



# 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, starters, or oil heater until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid-state components.

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

AVOID SPILLING liquid refrigerant on skin or getting it into the eyes. USE SAFETY GOGGLES. Wash any spills from the skin with

soap and water. If liquid refrigerant enters the eyes, IMMEDIATELY FLUSH EYES with water and consult a physician.

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

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

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

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 STARTER, TOWER FAN, OR PUMPS. Open the disconnect *ahead* of the starter, tower fans, or pumps.

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

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

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

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

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

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

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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.

## ▲ WARNING

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

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

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

This equipment uses, and can radiate, radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to 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:

<b>CCM</b>	— Chiller Control Module
<b>CCN</b>	— Carrier Comfort Network
<b>CCW</b>	— Counterclockwise
<b>CW</b>	— Clockwise
<b>ECDW</b>	— Entering Condenser Water
<b>ECW</b>	— Entering Chilled Water
<b>EMS</b>	— Energy Management System
<b>HGBP</b>	— Hot Gas Bypass
<b>I/O</b>	— Input/Output
<b>ICVC</b>	— International Chiller Visual Controller
<b>LCD</b>	— Liquid Crystal Display
<b>LCDW</b>	— Leaving Condenser Water
<b>LCW</b>	— Leaving Chilled Water
<b>LED</b>	— Light-Emitting Diode
<b>OLTA</b>	— Overload Trip Amps
<b>PIC III</b>	— Product Integrated Controls III
<b>RLA</b>	— Rated Load Amps
<b>SCR</b>	— Silicon Controlled Rectifier
<b>SI</b>	— International System of Units
<b>TXV</b>	— Thermostatic Expansion Valve
<b>VFD</b>	— 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 motor starter. All connections from pressure vessels have external threads to enable each component to be pressure tested with a threaded pipe cap during factory assembly.

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

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

**Motor-Compressor** — This component maintains system temperature and pressure differences and moves the heat-carrying refrigerant from the cooler to the condenser.

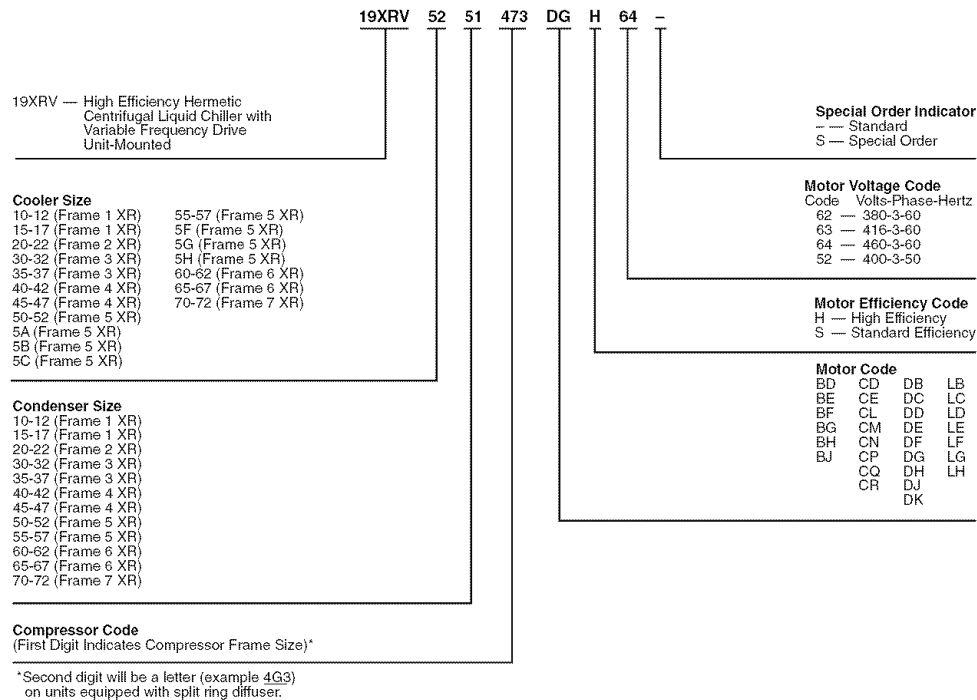
**Control Panel** — The control panel is the user interface for controlling the chiller. It regulates the chiller's capacity as required to maintain proper leaving chilled water temperature. The control panel:

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

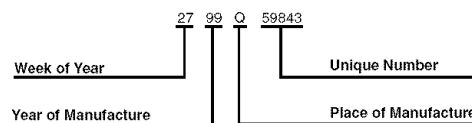
**Variable Frequency Drive (VFD)** — The VFD allows for the proper start and disconnect of electrical energy for the compressor-motor, oil pump, oil heater, and control panel.

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

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

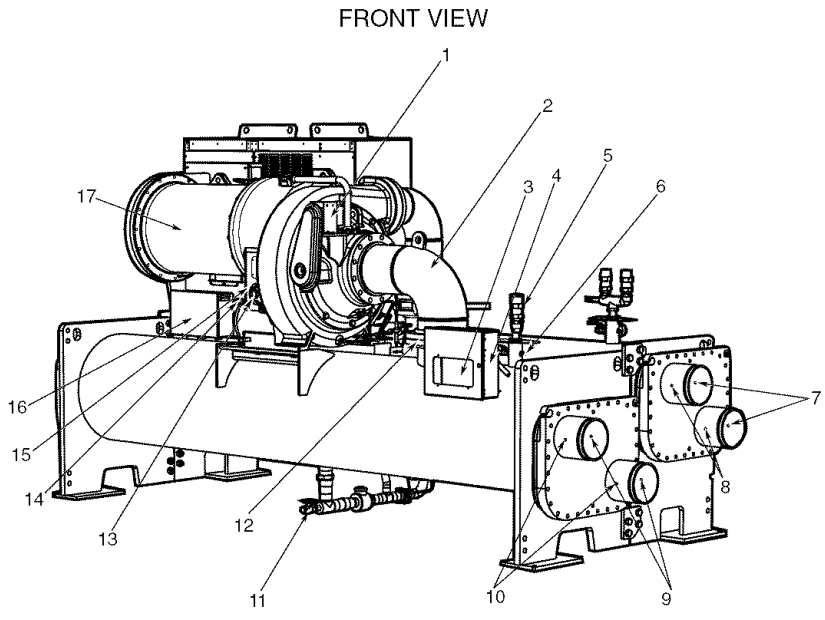


### MODEL NUMBER NOMENCLATURE

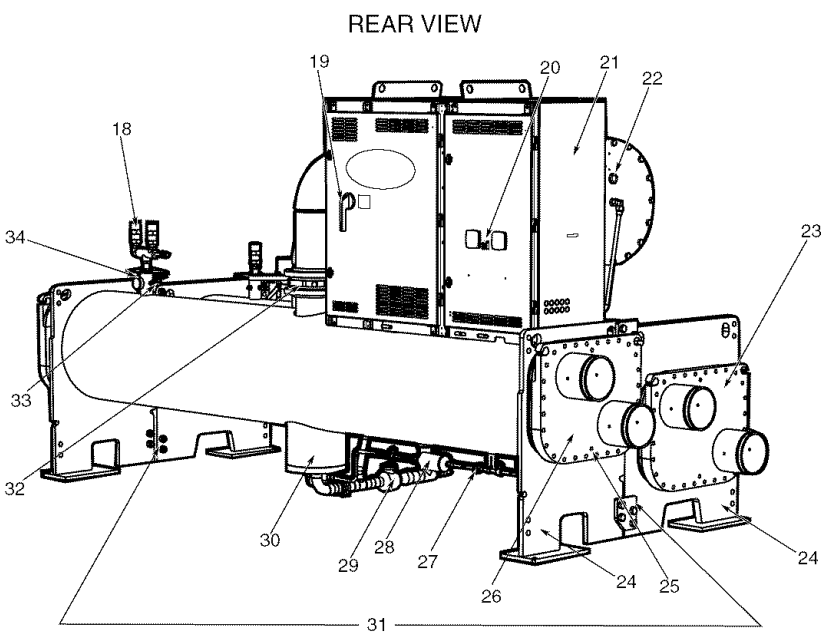


### SERIAL NUMBER BREAKDOWN

Fig. 1 — 19XRV Identification



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



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

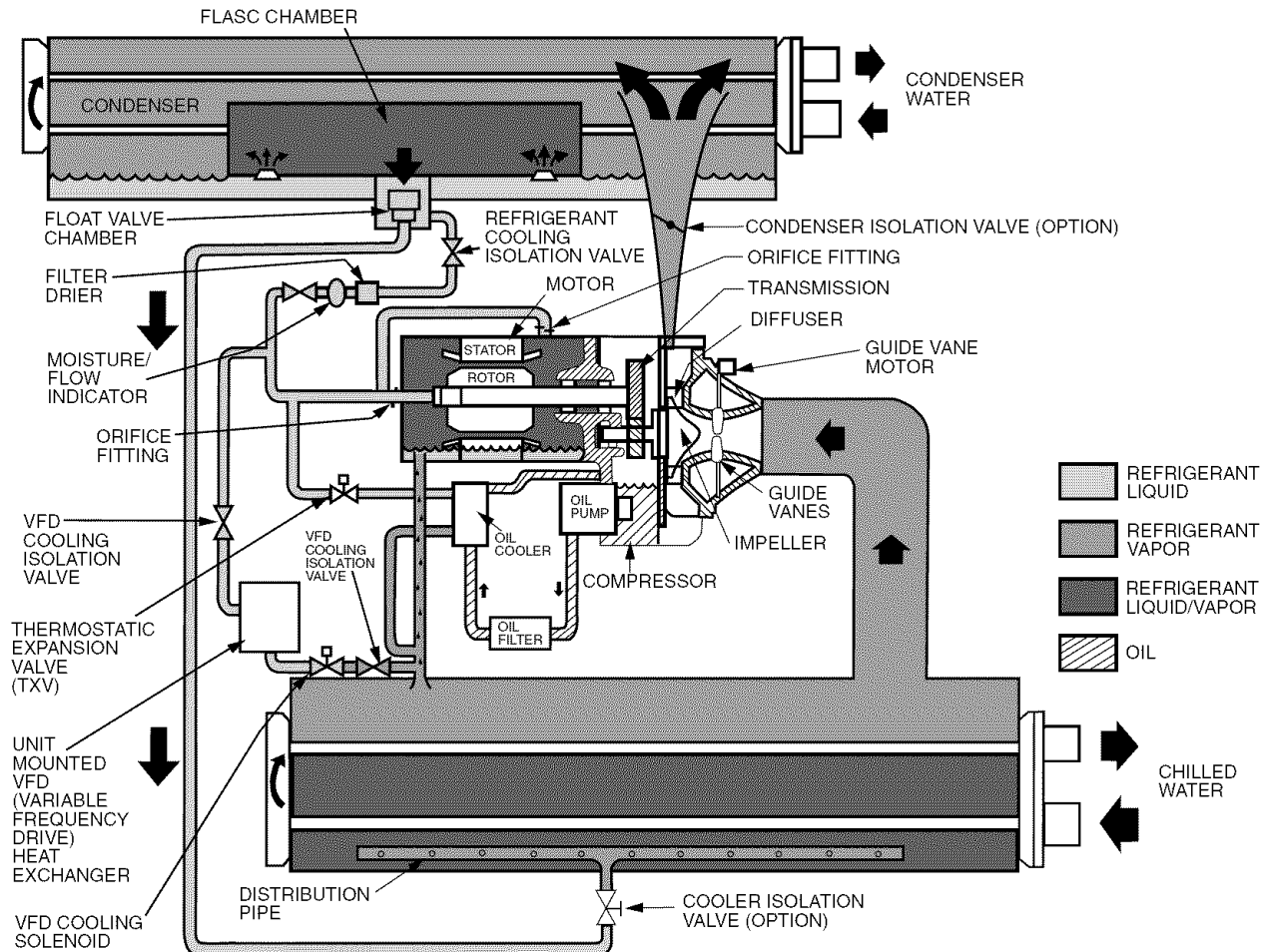


Fig. 3 — Refrigerant Motor Cooling and Oil Cooling Cycles

## 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 thermostatic expansion valve (TXV). To maintain proper operating temperature in the VFD, the TXV bulb is mounted to the 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 75 to 78, 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 39). 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.



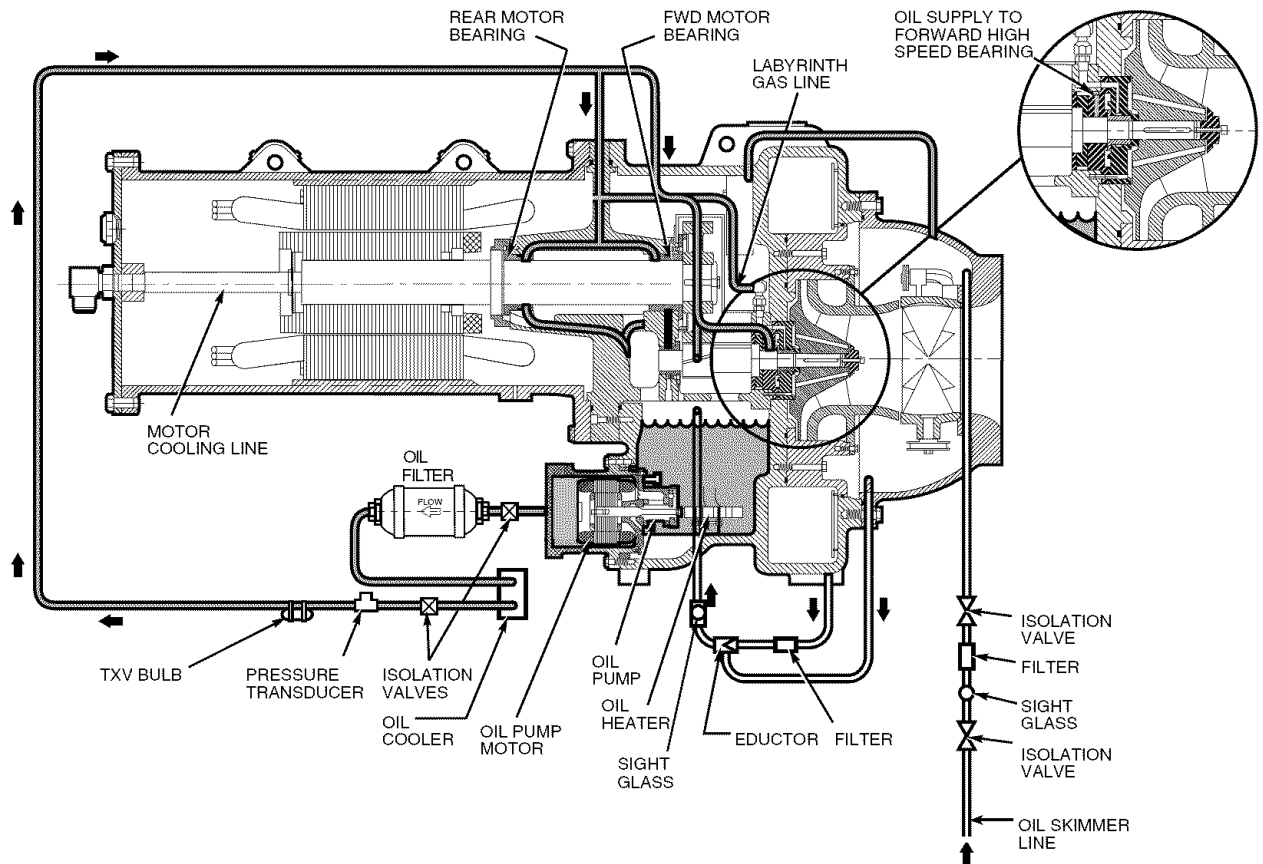


Fig. 4 — Lubrication System

## 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 contractor. The VFDs are mounted directly on the chiller.

Three separate circuit breakers are inside the starter. Circuit breaker CB1 is the VFD circuit breaker. The disconnect switch on the starter 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 starter 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 control panel, oil heater, and portions of the starter controls.

Circuit breaker CB3 supplies power at line voltage to the oil pump. Both CB2 and CB3 are wired in parallel with CB1 so that power is supplied to them if the CB1 disconnect is open.

### ▲ 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 480 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 11 and 79.

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.

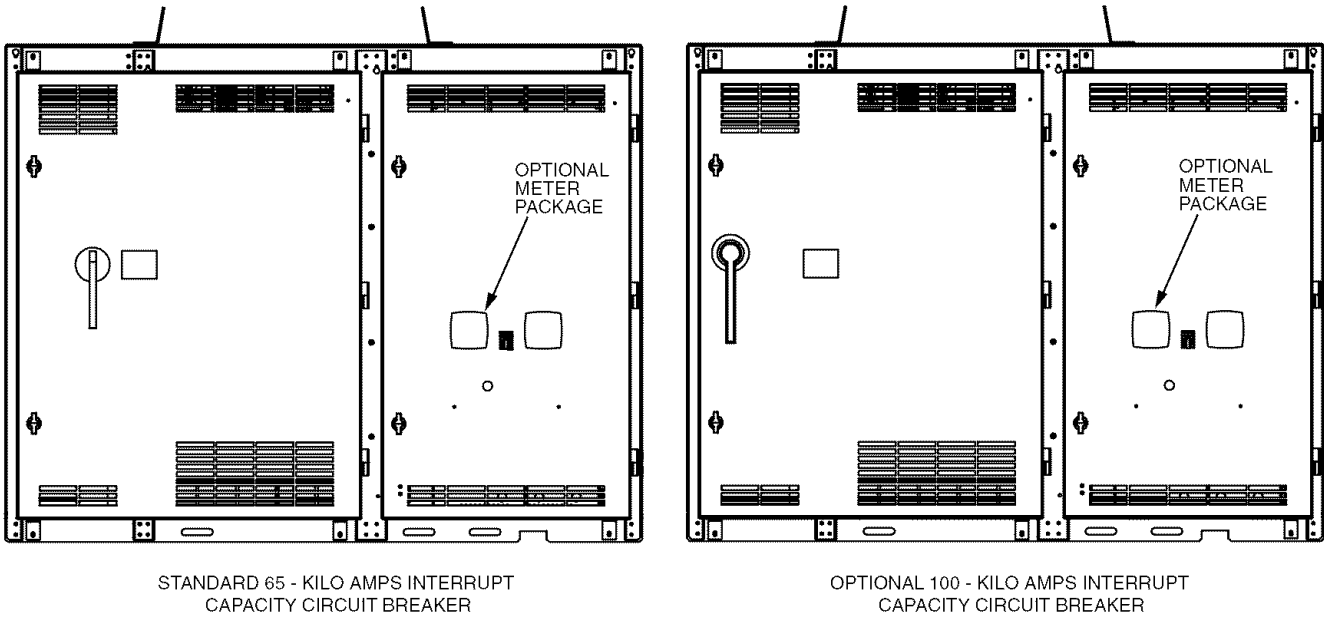


Fig. 5 — Variable Frequency Drive (VFD)

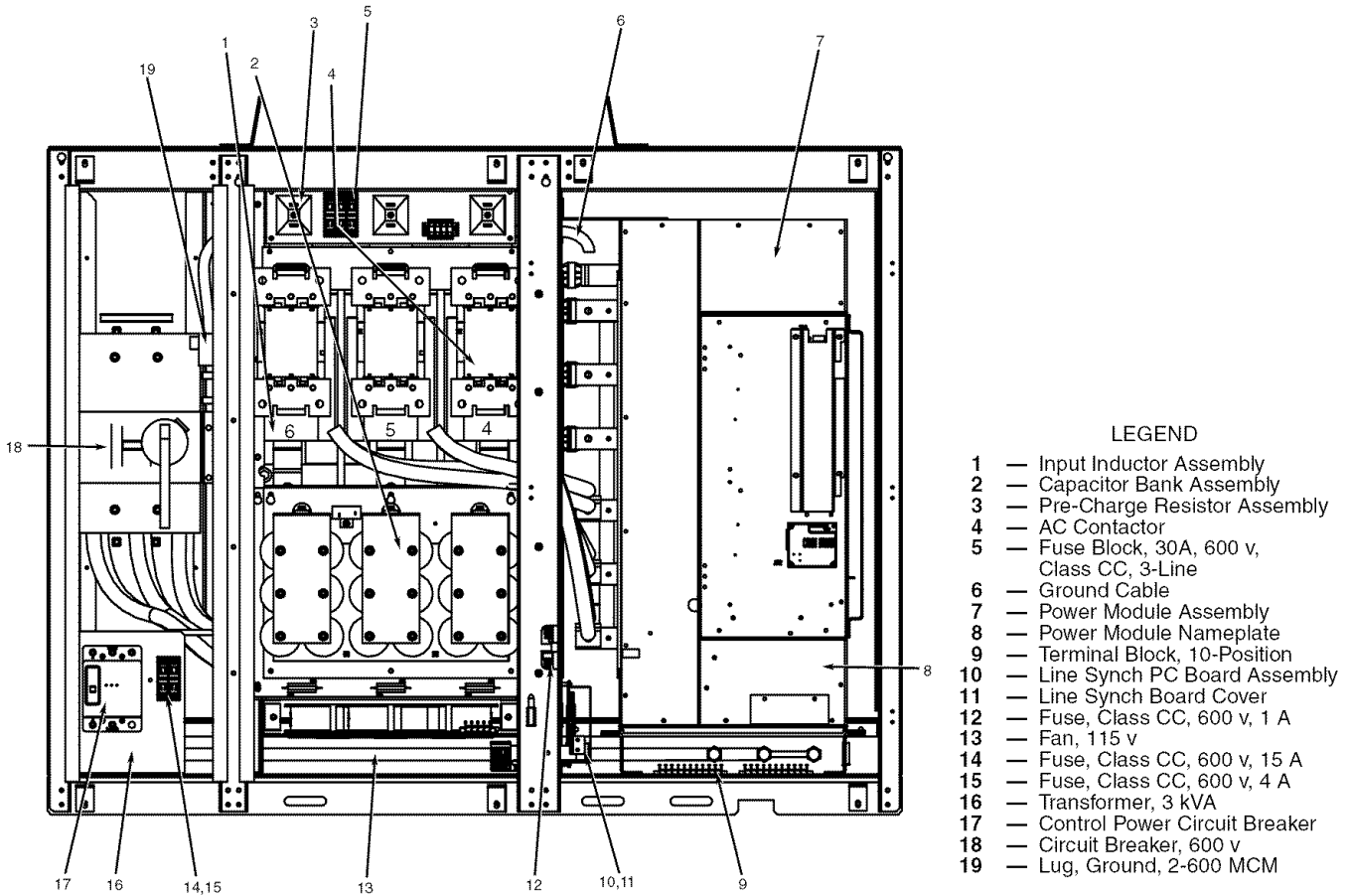


Fig. 6 — Variable Frequency Drive Internal

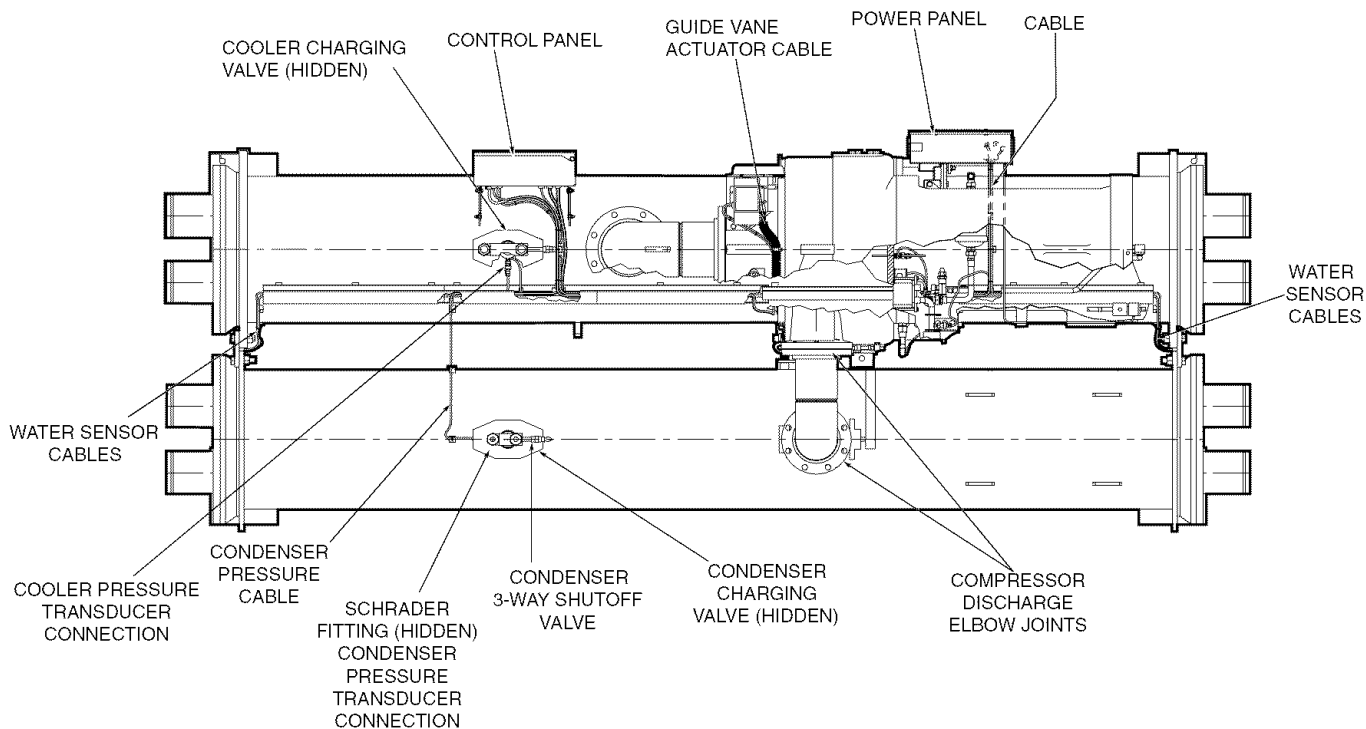


Fig. 7 — Chiller Controls and Sensor Locations

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

**PIC 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 motor starter. The PIC III can interface with the Carrier Comfort Network (CCN) 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 480 vac for oil pump power
- starter 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
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. 7.
Pressure Transducers	See Fig. 7.

\*See Fig. 5-10.

**INTERNATIONAL CHILLER VISUAL CONTROLLER (ICVC)** — The ICVC is the “brain” of the PIC III. This module contains all the operating software needed to control the chiller. The ICVC is mounted to the control panel (Fig. 9) 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. See Fig. 9. To change the contrast of the display, access the adjustment on the back of the ICVC. See Fig. 9.

The ICVC features 4 factory programmed languages:

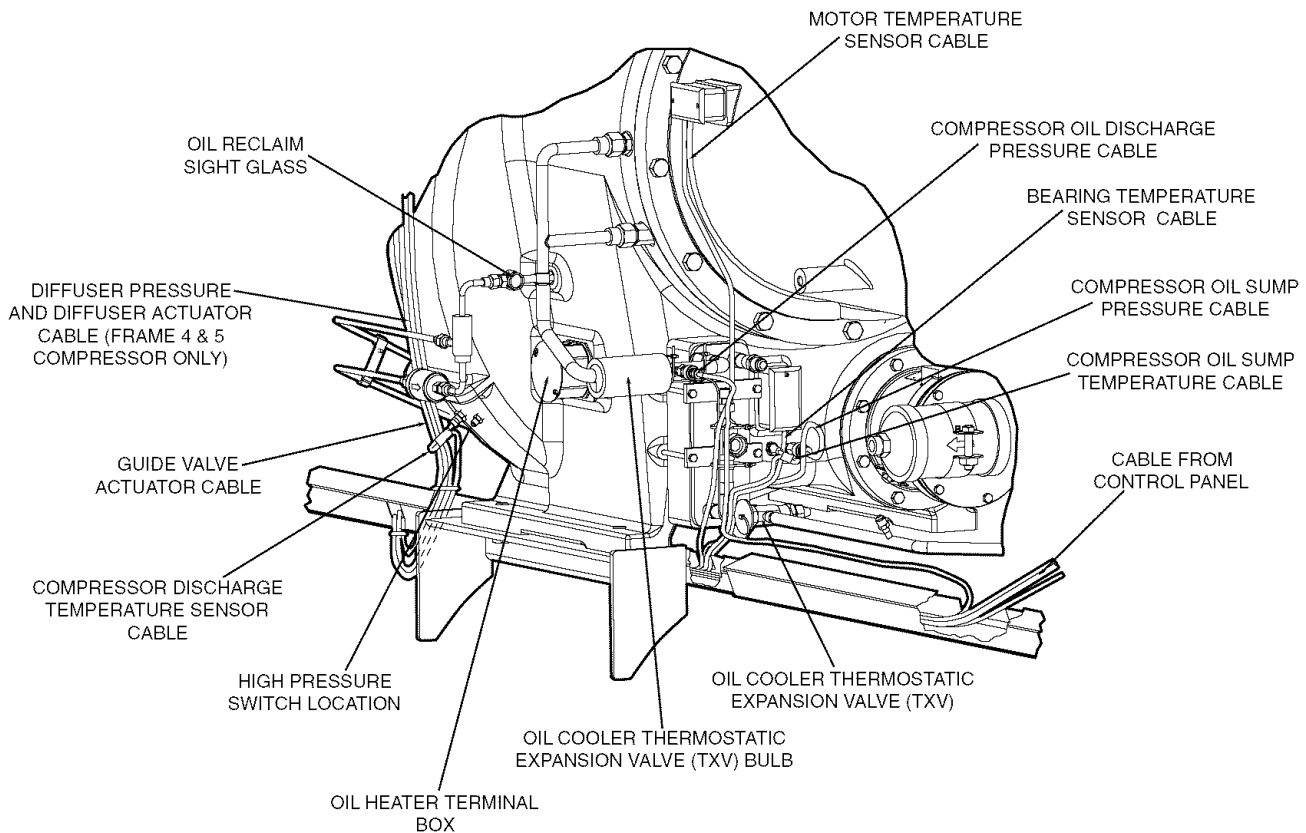
- English (default)
- Chinese
- Japanese
- Korean

**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. 8 — 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, refrigerant leak sensor and motor kilowatt output.

**OIL HEATER CONTACTOR (1C)** — This contactor is located in the power panel (Fig. 10) 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 control power to DataPort™/DataLINK™ modules.

**SENSORS** — Three types of temperature sensors are used:

Figure 11 shows a typical temperature sensor with which sensor wells are not used, in systems having a ICVC controller.

For this type the sensor cable can be easily disconnected from the sensor, which is in direct contact with the fluid.

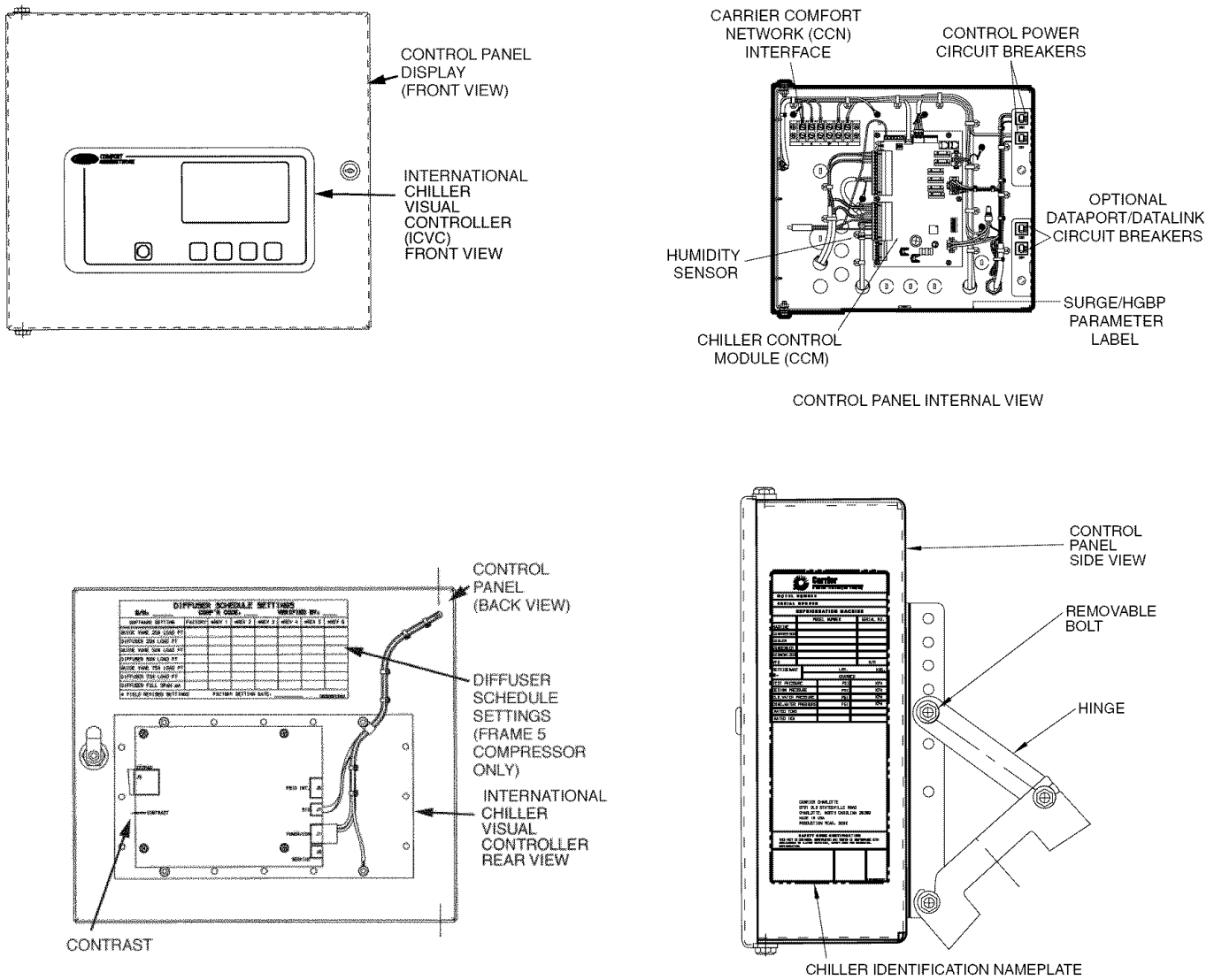
Figure 12 shows a typical temperature sensor for which sensor wells are used, in systems having an ICVC controller. For this type the sensor cable cannot be separated from the sensor itself, but the sensor can be readily removed from the well without breaking into the fluid boundary.

The third 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.

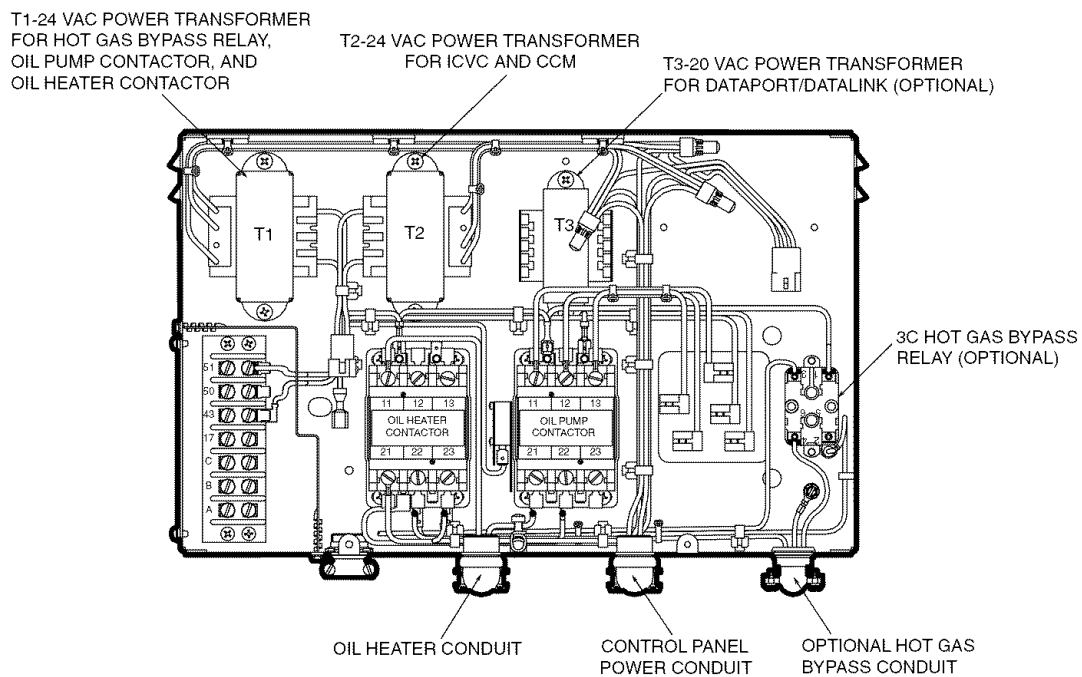
The PIC III control determines refrigerant temperature in the condenser and evaporator from pressure in those vessels, read from the corresponding pressure transducers. See Fig. 13. The pressure values are converted to the equivalent saturation temperatures for R-134a refrigerant. When the chiller is 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**

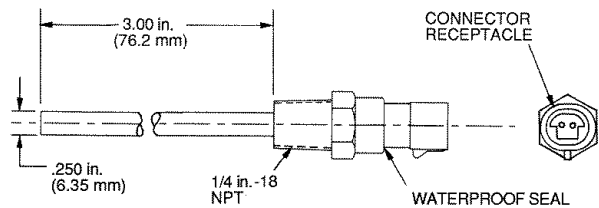
TYPE	LOCATION MONITORED	REMARKS
Temperature	Entering chilled water	Cooler inlet nozzle
	Leaving chilled water	Cooler outlet nozzle
	Entering condenser water	Condenser inlet nozzle
	Leaving condenser water	Condenser outlet nozzle
	Evaporator saturation	Sensor well on bottom of evaporator
	Compressor discharge	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
Pressure Switch	High condenser (discharge) pressure	Compressor volute, wired into the starter control circuit
Temperature Switch	Oil pump motor winding temperature	Wired into the oil pump control circuit



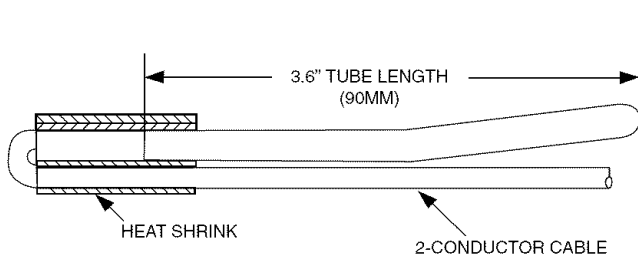
**Fig. 9 — Control Panel**



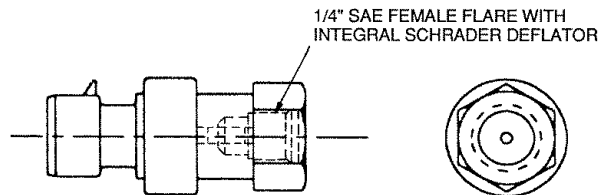
**Fig. 10 — Power Panel**



**Fig. 11 — Control Sensors (Temperature)**



**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 Pump-down 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 114. 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 (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 48.

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.
- 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 control center 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**.

- The STATUS menu allows viewing and limited calibration or modification of control points and sensors, relays and contacts, and the options board.

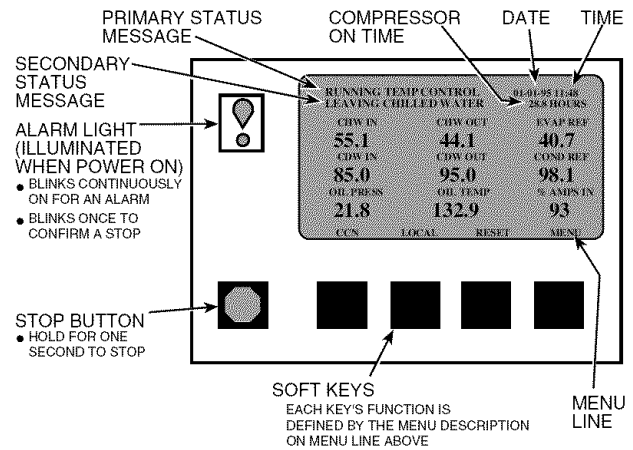


Fig. 14 — ICVC Default Screen

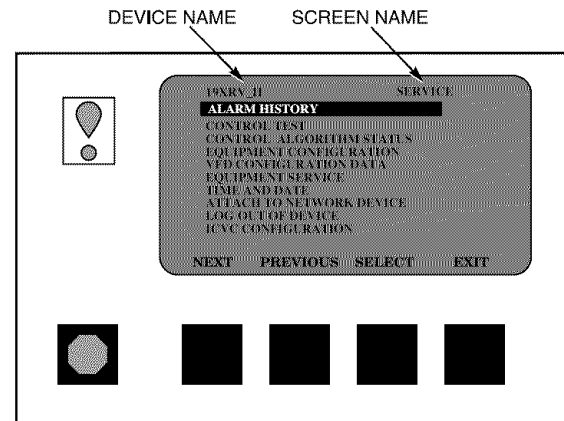


Fig. 15 — ICVC Service Screen

- 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.

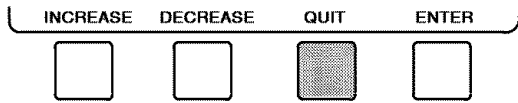
For more information on the menu structures, refer to Fig. 17.

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 below.

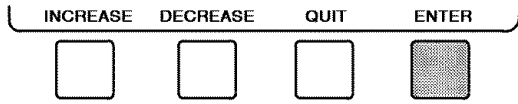
BASIC ICVC OPERATIONS (Using the Softkeys) — To perform any of the operations described below, the PIC III must be powered up and have successfully completed its self test.



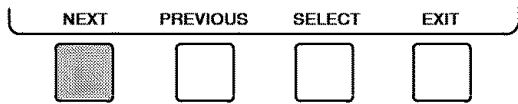
- Press **QUIT** to leave the selected decision or field without saving any changes.



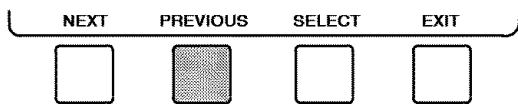
- Press **ENTER** to leave the selected decision or field and save changes.



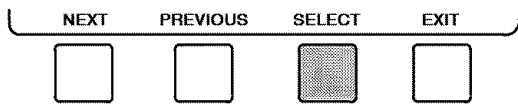
- Press **NEXT** to scroll the cursor bar down in order to highlight a point or to view more points below the current screen.



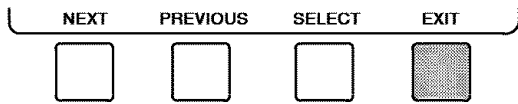
- Press **PREVIOUS** to scroll the cursor bar up in order to highlight a point or to view points above the current screen.



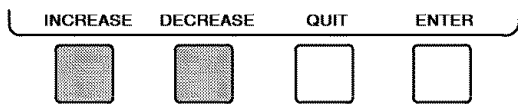
- Press **SELECT** to view the next screen level (highlighted with the cursor bar), or to override (if allowable) the highlighted point value.



- Press **EXIT** to return to the previous screen level.

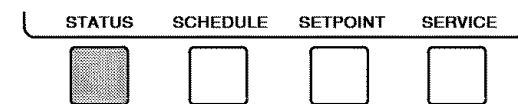


- Press **INCREASE** or **DECREASE** to change the highlighted point value.



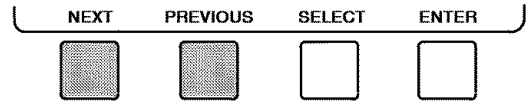
**TO VIEW STATUS (Fig. 16)** — The status table shows the actual value of overall chiller status such as CONTROL MODE, RUN STATUS, AUTO CHILLED WATER RESET, and REMOTE RESET SENSOR.

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

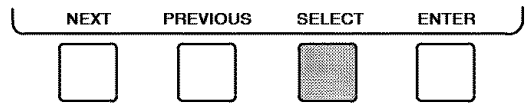


2. Press **NEXT** or **PREVIOUS** to highlight the desired status table. The list of tables is:

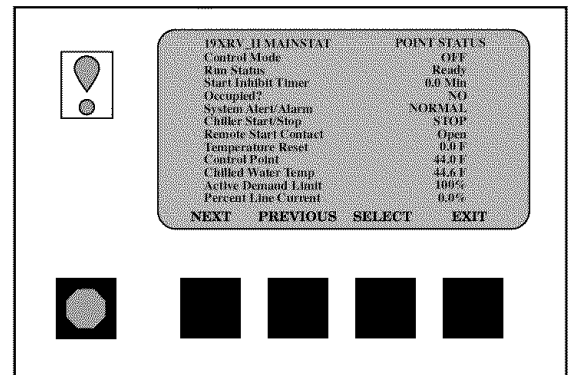
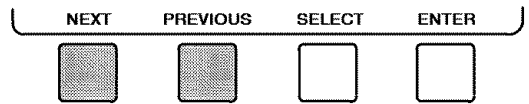
- MAINSTAT — Overall chiller status
- STARTUP — Status required to perform start-up of chiller
- COMPRESS — Status of sensors related to the compressor
- HEAT\_EX — Status of sensors related to the heat exchangers
- POWER — Status of motor input power
- VFD\_STAT — Status of motor starter
- ICVC\_PSWD — 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.

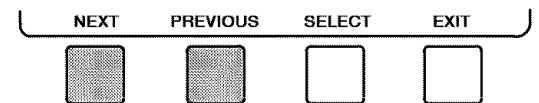


**Fig. 16 — Example of Status Screen**

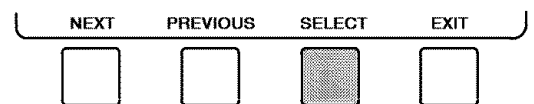
## FORCING OPERATIONS

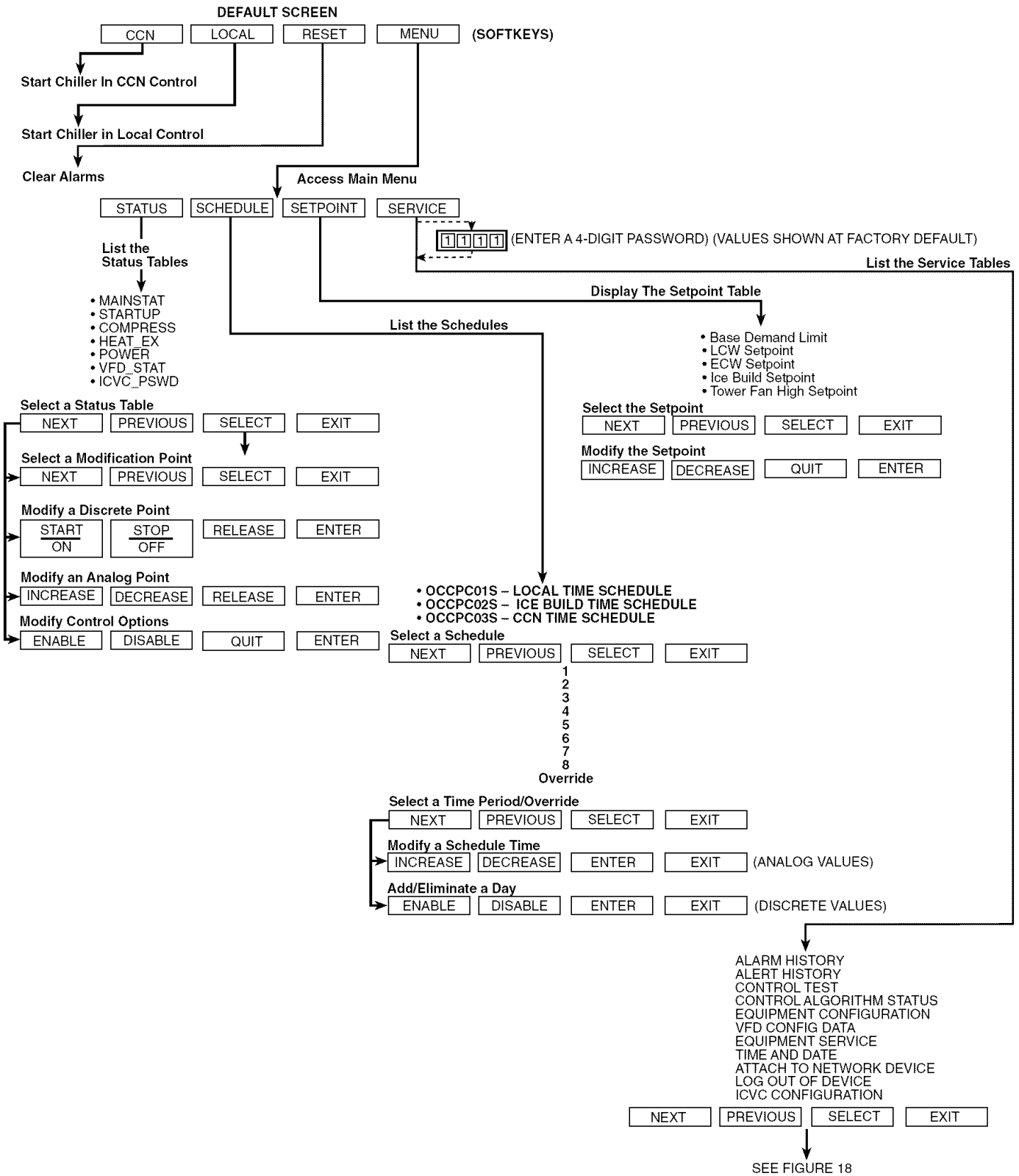
**To Force (manually override) a Value or Status**

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



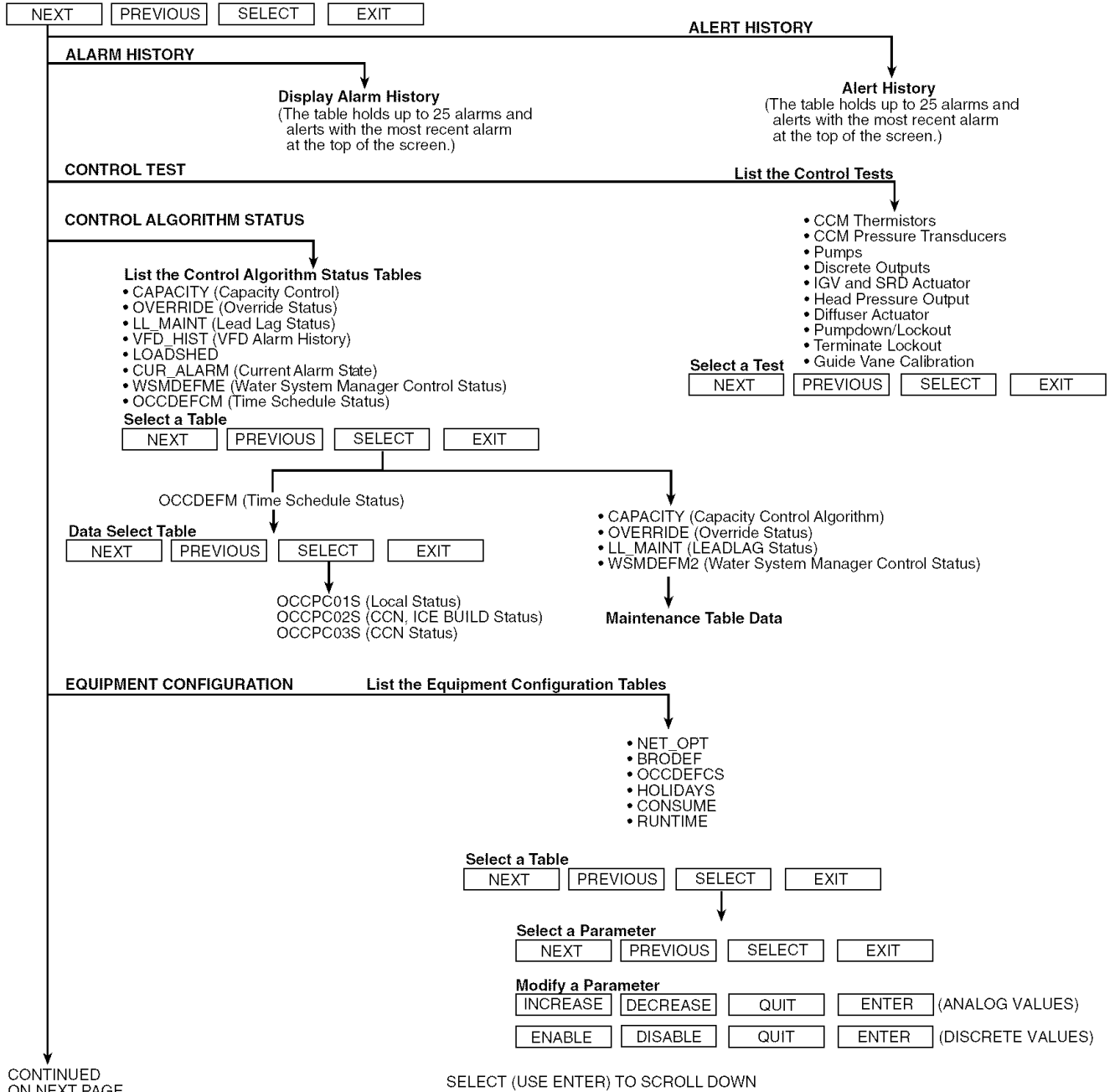
2. Press **SELECT** to select the highlighted value.





**Fig. 17 — 19XRV Chiller Display Menu Structure (ICVC)**

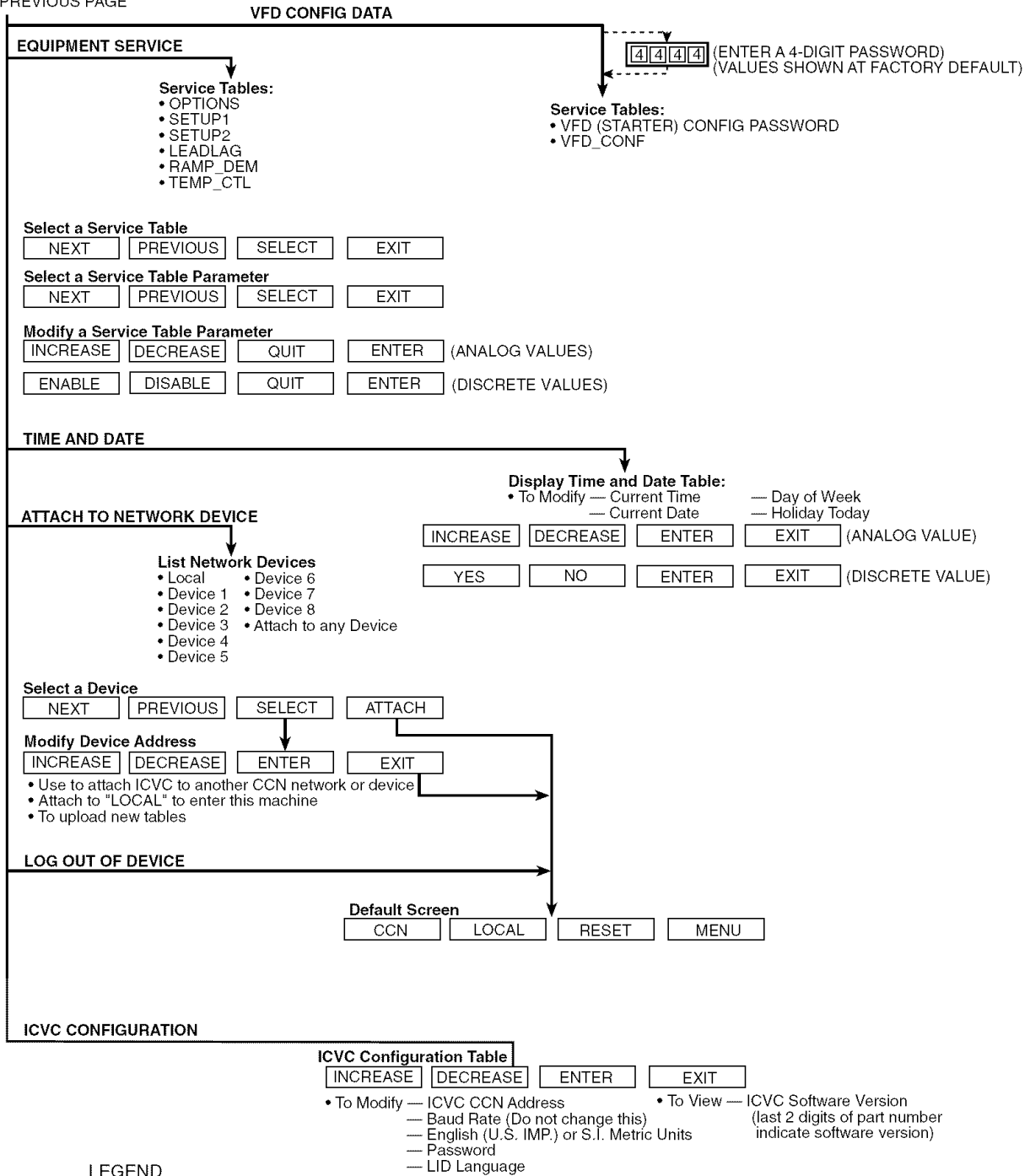
**SERVICE TABLE**



CONTINUED ON NEXT PAGE

SELECT (USE ENTER) TO SCROLL DOWN

**Fig. 18 — 19XRV Service Menu Structure**

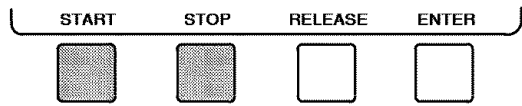


**LEGEND**

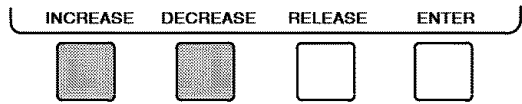
- CCN** — Carrier Comfort Network
- ICVC** — International Chiller Visual Controller
- PIC III** — Product Integrated Control III
- VFD** — Variable Frequency Drive

**Fig. 18 — 19XR Service Menu Structure (cont)**

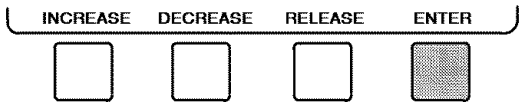
For Discrete Points — Press **START** or **STOP** to select the desired state.



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



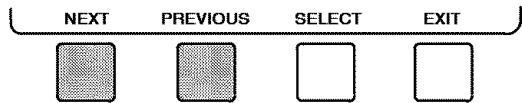
3. Press **ENTER** to register the new value.



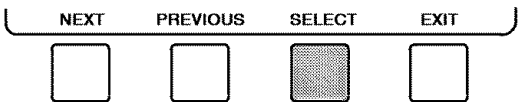
NOTE: When forcing or changing metric values, it is necessary to hold down the softkey for a few seconds in order to see a value change, especially on kilopascal values.

**To Remove a Force**

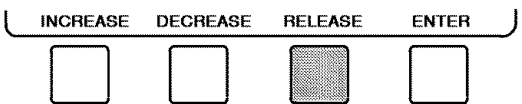
1. On the point status table press **NEXT** or **PREVIOUS** to highlight the desired value.



2. Press **SELECT** to access the highlighted value.



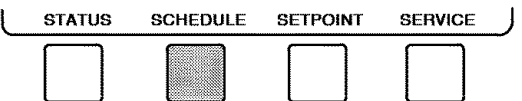
3. Press **RELEASE** to remove the force and return the point to the PIC III's automatic control.



**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)**

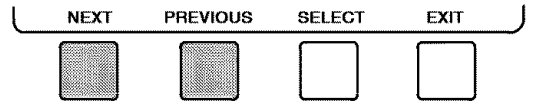
1. On the Menu screen, press **SCHEDULE**.



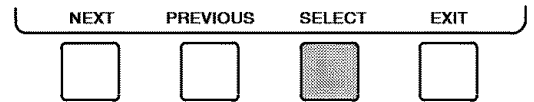
2. Press **NEXT** or **PREVIOUS** to highlight the desired schedule.

OCCPC01S — LOCAL Time Schedule  
OCCPC02S — ICE BUILD Time Schedule

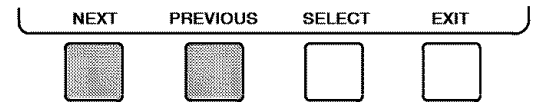
OCCPC03S — CCN Time Schedule



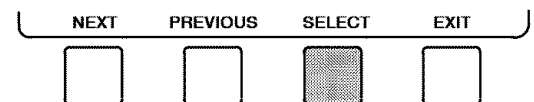
3. Press **SELECT** to view the desired time schedule.



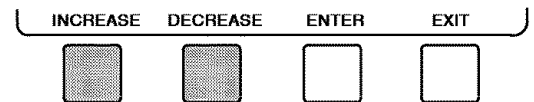
4. Press **NEXT** or **PREVIOUS** to highlight the desired period or override to change.



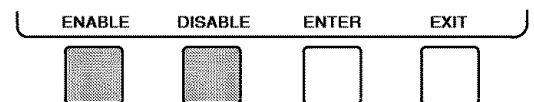
5. Press **SELECT** to access the highlighted PERIOD or OVERRIDE.



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.

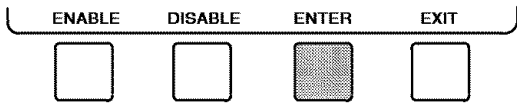


The screenshot shows a screen with a warning icon on the left. The main area contains a table with columns: 19XRV\_II, OCCPC01S, TIME PERIOD, and SELECT. Below the table are four softkeys: NEXT, PREVIOUS, SELECT, and EXIT. At the bottom of the screen are five physical buttons: a circular button with a light indicator, and four rectangular buttons.

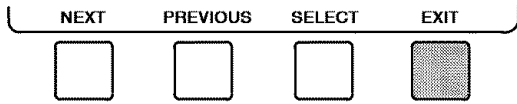
19XRV_II	OCCPC01S	TIME PERIOD	SELECT
PERIOD	ON	OFF	MTWTFSSH
1	0700	1800	XXXXX
2	0600	1300	X
3	0000	0300	X
4	0000	0000	
5	0000	0000	
6	0000	0000	
7	0000	0000	
8	0000	0000	
OVERRIDE	0 HOURS		

**Fig. 19 — Example of Time Schedule Operation Screen**

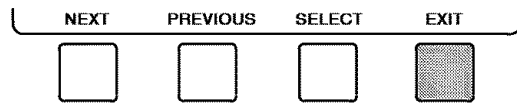
- Press **ENTER** to register the values and to move horizontally (left to right) within a period.



- Press **EXIT** to leave the PERIOD or OVERRIDE.



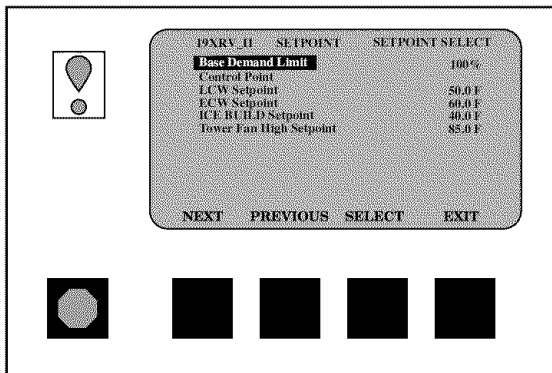
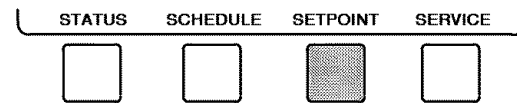
- Either return to Step 4 to select another PERIOD or OVERRIDE, or press **EXIT** again to leave the current time schedule screen and save the changes.



- The Holiday Designation (HOLIDEF table) may be found in the Service Operation section, page 48. 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)**

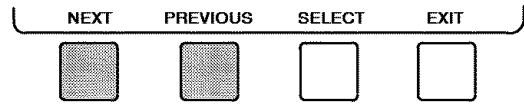
- To view the SETPOINT table, from the MENU screen press **SETPOINT**.



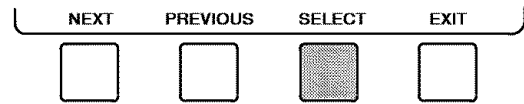
**Fig. 20 — Example of Set Point Screen**

- 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 48. The ice build (ICE BUILD) function is also activated and configured from the SERVICE menu.

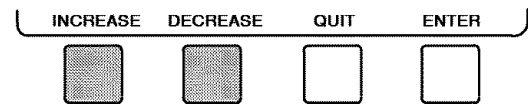
- Press **NEXT** or **PREVIOUS** to highlight the desired set point entry.



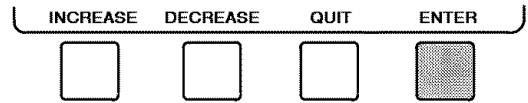
- Press **SELECT** to modify the highlighted set point.



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



- 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 48. For examples of ICVC display screens, see Table 4.

**Table 4 — ICVC Display Data**

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

- 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.
- 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.
- Terms in the Description column of these tables are listed as they appear on the chiller display screen.
- The ICVC may be configured in English or Metric (SI) units using the ICVC CONFIGURATION screen. See the Service Operation section, page 48, for instructions on making this change.
- 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.
- 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.
- 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 asterisk (or exclamation point) 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 16.

**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** (**MAINTSTAT** 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	0-2	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 Overtime	0-500000.0	HOURS	c_hrs
*Service Overtime	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 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, Alert, Alarm
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	%	LN_VOLT_P
Average Line Voltage	0.0-99999.0	VOLTS	LN_VOLT_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

**NOTES:**

1. All variables with CAPITAL LETTER point names are available for CCN read operation.
2. 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 point names written in capital letters are available for CCN Read operation only.  
 (\*) Variables support write operations for all CCN Devices.  
 (\*\*) Variables shall support write operations for the ICVC 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	0-100	%	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
<b>LeadLag Control</b>			
<b>LEADLAG: Configuration</b>	NOTE 1		leadlag
<b>Current Mode</b>	NOTE 2		llmode
<b>Load Balance Option</b>	0/1	DSABLE/ENABLE	loadbal
<b>LAG START Time</b>	2-60	MIN	lagstart
<b>LAG STOP Time</b>	2-60	MIN	lagstop
<b>Prestart Fault Time</b>	2-30	MIN	prefft
<b>Pulldown: Delta T / Min</b>	x.xx	^F	pull_dt
<b>Satisfied?</b>	0/1	NO/YES	pull_sat
<b>LEAD CHILLER in Control</b>	0/1	NO/YES	leadctrl
<b>LAG CHILLER: Mode</b>	NOTE 3		lagmode
<b>Run Status</b>	NOTE 4		lagstat
<b>Start/Stop</b>	NOTE 5		lag_s_s
<b>Recovery Start Request</b>	0/1	NO/YES	lag_rec
<b>STANDBY CHILLER: Mode</b>	NOTE 3		stdmode
<b>Run Status</b>	NOTE 4		stdstat
<b>Start/Stop</b>	NOTE 5		Std_s_s
<b>Recovery Start Request</b>	0/1	NO/YES	std_rec
<b>Spare Temperature 1</b>	-40-245	DEG F	SPARE_T1
<b>Spare Temperature 2</b>	-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
<b>VFD FAULT HISTORY</b>			
<b>Values at Last Fault:</b>			
<b>Line Current Ph1(R)</b>	0.0-99999.0	AMPS	LNAMPS1H
<b>Line Current Ph2(S)</b>	0.0-99999.0	AMPS	LNAMPS2H
<b>Line Current Ph3(T)</b>	0.0-99999.0	AMPS	LNAMPS3H
<b>Load Current Ph1(U)</b>	0.0-99999.0	AMPS	LDAMPS1H
<b>Load Current Ph2(V)</b>	0.0-99999.0	AMPS	LDAMPS2H
<b>Load Current Ph3(W)</b>	0.0-99999.0	AMPS	LDAMPS3H
<b>Line Voltage Ph1(RS)</b>	0.0-99999.0	VOLTS	LNVOLT1H
<b>Line Voltage Ph2(ST)</b>	0.0-99999.0	VOLTS	LNVOLT2H
<b>Line Voltage Ph3(TR)</b>	0.0-99999.0	VOLTS	LNVOLT3H
<b>Ground Fault Current</b>	0.0-999.0	AMPS	GF_AMPSH
<b>Line Frequency</b>	0.0-99.0	Hz	LINEFRQH
<b>Line Power Factor</b>	0.00-2.00		LINE_PFH
<b>Line Current Imbalance</b>	0.0-100.0	%	LN_IMBIH
<b>Line Voltage Imbalance</b>	0.0-100.0	%	LN_IMBVH
<b>Motor Power Factor</b>	0.00-2.00		MOTORPFH
<b>Motor Current Imbalance</b>	0.0-100.0	%	MT_IMBIH
<b>Motor Overload</b>	0.0-100.0	%	MOTOROVH
<b>Line Active Current</b>	0.0-99999.0	AMPS	AMPSACTH
<b>Line Reactive Current</b>	0.0-99999.0	AMPS	AMPS_REH
<b>Line Active Voltage</b>	0.0-99999.0	VOLTS	VOLTACTH
<b>Line Reactive Voltage</b>	0.0-99999.0	VOLTS	VOLT_REH
<b>DC Bus Voltage</b>	0.0-99999.0	VOLTS	BUSVOLTH
<b>DC Bus Voltage Reference</b>	0.0-99999.0	VOLTS	BUS_REFH
<b>Flux Current</b>	0.0-99999.0	AMPS	FLUXAMPH
<b>Torque Current</b>	0.0-99999.0	AMPS	TORQAMPH
<b>Inverter Temperature</b>	0.0-300.0	DEG F	INVTEMPH
<b>Rectifier Temperature</b>	0.0-300.0	DEG F	RECTEMPH
<b>VFD Enclosure Temp</b>	0.0-300.0	DEG F	VFDENCLH
<b>VFD Cold Plate Temp</b>	0.0-300.0	DEG F	CP_TEMPH
<b>Actual VFD Speed</b>	0.0-100.0	%	VFD_ACTH
<b>Chiller Fault State</b>	200-225		VFDSTATH
<b>VFD Fault Code</b>	200-225		VFD_FLTH

NOTE: All variables with point names written in capital letters 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_freq	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
<b>Lead Lag Control</b>				
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
<b>Pulldown Ramp Type:</b>	0/1		ramps1ct	1
Select: Temp=0, Load=1				
<b>Demand Limit and kW Ramp</b>				
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
<b>Control Point</b>				
ECW Control Option	0/1	DSABLE/ENABLE	ecw_opt	DSABLE
Temp Pulldown Deg/Min	2-10	^F	tmp_ramp	3
<b>Temperature Reset</b>				
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 42) 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 35.

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 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 table below 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.

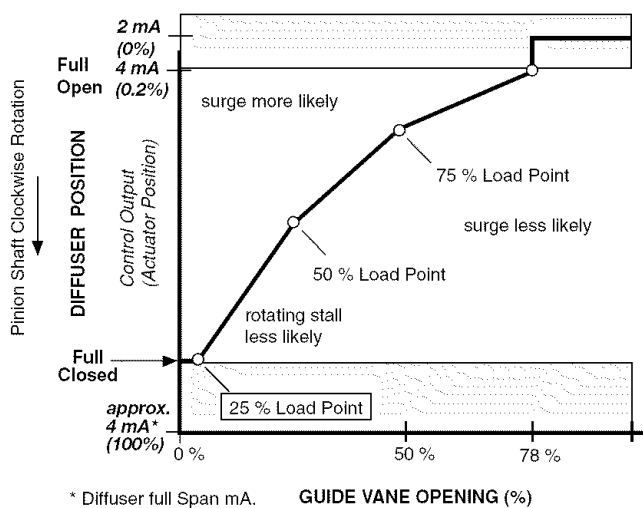
The *TARGET VFD SPEED*, *ACTUAL VFD SPEED* and the *VFD GAIN* can be viewed and modified in the CAPACITY display screen. The *TARGET VFD SPEED* can be manually overridden by the operator from the COMPRESS screen. The *VFD MINIMUM SPEED*, *VFD MAXIMUM SPEED*, *VFD GAIN* and *VFD INCREASE STEP* can be 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 shows the relationship between diffuser-related parameters for a typical build. See Fig. 21.



**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.

**The Proportional Band** — 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 BAND* 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 22, 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 44).

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).

**Demand Limit Control Option** — The demand limit control option (20 mA DEMAND LIMIT OPT) is externally controlled by a 4 to 20 mA signal from an energy management system (EMS). The option is set up on the RAMP\_DEM screen. When enabled, 4 mA will set ACTIVE DEMAND LIMIT to 100% of the DEMAND LIMIT SOURCE (regardless of the value of BASE DEMAND LIMIT), and 20 mA will set ACTIVE DEMAND LIMIT to the value configured as “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 50, for more information on this topic.

**OCCUPANCY SCHEDULE** — The chiller schedule, described in the Time Schedule Operation section (page 21), 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 50.

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 21.

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
- excessive starter transition 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 motor starter, 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 79.

**Shunt Trip (Option)** — The function of the shunt trip option on the PIC III is to act as a safety trip. The shunt trip is wired from the standard I/O board to a shunt trip equipped 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 starter, 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.

**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
			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 REFRIGTEMP<CONDENSERFREEZEPOINT. 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 <407VDC at 400/480 V Line Side Voltage
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

**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 CURRENT* 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 startup (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 startup.

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. (Refer to 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 42.

**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 PRESURE* 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)	COMP 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 *AUTORESTART OPTION* in the OPTIONS screen and the *REMOTE CONTACTS OPTION* are enabled, the REMOTE CONTRACTS 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 44).

**Alarm (Trip) Output Contacts** — One set of alarm contacts is provided in the starter. 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 the 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 can be placed back into a normal CCN operating mode when the *REMOTE RESET OPTION* (ICVC\_PSWD 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\_PSWD screen and force the *RESET ALARM?* point to YES to reset the fault condition. If the PIC III controls have determined that is safe to start the chiller the *CCN MODE?* point (ICVC\_PSWD 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 79. 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 pump-down 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 starter, 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 kPa) 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 kPa) 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 startup 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 SETPOINT* 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 “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  $\pm 30^\circ$  F ( $\pm 16.7^\circ$  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  $\pm 30^\circ$  F ( $\pm 16^\circ$  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  $\pm 30^\circ$  F ( $\pm 16^\circ$  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/HBBP DELTA P1, SURGE/HBBP DELTA T2, and SURGE/HBBP 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, that 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 IGV's open. When in Surge Prevention mode, with a command to decrease capacity, the IGV's 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*.

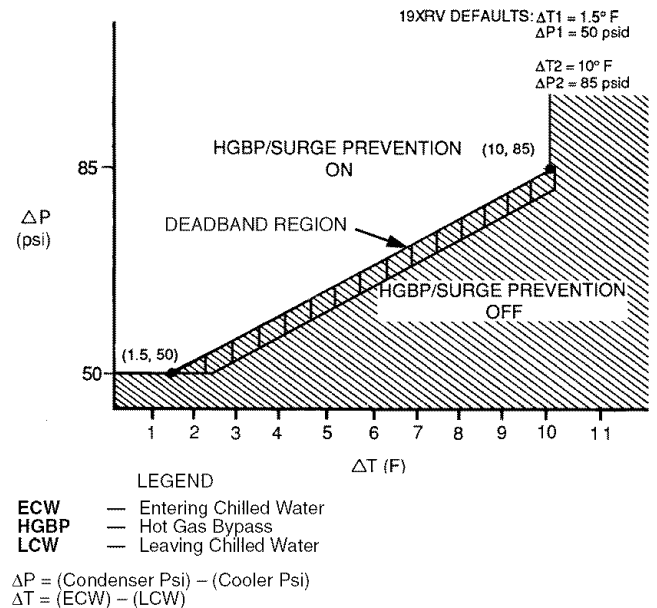
**Surge Protection** — The PIC III monitors surge, which is detected as a fluctuation in compressor motor amperage. Each time the fluctuation exceeds an operator-specified limit, the PIC III registers a surge protection count. The current fluctuation threshold that triggers a surge protection count is 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.

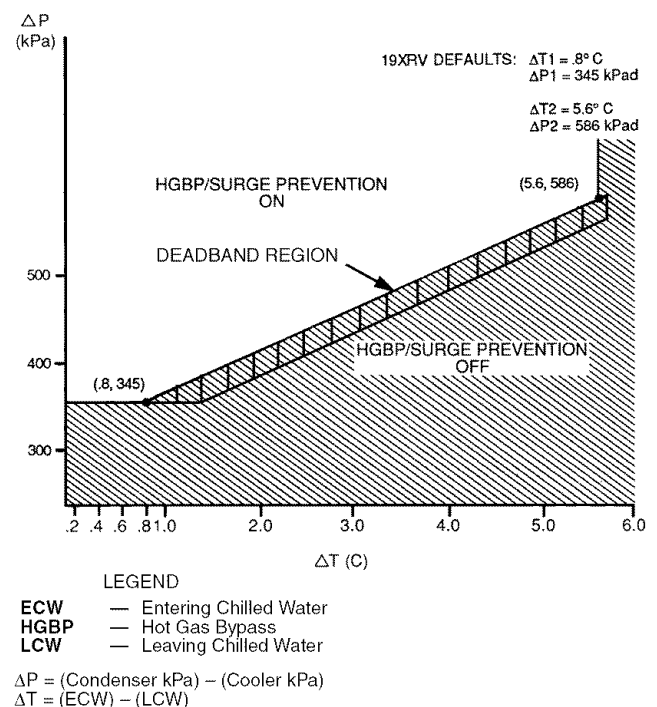
The portion of the surge count threshold attributable to current can be adjusted from the *OPTIONS* screen (see Table 4). Scroll down to the *SURGE DELTA % AMPS* parameter, and use the **INCREASE** or **DECREASE** softkey to adjust the percent current fluctuation. The default setting is 10% amps.

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*).



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



**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 LEAD-LAG 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

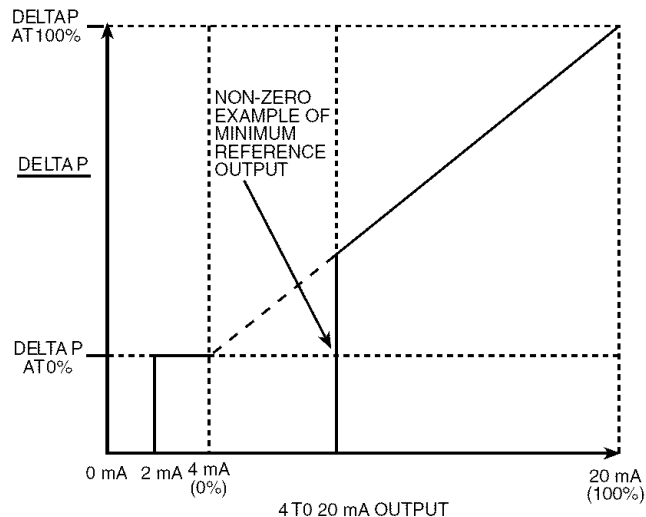


Fig. 24 — Head Pressure Reference Output

- 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-J26).

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 *LEADLAG: 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, 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 SETUPI 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 PULL-DOWN DEGMIN* 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 =  $115 - \text{LAG \% CAPACITY}$ . 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 SETUPI 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 =  $115 - \text{LAG \% CAPACITY}$ . 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  $\frac{1}{2}$  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 pull-down rate (*TEMP PULL-DOWN 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 KILOWATS* 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 21, 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.

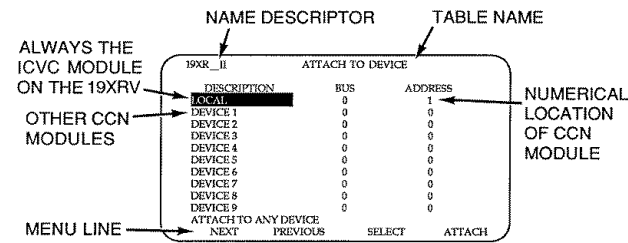
**ATTACHING TO OTHER CCN MODULES** — If the chiller ICVC has been connected to a CCN Network or other PIC controlled chillers through CCN wiring, the ICVC can be used to view or change parameters on the other controllers. Other PIC III chillers can be viewed and set points changed (if the other unit 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.

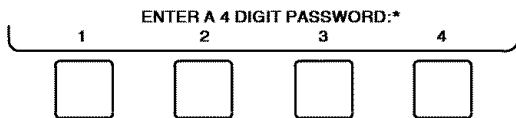


**Fig. 25 — Example of Attach to Network Device Screen**

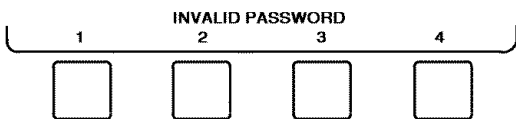
**Service Operation** — An overview of the tables and screens available for the SERVICE function is shown in Fig. 18.

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

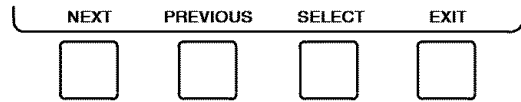
1. From the main MENU screen, press the **SERVICE** softkey. The softkeys now correspond to the numerals 1, 2, 3, 4.
2. Press the four digits of the password, one at a time. An asterisk (\*) appears as each digit is entered



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 on page 21.) 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 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.

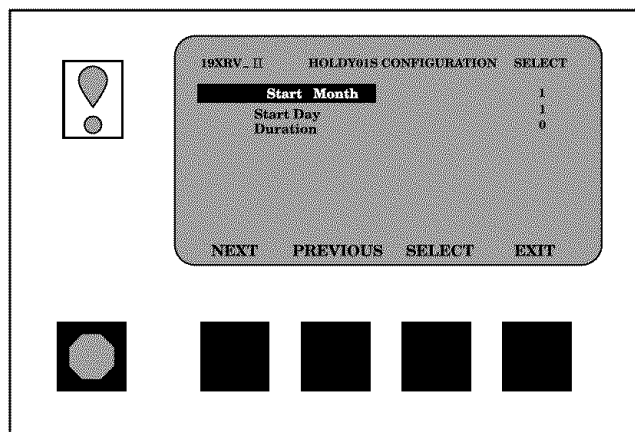
10. Press **[INCREASE]** or **[DECREASE]** to change the selected value.
11. Press **[ENTER]** to save the changes.
12. Press **[EXIT]** to return to the previous menu.

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 21), Occupancy Schedule (page 36), and To Prevent Accidental Start-Up (page 67), 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 **VERRIDE**, 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: 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).

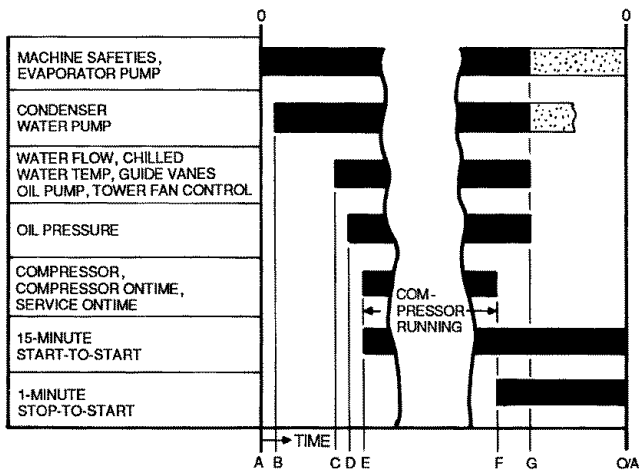
If the water/brine temperature is high enough, the start-up sequence continues and checks the guide vane position. If the guide vanes are more than 4% open, the start-up is delayed until the PIC III closes the vanes. If the vanes are closed and the oil pump pressure is less than 4 psi (28 kPa), the oil 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 < [EVAP REFRIG TEMP] + 50° F (10° C)	105
CONDENSER PRESSURE	< CONDENSER PRESSURE 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	Must have been calibrated	109



- 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 depressing 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 46).

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 650 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 Pump-out System** — Refer to Chillers with Storage Tanks section, page 71 for pumpout system preparation, refrigerant transfer, and chiller evacuation.

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

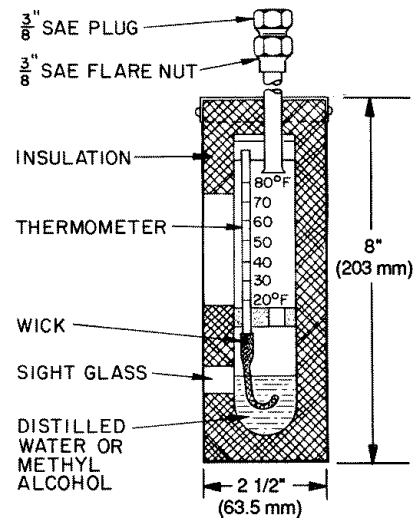


Fig. 28 — Typical Wet-Bulb Type Vacuum Indicator

**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, SAE354 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.

<b>⚠ WARNING</b>
Do not use air or oxygen as a means of pressurizing the chiller. Mixtures of HFC-134a and air can undergo combustion.

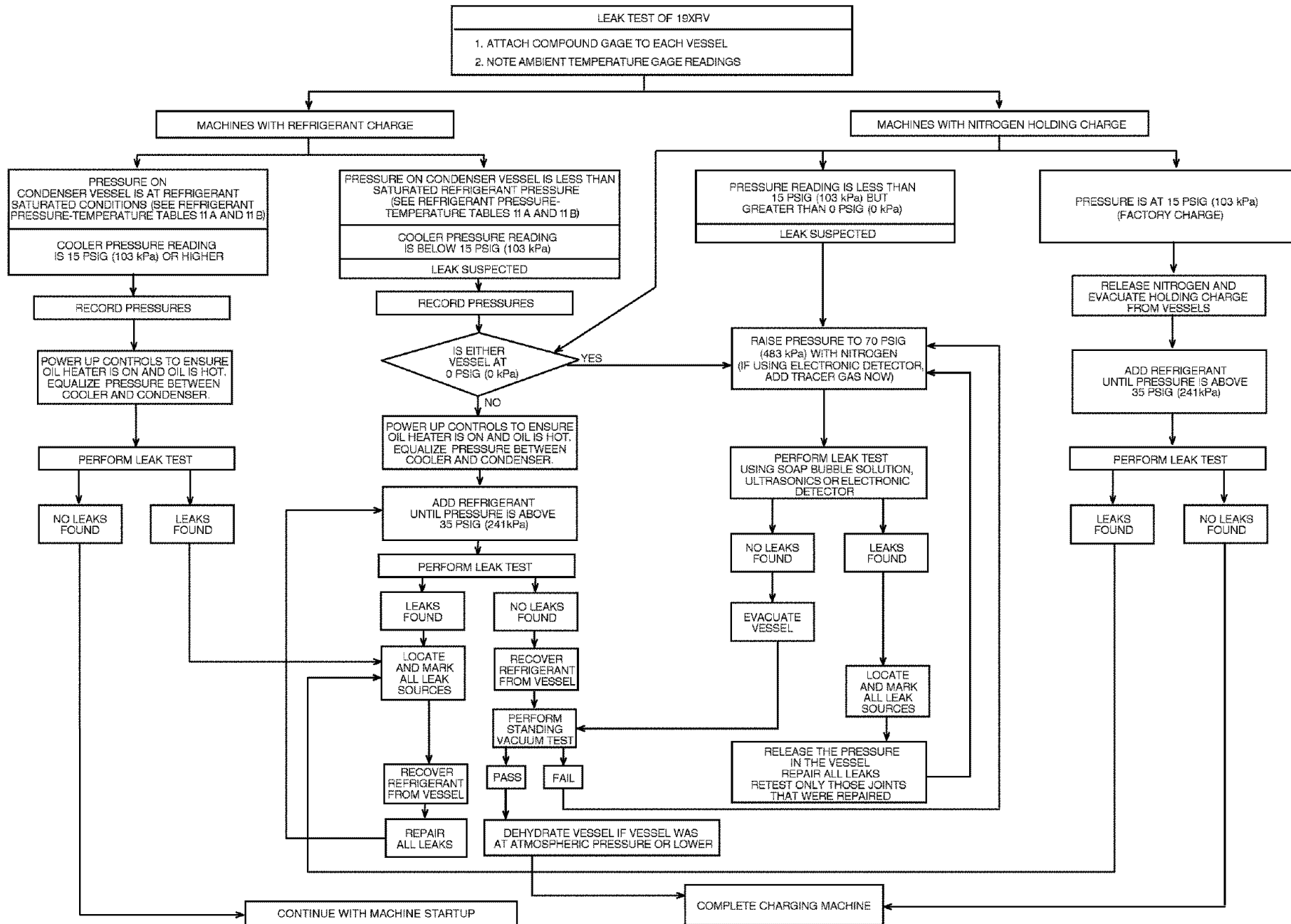


Fig. 29 — 19XRV Leak Test Procedures

**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 72.

**▲ 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.

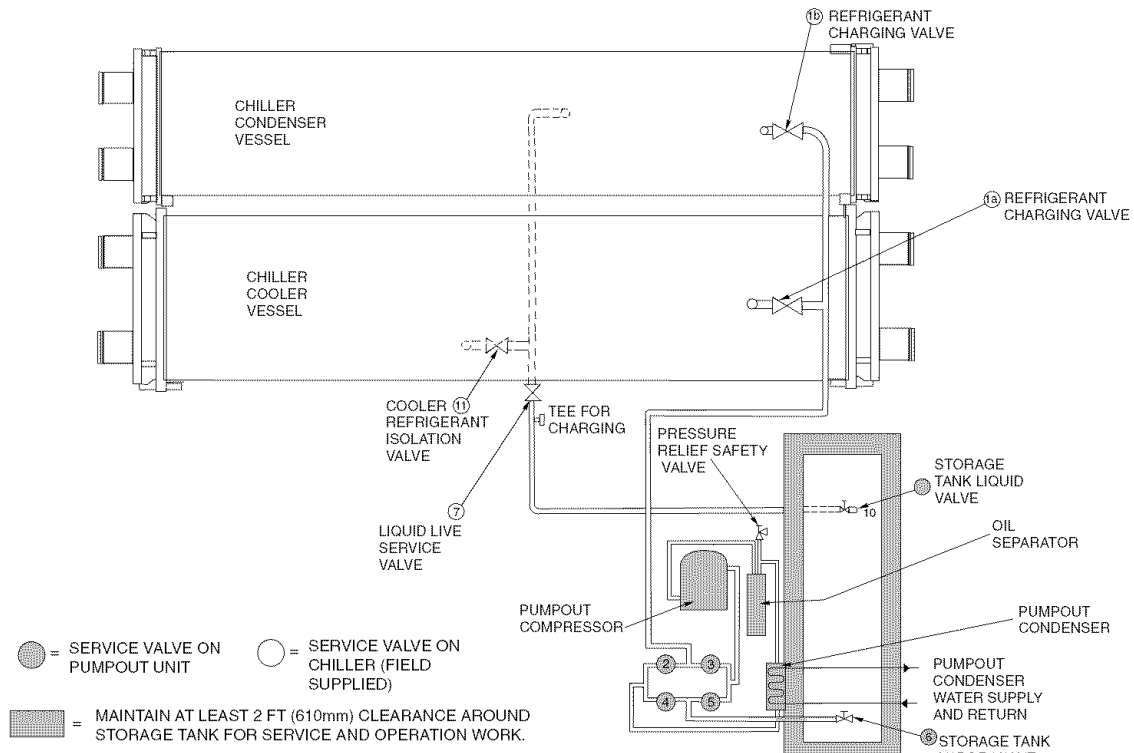
- c. Leak test chiller as outlined in Steps 3-9.
2. If the pressure readings are abnormal for the chiller condition:
  - a. Prepare to leak test chillers shipped with refrigerant (Step 2h).
  - b. Check for large leaks by connecting a nitrogen bottle and raising the pressure to 30 psig (207 kPa). Soap 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 58.
  - 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.

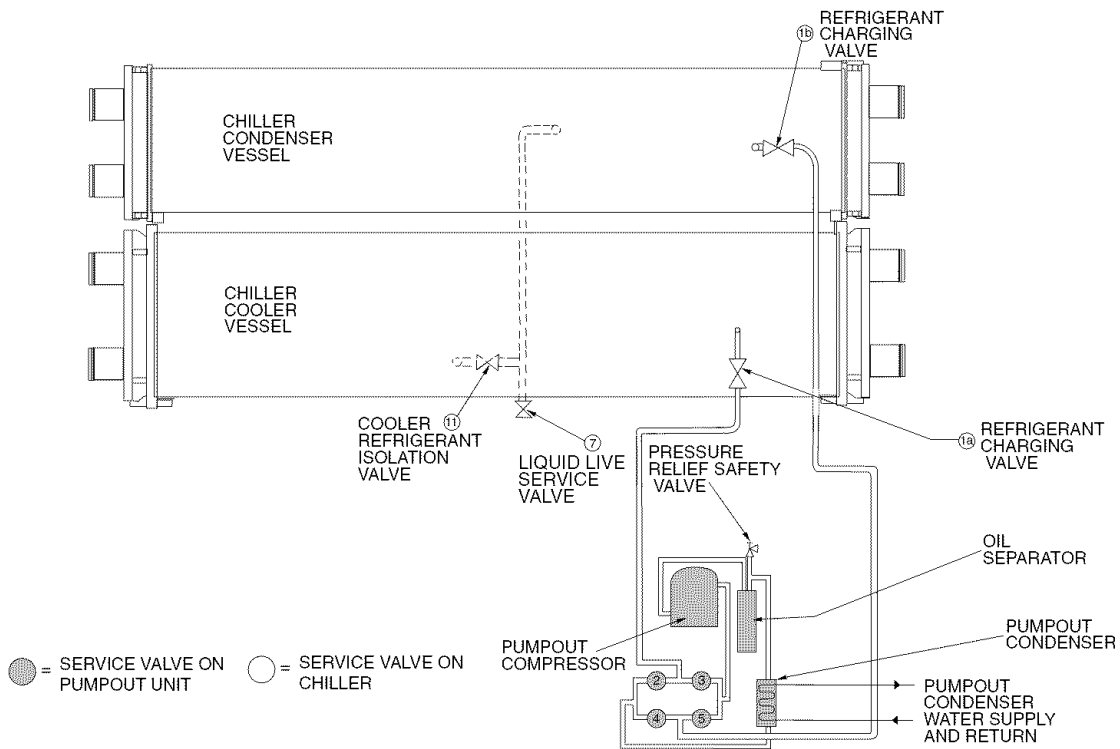
5. If no leak is found during the initial start-up procedures, complete the transfer of refrigerant gas from the pumpout storage tank to the chiller (see Transfer Refrigerant from Pumpout Storage Tank to Chiller section, page 72). Retest for leaks.
6. If no leak is found after a retest:
  - a. Transfer 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 72).
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 71) to at least 18 in. Hg vac, ref 30-in. bar (41 kPa), using a vacuum pump or the pump out 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 73. 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

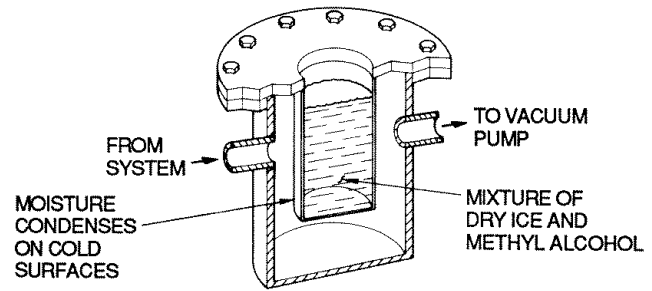
**Table 11B — HFC-134a Pressure —  
Temperature (C)**

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.



**Fig. 32 — Dehydration Cold Trap**

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 [0.002 m<sup>3</sup>/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.

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

**⚠ CAUTION**

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

**Check 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.

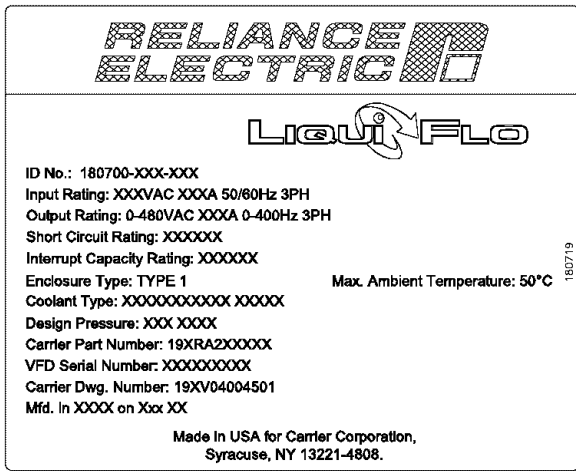
The 19XRV relief valves are set to relieve at the 185 psig (1275 kPa) chiller design pressure.

**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).

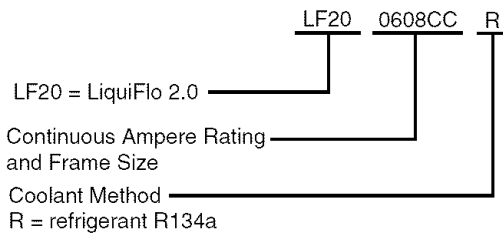
The control center is designed to operate in the following environmental conditions:

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)

This section describes how to identify the drive using the model number matrix and shows the major drive components.



**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 starter. Open the disconnect ahead of the starter in addition to shutting off the chiller or pump. Failure to do so could result in serious personal injury or death from electric shock.

**⚠ WARNING**  
 The main disconnect on the starter front panel may not deenergize all internal circuits. Open all internal and remote disconnects before servicing the starter. 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  $\pm 10\%$  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	NOMINAL INPUT VOLTAGE (V)	INPUT CURRENT (AMPS)	OUTPUT CURRENT AT 4 kHz* (AMPS)
19XVA2AA	2AA	NEMA 1	380 TO 460	440	460
19XVA2CC	2CC			608	608

\*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 starter nameplates.
3. Compare the ampere rating on the VFD enclosure nameplate to the rating on the compressor nameplate. OVERLOAD TRIP AMPS must be 108% of the MOTOR RATED LOAD AMPS.
4. The control center 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 control center 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 control center and the optional pumpout compressor. Compare voltages against nameplate values.
6. Ensure that fused disconnects or circuit breakers have been supplied to the control center 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 control center enclosure below the control panel.
10. Inspect the control panel in the control center enclosure to ensure that the contractor has used the knockouts to feed the wires into the back of the control panel. Wiring into the top of the panel can cause debris to fall into the control center. Clean and inspect the interior of the control center if this has occurred.

### ⚠ WARNING

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

11. Apply power to the control center. Go to the ICVC and access the MENU>SERVICE>VFD CONFIG DATA>VFD\_CONF screen. Confirm that the parameters entered in VFD\_CONF match the information on the Machine Nameplate and Sales Requisition. Confirm that the serial numbers on the chiller, Machine Nameplate, and Sales Requisition are consistent.

**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.

- a. Open the starter 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 starter solid-state components in the VFD.

- b. 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.
- c. Divide the 60-second resistance reading by the 10-second reading. The ratio, or polarization index, must be one or higher. Both the 10 and 60-second readings must be at least 50 megohms.  
If the readings 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 starter 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 11.

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*.

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

- Surge Parameters — Located inside the control panel (see Fig. 9).
- Refrigeration Machine Nameplate — Located on the right side of the control panel (see Fig. 9).
- 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:

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

Carrier A United Technologies Company	
MODEL NUMBER	
SERIAL NUMBER	
MACHINE NAMEPLATE SUPPLY DATA	
VOLTS/PHASE/HERTZ	
LOCKED MOTOR AMPS	
OVERLOAD TRIP AMPS	
MAX FUSE/CIRCUIT BREAKER SIZE	
MIN SUPPLY CIRCUIT AMPCACITY	
MACHINE ELECTRICAL DATA	
MOTOR NAMEPLATE VOLTAGE	
COMPRESSOR 100% SPEED	
RATED LINE VOLTAGE	
RATED LINE AMPS	
RATED LINE KILOWATTS	
MOTOR RATED LOAD KW	
MOTOR RATED LOAD AMPS	
MOTOR NAMEPLATE RPM	
MOTOR NAMEPLATE KW	
INVERTER PWM FREQUENCY	
SAFETY CODE CERTIFICATION THE COMPRESSOR MOTOR CONTROLLER AND OVERLOAD PROTECTION MUST BE IN ACCORDANCE WITH CARRIER SPECIFICATION 7-055 1099800001 REV. 1	

INTERNAL

Carrier A United Technologies Company	
MODEL NUMBER	
SERIAL NUMBER	
MACHINE ELECTRICAL DATA	
LINE SIDE	
VOLTAGE	
PHASE	
HZ	-3-
CHILLER FL AMPS	
MAX FUSE/CIRCUIT BREAKER	
MIN. CRT AMPCACITY	
LOAD SIDE	
VOLTAGE	
PHASE	-3-
HZ	
MOTOR FLA	
MOTOR LRA	
SAFETY CODE CERTIFICATION THE COMPRESSOR MOTOR CONTROLLER AND OVERLOAD PROTECTION MUST BE IN ACCORDANCE WITH CARRIER SPECIFICATION 7-055 1099800001 REV. 1	

EXTERNAL

**Fig. 35 — Machine Electrical Data Nameplate**

- 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 (Fig. 35) inside of the VFD enclosure door

**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  $\Delta T_2$ :

54 – 44 = 10° F (12.2 – 6.7 = 5.5° C)

Maximum Load  $\Delta P_2$ :

120 – 37 = 83 psid (827 – 255 = 572 kPad)

To avoid unnecessary surge prevention, add about 10 psid (70 kPad) to  $\Delta P_2$  from these conditions:

$\Delta T_2 = 10^\circ \text{ F (} 5.5^\circ \text{ C)}$

$\Delta P_2 = 93 \text{ psid (} 642 \text{ kPad)}$

**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  $\Delta T_1$  (at 20% Load): 2 F (1.1 C)

Minimum Load  $\Delta P_1$ :

71 – 38 = 33 psid (490 – 262 = 228 kPad)

Again, to avoid unnecessary surge prevention, add 20 psid (140 kPad) at  $\Delta P_1$  from these conditions:

$\Delta T_1 = 2 \text{ F (} 1.1 \text{ C)}$

$\Delta P_1 = 53 \text{ psid (} 368 \text{ kPad)}$

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)

The differential pressure ( $\Delta P$ ) and temperature ( $\Delta T$ ) 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. 9.

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.

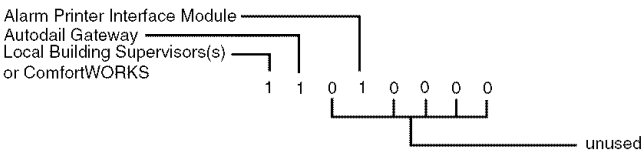
- first bit = 1 indicates that the alarm should be read and processed by a “front end” device, such as ComfortWORKS®.
- second bit = 1 indicates that the alarm should be read and processed by a TeLINK™ or Autodial Gateway module.
- fourth bit = 1 indicates that the alarm should be read and processed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

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

*Other Tables* — The CONSUME, NET\_OPT, and RUN-TIME 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 11010000

**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 (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
<b>1. CCM Thermistors</b>	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
<b>2. CCM Pressure Transducers</b>	Evaporator Pressure Condenser Pressure Oil Pump Delta P Chilled Water Delta Condenser Water Delta P Transducer Voltage Ref Humidity Sensor Input Relative Humidity
<b>3. Pumps</b>	Oil Pump — Confirm Pressure Chilled Water — Confirm Flow and Delta P Condenser Water — Confirm Delta P
<b>4. Discrete Outputs</b>	Oil Heater Relay Hot Gas Bypass Relay Tower Fan Relay Low Tower Fan Relay High VFD Coolant Solenoid Alarm Relay Shunt Trip Relay
<b>5. IGV &amp; SRD Actuator</b>	Open/Close If present, split ring diffuser will operate in coordination with the guide vanes per configured schedule.
<b>6. Head Pressure Output</b>	Increase/Decrease 4-20 mA output
<b>7. Diffuser Actuator*</b>	Open/Close (independent of guide vanes)
<b>8. Pumpdown Lockout</b>	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.
<b>9. Terminate Lockout</b>	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.
<b>10. Guide Vane Calibration</b>	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 reading 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  $\pm 15\%$  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 71 and 78, 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 on 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 refrigerant isolated 19XRV chiller, 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 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

Always operate the condenser and chilled water pumps 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
10	290	132	10	200	91
11	310	141	11	200	91
12	330	150	12	200	91
15	320	145	15	250	113
16	340	154	16	250	113
17	370	168	17	250	113
20	345	157	20	225	102
21	385	175	21	225	102
22	435	197	22	225	102
30	350	159	30	260	118
31	420	190	31	260	118
32	490	222	32	260	118
35	400	181	35	310	141
36	480	218	36	310	141
37	550	250	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

**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 main starter, oil pump relay, tower fan starter, oil heater relay, and the chiller control panel.
2. Cooling tower water is at proper level and at-or-below design entering temperature.
3. Chiller is charged with refrigerant and all refrigerant and oil valves are in their proper operating positions.
4. Oil is at the proper level in the reservoir sight glasses.
5. Oil reservoir temperature is above 140 F (60 C) or above 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 starter 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 starter is energized and the motor begins to turn, check for clockwise motor rotation (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 50.

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



## CORRECT MOTOR ROTATION IS CLOCKWISE WHEN VIEWED THROUGH MOTOR SIGHT GLASS

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

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

**Fig. 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 67.

### 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 50.

**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 kW, or the pulldown rate can be decreased to avoid a high demand charge for the short period of high demand operation. Pulldown rate can be based on load rate or temperature rate and is accessed on the 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 50. 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 53.

Recharge the chiller by transferring refrigerant from the pumpout storage tank (if supplied). Follow the Pumpout and Refrigerant Transfer Procedures section, page 71. 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.



## 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 78. 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. 9) 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 9 and 10 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.

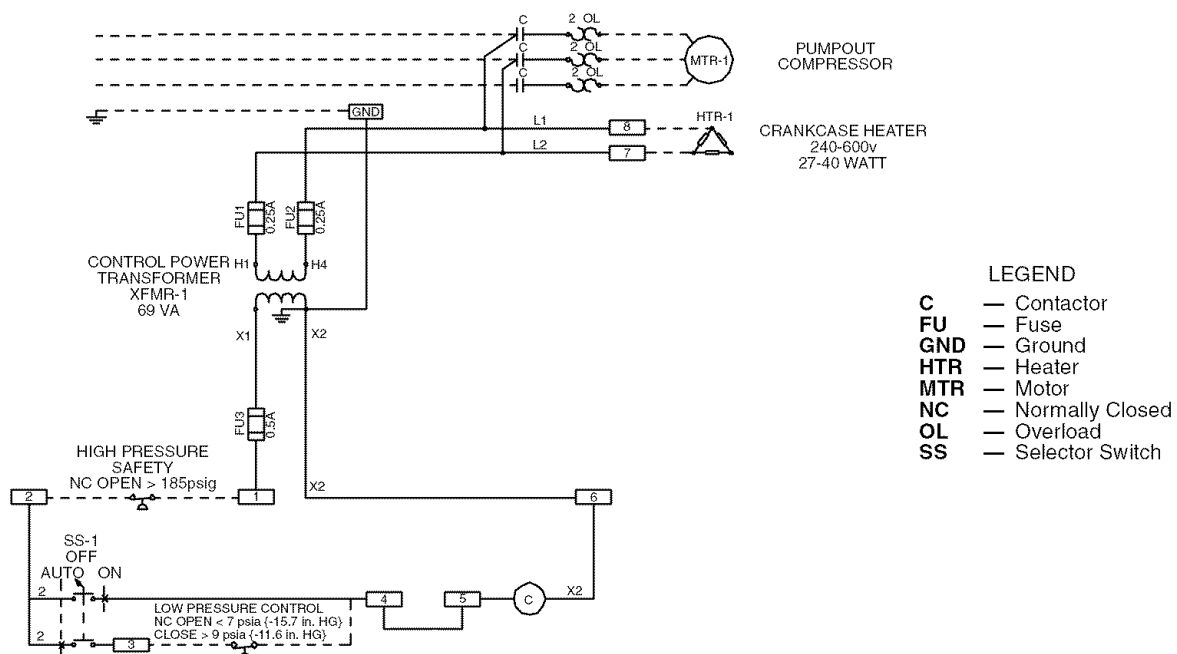
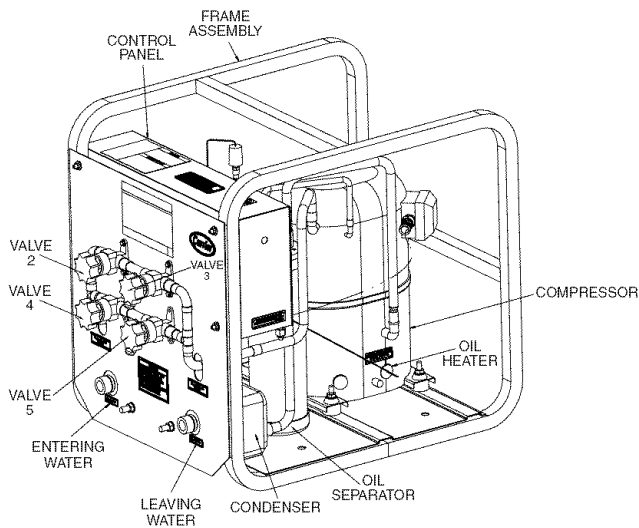


Fig. 39 — Pumpout Unit Wiring Schematic



**Fig. 40 — Pumpout Unit**

**Transfer Refrigerant from Pumpout Storage Tank to Chiller**

**⚠ WARNING**

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

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

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

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

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

2. Transfer remaining refrigerant.

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

- 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	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 75.

### **⚠ 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 75.

**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 55 and 58) 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. If slack develops in the drive chain, do the following to eliminate backlash:

1. With the chiller shut down and the actuator fully closed, remove the chain guard and loosen the actuator bracket holddown bolts.
2. Loosen guide vane sprocket adjusting bolts.
3. Pry bracket upwards to remove slack, then retighten the bracket holddown bolts.
4. Retighten the guide vane sprocket adjusting bolts. Ensure that the guide vane shaft is rotated fully in the clockwise direction in order close it fully.

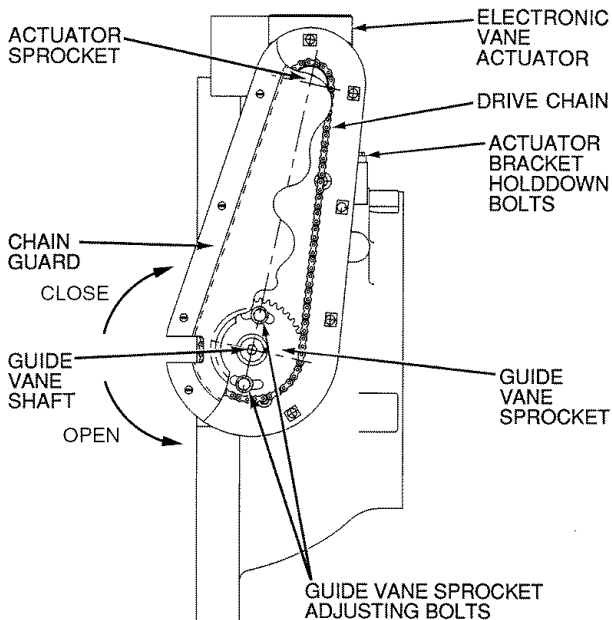


Fig. 41 —Guide Vane Actuator Linkage

**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 72.

Refer to the Trimming Refrigerant Charge section on page 66.

## 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 76. Any additional oil that is added should be logged by noting the amount and date. Any oil that is added due to oil loss that is not related to service will eventually return to the sump. It must be removed when the level is high.

An oil heater is controlled by the PIC III to maintain oil temperature (see the Controls section) when the compressor is off. The ICVC COMPRESS screen displays whether the heater is energized or not. The heater is energized if the *OIL HEATER RELAY* parameter reads ON. If the PIC III shows that the heater is energized and if the sump is still not heating up, the power to the oil heater may be off or the oil level may be too low. Check the oil level, the oil heater contactor voltage, and oil heater resistance.

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

## SCHEDULED MAINTENANCE

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

**Service Ontime** — The ICVC will display a *SERVICE ONTIME* value on the MAINSTAT screen. This value should be reset to zero by the service person or the operator each time major service work is completed so that the time between service can be viewed and tracked.

**Inspect the Control Panel** — Maintenance consists of general cleaning and tightening of connections. Vacuum the cabinet to eliminate dust build-up. If the chiller control malfunctions, refer to the Troubleshooting Guide section for control checks and adjustments.

**⚠ CAUTION**

Ensure power to the control center is off when cleaning and tightening connections inside the control panel. 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 12 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 amount shown in Step 2.

**Refrigerant Filter** — A refrigerant filter/drier, located on the refrigerant cooling line to the motor, should be changed once a year or more often if filter condition indicates a need for more frequent replacement. Change the filter by closing the filter isolation valves (Fig. 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 and 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.

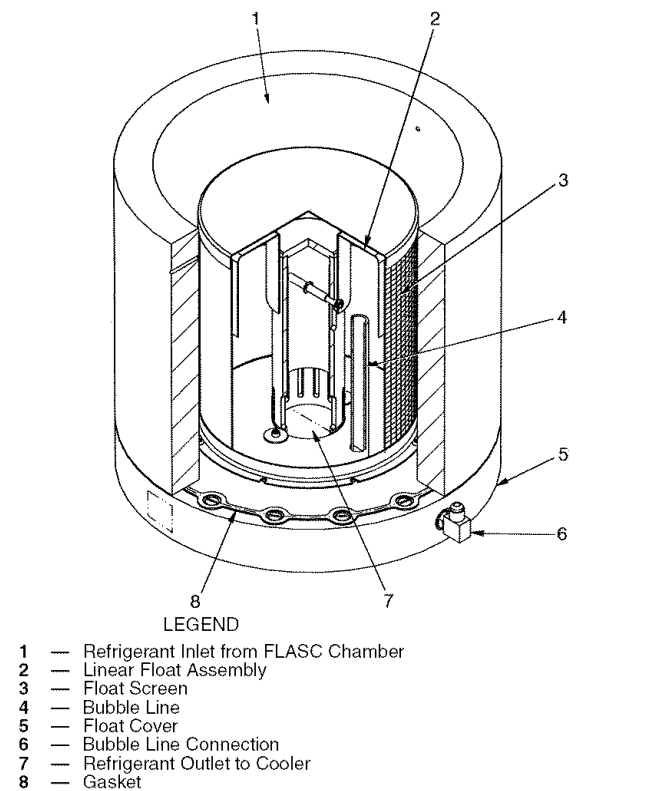
**⚠ CAUTION**

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 58.



**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 starter before an insulation test is performed. The voltage generated from the tester can damage the starter or drive components.

**⚠ WARNING**

Before working on any starter or drive, shut off the chiller, open and tag all disconnects supplying power to the starter. After disconnecting input power to a VFD and before touching any internal components, wait five minutes for the DC bus capacitors to discharge, then check the voltage with a voltmeter. Failure to observe this precaution could result in severe bodily injury or death.

**⚠ WARNING**

The disconnect on the starter front panel does not deenergize all internal circuits. Open all internal and remote disconnects before servicing the starter.

**⚠ 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 follows:

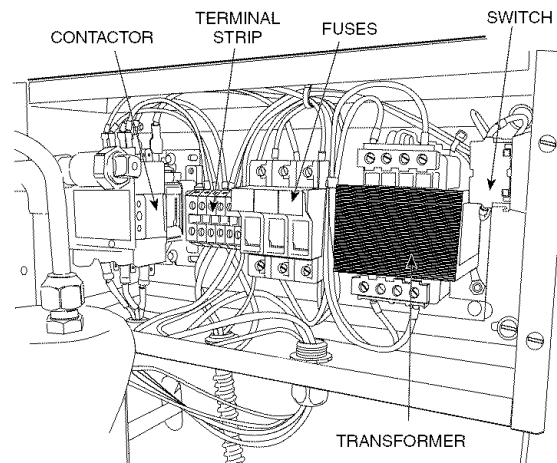
1. Close service valves 2 and 4.
2. Run the pumpout compressor in Automatic mode for one minute or until the vacuum switch is satisfied and compressor shuts off.
3. Move the pumpout selector switch to OFF. Pumpout compressor shell should now be under vacuum.
4. Oil can be added to the shell with a hand 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, WSM-DEFME, and OCCDEFM 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. 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.

NOTE: The date format in these tables is MM/DD/YY.

For a complete list of possible alarm and alert messages, see Table 15. 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. 7 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 keep 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  $\pm 5$  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 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. The tables are:

**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.
OCCDEFM	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.

Surge and hot gas bypass parameters may be observed in the HEAT\_EX screen. The surge and hot gas bypass control algorithm status is viewed from this screen. All values dealing with this control are displayed.



**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
<b>MANUALLY STOPPED — PRESS TERMINATE PUMPDOWN MODE</b>	CCN OR LOCAL TO START TO SELECT CCN OR LOCAL	PIC III in OFF mode, press CCN or LOCAL softkey to start unit. Enter the CONTROL TEST table and select TERMINATE LOCKOUT to unlock compressor.
<b>SHUTDOWN IN PROGRESS</b>	COMPRESSOR UNLOADING	Chiller unloading before shutdown due to soft/stop feature.
<b>SHUTDOWN IN PROGRESS</b>	COMPRESSOR DEENERGIZED	Chiller compressor is being commanded to stop. Water pumps are deenergized within one minute.
<b>ICE BUILD</b>	OPERATION COMPLETE	Chiller shutdown from Ice Build operation.
<b>SHUTDOWN IN PROGRESS</b>	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
<b>READY TO START IN XX MIN</b>	UNOCCUPIED MODE	Time schedule for PIC III is unoccupied. Chillers will start only when occupied. Check OCCPCnnS and Holidays screens.
<b>READY TO START IN XX MIN</b>	REMOTE CONTACT OPEN	Remote contacts are open. Close contacts to start.
<b>READY TO START IN XX MIN</b>	STOP COMMAND IN EFFECT	Chiller START/STOP on MAINSTAT manually forced to stop. Release SUPERVISOR force to start.
<b>READY TO START IN XX MIN</b>	OCCUPIED MODE	Chiller timer counting down. Unit ready to start.
<b>READY TO START IN XX MIN</b>	REMOTE CONTACT CLOSED	Chiller timer countdown complete. Unit will proceed to start. Remote contact Enabled and Closed.
<b>READY TO START IN XX MIN</b>	START COMMAND IN EFFECT	Chiller START/STOP on MAINSTAT manually forced to start. Release SUPERVISOR force to start under normal control.
<b>READY TO START IN XX MIN</b>	RECYCLE RESTART PENDING	Chiller is recycle mode.
<b>READY TO START</b>	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.
<b>READY TO START</b>	REMOTE CONTACT OPEN	Remote contacts have stopped the chiller. Close contacts to start.
<b>READY TO START</b>	STOP COMMAND IN EFFECT	Chiller START/STOP on MAINSTAT manually forced to stop. Release SUPERVISOR force to start.
<b>READY TO START</b>	OCCUPIED MODE	Chiller timers countdown is complete. Unit will proceed to start.
<b>READY TO START</b>	REMOTE CONTACT CLOSED	Chiller timer counting down. Unit ready to start.
<b>READY TO START</b>	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.
<b>STARTUP INHIBITED</b>	LOADSHED IN EFFECT	CCN loadshed module commanding chiller to stop.

#### C. IN RECYCLE SHUTDOWN

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
<b>RECYCLE RESTART PENDING</b>	OCCUPIED MODE	Unit in recycle mode, chilled water temperature is not sufficiently above Setpoint to start.
<b>RECYCLE RESTART PENDING</b>	REMOTE CONTACT CLOSED	Unit in recycle mode, chilled water temperature is not sufficiently above Setpoint to start.
<b>RECYCLE RESTART PENDING</b>	START COMMAND IN EFFECT	Chiller START/STOP on MAINSTAT manually forced to start, chilled water temperature is not sufficiently above Setpoint to start.
<b>RECYCLE RESTART PENDING</b>	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.

\*[LIMIT] is shown on the ICVC as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. [VALUE] is the actual pressure, temperature, voltage, etc., at which the control tripped.

**Table 16 — Alarm and Alert Messages (cont)**

**H. OUT-OF-RANGE SENSOR**

<b>ICVC FAULT STATE</b>	<b>PRIMARY MESSAGE</b>	<b>SECONDARY MESSAGE</b>	<b>PRIMARY CAUSE</b>	<b>ADDITIONAL CAUSE/REMEDY</b>
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.
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 deg. 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 flash 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. 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.
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 DIFFUSE 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 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.	

\*[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
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).
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 level.

\*[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. 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.	
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
6	Current reg saturated for > timeout			206
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.	1. Verify input voltage is within drive specified limits. 2. Verify system ground impedance follows proper grounding techniques. 3. 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).	1. Check parameters. 2. 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/O — Drive Peripheral Interface Inputs/Outputs
- EPROM — Erasable, Programmable, Read-Only
- FLA — Full Load Amps
- IGBT — Insulated Gate Bipolar Transistor
- NP — Nameplate

**Table 17 — Fault Code Descriptions and Corrective Actions (cont)**

Fault Type indicates if the fault is:

- 1 — Auto-resettable
- 2 — Non-resettable
- 3 — User-configurable
- 4 — Normal Fault

VFD FAULT CODE	FAULT TYPE	DESCRIPTION	ACTION	ICVC FAULT STATE
38	Phase U to Grnd	A phase-to-ground fault has been detected between the drive and motor in this phase.	1. Check the wiring between the drive and motor. 2. Check motor for grounded phase. 3. 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.	1. Check the motor and drive output terminal wiring for a shorted condition. 2. Replace drive.	246
42	Phase VW Short			
43	Phase UW Short			
48	Params Defaulted	The drive was commanded to write default values to EPROM.	1. Clear the fault or cycle power to the drive. 2. 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
69	DB Resistor Out of Range			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.).	1. Check communication board for proper connection to external network. 2. 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).	1. Reprogram Motor NP FLA (42) with the correct motor nameplate value. 2. Repeat Autotune (61).	206
79	Excessive Load	Motor did not come up to speed in the allotted time.	1. Uncouple load from motor. 2. 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.).	1. If module was not intentionally disconnected, check wiring to the port. Replace wiring, port expander, modules, Main Control board or complete drive as required. 2. Check OIM connection.	206
86	DPI Port 6 Communication Loss			206
87	Autotune: Ixo too large 4	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.	1. Restore defaults. 2. Reload user set if used.	206
101	UserSet1 Chksum 2	The checksum read from the user set does not match the checksum calculated.	Re-save user set.	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.	1. Cycle power to the drive. 2. If problem persists, replace drive.	206

**LEGEND**

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

**Table 17 — Fault Code Descriptions and Corrective Actions (cont)**

Fault Type indicates if the fault is:

- 1 — Auto-resettable
- 2 — Non-resettable
- 3 — User-configurable
- 4 — Normal Fault

VFD FAULT CODE	FAULT TYPE	DESCRIPTION	ACTION	ICVC FAULT STATE
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 k	Main Control board was replaced and parameters were not programmed.	1. Restore defaults. 2. Reprogram parameters.	206
109	I/O Board Check Sum Non-Resettable			206
110	I/O Board Failure Non-Resettable			206
121	I/O Board Comm Loss k	Loss of communication to I/O board.	Cycle power.	206
122	I/O Board Fail	Board failure.	1. Cycle power. 2. If fault repeats, replace I/O board.	206
200	Inverter Dsat U, V, W	High current was detected in an IGBT.	1. Check for loose connection in IGBT wire harness. 2. Check IGBTs. 3. Check precharge resistors and fuses. 4. Check precharge contactor.	201
201				
202				
203	Inverter OverCurrent U, V, W	High current was detected in an IGBT.	1. Verify proper motor data is entered. 2. Reduce current limit.	286
204				
205				
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	Rectifier Dsat U, V, W	High current was detected in an IGBT.	1. Check for loose connection in IGBT wire harness. 2. Check IGBTs.	200
209				
210				
211	Rectifier IOC U, V, W	Rectifier overcurrent.	1. Verify proper motor data is entered. 2. Reduce current limit.	241
212				
213				
214	Reactor Temp	Temperature switch in reactor opened.	Check for proper temperature and fan operation.	206
215	Rectifier Unused Bit 4	Rectifier section of power structure hardware reported unexpected fault.	Check wiring harness.	206
216	Rectifier Ground Fault	Excessive ground current measured.	Check for grounded input wiring.	220
217	Rectifier Base Temp	Excessive rectifier temperature measured.	Check for proper temperature and flow rate of coolant.	218
218	Rectifier IGBT Temp	Excessive calculated IGBT temperature.	Check for proper temperature and flow rate of coolant.	218
219	Rectifier IT Overload	Short-term current rating of rectifier exceeded.	Low input voltage can result in increased current load. Provide proper input voltage to the drive.	212
220	Rectifier I2T Overload	Long-term current rating of rectifier exceeded.	Low input voltage can result in increased current load. Provide proper input voltage to the drive.	212
221	Ride Thru Abort	Input power loss timed out.	1. Verify input power and connections. 2. Check Line Sync board. 3. 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

**LEGEND**

- DP1/I/O — Drive Peripheral Interface Inputs/Outputs
- EPROM — Erasable, Programmable, Read-Only
- FLA — Full Load Amps
- IGBT — Insulated Gate Bipolar Transistor
- NP — Nameplate

**Table 17 — Fault Code Descriptions and Corrective Actions (cont)**

Fault Type indicates if the fault is:

- 1 — Auto-resettable
- 2 — Non-resettable
- 3 — User-configurable
- 4 — Normal Fault

VFD FAULT CODE	FAULT TYPE	DESCRIPTION	ACTION	ICVC FAULT STATE
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.	1. Verify proper input voltage. 2. Check line sync board and fuse. 3. Check AC line I/O board. 4. 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.	1. Restore defaults. 2. Reload user set if used.	206
230	Inverter HW Detected a Fault Bit Non Was Found 4	Inverter section of power structure hardware reported unexpected fault.	Check wiring harness.	206
231	Recyifier HW Detected a Fault Bit Non Was Found 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.	1. Check AUX contacts on precharge. 2. Check input bit 0 in rectifier parameter 216 to view status of input. 3. Check wiring. 4. Check precharge resistors and fuses.	206
234	Precharge open	Precharge was open when it should be closed.	1. Check AUX contacts on precharge. 2. Check input bit 0 in rectifier parameter 216 to view status of input. 3. Check wiring. 4. 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. 1. Cycle power to the drive. 2. If problem persists, replace drive.	206
236	Rctfr I/O Board	Loss of communication to I/O board. Board failure.	Cycle power. 1. Cycle power. 2. If fault repeats, replace I/O board.	206
237	Rectifier Start Timed Out 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 Logged In 4	Rectifier took too long to connect to inverter.	1. Check the cabling between the communications interface and the two control boards. 2. Connect one DPI device at a time to see if one of the DPI devices is causing the problem. 3. Replace the communications interface. 4. Replace the rectifier control board.	206
239	Rectifier Power Phased ACB 4	Input power is phased ACB rather than ABC.	Switch two of the input power phases.	206

**LEGEND**

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

Table 18A — Thermistor Temperature (F) vs. Resistance/Voltage Drop

TEMPERATURE (F)	PIC III VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMPERATURE (F)	PIC III VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMPERATURE (F)	PIC III VOLTAGE DROP (V)	RESISTANCE (Ohms)
-25	4.700	98,010	60	2.756	7,665	145	0.769	1,141
-24	4.690	94,707	61	2.724	7,468	146	0.756	1,118
-23	4.680	91,522	62	2.692	7,277	147	0.744	1,095
-22	4.670	88,449	63	2.660	7,091	148	0.731	1,072
-21	4.659	85,486	64	2.628	6,911	149	0.719	1,050
-20	4.648	82,627	65	2.596	6,735	150	0.707	1,029
-19	4.637	79,871	66	2.565	6,564	151	0.696	1,007
-18	4.625	77,212	67	2.533	6,399	152	0.684	986
-17	4.613	74,648	68	2.503	6,238	153	0.673	965
-16	4.601	72,175	69	2.472	6,081	154	0.662	945
-15	4.588	69,790	70	2.440	5,929	155	0.651	925
-14	4.576	67,490	71	2.409	5,781	156	0.640	906
-13	4.562	65,272	72	2.378	5,637	157	0.630	887
-12	4.549	63,133	73	2.347	5,497	158	0.619	868
-11	4.535	61,070	74	2.317	5,361	159	0.609	850
-10	4.521	59,081	75	2.287	5,229	160	0.599	832
-9	4.507	57,162	76	2.256	5,101	161	0.589	815
-8	4.492	55,311	77	2.227	4,976	162	0.579	798
-7	4.477	53,526	78	2.197	4,855	163	0.570	782
-6	4.461	51,804	79	2.167	4,737	164	0.561	765
-5	4.446	50,143	80	2.137	4,622	165	0.551	750
-4	4.429	48,541	81	2.108	4,511	166	0.542	734
-3	4.413	46,996	82	2.079	4,403	167	0.533	719
-2	4.396	45,505	83	2.050	4,298	168	0.524	705
-1	4.379	44,066	84	2.021	4,196	169	0.516	690
0	4.361	42,679	85	1.993	4,096	170	0.508	677
1	4.344	41,339	86	1.965	4,000	171	0.499	663
2	4.325	40,047	87	1.937	3,906	172	0.491	650
3	4.307	38,800	88	1.989	3,814	173	0.484	638
4	4.288	37,596	89	1.881	3,726	174	0.476	626
5	4.269	36,435	90	1.854	3,640	175	0.468	614
6	4.249	35,313	91	1.827	3,556	176	0.460	602
7	4.229	34,231	92	1.800	3,474	177	0.453	591
8	4.209	33,185	93	1.773	3,395	178	0.445	581
9	4.188	32,176	94	1.747	3,318	179	0.438	570
10	4.167	31,202	95	1.721	3,243	180	0.431	561
11	4.145	30,260	96	1.695	3,170	181	0.424	551
12	4.123	29,351	97	1.670	3,099	182	0.418	542
13	4.101	28,473	98	1.644	3,031	183	0.411	533
14	4.079	27,624	99	1.619	2,964	184	0.404	524
15	3.056	26,804	100	1.595	2,898	185	0.398	516
16	4.033	26,011	101	1.570	2,835	186	0.392	508
17	4.009	25,245	102	1.546	2,773	187	0.385	501
18	3.985	24,505	103	1.523	2,713	188	0.379	494
19	3.960	23,789	104	1.499	2,655	189	0.373	487
20	3.936	23,096	105	1.476	2,597	190	0.367	480
21	3.911	22,427	106	1.453	2,542	191	0.361	473
22	3.886	21,779	107	1.430	2,488	192	0.356	467
23	3.861	21,153	108	1.408	2,436	193	0.350	461
24	3.835	20,547	109	1.386	2,385	194	0.344	456
25	3.808	19,960	110	1.364	2,335	195	0.339	450
26	3.782	19,393	111	1.343	2,286	196	0.333	445
27	3.755	18,843	112	1.321	2,239	197	0.328	439
28	3.727	18,311	113	1.300	2,192	198	0.323	434
29	3.700	17,796	114	1.279	2,147	199	0.318	429
30	3.672	17,297	115	1.259	2,103	200	0.313	424
31	3.644	16,814	116	1.239	2,060	201	0.308	419
32	3.617	16,346	117	1.219	2,018	202	0.304	415
33	3.588	15,892	118	1.200	1,977	203	0.299	410
34	3.559	15,453	119	1.180	1,937	204	0.294	405
35	3.530	15,027	120	1.161	1,898	205	0.290	401
36	3.501	14,614	121	1.143	1,860	206	0.285	396
37	3.471	14,214	122	1.124	1,822	207	0.281	391
38	3.442	13,826	123	1.106	1,786	208	0.277	386
39	3.412	13,449	124	1.088	1,750	209	0.272	382
40	3.382	13,084	125	1.070	1,715	210	0.268	377
41	3.353	12,730	126	1.053	1,680	211	0.264	372
42	3.322	12,387	127	1.036	1,647	212	0.260	367
43	3.291	12,053	128	1.019	1,614	213	0.256	361
44	3.260	11,730	129	1.002	1,582	214	0.252	356
45	3.229	11,416	130	0.986	1,550	215	0.248	350
46	3.198	11,112	131	0.969	1,519	216	0.245	344
47	3.167	10,816	132	0.953	1,489	217	0.241	338
48	3.135	10,529	133	0.938	1,459	218	0.237	332
49	3.104	10,250	134	0.922	1,430	219	0.234	325
50	3.074	9,979	135	0.907	1,401	220	0.230	318
51	3.042	9,717	136	0.893	1,373	221	0.227	311
52	3.010	9,461	137	0.878	1,345	222	0.224	304
53	2.978	9,213	138	0.864	1,318	223	0.220	297
54	2.946	8,973	139	0.849	1,291	224	0.217	289
55	2.914	8,739	140	0.835	1,265	225	0.214	282
56	2.882	8,511	141	0.821	1,240			
57	2.850	8,291	142	0.808	1,214			
58	2.819	8,076	143	0.795	1,190			
59	2.788	7,868	144	0.782	1,165			

**Table 18B — Thermistor Temperature (C) vs. Resistance/Voltage Drop**

TEMPERATURE (C)	PIC III VOLTAGE DROP (V)	RESISTANCE (Ohms)
-33	4.722	106 880
-32	4.706	100 260
-31	4.688	94 165
-30	4.670	88 480
-29	4.650	83 170
-28	4.630	78 125
-27	4.608	73 580
-26	4.586	69 250
-25	4.562	65 205
-24	4.538	61 420
-23	4.512	57 875
-22	4.486	54 555
-21	4.458	51 450
-20	4.429	48 536
-19	4.399	45 807
-18	4.368	43 247
-17	4.336	40 845
-16	4.303	38 592
-15	4.269	38 476
-14	4.233	34 489
-13	4.196	32 621
-12	4.158	30 866
-11	4.119	29 216
-10	4.079	27 633
-9	4.037	26 202
-8	3.994	24 827
-7	3.951	23 532
-6	3.906	22 313
-5	3.861	21 163
-4	3.814	20 079
-3	3.765	19 058
-2	3.716	18 094
-1	3.667	17 184
0	3.617	16 325
1	3.565	15 515
2	3.512	14 749
3	3.459	14 026
4	3.406	13 342
5	3.353	12 696
6	3.298	12 085
7	3.242	11 506
8	3.185	10 959
9	3.129	10 441
10	3.074	9 949
11	3.016	9 485
12	2.959	9 044
13	2.901	8 627
14	2.844	8 231
15	2.788	7 855
16	2.730	7 499
17	2.672	7 161
18	2.615	6 840
19	2.559	6 536
20	2.503	6 246
21	2.447	5 971
22	2.391	5 710
23	2.335	5 461
24	2.280	5 225
25	2.227	5 000
26	2.173	4 786
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

TEMPERATURE (C)	PIC III VOLTAGE DROP (V)	RESISTANCE (Ohms)
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	1 118
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	836
72	0.583	805
73	0.566	775
74	0.549	747
75	0.533	719
76	0.518	693
77	0.503	669
78	0.488	645
79	0.474	623
80	0.460	602
81	0.447	583
82	0.434	564
83	0.422	547
84	0.410	531
85	0.398	516
86	0.387	502
87	0.376	489
88	0.365	477
89	0.355	466
90	0.344	456
91	0.335	446
92	0.325	436
93	0.316	427
94	0.308	419
95	0.299	410
96	0.291	402
97	0.283	393
98	0.275	385
99	0.267	376
100	0.260	367
101	0.253	357
102	0.246	346
103	0.239	335
104	0.233	324
105	0.227	312
106	0.221	299
107	0.215	285



## 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 a problem 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.

**GREEN 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) (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 24V 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.

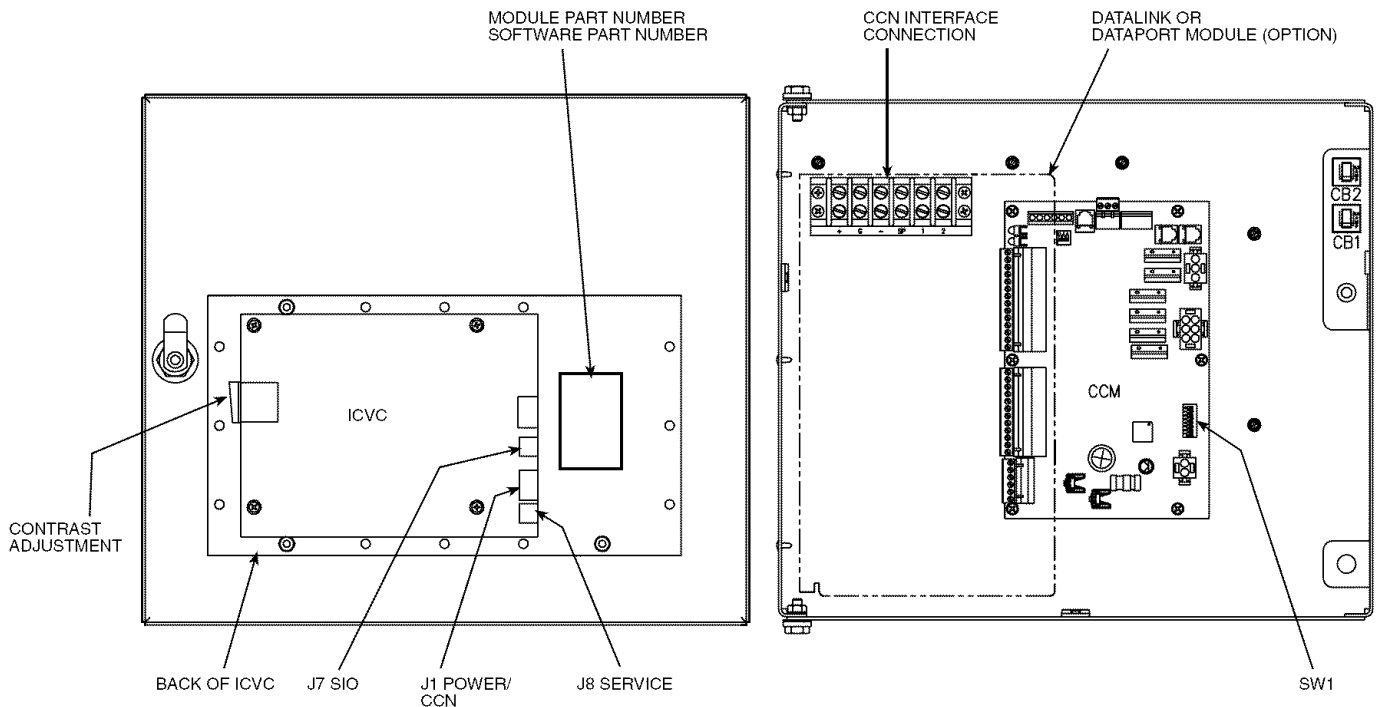
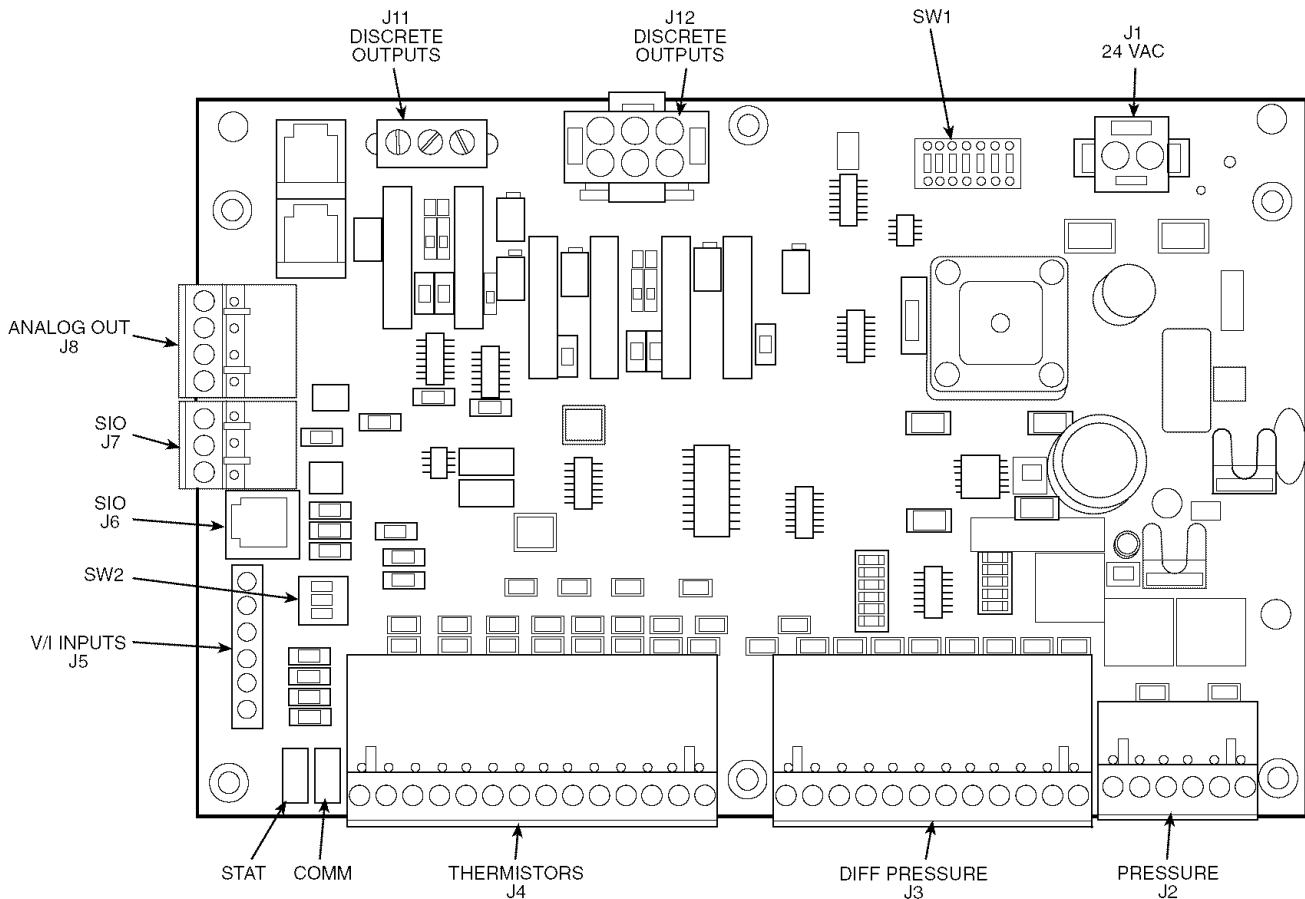


Fig. 44 — Rear of ICVC (International Chiller Visual Controller)



**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 61.

### **⚠ 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 79, and the Control Modules section, page 97. 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.

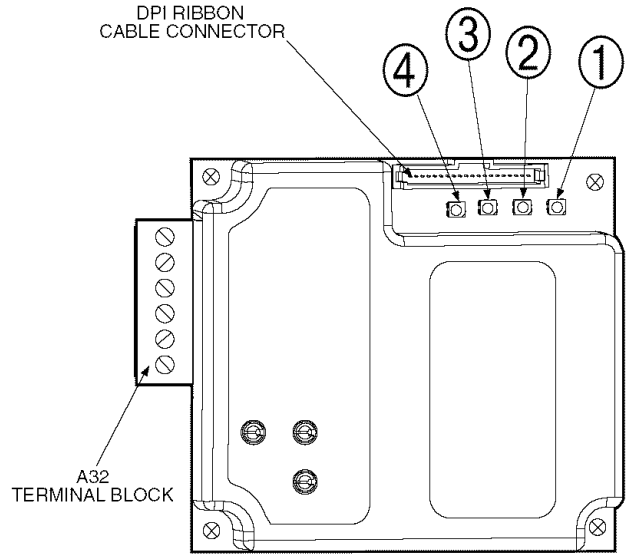
- Perform the guide vane calibration procedure (in Control Test). Check and recalibrate pressure transducer readings (refer to page 64). Check that the *CURRENT TIME* and *DATE* in the *TIME AND DATE* screen are correct.

**DPI Communications Interface Board Status LEDs** — 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.

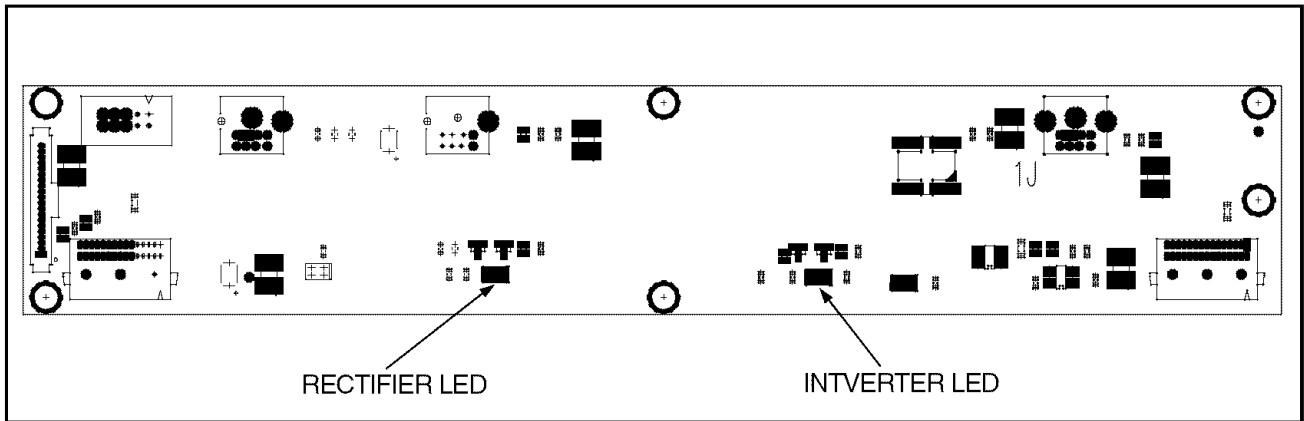
**DRIVE STATUS INDICATOR** — The DRIVE status indicator is on the right side of the Gateway. See Table 19.



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



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.
	Steady	An alarm condition exists. 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 due to a normal shutdown command or because the compressor high pressure switch has opened. This status LED combination is normal when the chiller is not running.

Fig. 46 — DPI Communications Interface Board Status LEDs

**Table 19 — DRIVE Status Indicator**

STATE	CAUSE	CORRECTIVE ACTION
<b>Off</b>	The Gateway is not powered or is not connected properly to the drive.	<ul style="list-style-type: none"> <li>Securely connect the Gateway to the drive using the DPI ribbon cable.</li> <li>Apply power to the drive.</li> </ul>
<b>Flashing Red</b>	The Gateway is not receiving a ping message from the drive.	<ul style="list-style-type: none"> <li>Verify that cables are securely connected.</li> <li>Cycle power to the drive.</li> </ul>
<b>Solid Red</b>	The drive has refused an I/O connection from the Gateway.	<p><b>IMPORTANT:</b> Cycle power after making the following correction:</p> <ul style="list-style-type: none"> <li>Verify that all DPI cables on the drive are securely connected and not damaged. Replace cables if necessary.</li> </ul>
<b>Orange</b>	The Gateway is connected to a product that does not support Rockwell Automation DPI communications.	<ul style="list-style-type: none"> <li>Check wires leading to the A32 terminal block.</li> <li>Check that A32 terminal block is fully engaged.</li> </ul>
<b>Flashing Green</b>	The Gateway is establishing an I/O connection to the drive or the I/O has been disabled.	Normal behavior.
<b>Solid Green</b>	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
<b>Off</b>	The Gateway is not powered.	<ul style="list-style-type: none"> <li>Securely connect the Gateway to the drive using the ribbon cable.</li> <li>Apply power to the drive.</li> </ul>
<b>Flashing Green</b>	The Gateway is operational. No I/O data is being transferred.	Normal behavior during SIO configuration initialization process.
<b>Solid Red</b>	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
<b>Off</b>	The module is not powered or is not properly connected to the network. First incoming network command not yet recognized.	<ul style="list-style-type: none"> <li>Securely connect the Gateway ribbon cable to the drive DPI board.</li> <li>Attach the RS485 cable in Gateway to the connector.</li> <li>Apply power to the drive.</li> </ul>
<b>Flashing Green</b>	Online to network, but not producing or consuming I/O information.	No action required. The LED will turn solid green when communication resumes.
<b>Solid Green</b>	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
<b>Off</b>	Gateway not receiving data over the network.	<ul style="list-style-type: none"> <li>Check wires leading to A32 terminal block.</li> <li>Check that A32 terminal block is fully engaged.</li> </ul>
<b>Solid Green</b>	Gateway is transmitting data.	No action required.

**Physical Data** — Tables 23A-29 and Fig. 48-57 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			
	Cooler	Condenser	Cooler Only	Condenser Only	Refrigerant Weight (lb)		Water Volume (gal)	
					Cooler	Condenser	Cooler	Condenser
10	142	180	2,707	2,704	290	200	34	42
11	161	200	2,777	2,772	310	200	37	45
12	180	225	2,848	2,857	330	200	40	49
15	142	180	2,968	2,984	320	250	39	48
16	161	200	3,054	3,068	340	250	43	52
17	180	225	3,141	3,173	370	250	47	57
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

**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 starter, isolation valves, and pumpout unit.

**Table 23B — Heat Exchanger Data (SI)**

SIZE	NUMBER OF TUBES		SI					
			Dry (Rigging) Weight (kg)		Chiller Charge			
	Cooler	Condenser	Cooler Only	Condenser Only	Refrigerant Weight (kg)		Water Volume (L)	
					Cooler	Condenser	Cooler	Condenser
10	142	180	1228	1227	132	91	129	159
11	161	200	1260	1257	141	91	140	170
12	180	225	1292	1296	150	91	151	185
15	142	180	1346	1354	145	113	148	182
16	161	200	1385	1392	154	113	163	197
17	180	225	1425	1439	168	113	178	216
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

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

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

NOTES:

1. Weight adder shown is the same for cooler and condenser of equal frame size.

2. 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	150	365	42	1034	166	159
FRAME 3, 1 AND 3 PASS	150	N/A	N/A	1034	N/A	N/A
FRAME 3, 2 PASS	150	365	42	1034	166	159
FRAME 4, 1 AND 3 PASS	150	N/A	N/A	1034	N/A	N/A
FRAME 4, 2 PASS	150	989	54	1034	449	205
FRAME 5, 1 AND 3 PASS	150	N/A	N/A	1034	N/A	N/A
FRAME 5, 2 PASS	150	1195	60	1034	542	226
FRAME 6, 1 AND 3 PASS	150	N/A	N/A	1034	N/A	N/A
FRAME 6, 2 PASS	150	1443	69	1034	655	262
FRAME 7, 1 AND 3 PASS	150	N/A	N/A	1034	N/A	N/A
FRAME 7, 2 PASS	150	1561	123	1034	708	465
FRAME 8, 1 AND 3 PASS	150	N/A	N/A	1034	N/A	N/A
FRAME 8, 2 PASS	150	1751	141	1034	794	532
FRAME 2, 1 AND 3 PASS	300	N/A	N/A	1034	N/A	N/A
FRAME 2, 2 PASS	300	430	42	2068	195	159
FRAME 3, 1 AND 3 PASS	300	N/A	N/A	2068	N/A	N/A
FRAME 3, 2 PASS	300	430	42	2068	195	159
FRAME 4, 1 AND 3 PASS	300	N/A	N/A	2068	N/A	N/A
FRAME 4, 2 PASS	300	1641	47	2068	744	178
FRAME 5, 1 AND 3 PASS	300	N/A	N/A	2068	N/A	N/A
FRAME 5, 2 PASS	300	1909	50	2068	866	190
FRAME 6, 1 AND 3 PASS	300	N/A	N/A	2068	N/A	N/A
FRAME 6, 2 PASS	300	2451	58	2068	1112	218
FRAME 7, 1 AND 3 PASS	300	N/A	N/A	2068	N/A	N/A
FRAME 7, 2 PASS	300	4652	94	2068	2110	356
FRAME 8, 1 AND 3 PASS	300	N/A	N/A	2068	N/A	N/A
FRAME 8, 2 PASS	300	4559	94	2068	2068	355

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

NOTES:

1. Weight adder shown is the same for cooler and condenser of equal frame size.

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

**Table 25A — 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	900	915	190	205	185	408	415	86	93	84
BE	915	965	200	220	185	415	438	91	100	84
BF	975	1000	215	230	185	442	454	98	104	84
BG	1000	1060	230	250	185	454	481	104	113	84
BH	1030	1175	240	265	185	467	501	109	120	84
BJ	1105	—	265	—	185	501	—	120	—	84
CB	1154	1188	236	255	274	523	539	107	116	125
CC	1182	1196	243	260	274	536	542	110	118	125
CD	1220	1258	252	270	274	553	571	114	122	125
CE	1253	1272	261	281	274	568	577	118	127	125
CL	1261	1328	265	284	274	572	602	120	129	125
CM	1294	1353	273	293	274	587	614	124	133	125
CN	1321	1386	280	303	274	599	629	127	137	125
CP	1343	1413	282	308	274	609	641	128	140	125
CQ	1419	1522	300	336	274	644	690	136	152	125
CR	1567	—	335	—	274	711	—	152	—	125
DB	1570	1725	324	347	236	712	782	147	157	107
DC	1580	1737	326	354	236	717	788	148	161	107
DD	1919	2069	423	458	318	870	938	192	208	144
DE	1939	2089	428	463	318	880	948	194	210	144
DF	1989	2139	448	478	318	902	970	203	217	144
DG	2054	1998	473	422	318	932	906	215	191	144
DH	2099	2056	488	443	318	952	933	221	201	144
DJ	2159	2101	508	464	318	979	953	230	210	144
DK	2380	—	522	—	318	1080	—	237	—	145
EH	2700	2770	651	701	414	1388	1415	295	341	188
EJ	2760	2890	670	701	414	1408	1474	325	341	188
EK	2760	2890	670	718	414	1442	1474	325	348	188
EL	2800	2960	685	751	414	1442	1529	334	363	188
EM	2800	2960	685	751	414	1483	1529	334	363	188
EN	2960	3110	751	801	414	1483	1597	363	386	188
EP	2960	3110	780	801	414	1515	1597	376	386	188
EQ	3110	—	801	—	414	1411	—	363	—	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 25B — 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	1030	1030	240	240	185	467	467	109	109	84
BE	1070	1070	250	250	185	485	485	113	113	84
BF	1120	1120	265	265	185	508	508	120	120	84
BG	1175	1175	290	290	185	533	533	132	132	84
BH	1175	1175	290	290	185	533	533	132	132	84
BJ	1175	—	290	—	185	533	—	132	—	84
CB	1235	1290	242	255	274	560	585	110	116	125
CC	1260	1295	249	259	274	572	587	113	117	125
CD	1286	1358	258	273	274	583	616	117	124	125
CE	1305	1377	265	279	274	592	625	120	127	125
CL	1324	1435	280	296	274	601	651	127	134	125
CM	1347	1455	303	298	274	611	660	137	135	125
CN	1358	1467	316	316	274	616	665	143	143	125
CP	1401	1479	329	316	274	635	671	149	143	125
CQ	1455	1479	329	329	274	660	671	149	149	125
CR	1567	—	335	—	274	711	—	152	—	125
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	2380	2380	604	604	318	1080	1080	274	274	144
DJ	2380	2380	614	614	318	1080	1080	279	279	144
DK	2380	—	614	—	318	1080	—	279	—	144
LB	1873	1939	364	389	318	850	880	165	176	144
LC	1939	2023	389	406	318	850	918	176	184	144
LD	2023	2043	406	417	318	880	927	184	189	144
LE	2043	2096	417	434	318	918	951	189	197	144
LF	2096	2133	434	444	318	927	968	197	201	144
LG	2133	2199	444	458	318	951	997	201	208	144
LH	2199	—	458	—	318	968	—	208	—	144
EH	3060	3120	701	751	414	1388	1415	318	341	188
EJ	3105	3250	716	751	414	1408	1474	325	341	188
EK	3180	3250	716	768	414	1442	1474	325	348	188
EL	3180	3370	737	801	414	1442	1529	334	363	188
EM	3270	3370	737	801	414	1483	1529	334	363	188
EN	3270	3520	801	851	414	1483	1597	363	386	188
EP	3340	3520	830	851	414	1515	1597	376	386	188
EQ	3520	—	851	—	414	1597	—	386	—	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 26A — 19XRV Waterbox Cover Weights — English (lb)**

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 1		FRAME 2		FRAME 3	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER/ CONDENSER	NIH, 1 Pass Cover, 150 psig	177	204	320	350	320	350
	NIH, 2 Pass Cover, 150 psig	185	218	320	350	320	350
	NIH, 3 Pass Cover, 150 psig	180	196	310	340	310	340
	NIH Plain End Cover, 150 psig	136	136	300	300	300	300
	MWB End Cover, 150 psig	—	—	300	300	300	300
	NIH, 1 Pass Cover, 300 psig	248	301	411	486	411	486
	NIH, 2 Pass Cover, 300 psig	255	324	411	518	411	518
	NIH, 3 Pass Cover, 300 psig	253	288	433	468	433	468
NIH Plain End Cover, 300 psig	175	175	400	400	400	400	
MWB End Cover, 300 psig	—	—	400	400	400	400	

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 4		FRAME 5		FRAME 6	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER/ CONDENSER	NIH, 1 Pass Cover, 150 psig	148	185	168	229	187	223
	NIH, 2 Pass Cover, 150 psig	202	256	224	298	257	330
	NIH, 3 Pass Cover, 150 psig	473	489	629	655	817	843
	NIH Plain End Cover, 150 psig	138	138	154	154	172	172
	MWB End Cover, 150 psig	317	317	393	393	503	503
	NIH, 1 Pass Cover, 300 psig	593	668	764	839	959	1035
	NIH, 2 Pass Cover, 300 psig	594	700	761	878	923	1074
	NIH, 3 Pass Cover, 300 psig	621	656	795	838	980	1031
NIH/MWB End Cover, 300 psig	569	569	713	713	913	913	

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 7 COOLER		FRAME 7 CONDENSER	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER/ CONDENSER	NIH, 1 Pass Cover, 150 psig	329	441	329	441
	NIH, 2 Pass Cover, 150 psig	426	541	426	541
	NIH, 3 Pass Cover, 150 psig	1202	1239	1113	1171
	NIH Plain End Cover, 150 psig	315	315	315	315
	MWB End Cover, 150 psig	789	789	703	703
	NIH, 1 Pass Cover, 300 psig	1636	1801	1472	1633
	NIH, 2 Pass Cover, 300 psig	1585	1825	1410	1644
	NIH, 3 Pass Cover, 300 psig	1660	1741	1496	1613
NIH/MWB End Cover, 300 psig	1451	1451	1440	1440	

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 8 COOLER		FRAME 8 CONDENSER	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER/ CONDENSER	NIH, 1 Pass Cover, 150 psig	417	494	417	494
	NIH, 2 Pass Cover, 150 psig	531	685	531	685
	NIH, 3 Pass Cover, 150 psig	1568	1626	1438	1497
	NIH Plain End Cover, 150 psig	404	404	404	404
	MWB End Cover, 150 psig	1339	1339	898	898
	NIH, 1 Pass Cover, 300 psig	2265	2429	1860	2015
	NIH, 2 Pass Cover, 300 psig	2170	2499	1735	2044
	NIH, 3 Pass Cover, 300 psig	2273	2436	1883	1995
NIH/MWB End Cover, 300 psig	1923	1923	1635	1635	

LEGEND

NIH — Nozzle-In-Head  
MWB — Marine Waterbox

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

**Table 26B — 19XRV Waterbox Cover Weights — SI (kg)**

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 1		FRAME 2		FRAME 3	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER/ CONDENSER	NIH, 1 Pass Cover, 1034 kPa	80	93	145	159	145	159
	NIH, 2 Pass Cover, 1034 kPa	84	99	145	159	145	159
	NIH, 3 Pass Cover, 1034 kPa	82	89	141	154	141	154
	NIH Plain End Cover, 1034 kPa	62	62	136	136	136	136
	MWB End Cover, 1034 kPa	—	—	136	136	136	136
	NIH, 1 Pass Cover, 2068 kPa	112	137	186	220	186	220
	NIH, 2 Pass Cover, 2068 kPa	116	147	186	235	186	235
	NIH, 3 Pass Cover, 2068 kPa	115	131	196	212	196	212
NIH Plain End Cover, 2068 kPa	79	79	181	181	181	181	
MWB End Cover, 2068 kPa	—	—	181	181	181	181	

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 4		FRAME 5		FRAME 6	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER/ CONDENSER	NIH, 1 Pass Cover, 1034 kPa	67	84	76	104	85	101
	NIH, 2 Pass Cover, 1034 kPa	92	116	102	135	117	150
	NIH, 3 Pass Cover, 1034 kPa	215	222	285	297	371	382
	NIH Plain End Cover, 1034 kPa	63	63	70	70	78	78
	MWB End Cover, 1034 kPa	144	144	178	178	228	228
	NIH, 1 Pass Cover, 2068 kPa	269	303	347	381	435	469
	NIH, 2 Pass Cover, 2068 kPa	269	318	345	398	419	487
	NIH, 3 Pass Cover, 2068 kPa	282	298	361	380	445	468
NIH/MWB End Cover, 2068 kPa	258	258	323	323	414	414	

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 7 COOLER		FRAME 7 CONDENSER	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER/ CONDENSER	NIH, 1 Pass Cover, 1034 kPa	149	200	149	200
	NIH, 2 Pass Cover, 1034 kPa	193	245	193	245
	NIH, 3 Pass Cover, 1034 kPa	545	562	505	531
	NIH Plain End Cover, 1034 kPa	143	143	143	143
	MWB End Cover, 1034 kPa	358	358	319	319
	NIH, 1 Pass Cover, 2068 kPa	742	817	668	741
	NIH, 2 Pass Cover, 2068 kPa	719	828	640	746
	NIH, 3 Pass Cover, 2068 kPa	753	790	679	732
NIH/MWB End Cover, 2068 kPa	658	658	653	653	

HEAT EXCHANGER	WATERBOX DESCRIPTION	FRAME 8 COOLER		FRAME 8 CONDENSER	
		Standard Nozzles	Flanged	Standard Nozzles	Flanged
COOLER/ CONDENSER	NIH, 1 Pass Cover, 1034 kPa	189	224	189	224
	NIH, 2 Pass Cover, 1034 kPa	241	311	241	311
	NIH, 3 Pass Cover, 1034 kPa	711	738	652	679
	NIH Plain End Cover, 1034 kPa	183	183	183	183
	MWB End Cover, 1034 kPa	607	607	407	407
	NIH, 1 Pass Cover, 2068 kPa	1027	1102	844	914
	NIH, 2 Pass Cover, 2068 kPa	984	1134	787	927
	NIH, 3 Pass Cover, 2068 kPa	1031	1105	854	905
NIH/MWB End Cover, 2068 kPa	872	872	742	742	

LEGEND

NIH — Nozzle-In-Head  
MWB — Marine Waterbox

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

**Table 27 — 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 28 — Additional Miscellaneous Weights**

ITEM	FRAME 2 COMPRESSOR		FRAME 3 COMPRESSOR		FRAME 4 COMPRESSOR		FRAME 5 COMPRESSOR	
	lb	kg	lb	kg	lb	kg	lb	kg
CONTROL CABINET	34	15	34	15	34	15	34	15
OPTIONAL DISCHARGE ISOLATION VALVE	26	12	46	21	74	34	108	49
OPTIONAL COOLER INLET ISOLATION VALVE	—	—	13	6	13	6	24	11
UNIT-MOUNTED VFD	1600	726	1600	726	1600	726	1600	726

LEGEND

VFD — Variable Frequency Drive

**Table 29 — 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	321-390, 3ZZ	421-490	4B1-4W8	501-600
	DESCRIPTION	Fixed Diffuser	With Rolling Element Bearings	Fixed Diffuser	Split Ring Diffuser	Split Ring Diffuser
<b>A</b>	Low Speed Journal-Gear End	.0050/.0040	.0050/.0040	.0055/.0043	.0055/.0043	.0069/.0059
<b>B</b>	Low Speed Journal-Motor End	.0050/.0040	.0050/.0040	.0053/.0043	.0053/.0043	.0065/.0055
<b>C1</b>	Low Speed Labyrinth to Thrust Disk	.0115/.0055	N/A	.010/-0.005	.010/-0.005	N/A
<b>C2</b>	Labyrinth to Low Speed Shaft	N/A	.010/.005	.0095/.0055	.0095/.0055	.013/.009
<b>D</b>	Low Speed Shaft Thrust Float	.020/.008	.020/.008	.023/.008	.023/.008	.020/.008
<b>E</b>	Impeller Eye to Shroud	*	*	*	*	*
<b>F1</b>	Impeller Bore to Shaft-Rear	-.0020/-0.0005	-.0025/-0.0010	-.0021/-0.0006	-.0021/-0.0006	-.0019/-0.0005
<b>F2</b>	Impeller Bore to Shaft-Front	N/A	N/A	-.0014/.0000	-.0014/.0000	-.0014/.0000
<b>G</b>	Impeller Discharge to Shroud	*	*	*	*	*
<b>H</b>	Impeller Spacer to Shaft	.0025/.0010	.0025/.0010	.0025/.0010	.0025/.0010	.0024/.0010
<b>I</b>	Slinger to Shaft	.0013/.0005	.0012/.0004	.0012/.0004	.0012/.0004	.0012/.0004
<b>J</b>	Labyrinth to Slinger	.013/.009	.010/.006	.010/.006	.010/.006	.010/.006
<b>K</b>	Labyrinth to Impeller	.012/.008	.012/.008	.012/.008	.012/.008	.012/.008
<b>L</b>	High Speed Journal-Impeller End	.0047/.0037	N/A	.0040/.0028	.0040/.0028	.0048/.0038
<b>M</b>	Thrust Assembly Seal Ring Axial Clearance	.006/.002	N/A	.006/.002	.006/.002	.006/.002
<b>N</b>	Thrust Assembly Seal Ring to Shaft	.0045/.0015	N/A	.0045/.0015	.0045/.0015	.0045/.0015
<b>O</b>	High Speed Shaft Thrust Float	.014/.008	0 Float	.014/.008	.014/.008	.014/.008
<b>P</b>	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.

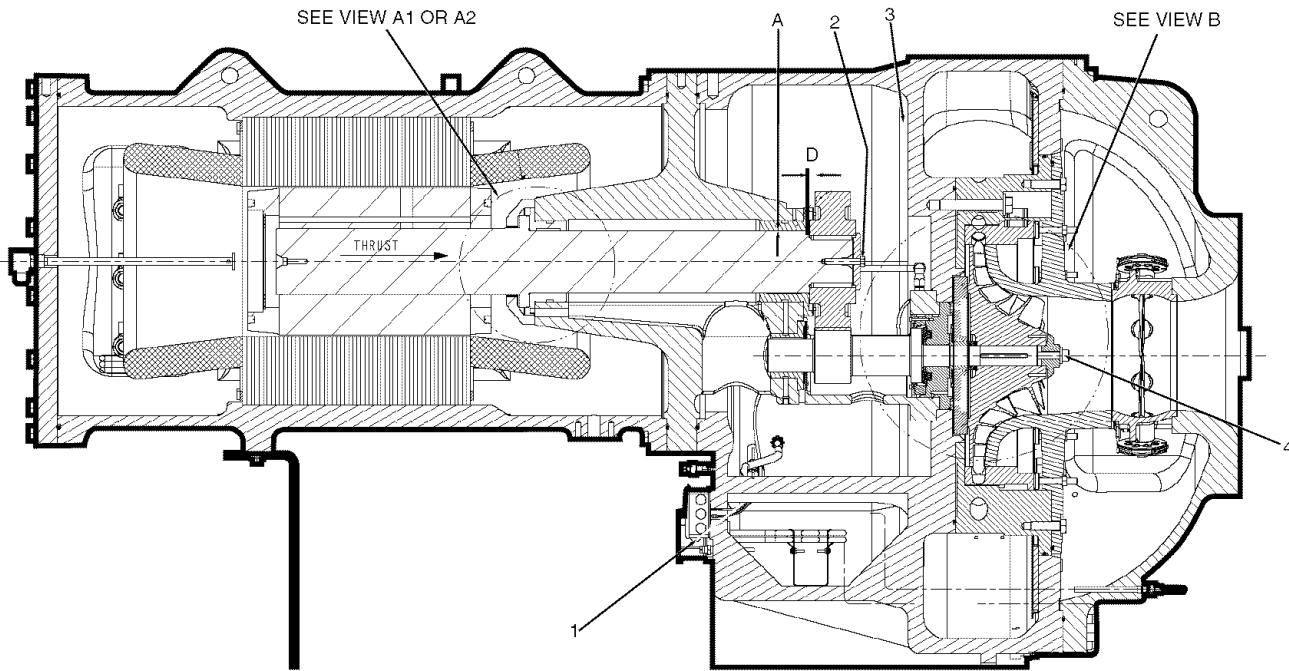
NOTES:

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.

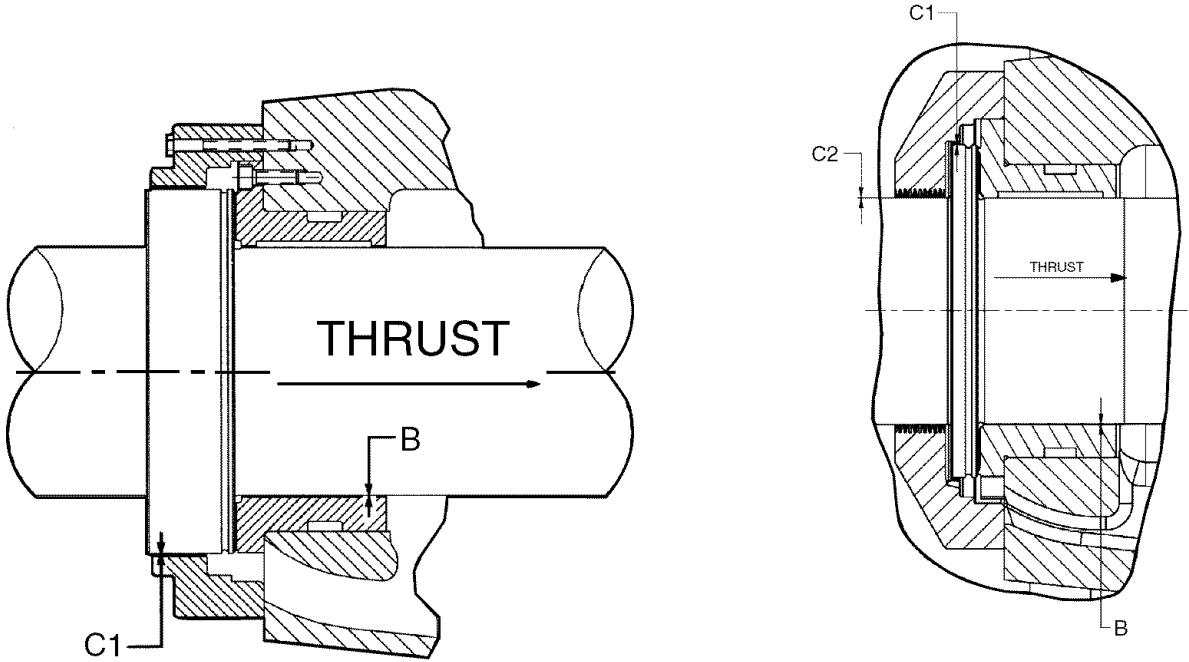
4. If any components within the Frame 3 rolling element high speed shaft and bearing assembly are damaged it is recommended that the entire high speed shaft and bearing assembly be replaced.
5. Impeller spacing should be performed in accordance with the most recent Carrier Impeller Spacing Service Bulletin.

**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

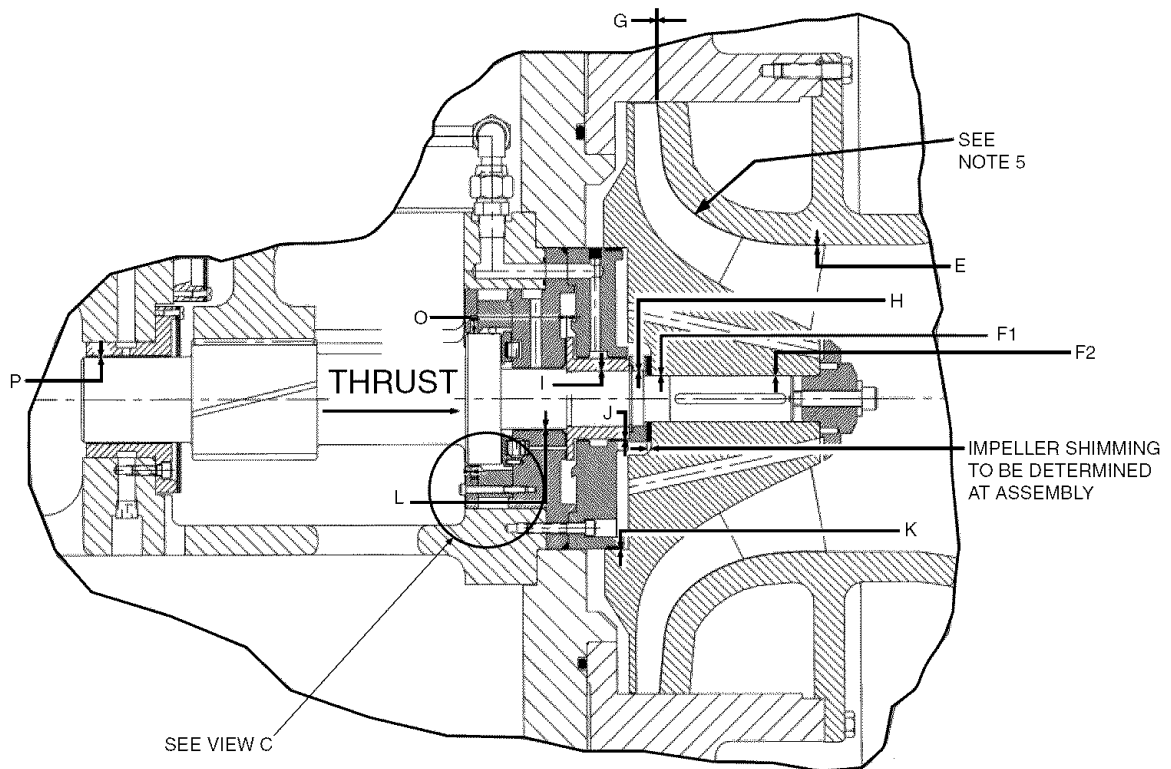
COMPRESSOR, TRANSMISSION AREA



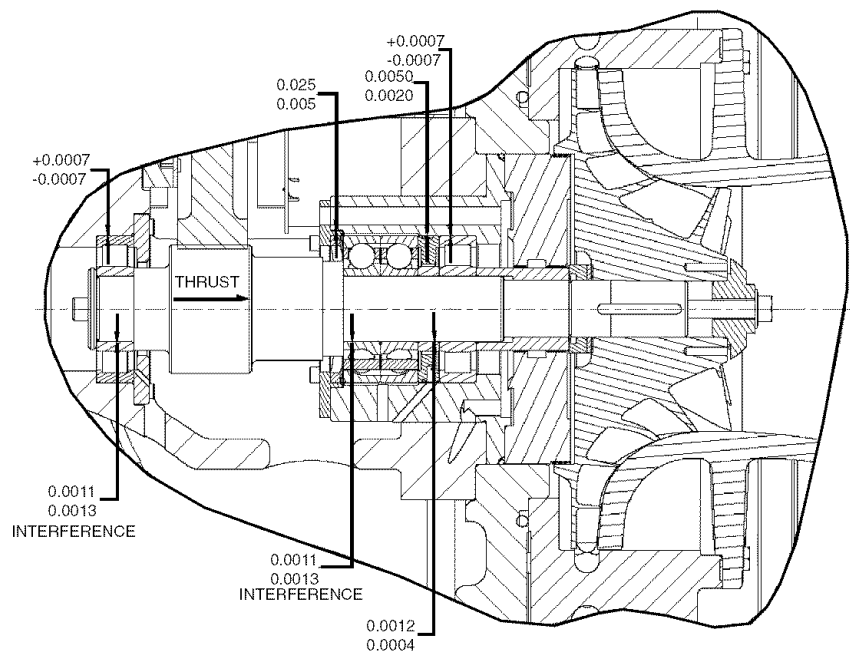
VIEW A1  
LOW SPEED SHAFT THRUST DISK

VIEW A2  
LOW SPEED SHAFT THRUST DISK

Fig. 48 — Compressor Fits and Clearances (cont)

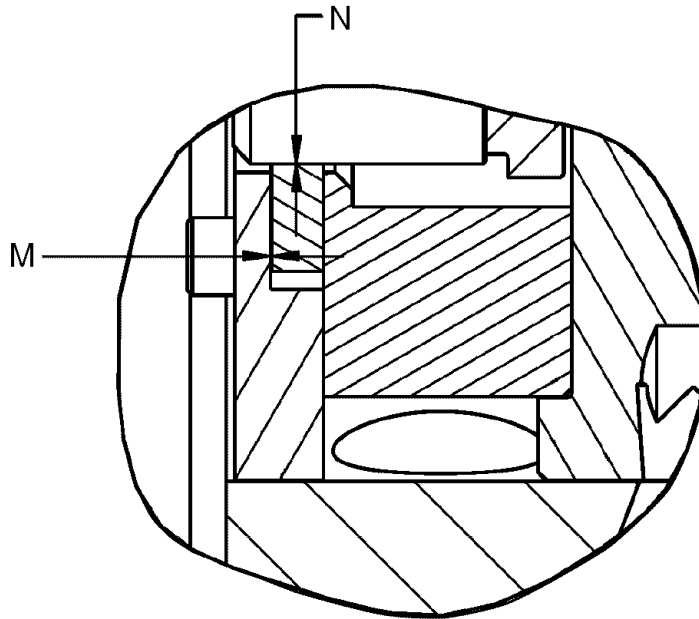


VIEW B — HIGH SPEED SHAFT (FRAME 2, 4, OR 5)



VIEW B — HIGH SPEED SHAFT (FRAME 3)

**Fig. 48 — Compressor Fits and Clearances (cont)**



VIEW C — HIGH SPEED SHAFT RING SEAL

**⚠ CAUTION**

USE COPPER CONDUCTORS ONLY  
UTILISEZ DES CONDUCTEURS EN CUIVRE SEULMENT

ALWAYS USE 2 WRENCHES TO TIGHTEN.

- TERM INSULATOR TO MOTOR — 15–35 ft. lb.
- BRASS NUT TO TERM INSULATOR — 3 ft. lb. max
- ADAPTOR TO TERM STUD — 30–35 ft. lb.
- LUG BOLTS (1/2") — 32–45 ft. lb.

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

---

1

2

3

TERMINAL STUD — INSULATION

ADAPTER — BRASS NUT — TERMINAL INSULATOR

13

**⚠ CAUTION**

USE COPPER CONDUCTORS ONLY  
UTILISEZ DES CONDUCTEURS EN CUIVRE SEULMENT

ALWAYS USE 2 WRENCHES TO TIGHTEN.

- TERM INSULATOR TO MOTOR — 15–35 ft. lb.
- CABLE LUG NUTS — 40–45 ft. lb.

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

---

1

2

3

6

4

5

TAPE TO EXTEND TO AND OVER LEAD WIRE INSULATION

AFTER ATTACHING LEAD, THIS AREA TO BE WRAPPED WITH ONE LAYER OF THERMAL INSULATION PUTTY AND AT LEAST FOUR LAYERS OF APPROPRIATE ELECTRICAL INSULATING TAPE.

MOTOR LEAD INSTALLATION LABELS

19XRV COMPRESSOR ASSEMBLY TORQUES








ITEM	COMPRESSOR	FRAME 2	FRAME 3	FRAME 4	FRAME 4	FRAME 5
	Code	201-299	321-390, 3ZZ	421-490	4B1-4W8	501-600
	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

<b>AUX</b>	—	Auxiliary
<b>CB</b>	—	Circuit Breaker
<b>CCM</b>	—	Chiller Control Module
<b>CCN</b>	—	Carrier Comfort Network
<b>COM</b>	—	Common
<b>COMM</b>	—	Communications
<b>DL/DP</b>	—	Data Link/Data Port
<b>GRD</b>	—	Chassis Ground
<b>GVA</b>	—	Guide Vane Actuator
<b>HGBP</b>	—	Hot Gas Bypass
<b>HPS</b>	—	High Pressure Switch
<b>ICVC</b>	—	International Chiller Visual Controller
<b>IGV</b>	—	Inlet Guide Vane
<b>J</b>	—	Junction
<b>RHS</b>	—	Relative Humidity Sensor
<b>T</b>	—	Transformer
<b>TB</b>	—	Terminal Block
<b>VFD</b>	—	Variable Frequency Drive

<b>1C</b>	—	Compressor Oil Heater Contactor
<b>2C</b>	—	Oil Pump Contactor
<b>3C</b>	—	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
		IGBT

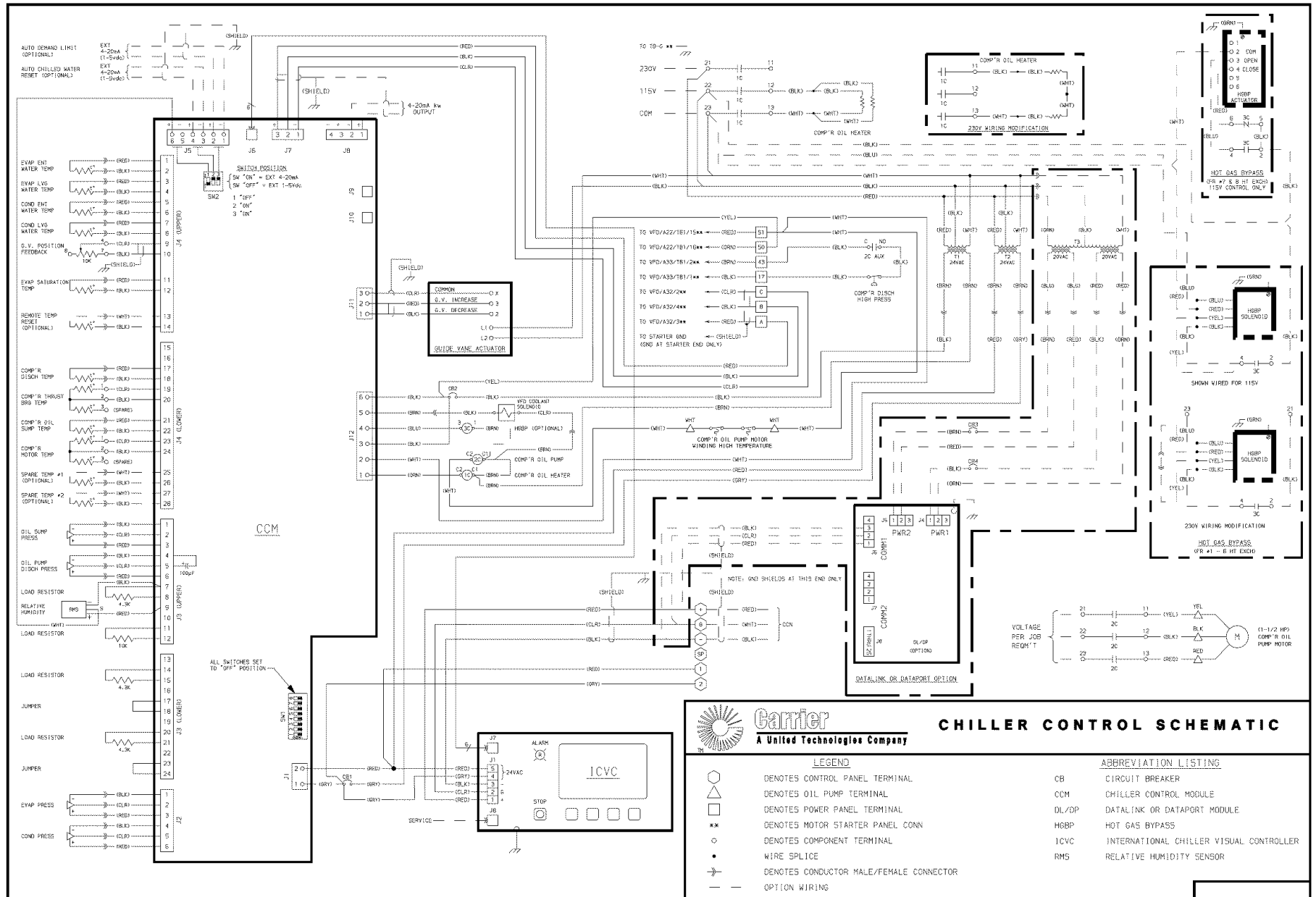


Fig. 49 — Electronic PIC III Control Panel Wiring Schematic (Frame 2, 3, 4 Compressor, Standard Diffuser)



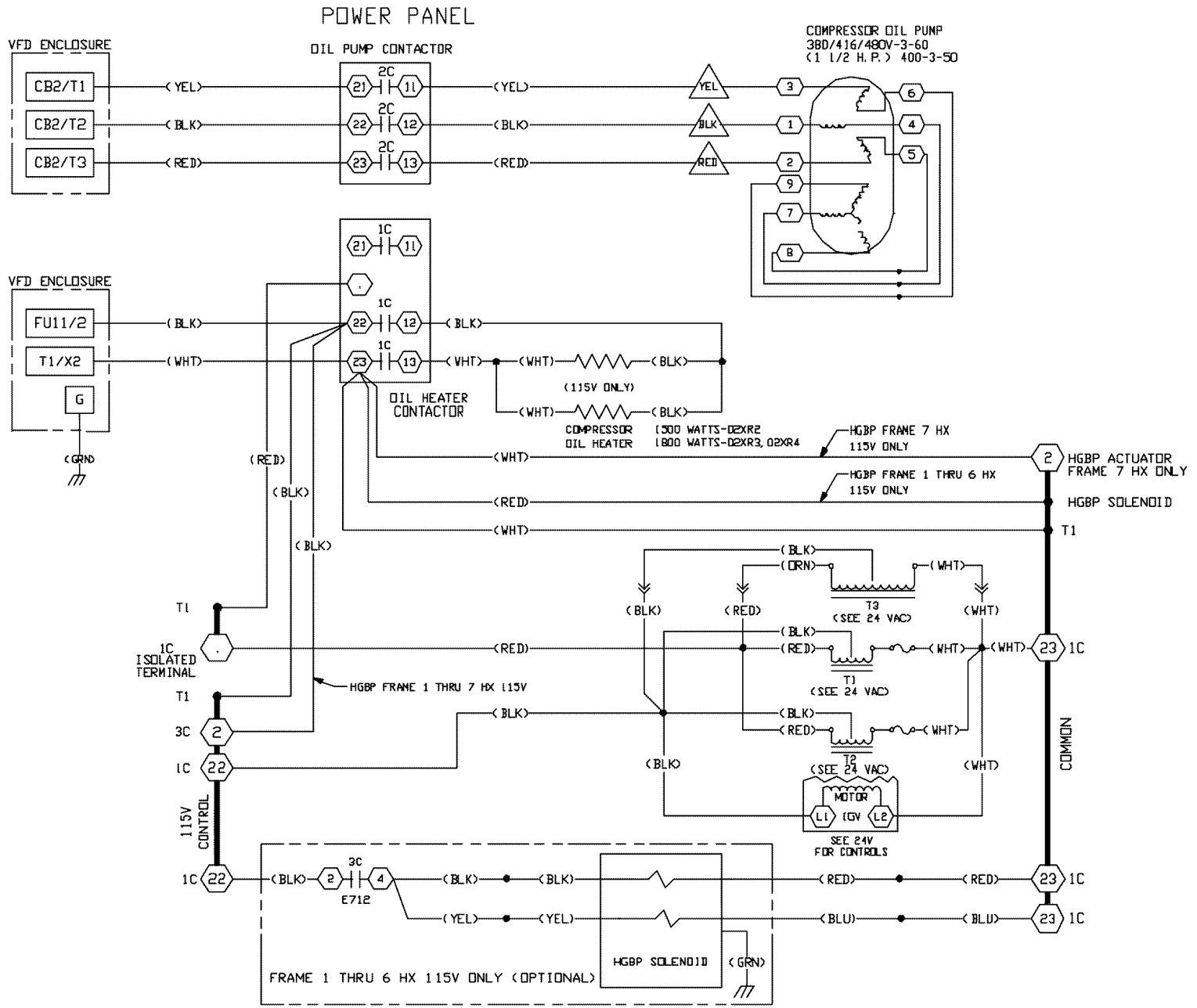
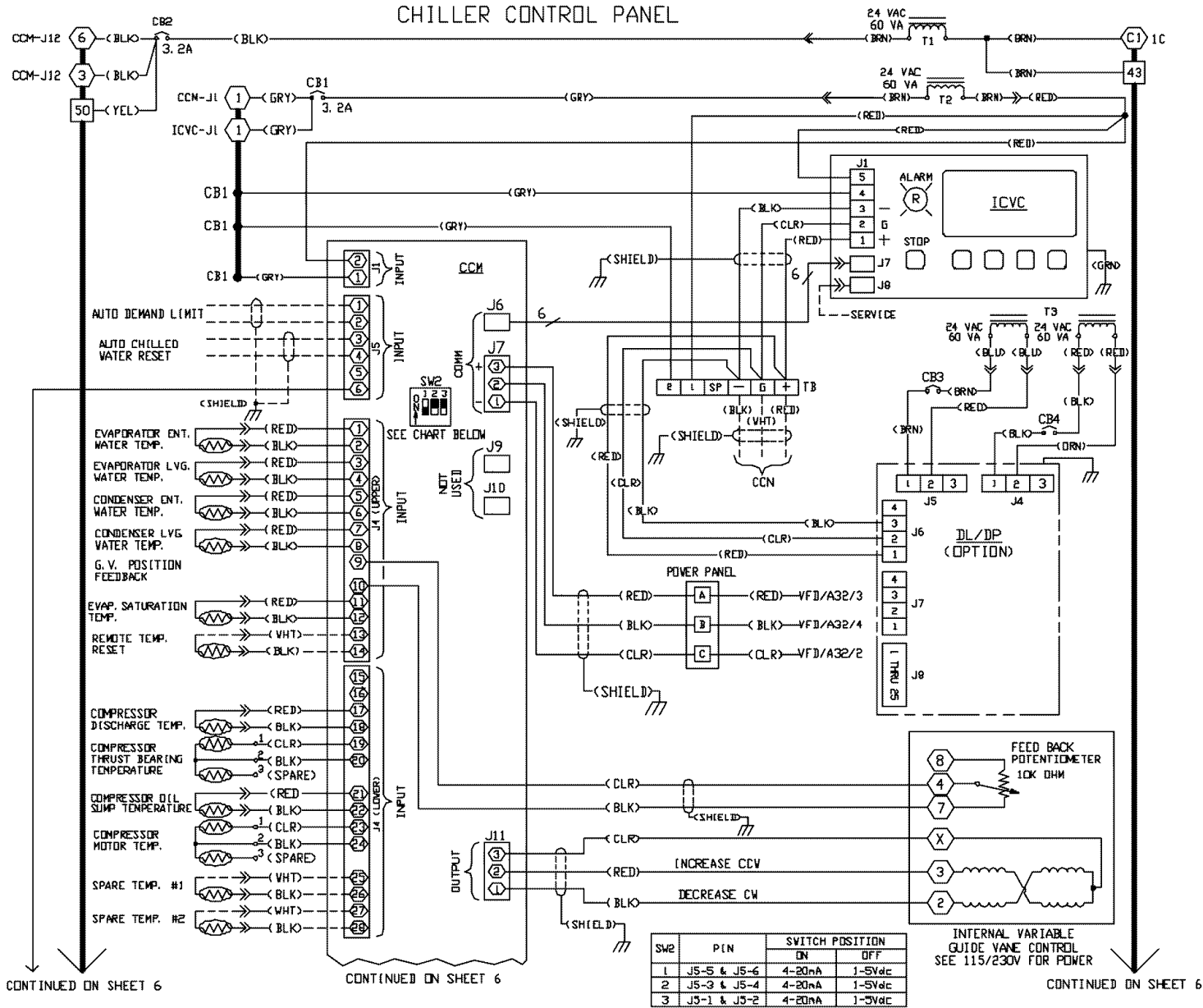


Fig. 51 — 19XRV Chiller Control Schematic



**Fig. 51 — 19XRV Chiller Control Schematic (cont)**

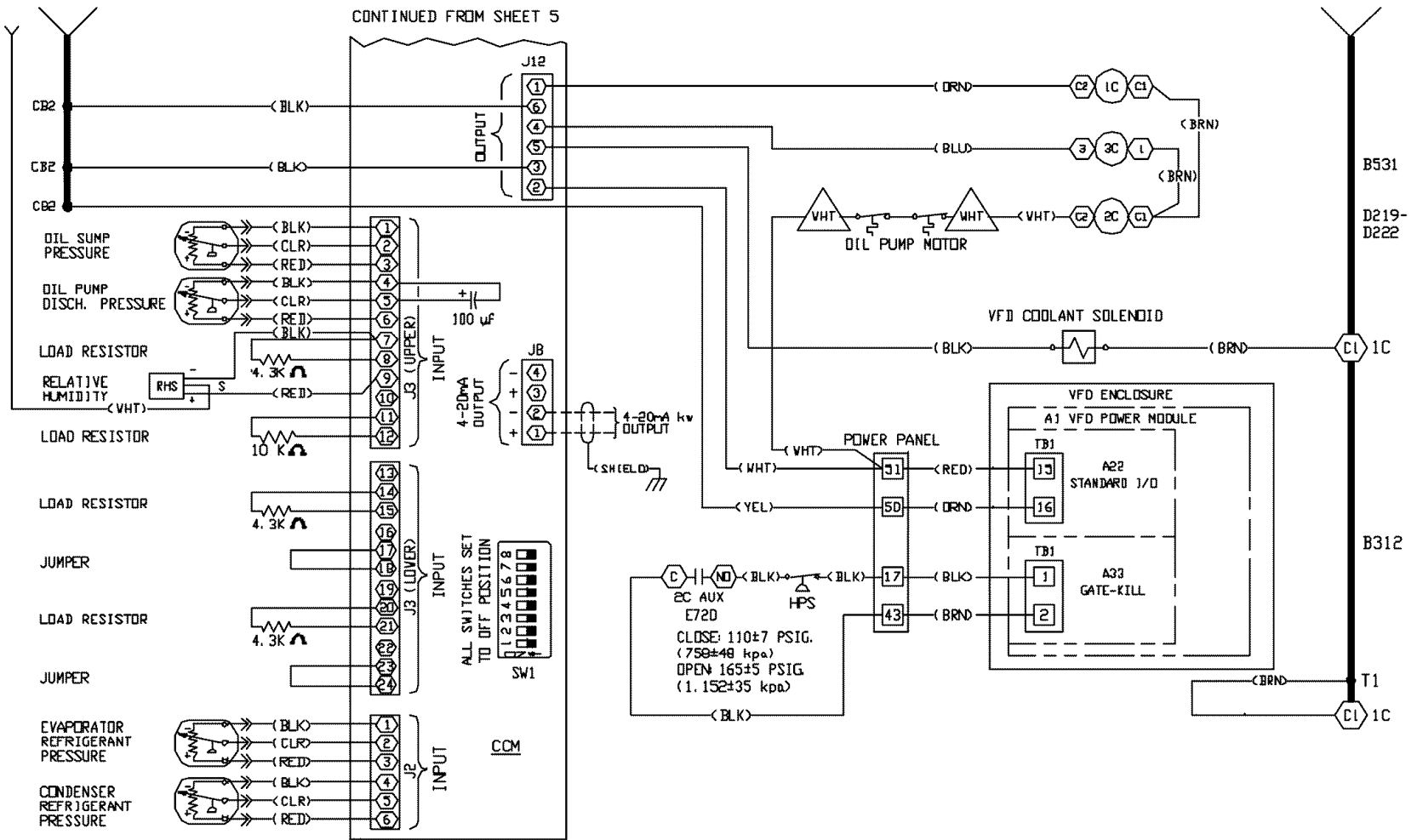
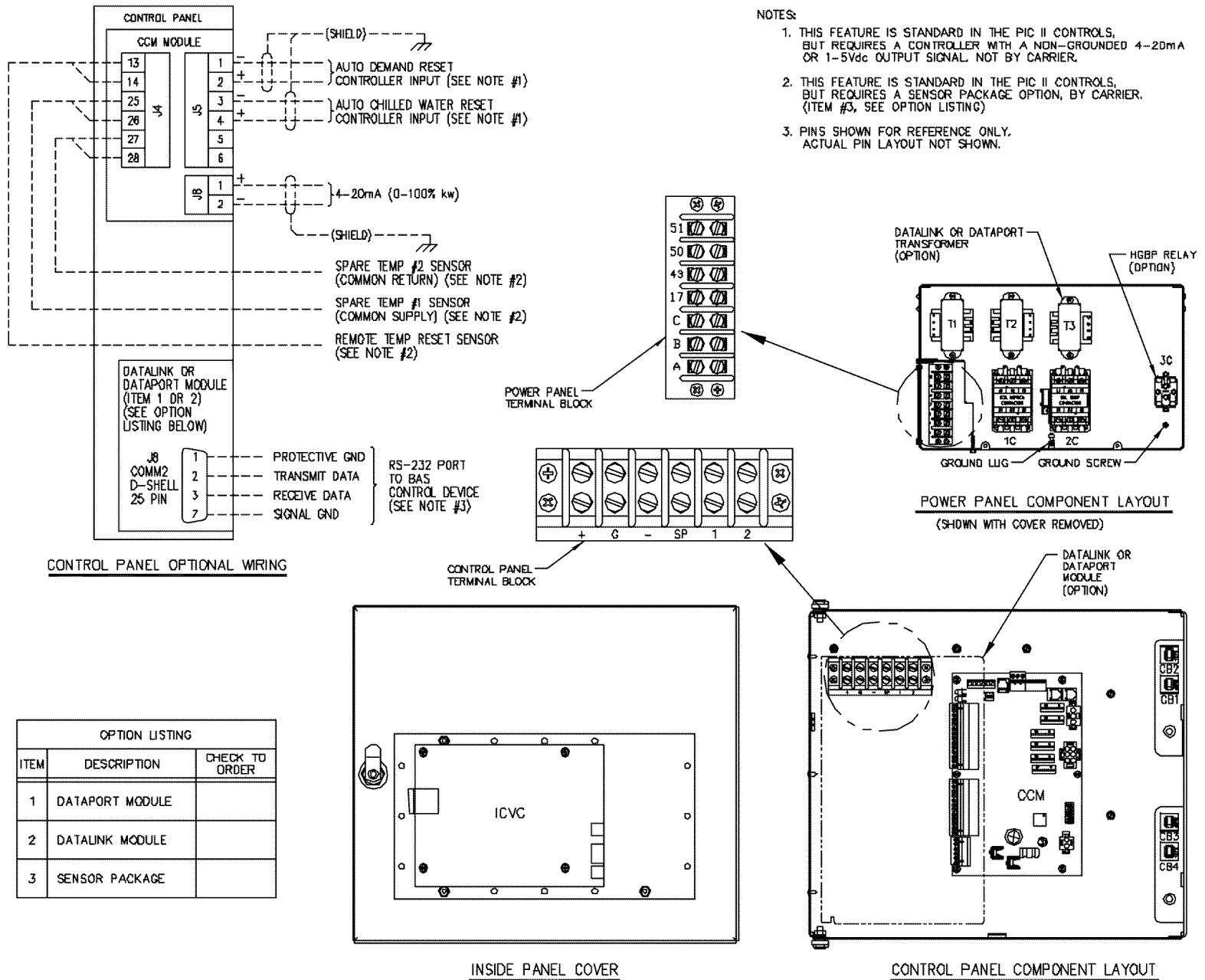


Fig. 51 — 19XRV Chiller Control Schematic (cont)





**NOTES:**

1. THIS FEATURE IS STANDARD IN THE PIC II CONTROLS, BUT REQUIRES A CONTROLLER WITH A NON-GROUNDED 4-20mA OR 1-5Vdc OUTPUT SIGNAL, NOT BY CARRIER.
2. THIS FEATURE IS STANDARD IN THE PIC II CONTROLS, BUT REQUIRES A SENSOR PACKAGE OPTION, BY CARRIER. (ITEM #3, SEE OPTION LISTING)
3. PINS SHOWN FOR REFERENCE ONLY. ACTUAL PIN LAYOUT NOT SHOWN.

**Fig. 53 — 19XRV Chiller Control Panel Component Layout**



## NOTES:

### I GENERAL

- 1.0 VFD SHALL BE DESIGNED AND MANUFACTURED IN ACCORDANCE WITH CARRIER ENGINEERING REQUIREMENT Z-420.
- 1.1 ALL FIELD-SUPPLIED CONDUCTORS, DEVICES AND THE FIELD-INSTALLATION WIRING, TERMINATION OF CONDUCTORS AND DEVICES, MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES AND JOB SPECIFICATIONS.
- 1.2 THE ROUTING OF FIELD-INSTALLED CONDUIT AND CONDUCTORS AND THE LOCATION OF FIELD-INSTALLED DEVICES, MUST NOT INTERFERE WITH EQUIPMENT ACCESS OR THE READING, ADJUSTING OR SERVICING OF ANY COMPONENT.
- 1.3 EQUIPMENT INSTALLATION AND ALL STARTING AND CONTROL DEVICES, MUST COMPLY WITH DETAILS IN EQUIPMENT SUBMITTAL DRAWINGS AND LITERATURE.
- 1.4 CONTACTS AND SWITCHES ARE SHOWN IN THE POSITION THEY WOULD ASSUME WITH THE CIRCUIT DE-ENERGIZED AND THE CHILLER SHUTDOWN.
- 1.5 WARNING – DO NOT USE ALUMINUM CONDUCTORS.

### II POWER WIRING TO VFD

- 2.0 PROVIDE A LOCAL MEANS OF DISCONNECTING POWER TO VFD, PROVIDE SHORT CIRCUIT PROTECTION FOR THE CHILLER AND INTERCONNECTING WIRE AT THE BRANCH FEEDER. THE SHORT CIRCUIT PROTECTION SHALL BE FUSED TYPE OR EQUIVALENT CIRCUIT BREAKER PER SHEET 3 OF 4 OF THIS DOCUMENT.
- 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 LINE LUG ADAPTORS ARE REQUIRED AT INSTALLATION. MINIMUM QUANTITY (# CONDUCTORS) AND SIZE (CONDUCTOR RANGE) CABLES PER PHASE AS FOLLOWS:

VFD MAX INPUT AMPS.	STANDARD 65KAIC LUG CAPACITY (PER PHASE)		OPTIONAL 100KAIC LUG CAPACITY (PER PHASE)	
	# CONDUCTORS	CONDUCTOR RANGE	# CONDUCTORS	CONDUCTOR RANGE
405A	3	3/0 – 500MCM	2	400 – 500MCM
608A	3	3/0 – 500MCM	3	3/0 – 400MCM

- 2.4 COMPRESSOR MOTOR AND CONTROLS MUST BE GROUNDED BY USING EQUIPMENT GROUNDING LUGS PROVIDED INSIDE UNIT MOUNTED VFD ENCLOSURE.

### III CONTROL WIRING

- 3.0 FIELD SUPPLIED CONTROL CONDUCTORS TO BE AT LEAST 18 AWG OR LARGER.
- 3.1 ICE BUILD START/TERMINATE DEVICE CONTACTS, REMOTE START/STOP DEVICE CONTACTS AND SPARE SAFETY DEVICE CONTACTS, (DEVICES NOT SUPPLIED BY CARRIER), MUST HAVE 24VAC RATING. MAX CURRENT IS 60mA, NOMINAL CURRENT IS 10mA. SWITCHES WITH GOLD PLATED BIFURCATED CONTACTS ARE RECOMMENDED.
- 3.2 REMOVE JUMPER WIRE BETWEEN TB1-19 AND TB1-20 BEFORE CONNECTING AUXILLIARY SAFETIES BETWEEN THESE TERMINALS.
- 3.3 THE VFD CONTACT OUTPUTS CAN CONTROL LOADS (VA) FOR COOLER AND FOR CONDENSER PUMP, TOWER FAN MOTOR CONTACTOR COIL AND ALARM ANNUNCIATOR DEVICES IS RATED 5 AMPS AT 115VAC UP TO 3 AMPS AT 277VAC. CONTROL WIRING REQUIRED FOR CARRIER TO START PUMPS AND TOWER FAN MOTORS MUST BE PROVIDED TO ASSURE MACHINE PROTECTION. IF PRIMARY PUMP AND TOWER FAN MOTOR CONTROL IS BY OTHER MEANS, ALSO PROVIDE A PARALLEL MEANS FOR CONTROL BY CARRIER. DO NOT USE STARTER CONTROL TRANSFORMER AS THE POWER SOURCE FOR CONTACTOR COIL, ACTUATOR MOTOR OR ANY OTHER LOADS.
- 3.4 DO NOT ROUTE CONTROL WIRING CARRYING 30V OR LESS WITHIN A CONDUIT WHICH HAS WIRES CARRYING 50V OR HIGHER OR ALONG SIDE WIRES CARRYING 50V OR HIGHER.
- 3.5 SPARE 4-20mA OUTPUT SIGNAL IS DESIGNED FOR CONTROLLERS WITH A NON-GROUNDED 4-20mA INPUT SIGNAL AND A MAXIMUM INPUT IMPEDANCE OF 500 OHMS.
- 3.6 REMOVE JUMPER WIRE TB1/19 TO TB1/20 IF INSTALLING SPARE SAFETY CONTACT.

**Fig. 54 — 19XRV Field Wiring**

COMPRESSOR MOTOR TERMINAL BOX

19-9/16" SQ. X 22-1/8" DEEP  
(APPROX. INSIDE DIMENSIONS)

SHT 3 OF 4  
SHT 4 OF 4

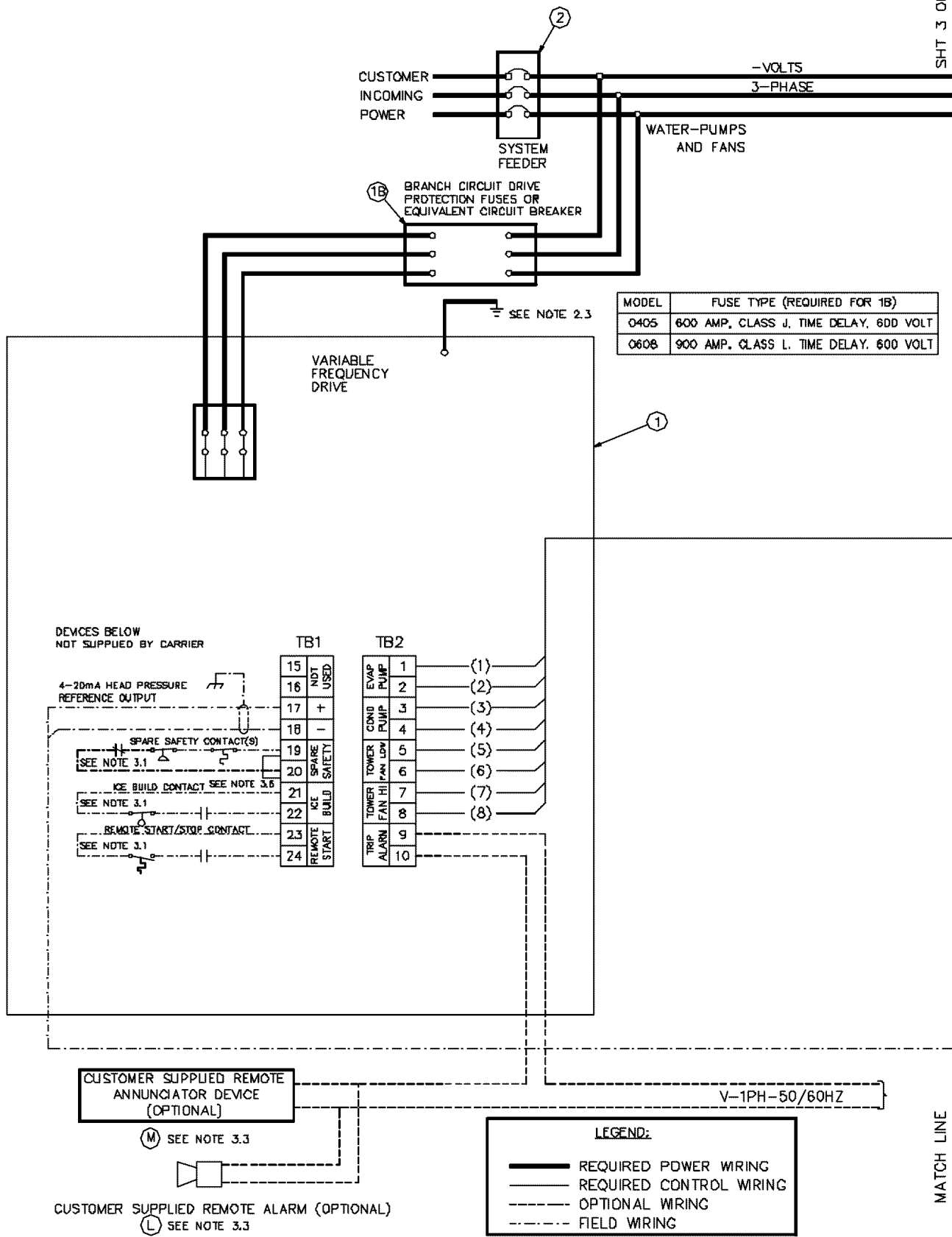


Fig. 54 — 19XRV Field Wiring (cont)

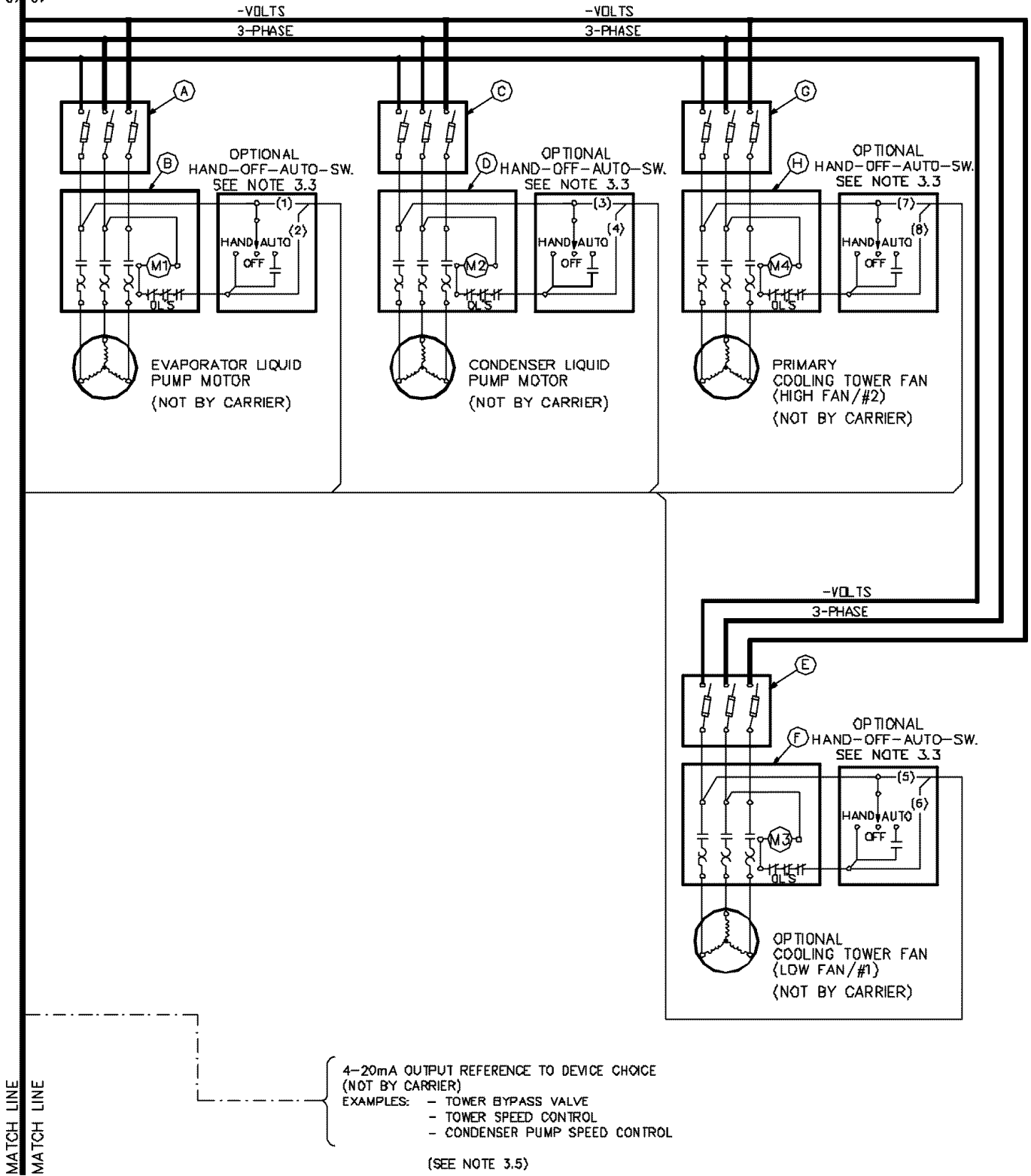


Fig. 54 — 19XRV Field Wiring (cont)

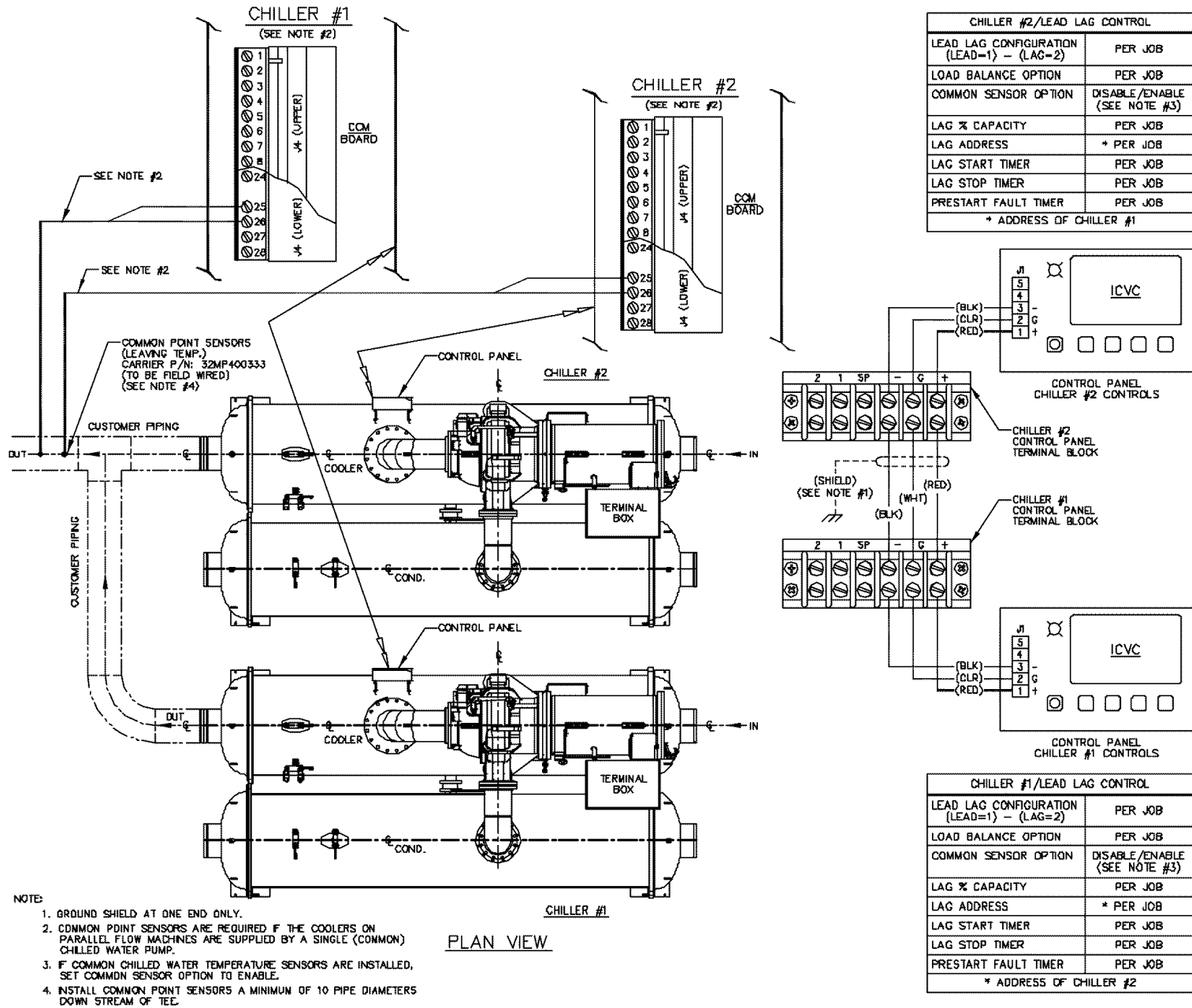
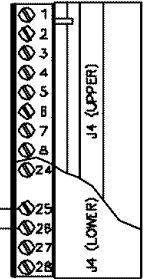


Fig. 55 — 19XRV Lead Lag Schematic

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	

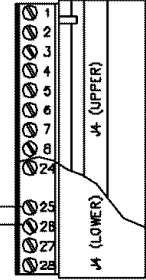
CHILLER #2  
(SEE NOTE #2)



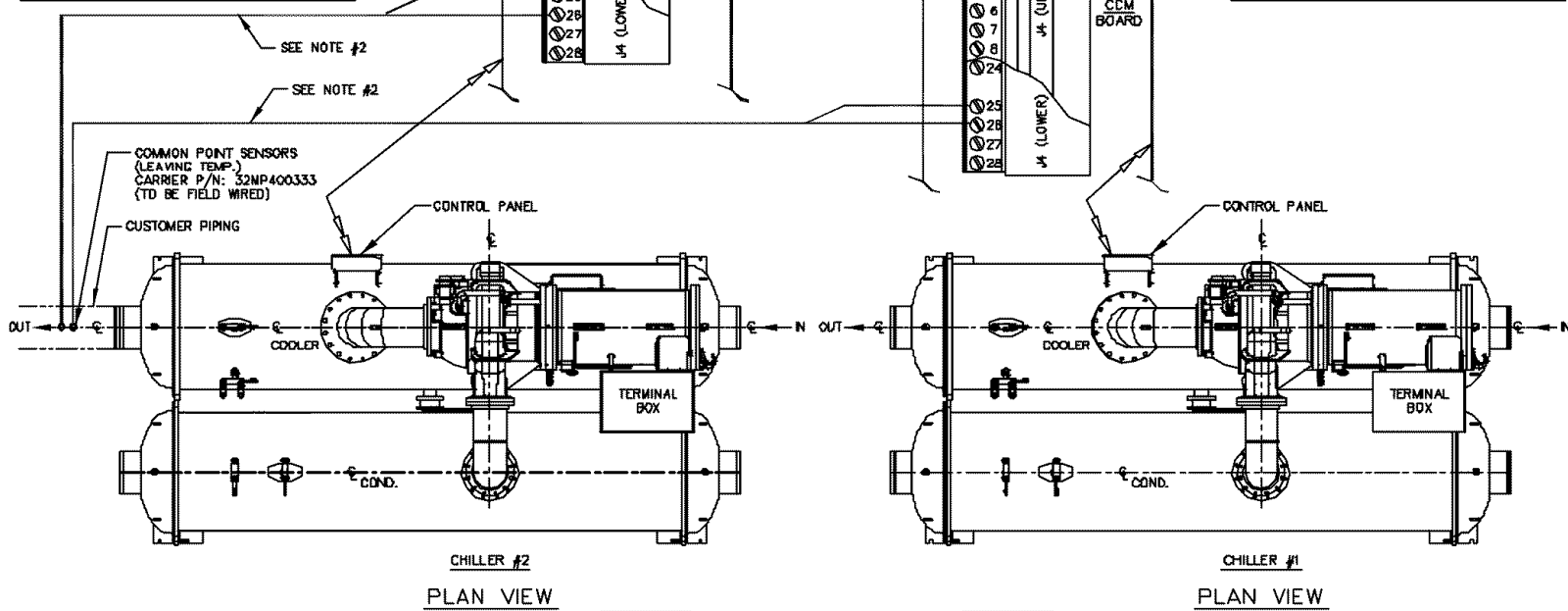
CCM BOARD

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	

CHILLER #1  
(SEE NOTE #2)

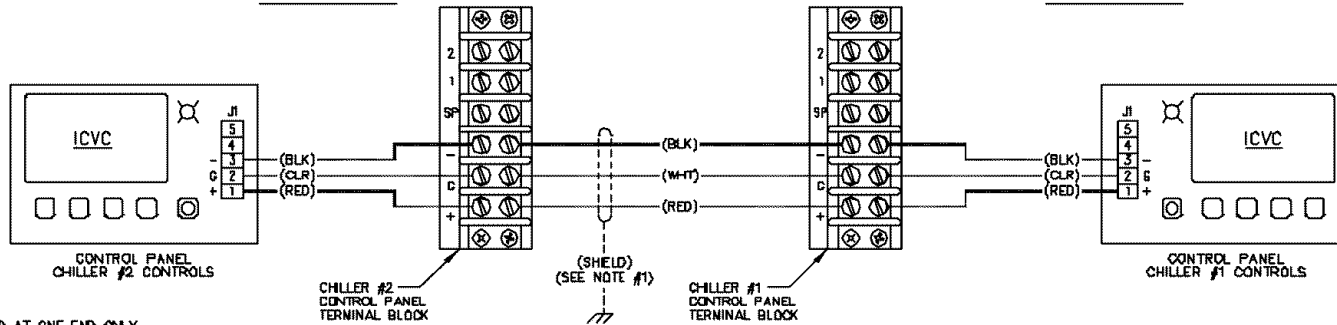


CCM BOARD



CHILLER #2  
PLAN VIEW

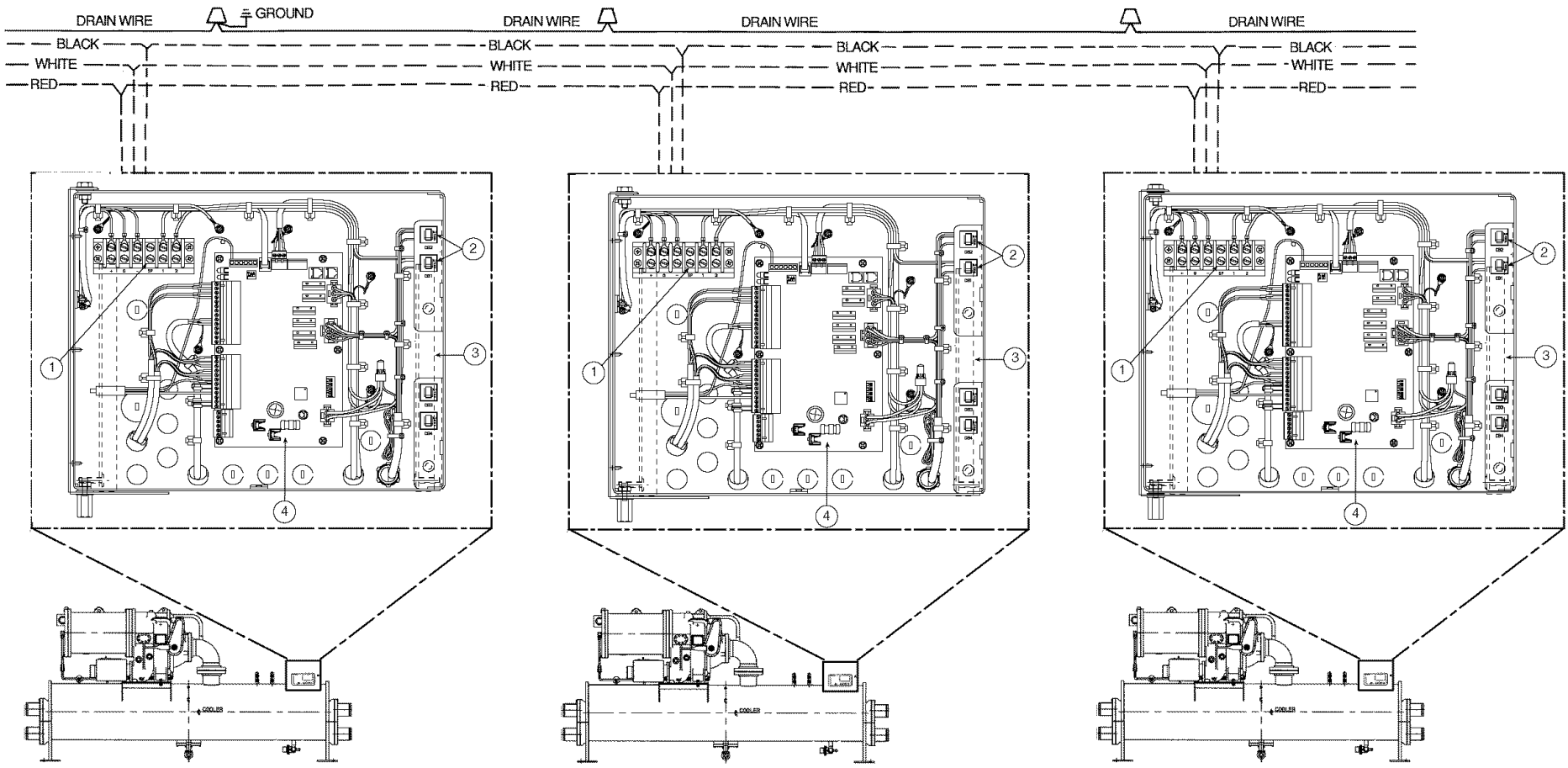
CHILLER #1  
PLAN VIEW



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. 55 — 19XRV Lead Lag Schematic (cont)



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19XRV CHILLERS

LEGEND

- 1 — Carrier Comfort Network (CCN) Interface
- 2 — Circuit Breakers
- 3 — Control Panel Internal View
- 4 — Chiller Control Module (CCM)
- Factory Wiring
- - - - Field Wiring

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

Fig. 56 — 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
1 <sup>st</sup> Current Alarm State	SERVICE	CONTROL ALGORITHM STATUS	CUR_ALARM	
20mA Demand Limit Opt	SERVICE	EQUIPMENT SERVICE	RAMP_DEM	X
2 <sup>nd</sup> Current Alarm State	SERVICE	CONTROL ALGORITHM STATUS	CUR_ALARM	
3 <sup>rd</sup> Current Alarm State	SERVICE	CONTROL ALGORITHM STATUS	CUR_ALARM	
4 <sup>th</sup> Current Alarm State	SERVICE	CONTROL ALGORITHM STATUS	CUR_ALARM	
5 <sup>th</sup> 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	

**APPENDIX — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)**

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



**APPENDIX — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)**

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	STATUS		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	STATUS	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	

**APPENDIX — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)**

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

**APPENDIX — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)**

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	

**APPENDIX — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)**

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

**APPENDIX — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)**

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	

**APPENDIX — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)**

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 Overtime	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

**APPENDIX — 19XRV LIQUIFLO™ 2 ICVC PARAMETER INDEX (cont)**

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	BRDEF	
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	

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**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								*****	

COMPRESSOR: Volts \_\_\_\_\_ RLA \_\_\_\_\_ OLTA \_\_\_\_\_  
 STARTER: Mfg \_\_\_\_\_ Type \_\_\_\_\_ S/N \_\_\_\_\_  
 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.

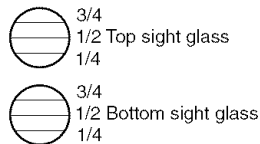
START-UP TO BE PERFORMED IN ACCORDANCE WITH APPROPRIATE MACHINE START-UP INSTRUCTIONS  
 JOB DATA REQUIRED:

- Machine Installation Instructions ..... Yes  No
- Machine Assembly, Wiring and Piping Diagrams ..... Yes  No
- Starting Equipment Details and Wiring Diagrams ..... Yes  No
- Applicable Design Data (see above) ..... Yes  No
- Diagrams and Instructions for Special Controls ..... Yes  No

INITIAL MACHINE PRESSURE: \_\_\_\_\_

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

CHECK OIL LEVEL AND RECORD:



ADD OIL: Yes  No   
 Amount: \_\_\_\_\_

RECORD PRESSURE DROPS: Cooler \_\_\_\_\_ Condenser \_\_\_\_\_

CHARGE REFRIGERANT: Initial Charge \_\_\_\_\_ Final Charge After Trim \_\_\_\_\_

INSPECT WIRING AND RECORD ELECTRICAL DATA:

RATINGS:

Motor Voltage \_\_\_\_\_ Motor(s) Amps \_\_\_\_\_ Oil Pump Voltage \_\_\_\_\_ Starter LRA Rating \_\_\_\_\_  
Line Voltages: Motor \_\_\_\_\_ Oil Pump \_\_\_\_\_ Controls/Oil Heater \_\_\_\_\_

FIELD-INSTALLED STARTERS ONLY:

Check continuity T1 to T1, etc. (Motor to starter, 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:	_____	_____	_____	_____	_____	_____

VFD Manufacturer \_\_\_\_\_  
VFD Serial Number \_\_\_\_\_  
VFD Date Code \_\_\_\_\_

CONTROLS: SAFETY, OPERATING, ETC.

Perform Controls Test (Yes/No) \_\_\_\_\_

<b>PIC III CAUTION</b>	
COMPRESSOR MOTOR AND CONTROL PANEL <b>MUST</b> BE PROPERLY AND INDIVIDUALLY CONNECTED BACK TO THE EARTH GROUND IN THE STARTER (IN ACCORDANCE WITH CERTIFIED DRAWINGS).	Yes _____

RUN MACHINE: Do these safeties shut down machine?

Condenser Water Flow	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Chilled Water Flow	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Pump Interlocks	Yes <input type="checkbox"/>	No <input type="checkbox"/>

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 65.
- B: Complete any remaining control calibration and record under Controls section (pages 11-49).
- 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.

SIGNATURES:

CARRIER TECHNICIAN \_\_\_\_\_

CUSTOMER REPRESENTATIVE \_\_\_\_\_

DATE \_\_\_\_\_

DATE \_\_\_\_\_

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE



**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 Version Number: \_\_\_\_\_

ICVC Controller Identification:    BUS: \_\_\_\_\_      ADDRESS: \_\_\_\_\_



19XRV PIC III TIME SCHEDULE CONFIGURATION SHEET OCCPC01S

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

NOTE: Default setting is OCCUPIED 24 hours/day.

ICE BUILD 19XRV PIC III TIME SCHEDULE CONFIGURATION SHEET OCCPC02S

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

NOTE: Default setting is UNOCCUPIED 24 hours/day.

19XRV PIC III TIME SCHEDULE CONFIGURATION SHEET OCCPC03S

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

NOTE: Default setting is OCCUPIED 24 hours/day.

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.

**19XRV PIC III OPTIONS TABLE CONFIGURATION SHEET**

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
<b>Auto Restart Option</b>	0/1	DSABLE/ENABLE	DSABLE	
<b>Remote Contacts Option</b>	0/1	DSABLE/ENABLE	DSABLE	
<b>Soft Stop Amps Threshold</b>	40 to 100	%	100	
<b>Surge/Hot Gas Bypass</b>				
<b>Surge Limit/HGBP Option Select: Surge=0, HGBP=1</b>	0/1		0	
<b>Min. Load Point (T1, P1)</b>				
<b>Surge/HGBP Delta T1</b>	0.5 to 20 (.3 to 11.1)	°F (°C)	1.5 (0.8)	
<b>Surge/HGBP Delta P1</b>	30 to 170 (206.9 to 1172.2)	PSI (kPa)	50 (344.8)	
<b>Full Load Point (T2, P2)</b>				
<b>Surge/HGBP Delta T2</b>	0.5 to 20 (.3 to 11.1)	°F (°C)	10 (5.6)	
<b>Surge/HGBP Delta P2</b>	50 to 170 (344.8 to 1172.2)	PSI (kPa)	85 (586.1)	
<b>Surge/HGBP Deadband</b>	0.5 to 3 (.3 to 1.7)	°F (°C)	1 (0.6)	
<b>Surge Protection</b>				
<b>Surge Delta % Amps</b>	5 to 20	%	10	
<b>Surge Time Period</b>	7 to 10	MIN	8	
<b>Ice Build Control</b>				
<b>Ice Build Option</b>	0/1	DSABLE/ENABLE	DSABLE	
<b>Ice Build Termination 0=Temp, 1=Contacts, 2=Both</b>	0 to 2		0	
<b>Ice Build Recycle</b>	0/1	DSABLE/ENABLE	DSABLE	
<b>Head Pressure Reference</b>				
<b>Delta P at 0% (4 mA)</b>	20 to 85 (138 to 586)	psi (kPa)	25 (172)	
<b>Delta P at 100% (20 mA)</b>	20 to 85 (138 to 586)	psi (kPa)	50 (344.8)	
<b>Minimum Output</b>	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)	°F (°C)	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)	°F (°C)	3 (1.7)	
Evap Approach Alert	0.5 to 15 (0.3 to 8.3)	°F (°C)	5 (2.8)	
Cond Approach Alert	0.5 to 15 (0.3 to 8.3)	°F (°C)	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
<b>Capacity Control</b>				
Proportional Inc Band	2 to 10		6.5	
Proportional DEC Band	2 to 10		6.0	
Proportional ECW Gain	1 to 3		2.0	
<b>Guide Vane Travel Limit</b>				
Guide Vane Travel Limit	30 to 100	%	80	
<b>Diffuser Control</b>				
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	
<b>VFD Speed Control</b>				
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
<b>Lead Lag Control</b>				
<b>LEAD/LAG: Configuration</b> DSABLE=0, LEAD=1, LAG=2, STANDBY=3	0 to 3		0	
<b>Load Balance Option</b>	0/1	DSABLE/ENABLE	DSABLE	
<b>Common Sensor Option</b>	0/1	DSABLE/ENABLE	DSABLE	
<b>LAG% Capacity</b>	25 to 75	%	50	
<b>LAG Address</b>	1 to 236		92	
<b>LAG START Timer</b>	2 to 60	MIN	10	
<b>LAG STOP Timer</b>	2 to 60	MIN	10	
<b>PRESTART FAULT Timer</b>	2 to 30	MIN	5	
<b>STANDBY Chiller Option</b>	0/1	DSABLE/ENABLE	DSABLE	
<b>STANDBY% Capacity</b>	25 to 75	%	50	
<b>STANDBY Address</b>	1 to 236		93	

**19XRV PIC III RAMP\_DEM TABLE CONFIGURATION SHEET**

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

**19XRV PIC III TEMP\_CTL TABLE CONFIGURATION SHEET**

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

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**BROADCAST (BRODEF) CONFIGURATION SHEET**

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Time Broadcast Enable	DSABLE/ENABLE		DSABLE	
Daylight Savings				
Start Month	1 to 12		4	
Start Day of Week	1 to 7		7	
Start Week	1 to 5		1	
Start Time	00:00 to 24:00	HH:MM	02:00	
Start Advance	0 to 360	MIN	0	
Stop Month	1 to 12		10	
Stop Day of Week	1 to 7		7	
Stop Week	1 to 5		5	
Stop Time	00:00 to 24:00		02:00	
Stop Back	0 to 360	MIN	0	

ICVC DISPLAY AND ALARM SHUTDOWN STATE RECORD SHEET

PRIMARY MESSAGE: \_\_\_\_\_

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

SECONDARY MESSAGE: \_\_\_\_\_

COMPRESSOR ONTIME: \_\_\_\_\_

CHW IN

CHW OUT

EVAP REF

CDW IN

CDW OUT

COND REF

OILPRESS

OIL TEMP

AMPS %IN

COMMUNICATION MESSAGE \_\_\_\_\_

CCN

LOCAL

RESET

MENU

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