324	366	2226	2286	254	127	394	416
41	364	415	2303	2373	286	127	424	450
42	400	464	2370	2460	313	127	450	488
45	324	366	2433	2541	290	150	424	454
46	364	415	2522	2642	327	150	462	492
47	400	464	2599	2742	358	150	492	534
50	431	507	2591	2762	340	181	500	556
51	485	556	2694	2850	381	181	541	591
52	519	602	2759	2932	408	181	568	625
5A	225	—	2324	—	227	—	466	—
5B	241	—	2348	—	236	—	477	—
5C	258	—	2378	—	249	—	488	—
55	431	507	2838	3078	395	222	545	609
56	485	556	2956	3178	426	222	591	647
57	519	602	3031	3273	445	222	621	689
5F	225	—	2530	—	249	—	503	—
5G	241	—	2558	—	259	—	519	—
5H	258	—	2593	—	272	—	534	—
60	557	648	3048	3068	426	191	636	689
61	599	695	3128	3152	445	191	666	723
62	633	741	3192	3234	463	191	693	757
65	557	648	3353	3485	463	231	693	757
66	599	695	3445	3581	481	231	731	795
67	633	741	3519	3675	494	231	761	833
70	644	781	4510	4891	553	354	912	1011
71	726	870	4686	5085	608	354	980	1083
72	790	956	4823	5267	653	354	1037	1155
75	644	781	4917	5377	619	420	992	1102
76	726	870	5121	5600	683	420	1071	1189
77	790	956	5279	5807	737	420	1136	1268
80	829	990	5744	5785	680	327	1238	1351
81	901	1080	5896	5964	735	327	1298	1427
82	976	1170	6054	6144	785	327	1363	1503
85	829	990	6261	6354	767	390	1340	1469
86	901	1080	6437	6561	826	390	1412	1556
87	976	1170	6621	6769	880	390	1484	1643

NOTES:
1. Cooler data: based on a cooler with standard wall tubing, 2-pass, 1034 kPa, nozzle-in-head waterbox with victaulic grooves. Weight includes suction elbow, control panel, and distribution piping. Weight does not include compressor.
2. Condenser data: based on a condenser with standard wall tubing, 2-pass, 1034 kPa, nozzle-in-head waterbox with victaulic grooves. Weight includes the float valve, discharge elbow, and distribution piping. Weight does not include unit-mounted VFD, isolation valves, and pumpout unit.

Table 24A — 19XRV Additional Data for Cooler Marine Water Boxes*

COOLER FRAME, PASS	ENGLISH			SI		
	psig	Rigging Weight (lb)	Water Volume (gal)	kPa	Rigging Weight (kg)	Water Volume (L)
FRAME 2, 1 AND 3 PASS	150	730	84	1034	331	318
FRAME 2, 2 PASS		365	42		166	159
FRAME 3, 1 AND 3 PASS		730	84		331	318
FRAME 3, 2 PASS		365	42		166	159
FRAME 4, 1 AND 3 PASS		1888	109		856	412
FRAME 4, 2 PASS		944	54		428	205
FRAME 5, 1 AND 3 PASS		2445	122		1109	462
FRAME 5, 2 PASS		1223	61		555	231
FRAME 6, 1 AND 3 PASS		2860	139		1297	524
FRAME 6, 2 PASS		1430	69		649	262
FRAME 7, 1 AND 3 PASS		3970	309		1801	1170
FRAME 7, 2 PASS		1720	155		780	585
FRAME 8, 1 AND 3 PASS		5048	364		2290	1376
FRAME 8, 2 PASS		2182	182		990	688
FRAME 2, 1 AND 3 PASS	300	860	84	2068	390	318
FRAME 2, 2 PASS		430	42		195	159
FRAME 3, 1 AND 3 PASS		860	84		390	318
FRAME 3, 2 PASS		430	42		195	159
FRAME 4, 1 AND 3 PASS		2162	109		981	412
FRAME 4, 2 PASS		1552	47		704	178
FRAME 5, 1 AND 3 PASS		2655	122		1204	462
FRAME 5, 2 PASS		1965	53		891	199
FRAME 6, 1 AND 3 PASS		3330	139		1510	524
FRAME 6, 2 PASS		2425	58		1100	218
FRAME 7, 1 AND 3 PASS		5294	309		2401	1170
FRAME 7, 2 PASS		4140	146		1878	553
FRAME 8, 1 AND 3 PASS		6222	364		2822	1376
FRAME 8, 2 PASS		4952	161		2246	609

*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 24B — 19XRV Additional Data for Condenser Marine Water Boxes*

CONDENSER FRAME, PASS	ENGLISH			SI		
	psig	Rigging Weight (lb)	Water Volume (gal)	kPa	Rigging Weight (kg)	Water Volume (L)
FRAME 2, 1 AND 3 PASS	150	N/A	N/A	1034	N/A	N/A
FRAME 2, 2 PASS		365	42		166	159
FRAME 3, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 3, 2 PASS		365	42		166	159
FRAME 4, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 4, 2 PASS		989	54		449	205
FRAME 5, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 5, 2 PASS		1195	60		542	226
FRAME 6, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 6, 2 PASS		1443	69		655	262
FRAME 7, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 7, 2 PASS		1561	123		708	465
FRAME 8, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 8, 2 PASS		1751	141		794	532
FRAME 2, 1 AND 3 PASS	300	N/A	N/A	2068	N/A	N/A
FRAME 2, 2 PASS		430	42		195	159
FRAME 3, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 3, 2 PASS		430	42		195	159
FRAME 4, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 4, 2 PASS		1641	47		744	178
FRAME 5, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 5, 2 PASS		1909	50		866	190
FRAME 6, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 6, 2 PASS		2451	58		1112	218
FRAME 7, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 7, 2 PASS		4652	94		2110	356
FRAME 8, 1 AND 3 PASS		N/A	N/A		N/A	N/A
FRAME 8, 2 PASS		4559	94		2068	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 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	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
SUCTION ELBOW	116	53	185	84	239	108	239	108	407	185
DISCHARGE ELBOW	100	45	125	57	157	71	157	71	325	147
TRANSMISSION*	320	145	400	181	656	298	656	298	1000	454
SUCTION HOUSING	370	168	400	181	585	265	810	367	1200	544
IMPELLER SHROUD	35	16	79	36	126	57	200	91	500	227
COMPRESSOR BASE	1260	572	1565	710	1589	721	2020	916	3700	1678
DIFFUSER	35	16	67	30	130	59	130	59	350	159
OIL PUMP	125	57	150	68	150	68	150	68	185	84
HIGH SPEED SHAFT ASSEMBLY	15	7	12	5	30	14	30	14	65	29
IMPELLER	5	2	8	4	15	7	15	7	50	23
MISCELLANEOUS (Incl. Low Speed Gear)	135	61	135	61	144	65	200	91	235	107
TOTAL COMPRESSOR WEIGHT (Less Motor and Elbows)	2300	1043	2816	1277	3425	1553	4211	1910	7285	3304

*Transmission weight does not include rotor, shaft, and gear.

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 and 26B.

Table 26A — 19XRV Motor Weights — Standard Motors

MOTOR CODE	ENGLISH					SI				
	Stator Weight* (lb)		Rotor Weight† (lb)		End Bell Cover (lb)	Stator Weight* (kg)		Rotor Weight† (kg)		End Bell Cover (kg)
	60 Hz	50 Hz	60 Hz	50 Hz		60 Hz	50 Hz	60 Hz	50 Hz	
BD	859	911	206	224	182	390	413	93	102	83
BE	892	950	217	238	182	405	431	98	108	83
BF	948	997	231	255	182	430	452	105	116	83
BG	972	1045	245	273	182	441	474	111	124	83
BH	1006	1102	259	294	182	456	500	117	133	83
BJ	1102	—	294	—	182	500	—	133	—	83
CD	1220	1212	256	280	274	553	550	116	127	124
CE	1253	1259	261	281	274	568	571	118	127	124
CL	1261	1271	272	293	274	572	577	123	133	124
CM	1294	1318	273	305	274	587	598	124	138	124
CN	1341	1357	293	305	274	608	616	133	138	124
CP	1343	1413	293	321	274	609	641	133	146	124
CQ	1419	1522	305	336	274	644	690	138	152	124
CR	1522	—	346	—	274	711	—	157	—	124
DB	1522	1900	389	389	318	690	862	176	176	144
DC	1850	1950	389	405	318	839	885	176	184	144
DD	1850	2150	497	536	318	839	975	225	243	144
DE	2050	2150	497	536	318	930	975	225	243	144
DF	2150	2250	497	536	318	975	1021	225	243	144
DG	2150	2250	536	555	318	975	1021	243	252	144
DH	2250	2380	536	555	318	1021	1080	243	252	144
DJ	2250	2380	536	555	318	1021	1080	243	252	144
DK	2200	—	555	—	318	998	—	252	—	144
EH	2843	2943	741	775	414	1290	1335	336	352	188
EJ	2855	2943	769	775	414	1295	1335	349	352	188
EK	2943	2997	803	810	414	1335	1359	364	367	188
EL	2932	3058	803	871	414	1330	1387	364	395	188
EM	2932	3096	854	871	414	1330	1404	387	395	188
EN	3023	3281	854	974	414	1371	1488	387	442	188
EP	3068	3288	871	974	414	1392	1491	395	442	188
EQ	3203	—	914	—	414	1453	—	415	—	188

*Stator weight includes stator and shell.
†Rotor weight includes rotor and shaft.

NOTE: When different voltage motors have different weights the largest weight is given.

Table 26B — 19XRV Motor Weights — High-Efficiency Motors

MOTOR CODE	ENGLISH					SI				
	Stator Weight* (lb)		Rotor Weight† (lb)		End Bell Cover (lb)	Stator Weight* (kg)		Rotor Weight† (kg)		End Bell Cover (kg)
	60 Hz	50 Hz	60 Hz	50 Hz		60 Hz	50 Hz	60 Hz	50 Hz	
BD	1014	1014	240	255	182	460	460	109	116	83
BE	1053	1053	252	273	182	478	478	114	124	83
BF	1096	1102	266	294	182	497	500	121	133	83
BG	1160	1160	289	311	182	526	526	131	141	83
BH	1160	1198	289	328	182	526	543	131	149	83
BJ	1198	—	328	—	182	543	—	149	—	83
CD	1171	1238	288	313	274	531	562	131	142	124
CE	1216	1285	305	330	274	552	583	138	150	124
CL	1242	1328	305	346	274	563	602	138	157	124
CM	1321	1380	313	363	274	599	626	142	165	124
CN	1369	1423	330	379	274	621	645	150	172	124
CP	1411	1444	346	387	274	640	655	157	176	124
CQ	1411	1444	363	387	274	640	655	165	176	124
CR	1428	—	335	—	274	648	—	152	—	124
KB	965	995	221	229	274	438	451	100	104	124
KC	995	1015	229	236	274	451	460	104	107	124
KD	1015	1045	236	244	274	460	474	107	111	124
KE	1045	1065	244	251	274	474	483	111	114	124
KF	1065	1090	251	259	274	483	494	114	117	124
KG	1090	1110	259	267	274	494	503	117	121	124
KH	1110	—	267	—	274	503	—	121	—	124
DB	1950	1950	406	406	318	885	885	184	184	144
DC	1950	2025	406	429	318	885	919	184	195	144
DD	2150	2250	536	546	318	975	1021	243	248	144
DE	2150	2250	550	550	318	975	1021	249	249	144
DF	2250	2380	575	567	318	1021	1080	261	257	144
DG	2250	2380	599	599	318	1021	1080	272	272	144
DH	2203	2380	604	604	318	999	1080	274	274	144
DJ	2228	2380	614	614	318	1011	1080	279	279	144
DK	2305	—	614	—	318	1046	—	279	—	144
LB	1873	1939	364	389	318	850	880	165	176	144
LC	1939	2023	389	406	318	880	918	176	184	144
LD	2023	2043	406	417	318	918	927	184	189	144
LE	2043	2096	417	434	318	927	951	189	197	144
LF	2096	2133	434	444	318	951	968	197	201	144
LG	2133	2199	444	458	318	968	997	201	208	144
LH	2199	—	458	—	318	997	—	208	—	144
EH	3000	3125	810	862	414	1361	1417	367	391	188
EJ	3105	3250	855	862	414	1408	1474	388	391	188
EK	3105	3250	855	872	414	1408	1474	388	396	188
EL	3195	3340	872	872	414	1449	1515	396	396	188
EM	3195	3340	872	914	414	1449	1515	396	415	188
EN	3195	3415	872	974	414	1449	1549	396	442	188
EP	3195	3415	872	974	414	1449	1549	396	442	188
EQ	3195	—	872	—	414	1449	—	396	—	188

*Stator weight includes stator and shell.
†Rotor weight includes rotor and shaft.

NOTE: When different voltage motors have different weights the largest weight is given.

Table 27A — 19XRV Cooler Waterbox Cover Weights — English (lb)

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 2		FRAME 3	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER	NIH, 1 Pass Cover, 150 psig	282	318	282	318
	NIH, 2 Pass Cover, 150 psig	287	340	287	340
	NIH, 3 Pass Cover, 150 psig	294	310	294	310
	NIH Plain End Cover, 150 psig	243	243	243	243
	MWB End Cover, 150 psig	315	315	315	315
	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

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 4		FRAME 5		FRAME 6	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER	NIH, 1 Pass Cover, 150 psig	148	185	168	229	187	223
	NIH, 2 Pass Cover, 150 psig	202	256	222	276	258	331
	NIH, 3 Pass Cover, 150 psig	472	488	617	634	765	791
	NIH Plain End Cover, 150 psig	138	138	154	154	172	172
	MWB End Cover, 150 psig	314	314	390	390	487	487
	MWB Return Cover, 150 psig	138	138	154	154	172	172
	NIH, 1 Pass Cover, 300 psig	633	709	764	840	978	1053
	NIH, 2 Pass Cover, 300 psig	626	733	760	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

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 7		FRAME 8	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER	NIH, 1 Pass Cover, 150 psig	329	441	417	494
	NIH, 2 Pass Cover, 150 psig	426	541	531	685
	NIH, 3 Pass Cover, 150 psig	1250	1291	1629	1687
	NIH Plain End Cover, 150 psig	315	315	404	404
	MWB End Cover, 150 psig	844	844	1339	1339
	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

LEGEND

MWB — Marine Waterbox
NIH — Nozzle-In-Head

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 Cooler Waterbox Cover Weights — SI (kg)

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 2		FRAME 3	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER	NIH, 1 Pass Cover, 150 psig	128	144	128	144
	NIH, 2 Pass Cover, 150 psig	130	154	130	154
	NIH, 3 Pass Cover, 150 psig	133	141	133	141
	NIH Plain End Cover, 150 psig	110	110	110	110
	MWB End Cover, 150 psig	143	143	143	143
	MWB Return Cover, 150 psig	110	110	110	110
	NIH, 1 Pass Cover, 300 psig	186	220	186	220
	NIH, 2 Pass Cover, 300 psig	186	235	186	235
	NIH, 3 Pass Cover, 300 psig	196	212	196	212
	NIH Plain End Cover, 300 psig	132	132	132	132
	MWB End Cover, 300 psig	281	281	281	281
	MWB Return Cover, 300 psig	202	202	202	202

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 4		FRAME 5		FRAME 6	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER	NIH, 1 Pass Cover, 150 psig	67	84	76	104	85	101
	NIH, 2 Pass Cover, 150 psig	92	116	101	125	117	150
	NIH, 3 Pass Cover, 150 psig	214	221	280	288	347	359
	NIH Plain End Cover, 150 psig	63	63	70	70	78	78
	MWB End Cover, 150 psig	142	142	177	177	221	221
	MWB Return Cover, 150 psig	63	63	70	70	78	78
	NIH, 1 Pass Cover, 300 psig	287	322	347	381	444	478
	NIH, 2 Pass Cover, 300 psig	284	332	345	393	420	489
	NIH, 3 Pass Cover, 300 psig	299	315	361	376	452	476
	NIH/MWB End Cover, 300 psig	237	237	299	298	378	378

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 7		FRAME 8	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER	NIH, 1 Pass Cover, 150 psig	149	200	189	224
	NIH, 2 Pass Cover, 150 psig	193	245	241	311
	NIH, 3 Pass Cover, 150 psig	567	586	739	765
	NIH Plain End Cover, 150 psig	143	143	183	183
	MWB End Cover, 150 psig	383	383	607	607
	MWB Return Cover, 150 psig	143	143	183	183
	NIH, 1 Pass Cover, 300 psig	777	854	1070	1144
	NIH, 2 Pass Cover, 300 psig	754	865	1075	1179
	NIH, 3 Pass Cover, 300 psig	782	820	1067	1141
	NIH/MWB End Cover, 300 psig	625	625	885	885

LEGEND

MWB — Marine Waterbox
NIH — Nozzle-In-Head

NOTE: Weight for NIH 2-Pass Cover, 1034 kPa is included in the heat exchanger weights shown in Tables 23A and 23B.

Table 28A — 19XRV Condenser Waterbox Cover Weights — English (lb)

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 2		FRAME 3	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
CONDENSER	NIH, 1 Pass Cover, 150 psig	282	318	282	318
	NIH, 2 Pass Cover, 150 psig	287	340	287	340
	NIH, 3 Pass Cover, 150 psig	294	310	294	310
	NIH Plain End Cover, 150 psig	225	225	225	225
	MWB End Cover, 150 psig	234	234	234	234
	MWB Return Cover, 150 psig	225	225	225	225
	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	270	270	270	270
	MWB End Cover, 300 psig	474	474	474	474
	MWB Return Cover, 300 psig	359	359	359	359

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 4		FRAME 5		FRAME 6	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged	Standard Nozzles	Flanged
CONDENSER	NIH, 1 Pass Cover, 150 psig	148	185	168	229	187	223
	NIH, 2 Pass Cover, 150 psig	191	245	224	298	245	318
	NIH, 3 Pass Cover, 150 psig	503	519	628	655	772	799
	NIH Plain End Cover, 150 psig	138	138	154	154	172	172
	MWB End Cover, 150 psig	314	314	390	390	487	487
	MWB Return Cover, 150 psig	138	138	154	154	172	172
	NIH, 1 Pass Cover, 300 psig	633	709	764	840	978	1053
	NIH, 2 Pass Cover, 300 psig	622	729	727	878	926	1077
	NIH, 3 Pass Cover, 300 psig	655	689	785	838	995	1049
	NIH/MWB End Cover, 300 psig	522	522	658	658	834	834

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 7		FRAME 8	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
CONDENSER	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	1218	1469	1527
	NIH Plain End Cover, 150 psig	315	315	404	404
	MWB End Cover, 150 psig	781	781	1007	1007
	Bolt On MWB End Cover, 150 PSI	700	700	1307	1307
	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

MWB — Marine Waterbox
NIH — Nozzle-In-Head

NOTE: Weight for NIH 2-Pass Cover, 150 psig is included in the heat exchanger weights shown in Tables 23A and 23B.

Table 28B — 19XRV Condenser Waterbox Cover Weights — SI (kg)

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 2		FRAME 3	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
CONDENSER	NIH, 1 Pass Cover, 150 psig	128	144	128	144
	NIH, 2 Pass Cover, 150 psig	130	154	130	154
	NIH, 3 Pass Cover, 150 psig	133	141	133	141
	NIH Plain End Cover, 150 psig	102	102	102	102
	MWB End Cover, 150 psig	106	106	106	106
	MWB Return Cover, 150 psig	102	102	102	102
	NIH, 1 Pass Cover, 300 psig	186	220	186	220
	NIH, 2 Pass Cover, 300 psig	186	235	186	235
	NIH, 3 Pass Cover, 300 psig	196	212	196	212
	NIH Plain End Cover, 300 psig	122	122	122	122
	MWB End Cover, 300 psig	215	215	215	215
	MWB Return Cover, 300 psig	163	163	163	163

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 4		FRAME 5		FRAME 6	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged	Standard Nozzles	Flanged
CONDENSER	NIH, 1 Pass Cover, 150 psig	67	84	76	104	85	101
	NIH, 2 Pass Cover, 150 psig	87	111	102	135	111	144
	NIH, 3 Pass Cover, 150 psig	228	235	285	297	350	362
	NIH Plain End Cover, 150 psig	63	63	70	70	78	78
	MWB End Cover, 150 psig	142	142	177	177	221	221
	MWB Return Cover, 150 psig	63	63	70	70	78	78
	NIH, 1 Pass Cover, 300 psig	287	322	347	381	444	478
	NIH, 2 Pass Cover, 300 psig	282	331	330	398	420	489
	NIH, 3 Pass Cover, 300 psig	297	313	356	380	451	476
	NIH/MWB End Cover, 300 psig	237	237	298	298	378	378

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 7		FRAME 8	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
CONDENSER	NIH, 1 Pass Cover, 150 psig	149	200	189	224
	NIH, 2 Pass Cover, 150 psig	183	236	230	300
	NIH, 3 Pass Cover, 150 psig	554	552	666	693
	NIH Plain End Cover, 150 psig	143	143	183	183
	MWB End Cover, 150 psig	354	354	457	457
	Bolt On MWB End Cover, 150 PSI	318	318	593	593
	MWB Return Cover, 150 psig	143	143	183	183
	NIH, 1 Pass Cover, 300 psig	767	840	901	976
	NIH, 2 Pass Cover, 300 psig	738	845	859	1008
	NIH, 3 Pass Cover, 300 psig	777	831	904	958
	NIH/MWB End Cover, 300 psig	579	579	760	760

LEGEND

MWB — Marine Waterbox
NIH — Nozzle-In-Head

NOTE: Weight for NIH 2-Pass Cover, 1034 kPa is included in the heat exchanger weights shown in Tables 23A and 23B.

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 — Additional Miscellaneous Weights

ITEM	FRAME 2 COMPRESSOR		FRAME 3 COMPRESSOR		FRAME 4 COMPRESSOR		FRAME 5 COMPRESSOR	
	lb	kg	lb	kg	lb	kg	lb	kg
Suction Elbow	116	53	185	84	239	108	407	185
Discharge Elbow	100	45	125	57	157	71	325	147
Control Panel	34	15	34	15	34	15	34	15
Optional Cooler Inlet Isolation Valve	8	4	13	6	20	9	24	11
Optional Discharge Isolation Valve	26	12	46	21	74	34	108	49
442A / 608A VFD	1600	726	1600	726	1600	726	—	—
1169A VFD	—	—	—	—	2800	1270	2800	1270
VFD Shelf (1169A VFD only)	—	—	—	—	1049	476	1049	476

LEGEND

VFD — Variable Frequency Drive

Table 31 — Motor Voltage Code

MOTOR CODE	VOLTS	FREQUENCY
62	380	60
63	416	60
64	460	60
52	400	50

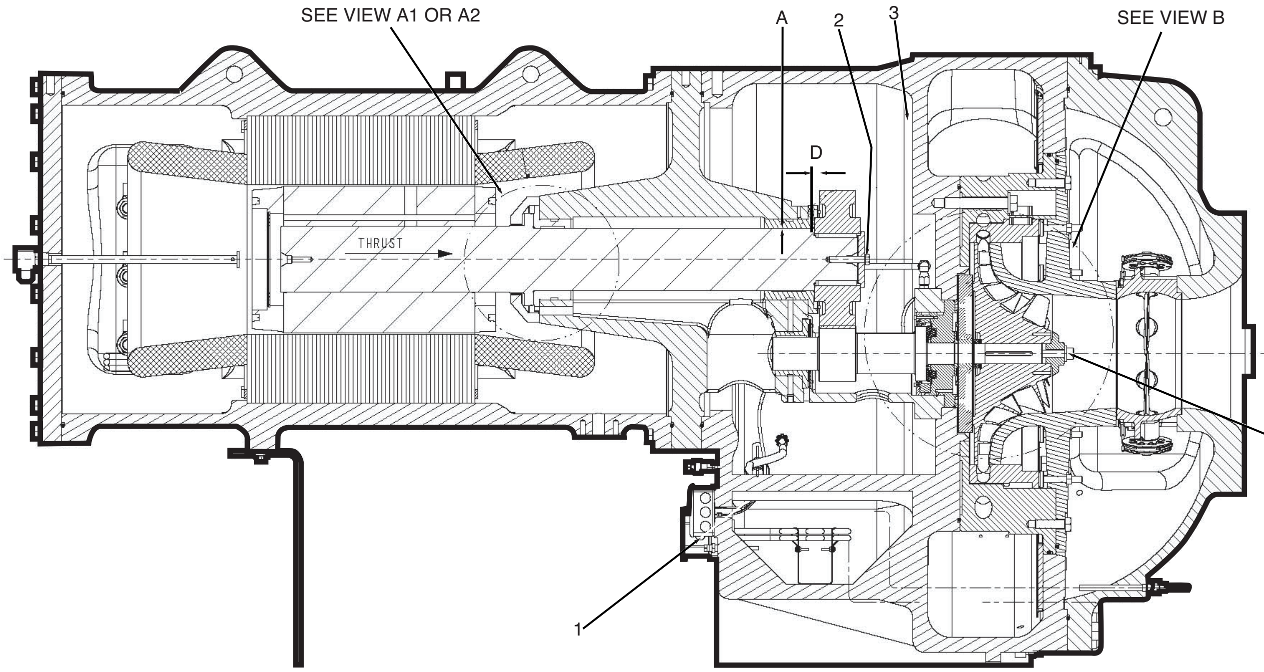
19XRV COMPRESSOR FITS AND CLEARANCES (in.)

ITEM	COMPRESSOR	FRAME 2	FRAME 3	FRAME 4	FRAME 4	FRAME 5
	Code	201-299, 2ZZ	321-389, 3ZZ	421-487	4B1-4W7	501-599
	DESCRIPTION	Fixed Diffuser	With Rolling Element Bearings	Fixed Diffuser	Split Ring Diffuser	Split Ring Diffuser
A	Low Speed Journal-Gear End	.0050/.0040	.0050/.0040	.0055/.0043	.0055/.0043	.0069/.0059
B	Low Speed Journal-Motor End	.0050/.0040	.0050/.0040	.0053/.0043	.0053/.0043	.0065/.0055
C1	Low Speed Labyrinth to Thrust Disk	.0115/.0055	N/A	.010/–.005	.010/–.005	N/A
C2	Labyrinth to Low Speed Shaft	N/A	.010/.005	.0095/.0055	.0095/.0055	.013/.009
D	Low Speed Shaft Thrust Float	.020/.008	.020/.008	.023/.008	.023/.008	.020/.008
E	Impeller Eye to Shroud	*	*	*	*	*
F1	Impeller Bore to Shaft-Rear	–.0020/–.0005	–.0025/–.0010	–.0021/–.0006	–.0021/–.0006	–.0019/–.0005
F2	Impeller Bore to Shaft-Front	N/A	N/A	–.0014/.0000	–.0014/.0000	–.0014/.0000
G	Impeller Discharge to Shroud	*	*	*	*	*
H	Impeller Spacer to Shaft	.0025/.0010	.0025/.0010	.0025/.0010	.0025/.0010	.0024/.0010
I	Slinger to Shaft	.0013/.0005	.0012/.0004	.0012/.0004	.0012/.0004	.0012/.0004
J	Labyrinth to Slinger	.013/.009	.010/.006	.010/.006	.010/.006	.010/.006
K	Labyrinth to Impeller	.012/.008	.012/.008	.012/.008	.012/.008	.012/.008
L	High Speed Journal-Impeller End	.0047/.0037	N/A	.0040/.0028	.0040/.0028	.0048/.0038
M	Thrust Assembly Seal Ring Axial Clearance	.006/.002	N/A	.006/.002	.006/.002	.006/.002
N	Thrust Assembly Seal Ring to Shaft	.0045/.0015	N/A	.0045/.0015	.0045/.0015	.0045/.0015
O	High Speed Shaft Thrust Float	.014/.008	0 Float	.014/.008	.014/.008	.014/.008
P	High Speed Journal-Gear End	.0050/.0040	N/A	.0048/.0038	.0048/.0038	.0062/.0052

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

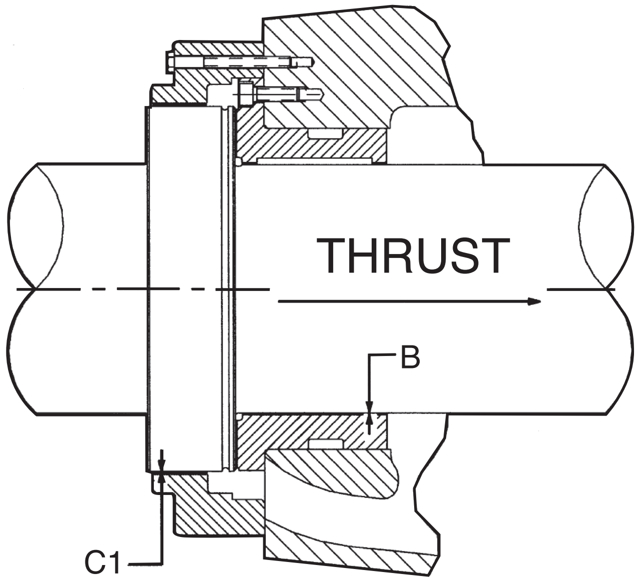
NOTES:
1. All clearances for cylindrical surfaces are diametrical.
2. Dimensions shown are with rotors in the thrust position.
3. Frame 3 rolling element style high speed shaft and bearing assembly cannot be pulled from impeller end. The transmission assembly must be removed from the compressor casting (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 the Frame 3 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.

Fig. 48 — Compressor Fits and Clearances

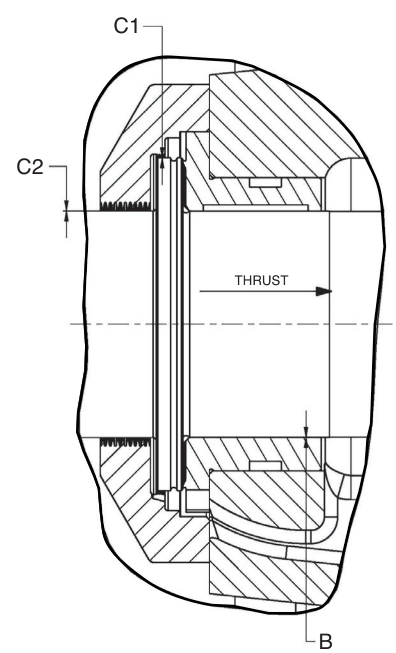


COMPRESSOR, TRANSMISSION AREA (FRAME 5 COMPRESSOR SHOWN)
1) OIL HEATER RETAINING NUT (NOT SHOWN)
2) BULL GEAR RETAINING BOLT
3) DEMISTER BOLTS (NOT SHOWN)
4) IMPELLER BOLT

COMPRESSOR, TRANSMISSION AREA

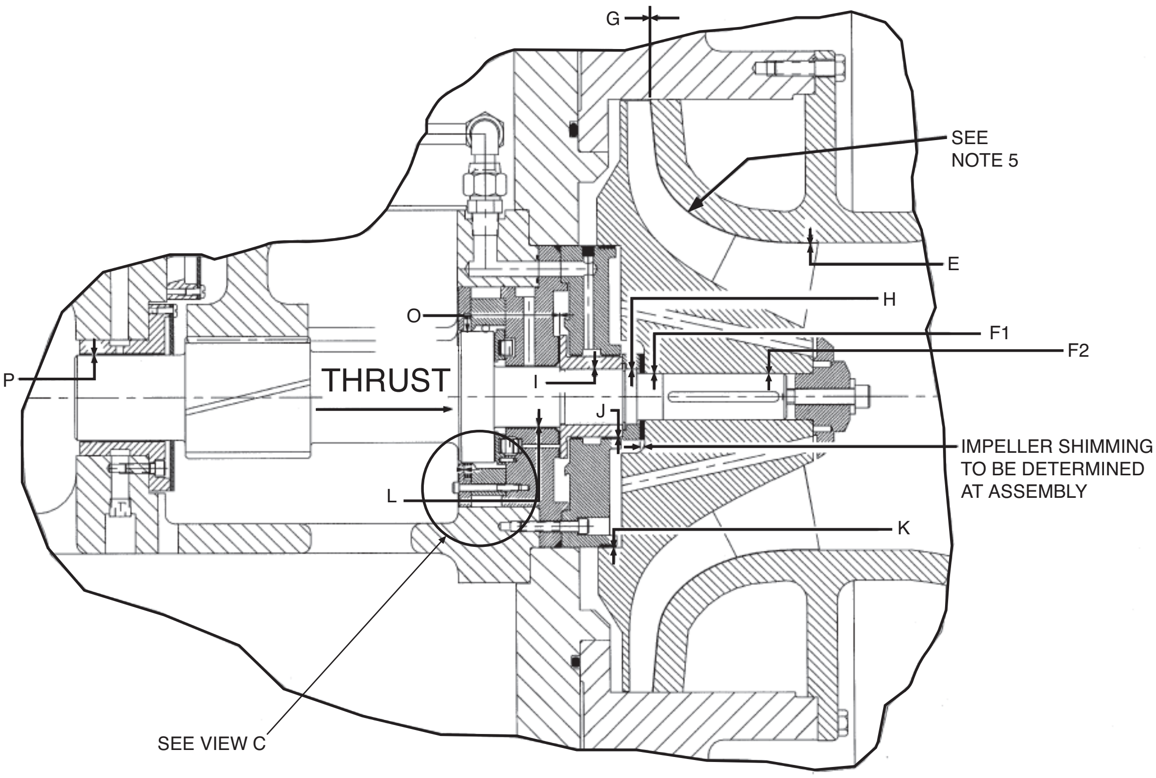


VIEW A1
LOW SPEED SHAFT THRUST DISK

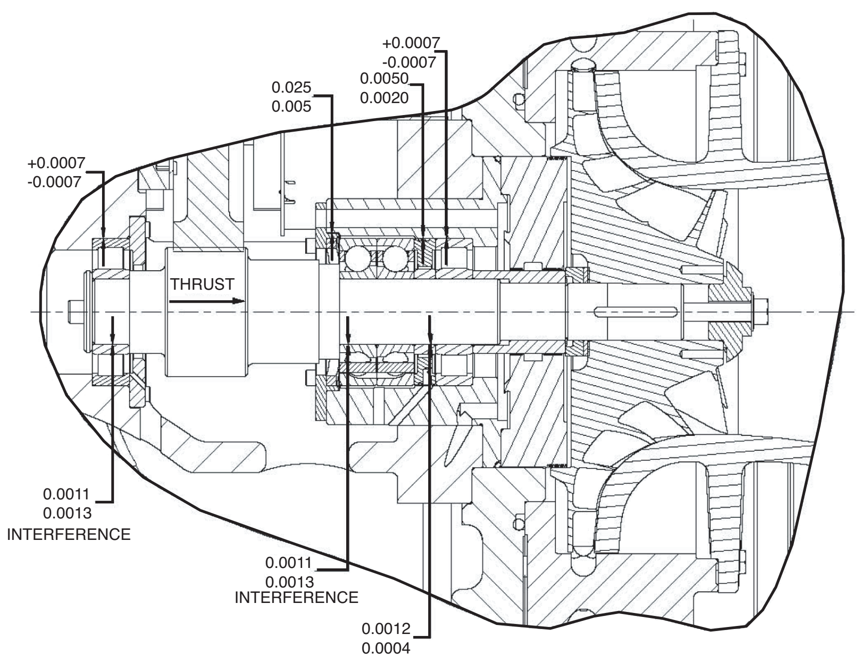


VIEW A2
LOW SPEED SHAFT THRUST DISK

Fig. 48 — Compressor Fits and Clearances (cont)

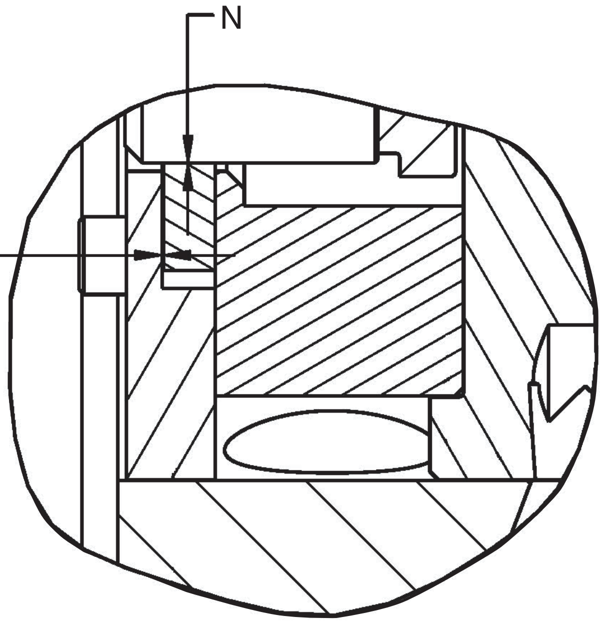


VIEW B — HIGH SPEED SHAFT (FRAME 2, 4, OR 5)

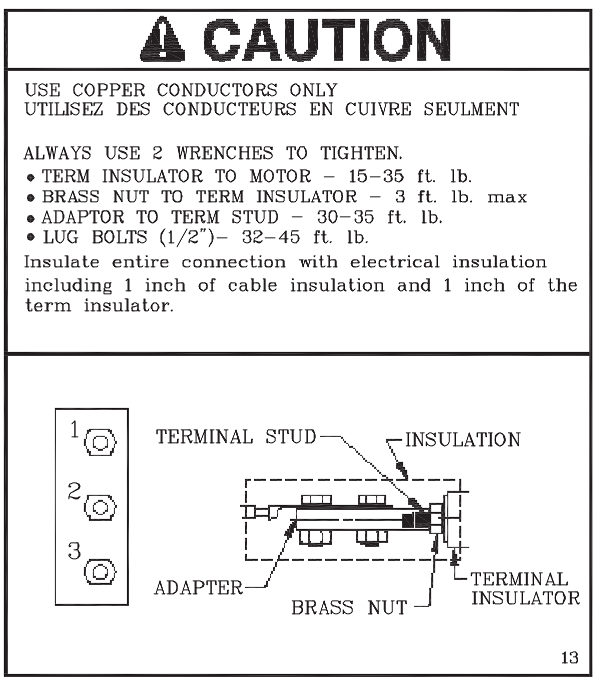


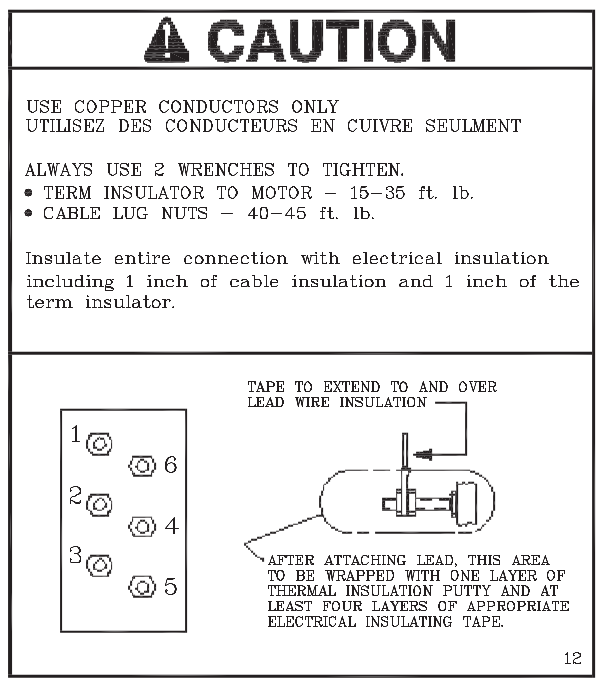
VIEW B — HIGH SPEED SHAFT (FRAME 3)

Fig. 48 — Compressor Fits and Clearances (cont)



VIEW C — HIGH SPEED SHAFT RING SEAL





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**	**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)

Fig. 48 — Compressor Fits and Clearances (cont)

LEGEND FOR FIG. 49-54

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
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

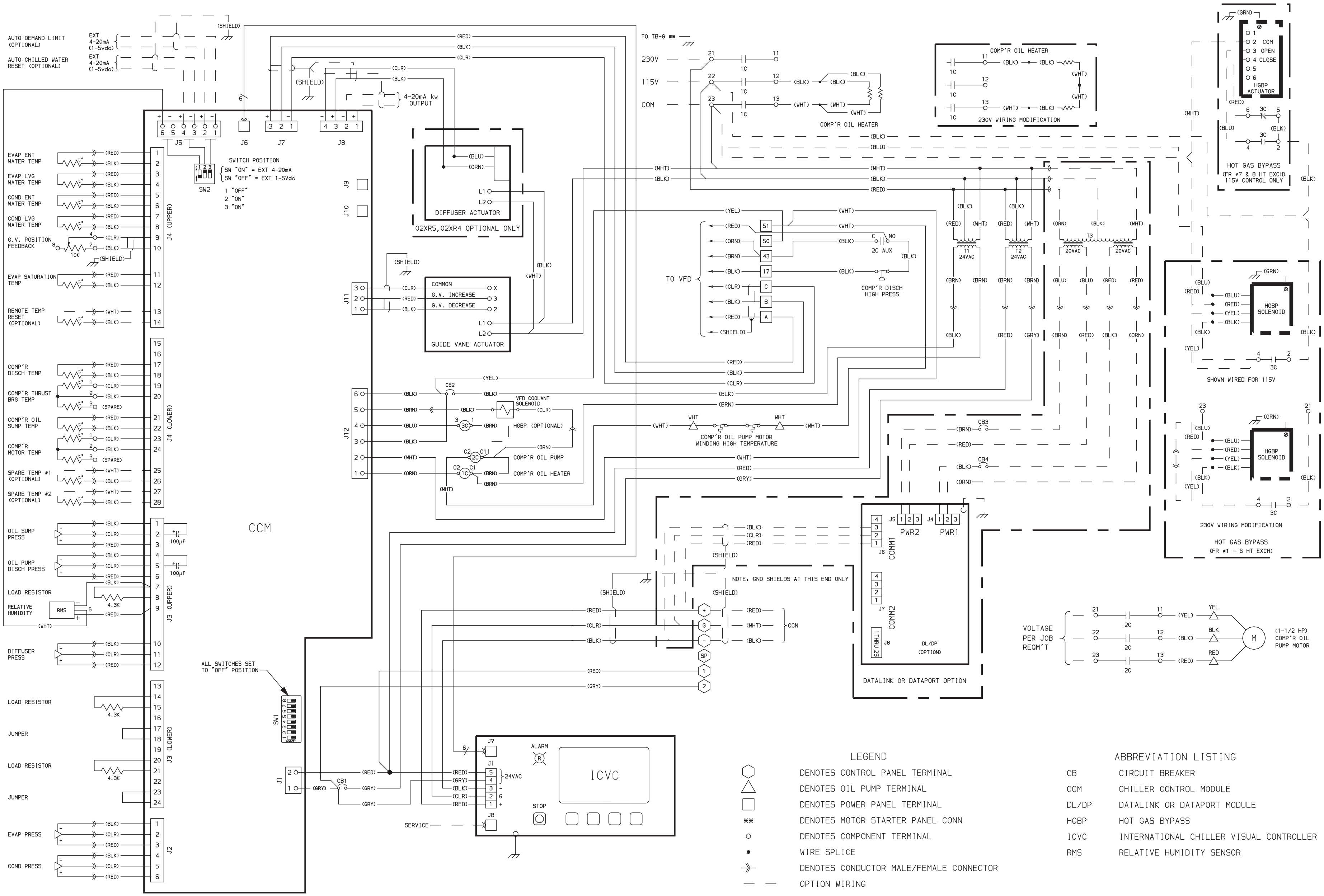


Fig. 49 — Electronic PIC III Control Panel Wiring Schematic (Frame 2, 3, 4 Compressor, Standard Diffuser)

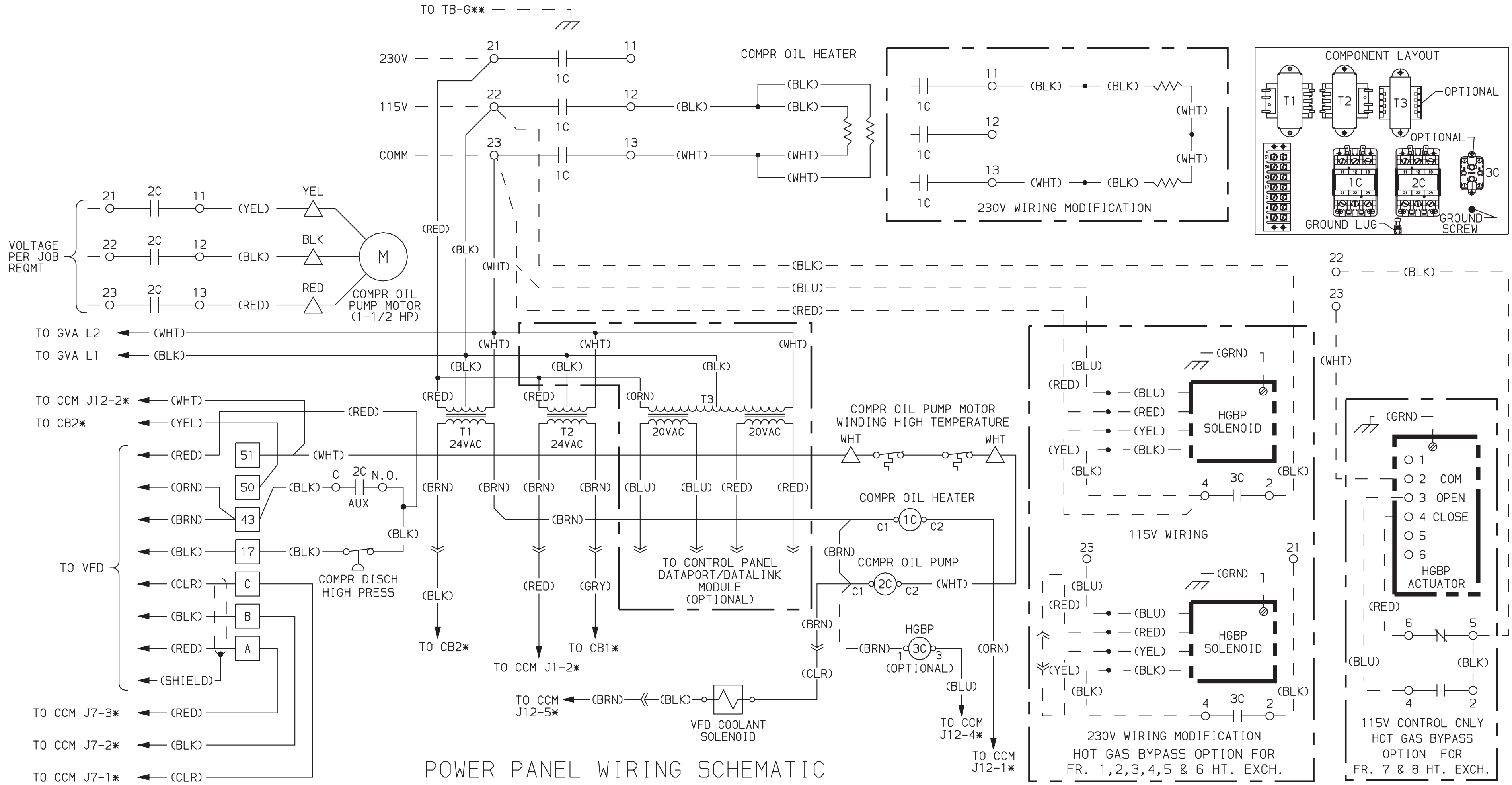


Fig. 50 — Power Panel Wiring Schematic

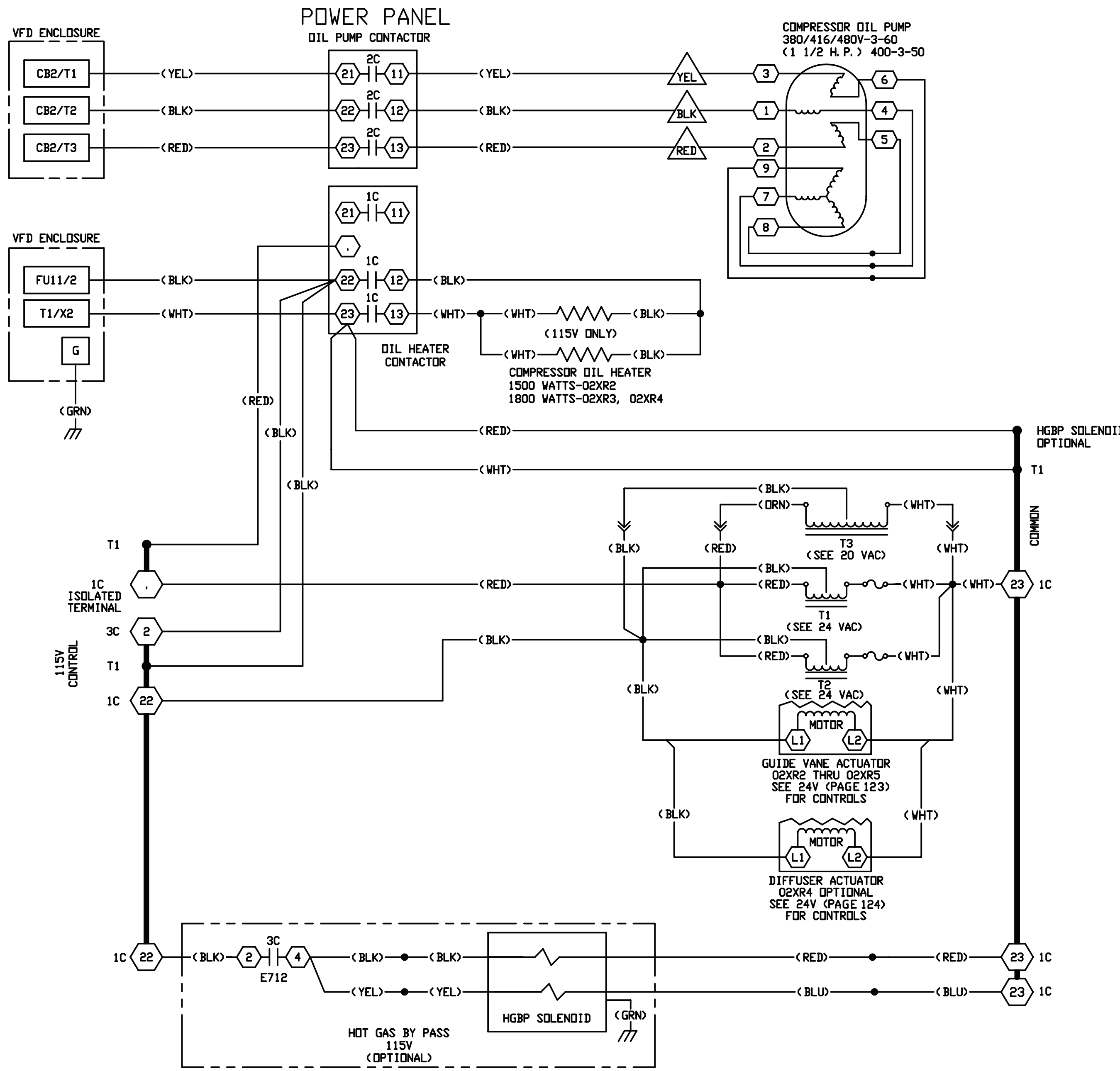
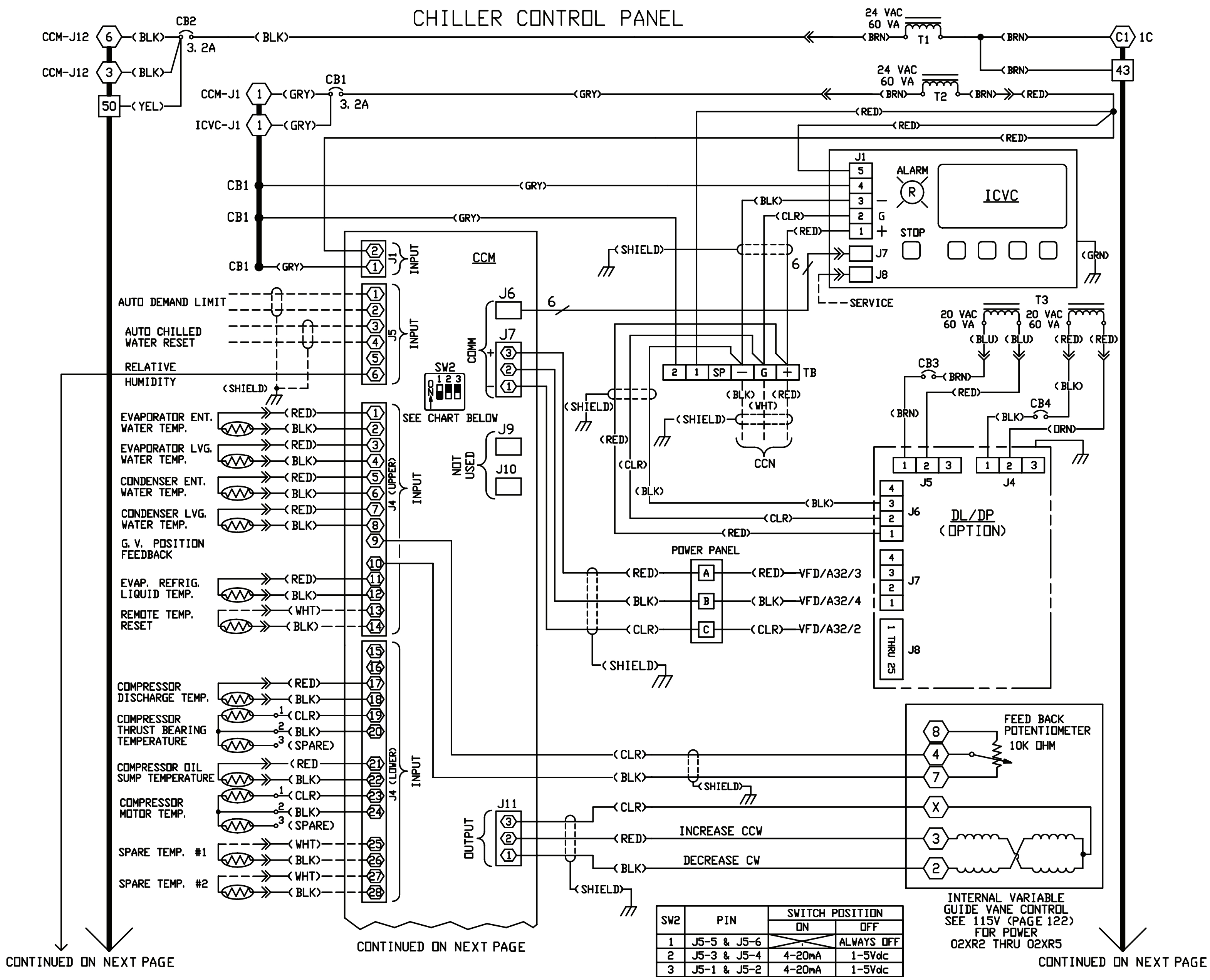


Fig. 51 — 19XRV 442A and 608A Chiller Control Schematic



SW2	PIN	SWITCH POSITION ON	SWITCH POSITION OFF
1	J5-5 & J5-6		ALWAYS OFF
2	J5-3 & J5-4	4-20mA	1-5Vdc
3	J5-1 & J5-2	4-20mA	1-5Vdc

Fig. 51 — 19XRV 442A and 608A Chiller Control Schematic (cont)

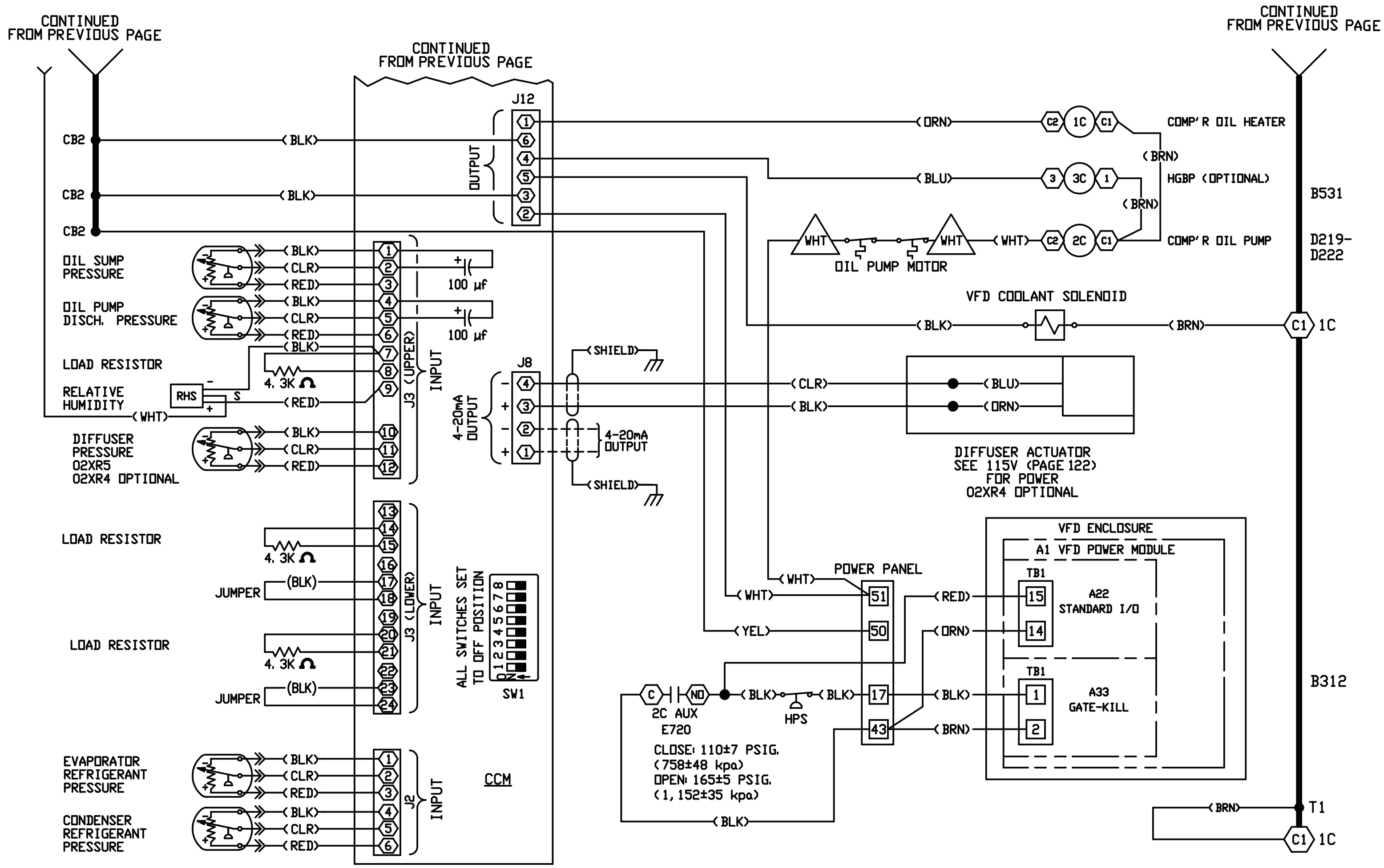


Fig. 51 — 19XRV 442A and 608A Chiller Control Schematic (cont)

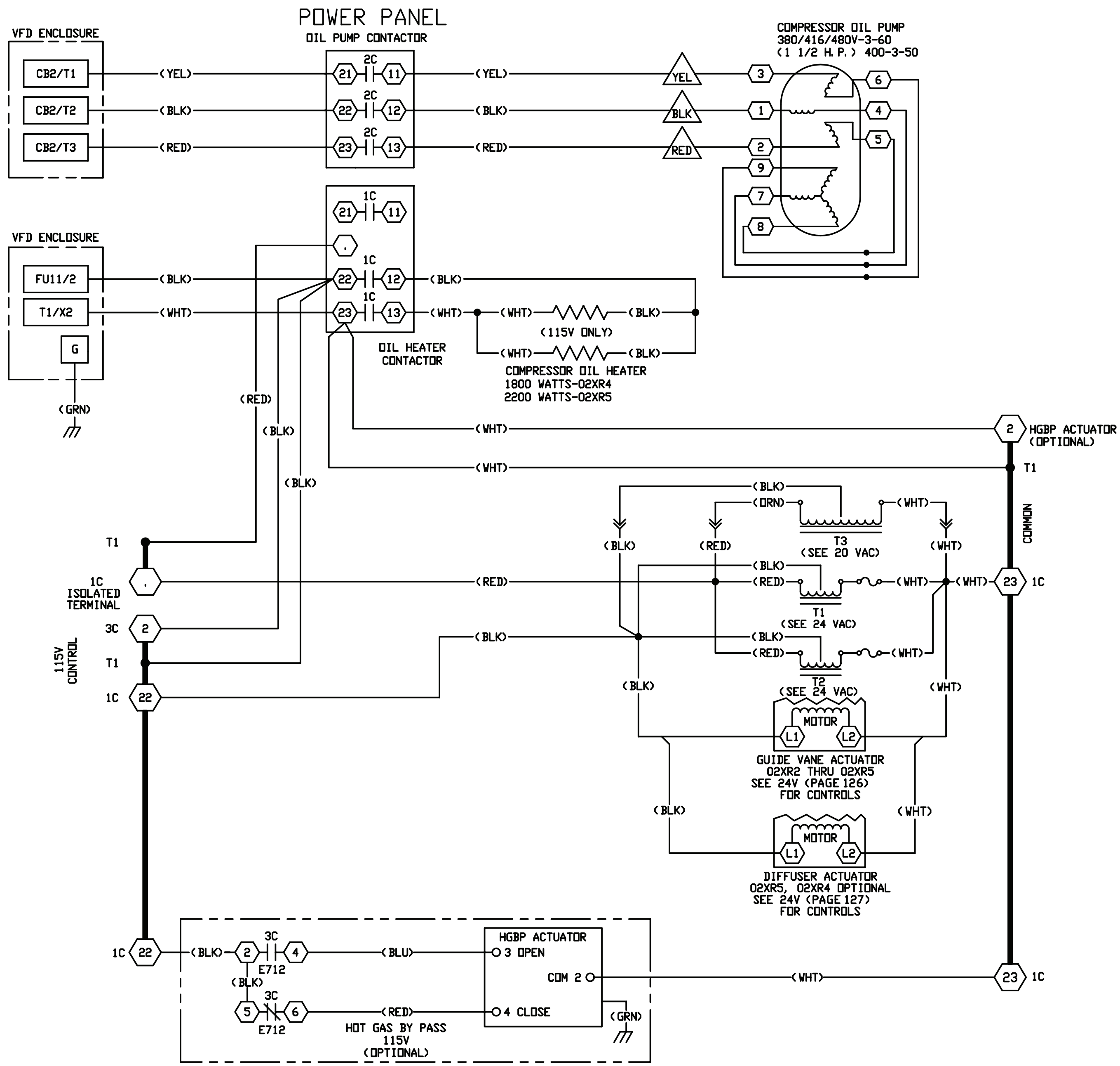
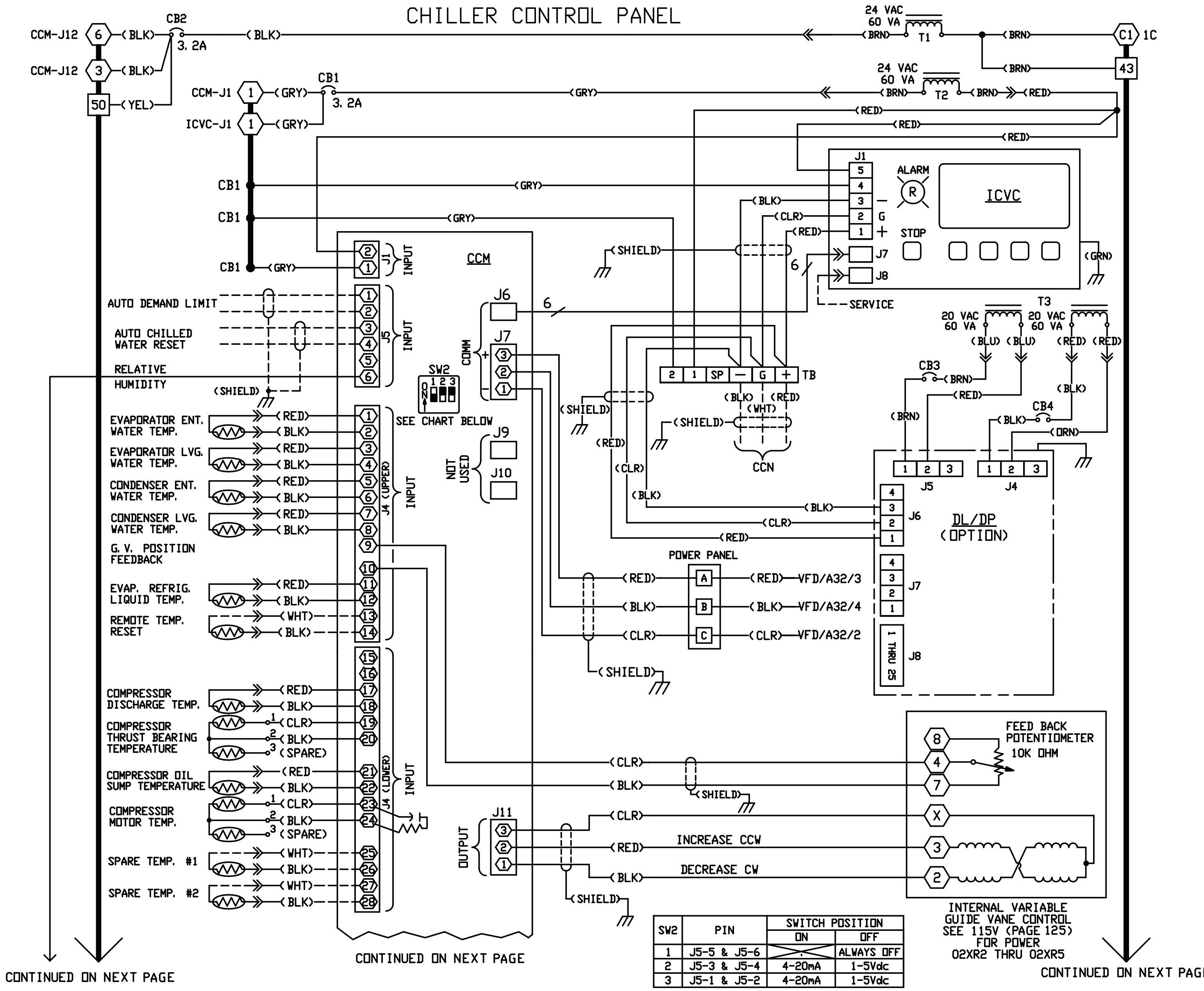


Fig. 52 — 19XRV 1169A Chiller Control Schematic



SW2	PIN	SWITCH POSITION	
		ON	OFF
1	J5-5 & J5-6		ALWAYS OFF
2	J5-3 & J5-4	4-20mA	1-5Vdc
3	J5-1 & J5-2	4-20mA	1-5Vdc

Fig. 52 — 19XRV 1169A Chiller Control Schematic (cont)

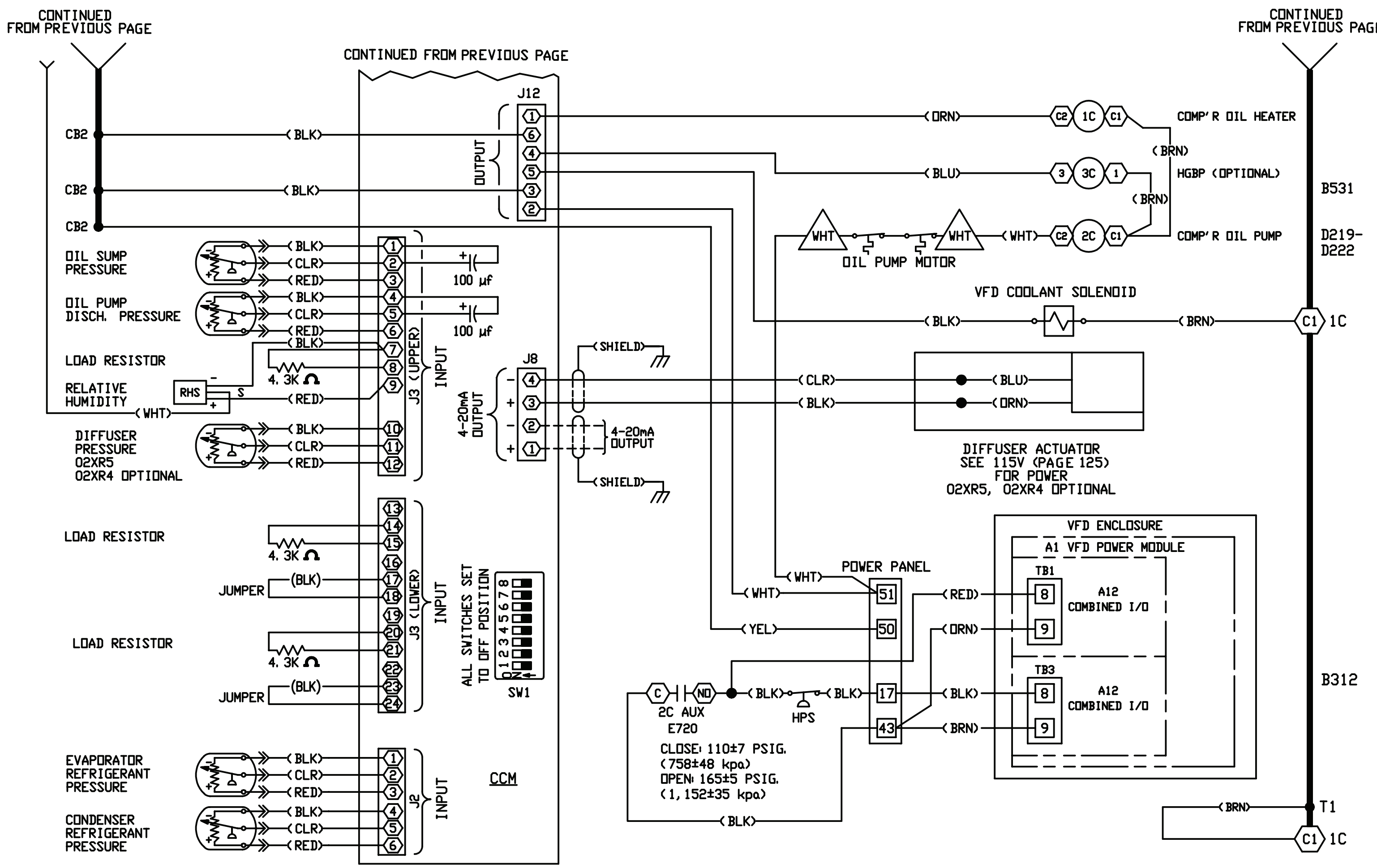


Fig. 52 — 19XRV 1169A Chiller Control Schematic (cont)

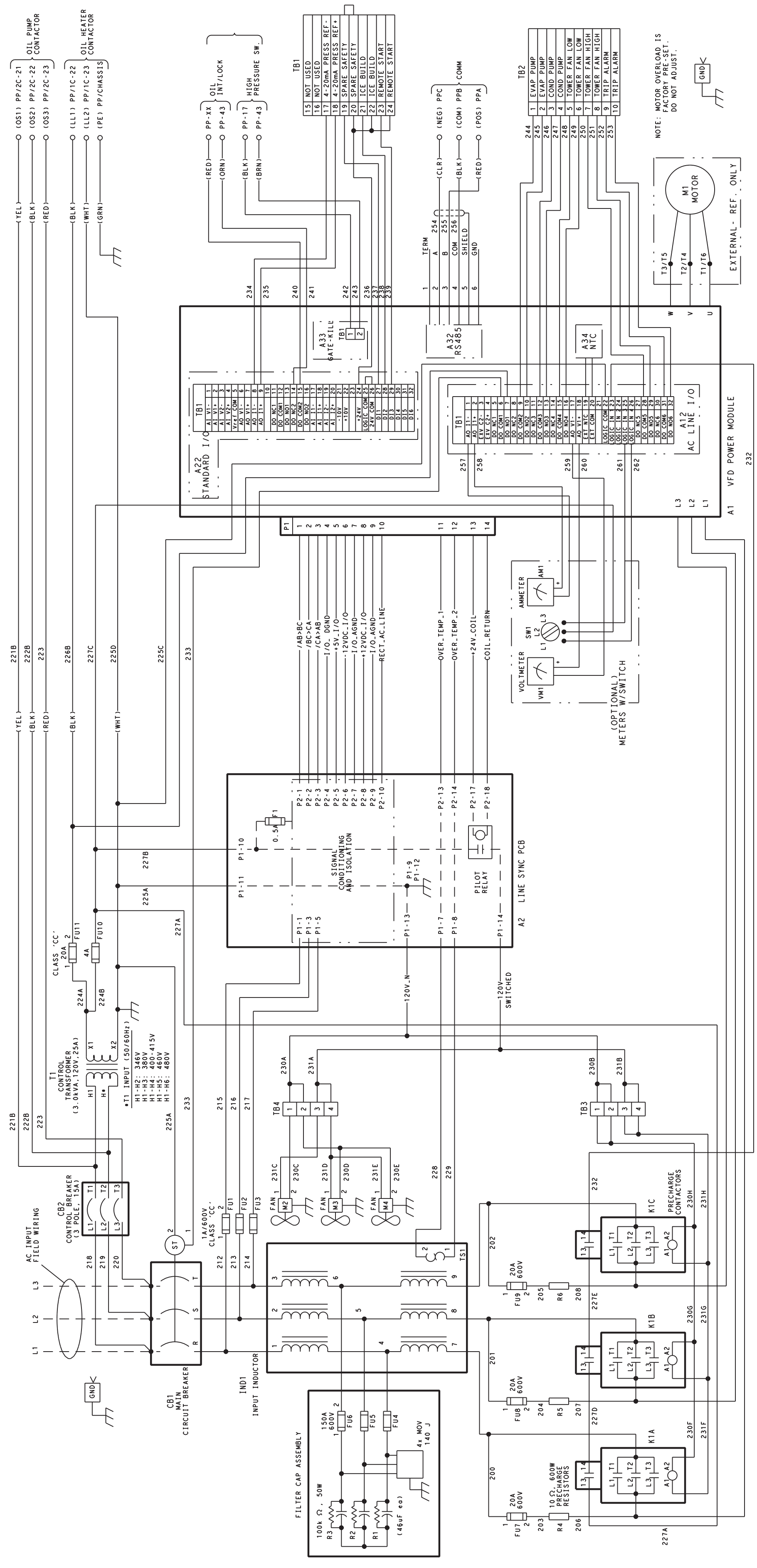


Fig. 53 — 19XRV 442A and 608A Chiller VFD Schematic

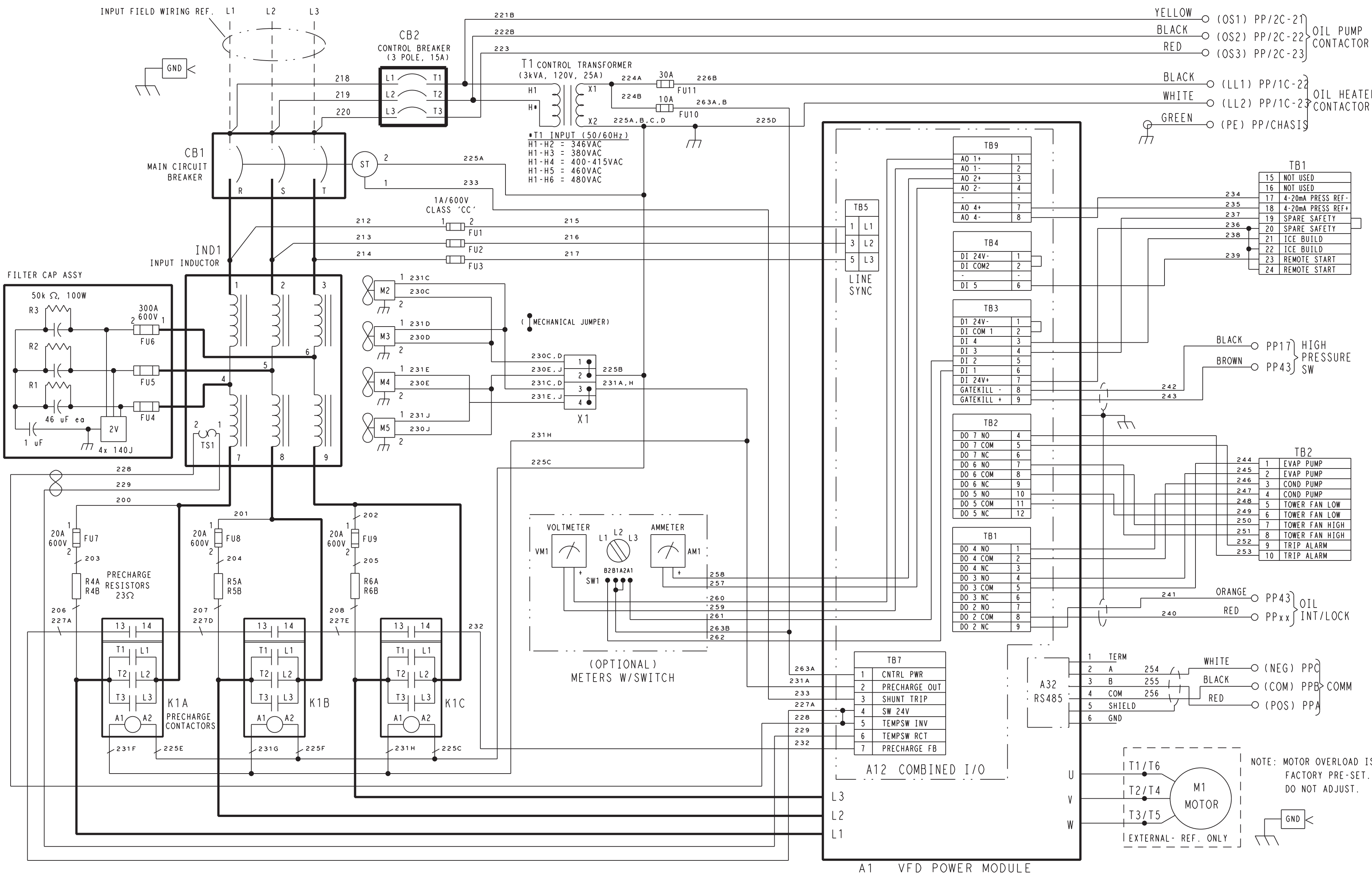


Fig. 54 — 19XRV 1169A Chiller VFD Schematic

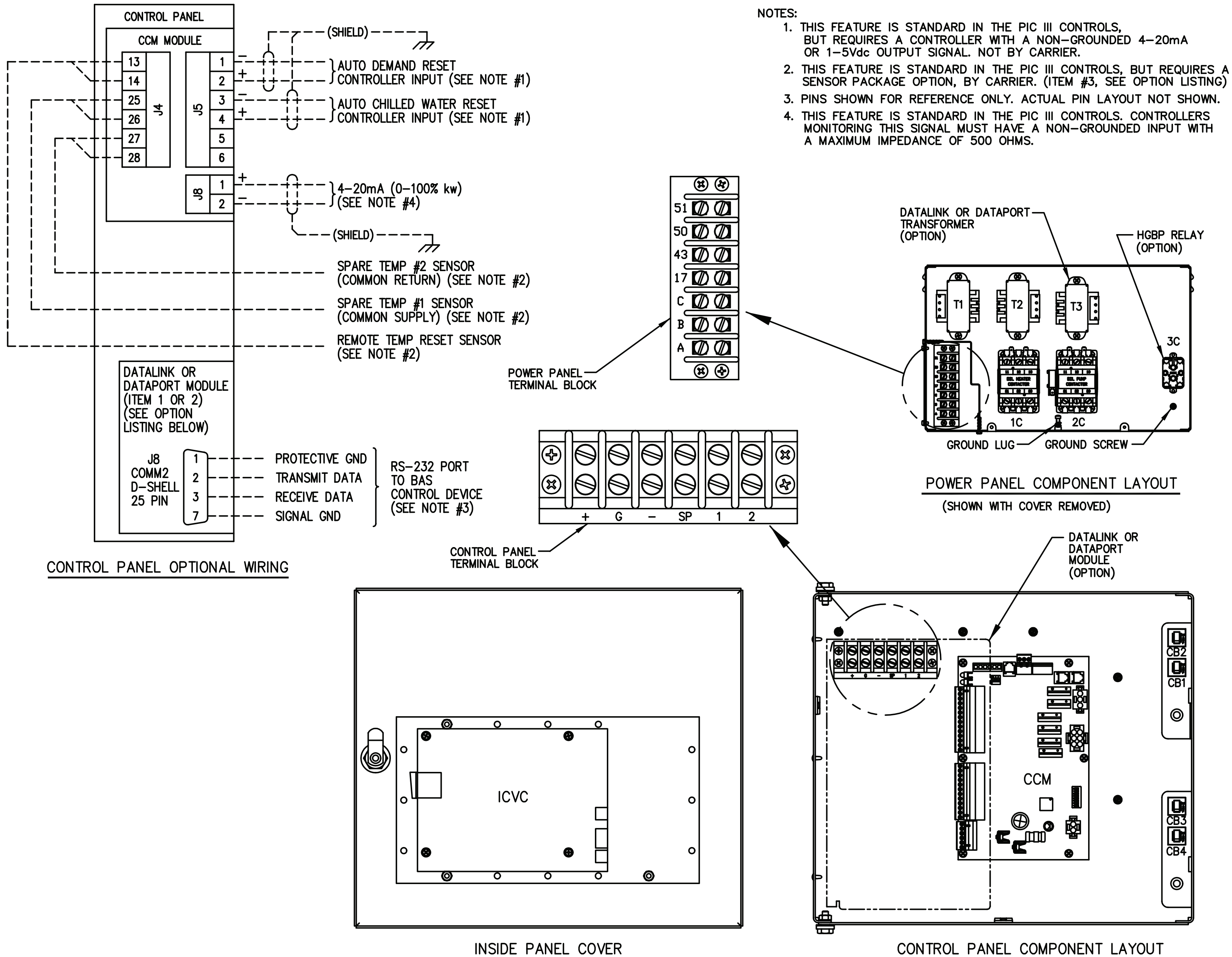


Fig. 55 — 19XRV Chiller Control Panel Component Layout

LEGEND

ITEM		DESCRIPTION
1		Unit-Mounted VFD Model 0442
		Unit-Mounted VFD Model 0608
		Unit-Mounted VFD Model 1169
		VFD with 65 KAIC Circuit Breaker (Std)
		VFD with 100 KAIC Circuit Breaker (Optional)
		Includes: (1) N.O. Chilled Water Pump Contact Output (1) N.O. Condenser Water Pump Contact Output (1) N.O. Tower Fan Low/#1 Contact Output (1) N.O. Tower Fan High/#2 Contact Output (1) N.O. Alarm Contact Output (1) 4-20mA Head Pressure Reference Output (1) N.C. Spare Safety (Dry) Contact Input (1) N.O. Remote Start (Dry) Contact Input (1) N.O. Ice Build (Dry) Contact Input
	PROTECTION	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)
	METERING	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)
	ANCIL-LIARY	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 [N.C.] See Note 3.1
K		Remote Start/Stop Device [N.O.] 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

Fig. 56 — 19XRV Field Wiring

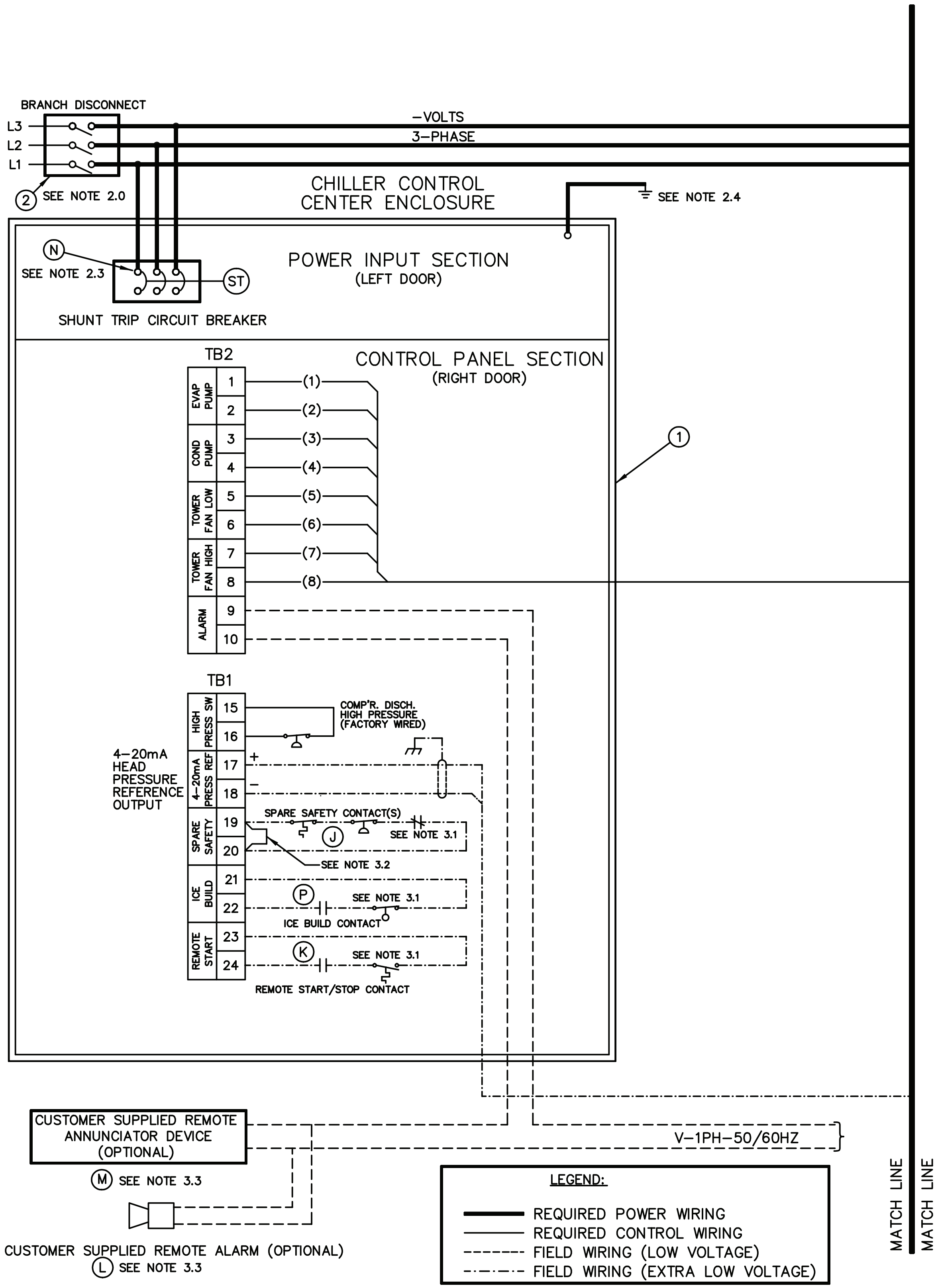


Fig. 56 — 19XRV Field Wiring (cont)

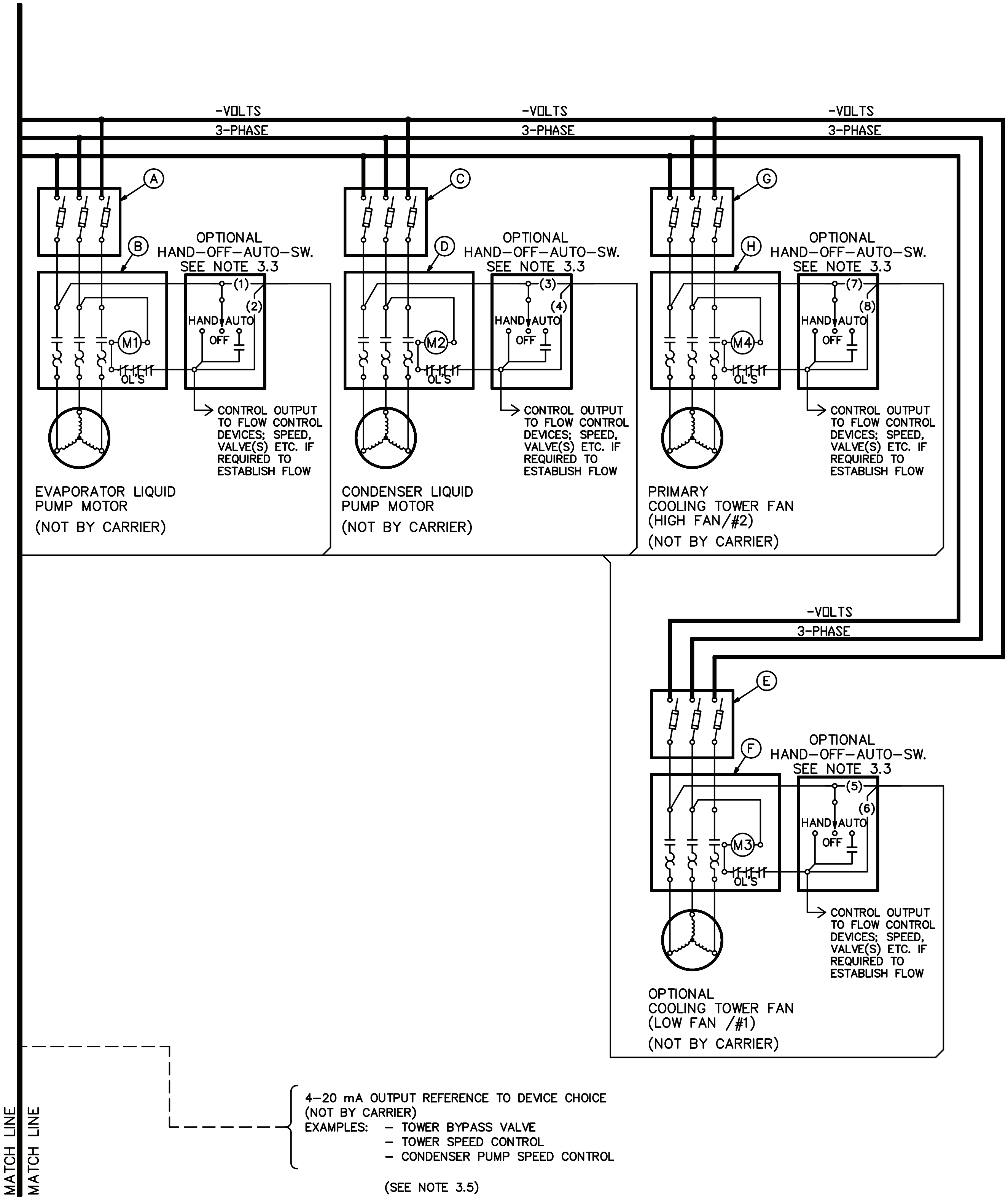


Fig. 56 — 19XRV Field Wiring (cont)

NOTES

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	3/0 — 500MCM	2	400 — 500MCM
608A	3	3/0 — 500MCM	3	3/0 — 400MCM
1169A	4	500 — 1000MCM	4	500 — 1000MCM

If larger lugs are required, they can be purchased from the manufacturer of the circuit breaker (Cutler-Hammer or Square D).
2.4 Compressor motor and controls must be grounded by using equipment grounding lug provided inside unit-mounted VFD enclosure.

III Control Wiring

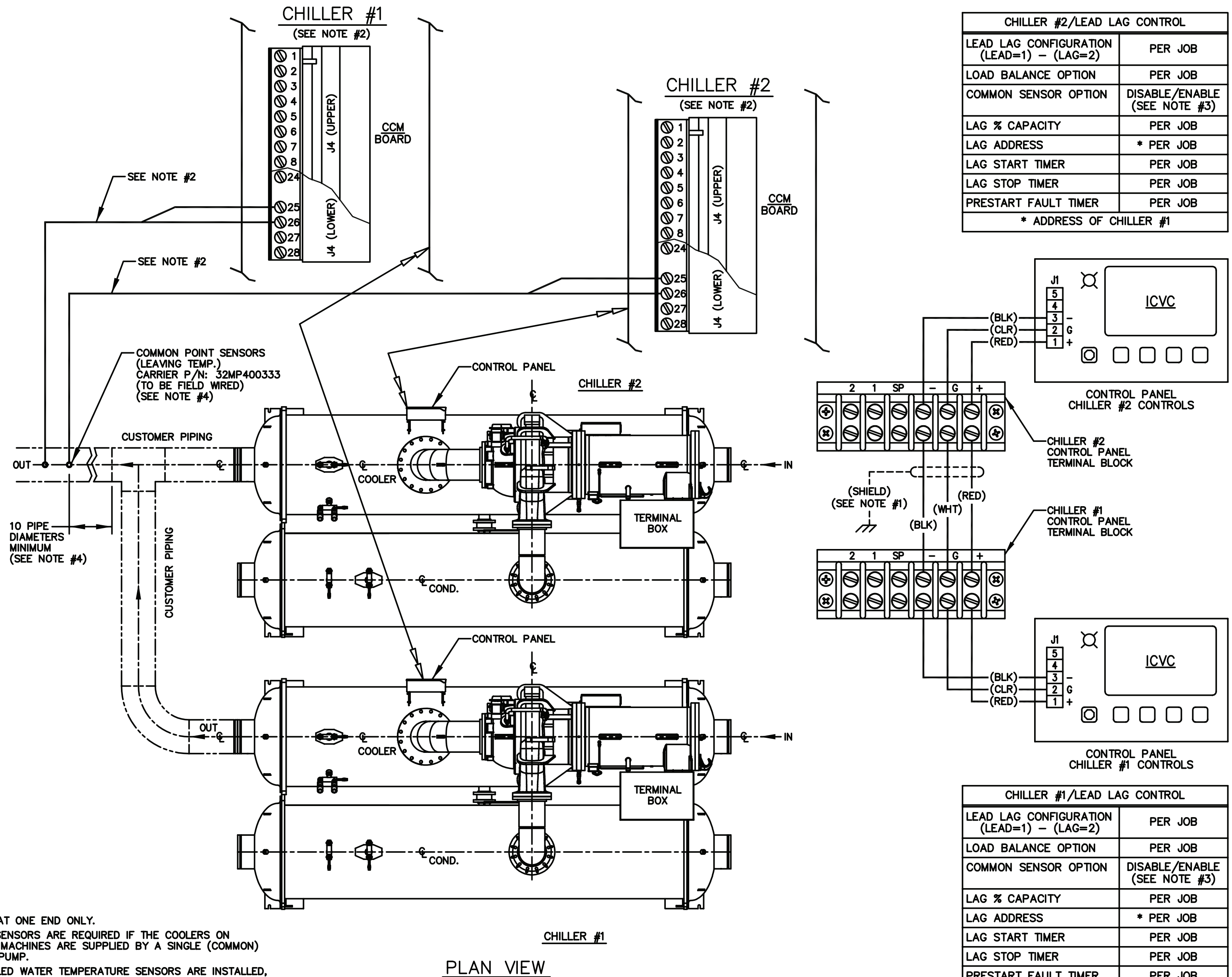
3.0 Field-supplied control conductors to be at least 18 AWG (American Wire Gage) or larger.
3.1 Ice build start/terminate device contacts, remote start/stop device contacts and spare safety device contacts (devices not supplied by Carrier) must have 24 vac rating. Max current is 60 mA, nominal current 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. 56 — 19XRV Field Wiring (cont)



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

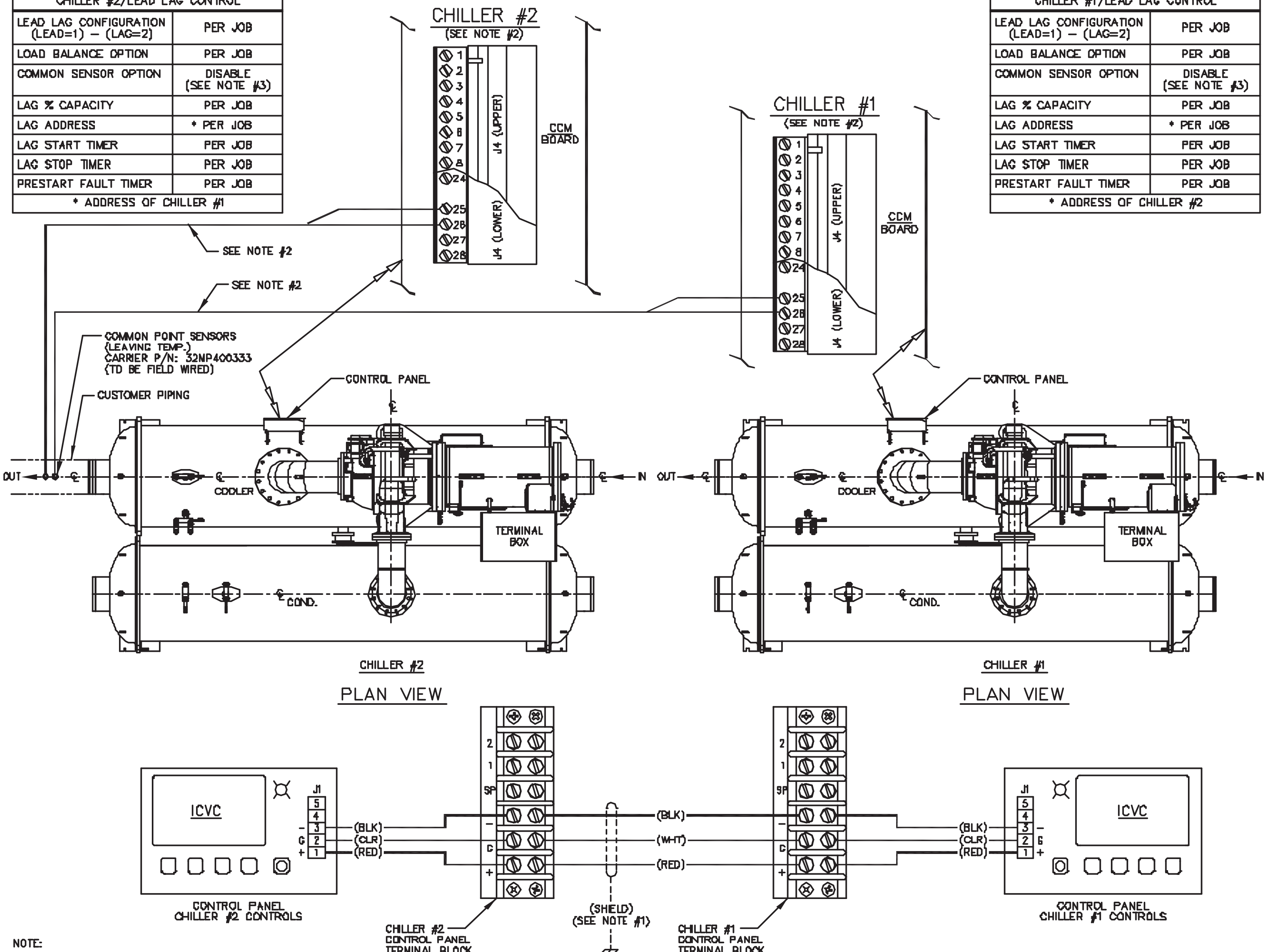
CHILLER #1/LEAD LAG CONTROL	
LEAD LAG CONFIGURATION (LEAD=1) – (LAG=2)	PER JOB
LOAD BALANCE OPTION	PER JOB
COMMON SENSOR OPTION	DISABLE/ENABLE (SEE NOTE #3)
LAG % CAPACITY	PER JOB
LAG ADDRESS	* PER JOB
LAG START TIMER	PER JOB
LAG STOP TIMER	PER JOB
PRESTART FAULT TIMER	PER JOB
* ADDRESS OF CHILLER #2	

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.

Fig. 57A — 19XRV Lead Lag Schematic Parallel Cooler Flow

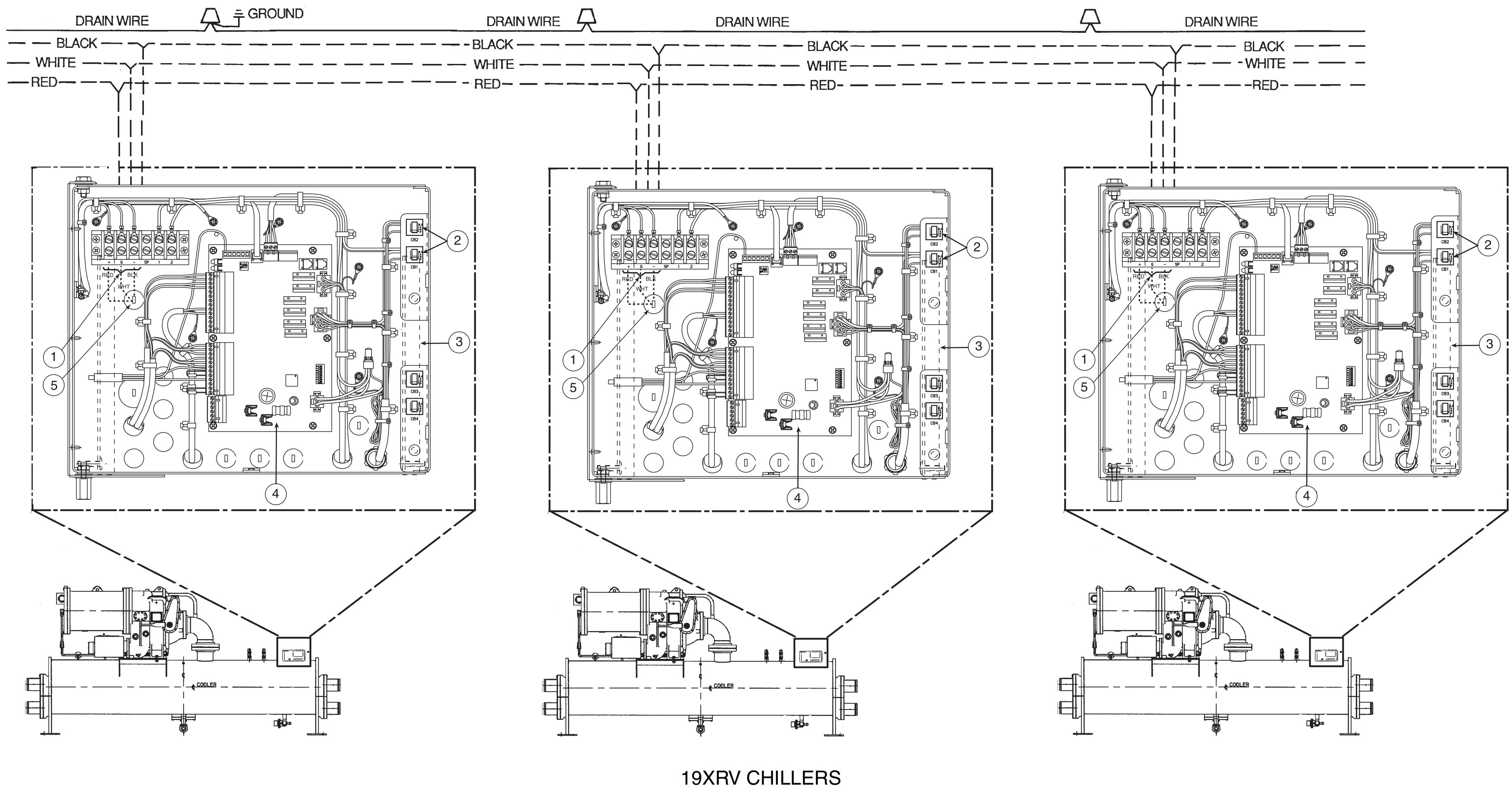
CHILLER #2/LEAD LAG CONTROL	
LEAD LAG CONFIGURATION (LEAD=1) – (LAG=2)	PER JOB
LOAD BALANCE OPTION	PER JOB
COMMON SENSOR OPTION	DISABLE (SEE NOTE #3)
LAG % CAPACITY	PER JOB
LAG ADDRESS	* PER JOB
LAG START TIMER	PER JOB
LAG STOP TIMER	PER JOB
PRESTART FAULT TIMER	PER JOB
* ADDRESS OF CHILLER #1	

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



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

Fig. 57B — 19XRV Lead Lag Schematic Series Cooler Flow



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. 58 — CCN Communication Wiring For Multiple Chillers (Typical)

APPENDIX — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
0% Actual Guide Vane Position	SERVICE	CONTROL TEST	GUIDE VANE CALIBRATION	X
100% Actual Guide Vane Position	SERVICE	CONTROL TEST	GUIDE VANE CALIBRATION	X
1st Current Alarm State	SERVICE	CONTROL ALGORITHM STATUS	CUR_ALARM	
20mA Demand Limit Opt	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
2nd Current Alarm State	SERVICE	CONTROL ALGORITHM STATUS	CUR_ALARM	
3rd Current Alarm State	SERVICE	CONTROL ALGORITHM STATUS	CUR_ALARM	
4th Current Alarm State	SERVICE	CONTROL ALGORITHM STATUS	CUR_ALARM	
5th Current Alarm State	SERVICE	CONTROL ALGORITHM STATUS	CUR_ALARM	
Active Delta P	STATUS		HEAT_EX	
Active Delta T	STATUS		HEAT_EX	
Active Demand Limit	STATUS		MAINSTAT	X
Actual Guide Vane Pos	STATUS		STARTUP	
Actual Guide Vane Pos	STATUS		COMPRESS	
Actual Guide Vane Pos	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Actual Guide Vane Position	SERVICE	CONTROL TEST	GUIDE VANE CALIBRATION	
Actual Guide Vane Position	SERVICE	CONTROL TEST	IGV & SRD ACTUATOR	
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 Configuration	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	
ALARM HISTORY	SERVICE			
Alarm Relay Test	SERVICE	CONTROL TEST	DISCRETE OUTPUTS	X
Alarm Routing	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
ALERT HISTORY	SERVICE			
Amps or kW Ramp %/Min.	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
Amps/kW Ramp	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
ATTACH TO NETWORK DEVICE	SERVICE			
Auto Chilled Water Reset	STATUS		MAINSTAT	
Auto Demand Limit Input	STATUS		MAINSTAT	
Auto Restart Option	SERVICE	EQUIPMENT SERVICE	OPTIONS	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
Capacity Control	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Capacity Control	SERVICE	EQUIPMENT SERVICE	SETUP2	
CCM Pressure Transducers	SERVICE		CONTROL TEST	
CCM Temperature Thermistors	SERVICE		CONTROL TEST	
CCN			DEFAULT SCREEN	X
CCN Mode?	STATUS		ICVC_PWD	X
CCN Occupancy Config:	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	
CCN Time Schedule	SCHEDULE		OCCP03S	X
CCN Time Schedule (OCCPC03S)	SERVICE	EQUIPMENT CONFIGURATION	OCCDEFCS	X
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	
Chilled Water Delta P	SERVICE	CONTROL TEST	PRESSURE TRANSDUCERS	
Chilled Water Delta P	SERVICE	CONTROL TEST	PUMPS	
Chilled Water Delta T	STATUS		HEAT_EX	
Chilled Water Flow	STATUS		STARTUP	
Chilled Water Flow	SERVICE	CONTROL TEST	PUMPS	
Chilled Water Pump	STATUS		STARTUP	
Chilled Water Pump	SERVICE	CONTROL TEST	PUMPS	

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
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	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Discharge Temp	SERVICE	CONTROL TEST	THERMITORS	
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 Motor Winding Temp	SERVICE	CONTROL TEST	THERMITORS	
Comp Thrust Brg Alert	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Thrust Brg Alert	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Comp Thrust Brg Temp	STATUS		COMPRESS	
Comp Thrust Brg Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Comp Thrust Brg Temp	SERVICE	CONTROL TEST	THERMITORS	
Compressor 100% Speed	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Compressor Ontime	STATUS		MAINSTAT	
Compressor Ontime			DEFAULT SCREEN	
Cond Approach Alert	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Cond Flow Delta P Cutout	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 Pressure	SERVICE	CONTROL TEST	PRESSURE TRANSDUCERS	
Condenser Refrig Temp	STATUS		HEAT_EX	
Condenser Refrig Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Condenser Refrigerant Temperature			DEFAULT SCREEN	
Condenser Water Delta P	STATUS		HEAT_EX	
Condenser Water Delta P	SERVICE	CONTROL TEST	PRESSURE TRANSDUCERS	
Condenser Water Delta P	SERVICE	CONTROL TEST	PUMPS	
Condenser Water Flow	STATUS		STARTUP	
Condenser Water Flow	SERVICE	CONTROL TEST	PUMPS	
Condenser Water Pump	STATUS		STARTUP	
Condenser Water Pump	SERVICE	CONTROL TEST	PUMPS	
CONSUME	SERVICE	EQUIPMENT CONFIGURATION	CONSUME	X
Control Mode	STATUS		MAINSTAT	
Control Point	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Control Point	STATUS		MAINSTAT	X
Control Point	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	
Control Point	SETPOINT		SETPOINT	X
Control Point Error	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
CONTROL TEST	SERVICE			
Current CHW Setpoint	SERVICE	CONTROL ALGORITHM STATUS	WSMDEFME	
Current Date	SERVICE		TIME AND DATE	X
Current Mode	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Current Time	SERVICE		TIME AND DATE	X

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Date	SERVICE		TIME AND DATE	X
Day of Week	SERVICE		TIME AND DATE	X
Daylight Savings	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
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	
Decrease Ramp Time	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Degrees Reset	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
Degrees Reset	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
Degrees Reset At 20 mA	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
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	
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 Actuator	SERVICE		CONTROL TEST	
Diffuser Actuator	SERVICE	CONTROL TEST	IGV & SRD ACTUATOR	
Diffuser Actuator	SERVICE	CONTROL TEST	DIFFUSER ACTUATOR	X
Diffuser Control	SERVICE	EQUIPMENT SERVICE	SETUP2	
Diffuser Full Span mA	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Diffuser Option	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Disable Service Password	SERVICE		ICVC_PWD	X
Discharge Pressure	SERVICE	CONTROL TEST	PRESSURE TRANSDUCERS	
Discrete Outputs Control Test	SERVICE		CONTROL TEST	
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 Chilled Water			DEFAULT SCREEN	
Entering Chilled Water	SERVICE	CONTROL TEST	THERMITORS	
Entering Cond Water	SERVICE	CONTROL TEST	THERMITORS	
Entering Condenser Water	STATUS		HEAT_EX	
Entering Condenser Water			DEFAULT SCREEN	
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 Ref Override Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Evap Refrig Trippoint	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Evap Saturation Temp	STATUS		HEAT_EX	
Evap Saturation Temp	SERVICE	CONTROL TEST	THERMITORS	
Evaporator Approach	STATUS		HEAT_EX	
Evaporator Pressure	STATUS		HEAT_EX	
Evaporator Pressure	SERVICE	CONTROL TEST	PRESSURE TRANSDUCERS	

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Evaporator Refrig Temp	STATUS		HEAT_EX	
Evaporator Refrig Temp	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Evaporator Refrigerant Temperature			DEFAULT SCREEN	
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	
Full Load Point (T2, P2)	SERVICE	EQUIPMENT SERVICE	OPTIONS	
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 Calibration	SERVICE		CONTROL TEST	
Guide Vane Control	SERVICE	CONTROL TEST	IGV & SRD ACTUATOR	X
Guide Vane Delta	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Guide Vane Delta	STATUS		COMPRESS	
Guide Vane Travel Limit	SERVICE	EQUIPMENT SERVICE	SETUP2	X
Head Pressure Output Control Test	SERVICE		CONTROL TEST	X
Head Pressure Reference	STATUS		HEAT_EX	
Head Pressure Reference	SERVICE	EQUIPMENT SERVICE	OPTIONS	
Head Pressure Reference	SERVICE	CONTROL TEST	HEAD PRESSURE OUTPUT	
High DC Bus Voltage	STATUS		VFD_STAT	
High Line Voltage	STATUS		VFD_STAT	
Holiday	SERVICE		TIME AND DATE	X
HOLIDAYS	SERVICE	EQUIPMENT CONFIGURATION	HOLIDAYS	X
Hot Gas Bypass Relay	STATUS		HEAT_EX	
Hot Gas Bypass Relay Test	SERVICE	CONTROL TEST	DISCRETE OUTPUTS	X
Humidity Sensor Input	STATUS		POWER	
Humidity Sensor Input	SERVICE	CONTROL TEST	PRESSURE TRANSDUCERS	
Ice Build Contact	STATUS		MAINSTAT	
Ice Build Control	SERVICE	EQUIPMENT SERVICE	OPTIONS	
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
Ice Build Time Schedule	SCHEDULE		OCCP02S	X
Ice Build Time Schedule (OCCPC02S)	SERVICE	EQUIPMENT CONFIGURATION	OCCDEFCS	X
ICVC CONFIGURATION	SERVICE			
IGV & SRD Actuator	SERVICE		CONTROL TEST	
Incompatibility Fault	STATUS		VFD_STAT	
Increase Ramp Time	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Inverter Overcurrent	STATUS		VFD_STAT	
Inverter Overload	STATUS		POWER	
Inverter Overtemp	STATUS		VFD_STAT	
Inverter Power Fault	STATUS		VFD_STAT	
Inverter PWM Frequency	SERVICE	VFD CONFIG DATA	VFD_CONF	X
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

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
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 Control	SERVICE	EQUIPMENT SERVICE	LEADLAG	
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 Chilled Water			DEFAULT SCREEN	
Leaving Chilled Water	SERVICE	CONTROL TEST	THERMITORS	
Leaving Cond Water	SERVICE	CONTROL TEST	THERMITORS	
Leaving Condenser Water	STATUS		HEAT_EX	
Leaving Condenser Water			DEFAULT SCREEN	
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	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Line Current Imbal Time	SERVICE	VFD CONFIG DATA	VFD_CONF	X
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	
Line Freq=60 Hz? (No=50)	SERVICE	VFD CONFIG DATA	VFD_CONF	X
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 Volt Imbalance Time	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Line Voltage % Imbalance	SERVICE	VFD CONFIG DATA	VFD_CONF	X
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	

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Loadshed	SERVICE	CONTROL ALGORITHM STATUS	LOADSHED	
Loadshed Function	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	
Loadshed Function	SERVICE	CONTROL ALGORITHM STATUS	LOADSHED	
Loadshed Timer	SERVICE	CONTROL ALGORITHM STATUS	LOADSHED	
LOCAL			DEFAULT SCREEN	X
Local Network Device	SERVICE		ATTACH TO NETWORK DEVICE	X
Local Time Schedule	SCHEDULE		OCCP01S	X
Local Time Schedule (OCCPC01S)	SERVICE	EQUIPMENT CONFIGURATION	OCCDEFCS	X
LOG OUT OF DEVICE	SERVICE			
Low DC Bus Voltage	STATUS		VFD_STAT	
Low Line Voltage	STATUS		VFD_STAT	
Maximum Loadshed Time	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
Min. Load Point (T1, P1)	SERVICE	EQUIPMENT SERVICE	OPTIONS	
Minimum Output	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Model Number	SERVICE		ICVC CONFIGURATION	
Motor Amps Not Sensed	STATUS		VFD_STAT	
Motor Current % Imbalance	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Motor Current Imbal Time	SERVICE	VFD CONFIG DATA	VFD_CONF	X
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 Nameplate Amps	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Motor Nameplate kW	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Motor Nameplate RPM	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Motor Nameplate Voltage	SERVICE	VFD CONFIG DATA	VFD_CONF	X
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	
Motor Rated Load Amps	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Motor Rated Load kW	SERVICE	VFD CONFIG DATA	VFD_CONF	X
OCCPC01S (Local Time Schedule)	SCHEDULE		OCCP01S	X
OCCPC02S (Ice Build Time Schedule)	SCHEDULE		OCCP02S	X
OCCPC03S (CCN Time Schedule)	SCHEDULE		OCCP03S	X
OCCPC01S (Local Time Schedule)	SERVICE	EQUIPMENT CONFIGURATION	OCCDEFCS	X
OCCPC02S (Ice Build Time Schedule)	SERVICE	EQUIPMENT CONFIGURATION	OCCDEFCS	X
OCCPC03S (CCN Time Schedule)	SERVICE	EQUIPMENT CONFIGURATION	OCCDEFCS	X
Occupied?	STATUS		MAINSTAT	
Oil Heater Relay	STATUS		COMPRESS	
Oil Heater Relay Test	SERVICE	CONTROL TEST	DISCRETE OUTPUTS	X
Oil Press Verify Time	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Oil Pressure			DEFAULT SCREEN	
Oil Pressure Acceptable?	SERVICE	CONTROL TEST	PUMPS	
Oil Pump Delta P	STATUS		STARTUP	X
Oil Pump Delta P	STATUS		COMPRESS	X
Oil Pump Delta P	SERVICE	CONTROL TEST	PRESSURE TRANSDUCERS	
Oil Pump Delta P	SERVICE	CONTROL TEST	PUMPS	
Oil Pump Relay	STATUS		STARTUP	
Oil Pump Relay	SERVICE	CONTROL TEST	PUMPS	
Oil Sump Temp	STATUS		STARTUP	
Oil Sump Temp	STATUS		COMPRESS	
Oil Sump Temp			DEFAULT SCREEN	
Oil Sump Temp	SERVICE	CONTROL TEST	THERMITORS	
Password (VFD CONFIG DATA)	SERVICE		VFD CONFIG DATA	X
Password (SERVICE)	SERVICE		ICVC CONFIGURATION	X

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Percent Line Current	STATUS		MAINSTAT	
Percent Line Current	STATUS		POWER	
Percent Line Current			DEFAULT SCREEN	
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	
Pressure Transducers Control Test	SERVICE		CONTROL TEST	
PRESTART FAULT Time	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
PRESTART FAULT Timer	SERVICE	EQUIPMENT SERVICE	LEADLAG	X
PRIMARY MESSAGE			DEFAULT SCREEN	
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 Ramp Type:	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
Pulldown: Delta T / Min	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Pumpdown/Lockout Control Test	SERVICE		CONTROL TEST	X
Pumpdown/Lockout Control Test	SERVICE	CONTROL TEST	CONTROL TEST	
Pumps Control Test	SERVICE		CONTROL TEST	
Rated Line Amps	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Rated Line Kilowatts	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Rated Line Voltage	SERVICE	VFD CONFIG DATA	VFD_CONF	X
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	
Recycle Control	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Redline	SERVICE	CONTROL ALGORITHM STATUS	LOADSHED	
Reference Number	SERVICE		ICVC CONFIGURATION	
Refrig Override Delta T	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Relative Humidity	SERVICE	CONTROL TEST	PRESSURE TRANSDUCERS	
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 Reset Sensor	SERVICE	CONTROL TEST	THERMITORS	
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			DEFAULT SCREEN	X
Reset Alarm?	STATUS		ICVC_PWD	X
RESET TYPE 1	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	
RESET TYPE 2	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	
RESET TYPE 3	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	
Restart Delta T	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Run Status	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Run Status	STATUS		MAINSTAT	

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
RUNTIME	SERVICE	EQUIPMENT CONFIGURATION	RUNTIME	X
Schedule Number	SERVICE	EQUIPMENT CONFIGURATION	NET_OPT	X
SECONDARY MESSAGE			DEFAULT SCREEN	
Serial Number	SERVICE		ICVC CONFIGURATION	
Service Ontime	STATUS		MAINSTAT	
Shunt Trip Relay	STATUS		STARTUP	
Shunt Trip Relay Test	SERVICE	CONTROL TEST	DISCRETE OUTPUTS	X
Shutdown Delta T	SERVICE	EQUIPMENT SERVICE	SETUP1	X
Single Cycle Dropout	STATUS		VFD_STAT	
Single Cycle Dropout	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Skip Frequency 1	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Skip Frequency 2	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Skip Frequency 3	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Skip Frequency Band	SERVICE	VFD CONFIG DATA	VFD_CONF	X
Soft Stop Amps Threshold	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Software Part Number	SERVICE		ICVC CONFIGURATION	
Spare Alert/Alarm Enable	SERVICE	EQUIPMENT SERVICE	SETUP1	
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 1	SERVICE	CONTROL TEST	THERMITORS	
Spare Temperature 2	STATUS		COMPRESS	
Spare Temperature 2	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Spare Temperature 2	SERVICE	CONTROL TEST	THERMITORS	
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 Advance	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Start Complete	STATUS		STARTUP	
Start Complete	STATUS		VFD_STAT	
Start Day of Week	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Start Inhibit Timer	STATUS		MAINSTAT	
Start Month	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Start Time	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Start Week	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Start/Stop	SERVICE	CONTROL ALGORITHM STATUS	LL_MAINT	
Starts In 12 Hours	STATUS		MAINSTAT	
Stop Back	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Stop Complete	STATUS		STARTUP	
Stop Complete	STATUS		VFD_STAT	
Stop Day of Week	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Stop Fault	STATUS		VFD_STAT	
Stop Month	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Stop Time	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Stop Week	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	X
Superheat Required	SERVICE	CONTROL ALGORITHM STATUS	OVERRIDE	
Surge / HGBP Active?	STATUS		HEAT_EX	
Surge / Hot Gas Bypass	SERVICE	EQUIPMENT SERVICE	OPTIONS	
Surge Delta % Amps	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge Limit/HGBP Option	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge Protection	SERVICE	EQUIPMENT SERVICE	OPTIONS	
Surge Protection Counts	STATUS		COMPRESS	
Surge Time Period	SERVICE	EQUIPMENT SERVICE	OPTIONS	X

PARAMETER	MENU SOFTKEY	TABLE	SCREEN NAME	CONFIGURABLE
Surge/HGBP Deadband	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge/HGBP Delta P1	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge/HGBP Delta P2	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge/HGBP Delta T	STATUS		HEAT_EX	
Surge/HGBP Delta T1	SERVICE	EQUIPMENT SERVICE	OPTIONS	X
Surge/HGBP Delta T2	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 VFD Speed	STATUS		COMPRESS	X
Target VFD Speed	STATUS		STARTUP	
Target VFD Speed	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Temp Pulldown Deg/Min.	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	X
Temperature Reset	STATUS		MAINSTAT	
Temperature Reset	SERVICE	EQUIPMENT SERVICE	TEMP_CTL	
Terminate Lockout	SERVICE	EQUIPMENT SERVICE	CONTROL TEST	X
Thermistors Control Test	SERVICE		CONTROL TEST	
TIME AND DATE	SERVICE		TIME AND DATE	
Time Broadcast Enable	SERVICE	EQUIPMENT CONFIGURATION	BRODEF	
Torque Current	STATUS		POWER	
Torque Current	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
Total Compressor Starts	STATUS		MAINSTAT	
Total Error + Resets	SERVICE	CONTROL ALGORITHM STATUS	CAPACITY	
Tower Fan High Setpoint	SETPOINT		SETPOINT	X
Tower Fan Relay High	STATUS		STARTUP	
Tower Fan Relay High Test	SERVICE	CONTROL TEST	DISCRETE OUTPUTS	X
Tower Fan Relay Low	STATUS		STARTUP	
Tower Fan Relay Low Test	SERVICE	CONTROL TEST	DISCRETE OUTPUTS	X
Transducer Voltage Ref	SERVICE	CONTROL TEST	PRESSURE TRANSDUCERS	
US Imp / Metric	SERVICE		ICVC CONFIGURATION	X
Values at Last Fault:	SERVICE	CONTROL ALGORITHM STATUS	VFD_HIST	
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 CONFIG PASSWORD	SERVICE		VFD CONFIG DATA	X
VFD Coolant Flow	STATUS		HEAT_EX	
VFD Coolant Flow	STATUS		POWER	
VFD Coolant Solenoid Test	SERVICE	CONTROL TEST	DISCRETE OUTPUTS	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 FAULT HISTORY	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 Maximum Speed	SERVICE	EQUIPMENT SERVICE	SETUP2	X
VFD Minimum Speed	SERVICE	EQUIPMENT SERVICE	SETUP2	X
VFD Power On Reset	STATUS		VFD_STAT	
VFD Rectifier Version #	STATUS		VFD_STAT	
VFD Speed Control	SERVICE	EQUIPMENT SERVICE	SETUP2	
VFD Start	STATUS		STARTUP	
VFD Start Inhibit	STATUS		VFD_STAT	
Water Flow Verify Time	SERVICE	EQUIPMENT SERVICE	SETUP1	X
WSM Active?	SERVICE	CONTROL ALGORITHM STATUS	WSMDEFME	

INDEX

INITIAL START-UP CHECKLIST
FOR 19XRV HERMETIC CENTRIFUGAL LIQUID CHILLER
(Remove and use for job file.)

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

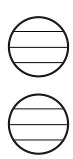
JOB DATA REQUIRED:

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:



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

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

ADD OIL: Yes ☐ No ☐

Amount: ________________

RECORD PRESSURE DROPS: Cooler _______________ Condenser ________________

CHARGE REFRIGERANT: Initial Charge _______________ Final Charge After Trim _______________

INSPECT WIRING AND RECORD ELECTRICAL DATA:

RATINGS:

Motor Voltage ________ Motor 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.

START MACHINE AND OPERATE. COMPLETE THE FOLLOWING:

A: Trim charge and record under Charge Refrigerant Into Chiller section on page 68.
B: Complete any remaining control calibration and record under Controls section (pages 14-52).
C: Take at least two sets of operational log readings and record.
D: After machine has been successfully run and set up, shut down and mark shutdown oil and refrigerant levels.
E: Give operating instructions to owner's operating personnel. Hours Given: _________ Hours
F: Call your Carrier factory representative to report chiller start-up.
G: Register LiquiFlo2 VFD startup at www.automation.rockwell.com/complete1/warp.
H: Return a copy of this checklist to the local Carrier Service office.

SIGNATURES:

CARRIER TECHNICIAN _________________________ CUSTOMER REPRESENTATIVE _________________________

DATE _____________ DATE _____________

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

Carrier COMFORT NETWORK

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: ____________ 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): ____________________

19XRV PIC III LOCAL TIME SCHEDULE CONFIGURATION SHEET OCCPC01S

	Day Flag M	T	W	T	F	S	S	H	Occupied Time	Unoccupied Time
Period 1:										
Period 2:										
Period 3:										
Period 4:										
Period 5:										
Period 6:										
Period 7:										
Period 8:										

NOTE: Default setting is OCCUPIED 24 hours/day.

ICE BUILD 19XRV PIC III TIME SCHEDULE CONFIGURATION SHEET OCCPC02S

	Day Flag M	T	W	T	F	S	S	H	Occupied Time	Unoccupied Time
Period 1:										
Period 2:										
Period 3:										
Period 4:										
Period 5:										
Period 6:										
Period 7:										
Period 8:										

NOTE: Default setting is UNOCCUPIED 24 hours/day.

19XRV PIC III CCN TIME SCHEDULE CONFIGURATION SHEET OCCPC03S

	Day Flag M	T	W	T	F	S	S	H	Occupied Time	Unoccupied Time
Period 1:										
Period 2:										
Period 3:										
Period 4:										
Period 5:										
Period 6:										
Period 7:										
Period 8:										

NOTE: Default setting is OCCUPIED 24 hours/day.

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

19XRV PIC III VFD_CONF TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Motor Nameplate Voltage	380-460	VOLTS	460	
Compressor 100% Speed	45.0-62.0	Hz	60.0	
Line Freq=60 Hz? (No=50)	0/1	NO/YES	YES	
*** Rated Line Voltage**	346-480	VOLTS	460	
*** Rated Line Amps**	10-1500	AMPS	200	
*** Rated Line Kilowatts**	0-7200	kW	100	
*** Motor Rated Load KW**	0-7200	kW	100	
*** Motor Rated Load Amps**	10-1500	AMPS	200	
Motor Nameplate Amps	10-1500	AMPS	100	
Motor Nameplate RPM	1500-3600		3456	
Motor Nameplate KW	0-5600	kW	100	
Inverter PWM Frequency (0=4 k Hz, 1=2 k Hz)	0/1		0	
Skip Frequency 1	0.0-102.0	Hz	102.0	
Skip Frequency 2	0.0-102.0	Hz	102.0	
Skip Frequency 3	0.0-102.0	Hz	102.0	
Skip Frequency Band	0.0-102.0	Hz	0.0	
Line Voltage % Imbalance	1-10	%	10	
Line Volt Imbalance Time	1-10	SEC	10	
Line Current % Imbalance	5-40	%	40	
Line Current Imbal Time	1-10	SEC	10	
Motor Current % Imbalance	5-40	%	40	
Motor Current Imbal Time	1-10	SEC	10	
Increase Ramp Time	5-60	SEC	30	
Decrease Ramp Time	5-60	SEC	30	
Single Cycle Dropout	0/1	DSABLE/ENABLE	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.

Carrier COMFORT NETWORK

19XRV PIC III OPTIONS TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Auto Restart Option	0/1	DSABLE/ENABLE	DSABLE	
Remote Contacts Option	0/1	DSABLE/ENABLE	DSABLE	
Soft Stop Amps Threshold	40 to 100	%	100	
Surge/Hot Gas Bypass				
Surge Limit/HGBP Option **Select: Surge=0, HGBP=1**	0/1		0	
Min. Load Point (T1, P1)				
Surge/HGBP Delta T1	0.5 to 20 (.3 to 11.1)	ˆF (ˆC)	1.5 (0.8)	
Surge/HGBP Delta P1	30 to 170 (206.9 to 1172.2)	PSI (kPa)	50 (344.8)	
Full Load Point (T2, P2)				
Surge/HGBP Delta T2	0.5 to 20 (.3 to 11.1)	ˆF (ˆC)	10 (5.6)	
Surge/HGBP Delta P2	50 to 170 (344.8 to 1172.2)	PSI (kPa)	85 (586.1)	
Surge/HGBP Deadband	0.5 to 3 (.3 to 1.7)	ˆF (ˆC)	1 (0.6)	
Surge Protection				
Surge Delta% Amps	5 to 20	%	10	
Surge Time Period	7 to 10	MIN	8	
Ice Build Control				
Ice Build Option	0/1	DSABLE/ENABLE	DSABLE	
Ice Build Termination **0=Temp, 1=Contacts, 2=Both**	0 to 2		0	
Ice Build Recycle	0/1	DSABLE/ENABLE	DSABLE	
Head Pressure Reference				
Delta P at 0% (4 mA)	20 to 85 (138 to 586)	psi (kPa)	25 (172)	
Delta P at 100% (20 mA)	20 to 85 (138 to 586)	psi (kPa)	50 (344.8)	
Minimum Output	0 to 100	%	0	

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

19XRV PIC III SETUP1 TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Comp Motor Temp Override	150 to 200 (66 to 93)	°F (°C)	200 (93)	
Cond Press Override	90 to 165 (621 to 1138)	PSI (kPa)	125 (862)	
Rectifier Temp Override	155 to 170 (68 to 77)	°F (°C)	160 (71)	
Inverter Temp Override	155 to 170 (68 to 77)	°F (°C)	160 (71)	
Comp Discharge Alert	125 to 200 (52 to 93)	°F (°C)	200 (93)	
Comp Thrust Brg Alert	165 to 185 (74 to 85)	°F (°C)	175 (79)	
Chilled Medium	0/1	WATER/ BRINE	WATER	
Chilled Water Deadband	.5 to 2.0 (0.3 to 1.1)	ˆF (ˆC)	1.0 (0.6)	
Evap Refrig Trippoint	0.0 to 40.0 (–17.8 to 4.4)	°F (°C)	33 (0.6)	
Refrig Override Delta T	2.0 to 5.0 (1.1 to 2.8)	ˆF (ˆC)	3 (1.7)	
Evap Approach Alert	0.5 to 15 (0.3 to 8.3)	ˆF (ˆC)	5 (2.8)	
Cond Approach Alert	0.5 to 15 (0.3 to 8.3)	ˆF (ˆC)	6 (3.3)	
Condenser Freeze Point	–20 to 35 (–28.9 to 1.7)	°F (°C)	34 (1.1)	
Flow Delta P Display	0 to 1	DSABLE/ ENABLE	DSABLE	
Evap Flow Delta P Cutout	0.5 to 50.0 (3.4 to 344.8)	PSI (kPa)	5.0 (34.5)	
Cond Flow Delta P Cutout	0.5 to 50.0 (3.4 to 344.8)	PSI (kPa)	5.0 (34.5)	
Water Flow Verify Time	0.5 to 5	MIN	5	
Oil Press Verify Time	15 to 300	SEC	40	
Recycle Control				
Restart Delta T	2.0 to 10.0 (1.1 to 5.6)	°F (°C)	5 (2.8)	
Shutdown Delta T	0.5 to 4.0 (0.3 to 2.2)	°F (°C)	1 (.0.6)	
Spare Alert/Alarm Enable Disable=0, Lo=1/3, Hi=2/4				
Spare Temp #1 Enable	0 to 4		0	
Spare Temp #1 Limit	–40 to 245 (–40 to 118)	°F (°C)	245 (118)	
Spare Temp #2 Enable	0 to 4		0	
Spare Temp #2 Limit	–40 to 245 (–40 to 118)	°F (°C)	245 (118)	

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

19XRV PIC III SETUP2 TABLE CONFIGURATION SHEET

DESCRIPTION	STATUS	UNITS	DEFAULT	VALUE
Capacity Control				
Proportional Inc Band	2 to 10		6.5	
Proportional DEC Band	2 to 10		6.0	
Proportional ECW Gain	1 to 3		2.0	
Guide Vane Travel Limit	30 to 100	%	80	
Diffuser Control				
Diffuser Option	0/1	DSABLE/ENABLE	DSABLE	
Guide Vane 25% Load Pt	0 to 78	%	25	
Diffuser 25% Load Point	0 to 100	%	0	
Guide Vane 50% Load Pt	0 to 78	%	50	
Diffuser 50% Load Point	0 to 100	%	0	
Guide Vane 75% Load Pt	0 to 78	%	75	
Diffuser 75% Load Point	0 to 100	%	0	
Diffuser Full Span mA	15 to 22	mA	18	
VFD Speed Control				
VFD Gain	0.1 to 1.5		0.75	
VFD Increase Step	1 to 5	%	2	
VFD Minimum Speed	65 to 100	%	70	
VFD Maximum Speed	90 to 100	%	100	

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

19XRV PIC III LEADLAG TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Lead Lag Control				
LEAD/LAG: Configuration DSABLE=0, LEAD=1, LAG=2, STANDBY=3	0 to 3		0	
Load Balance Option	0/1	DSABLE/ENABLE	DSABLE	
Common Sensor Option	0/1	DSABLE/ENABLE	DSABLE	
LAG% Capacity	25 to 75	%	50	
LAG Address	1 to 236		92	
LAG START Timer	2 to 60	MIN	10	
LAG STOP Timer	2 to 60	MIN	10	
PRESTART FAULT Timer	2 to 30	MIN	5	
STANDBY Chiller Option	0/1	DSABLE/ENABLE	DSABLE	
STANDBY% Capacity	25 to 75	%	50	
STANDBY Address	1 to 236		93	

19XRV PIC III RAMP_DEM TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Pulldown Ramp Type: Select: Temp=0, Load=1	0/1		1	
Demand Limit and kW Ramp				
Demand Limit Source Select: Amps=0, kW=1	0/1		0	
Amps or kW Load Ramp% Min	5 to 20		10	
Demand Limit Prop Band	3 to 15	%	10	
Demand Limit At 20 mA	40 to 100	%	40	
20 mA Demand Limit Opt	0/1	DSABLE/ENABLE	DSABLE	
Demand Watts Interval	5 to 60	MIN	15	

19XRV PIC III TEMP_CTL TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Control Point				
ECW Control Option	0/1	DSABLE/ENABLE	DSABLE	
Temp Pulldown Deg/Min	2 to 10 (1.1 to 5.6)	ˆF (ˆC)	3 (1.7)	
Temperature Reset				
RESET TYPE 1				
Degrees Reset At 20 mA	–30 to 30 (–17 to 17)	ˆF (ˆC)	10 (6)	
RESET TYPE 2				
Remote Temp -> No Reset	–40 to 245 (–40 to 118)	DEG F (C)	85 (29)	
Remote Temp -> Full Reset	–40 to 245 (–40 to 118)	DEG F (C)	65 (18)	
Degrees Reset	–30 to 30 (–17 to 17)	ˆF (ˆC)	10 (6)	
RESET TYPE 3				
CHW Delta T -> No Reset	0 to 15 (0 to 8)	ˆF (ˆC)	10 (6)	
CHW Delta T -> Full Reset	0 to 15 (0 to 8)	ˆF (ˆC)	0 (0)	
Degrees Reset	–30 to 30 (–17 to 17)	ˆF (ˆC)	5 (3)	
Enable Reset Type	0 to 3		0	

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

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	

Carrier COMFORT NETWORK

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

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE