



PIC (Product Integrated Control) Retrofit Kit for Centrifugal Liquid Chillers 50/60 Hz With HFC-134a

Start-Up, Operation, and Maintenance Instructions

SAFETY CONSIDERATIONS

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

Be sure you understand and follow the procedures and safety precautions contained in the machine 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 ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) 15. The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.

PROVIDE adequate ventilation in accordance with 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 machine 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 machine.

⚠ 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 machine 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 any enters the eyes, IMMEDIATELY FLUSH EYES with water and consult a physician.

NEVER APPLY an open flame or live steam to a refrigerant cylinder. Dangerous overpressure can result. When 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 machine. The introduction of the wrong refrigerant can cause damage or malfunction to this machine.

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

DO NOT ATTEMPT TO REMOVE fittings, covers, etc., while machine is under pressure or while machine 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 machine 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 cause personal injury.

DO NOT climb over a machine. 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 such equipment when there is a risk of slipping or losing your balance.

BE AWARE that certain automatic start arrangements CAN ENGAGE THE STARTER. Open the disconnect *ahead of* the starter in addition to shutting off the machine or pump.

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 permission of your process control group.

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

DOUBLE-CHECK that coupling nut wrenches, dial indicators, or other items have been removed before rotating any shafts.

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 unit, those involved in the installation, start-up, operation, and maintenance should be thoroughly familiar with these instructions and other necessary job data. This book is outlined so that you may become familiar with the control system before performing start-up procedures. Procedures in this manual are arranged in the sequence required for proper control installation machine 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.

This retrofit kit is used to modernize an existing centrifugal chiller controls by retrofitting it with the Product Integrated Control (PIC). The kit is designed to interface with virtually any squirrel cage induction-motor driven centrifugal refrigeration machine on standard chilled water duty, with R-134a refrigerant, regardless of age or manufacturer. In general, it is not recommended for use in heat recovery, industrial process, or other non-comfort cooling applications; in these cases an engineering study should be made to determine suitability.

This Installation, Start-Up, Operation, and Maintenance manual is intended to be used in conjunction with the existing unit's instruction manual.

Retrofit kits are available for hermetic machines (Carrier 19 Series units) or open-drive machines (Carrier 17 Series units).

Table 1 lists the parts supplied within each kit. Check the package for any shortages and notify your Replacement Components Division correspondent if any items are missing.

Additional items required:

- Job/machine "as built" wiring diagrams including chiller and starter data
- Electric drill, bits, and taps for installing sensors
- Standard refrigeration tools
- Touch-up paint, as required

The following hardware is required for mounting the actuator:

- 3 — ¼-20 x 1 ¾ lg hex head bolts (use longer ones if required)
- 6 — ¼-20 hexnuts
- 3 — ¼-in. washers
- bushings, if needed

Before any work begins, be sure that unit is off and the disconnect is open and tagged for all power supplies. All electrical wiring must be done in accordance with applicable local codes.

Before any work on the refrigerant side sensors is started, the machine's refrigerant should be recovered or placed in the storage vessel. The water side should be drained before any of the waterside sensors are installed. All connections for refrigerant temperature or pressure sensors, or water temperature sensors should be installed in accordance with local codes and leak checked. Pressure sensors can be connected into existing gage lines or installed at the vessels with the valve assemblies shown in Table 1, if allowed by local codes.

ABBREVIATIONS

Frequently used abbreviations in this manual include:

CCN	— Carrier Comfort Network
CCW	— Counterclockwise
CHW	— Chilled Water
CHWR	— Chilled Water Return
CHWS	— Chilled Water Supply
CW	— Clockwise
ECDW	— Entering Condenser Water
ECW	— Entering Chilled Water
EMS	— Energy Management System
HGBP	— Hot Gas Bypass
I/O	— Input/Output
LCD	— Liquid Crystal Display
LCDW	— Leaving Condenser Water
LCW	— Leaving Chilled Water
LED	— Light-Emitting Diode
LID	— Local Interface Device
OLTA	— Overload Trip Amps
PIC	— Product Integrated Control
PSIO	— Processor Sensor Input/Output Module
RLA	— Rated Load Amps
SCR	— Silicon Control Rectifier
SMM	— Starter Management Module
TXV	— Thermostatic Expansion Valve

Table 1 — Kit Contents

ITEM PART NUMBER	DESCRIPTION	OPEN-DRIVE KIT PART NUMBER 17EX660001	HERMETIC KIT PART NUMBER 19EX660003
		Quantity	Quantity
HF26BB025	Actuator Motor	1	1
HH79NZ047	Temperature Sensor	6	6
HK05YZ002	Pressure Transducer	4	3
HH79NZ073	Thrust Bearing Sensor	1	1
19EX04002601	High-Pressure Switch	1	1
AT-225	Temperature Sensor Well	4	4
17EX54001702	PIC Control Panel	1	—
19EX54005002	PIC Control Panel	—	1
19EX54000302	PIC Power Panel	1	—
19EX04000202	PIC Power Panel	—	1
E950705-2	SMM Panel	1	1
06DA403844	Valve Assembly	5	4
32MP500354	Motor Sensor	—	2

NOTE: If the original control panel is a 32MP panel, the motor sensor (32MP500354) and thrust bearing sensor (HH79NZ073) are not required. For hermetic compressor units, if the compressor oil sump is not vented to the cooler such that the sump is at cooler pressure, the 17 Series retrofit kit will be required. The above part numbers are subject to change without notice.

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.)

DIGITAL SIGNAL — *A digital (discrete) signal* is a 2-position representation of the value of a monitored source. (Example: A switch is a digital device because it only indicates whether a value is above or below a set point or boundary by generating an on/off, high/low, or open/closed signal.)

VOLATILE MEMORY — *Volatile memory* is memory incapable of being sustained if power is lost and subsequently restored.

⚠ CAUTION

The memory of the PSIO module is volatile. If the battery in a module is removed or damaged, all programming will be lost.

General — The microprocessor-based control center monitors and controls all operations of the machine. The microprocessor control system matches the cooling capacity of the machine to the cooling load while providing state-of-the-art machine 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 prewhirl 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. Machine protection is provided by the processor which monitors the digital and analog inputs and executes capacity overrides or safety shutdowns, if required.

PIC System Components — The Product Integrated Control (PIC) is the control system on the machine. See Table 2. The PIC controls the operation of the machine by monitoring all operating conditions. The PIC 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 only 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 the hot gas bypass valve, if installed.

The PIC can be interfaced with the Carrier Comfort Network (CCN) if desired. It can communicate with other PIC-equipped chillers and other CCN devices.

The PIC consists of 3 modules housed inside the 3 major components. The component names and the control voltage contained in each component are listed below (also see Table 2):

- control center
 - all extra low-voltage wiring (24 v or less)
- power panel
 - 115 v control voltage
 - up to 600 v for oil pump power
- starter cabinet
 - machine power wiring (per job requirement)

Table 2 — Major PIC Components and Panel Locations*

PIC COMPONENT	PANEL LOCATION
Processor Sensor Input/Output Module (PSIO)	Control Center
Starter Management Module (SMM)	Starter Cabinet
Local Interface Device (LID)	Control Center
6-Pack Relay Board	Control Center
8-Input Modules (Optional)	Control Center
Oil Differential Pressure/Power Supply Module	Control Center
Oil Heater Contactor (1C)	Power Panel
Oil Pump Contactor (2C)	Power Panel
Hot Gas Bypass Relay (3C) (Optional)	Power Panel
Control Transformers (T1-T4)	Power Panel
Control and Oil Heater Voltage Selector (S1)	Power Panel
Temperature Sensors	See Fig. 4
Pressure Transducers	See Fig. 5

*See Fig. 1-7.

PROCESSOR MODULE (PSIO) — This module contains all of the operating software needed to control the machine. The open-drive machines use a different software package within the PSIO than the hermetic machines. There are also control hardware differences between the two types of machines. Hermetic machines use 3 pressure transducers and 8 thermistors to sense pressures and temperatures. Open-drive machines use 4 pressure transducers and 7 thermistors to sense pressures and temperatures.

These inputs are connected to the PSIO module. The PSIO also provides outputs to the: guide vane actuator; oil pump; oil heater; hot gas bypass (optional); motor cooling solenoid; and alarm contact. The PSIO communicates with the LID, the SMM, and the optional 8-input modules for user interface and starter management.

STARTER MANAGEMENT MODULE (SMM) — This module is located on the starter cabinet. This module initiates PSIO commands for starter functions such as start/stop of the compressor, start/stop of the condenser and chilled water pumps, start/stop of the tower fan, spare alarm contacts, and the shunt trip. The SMM monitors starter inputs such as flow switches, line voltage, remote start contact, spare safety, condenser high pressure, oil pump interlock, motor current signal, starter IM and run contacts, and kW transducer input (optional). The SMM contains logic capable of safely shutting down the machine if communication with the PSIO is lost.

LOCAL INTERFACE DEVICE (LID) — The LID is mounted to the control center and allows the operator to interface with the PSIO or other CCN devices. It is the input center for all local machine set points, schedules, set-up functions, and options. The LID has a STOP button, an alarm light, 4 buttons for logic inputs, and a display. The function of the 4 buttons or "softkeys" are menu driven and are shown on the display directly above the key.

6-PACK RELAY BOARD — This device is a cluster of 6 pilot relays located in the control center. It is energized by the PSIO for the oil pump, oil heater, alarm, optional hot gas bypass relay, and motor cooling solenoid (hermetic machines) on auxiliary oil pump (open-drive machines).

8-INPUT MODULES — One optional module is factory installed in the control center panel when ordered. There can be up to 2 of these modules per chiller with 8 spare inputs each. They are used whenever chilled water reset, demand reset, or reading a spare sensor is required. The sensors or 4 to 20 mA signals are field-installed.

The spare temperature sensors must have the same temperature/resistance curve as the other temperature sensors on this unit. These sensors are rated 5,000 ohm at 75 F (25 C).

OIL HEATER CONTACTOR (1C) — This contactor is located in the power panel and operates the heater at 115 v. It

is controlled by the PIC to maintain oil temperature during machine shutdown.

OIL PUMP CONTACTOR (2C) — This contactor is located in the power panel. It operates all 200 to 575-v oil pumps. The PIC energizes the contactor to turn on the oil pump as necessary.

Contact Ratings for Oil Heater Contactor and Oil Pump Contactor

VOLTS	FLA	LRA	RESISTIVE
240	30	240	50
480	30	200	50
600	30	160	50

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 energizes the relay during low load, high lift conditions.

OIL AUXILIARY RELAY (4C) — This relay, supplied only with open-drive machines, opens the oil cooler solenoid valve and interlocks the oil pump with the compressor.

CONTROL TRANSFORMERS (T1-T4) — These transformers are located in the power panel and convert incoming control voltage to either 21 vac power for the PSIO module and options modules, or 24 vac power for 3 power panel contactor relays and a control solenoid valve.

CONTROL AND OIL HEATER VOLTAGE SELECTOR (S1) — It is necessary to use 115 v incoming control power in the power panel. The switch must be set to the 115-v position.

OIL DIFFERENTIAL PRESSURE/POWER SUPPLY MODULE — This module, which is located in the control center, provides 5 vdc power for the transducers and LID backlight.

On open-drive machines, this module outputs the difference between two pressure transducer input signals. The module subtracts oil supply pressure from transmission sump pressure and outputs the difference as an oil differential pressure signal to the PSIO. The PSIO converts this signal to differential oil pressure. To calibrate this reading, refer to the Troubleshooting Guide, Checking Pressure Transducers.

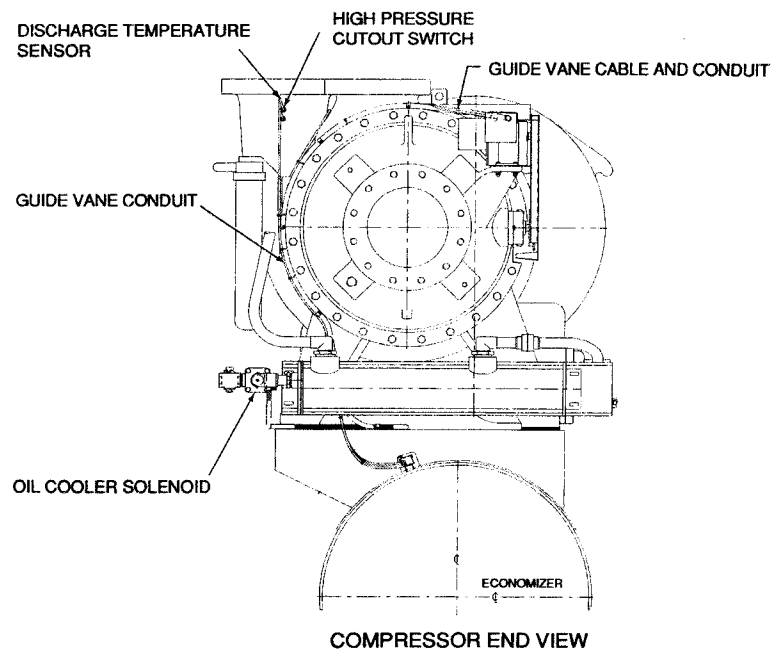
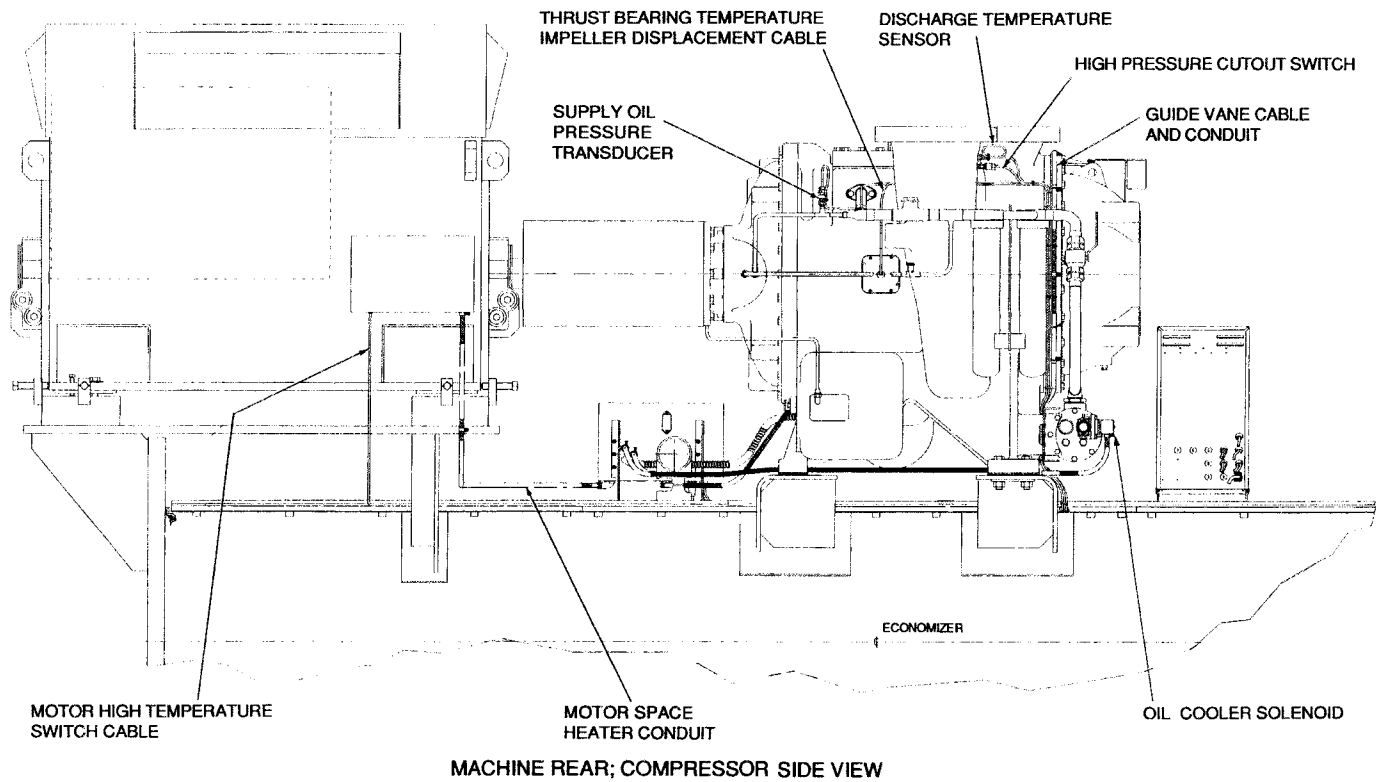


Fig. 1 — Controls and Sensor Locations for Open-Drive Machines (Typical)

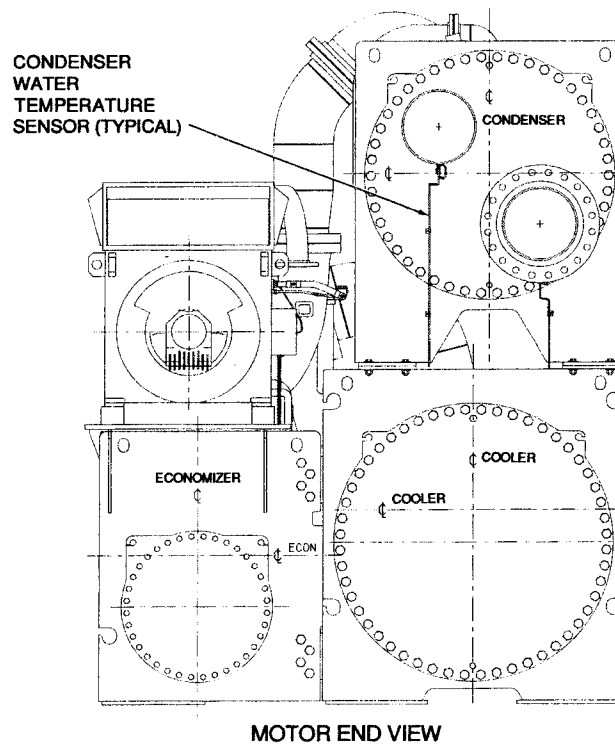
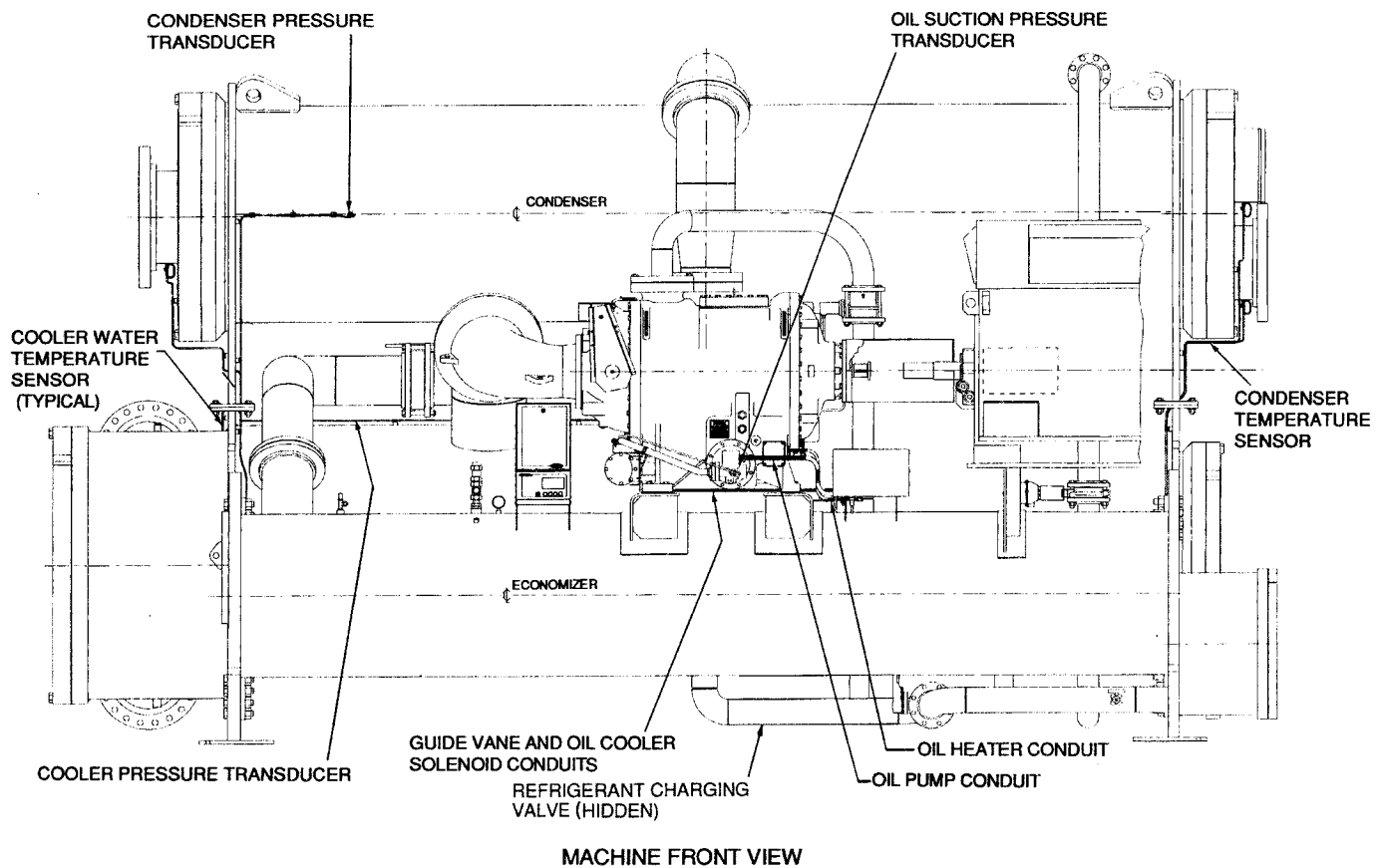
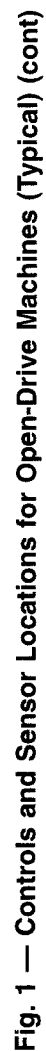


Fig. 1 — Controls and Sensor Locations for Open-Drive Machines (Typical) (cont)



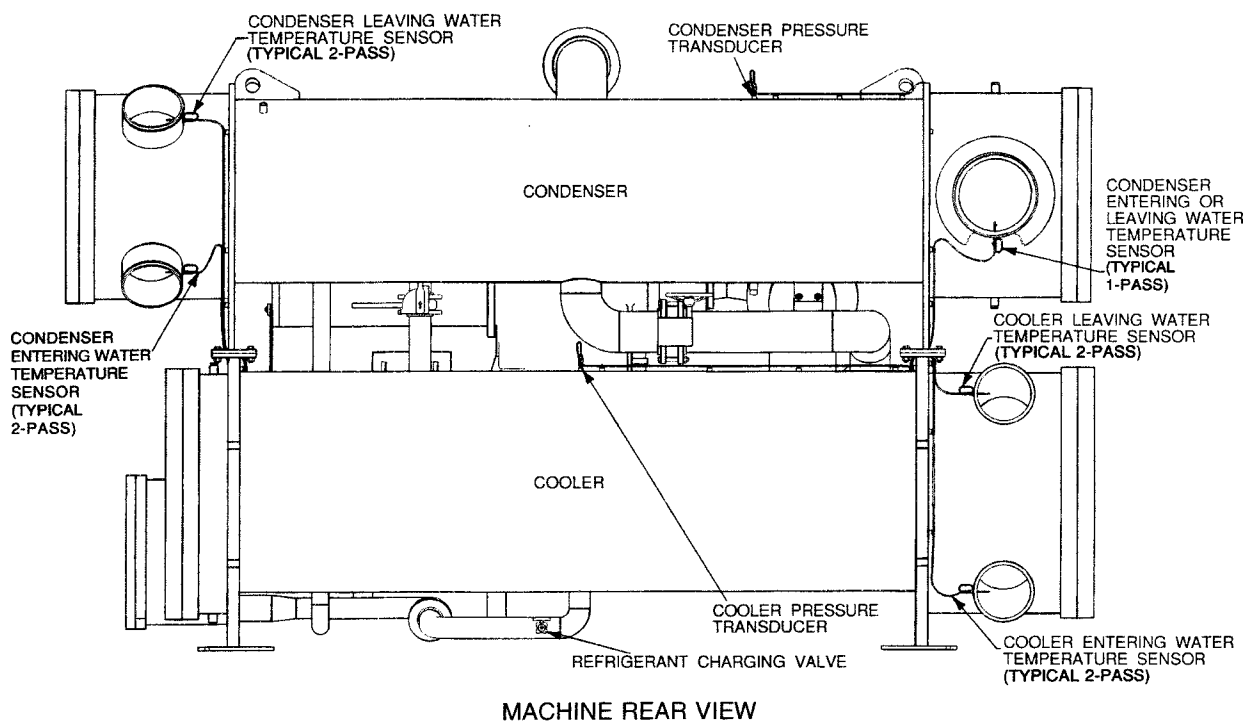
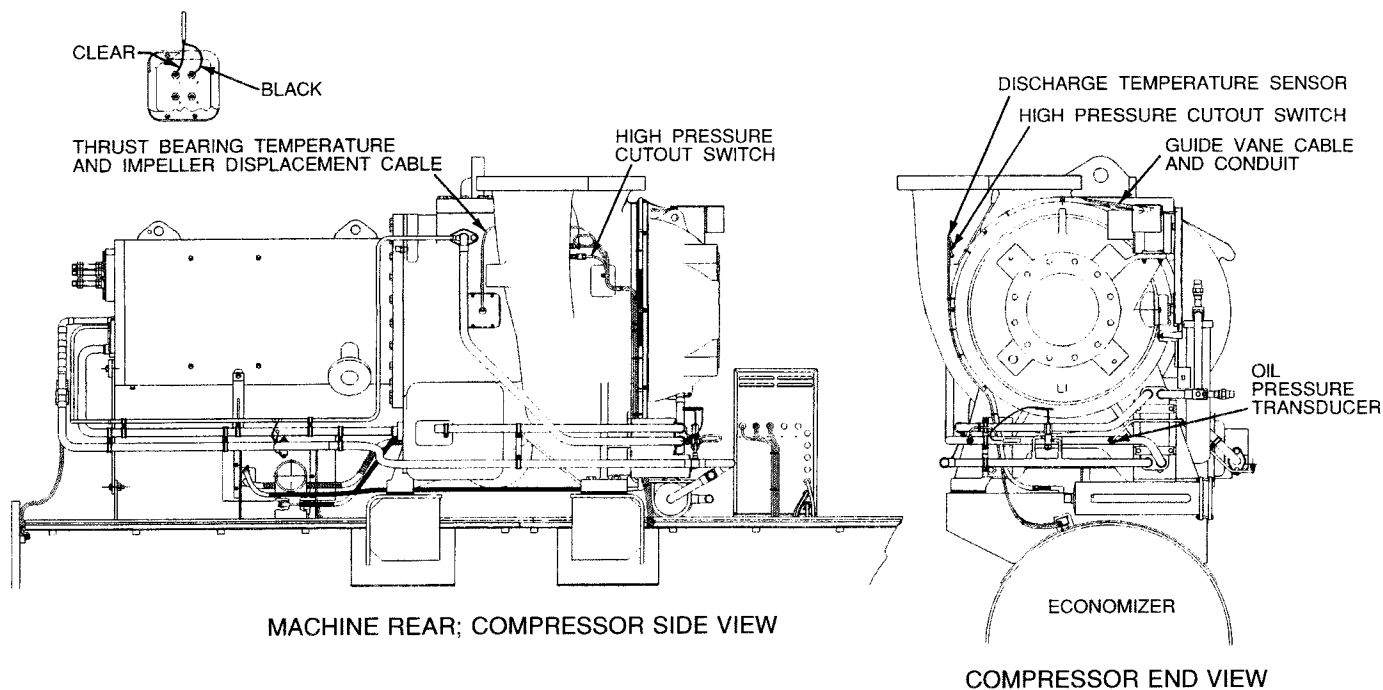


Fig. 2 — Controls and Sensor Locations for Hermetic Machines (Typical)

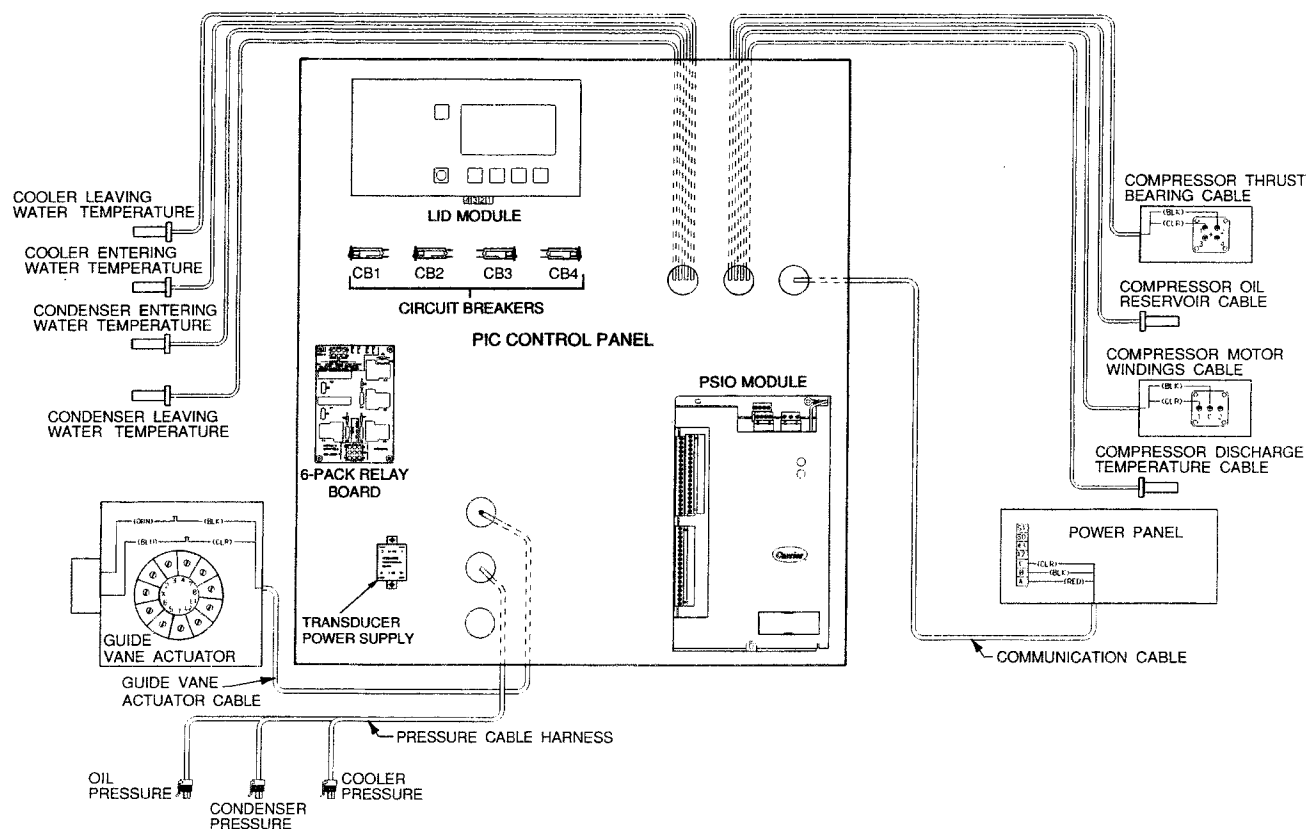
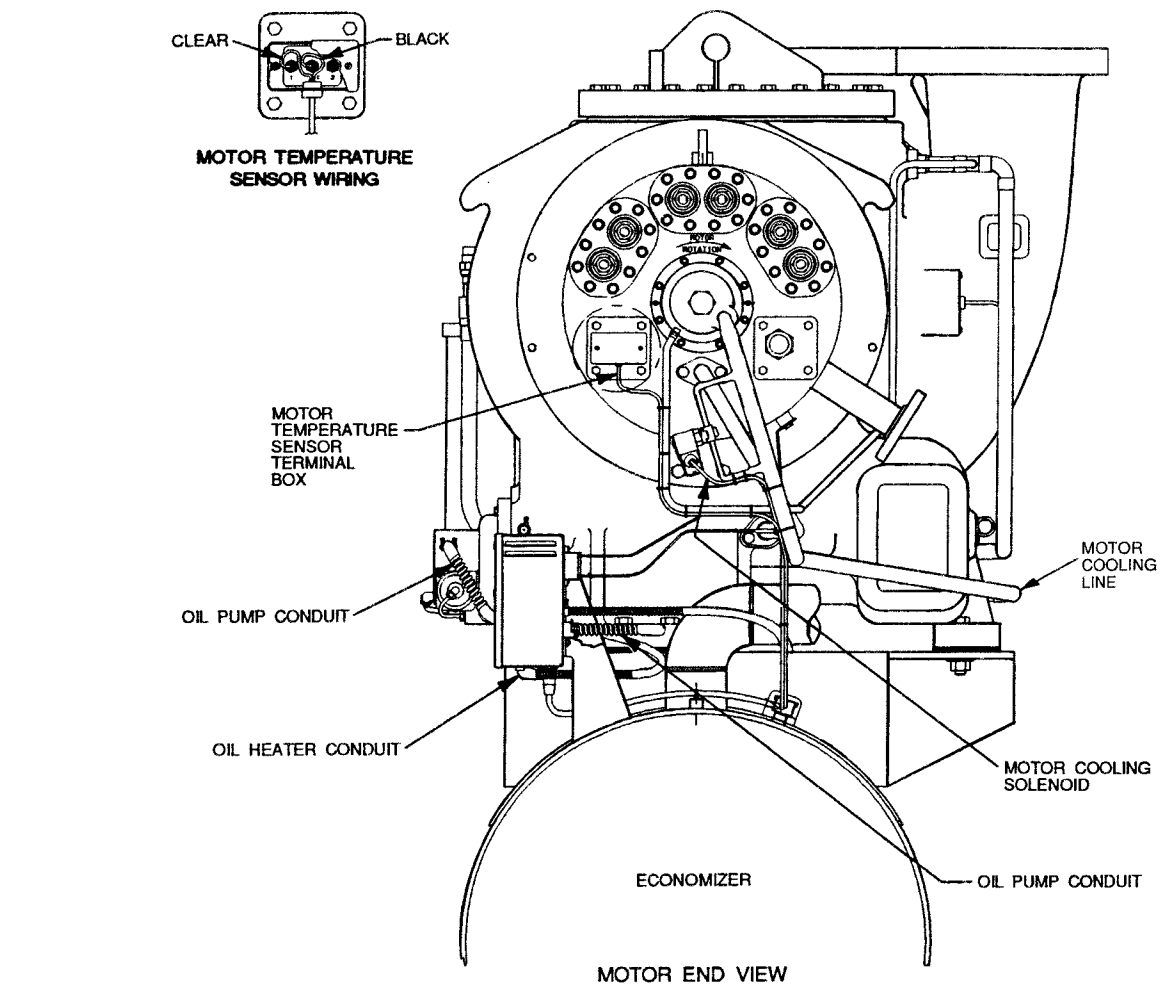
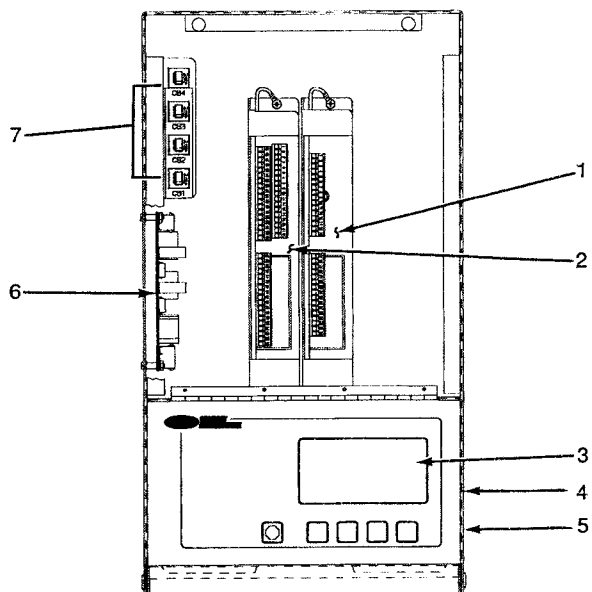


Fig. 2 — Controls and Sensor Locations for Hermetic Machines (Typical) (cont)



LEGEND

- LID — Local Interface Device
- PIC — Product Integrated Controls
- PSIO — Processor Sensor Input/Output Module
- 1 — Optional 8-Input Module for Spare Inputs to Control Interface (One of Two Available)
- 2 — PSIO
- 3 — LID Input/Output Interface Panel Display
- 4 — Oil Differential Pressure/Power Supply Module (Hidden)
- 5 — LID Light (Hidden)
- 6 — 6-Pack Relay Board
- 7 — Circuit Breakers (4)

**Fig. 3 — Control Center (Front View);
Shown with Options Module**

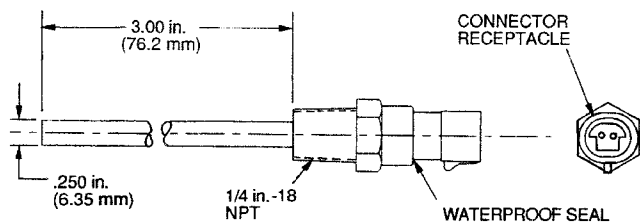


Fig. 4 — Control Sensors (Temperature)

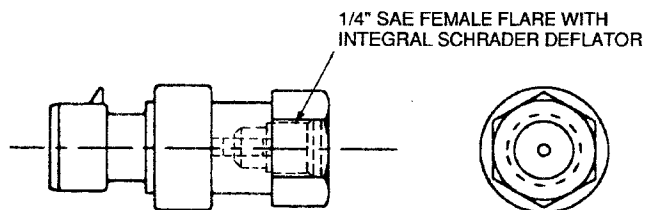
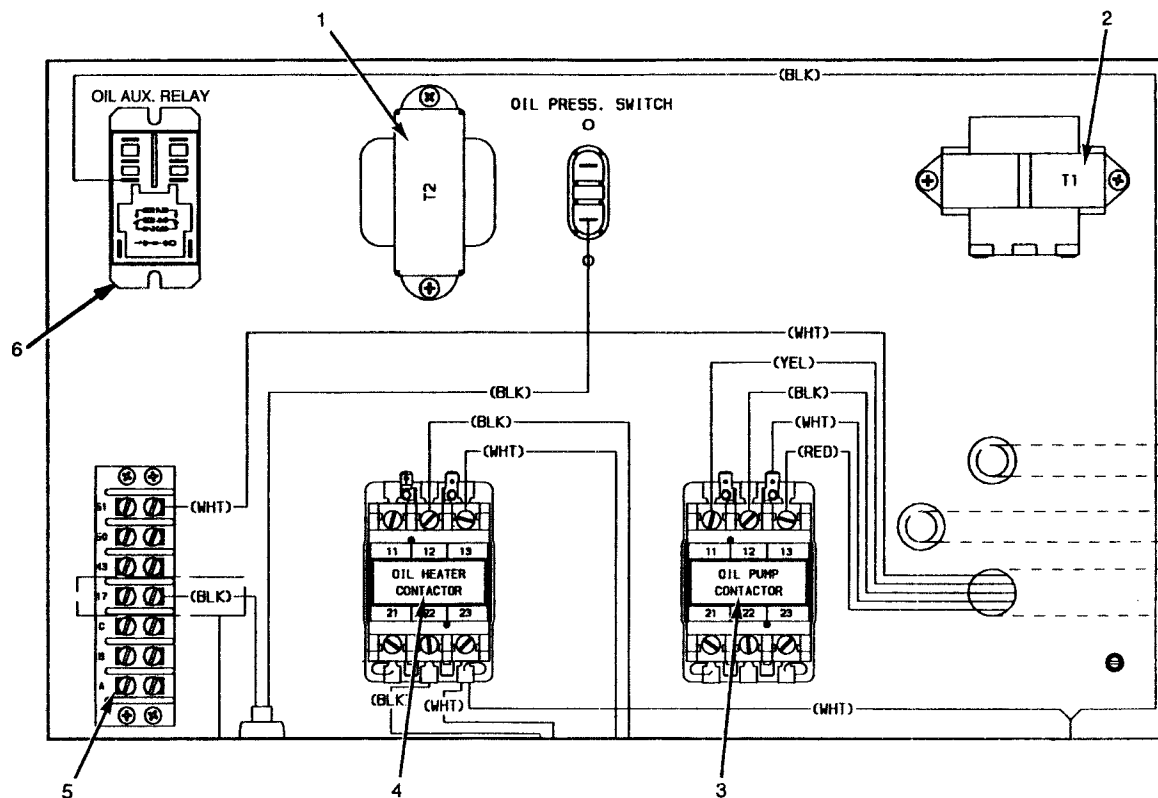


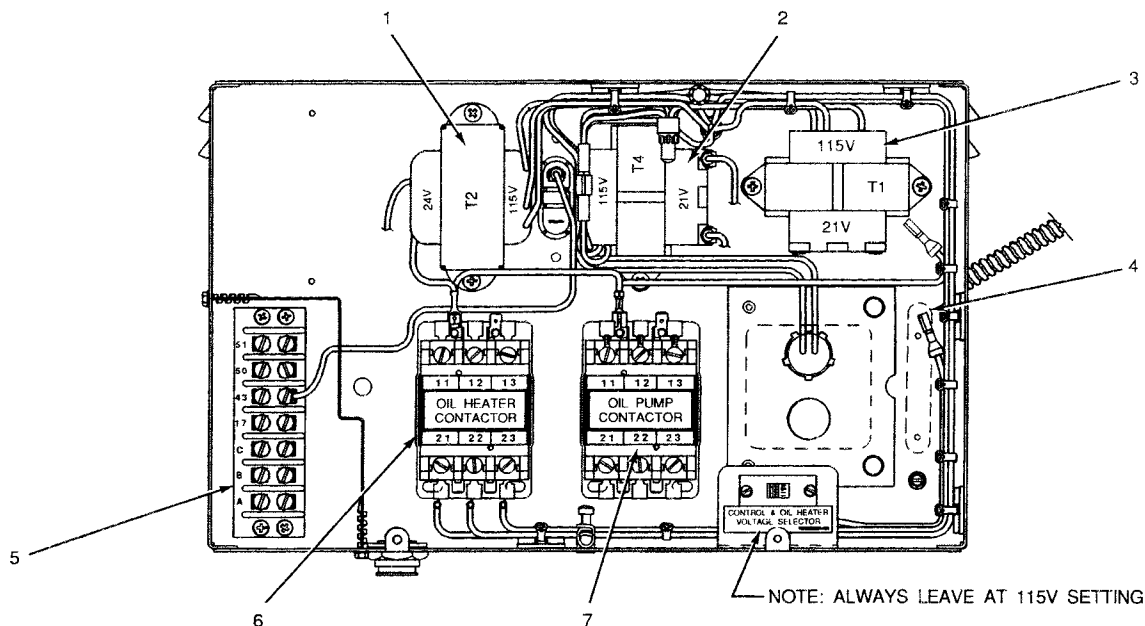
**Fig. 5 — Control Sensors
(Pressure Transducer, Typical)**



LEGEND

- 1 — T2 — Power Transformer (Hot Gas Bypass Relay, Oil Pump Relay and Oil Heater Relay)
- 2 — T1 — Control Center Transformer
- 3 — Oil Pump Contactor (2C)
- 4 — Oil Heater Contactor (1C)
- 5 — Factory Terminal Connections
- 6 — Oil Auxiliary Relay (4C)

Fig. 6 — Power Panel Without Options (Open-Drive Machine Shown)



LEGEND

- 1 — T2 — Power Transformer (Hot Gas Bypass Relay, Oil Pump Relay and Oil Heater Relay)
- 2 — T4 — Transformer (8-Input Modules)
- 3 — T1 — Control Center Transformer
- 4 — 3C Hot Gas Bypass Relay Location
- 5 — Factory Terminal Connections
- 6 — Oil Heater Contactor (1C)
- 7 — Oil Pump Contactor (2C)

Fig. 7 — Power Panel with Options (Hermetic Machine Shown)

Control Panel and Power Panel Installation —

The new control and power panels must be mounted in a location that is easily accessible, in any convenient location either on or near the machine. The panels may be mounted in place of the existing control box, if enough room exists. Be sure to locate the control panel so that the factory-supplied wiring harness will reach the newly installed thermistors, pressure transducers, and high-pressure switch. Securely mount the power and control panels on adequate support. Use caution not to damage any of the internal components when mounting the control and power panels.

NOTE: Welding on pressure vessels will require re-certification to ASME (American Society of Mechanical Engineers) Standards.

Thermistor Installation — New temperature sensors (HH79NZ047) are required in the leaving (supply) and entering (return) chilled water, entering and leaving condenser water, compressor oil sump, and the compressor discharge. All of these sensors are equipped with a 1/4-18 NPT thread. The locations for these sensors are shown schematically in Fig. 1 and 2.

A new thrust bearing sensor (HH79NZ073) is required if the original control is not a 32MP system. Install this sensor in the thrust bearing housing so that it will sense the temperature in the thrust bearing during operation. The thermistor wires must be connected to terminals exiting the transmission. Be sure that the wires are free of any rotating parts. Typical thermistor routing is shown in Fig. 8. Refer to Fig. 9 for terminal connections.

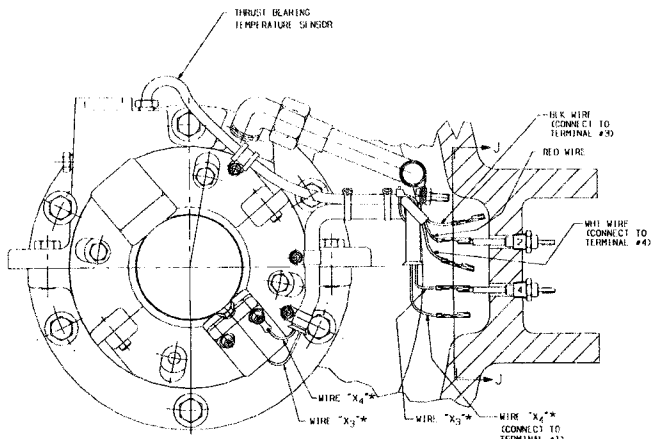
If the original control is not a 32MP system, the motor temperature sensors (32MP500354) must be installed. The motor must be removed from the compressor to obtain access to the stator windings. The sensors should be installed at or near the vertical center line of the stator

windings as shown in Fig. 10. The sensors should be secured with fiberglass tape and epoxy to ensure contact with the stator windings. In a typical installation, the sensor leads are routed to the terminal end of the motor and exit through connectors into a junction box. Each sensor's leads must be twisted together and placed in an acrylic varnish fiberglass tube, Fig. 11, and routed as shown in Fig. 12.

Inlet Guide Vane Actuator Installation — The new inlet guide vane actuator (HF26BB025) must be installed on the compressor and connected to the guide vane shaft. The actuator is provided with three 0.265-in. (6.75-mm) holes in the base for mounting. Mount the actuator with three 1/4-20 x 1 1/4 lg hex head bolts (use longer ones if required), six 1/4-20 hex nuts, three 1/4-in. washers, and bushings, if needed.

The actuator converts a 4-to-20 mA signal sent by the PSIO to a rotational position. The full rotation of the actuator is 308 degrees. It has a rated (running) torque value of 400 in.-lb (45.1 N-m) at 103.5 VAC. Be sure that the torque supplied by the actuator will meet the current machine requirements. If this actuator will not meet the requirements, a different control scheme will be required.

The actuator shaft is fitted with a 0.875-in. (22.4-mm) diameter x 0.8-in. (20.3-mm) long bushing for mounting a sprocket. The actuator's rotational travel can be limited by the software under Service03, "MAXIMUM GUIDE VANE OPENING." The setting for the maximum guide vane opening can be set from 30 to 100%. The default from the factory is 50%. Use this option if the travel must be limited to prevent over-rotation of inlet guide vanes. The correct sprockets and chain must be determined to allow for the proper rotation of the inlet guide vanes. Be sure to replace or install the proper guard once installation of the chain and sprockets is complete.



*Refer to Fig. 9.

Fig. 8 — Routing of Thrust Bearing Sensor

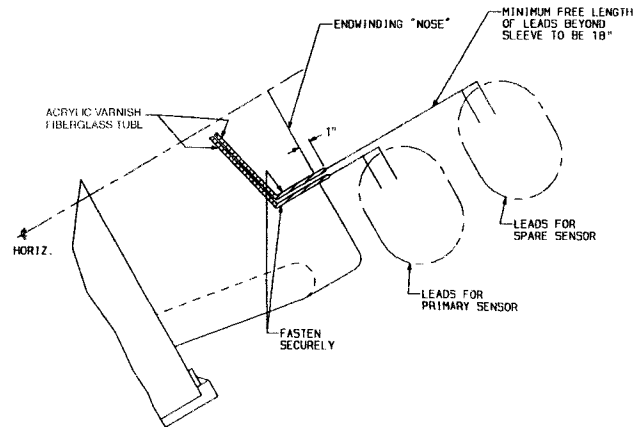


Fig. 11 — Securing Motor Temperature Sensor Leads (Typical Installation)

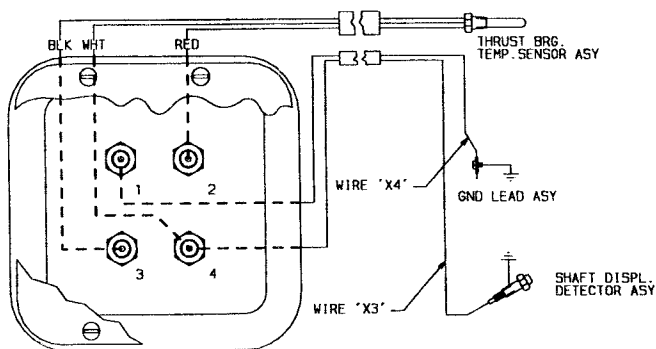


Fig. 9 — Thrust Bearing Sensor Terminal Connections

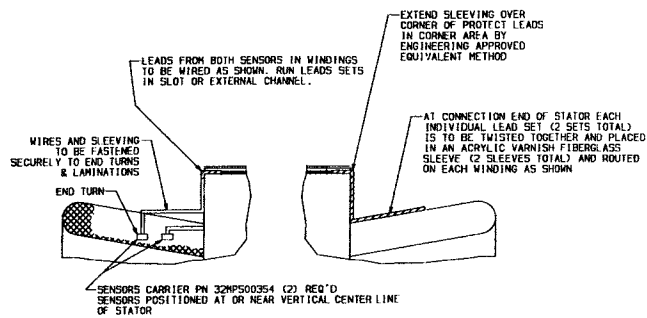
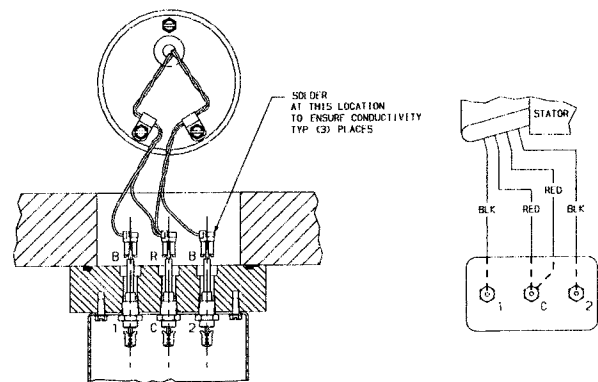


Fig. 10 — Typical Motor Temperature Sensor Installation Location

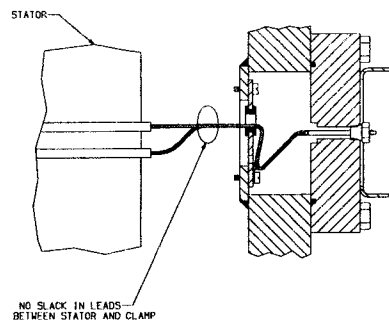


Fig. 12 — Routing Motor Temperature Sensor Leads (Typical Installation)

High-Pressure Cutout Installation

⚠ DANGER

Incorrect pressure switch settings may cause the machine to exceed specified test pressures.

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 machine.

A new pressure switch is supplied with the retrofit kit. The new pressure switch assembly, 19EX04002601, will open at 218 ± 7 psig (1503 ± 48 kPa). The PIC control monitors this switch via a 24-vdc circuit. Before installing this new switch, determine whether or not it will adequately protect the machine by comparing it to the existing high pressure switch setting. Check local codes. The switch must stop the machine's operation before any relief devices open and maintain safe unit operation. If the new switch open pressure setting is higher than the existing one, use the existing one. If the existing switch is used, it must be capable of operation with the 24-vdc circuit without nuisance alarms. If the new high pressure switch is installed, it should be mounted in the location shown in Fig. 1 and 2. If required, drill and tap into the discharge piping of the compressor for 1/4-18 NPTF threads to accept the 06DA403844 valve assembly. The valve assembly should be installed using an appropriate thread sealer. The switch must be installed in an area that cannot be isolated from the compressor. No service valves shall be between the compressor and the switch.

Pressure Transducer Installation

⚠ WARNING

Make sure to use a backup wrench on the Schrader fitting whenever removing a transducer.

The new pressure transducers (HK056YZ002) mount in the locations shown in Fig. 1 and 2. For open-drive machines, 4 transducers are required to sense the following pressures: cooler pressure, condenser pressure, compressor oil sump pressure, and compressor oil supply pressure (after oil cooler and filter). For hermetic machines, 3 transducers are required to sense the following pressures: cooler pressure, condenser pressure, and compressor oil supply pressure (after oil cooler and filter). The software for hermetic machines assumes that the oil sump is at cooler pressure. When calculating the supply oil pressure, the software subtracts the oil supply pressure from the suction pressure to determine the differential. In order for this control to function properly, the compressor oil sump pressure must be at cooler pressure. If this is not the case, you will need to use the open-drive retrofit kit.

Locate the required transducers. If required, drill and tap for 1/4-18 NPTF threads to accept the 06DA403844 valve assemblies. The valve should be installed using an appropriate thread sealer. Assemble the pressure transducers to the valve assemblies.

Control Wiring — Connect the control wiring from the control box to the sensors. The harness cables are labeled to identify to which sensor they should be connected.

Connect the impeller displacement switch, motor overloads (compressor, oil pump, etc.) as shown in the typical wiring diagram. If equipped, connect the seal oil return pump and motor space heater, as shown in the typical wiring diagram.

Hot Gas Bypass Controls — If the machine is equipped with hot gas bypass, a relay HN61KQ120 is required. The relay is a double-pole single-throw relay, one pole normally open, the other normally closed. The relay contacts are rated as follows:

	VOLTAGE	FLA (Full Load Amps)	LRA (Locked Rotor Amps)
INDUCTIVE	120 240	12 8	60 48
RESISTIVE	120/240	18	---

The coil has the following ratings:

Voltage	24
Coil Pick-Up and Seal Voltage	20 max
Coil Inrush	3.5 VA
Coil Seal VA	3.0

The relay is mounted in the power panel as shown in Fig. 13. Figure 13 shows the relay connected to the standard Carrier hot gas bypass valve. It may be necessary to modify the chillers existing controls to make them compatible with the PIC control scheme. The signal from the 6-pack relay, K5, (power panel) should be wired to the hot gas bypass relay terminal 3. Terminal 1 on the hot gas bypass relay should be wired to L2. The wires are provided in the panel. Power of the appropriate voltage for the hot gas bypass actuator must be supplied to terminals 2 and 5 on the relay. When the control relay is energized by the K5 relay on the 6-pack relay board, the normally open contacts between terminals 2 and 4 close and the normally closed contacts between terminals 5 and 6 open.

A field provided harness from the power panel to the actuator is required.

In accordance with good refrigeration practice, the machine should be leak tested prior charging the machine. The chilled fluid and condenser fluid sensors should also be leak checked. Carefully check all controls additions for leaks following the manufacturer's recommendations for leak testing.

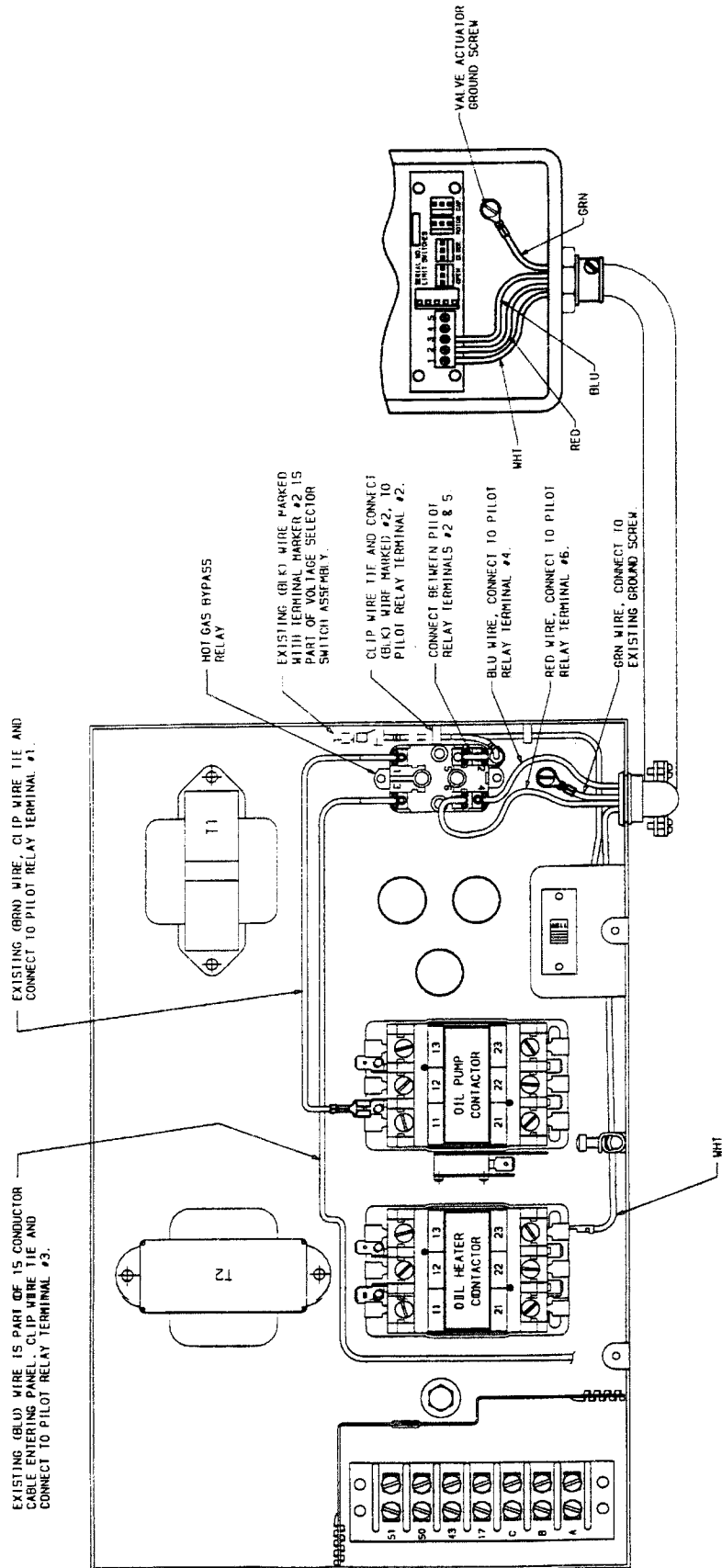


Fig. 13 — Hot Gas Bypass Relay Wiring Connections

Make Electrical Connections — Field wiring must be installed in accordance with job wiring diagrams and all applicable electrical codes.

All wiring must be in compliance with NEC (National Electrical Code) and all local codes. Check all components for voltage and lead requirements. Be sure that all contactors are capable of carrying the current required. Check complete load to be sure wire size is correct.

⚠ CAUTION

Do not run 120-v wiring into the control center. The control center should only be used for additional extra low-voltage wiring (50 v maximum).

Wiring diagrams in this publication (Fig. 14-20) are for reference only and are not intended for use during actual installation; follow job specific wiring diagrams.

⚠ WARNING

Do not attempt to start compressor or oil pump — even for a rotation check — or apply test voltage of any kind while machine is under dehydration vacuum. Motor insulation breakdown and serious damage may result.

CONNECT CONTROL INPUTS — Connect the control input wiring from the chilled and condenser water flow switches to the starter terminal strip. Wiring may also be specified for a spare safety switch, and a remote start/stop contact can be wired to the starter terminal strip, as shown in Fig. 14 and 16. Additional spare sensors and Carrier Comfort Network modules may be specified as well. These are wired to the machine control center as indicated in Fig. 19 and 20.

CONNECT CONTROL OUTPUTS — Connect auxiliary equipment, chilled and condenser water pumps, and spare alarms as required and indicated on job wiring drawings.

MOTOR STARTER (Purchased Separately) — The starter allows for the proper starting and disconnecting of the electrical energy for the compressor-motor, oil pump, oil heater, and control panels.

All starters, whether supplied by Carrier or the customer, must meet Carrier Starter Specification Z-375. This specification can be obtained from the Carrier Replacement Components Division or local sales office. The purpose of this specification is to ensure the compatibility of the starter and the controls. Many styles of compatible starters are available, including solid-state starters, autotransformer, wye-delta closed transition starters, and full voltage starters.

The SMM (Starter Management Module) panel is equipped to transition the existing starter to the current Z-375 specification. Follow the instructions provided with the SMM panel for wiring to the existing starter. All wiring diagrams shown here at the starter are connected to the SMM panel.

⚠ CAUTION

Compressor motor and control panel must be properly and individually connected back to the earth ground in the starter.

Connect Starter — Assemble and install compressor terminal box in desired orientation, and cut necessary conduit openings in conduit support plates. Attach power leads to

compressor terminals in accordance with job wiring drawings, observing caution label in terminal box. Use only copper conductors. The motor must be grounded in accordance with NEC, applicable local codes, and job wiring diagrams.

IMPORTANT: Do not insulate terminals until wiring arrangement has been checked and approved by Carrier start-up personnel. Also, make sure correct phasing is followed for proper motor rotation.

Connect Power Wires to Oil Pump Contactor — Connect power wires to oil pump contactor mounted in machine power panel and from the contactor to the oil pump. (See Fig. 15.) Use the electrical disconnect located in the machine starter (if supplied), or a separate fused disconnect as shown on job wiring diagrams. Check that power supply voltage agrees with oil pump voltage. Follow correct phasing for proper motor rotation.

⚠ CAUTION

Do not wire into the top surface of the power panel. Knock-outs are provided on the underside of the panel.

Connect Power Wires to Oil Heater Contactor — Connect control power wiring between the oil heater contactor terminals (Fig. 14 and 16) and terminals LL1 and LL2 on the field wiring strip in the compressor motor starter and from the contactor to the heater. Refer to Fig. 18 and wiring label on the chiller power panel.

⚠ WARNING

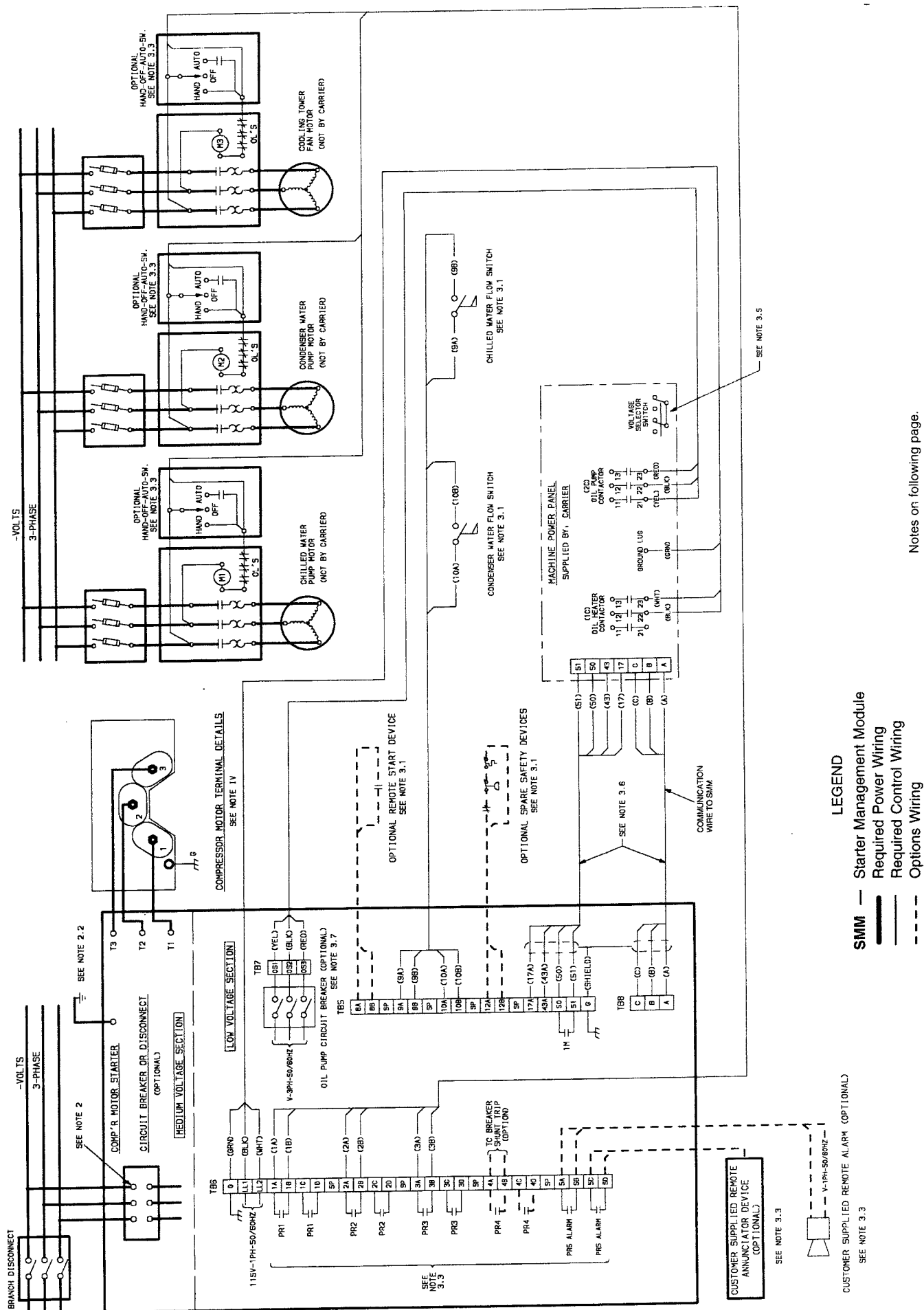
Voltage to terminals LL1 and LL2 comes from a control transformer in a starter built to Carrier specifications. Do not connect an outside source of control power to the compressor motor starter (terminals LL1 and LL2). An outside power source will produce dangerous voltage at the line side of the starter, because supplying voltage at the transformer secondary terminals produces input level voltage at the transformer primary terminals.

Connect Communication and Control Wiring from Starter to Power Panel — Connect control wiring from main motor starter to the chiller power panel. All control wiring must use shielded cable. Also connect the communications cable. Make sure the control circuit is grounded in accordance with applicable electrical codes and instructions on chiller control wiring label.

CARRIER COMFORT NETWORK INTERFACE — The Carrier Comfort Network (CCN) communication bus wiring is supplied and installed by the electrical contractor (if required by jobsite prints). 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 Fig. 20 for location of the CCN network connector (COMM1) on the processor module.

Copy continued on page 23.



NOTES:

I GENERAL

- 1.0 Starters shall be designed and manufactured in accordance with Carrier Engineering requirement Z-375.
- 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 of the reading, adjusting, or servicing of any component.
- 1.3 Equipment installation and all starting and control devices must comply with details in equipment submittal drawings and literature.
- 1.4 Contacts and switches are shown in the position they would assume with the circuit deenergized and the chiller shut down.
- 1.5 **WARNING:** Do not use aluminum conductors.
- 1.6 Installer is responsible for any damage caused by improper wiring between starter and machine.

II POWER WIRING TO STARTER

- 2.0 Power conductor rating must meet minimum unit nameplate voltage and compressor motor RLA (rated load amps). When (3) conductors are used:
Minimum ampacity per conductor = $1.25 \times$ compressor RLA
When (6) conductors are used:
Minimum ampacity per conductor = $0.721 \times$ compressor RLA.
- 2.1 Lug adapters may be required if installation conditions dictate that conductors be sized beyond the minimum ampacity required. Contact starter supplier for lug information.
- 2.2 Compressor motor and controls must be grounded by using equipment grounding lugs provided inside starter enclosure.

III CONTROL WIRING

- 3.0 Field supplied control conductors to be at least 18 AWG (American Wire Gage), or larger.
- 3.1 Chilled water and condenser water flow switch contacts, optional remote start device contacts, and optional spare safety device contacts must have 24 vdc rating. Maximum current is 60 ma, nominal current is 10 ma. Switches with gold plated bifurcated contacts are recommended.
- 3.2 Remove jumper wire between 12A and 12B before connecting auxiliary safeties between these terminals.
- 3.3 Maximum load on pilot relays is 10 amps. Pilot relays can control cooler and condenser pump and tower fan motor contactor coil loads rated up to 10 amps at 115 vac or up to 3 amps at 600 vac. Control wiring required for Carrier to start pumps and tower fan motors must be provided to assure machine protection. If primary pump and tower 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 pilot relay loads.

- 3.4 Do not route control wiring carrying 30 v or less within a conduit which has wires carrying 50 v or higher or along side wires carrying 50 v or higher.
- 3.5 Voltage selector switch in machine power panel is factory set for 115 v control and oil heater power source. The 230 v position is not used. If switch is set to 230 v position, oil heater will not operate.
- 3.6 Control wiring cables between starter and power panel must be shielded with minimum rating of 600 v, 80 C. Ground shield at starter. Wires A, B, and C are communication wires and must be run in a separate cable.
- 3.7 If optional oil pump circuit breaker is not supplied within the starter enclosure as shown, it must be located within sight of the machine with wiring routed to suit.
- 3.8 Voltage to terminals LL1 and LL2 comes from a control transformer in a starter built to Carrier specifications. Do not connect an outside source of control power to the compressor motor starter (terminals LL1 and LL2). An outside power source will produce dangerous voltage at the line side of the starter, because supplying voltage at the transformer secondary terminals produces input level voltage at the transformer primary terminals.

IV POWER WIRING BETWEEN STARTER AND COMPRESSOR MOTOR

- 4.0 Medium voltage (over 600 volts) hermetic compressor motors have 3 terminals. Use no. 4 AWG strand wires for all medium and high voltage hermetic motors. Distance between terminal is $7\frac{9}{16}$ inches. Use suitable splice connectors and insulation for high-voltage alternating current cable terminations (these items are not supplied by Carrier). Compressor motor starter must have nameplate stamped as to conforming with Carrier requirement Z-375. Medium voltage open motors have lug terminations (see certified drawings for size).
- 4.1 When more than one conduit is used to run conductors from starter to compressor motor terminal box, one conductor from each phase must be in each conduit, to prevent excessive heating, (e.g., conductors to motor terminals 1, 2, and 3 in one conduit, and those to 1, 2, and 3 in another).
- 4.2 Compressor motor power connections can be made through top, top rear, or sides of compressor motor terminal box by using holes cut by contractor to suit conduit. Flexible conduit should be used for the last few feet to the terminal box for unit vibration isolation. Use of stress cones may require an over-size (special) motor terminal box (not supplied by Carrier).
- 4.3 Compressor motor frame to be grounded in accordance with the National Electrical Code (NFPA-70) and applicable codes. Means for grounding compressor motor is a no. 4 AWG, 500 MCM pressure connector, supplied and located in the lower left side corner of the compressor motor terminal box.
- 4.4 Do not allow motor terminals to support weight of wire cables, use cable supports and strain reliefs as required.

Fig. 14 — Field Wiring (High Voltage Motors) with Optional Free-Standing Starter (cont)

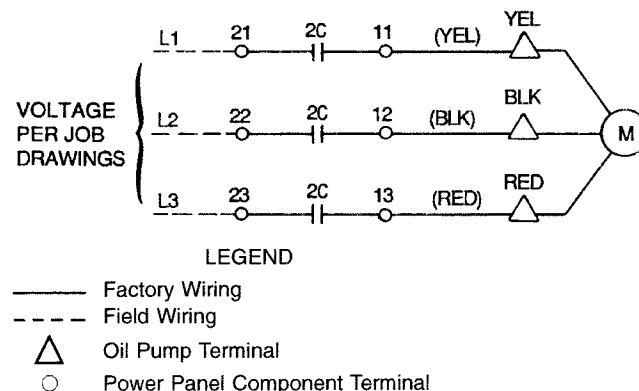
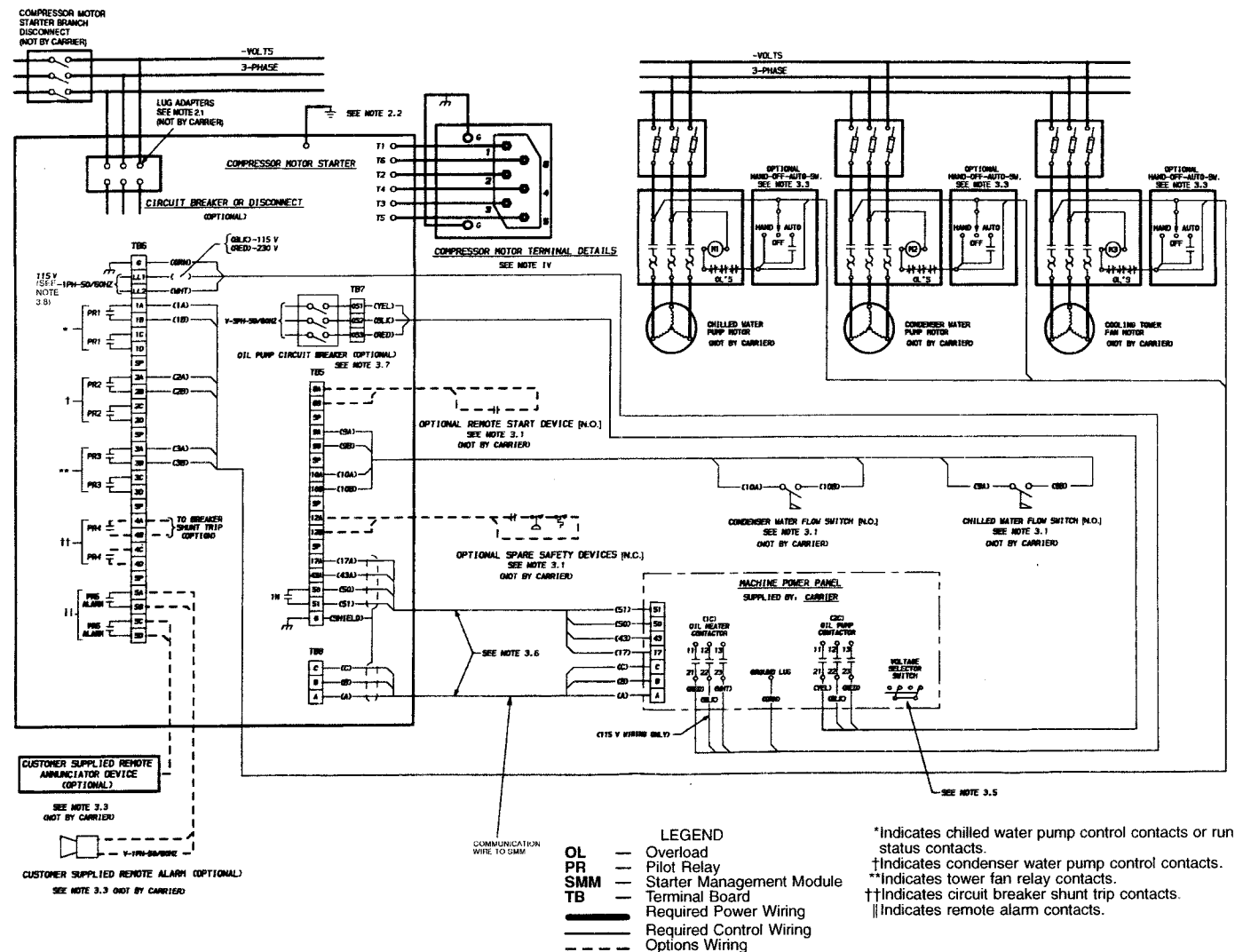


Fig. 15 — Oil Pump Wiring



NOTES:

I. GENERAL

- 1.0 Starters shall be designed and manufactured in accordance with Carrier Engineering Requirement Z-375.
- 1.1 All field-supplied conductors, devices, field-installation wiring, and 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 deenergized and the chiller shut down.
- 1.5 **WARNING** — Do not use aluminum conductors.
- 1.6 Installer is responsible for any damage caused by improper wiring between starter and machine.

II. POWER WIRING TO STARTER

- 2.0 Power conductor rating must meet minimum unit nameplate voltage and compressor motor RLA.
When (3) conductors are used:
Minimum ampacity per conductor = 1.25 x compressor RLA
When (6) conductors are used for Wye-Delta starting:
Minimum ampacity per conductor = 0.721 x compressor RLA
- 2.1 Lug adapters may be required if installation conditions dictate that conductors be sized beyond the minimum ampacity required. Contact starter supplier for lug information.
- 2.2 Compressor motor and controls must be grounded by using equipment grounding lugs provided inside starter enclosure.

III. CONTROL WIRING

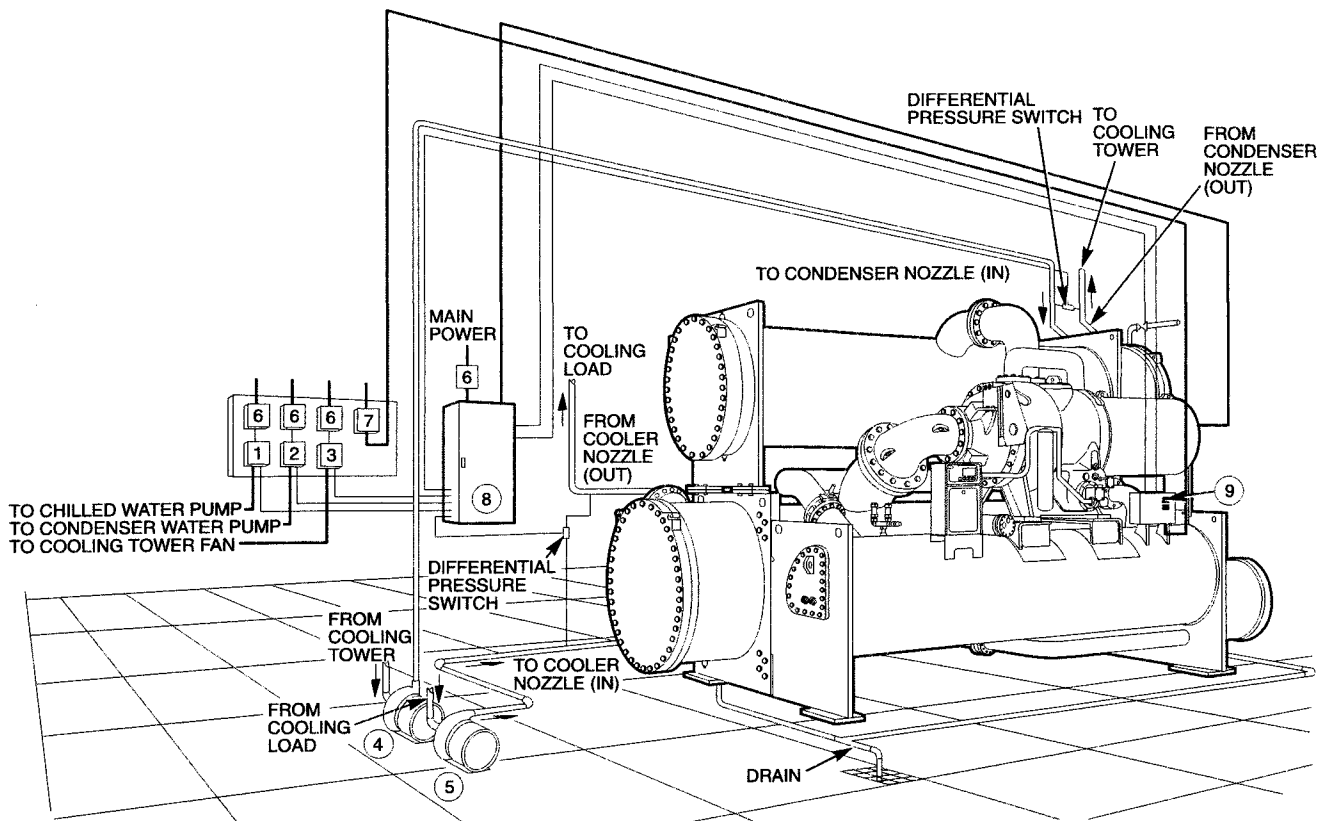
- 3.0 Field supplied control conductors to be at least 18 AWG or larger.
- 3.1 Chilled water and condenser water flow switch contacts, optional remote start device contacts and optional spare safety device contacts must have 24 vdc rating. Max current is 60 ma, nominal current is 10 ma. Switches with gold plated bifurcated contacts are recommended.
- 3.2 Remove jumper wire between 12A and 12B before connecting auxiliary safeties between these terminals.
- 3.3 Pilot relays can control cooler and condenser pump and tower fan motor contactor coil loads rated 10 amps at 115 vac up to 3 amps at 600 vac. 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 are controlled by other means, also provide a parallel means for control by Carrier. **Do not use starter control transformer as the power source for pilot relay loads.**
- 3.4 Do not route control wiring carrying 30 v or less within a conduit which has wires carrying 50 v or higher or along side wires carrying 50 v or higher.

- 3.5 Voltage selector switch in machine power panel is factory set for 115 v control power source. Do not use the 230 v position. If this switch is set to 230 v position, the oil heater will not operate.
- 3.6 Control wiring cables between starter and power panel must be shielded with minimum rating of 600 v, 80 C ground shield at starter. Wires A, B, and C are communication wires and must be run in a separate cable.
- 3.7 If optional oil pump circuit breaker is not supplied within the starter enclosure as shown, it must be located within sight of the machine with wiring routed to suit.
- 3.8 Voltage to terminals LL1 and LL2 comes from a control transformer in a starter built to Carrier specifications. Do not connect an outside source of control power to the compressor motor starter (terminals LL1 and LL2). An outside power source will produce dangerous voltage at the line side of the starter, because supplying voltage at the transformer secondary terminals produces input level voltage at the transformer primary terminals.

IV. POWER WIRING BETWEEN STARTER AND COMPRESSOR MOTOR

- 4.0 Low voltage (600 v or less) compressor motors have (6), 5/16 in. terminal studs (lead connectors not supplied by Carrier). Either 3 or 6 leads must be run between compressor motor and starter, depending on type of motor starter employed. If only 3 leads are required, jumper motor terminals as follows: 1 to 6, 2 to 4, 3 to 5. Center to center distance between terminals is 2 1/16 inches. Compressor motor starter must have nameplate stamped as to conforming with Carrier requirement Z-375. Medium voltage (over 600 v) compressor motors have (3) terminals. Connections out of terminals are 3 in. long stranded wire pigtailed, #4 AWG, strand wire for all medium voltage motor sizes. Distance between terminal is 7 7/16 inches. Use suitable splice connectors and insulation for high voltage alternating current cable terminations (these items are not supplied by Carrier). Compressor motor starter must have nameplate stamped as to conforming with Carrier requirement Z-375.
- 4.1 When more than one conduit is used to run conductors from starter to compressor motor terminal box, one conductor from each phase must be in each conduit to prevent excessive heating, (e.g., conductors to motor terminals 1, 2 and 3 in one conduit, and those to 4, 5 and 6 in another.)
- 4.2 Compressor motor power connections can be made through top, top rear or sides of compressor motor terminal box using holes cut by contractor to suit conduit. Flexible conduit should be used for the last few feet to the terminal box for unit vibration isolation. Use of stress cones or 12 conductors larger than 500 MCM may require an oversize (special) motor terminal box (not supplied by Carrier). Lead connections between 3-phase motors and their starters must not be insulated until Carrier personnel have checked compressor and oil pump rotations.
- 4.3 Compressor motor frame to be grounded in accordance with the National Electrical Code (NFPA-70) and applicable codes. Means for grounding compressor motor is a pressure connector for #4 to 500 MCM wire, supplied and located in the back lower left side corner of the compressor motor terminal box.
- 4.4 Do not allow motor terminals to support weight of wire cables. Use cable supports and strain reliefs as required.
- 4.5 Use backup wrench when tightening lead connectors to motor terminal studs. Torque to 45 lb-ft max.

Fig. 16 — Typical Field Wiring (Low-Voltage Motors) with Free-Standing Starter



LEGEND

- 1 — Chilled Water Pump Starter
- 2 — Condenser Water Pump Starter
- 3 — Cooling Tower Fan Starter
- 4 — Condenser Water Pump
- 5 — Chilled Water Pump
- 6 — Disconnect
- 7 — Oil Pump Disconnect (See Note 5)
- 8 — Free-Standing Compressor Motor Starter
- 9 — Chiller Auxiliary Power Panel
- Piping
- Control Wiring
- Power Wiring

NOTES:

1. Wiring and piping shown are for general point-of-connection only and are not intended to show details for a specific installation. Certified field wiring and dimensional diagrams are available on request.
2. All wiring must comply with applicable codes.
3. Refer to Carrier System Design Manual for details regarding piping techniques.
4. Wiring not shown for optional devices such as:
 - Remote Start-Stop
 - Remote Alarms
 - Optional Safety Device
 - 4 to 20 mA Resets
 - Optional Remote Sensors
5. Oil pump disconnect may be located within the enclosure of Item 8 — Free-Standing Compressor Motor Starter.
6. Water piping to the oil cooler is required on FA compressors.

Fig. 17 — Typical Piping and Wiring — Chiller with Free-Standing Starter (Hermetic Machine Shown)

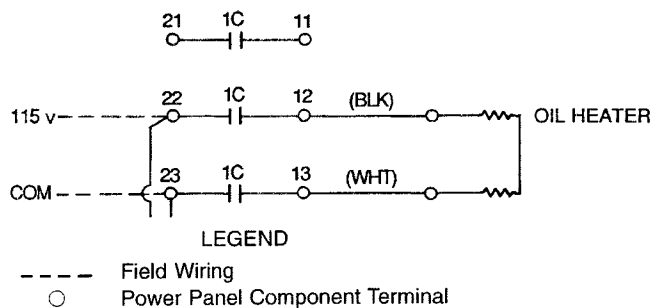


Fig. 18 — Oil Heater and Control Power Wiring

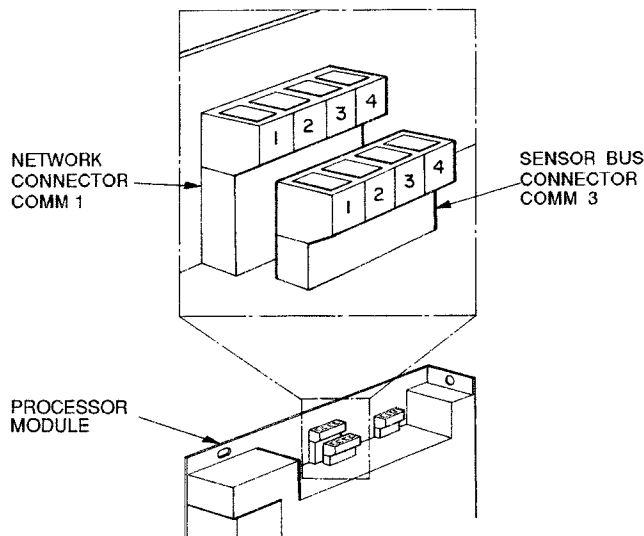
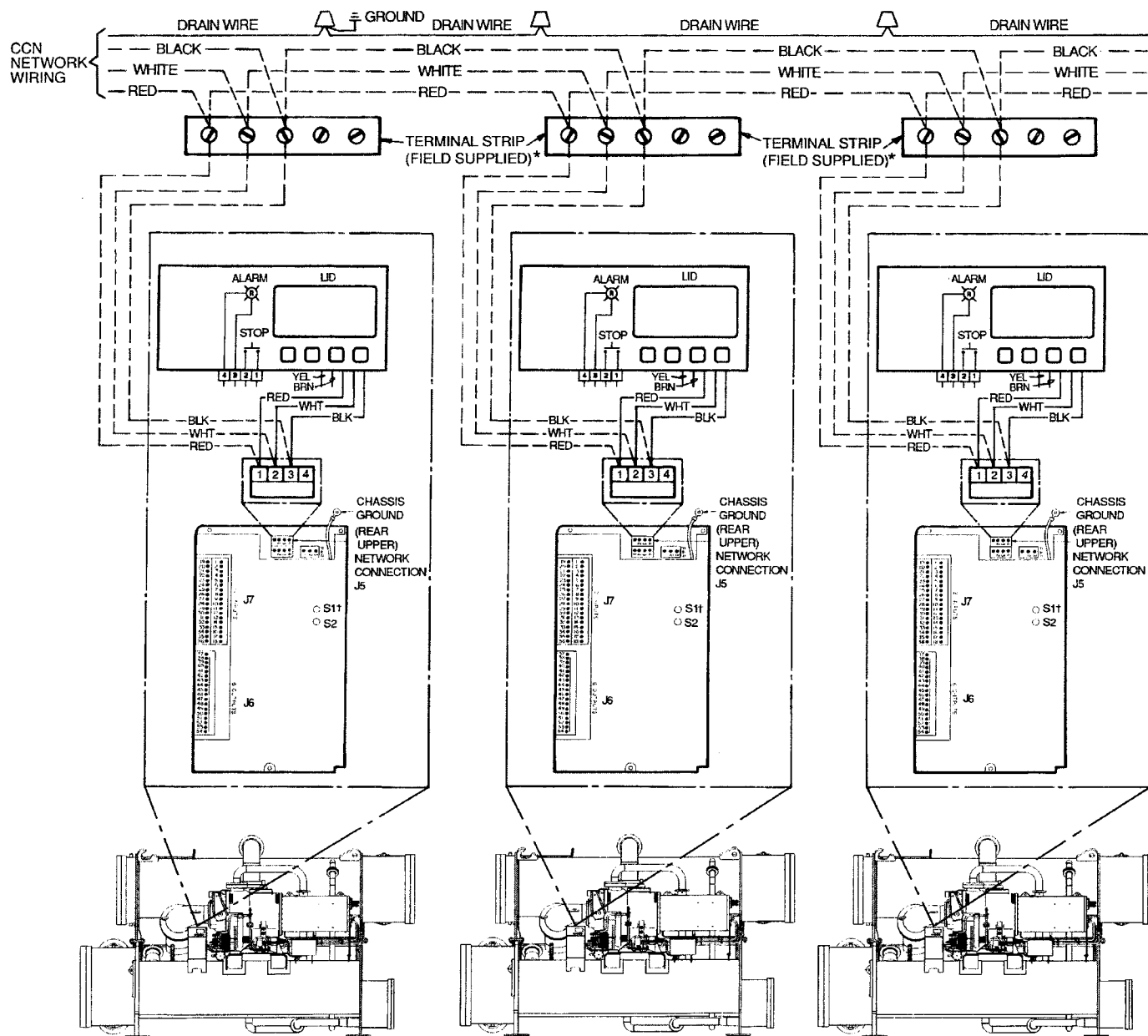


Fig. 19 — Carrier Comfort Network Communication Bus Wiring



LEGEND

- Factory Wiring
- Field Wiring

*Field-supplied terminal strip must be located in the control center.

†Switches S1 and S2 are factory set on PSIO modules. Do not alter the switches.

Fig. 20 — COMM1 CCN Communication Wiring for Multiple Chillers (Typical)

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	COMM1 PLUG PIN NO.
+	Red	1
Ground	White	2
-	Black	3

If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to ground at only one single point. See Fig. 20. If the communication bus cable exits from one building and enters another, the shields must be connected to ground at the lightning suppressor in each building where the cable enters or exits the building (one point only).

To connect the chiller to the network, proceed as follows (Fig. 20):

1. Cut power to the PIC (Product Integrated Control) panel.
2. Remove the COMM1 plug from the processor module.
3. Cut a CCN wire and strip the ends of the RED, WHITE, and BLACK conductors.
4. Using a wirenut, connect the drain wires together.
5. Insert and secure the RED wire to Terminal 1 of the COMM1 plug.
6. Insert and secure the WHITE wire to Terminal 2 of the COMM1 plug.
7. Insert and secure the BLACK wire to Terminal 3 of the COMM1 plug.
8. Attach the COMM1 plug back onto the processor module.
9. Mount a terminal strip in a convenient location.
10. Connect the opposite ends of each conductor to separate terminals on the terminal strip.
11. Attach the CCN Network wiring:
 - a. Connect the RED wire to the matching location on the terminal strip.
 - b. Connect the WHITE wire to the matching location on the terminal strip.
 - c. Connect the BLACK wire to the matching location on the terminal strip.

Control Center — The control center is the user interface for controlling the machine and regulates the machine capacity as required to maintain proper leaving chilled water temperature. The control center:

- registers cooler, condenser, and lubricating system pressures
- shows machine operating condition and alarm shutdown conditions
- records the total machine operating hours and how many hours the machine has been running
- sequences machine start, stop, and recycle under micro-processor control
- provides access to other CCN devices

Lubrication Cycle — Controls — Refer to unit instructions for oil lubrication system.

A motor-driven oil pump discharges oil to an oil cooler at a rate and pressure controlled by an oil regulator. The differential oil pressure is registered on the control panel. For open-drive machines, the differential oil pressure is bearing supply versus oil reservoir. For hermetic machines, the differential oil pressure is supply versus cooler suction. Oil differential pressure is maintained between 18 to 30 psi (124 to 207 kPa).

During shutdown, the oil temperature is also maintained at 150 to 160 F (65 to 71 C) by an immersion heater in order to minimize absorption of refrigerant by the oil.

On open-drive machines only: If the machine is not operating and the oil pump has not operated during the last 12 hours, the control system will automatically run the oil pump for one minute in order to keep the contact seal filled with oil.

Several safety features are part of the lubrication system:

The bearing temperature sensor monitors thrust bearing temperatures and shuts off the machine if the temperature rises above a selected point. Low-oil pressure will shut down the machine or prevent a start if oil pressure is not adequate.

The PIC (Product Integrated Control) measures the temperature of the oil in the sump and maintains the temperature during shutdown (see Oil Sump Temperature Control section, page 41. This temperature is read on the LID default screen.

During the machine start-up, the PIC will energize the oil pump and provide 15 seconds of prelubrication to the bearings after the oil pressure is verified and before the controls start the compressor. During shutdown, the oil pump will run for 60 seconds after the compressor actually shuts down for the purpose of post-lubrication. The oil pump can also be energized for testing purposes in controls 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; oil pressure falls off, and lubrication is poor. If oil pressure falls below 15 psi (90 kPa) differential, the PIC will shut down the compressor.

GENERAL

-
- PRIMARY STATUS MESSAGE**
- SECONDARY STATUS MESSAGE**
- ALARM LIGHT (ILLUMINATED WHEN POWER ON)**
- BLINKS CONTINUOUSLY ON FOR AN ALARM
 - BLINKS ONCE TO CONFIRM A STOP
- STOP BUTTON**
- HOLD FOR ONE SECOND TO STOP
- COMPRESSOR ON TIME**
- DATE**
- TIME**
- SOFT KEYS**
- MENU LINE**
- EACH KEY'S FUNCTION IS DEFINED BY THE MENU DESCRIPTION ON MENU LINE ABOVE**
- The diagram shows a control panel with a large rectangular display area. Above the display, labels point to 'PRIMARY STATUS MESSAGE', 'SECONDARY STATUS MESSAGE', 'COMPRESSOR ON TIME', 'DATE', and 'TIME'. To the left of the display is an 'ALARM LIGHT' icon. Below the display is a row of five 'SOFT KEYS' and a 'STOP BUTTON' icon. A 'MENU LINE' is indicated at the bottom right. The display itself shows a table of data:
- | TEMP | TEMP | TEMP |
|-------|--------|------|
| 57.1 | 44.1 | 40.2 |
| 58.0 | 58.0 | 98.1 |
| 2.158 | 1331.0 | 90 |

ALARMS AND ALERTS — Alarm (*) and alert (!) status are indicated on the Default screen and the Status tables. An alarm (*) will shut down the compressor. An alert (!) notifies the operator that an unusual condition has occurred. The machine will continue to operate when an alert is shown.

NOTE: When an alarm is detected, the LID default screen will freeze (stop updating) at the time of alarm. The freeze enables the operator to view the machine 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 LID screen will return to normal operation.



The Default screen menu selection offers four options (Status, Schedule, Set Point, and Service). The Status menu allows for viewing and limited calibration/modification of control points and sensors, relays and contacts, and the options board. The Schedule menu allows for the viewing and modification of the Local Control, CCN Control, and Ice Build time schedules. Numerous set points including Base Demand Limit, LCW, ECW, and Ice Build can be adjusted under the Set Point menu. The Service menu can be used to revise alarm history, control test, control algorithm status, equipment configuration, equipment service, time and date, attach to network, log out of device, controller identification, and LID configurations. Figures 23 and 24 provide additional information on the menu structure.

MENU STRUCTURE — To perform any of the operations described below, the PIC must be powered up and have successfully completed its self test.

- | CCN | LOCAL | RESET | MENU |
|---|---|---|---|
|  |  |  |  |

- | STATUS | SCHEDULE | SETPOINT | SERVICE |
|--------|----------|----------|---------|
| | | | |

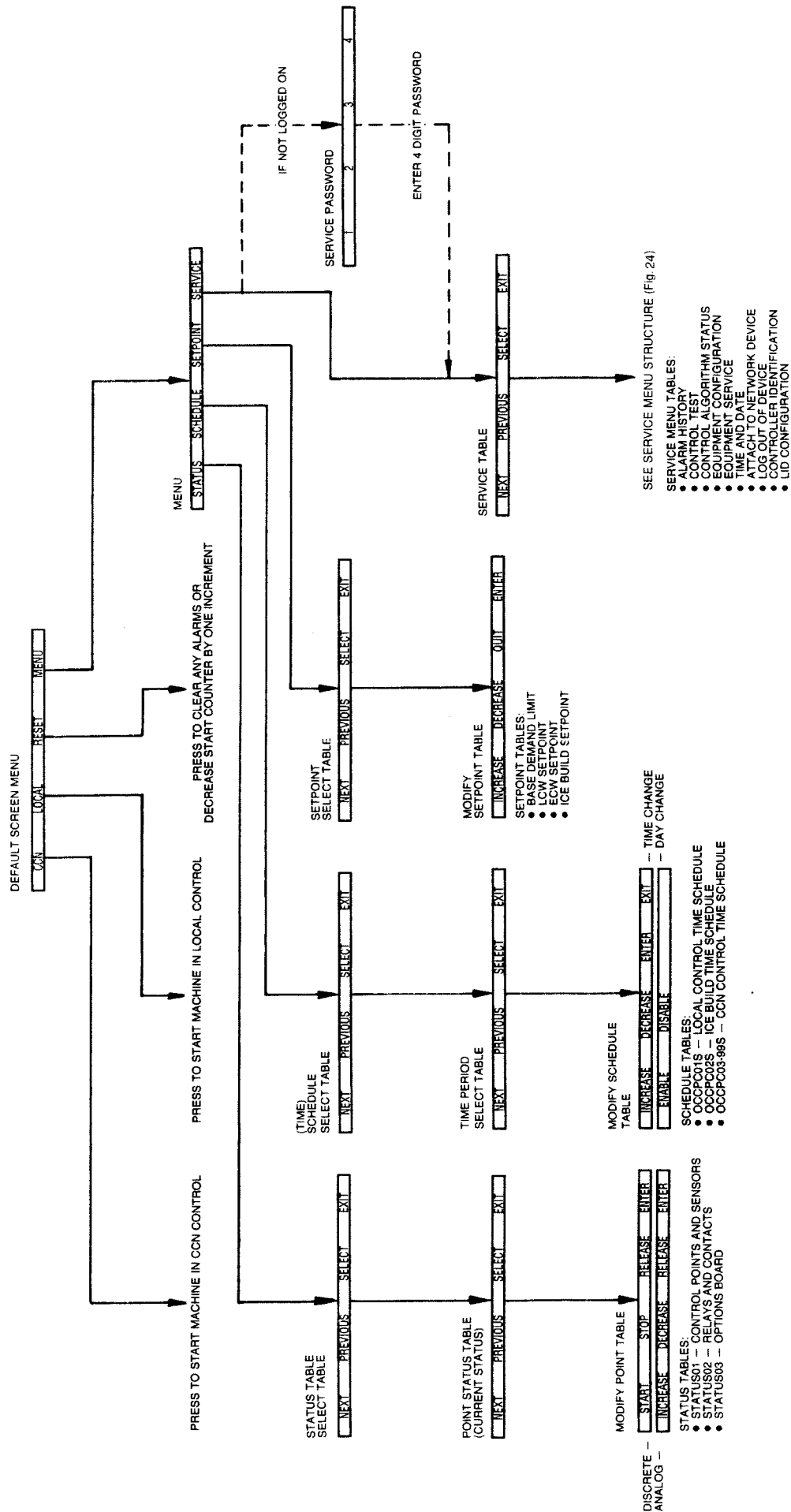


Fig. 23 — LID Menu Structure

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

NEXT	PREVIOUS	SELECT	ENTER

- Press **SELECT** to access the highlighted point.

NEXT	PREVIOUS	SELECT	EXIT

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

INCREASE	DECREASE	QUIT	ENTER

- Or, press **ENTER** to leave the selected decision or field and save changes.

INCREASE	DECREASE	QUIT	ENTER

TO VIEW OR CHANGE POINT STATUS (Fig. 25) — Point Status is the actual value of all of the temperatures, pressures, relays, and actuators sensed and controlled by the PIC.

- On the Menu screen, press **STATUS** to view the list of Point Status tables.

STATUS	SCHEDULE	SETPOINT	SERVICE

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

- Status01 — Status of control points and sensors
- Status02 — Status of relays and contacts
- Status03 — Status of both optional 8-input modules and sensors

NEXT	PREVIOUS	SELECT	ENTER

- Press **SELECT** to view the desired Point Status table.

NEXT	PREVIOUS	SELECT	ENTER

- On the Point Status table press **NEXT** or **PREVIOUS** until desired point is displayed on the screen.

NEXT	PREVIOUS	SELECT	ENTER

For Discrete Points — Press **START** or **STOP**, **YES** or **NO**, **ON** or **OFF**, etc. to select the desired state.

START	STOP	RELEASE	ENTER

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

INCREASE	DECREASE	RELEASE	ENTER

- Press **ENTER** to register new value.

INCREASE	DECREASE	RELEASE	ENTER

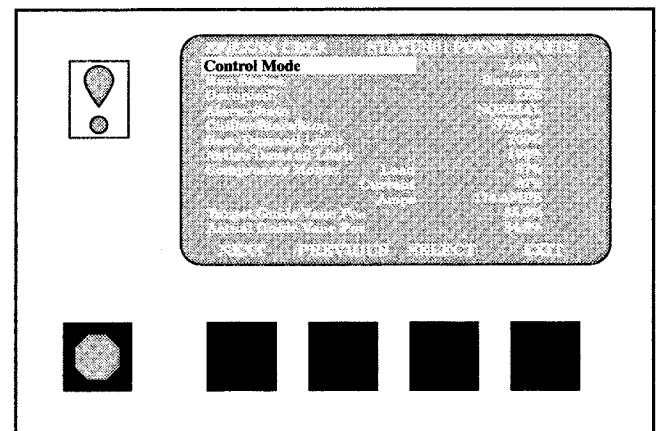


Fig. 25 — Example of Point Status Screen (Status01)

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

To Remove an Override

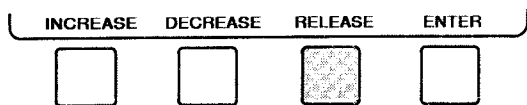
- On the Point Status table press **NEXT** or **PREVIOUS** to highlight the desired point.

NEXT	PREVIOUS	SELECT	EXIT

- Press **SELECT** to access the highlighted point.

NEXT	PREVIOUS	SELECT	EXIT

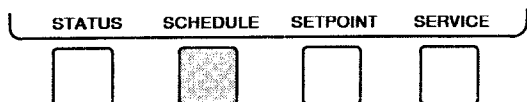
3. Press **RELEASE** to remove the override and return the point to the PIC's automatic control.



Override Indication — An override value is indicated by "SUPVSR," "SERVC," or "BEST" flashing next to the point value on the Status table.

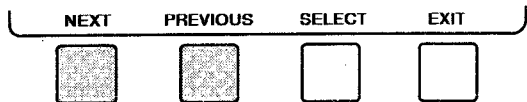
TO VIEW OR CHANGE TIME SCHEDULE OPERATION (Fig. 26)

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

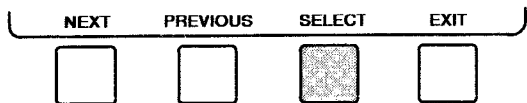


2. Press **NEXT** or **PREVIOUS** to highlight one of the following schedules.

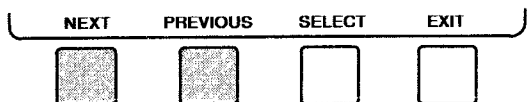
OCCPC01S — LOCAL Time Schedule
OCCPC02S — ICE BUILD Time Schedule
OCCPC03-99S — CCN Time Schedule (Actual number is defined in Config table.)



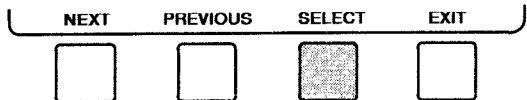
3. Press **SELECT** to access and view the time schedule.



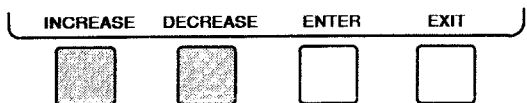
4. Press **NEXT** or **PREVIOUS** to highlight the desired period or override that you wish to change.



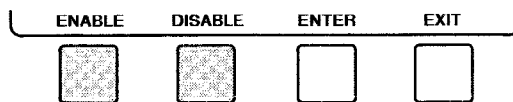
5. Press **SELECT** to access the highlighted period or override.



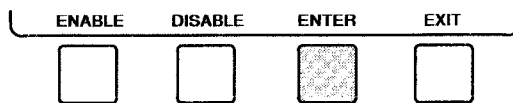
6. a. Press **INCREASE** or **DECREASE** to change the time values. Override values are in one-hour increments, up to 4 hours.



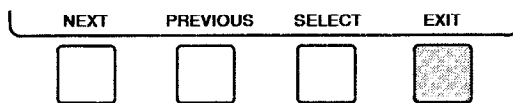
- b. Press **ENABLE** to select days in the day-of-week fields. Press **DISABLE** to eliminate days from the period.



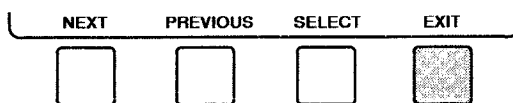
7. Press **ENTER** to register the values and to move horizontally (left to right) within a period.



8. Press **EXIT** to leave the period or override.



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



10. Holiday Designation (HOLIDEF table) may be found in the Service Operation section, page 46. You must assign the month, day, and duration for the holiday. The Broadcast function in the Brodefs table also must be enabled for holiday periods to function.

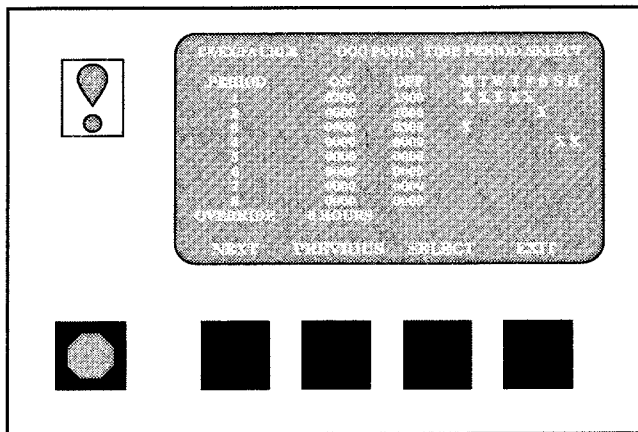
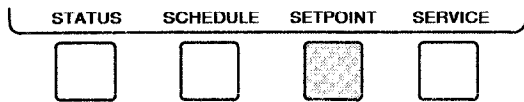


Fig. 26 — Example of Time Schedule Operation Screen

TO VIEW AND CHANGE SET POINTS (Fig. 27)

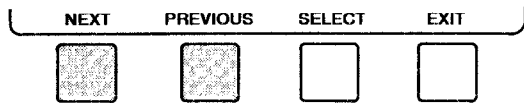
1. To view the Set Point table, at the Menu screen press

SET POINT.

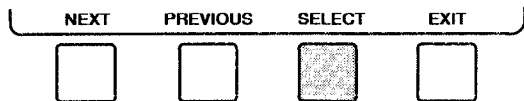


2. There are 4 set points on this screen: Base Demand Limit; LCW Set Point (leaving chilled water set point); ECW Set Point (entering chilled water set point); and ICE BUILD set point. Only one of the chilled water set points can be active at one time, and the type of set point is activated in the Service menu. ICE BUILD is also activated and configured in the Service menu.

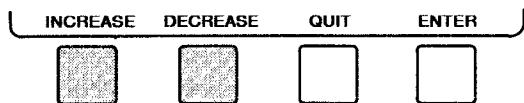
3. Press **NEXT** or **PREVIOUS** to highlight the desired set point entry.



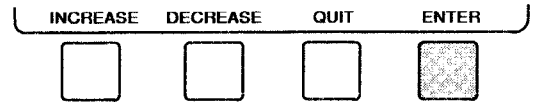
4. Press **SELECT** to modify the highlighted set point.



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



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



SERVICE OPERATION — To view the menu-driven programs available for Service Operation, see Service Operation section, page 47. For examples of LID display screens, see Table 3.

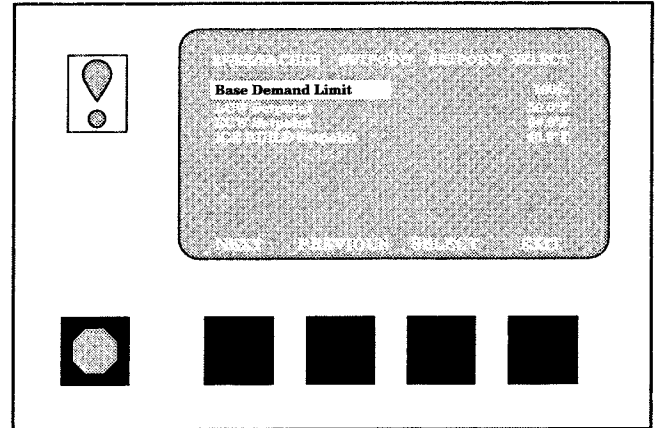


Fig. 27 — Example of Set Point Screen

Table 3 — LID Screens

NOTES:

1. Only 12 lines of information appear on the LID screen at any given time. Press **NEXT** or **PREVIOUS** to highlight a point or to view points below or above the current screen.
2. The LID may be configured in English or SI units, as required, through the LID configuration screen.
3. Data appearing in the Reference Point Names column is used for CCN operations only.

EXAMPLE 1 — STATUS01 DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **STATUS** (STATUS01 will be highlighted).
3. Press **SELECT**.

DESCRIPTION	RANGE	UNITS	REFERENCE POINT NAME (ALARM HISTORY)
Control Mode	Reset.Off.Local.CCN		MODE
Run Status	Timeout.Recycle.Startup. Ramping.Running.Demand. Override.Shutdown.Abnormal. Pumpdown		STATUS
Occupied ?	No/Yes		OCC
Alarm State	Normal/Alarm		ALM
*Chiller Start/Stop	Stop/Start		CHIL...S...S
Base Demand Limit	40-100	%	DLM
*Active Demand Limit	40-100	%	DEM...LIM
Compressor Motor Load	0-999	%	CA...L
Current	0-999	%	CA...P
Amps	0-9999	AMPS	CA...A
*Target Guide Vane Pos	0-100	%	GV...TRG
Actual Guide Vane Pos	0-100	%	GV...ACT
Water/Brine: Setpoint	10-120 (-12.2-48.9)	DEG F (DEG C)	SP
* Control Point	10-120 (-12.2-48.9)	DEG F (DEG C)	LCW...STPT
Entering Chilled Water	-40-245 (-40-118)	DEG F (DEG C)	ECW
Leaving Chilled Water	-40-245 (-40-118)	DEG F (DEG C)	LCW
Entering Condenser Water	-40-245 (-40-118)	DEG F (DEG C)	ECDW
Leaving Condenser Water	-40-245 (-40-118)	DEG F (DEG C)	LCDW
Evaporator Refrig Temp	-40-245 (-40-118)	DEG F (DEG C)	ERT
Evaporator Pressure	-6.7-420 (-46-2896)	PSI (kPa)	ERP
Condenser Refrig Temp	-40-245 (-40-118)	DEG F (DEG C)	CRT
Condenser Pressure	-6.7-420 (-46-2896)	PSI (kPa)	CRP
Discharge Temperature	-40-245 (-40-118)	DEG F (DEG C)	CMPD
Bearing Temperature	-40-245 (-40-118)	DEG F (DEG C)	MTRB
Motor Winding Temp†	-40-245 (-40-118)	DEG F (DEG C)	MTRW
Motor Winding Hi			
Temp Cutout**	Normal/Alarm		MTRW
Oil Sump Temperature	-40-245 (-40-118)	DEG F (DEG C)	OILT
Oil Pressure Transducert	-6.7-420 (-46-2896)	PSI (kPa)	OILP
Oil Pressure††	-6.7-420 (-46-2896)	PSID (kPad)	OILPD
Line Voltage: Percent	0-999	%	V...P
Actual	0-9999	VOLTS	V...A
*Remote Contacts Input	Off/On		REMCON
Total Compressor Starts	0-65535		c...starts
Starts in 12 Hours	0-8		STARTS
Compressor Ontime	0-500000.0	HOURS	c...hrs
*Service Ontime	0-32767	HOURS	S...HRS
*Compressor Motor kW	0-9999	kW	CKW

NOTE: All values are variables available for read operation to a CCN. Descriptions shown with (*) support write operations for BEST programming language, data-transfer, and overriding.

†Information is applicable to hermetic machines only.

**Information is applicable to open-drive machines only.

††Oil pressure is read directly from a differential pressure module on open-drive machines.

Table 3 — LID Screens (cont)

EXAMPLE 2 — STATUS02 DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **STATUS**.
3. Scroll down to highlight **STATUS02**.
4. Press **SELECT**.

DESCRIPTION	POINT TYPE		UNITS	REFERENCE POINT NAME (ALARM HISTORY)
	INPUT	OUTPUT		
Hot Gas Bypass Relay		X	OFF/ON	HGBR
*Chilled Water Pump		X	OFF/ON	CHWP
Chilled Water Flow	X		NO/YES	EVFL
*Condenser Water Pump		X	OFF/ON	CDP
Condenser Water Flow	X		NO/YES	CDFL
Compressor Start Relay		X	OFF/ON	CMPR
Compressor Start Contact	X		OPEN/CLOSED	1CR...AUX
Compressor Run Contact	X		OPEN/CLOSED	RUN...AUX
Starter Fault Contact	X		OPEN/CLOSED	STR...FLT
Pressure Trip Contact	X		OPEN/CLOSED	PRS...TRIP
Single Cycle Dropout	X		NORMAL/ALARM	V1...CYCLE
Oil Pump Relay		X	OFF/ON	OILR
Oil Heater Relay		X	OFF/ON	OILH
Motor Cooling Relay†		X	OFF/ON	MTRC
Auxiliary Oil Pump Relay**		X	OFF/ON	AUXOILR
*Tower Fan Relay		X	OFF/ON	TFR
Compr. Shunt Trip Relay		X	OFF/ON	TRIPR
Alarm Relay		X	NORMAL/ALARM	ALM
Spare Prot Limit Input	X		ALARM/NORMAL	SPR...PL

NOTE: All values are variables available for read operation to a CCN. Descriptions shown with (*) support write operations from the LID only.

†Information is applicable to hermetic machines only.

**Information is applicable to open-drive machines only.

EXAMPLE 3 — STATUS03 DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **STATUS**.
3. Scroll down to highlight **STATUS03**.
4. Press **SELECT**.

DESCRIPTION	RANGE	UNITS	REFERENCE POINT NAME (ALARM HISTORY)
OPTIONS BOARD 1			
*Demand Limit 4-20 mA	4-20	mA	DEM...OPT
*Temp Reset 4-20 mA	4-20	mA	RES...OPT
*Common CHWS Sensor	-40-245 (-40-118)	DEG F (DEG C)	CHWS
*Common CHWR Sensor	-40-245 (-40-118)	DEG F (DEG C)	CHWR
*Remote Reset Sensor	-40-245 (-40-118)	DEG F (DEG C)	R...RESET
*Temp Sensor — Spare 1	-40-245 (-40-118)	DEG F (DEG C)	SPARE1
*Temp Sensor — Spare 2	-40-245 (-40-118)	DEG F (DEG C)	SPARE2
*Temp Sensor — Spare 3	-40-245 (-40-118)	DEG F (DEG C)	SPARE3
OPTIONS BOARD 2			
*4-20 mA — Spare 1	4-20	mA	SPARE1...M
*4-20 mA — Spare 2	4-20	mA	SPARE2...M
*Temp Sensor — Spare 4	-40-245 (-40-118)	DEG F (DEG C)	SPARE4
*Temp Sensor — Spare 5	-40-245 (-40-118)	DEG F (DEG C)	SPARE5
*Temp Sensor — Spare 6	-40-245 (-40-118)	DEG F (DEG C)	SPARE6
*Temp Sensor — Spare 7	-40-245 (-40-118)	DEG F (DEG C)	SPARE7
*Temp Sensor — Spare 8	-40-245 (-40-118)	DEG F (DEG C)	SPARE8
*Temp Sensor — Spare 9	-40-245 (-40-118)	DEG F (DEG C)	SPARE9

NOTE: All values shall be variables available for read operation to a CCN network. Descriptions shown with (*) support write operations for BEST programming language, data-transfer, and overriding.

Table 3 — LID Screens (cont)

EXAMPLE 4 — SETPOINT DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **SETPOINT**.

DESCRIPTION	CONFIGURABLE RANGE	UNITS	REFERENCE POINT NAME	DEFAULT VALUE
Base Demand Limit	40-100	%	DLM	100
LCW Setpoint	20-120 (-6.7-48.9)	DEG F (DEG C)	lcw... sp	50.0 (10.0)
ECW Setpoint	20-120 (-6.7-48.9)	DEG F (DEG C)	ecw... sp	60.0 (15.6)
ICE BUILD Setpoint	20- 60 (-6.7-15.6)	DEG F (DEG C)	ice... sp	40.0 (4.4)

EXAMPLE 5 — CONFIGURATION (CONFIG) DISPLAY SCREEN

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

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

DESCRIPTION	CONFIGURABLE RANGE	UNITS	REFERENCE POINT NAME	DEFAULT VALUE
RESET TYPE 1 Degrees Reset at 20 mA	-30-30 (-17-17)	DEG F (DEG C)	deg... 20ma	10Δ(6Δ)
RESET TYPE 2 Remote Temp (No Reset)	-40-245 (-40-118)	DEG F (DEG C)	res... rt1	85 (29)
Remote Temp (Full Reset)	-40-245 (-40-118)	DEG F (DEG C)	res... rt2	65 (18)
Degrees Reset	-30-30 (-17-17)	DEG F (DEG C)	res... rt	10Δ(6Δ)
RESET TYPE 3 CHW Delta T (No Reset)	0-15 (0-8)	DEG F (DEG C)	restd... 1	10Δ(6Δ)
CHW Delta T (Full Reset)	0-15 (0-8)	DEG F (DEG C)	restd... 2	0Δ(0Δ)
Degrees Reset	-30-30 (-17-17)	DEG F (DEG C)	deg... chw	5Δ(3Δ)
Select/Enable Reset Type	0-3		res... sel	0
ECW CONTROL OPTION	DISABLE/ENABLE		ecw... opt	DISABLE
Demand Limit At 20 mA	40-100	%	dem... 20ma	40
20mA Demand Limit Option	DISABLE/ENABLE		dem... sel	DISABLE
Auto Restart Option	DISABLE/ENABLE		astart	DISABLE
Remote Contacts Option	DISABLE/ENABLE		r... contact	DISABLE
Temp Pulldown Deg/Min	2-10		tmp... ramp	3
Load Pulldown %/Min	5-20		kw... ramp	10
Select Ramp Type:	0/1		ramp... opt	1
Temp = 0, Load = 1				
Loadshed Group Number	0-99		ldsgrp	0
Loadshed Demand Delta	0-60	%	ldsdelta	20
Maximum Loadshed Time	0-120	MIN	maxldstm	60
CCN Occupancy Config:				
Schedule Number	3-99		occpccxe	3
Broadcast Option	DISABLE/ENABLE		occbrcst	DISABLE
ICE BUILD Option	DISABLE/ENABLE		ibopt	DISABLE
ICE BUILD TERMINATION 0 =Temp, 1 =Contacts, 2 =Both	0-2		ibterm	0
ICE BUILD Recycle Option	DISABLE/ENABLE		ibrecyc	DISABLE

NOTE: Δ = delta degrees.

Table 3 — LID Screens (cont)

EXAMPLE 6 — LEAD/LAG CONFIGURATION DISPLAY SCREEN

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

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

LEAD/LAG CONFIGURATION SCREEN

DESCRIPTION	CONFIGURABLE RANGE	UNITS	REFERENCE POINT NAME	DEFAULT VALUE
LEAD/LAG SELECT DISABLE =0, LEAD =1, LAG =2, STANDBY =3	0-3		leadlag	0
Load Balance Option	DISABLE/ENABLE		loadbal	DISABLE
Common Sensor Option	DISABLE/ENABLE		commsens	DISABLE
LAG Percent 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	0-30	MIN	prefit	5
STANDBY Chiller Option	DISABLE/ENABLE		stndopt	DISABLE
STANDBY Percent Capacity	25-75	%	stnd --- per	50
STANDBY Address	1-236		stnd --- add	93

Table 3 — LID Screens (cont)

EXAMPLE 7 — SERVICE1 DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **SERVICE1**.
6. Press **SELECT**.

DESCRIPTION	CONFIGURABLE RANGE	UNITS	REFERENCE POINT NAME	DEFAULT VALUE
Motor Temp Override*	150-200 (66-93)	DEG F (DEG C)	mt___over	200 (93)
Cond Press Override	90-200 (620-1379)	PSI (kPa)	cp___over	125 (862)
Refrig Override Delta T	2-5 (1-3)	DEG F (DEG C)	ref___over	3Δ (1.6Δ)
Chilled Medium	Water/Brine		medium	WATER
Brine Refrig Trippoint	8-40 (-13.3-4)	DEG F (DEG C)	br___trip	33 (1)
Compr Discharge Alert	125-200 (52-93)	DEG F (DEG C)	cd___alert	200 (93)
Bearing Temp Alert	165-210 (74-99)	DEG F (DEG C)	tb___alert	210 (99)
Water Flow Verify Time	0.5-5	MIN	wflow___t	5
Oil Press Verify Time	15-300	SEC	oilpr___t	15
Water/Brine Deadband	0.5-2.0 (0.3-1.1)	DEG F (DEG C)	cw___db	1.0 (0.6)
Recycle Restart Delta T	2.0-10.0 (1.1-5.6)	DEG F (DEG C)	rcycrdt	5 (2.8)
Recycle Shutdown Delta†	0.5-4.0 (.27-2.2)		rcycsdt	1.0 (0.6)
Surge Limit/HGBP Option	0/1		srg___hgbp	0
Select: Surge=0, HGBP=1				
Surge/HGBP Delta T1	0.5-15 (0.3-8.3)	DEG F (DEG C)	hgb___dt1	1.5 (0.8)
Surge/HGBP Delta P1	30-170 (207-1172)	PSI (kPa)	hgb___dp1	50 (345)
Min. Load Points (T1/P1)				
Surge/HGBP Delta T2	0.5-15 (0.3-8.3)	DEG F (DEG C)	hgb___dt2	10 (5.6)
Surge/HGBP Delta P2	30-170 (207-1172)	PSI (kPa)	hgb___dp2	85 (586)
Full Load Points (T2/P2)				
Surge/HGBP Deadband	1-3 (0.6-1.6)	DEG F (DEG C)	hgb___dp	1 (0.6)
Surge Delta Percent Amps	10-50	%	surge___a	25
Surge Time Period	1-5	MIN	surge___t	2
Demand Limit Source	0/1		dem___src	0
Select: Amps=0, Load=1				
Amps Correction Factor	1-8		corfact	3
Motor Rated Load Amps	1-9999	AMPS	a___fs	200
Motor Rated Line Voltage	1-9999	VOLTS	v___fs	460
Meter Rated Line kW	1-9999	kW	kw___fs	600
Line Frequency	0/1	HZ	freq	0
Select: 0=60 Hz, 1=50 Hz				
Compr Starter Type	REDUCE/FULL		starter	REDUCE
Condenser Freeze Point	-20-35 (-28.9-1.7)	DEG F (DEG C)	cdfreeze	34 (1)
Soft Stop Amps Threshold	40-100	%	softstop	100
Stop to Start Timert†	3-50	MIN	stopmtr	20

NOTE: Δ = delta degrees.

*Information is applicable to hermetic machines only.

†Information is applicable to open-drive machines only.

Table 3 — LID Screens (cont)

EXAMPLE 8 — SERVICE2 DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **SERVICE2**.
6. Press **SELECT**.

DESCRIPTION	CONFIGURABLE RANGE	UNITS	REFERENCE POINT NAME	DEFAULT VALUE
OPTIONS BOARD 1				
20 mA POWER CONFIGURATION				
External = 0, Internal = 1				
RESET 20 mA Power Source	0,1		res—20 ma	0
DEMAND 20 mA Power Source	0,1		dem—20 ma	0
SPARE ALERT ENABLE				
Disable = 0, 1 = High Alert, 2 = Low Alert, 3 = High Alarm, 4 = Low Alarm				
Temp = Alert Threshold				
CHWS Temp Enable	0-4		chws—en	0
CHWS Temp Alert	–40-245 (–40-118)	DEG F (DEG C)	chws—al	245 (118)
CHWR Temp Enable	0-4		chwr—en	0
CHWR Temp Alert	–40-245 (–40-118)	DEG F (DEG C)	chwr—al	245 (118)
Reset Temp Enable	0-4		rres—en	0
Reset Temp Alert	–40-245 (–40-118)	DEG F (DEG C)	rres—al	245 (118)
Spare Temp 1 Enable	0-4		spr1—en	0
Spare Temp 1 Alert	–40-245 (–40-118)	DEG F (DEG C)	spr1—al	245 (118)
Spare Temp 2 Enable	0-4		spr2—en	0
Spare Temp 2 Alert	–40-245 (–40-118)	DEG F (DEG C)	spr2—al	245 (118)
Spare Temp 3 Enable	0-4		spr3—en	0
Spare Temp 3 Alert	–40-245 (–40-118)	DEG F (DEG C)	spr3—al	245 (118)
OPTIONS BOARD 2				
20 mA POWER CONFIGURATION				
External = 0, Internal = 1				
SPARE 1 20 mA Power Source	0,1		sp1—20 ma	0
SPARE 2 20 mA Power Source	0,1		sp2—20 ma	0
SPARE ALERT ENABLE				
Disable = 0, 1 = High Alert, 2 = Low Alert, 3 = High Alarm, 4 = Low Alarm				
Temp = Alert Threshold				
Spare Temp 4 Enable	0-4		spr4—en	0
Spare Temp 4 Alert	–40-245 (–40-118)	DEG F (DEG C)	spr4—al	245 (118)
Spare Temp 5 Enable	0-4		spr5—en	0
Spare Temp 5 Alert	–40-245 (–40-118)	DEG F (DEG C)	spr5—al	245 (118)
Spare Temp 6 Enable	0-4		spr6—en	0
Spare Temp 6 Alert	–40-245 (–40-118)	DEG F (DEG C)	spr6—al	245 (118)
Spare Temp 7 Enable	0-4		spr7—en	0
Spare Temp 7 Alert	–40-245 (–40-118)	DEG F (DEG C)	spr7—al	245 (118)
Spare Temp 8 Enable	0-4		spr8—en	0
Spare Temp 8 Alert	–40-245 (–40-118)	DEG F (DEG C)	spr8—al	245 (118)
Spare Temp 9 Enable	0-4		spr9—en	0
Spare Temp 9 Alert	–40-245 (–40-118)	DEG F (DEG C)	spr9—al	245 (118)

NOTE: This screen provides the means to generate alert messages based on exceeding the “Temp” threshold for each point listed. If the “Enable” is set to 1, a value above the “Temp” threshold shall generate an alert message. If the “Enable” is set to 2, a value below the “Temp Alert” threshold shall generate an alert message. If the “Enable” is set to 0, alert generation is disabled. If the “Enable” is set to 3, a value above the “Temp” threshold will generate an alarm. If the “Enable” is set to 4, a value below the “Temp” threshold will generate an alarm.

EXAMPLE 9 — SERVICE3 DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **EQUIPMENT SERVICE**.
4. Press **SELECT**.
5. Scroll down to highlight **SERVICE3**.

DESCRIPTION	CONFIGURABLE RANGE	UNITS	REFERENCE POINT NAME	DEFAULT VALUE
Proportional Inc Band	2-10		gv—inc	6.5
Proportional Dec Band	2-10		gv—de	6.0
Proportional ECW Gain	1-3		gv—ecw	2.0
Guide Vane Travel Limit	30-100	%	gv—lim	50

Table 3 — LID Screens (cont)

EXAMPLE 10 — MAINTENANCE (MAINT01) DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **MAINT01**.

DESCRIPTION	RANGE/STATUS	UNITS	REFERENCE POINT NAME
CAPACITY CONTROL			
Control Point	10-120 (-12.2-48.9)	DEG F (DEG C)	ctrlpt
Leaving Chilled Water	-40-245 (-40-118)	DEG F (DEG C)	LCW
Entering Chilled Water	-40-245 (-40-118)	DEG F (DEG C)	ECW
Control Point Error	-99-99 (-55-55)	DEG F (DEG C)	cperr
ECW Delta T	-99-99 (-55-55)	DEG F (DEG C)	ecwdt
ECW Reset	-99-99 (-55-55)	DEG F (DEG C)	ecwres
LCW Reset	-99-99 (-55-55)	DEG F (DEG C)	lcwres
Total Error + Resets	-99-99 (-55-55)	DEG F (DEG C)	error
Guide Vane Delta	-2-2	%	gvd
Target Guide Vane Pos	0-100	%	GV_____TRG
Actual Guide Vane Pos	0-100	%	GV_____ACT
Proportional Inc Band	2-10		gv____inc
Proportional Dec Band	2-10		gv____dec
Proportional ECW Gain	1-3		gv____ecw
Water/Brine Deadband	0.5-2 (0.3-1.1)	DEG F (DEG C)	cwdb

NOTE: Overriding is not supported on this maintenance screen. Active overrides show the associated point in alert (!). Only values with capital letter reference point names are variables available for read operation.

EXAMPLE 11 — MAINTENANCE (MAINT02) DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **MAINT02**.
6. Press **SELECT**.

DESCRIPTION	RANGE/STATUS	UNITS	REFERENCE POINT NAME
OVERRIDE/ALERT STATUS			
MOTOR WINDING TEMP†	-40-245 (-40-118)	DEG F (DEG C)	MTRW
Override Threshold	150-200 (66-93)	DEG F (DEG C)	mt____over
CONDENSER PRESSURE	-6.7-420 (-42-2896)	PSI (kPa)	CRP
Override Threshold	90-245 (621-1689)	PSI (kPa)	cp____over
EVAPORATOR REFRIG TEMP	-40-245 (-40-118)	DEG F (DEG C)	ERT
Override Threshold	2-45 (1-7.2)	DEG F (DEG C)	rt____over
DISCHARGE TEMPERATURE	-40-245 (-40-118)	DEG F (DEG C)	CMPD
Alert Threshold	125-200 (52-93)	DEG F (DEG C)	cd____alert
BEARING TEMPERATURE	-40-245 (-40-118)	DEG F (DEG C)	MTRB
Alert Threshold	175-185 (79-85)	DEG F (DEG C)	tb____alert

NOTE: Overriding is not supported on this maintenance screen. Active overrides show the associated point in alert (!). Only values with capital letter reference point names are variables available for read operation.

†Information is applicable to hermetic machines only.

Table 3 — LID Screens (cont)

EXAMPLE 12 — MAINTENANCE (MAINT03) DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **MAINT03**.
6. Press **SELECT**.

DESCRIPTION	RANGE/STATUS	UNITS	REFERENCE POINT NAME
SURGE/HGBP ACTIVE ?	NO/YES		
Active Delta P	0-200 (0-1379)	PSI (kPa)	dp___a
Active Delta T	0-200 (0-111)	DEG F (DEG C)	dt___a
Calculated Delta T	0-200 (0-111)	DEG F (DEG C)	dt___c
Surge Protection Counts	0-12		spc

NOTE: Override is not supported on this maintenance screen. Only values with capital letter reference point names are variables available for read operation.

EXAMPLE 13 — MAINTENANCE (MAINT04) DISPLAY SCREEN

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

1. Press **MENU**.
2. Press **SERVICE**.
3. Scroll down to highlight **CONTROL ALGORITHM STATUS**.
4. Press **SELECT**.
5. Scroll down to highlight **MAINT04**.
6. Press **SELECT**.

DESCRIPTION	RANGE/STATUS	UNITS	REFERENCE POINT NAME
LEAD/LAG: Configuration	DISABLE, LEAD, LAG, STANDBY, INVALID		leadlag
Current Mode	DISABLE, LEAD, LAG, STANDBY, CONFIG		llmode
Load Balance Option	DISABLE/ENABLE		loadbal
LAG Start Time	0-60	MIN	lagstart
LAG Stop Time	0-60	MIN	lagstop
Prestart Fault Time	0-30	MIN	preflt
Pulldown: Delta T/Min	x.xx	Δ DEG F (Δ DEG C)	pull___dt
Satisfied?	No/Yes		pull___sat
LEAD CHILLER in Control	No/Yes		leadctrl
LAG CHILLER: Mode	Reset, Off, Local, CCN		lagmode
Run Status	Timeout, Recycle, Startup, Ramping, Running		lagstat
Start/Stop	Demand, Override, Shutdown, Abnormal, Pumpdown		lag___s___s
Stop, Start, Retain			
Recovery Start Request	No/Yes		lag___rec
STANDBY CHILLER: Mode	Reset, Off, Local, CCN		stdmode
Run Status	Timeout, Recycle, Startup, Ramping, Running		stdstat
Start/Stop	Demand, Override, Shutdown, Abnormal, Pumpdown		std___s___s
Stop, Start, Retain			
Recovery Start Request	No/Yes		std___rec

NOTES:

1. Only values with capital letter reference point names are variables available for read operation. Forcing is not supported on this maintenance screen.
2. Δ = delta degrees.

PIC System Functions

NOTE: Throughout this manual, words printed in capital letters and italics are values that may be viewed on the LID. See Table 3 for examples of LID screens. Point names are listed in the Description column. An overview of LID operation and menus is given in Fig. 21-27.

CAPACITY CONTROL — The PIC controls the machine capacity by modulating the inlet guide vanes in response to chilled water temperature changes away from the *CONTROL POINT*. The *CONTROL POINT* may be changed by a CCN network device, or is determined by the PIC adding any active chilled water reset to the chilled water *SET POINT*. The PIC uses the *PROPORTIONAL INC (Increase) BAND*, *PROPORTIONAL DEC (Decrease) BAND*, and the *PROPORTIONAL ECW (Entering Chilled Water) GAIN* to determine how fast or slow to respond. *CONTROL POINT* may be viewed/overridden on the Status table, Status01 selection.

ENTERING CHILLED WATER CONTROL — If this option is enabled, the PIC uses *ENTERING CHILLED WATER* temperature to modulate the vanes instead of *LEAVING CHILLED WATER* temperature. *ENTERING CHILLED WATER* control option may be viewed/modified on the Equipment Configuration table, Config table.

DEADBAND — This is the tolerance on the chilled water/brine temperature *CONTROL POINT*. If the water temperature goes outside of the *DEADBAND*, the PIC opens or closes the guide vanes in response until it is within tolerance. The PIC may be configured with a 0.5° to 2° F (0.3° to 1.1° C) deadband. *DEADBAND* may be viewed or modified on the Equipment Service1 table.

For example, a 1° F (0.6° C) deadband setting controls the water temperature within $\pm 0.5^\circ\text{F}$ (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.

PROPORTIONAL BANDS AND GAIN — Proportional band is the rate at which the guide vane position is corrected in proportion to how far the chilled water/brine temperature is from the control point. Proportional gain determines how quickly the guide vanes react to how quickly the temperature is moving from *CONTROL POINT*.

The Proportional Band can be viewed/modified on the LID. There are two response modes, one for temperature response above the control point, the other for response below the control point.

The first type is called *PROPORTIONAL INC BAND*, and it can slow or quicken vane response to chilled water/brine temperature above *DEADBAND*. It can be adjusted from a setting of 2 to 10; the default setting is 6.5. *PROPORTIONAL DEC BAND* can slow or quicken vane response to chilled water temperature below deadband plus control point. It can be adjusted on the LID from a setting of 2 to 10, and the default setting is 6.0. Increasing either of these settings will cause the vanes to respond slower than a lower setting.

The *PROPORTIONAL ECW GAIN* can be adjusted at the LID display from a setting of 1.0 to 3.0, with a default setting of 2.0. Increase this setting to increase guide vane response to a change in entering chilled water temperature. The proportional bands and gain may be viewed/modified on the Equipment Service3 table.

DEMAND LIMITING — The PIC will respond to the *ACTIVE DEMAND LIMIT* set point by limiting the opening of the guide vanes. It will compare the set point to either *COMPRESSOR MOTOR LOAD* or *COMPRESSOR MOTOR CURRENT* (percentage), depending on how the control is configured for the *DEMAND LIMIT SOURCE* which is accessed on the SERVICE1 table. The default setting is current limiting.

MACHINE TIMERS — The PIC maintains 2 runtime clocks, known as *COMPRESSOR ONTIME* and *SERVICE ONTIME*. *COMPRESSOR ONTIME* indicates the total lifetime compressor run hours. This timer can register up to 500,000 hours before the clock turns back to zero. The *SERVICE ONTIME* is a resettable timer that can be used to indicate the hours since the last service visit or any other reason. The time can be changed through the LID to whatever value is desired. This 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 machine can be started. See the Start-Up/Shutdown/Recycle Sequence section, page 48, for operational information.

OCCUPANCY SCHEDULE — This schedule determines when the chiller is either occupied or unoccupied.

Each schedule consists of from one to 8 occupied/unoccupied time periods, set by the operator. These time periods can be enabled to be in effect, or not in effect, on each day of the week and for holidays. The day begins with 0000 hours and ends with 2400 hours. The machine is in *OCCUPIED* mode unless an unoccupied time period is in effect.

The machine will shut down when the schedule goes to *UNOCCUPIED*. These schedules can be set up to follow the building schedule or to be 100% *OCCUPIED* if the operator wishes. The schedules also can be bypassed by forcing the Start/Stop command on the PIC Status screen to start. The schedules also can be overridden to keep the unit in an *OCCUPIED* mode for up to 4 hours, on a one-time basis.

Figure 26 shows a schedule for a typical office building time schedule, with a 3-hour, off-peak cool down period from midnight to 3 a.m., following a weekend shutdown. Example: Holiday periods are unoccupied 24 hours per day. The building operates Monday through Friday, 7:00 a.m. to 6:00 p.m., with a Saturday schedule of 6:00 a.m. to 1:00 p.m., and 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, the machine uses Occupancy Schedule 01.

The Ice Build Time Schedule is Schedule 02. When in the CCN mode, Occupancy Schedule 03 is used.

The CCN schedule number is defined on the Config table in the Equipment Configuration table on page 32. The schedule number can change to any value from 03 to 99. If this schedule number is changed on the Config table, the operator must use the Attach to Network Device table to upload the new number into the Schedule screen. See Fig. 24.

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

- high bearing temperature
- high motor winding temperature
- high discharge temperature
- 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
- excessive motor acceleration time
- excessive starter transition time
- lack of motor current signal
- excessive motor amps
- excessive compressor surge
- temperature and transducer faults

Starter faults or optional protective devices within the starter can shut down the machine. These devices are dependent on what has been purchased as options.

⚠ CAUTION

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

If the controller initiates a safety shutdown, it displays the fault on the LID with a primary and a secondary message, and energizes an alarm relay in the starter and blinks the alarm light on the control center. The alarm is stored in memory and can be viewed in the PIC Alarm History table along with a message for troubleshooting.

To give a better warning as to the operating condition of the machine, the operator also can define alert limits on various monitored inputs. Safety contact and alert limits are defined in Table 4. Alarm and alert messages are listed in the Troubleshooting Guide section, page 57.

SHUNT TRIP — The optional shunt trip function of the PIC is a safety trip. The shunt trip is wired from an output on the SMM to the motor circuit breaker. If the PIC tries to shut down the compressor through normal shutdown procedure but is unsuccessful for 30 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 will also energize the shunt trip to trip the circuit breaker.

Default Screen Freeze — Whenever an alarm occurs, the LID default screen will freeze displaying the condition of the machine at the time of alarm. Knowledge of the operating state of the chiller at the time an alarm occurs is useful when troubleshooting. Current machine information can be viewed on the Status tables. Once all existing alarms are cleared (by pressing the **RESET** softkey), the default LID will return to normal operation.

Motor Cooling Control (Hermetic Motors Only)

— Motor temperature is reduced by refrigerant entering the motor shell and evaporating. The refrigerant is regulated by the motor cooling relay. This relay will energize when the compressor is running and motor temperature is above 125 F (51.7 C). The relay will close when motor temperature is below 100 F (37.8 C). Note that there is always a minimum flow of refrigerant when the compressor is operating for motor cooling; the relay only controls additional refrigerant to the motor.

NOTE: An additional motor cooling relay is not required for Hermetic FA style compressors.

Auxiliary Oil Pump Control (Open Drive Machines Only)

— The auxiliary oil pump (optional) is controlled by the PIC. During start-up, if the main oil pump cannot raise pressure to 18 psid (124 kPa), the auxiliary oil pump will be energized. During compressor operation, the auxiliary oil pump will be energized if the oil pressure falls below the alert threshold (18 psid [124 kPa]). Once running, the auxiliary oil pump will remain on until the compressor is turned off and will deenergize with the main oil pump after the post-lube time period.

Shaft Seal Oil Control (Open Drive Machines Only) — All open drive machines require that the shaft seal be bathed in oil at all times, especially when the

machine is not running. This ensures that refrigerant does not leak past the seal. The PIC control will energize the oil pump for one minute if the oil pump has not operated during the past 12 hours.

It is important to note that if control power is to be turned off for longer than this period, the refrigerant charge must be pumped over into the utility vessel. Because the oil heater will also be off during this time, storing the refrigerant will also prevent refrigerant migration into the oil.

Ramp Loading Control — 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 machine is started, and the chilled water loop has to be brought down to normal design conditions. This helps reduce electrical demand charges by slowly bringing the chilled water to control point. However, the total power draw during this period remains almost unchanged.

There are 2 methods of ramp loading with the PIC. Ramp loading can be based on chilled water temperature or on motor load.

1. **Temperature ramp loading** limits the rate at which either leaving chilled water or entering chilled water temperature decreases by an operator-configured rate. The lowest temperature ramp table will be used the first time the machine is started (at commissioning). The lowest temperature ramp rate will also be used if machine power has been off for 3 hours or more (even if the motor ramp load is selected).
2. **Motor load ramp loading** limits the rate at which the compressor motor current or compressor motor load increases by an operator-configured rate.

The *TEMP (Temperature) PULLDOWN*, *LOAD PULL DOWN*, and *SELECT RAMP TYPE* may be viewed/modified on the LID Equipment Configuration table, Config table (see Table 3). Motor load is the default type.

Capacity Override (See Table 5) — These can prevent some safety shutdowns caused by exceeding motor amperage limit, refrigerant low temperature safety limit, motor high temperature safety limit, and condenser high pressure limit. In all cases there are 2 stages of compressor vane control.

1. The vanes are held from opening further, and the status line on the LID indicates the reason for the override.
2. The vanes are closed until condition decreases below the first step set point, and then the vanes are released to normal capacity control.

Whenever the motor current demand limit set point 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 compressor high 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 hold the guide vanes from opening. If so equipped, the hot gas bypass valve will open instead of holding the vanes.

High Discharge Temperature Control — If the discharge temperature increases above 200 F (93 C), the guide vanes are proportionally opened to increase gas flow through the compressor. If the leaving chilled water temperature drops 5° F (2.8° C) below the control point temperature, machine will enter the recycle mode.

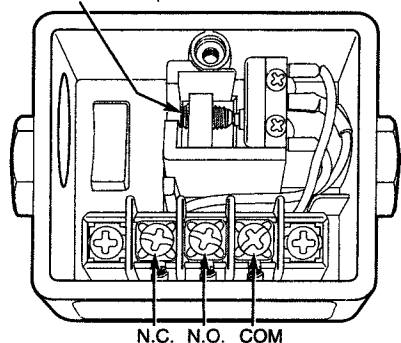
Table 4 — Protective Safety Limits and Control Settings

MONITORED PARAMETER	LIMIT	APPLICABLE COMMENTS
TEMPERATURE SENSORS OUT OF RANGE	-40 to 245 F (-40 to 118.3 C)	Must be outside range for 2 seconds
PRESSURE TRANSDUCERS OUT OF RANGE	0.08 to 0.98 Voltage Ratio	Must be outside range for 2 seconds. Ratio = Input Voltage ÷ Voltage Reference
COMPRESSOR DISCHARGE TEMPERATURE	>220 F (104.4 C)	Preset, alert setting configurable
MOTOR WINDING TEMPERATURE	>220 F (104.4 C)	Preset, alert setting configurable
BEARING TEMPERATURE	>220 F (104.4 C)	Preset, alert setting configurable
EVAPORATOR REFRIGERANT TEMPERATURE (Temp converted from Pressure Reading)	<33 F (for water chilling) (0.6° C)	Preset, configure chilled medium for water (Service1 table)
	<Brine Refrigerant Trippoint (set point adjustable from 0 to 40 F [-18 to 4 C] for brine chilling)	Configure chilled medium for brine (Service1 table). Adjust brine refrigerant trippoint for proper cutout
TRANSDUCER VOLTAGE	<4.5 vdc > 5.5 vdc	Preset (Read voltage at terminals 34 and 35 on PSIO module)
CONDENSER PRESSURE — SWITCH — CONTROL	>218 ± 7 psig (1503 ± 48 kPa), reset at 120 ± 10 (827 ± 69 kPa)	Preset
	215 psig (1482 kPa)	Preset
OIL PRESSURE — SWITCH — CONTROL	Cutout <11 psid (76 kPad) ± 1.5 psid (10.3 kPad) Cut-in >16.5 psid (114 kPad) ± 4 psid (27.5 kPad)	Preset, no calibration needed
	Cutout <15 psid (103 kPad) Alert <18 psid (124 kPad)	Preset
LINE VOLTAGE — HIGH — LOW — SINGLE-CYCLE	>110% for one minute	Preset, based on transformed line voltage to 24 vac rated-input to the Starter Management Module. Also monitored at PSIO power input.
	<90% for one minute or <85% for 3 seconds	
	<50% for one cycle	
COMPRESSOR MOTOR LOAD (% Compressor Amps)	>110% for 30 seconds	Preset
	<10% with compressor running	Preset
	>10% with compressor off	Preset
STARTER ACCELERATION TIME (Determined by inrush current going below 100% compressor motor load)	>45 seconds	For machines with reduced voltage mechanical and solid-state starters
	>10 seconds	For machines with full voltage starters (Configured on Service1 table)
STARTER TRANSITION	>75 seconds	Reduced voltage starters only
CONDENSER FREEZE PROTECTION	Energizes condenser pump relay if condenser refrigerant temperature or condenser entering water temperature is below the configured condenser freeze point temperature. Deenergizes when the temperature is 5 F (3 C) above condenser freeze point temperature.	CONDENSER FREEZE POINT configured in Service01 table with a default setting of 34 F (1 C).
IMPELLER CLEARANCE	Displacement switch open	Thrust movement excessive
MOTOR LEAK DETECTOR*	Water from motor cooling is leaking	Water sensors are installed only on open-drive motors that use water cooling. (Totally enclosed, water-to-air cooled [TEWAC] motors)

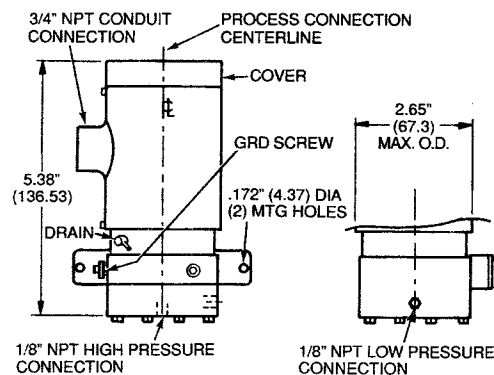
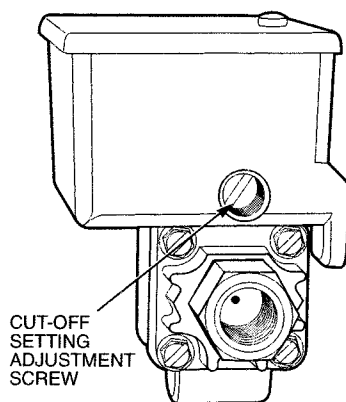
Flow Switches (Field Supplied)

Operate water pumps with machine off. Manually reduce water flow and observe switch for proper cut-out. Safety shutdown occurs when cutout time exceeds 3 seconds.

NO ADJUSTMENTS ARE TO BE MADE ON THIS SETSCREW! (FACTORY ADJUSTED ONLY)



WIRE FLOW SWITCH TO STARTER TERMINAL STRIP TB-5, FOR FLOW INDICATIONS.



Carrier Part No. HK06ZC001

NOTE: Dimensions in parentheses are in millimeters.

Carrier Part No. HK06ZC033

*Applicable to open-drive machines only.

Table 5 — Capacity Overrides

OVERRIDE CAPACITY CONTROL	FIRST STAGE SETPOINT			SECOND STAGE SETPOINT	OVERRIDE TERMINATION
	View/Modify on LID Screen	Default Value	Configurable Range	Value	Value
HIGH CONDENSER PRESSURE	Equipment Service1	125 psig (862 kPa)	90 to 200 psig (620 to 1379 kPa)	>Override Set Point + 4 psid (28 kPad)	<Override Set Point
HIGH MOTOR TEMPERATURE*	Equipment Service1	>200 F (93.3 C)	150 to 200 F (66 to 93 C)	>Override Set Point +10° F (6° C)	<Override Set Point
LOW REFRIGERANT TEMPERATURE (Refrigerant Override Delta Temperature)	Equipment Service1	<3° F (1.6° C) (Above Trippoint)	2° to 5° F (1° to 3° C)	≠Trippoint + Override ΔT -1° F (0.56° C)	>Trippoint + Override ΔT +2° F (1.2° C)
HIGH COMPRESSOR LIFT (Surge Prevention)	Equipment Service1	Min: T1 — 1.5° F (0.8° C) P1 — 50 psid (345 kPad) Max: T2 — 10° F (5.6° C) P2 — 85 psid (586 kPad)	0.5° to 15° F (0.3° to 8.3° C) 30 to 170 psid (207 to 1172 kPad) 0.5° to 15° F (0.3° to 8.3° C) 30 to 170 psid (207 to 1172 kPad)	None	Within Lift Limits Plus Surge/ HGBP Deadband Setting
MANUAL GUIDE VANE TARGET	Control Algorithm Maint01	Automatic	0 to 100%	None	Release of Manual Control
MOTOR LOAD — ACTIVE DEMAND LIMIT	Status01	100%	40 to 100%	≥5% of Set Point	2% Lower Than Set Point

LEGEND

P1 — Minimum Pressure Load
P2 — Maximum Pressure Load
T1 — Minimum Temperature Load
T2 — Maximum Temperature Load

*Not available on open drive machines.

Oil Sump Temperature Control — The oil sump temperature control is regulated by the PIC which uses the oil heater relay when the machine is shut down.

As part of the pre-start checks executed by the controls, oil sump temperature is compared against evaporator refrigerant temperature. If the difference between these 2 temperatures is 50 F (27.8 C) or less, the start-up will be delayed until the oil temperature is 50 F (27.8 C) or more. Once this temperature is confirmed, the start-up continues.

The oil heater relay is energized whenever the chiller compressor is off and the oil sump temperature is less than 150 F (65.6 C) or the oil sump temperature is less than the cooler refrigerant temperature plus 70° F (39° C). The oil heater is turned off when the oil sump temperature is either 1) more than 160 F (71.1 C); or 2) the oil sump temperature is more than 155 F (68.3 C) and more than the cooler refrigerant temperature plus 75° F (41.6° C). The oil heater is always off during start-up or when the compressor is running.

When a power failure to the PSIO module has occurred for more than 3 hours (i.e., initial start-up), the compressor guide vane opening will be slowed down to prevent excessive oil foaming that may result from refrigerant migration into the oil sump during the power failure. The vane opening will be slowed to a value of 2° F (1.1° C) per minute with temperature ramp loading.

Remote Start/Stop Controls — A remote device, such as a timeclock which uses a set of contacts, may be used to start and stop the machine. However, the device should not be programmed to start and stop the machine in excess of 2 or 3 times every 12 hours. If more than 8 starts in 12 hours occur, then an Excessive Starts alarm is displayed, preventing the machine from starting. The operator must reset the alarm at the LID in order to override the starts counter and start the machine. If Automatic Restart After a Power

Failure is not activated when a power failure occurs, and the remote contact is closed, the machine will indicate an alarm because of the loss of voltage.

The contacts for Remote Start are wired into the starter at terminal strip TB5, terminals 8A and 8B. See the certified drawings for further details on contact ratings. The contacts must be dry (no power).

Spare Safety Inputs — Normally closed (NC) digital inputs for additional field-supplied safeties may be wired to the spare protective limits input channel in place of the factory-installed jumper. (Wire multiple inputs in series.) The opening of any contact will result in a safety shutdown and LID display. Refer to the certified drawings for safety contact ratings.

Analog temperature sensors may also be added to the options modules, if installed. These may be programmed to cause an alert on the CCN network, but will not shut the machine down.

Spare Alarm Contacts — Two spare sets of alarm contacts are provided within the starter. The contact ratings are provided in the certified drawings. The contacts are located on terminal strip TB6, terminals 5A and 5B, and terminals 5C and 5D.

Condenser Pump Control — The machine will monitor the *CONDENSER PRESSURE* and may turn on this pump if the pressure becomes too high whenever the compressor is shut down. *CONDENSER PRESSURE OVERRIDE* is used to determine this pressure point. This value is found on the Equipment Service1 LID table and has a default value (Table 5). If the *CONDENSER PRESSURE* is greater than or equal to the *CONDENSER PRESSURE OVERRIDE*, and the *ENTERING CONDENSER WATER TEMP (Temperature)* is less than 115 F (46 C), then the condenser pump will energize to try to decrease the pressure. The pump will turn

off when the condenser pressure is less than the pressure override less 5 psi (34 kPa), or the *CONDENSER REFRIG (Refrigerant) TEMP* is within 3° F (2° 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. If the pump is controlled by the PIC, starting the pump will help prevent the water in the condenser from freezing. Condenser freeze prevention can occur whenever the machine is not running except when it is either actively in pumpdown or in Pumpdown Lockout with the freeze prevention disabled (refer to Table 6).

When the *CONDENSER REFRIG TEMP* is less than or equal to the *CONDENSER FREEZE POINT*, or the *ENTERING CONDENSER WATER* temperature is less than or equal to the *CONDENSER FREEZE POINT*, then the *CONDENSER WATER PUMP* shall be energized until the *CONDENSER REFRIG TEMP* is greater than the *CONDENSER FREEZE POINT* plus 5° F (2.7° C). An alarm will be generated if the machine is in PUMPDOWN mode and the pump is energized. An alert will be generated if the machine is not in PUMPDOWN mode and the pump is energized. If in recycle shutdown, the mode shall transition to a non-recycle shutdown.

Tower-Fan Relay — This control can be used to assist the condenser water temperature control system (field supplied). Low condenser water temperature can cause the chiller to shut down on low refrigerant temperature. The tower fan relay, located in the starter, is controlled by the PIC to energize and deenergize as the pressure differential between cooler and condenser vessels changes in order to prevent low condenser water temperature and to maximize machine efficiency. The tower-fan relay can only accomplish this if the relay has been added to the cooling tower temperature controller. The *TOWER FAN RELAY* 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) or entering condenser water temperature is greater than 85 F (29 C). The *TOWER FAN RELAY* is deenergized when the condenser pump is off, flow is lost, the evaporator refrigerant temperature is less than the override temperature, or the differential pressure is less than 28 psid (193 kPa) and entering condensing water is less than 80 F (27 C).

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 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 and associated problems.

Auto. Restart After Power Failure — This option may be enabled or disabled, and may be viewed/modified in the Config table of Equipment Configuration. If enabled, the chiller will start up automatically after a single cycle drop-out, low, high, or loss of voltage has occurred, and the power is within ±10% of normal. The 15-min start-to-start timer and the stop-to-start timer are ignored during this type of start-up.

When power is restored after the power failure, and if the compressor had been running, the oil pump will be energized for one minute prior to the evaporator pump energizing. Auto restart will then continue like a normal start-up.

Water/Brine Reset — Three types of chilled water or brine reset are available and can be viewed or modified on the Equipment Configuration table Config selection.

The LID default screen status message indicates when the chilled water reset is active. The *CONTROL POINT* temperature on the Status01 table indicates the machine's current reset temperature.

To activate a reset type, input all configuration information for that reset type in the Config table. Then input the reset type number in the *SELECT/ENABLE RESET TYPE* input line.

1. **Reset Type 1** (Requires optional 8-input module) — Automatic chilled water temperature reset based on a 4 to 20 mA input signal. This type permits up to ±30° F (±17° C) of automatic reset to the chilled water or brine temperature set point, based on the input from a 4 to 20 mA signal. This signal is hardwired into the number one 8-input module.

If the 4 to 20 mA signal is externally powered from the 8-input module, the signal is wired to terminals J1-5(+) and J1-6(-). If the signal is to be internally powered by the 8-input module (for example, when using variable resistance), the signal is wired to J1-7(+) and J1-6(-). The PIC must now be configured on the Service2 table to ensure that the appropriate power source is identified.

2. **Reset Type 2** (Requires optional 8-input module) — Automatic chilled water temperature reset based on a remote temperature sensor input. This type permits ±30° F (±16° C) of automatic reset to the set point based on a temperature sensor wired to the number one 8-input module (see wiring diagrams or certified drawings).

The temperature sensor must be wired to terminal J1-19 and J1-20.

To configure Reset Type 2, enter the temperature of the remote sensor at the point where no temperature reset will occur. Next, enter the temperature at which the full amount of reset will occur. Then, enter the maximum amount of reset required to operate the machine. Reset Type 2 can now be activated.

3. **Reset Type 3** — Automatic chilled water temperature reset based on cooler temperature difference. This type of reset will add ±30° F (±16° C) based on the temperature difference between entering and leaving chilled water temperature. This is the only type of reset available without the need of the number one 8-input module. No wiring is required for this type as it already uses the cooler water sensors.

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. This chilled water temperature difference is usually the full design load temperature difference. The difference in chilled water temperature at which the full amount of reset will occur is now entered on the next input line. Next, the amount of reset is entered. Reset Type 3 can now be activated.

Demand Limit Control Option (Requires Optional 8-Input Module) — The demand limit may be externally controlled with a 4 to 20 mA signal from an energy management system (EMS). The option is set up on the Config table. When enabled, the control is set for 100%

INSTALLATION START-UP REQUEST CHECKLIST

Machine Model Number: _____ Serial Number: _____

To: _____ Date _____

Project Name _____

Attn: _____ Carrier Job Number _____

The following information provides the status of the chiller installation.

	YES/NO (N/A)	DATE TO BE COMPLETED
1. All sensors have been installed, leak checked, and wired.	_____	_____
2. All control wiring is complete.	_____	_____
3. Power wiring to contactors is of the appropriate voltage.	_____	_____
4. All communication wiring between the SMM panel, starter, and control panel is complete.	_____	_____
5. The machine's starter wiring is complete. The wiring is installed per installation instructions and certified prints.		
a. Power wiring to compressor motor. (Motor leads will not be taped until the Carrier technician megger tests the motor.)	_____	_____
b. Oil pump wiring	_____	_____
c. Oil heater/control wiring	_____	_____
d. Other _____	_____	_____
6. The motor starter has not been supplied by Carrier. It has been installed according to the manufacturer's instructions.	_____	_____
The motor starter has not been supplied by Carrier and it has been checked for proper operation.	_____	_____

COMMENTS:

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

MACHINE INFORMATION:

NAME _____ JOB NO. _____
 ADDRESS _____ MODEL _____
 CITY _____ STATE _____ ZIP _____ S/N _____

DESIGN CONDITIONS:

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

COMPRESSOR: Volts _____ RLA _____ OLTA _____

STARTER: Mfg _____ Type _____

OIL PUMP: Volts _____ RLA _____ OLTA _____

REFRIGERANT: Charge _____ Lbs

CARRIER OBLIGATIONS:

Assemble	Yes ☐	No ☐
Leak Test	Yes ☐	No ☐
Dehydrate	Yes ☐	No ☐
Charging	Yes ☐	No ☐
Alignment	Yes ☐	No ☐
Operating Instructions _____	Hrs.	

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

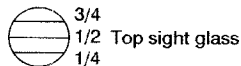
JOB DATA REQUIRED:

- 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 COMPRESSOR 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 Amps _____

Line Voltages: Motor _____ Oil Pump _____ Controls/Oil Heater _____

STARTER CHECKOUT:

Check continuity T1 to T1, etc. (Motor to starter, disconnect motor leads T4, T5, T6.) Do not megohm test solid-state starters, 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:						

STARTER: Electro-Mechanical ☐ Solid-State ☐

Motor Load Current Transformer Ratio _____ : _____ Signal Resistor Size _____ Ohms

Transition Timer Time _____ Seconds

Check Magnetic Overloads Add Dash Pot Oil Yes ☐ No ☐ Solid-State Overloads Yes ☐ No ☐

Solid State Starter: Torque Setting _____ O'Clock Ramp Setting _____ Seconds

OPEN-DRIVE MOTOR BEARINGS: Added Oil to Proper Level ☐ Yes

CONTROLS: SAFETY, OPERATING, ETC.

Perform Controls Test (Yes/No) _____

PIC CAUTION

COMPRESSOR MOTOR AND CONTROL PANEL **MUST** BE PROPERLY AND INDIVIDUALLY CONNECTED BACK TO THE EARTH GROUND IN THE STARTER.

Yes _____

RUN MACHINE: Do these safeties shut down machine?

Condenser Water Flow Switch

Yes ☐ No ☐

Chilled Water Flow Switch

Yes ☐ No ☐

Pump Interlocks

Yes ☐ No ☐

INITIAL START:

Line Up All Valves in Accordance With Instruction Manual: _____ Start Water Pumps and Establish Water Flow _____

Oil Level OK and Oil Temperature OK _____ Check Oil Pump Rotation-Pressure _____

Check Compressor Motor Rotation (Motor End Sight Glass) and Record: Clockwise _____

Restart Compressor, Bring Up To Speed. Shut Down. Any Abnormal Coastdown Noise? Yes* ☐ No ☐

*If yes determine cause.

START MACHINE AND OPERATE. COMPLETE THE FOLLOWING:

A: Trim Charge and Record According to Chiller Start-Up and Service Instructions.

B: Complete Any Remaining Control Calibration and Record Under Controls Section (pages 5-47).

C: Take At Least 2 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

SIGNATURES:

DATE _____

CARRIER
TECHNICIAN _____

CUSTOMER REPRESENTATIVE _____
DATE _____



**CENTRIFUGAL LIQUID CHILLER
CONFIGURATION SETTINGS LOG**
(Remove and use for job file.)

SET POINT TABLE CONFIGURATION SHEET				
DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Base Demand Limit	40 to 100	%	100.0	
LCW Setpoint	20 to 120 (-6.7 to 48.9)	DEG F (DEG C)	50.0	
ECW Setpoint	20 to 120 (-6.7 to 48.9)	DEG F (DEG C)	60.0	
ICE BUILD Setpoint	20 to 60 (-6.7 to 15.6)	DEG F (DEG C)	40.0	

PSIO Software Version Number: _____

LID Software Version Number: _____

PSIO Controller Identification: BUS _____ ADDRESS _____

LID Identification: BUS _____ ADDRESS _____

LOCAL MODE 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 MODE 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.

CCN MODE TIME SCHEDULE CONFIGURATION SHEET OCCPC__ S

	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.

CONFIG TABLE CONFIGURATION SHEET				
DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
RESET TYPE 1				
Degrees Reset at 20 mA	-30 to 30 (-17 to 17)	DEG F (DEG C)	10 (6)	
RESET TYPE 2				
Remote Temp (No Reset)	-40 to 245 (-40 to 118)	DEG F (DEC C)	85 (29)	
Remote Temp (Full Reset)	-40 to 245 (-40 to 118)	DEG F (DEG C)	65 (18)	
Degrees Reset	-30 to 30 (-17 to 17)	DEG F (DEG C)	10 (6)	
RESET TYPE 3				
CHW Temp (No Reset)	0 to 15 (0 to 8)	DEG F (DEG C)	10 (6)	
CHW Temp (Full Reset)	0 to 15 (0 to 8)	DEG F (DEG C)	0 (0)	
Degrees Reset	-30 to 30 (-17 to 17)	DEG F (DEG C)	5 (3)	
Select/Enable Reset Type	0 to 3		0	
ECW Control Option	Disable/Enable		Disable	
Demand Limit at 20 mA	40 to 100	%	40	
20 mA Demand Limit Option	Disable/Enable		Disable	
Auto Restart Option	Disable/Enable		Disable	
Remote Contacts Option	Disable/Enable		Disable	
Temp Pulldown Deg/Min	2 to 10		3	
Load Pulldown %/Min	5 to 20		10	
Select Ramp Type: Temp=0/Load=1	0/1		1	
Loadshed Group Number	0 to 99		0	
Loadshed Demand Delta	0 to 60	%	20	
Maximum Loadshed Time	0 to 120	Min	60	
CCN Occupancy Config: Schedule Number	3 to 99		3	
CCN Occupancy Config: Broadcast Option	Disable/Enable		Disable	
ICE BUILD Option	Disable/Enable		Disable	
ICE BUILD TERMINATION: 0 =Temp, 1 =Contacts, 2 =Both	0, 1, 2		0	
ICE BUILD RECYCLE Option	Disable/Enable		Disable	

LEAD/LAG TABLE CONFIGURATION SHEET				
DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
LEAD/LAG SELECT DISABLE =0, LEAD =1, LAG =2, STANDBY =3	0, 1, 2, 3		0	
Load Balance Option	Disable/Enable		Disable	
Common Sensor Option	Disable/Enable		Disable	
LAG Percent Capacity	25 to 75	%	50	
LAG Address	1 to 236		92	
LAG START Timer	2 to 60	Min	10	
LAG STOP Timer	2 to 60	Min	10	
PRESTART FAULT Timer	0 to 30	Min	5	
STANDBY Chiller Option	Disable/Enable		Disable	
STANDBY Percent Capacity	25 to 75	%	50	
STANDBY Address	1 to 236		93	

SERVICE1 TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Motor Temp Override	150 to 200 (66 to 93)	DEG F (DEG C)	200 (93)	
Cond Pressure Override	90 to 200 (620 to 1379)	psig (kPa)	125 (862)	
Refrig Override Delta T	2 to 5 (1 to 3)	DEG F (DEG C)	3 (1.6)	
Chilled Medium	Water/Brine		Water	
Brine Refrig Trippoint	8 to 40 (-13.3 to 4)	DEG F (DEG C)	33 (1)	
Compr Discharge Alert	125 to 200 (52 to 93)	DEG F (DEG C)	200 (93)	
Bearing Temp Alert	165 to 210 (74 to 99)	DEG F (DEG C)	210 (99)	
Water Flow Verify Time	0.5 to 5	MIN	5	
Oil Press Verify Time	15 to 300	SEC	15	
Water/Brine Deadband	0.5 to 2.0 (0.3 to 1.1)	DEG F (DEG C)	1.0 (0.6)	
Recycle Restart Delta T	2.0 to 10 (1.1 to 5.6)	DEG F (DEG C)	5 (2.8)	
Recycle Shutdown Delta T	0.5 to 4.0 (0.27 to 2.2)	DEG F (DEG C)	1.0 (0.6)	
Surge Limit/HGBP Option Surge=0/HGBP=1	0/1		0	
Surge/HGBP Delta T1	0.5 to 15 (0.3 to 8.3)	DEG F (DEG C)	1.5 (0.8)	
Surge/HGBP Delta P1	30 to 170 (207 to 1172)	psi (kPa)	50 (345)	
Surge/HGBP Delta T2	0.5 to 15.0 (0.3 to 8.3)	DEG F (DEG C)	10 (5.6)	
Surge/HGBP Delta P2	30 to 170 (206 to 1172)	psi (kPa)	85 (586)	
Surge/HGBP Deadband	1 to 3 (0.6 to 1.6)	DEG F (DEG C)	1 (0.6)	
Surge Delta Percent Amps	10 to 50	%	25	
Surge Time Period	1 to 5	MIN	2	
Demand Limit Source Amps=0/Load=1	0/1		0	
Amps Correction Factor	1 to 8		3	

SERVICE1 TABLE CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Motor Rated Load Amps	1 to 9999	AMPS	200	
Motor Rated Line Voltage	1 to 9999	VOLTS	460	
Meter Rated Line kW	1 to 9999	kW	600	
Line Frequency 0=60 Hz/1=50 Hz	0/1		0	
Compressor Starter Type	REDUCE/FULL		REDUCE	
Condenser Freeze Point	-20 to 35 (-28.9 to 1.7)	DEG F (DEG C)	34 (1.1)	
Soft Stop Amps Threshold	40 to 100	%	100	
Stop-to-Start Timer*	3 to 50	MIN	20	

*Open-drive machines only. Standard stop-to-start time for hermetic machines is 3 minutes.

SERVICE2 TABLE CONFIGURATION SHEET				
DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
RESET 20 mA Power Source	0/1	0 = EXTERNAL, 1 = INTERNAL	0	
DEMAND 20 mA Power Source	0/1	0 = EXTERNAL, 1 = INTERNAL	0	
CHWS Temp Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
CHWS Temp Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
CHWR Temp Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
CHWR Temp Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
Reset Temp Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Reset Temp Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
Spare Temp 1 Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Spare Temp 1 Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
Spare Temp 2 Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Spare Temp 2 Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
Spare Temp 3 Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Spare Temp 3 Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
SPARE 1 20 mA Power Source	0/1	0 = EXTERNAL, 1 = INTERNAL	0	
SPARE 2 20 mA Power Source	0/1	0 = EXTERNAL, 1 = INTERNAL	0	
Spare Temp 4 Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Spare Temp 4 Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
Spare Temp 5 Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Spare Temp 5 Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
Spare Temp 6 Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Spare Temp 6 Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
Spare Temp 7 Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Spare Temp 7 Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
Spare Temp 8 Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Spare Temp 8 Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	
Spare Temp 9 Enable	0 to 4	0 = DISABLE, 1 = HIGH ALERT, 2 = LOW ALERT, 3 = HIGH ALARM, 4 = LOW ALARM	0	
Spare Temp 9 Alert	-40 to 245 (-40 to 118)	DEG F (DEG C)	245 (118)	

SERVICE3 TABLE CONFIGURATION SHEET				
DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Proportional Inc Band	2 to 10		6.5	
Proportional Dec Band	2 to 10		6.0	
Proportional ECW Gain	1 to 3		2.0	
Guide Vane Travel Limit	30 to 100	%	50	

HOLIDAY (HOLIDEF) CONFIGURATION SHEET HOLIDEF__S			
DESCRIPTION	RANGE	UNITS	VALUE
Holiday Start Month	1 to 12		
Start Day	1 to 31		
Duration	0 to 99	DAYS	

HOLIDAY (HOLIDEF) CONFIGURATION SHEET HOLIDEF__S			
DESCRIPTION	RANGE	UNITS	VALUE
Holiday Start Month	1 to 12		
Start Day	1 to 31		
Duration	0 to 99	DAYS	

HOLIDAY (HOLIDEF) CONFIGURATION SHEET HOLIDEF__S			
DESCRIPTION	RANGE	UNITS	VALUE
Holiday Start Month	1 to 12		
Start Day	1 to 31		
Duration	0 to 99	DAYS	

NOTE: There are no HOLIDAYS defined on the default menu. HOLIDAY dates must be updated yearly if they are used.

BROADCAST (BRODEFS) CONFIGURATION SHEET

DESCRIPTION	RANGE	UNITS	DEFAULT	VALUE
Activate	Yes/No		No	
OAT Broadcast				
Controller Name	8 characters	Text		
Bus Number	0 to 239	Bus #s	0	
Element Number	0 to 239	SE #s	0	
OARH Broadcast				
Controller Name	8 characters	Text		
Bus Number	0 to 239	Bus #s	0	
Element Number	0 to 239	SE #s	0	
Daylight Savings Start				
Month	1 to 12		4	
Day	1 to 31		15	
Time	00:00 to 23:59	HH:MM	02:00	
Minutes To Add	1 to 1440	MIN	60	
Daylight Savings Stop				
Month	1 to 12		10	
Day	1 to 31		15	
Time	00:00 to 23:59	HH:MM	02:00	
Minutes To Subtract	1 to 1440	MIN	60	

demand with 4 mA and an operator configured minimum demand set point at 20 mA.

The Demand Reset input from an energy management system is hardwired into the number one, 8-input module. The signal may be internally powered by the module or externally powered. If the signal is externally powered, the signal is wired to terminals J1-1(+) and J1-2(-). If the signal is internally powered, the signal is wired to terminals J1-3(+) and J1-2(-). When enabled, the control is set for 100% demand with 4 mA and an operator configured minimum demand set point at 20 mA.

Surge Prevention Algorithm — This is an operator configurable feature which 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 the impeller discharge. The maximum lift that a particular impeller wheel can perform varies with the gas flow across the impeller, and the size of the wheel.

The algorithm first determines if corrective action is necessary. This is done by checking 2 sets of operator configured data points, which are the MINIMUM and the MAXIMUM Load Points (T1/P1;T2/P2). These points have default settings as defined on the Service1 table, or on Table 5. These settings and the algorithm function are graphically displayed in Fig. 28 and 29. The 2 sets of load points on this graph (default settings are shown) describe a line which the algorithm uses to determine the maximum lift of the compressor. Whenever the actual differential pressure between the cooler and condenser, and the temperature difference between the entering and leaving chilled water are above the line on the graph (as defined by the MINIMUM and MAXIMUM Load Points) the algorithm will go into a corrective action mode. If the actual values are below the line, the algorithm takes no action. Modification of the default set points of the MINIMUM and MAXIMUM load points is described in the Input Service Configurations section on page 51.

Corrective action can be taken by making one of 2 choices. If a hot gas bypass line is present, and the hot gas is configured on the Service1 table, then the hot gas bypass valve can be energized. If a hot gas bypass is not present, then the action taken is to hold the guide vanes. See Table 5, Capacity Overrides. Both of these corrective actions will reduce the lift experienced by the compressor and help to prevent a surge condition. Surge is a condition when the lift becomes so high that the gas flow across the impeller reverses. This condition can eventually cause machine damage. The surge prevention algorithm is intended to notify the operator that machine operating conditions are marginal, and to take action, such as lowering entering condenser water temperature, to help prevent machine damage.

Surge Protection — Surging of the compressor can be determined by the PIC through operator configured settings. Surge will cause amperage fluctuations of the compressor motor. The PIC monitors these amperage swings, and if the swing is greater than the configurable setting in one second, then one surge count has occurred. The *SURGE DELTA PERCENT AMPS* setting is displayed and configured on the Service1 screen. It has a default setting of 25% amps, *SURGE PROTECTION COUNTS* can be monitored on the Maint03 table.

A surge protection shutdown of the machine will occur whenever the surge protection counter reaches 12 counts within an operator specified time, known as the *SURGE TIME PERIOD*. The *SURGE TIME PERIOD* is displayed and configured on the Service1 screen. It has a default of 2 minutes.

Lead/Lag Control — Lead/lag is a control system process that automatically starts and stops a lag or second chiller

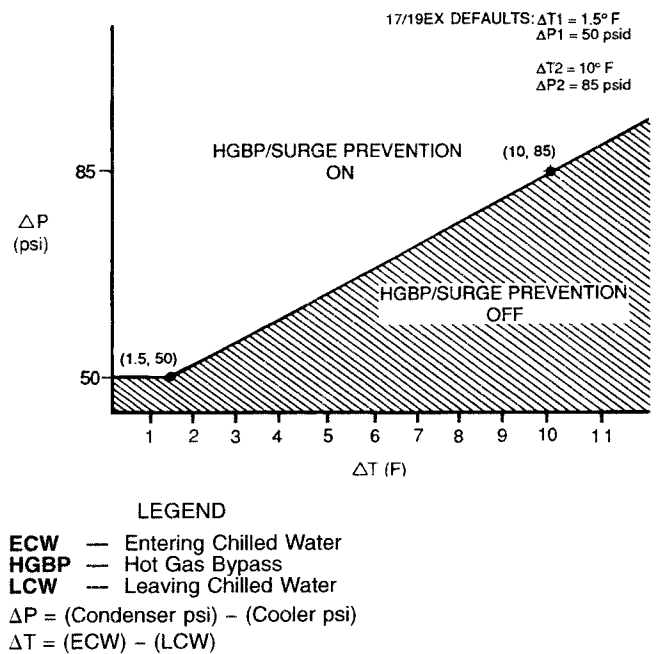


Fig. 28 — Hot Gas Bypass/Surge Prevention

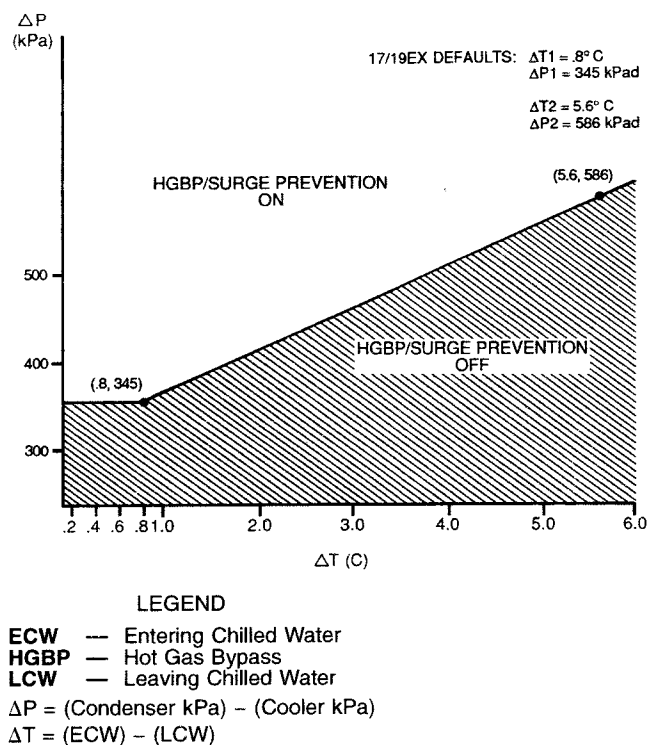


Fig. 29 — Hot Gas Bypass/Surge Prevention with Default Metric Settings

in a 2-chiller water system. Refer to Fig. 23 and 24 for menu, table, and screen selection information. On machines that have PSIO software with lead/lag capability, it is possible to utilize the PIC controls to perform the lead/lag function on 2 machines. A third machine 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.

NOTE: Lead/lag configuration is viewed and edited under Lead/Lag in the Equipment Configuration table (located in the Service menu). Lead/lag status during machine operation is viewed in the MAINT04 table in the Control Algorithm Status table. See Table 3.

Lead/Lag System Requirements:

- all machines must have PSIO software capable of performing the lead/lag function
- water pumps **MUST** be energized from the PIC controls
- water flows should be constant
- CCN Time Schedules for all machines must be identical

Operation Features:

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

COMMON POINT SENSOR INSTALLATION — Lead/lag operation does not require a common chilled water point sensor. Common point sensors can be added to the 8-input option module, if desired. Refer to the certified drawings for termination of sensor leads.

NOTE: If the common point sensor option is chosen on a chilled water system, both machines should have their own 8-input option module and common point sensor installed. Each machine will use its own common point sensor for control, when that machine is designated as the lead chiller. The PIC cannot read the value of common point sensors installed on other machines in the chilled water system.

When installing chillers in series, a common point sensor should be used. If a common point sensor is not used, the leaving chilled water sensor of the upstream chiller must be moved into the leaving chilled water pipe of the downstream chiller.

If return chilled water control is required on chillers piped in series, the common point return chilled water sensor should be installed. If this sensor is not installed, the return chilled water sensor of the downstream chiller must be relocated to the return chilled water pipe of the upstream machine.

To properly control the common supply point temperature sensor when chillers are piped in parallel, the water flow through the shutdown chillers must be isolated so that no water bypass around the operating chiller occurs. The common point sensor option must not be used if water bypass around the operating chiller is occurring.

MACHINE COMMUNICATION WIRING — Refer to the machine's Installation Instructions and Carrier Comfort Network Interface section on page 17 for information on machine communication wiring.

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

NOTE: Lead/lag configuration is viewed and edited in Lead/Lag, under the Equipment Configuration table of the Service menu. Lead/lag status during machine operation is viewed in the MAINT04 table in the Control Algorithm Status table.

Lead/Lag Chiller Configuration and Operation — The configured lead chiller is identified when the LEAD/LAG SELECT value for that chiller is configured to the value of "1." The configured lag chiller is identified when the LEAD/LAG SELECT for that chiller is configured to the value of "2." The standby chiller is configured to a value of "3." A value of "0" disables the lead/lag in that chiller.

To configure the *LAG ADDRESS* value on the LEAD/LAG Configuration table, always use the address of the other chiller on the system for this value. Using this address will make it easier to rotate the lead and lag machines.

If the address assignments placed into the *LAG ADDRESS* and *STANDBY ADDRESS* values conflict, the lead/lag will be disabled and an alert (!) message will occur. For example, if the *LAG ADDRESS* matches the lead machine's address, the lead/lag will be disabled and an alert (!) message will occur. The lead/lag maintenance screen (MAINT04) will display the message 'INVALID CONFIG' in the *LEAD/LAG CONFIGURATION* and *CURRENT MODE* fields.

The lead chiller responds to normal start/stop controls such as occupancy schedule, forced start/stop, and remote start contact inputs. After completing start up and ramp loading, the PIC evaluates the need for additional capacity. If additional capacity is needed, the PIC 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, then the chiller at the *STANDBY ADDRESS* (if configured) is requested to start. After the second chiller is started and is running, the lead chiller shall monitor conditions and evaluate whether the capacity has 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, then the lag and standby chillers are stopped. If the configured lead chiller stops for an alarm condition, then the configured lag chiller takes the lead chiller's place as the lead chiller and the standby chiller serves as the lag chiller.

If the configured lead chiller does not complete the start-up before the *PRESTART FAULT TIMER* (user configured value) elapses, then the lag chiller shall be started and the lead chiller will shut down. The lead chiller then monitors the start request from the acting lead chiller to start. The *PRESTART FAULT TIMER* is initiated at the time of a start request. The *PRESTART FAULT TIMER*'s function is to provide a time-out in the event that there is a prestart alert condition preventing the machine from starting in a timely manner. The timer is configured under Lead/Lag, found in the Equipment Configuration table of the Service menu.

If the lag chiller does not achieve start-up before the *PRESTART FAULT TIMER* elapses, then the lag chiller shall be stopped and the standby chiller will be requested to start, if configured and ready.

Standby Chiller Configuration and Operation — The configured standby chiller is identified as such by having the *LEAD/LAG SELECT* configured to the value of "3." The standby chiller can only operate as a replacement for the lag chiller if one of the other two chillers is in an alarm (*) condition (as shown on the LID panel). If both lead and lag chillers are in an alarm (*) condition, the standby chiller shall default to operate in CCN mode based on its configured 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 chiller CHILLED WATER temperature must be greater than the *CONTROL POINT* plus 1/2 the *WATER/BRINE DEADBAND*.

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* value must be greater than 95% of full load amps.
4. Lead chiller temperature pulldown rate of the CHILLED WATER temperature is less than 0.5° F (0.27° C) per minute.
5. The lag chiller status indicates it is in CCN mode and is not faulted. If the current lag chiller is in an alarm condition, then 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* shall be started when the lead chiller ramp loading is completed. The *LAG START TIMER* entry is accessed by selecting Lead/Lag from the Equipment Configuration table of the Service menu.

When all of the above requirements have been met, the lag chiller is forced to a START mode. The PIC 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 *COMPRESSOR MOTOR LOAD* value is less than the lead chiller percent capacity plus 15%.

NOTE: Lead chiller percent capacity = 100 – *LAG PERCENT CAPACITY*

The *LAG PERCENT CAPACITY* value is configured on the Lead/Lag Configuration screen.
2. The lead chiller chilled water temperature is less than the *CONTROL POINT* plus 1/2 of the *WATER/BRINE DEADBAND*.
3. The configured *LAG STOP TIMER* entry has elapsed. The *LAG STOP TIMER* is started when the *LEAVING CHILLED WATER* temperature is less than the CHILLED WATER *CONTROL POINT* plus 1/2 of the *WATER/BRINE DEADBAND* and the lead chiller *COMPRESSOR MOTOR LOAD* is less than the lead chiller percent capacity plus 15%. The timer is ignored if the chilled water temperature reaches 3° F (1.67° C) below the *CONTROL POINT* and the lead chiller *COMPRESSOR MOTOR LOAD* value is less than the lead chiller percent capacity plus 15%.

FAULTED CHILLER OPERATION — If the lead chiller shuts down on an alarm (*) condition, it stops communication to the lag and standby chillers. After 30 seconds, the lag chiller will now become the acting lead chiller and will start and stop the standby chiller, if necessary.

If the lag chiller faults when the lead chiller is also faulted, 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 LID panel), the **RESET** softkey is pressed to clear the alarm, and the chiller is placed in the CCN mode, the lead chiller will now communicate and monitor the RUN STATUS of the lag and standby chillers. If both the lag and standby chillers are running, the lead chiller will not attempt to start and will 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 will wait for a start request from the operating chiller. When the configured lead chiller starts, it assumes its role as lead chiller.

LOAD BALANCING — When the *LOAD BALANCE OPTION* is enabled, the lead chiller will set the *ACTIVE DEMAND LIMIT* in the lag chiller to the lead chiller's *COMPRESSOR MOTOR LOAD* value. This value has limits of 40% to 100%. When setting the lag chiller *ACTIVE DEMAND LIMIT*, the *CONTROL POINT* shall 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 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 verification. The PIC controls ensure that the guide vanes are closed. After the guide vane position is confirmed, the delay for lag and standby chiller 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 motors from being energized simultaneously. This will help reduce the inrush demands on the building power system.

Ice Build Control — Ice build control automatically sets the chilled *WATER/BRINE CONTROL POINT* of the machine from normal operation set point temperature to a temperature where an ice building operation for thermal storage can be accomplished.

NOTE: For ice build control to properly operate, the PIC controls must be placed in CCN mode. See Fig. 23 and 24.

The PIC can be configured for ice build operation. Configuration of ice build control is accomplished through entries in the Config table, Ice Build Set Point table, and the Ice Build Time Schedule table. Figures 23 and 24 show how to access each entry.

The Ice Build Time Schedule defines the period during which ice build is active if the ice build option is *ENABLED*. If the Ice Build Time Schedule overlaps other schedules defining time, then the Ice Build Time Schedule shall take priority. During the ice build period, the *WATER/BRINE CONTROL POINT* is set to the *ICE BUILD SET POINT* for temperature control. The *ICE BUILD RECYCLE OPTION* and *ICE BUILD TERMINATION* entries from a screen in the Config (configuration) table provide options for machine recycle and termination of ice build cycle, respectively. Termination of ice build can result from the *ENTERING CHILLED WATER* (brine) temperature being less than the *ICE BUILD SET POINT*, opening the *REMOTE CONTACTS INPUT* from an ice level indicator, or reaching the end of the Ice Build Time Schedule.

ICE BUILD INITIATION — The Ice Build Time Schedule provides the means for activating ice build. The ice build time table is named OCCPC02S.

If the Ice Build Time Schedule is *OCCUPIED* and the *ICE BUILD OPTION* is *ENABLED*, then ice build is active and the following events automatically take place (unless overridden by a higher authority CCN device):

1. Force *CHILLER START/STOP* to *START*.
2. Force *WATER/BRINE CONTROL POINT* to the *ICE BUILD SET POINT*.
3. Remove any force (Auto) on the *ACTIVE DEMAND LIMIT*.

NOTE: Items 1-3 (shown) shall not occur if the chiller is configured and operating as a lag or standby chiller for lead/lag and is actively controlled by a lead chiller. The lead chiller communicates the *ICE BUILD SET POINT*, desired *CHILLER START/STOP* state, and *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 machine is not running when ice build activates, then the PIC checks the following parameters, based on the *ICE BUILD TERMINATION* value, to avoid starting the compressor unnecessarily:

- if *ICE BUILD TERMINATION* is set to the *TEMPERATURE ONLY OPTION* and the *ENTERING CHILLED WATER* temperature is less than or equal to the *ICE BUILD SET POINT*;
- if *ICE BUILD TERMINATION* is set to the *CONTACTS ONLY OPTION* and the remote contacts are open;
- if the *ICE BUILD TERMINATION* is set to the *BOTH* (temperature and contacts) option and *ENTERING CHILLED WATER* temperature is less than or equal to the *ICE BUILD SET POINT* and remote contacts are open.

The *ICE BUILD RECYCLE OPTION* determines whether or not the PIC will go into a *RECYCLE* mode. If the *ICE BUILD RECYCLE OPTION* is set to *DSABLE* (disable) when the ice build terminates, the PIC will revert back to normal temperature control duty. If the *ICE BUILD RECYCLE OPTION* is set to *ENABLE*, when ice build terminates, the PIC will go into an ice build recycle mode and the chilled water pump relay will remain energized to keep the chilled water flowing. If the *ENTERING CHILLED WATER* (brine) temperature increases above the *ICE BUILD SET POINT* plus the *RECYCLE RESTART DELTA T* value, the compressor will restart and control the *CHILLED WATER/BRINE TEMPERATURE* to the *ICE BUILD SET POINT*.

TEMPERATURE CONTROL DURING ICE BUILD — During ice build, the capacity control algorithm uses the *WATER/BRINE CONTROL POINT* minus 5 F (2.7 C) to control the *LEAVING CHILLED WATER* temperature. The *ECW CONTROL OPTION* and any temperature reset option are ignored during ice build. The 20 mA *DEMAND LIMIT* option is also ignored during ice build.

TERMINATION OF ICE BUILD — Ice build termination occurs under the following conditions:

1. **Ice Build Time Schedule** — When the Ice Build Time Schedule transitions to *UNOCCUPIED*, ice build operation shall terminate.
2. **ECW TEMPERATURE** — Termination of compressor operation, based on temperature, shall occur if the *ICE BUILD TERMINATION* is set to the *ICE BUILD TERMINATION TEMP* option and the *ENTERING CHILLED WATER* temperature is less than the *ICE BUILD SET POINT*. If the *ICE BUILD RECYCLE OPTION* is set to *ENABLE*, a recycle shutdown occurs and recycle start-up shall be based on *LEAVING CHILLED WATER* temperature being greater than the *WATER/BRINE CONTROL POINT* plus *RECYCLE RESTART DELTA T*.
3. **Remote Contacts/Ice Level Input** — Termination of compressor operation occurs when *ICE BUILD TERMINATION* is set to *CONTACTS ONLY OPTION* and the remote contacts are open. In this case, the contacts are provided for ice level termination control. The remote contacts can still be opened and closed to start and stop the chiller when the Ice Build Time Schedule is *UNOCCUPIED*. The contacts are used to stop the *ICE BUILD* mode when the Ice Build Time Schedule is *OCCUPIED*.

4. **ECW TEMPERATURE and Remote Contacts** — Termination of compressor operation shall occur when *ICE BUILD TERMINATION* is set to *BOTH* (temperature and contacts) option and the previously described conditions for *ENTERING CHILLED WATER* temperature and remote contacts have occurred.

NOTE: Overriding the *CHILLER START/STOP*, *WATER/BRINE CONTROL POINT*, and *ACTIVE DEMAND LIMIT* variables by CCN devices (with a priority less than 4) during the ice build period is not possible. However, overriding can be accomplished with CCN during two chiller lead/lag.

RETURN TO NON-ICE BUILD OPERATIONS — Upon termination of ice build, the machine shall return to normal temperature control and start/stop schedule operation. If the *CHILLER START/STOP* or *WATER/BRINE CONTROL POINT* has been forced (with a priority less than 4), prior to entering ice build operation, then *CHILLER START/STOP* and *WATER/BRINE CONTROL POINT* forces will be removed.

Attach to Network Device Control — On the Service menu, one of the selections is *ATTACH TO NETWORK DEVICE*. This table serves the following purposes:

- to upload the Occupancy Schedule Number (if changed) for OCCPC03S, as defined in the Service01 table
- to attach the LID to any CCN device, if the machine has been connected to a CCN Network. This may include other PIC controlled chillers.
- to change to a new PSIO or LID module or upgrade software.

Figure 30 illustrates the *ATTACH TO NETWORK DEVICE* table. The Local description is always the PSIO module address of the machine the LID is mounted on. Whenever the controller identification of the PSIO is changed, this change is reflected on the bus and address for the *LOCAL DEVICE* of the *ATTACH TO DEVICE* screen automatically. See Fig. 24.

Whenever the *ATTACH TO NETWORK DEVICE* table is entered, the LID erases information on the module to which it was attached in order to make room for another device. Therefore, it is then required to attach to a CCN module when this screen is entered, even if the LID is attached back to the original module. When the *ATTACH* softkey is pressed, the message “*UPLOADING TABLES, PLEASE WAIT*” flashes. The LID will then upload the highlighted device or module. If the module address cannot be found, the message “*COMMUNICATION FAILURE*” will appear. The LID will then revert back to the *ATTACH TO DEVICE* screen. The upload process time for various CCN modules is different for each module. In general, the uploading process will take 3 to 5 minutes.

ATTACHING TO OTHER CCN MODULES — If the machine PSIO has been connected to a CCN Network or other PIC controlled chillers through CCN wiring, the LID can be used to view or change parameters on the other controllers. Other PIC machines can be viewed and set points changed (if the other unit is in CCN control), if desired from this particular LID module.

To view the other devices, move to the *ATTACH TO NETWORK DEVICE* table. Move the highlight bar to any device number. Press *SELECT* softkey to change the bus number and address of the module to be viewed. Press *EXIT* softkey to move back to the *ATTACH TO NETWORK DEVICE* table. If the module number is not valid, the “*COMMUNICATION FAILURE*” message will show and a new address number should be entered or the wiring checked. If the model 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 CCN module the LID is currently showing, check the device name descriptor on the upper left hand corner of the LID screen. See Fig. 30.

When the CCN device has been viewed, the ATTACH TO NETWORK DEVICE table should now be used to attach to the PSIO that is on the machine. Move to the ATTACH TO NETWORK DEVICE table and press the **ATTACH** softkey to upload the LOCAL device. The PSIO for the chiller will now be uploaded.

NOTE: The LID will not automatically re-attach to the PSIO module on the machine. Press the **ATTACH** softkey to attach to LOCAL DEVICE and view the machine PSIO.

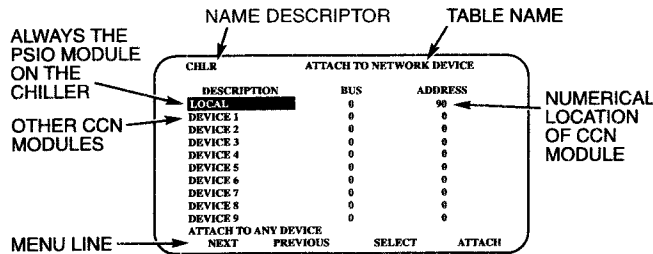


Fig. 30 — Example of Attach to Network Device Screen

Service Operation — An overview of the menu-driven programs available for Service Operation is shown in Fig. 24.

TO LOG ON

- On the Menu screen, press **SERVICE**. The keys now correspond to the numerals 1, 2, 3, 4.
- Press the four digits of your password, one at a time. An asterisk (*) appears as you enter each digit.

ENTER A 4 DIGIT PASSWORD:*

1	2	3	4

The menu bar (Next-Previous-Select-Exit) is displayed to indicate that you have successfully logged on.

NEXT	PREVIOUS	SELECT	EXIT

If the password is entered incorrectly, an error message is displayed. If this occurs, return to Step 1 and try logging on again.

INVALID PASSWORD

1	2	3	4

NOTE: The initial factory set password is 1-1-1-1.

TO LOG OFF — Access the Log Out of Device table of the Service menu in order to password-protect the Service menu. The LID will automatically sign off and password-protect itself if a key is not pressed for 15 minutes. The LID default screen is then displayed.

HOLIDAY SCHEDULING (Fig. 31) — The time schedules may be configured for special operation during a holiday period. When modifying a time period, the "H" at the end of the days of the week field signifies that the period is applicable to a holiday.

The Broadcast function must be activated for the holidays configured in the Holidef tables to work properly. Access the Brodef's table in the Equipment Configuration table and answer "Yes" to the activated function. However, when the machine is connected to a CCN Network, only one machine or CCN device can be configured to be the broadcast device. The controller that is configured to be the broadcaster is the device responsible for transmitting holiday, time, and daylight-savings dates throughout the network.

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

- At the Menu screen, press **SERVICE** to access the Service menu.

STATUS	SCHEDULE	SETPOINT	SERVICE

- If not logged on, follow the instructions for To Log On or To Log Off. Once logged on, press **NEXT** until Equipment Configuration is highlighted.

NEXT	PREVIOUS	SELECT	EXIT

- Once Equipment Configuration is highlighted, press **SELECT** to access.

NEXT	PREVIOUS	SELECT	EXIT

- Press **NEXT** until Holidef is highlighted. This is the Holiday Definition table.

NEXT	PREVIOUS	SELECT	EXIT

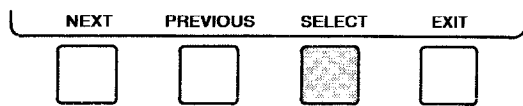
- Press **SELECT** to enter the Data Table Select screen. This screen lists 18 holiday tables.

NEXT	PREVIOUS	SELECT	EXIT

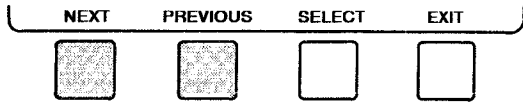
- Press **NEXT** to highlight the holiday table that you wish to view or change. Each table is one holiday period, starting on a specific date, and lasting up to 99 days.

NEXT	PREVIOUS	SELECT	EXIT

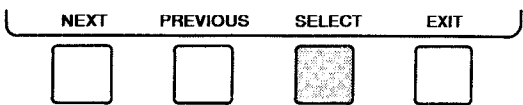
7. Press **SELECT** to access the holiday table. The Configuration Select table now shows the holiday start month and day, and how many days the holiday period will last.



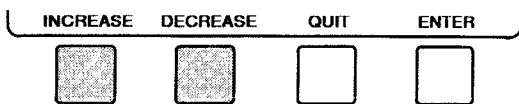
8. Press **NEXT** or **PREVIOUS** to highlight the month, day, or duration.



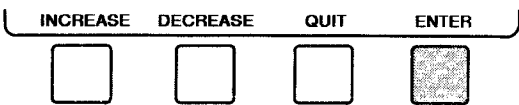
9. Press **SELECT** to modify the month, day, or duration.



10. Press **INCREASE** or **DECREASE** to change the selected value.



11. Press **ENTER** to save the changes.



12. Press **EXIT** to return to the previous menu.

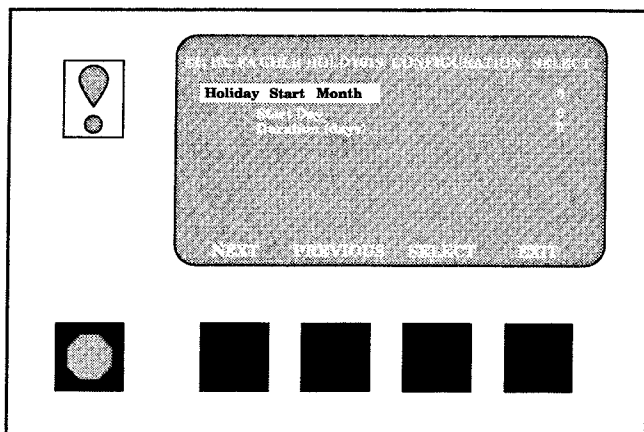
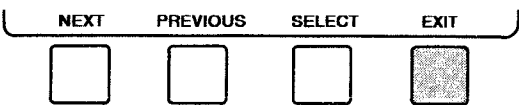


Fig. 31 — Example of Holiday Period Screen

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

Local Start-Up — Local start-up (or a manual start-up) is initiated by pressing the **LOCAL** menu softkey which is on the default LID screen. Local start-up can proceed when Time Schedule 01 is in OCCUPIED mode, and after the internal 15-minute start-to-start timer and the stop-to-start inhibit timer have expired.

The chiller start/stop status point on the Status01 table may be overridden to start, regardless of the time schedule, in order to locally start the unit. Also, the remote contacts may be enabled through the LID and closed to initiate a start-up.

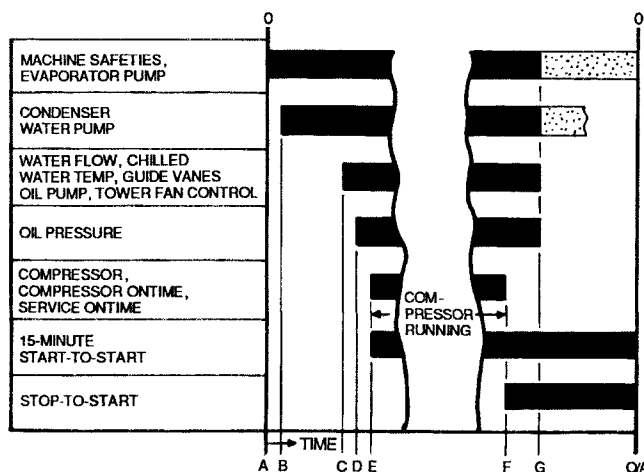
Whenever the chiller is in LOCAL control mode, the PIC will wait for Time Schedule 01 to become occupied and the remote contacts to close, if enabled. The PIC will then perform a series of pre-start checks to verify that all pre-start alerts and safeties are within the limits shown in Table 4. The run status line on the LID now reads "Starting." If the checks are successful, the chilled water/brine pump relay will be energized. Five seconds later, the condenser pump relay is energized. Thirty seconds later the PIC monitors the chilled water and condenser water flow switches, and waits until the *WATER FLOW VERIFY TIME* (operator configured, default 5 minutes) to confirm flow. After flow is verified, the chilled water/brine temperature is compared to *CONTROL POINT* plus *DEADBAND*. If the temperature is less than or equal to this value, the PIC will turn off the condenser pump relay and go into a RECYCLE mode. If the water/brine temperature is high enough, the start-up sequence continues on to check the guide vane position. If the guide vanes are more than 6% open, the start-up waits until the PIC closes the vanes. If the vanes are closed, and the oil pump pressure is less than 4 psid (28 kPad), the oil pump relay will then be energized. The PIC then waits until the *OIL PRESS (Pressure) VERIFY TIME* (operator configured, default 15 seconds) for oil pressure to reach 18 psid (124 kPad). After oil pressure is verified, the PIC waits 10 seconds, and then the compressor start relay (ICR) is energized to start the compressor.

Failure to verify any of the requirements up to this point will result in the PIC aborting the start and displaying the applicable pre-start mode of failure on the LID default screen. A pre-start failure does not advance the starts in 12 hours counter. Any failure after the ICR relay has energized results in a safety shutdown, advances the starts in the 12 hours counter by one, and displays the applicable shutdown status on the LID display.

Shutdown Sequence — Shutdown of the machine can occur if any of the following events happen:

- the STOP button is pressed for at least one second (the alarm light will blink once to confirm stop command)
- recycle condition is present (see Chilled Water Recycle Mode section)
- time schedule has gone into UNOCCUPIED mode
- remote contact opens
- the start/stop status is overridden to stop from the CCN network or the LID

When a stop signal occurs, the shutdown sequence first stops the compressor by deactivating the start relay. A status message of "SHUTDOWN IN PROGRESS, COMPRESSOR DEENERGIZED" is displayed. The guide vanes are then brought to the closed position. The oil pump relay and the chilled water/brine pump relay are shut down 60 seconds after the compressor stops. The condenser water pump will be shut down when the *CONDENSER REFRIGERANT TEMP* is less than the *CONDENSER PRESSURE*



- A** — START INITIATED — Prestart checks 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).
- F** — SHUTDOWN INITIATED — Compressor motor stops, compressor ontime and service ontime stops, stop-to-start 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 3 minutes after F).

Fig. 32 — Control Sequence

VERRIDE minus 5 psi (34 kPa) or is less than or equal to the *ENTERING CONDENSER WATER TEMP* plus 3° F (2° C). The stop-to-start timer will now begin to count down. If the start-to-start timer is still greater than the value of the start-to-stop timer, then this time is now displayed on the LID.

Certain conditions during shutdown will change this sequence:

- if the *COMPRESSOR MOTOR LOAD* is greater than 10% after shutdown, or the starter contacts remain energized, the oil pump and chilled water pump remain energized and the alarm is displayed
- if the *ENTERING CONDENSER WATER* temperature is greater than 115 F (46 C) at shutdown, the condenser pump will be deenergized after the ICR compressor start relay
- if the machine shuts down due to low refrigerant temperature, the chilled water pump will stay running until the *LEAVING CHILLED WATER* is greater than *CONTROL POINT*, plus 5° F (3° C)

Automatic Soft Stop Amps Threshold — The *SOFT STOP AMPS THRESHOLD* closes the guide vanes of the compressor automatically when a non-recycle, non-alarm stop signal occurs before the compressor motor is deenergized.

If the STOP button is pressed, the guide vanes close to a preset amperage percent or until the guide vane is less than 2% open. The compressor will then shut off.

If the machine enters an alarm state or if the compressor enters a RECYCLE mode, the compressor will be deenergized immediately.

To activate *SOFT STOP AMPS THRESHOLD*, view the bottom of Service1 table. Set the *SOFT STOP AMPS THRESHOLD* value to the percentage amps at which the motor will shut down. The default setting is 100% amps (no Soft Stop).

When the *SOFT STOP AMPS THRESHOLD* is being applied, a status message "SHUTDOWN IN PROGRESS, COMPRESSOR UNLOADING" is shown.

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

- when in LCW control, the difference between the *LEAVING CHILLED WATER* temperature and *ENTERING CHILLED WATER* temperature is less than the *RECYCLE SHUTDOWN DELTA T* (found in the Service1 table) and the *LEAVING CHILLED WATER TEMP* is below the *CONTROL POINT*, and the *CONTROL POINT* has not increased in the last 5 minutes
- when *ECW CONTROL OPTION* is enabled, the difference between the *ENTERING CHILLED WATER* temperature and the *LEAVING CHILLED WATER* temperature is less than the *RECYCLE SHUTDOWN DELTA T* (found in the Service1 table) and the *ENTERING CHILLED WATER TEMPERATURE* is below the *CONTROL POINT*, and the *CONTROL POINT* has not increased in the last 5 minutes
- when the *LEAVING CHILLED WATER* temperature is within 3° F (2° C) of the *BRINE REFRIG TRIPPOINT*

When the machine is in RECYCLE mode, the chilled water pump relay remains energized so that the chilled water temperature can be monitored for increasing load. The recycle control uses *RECYCLE RESTART DELTA T* to check when the compressor should be restarted. This is an operator-configured function which defaults to 5° F (3° C). This value is viewed/modified on the Service1 table. The compressor will restart when:

- in LCW CONTROL the *LEAVING CHILLED WATER* temperature is greater than the *CONTROL POINT* plus the *RECYCLE RESTART DELTA T*; or
- in ECW CONTROL, the *ENTERING CHILLED WATER* temperature is greater than the *CONTROL POINT* plus the *RECYCLE RESTART DELTA T*

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

An alert condition may be generated if 5 or more RECYCLE STARTUPS occur in less than 4 hours. This excessive recycling can reduce machine life. Compressor recycling due to extremely low loads should be reduced. To reduce compressor recycling, use the time schedule to shut the machine down during low load operation or increase the machine 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 RESTART DELTA T* on the Service1 table to lengthen the time between restarts.

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

Safety Shutdown — A safety shutdown is identical to a manual shutdown with the exception that the LID will display the reason for the shutdown, the alarm light will blink continuously, and the spare alarm contacts will be energized. A safety shutdown requires that the **RESET** softkey

be pressed in order to clear the alarm. If the alarm is still present, the alarm light will continue to blink. Once the alarm is cleared, the operator must press the **CCN** or **LOCAL** softkeys to restart the machine.

⚠ CAUTION

Do not reset starter loads or any other starter safety for 30 seconds after the compressor has stopped. Voltage output to the compressor start signal is maintained for 10 seconds to determine starter fault.

Check Starter

⚠ CAUTION

BE AWARE that certain automatic start arrangements *can engage the starter*. Open the disconnect *ahead* of the starter in addition to shutting off the machine or pump.

Use the instruction and service manual supplied by the starter manufacturer to verify that the starter and SMM Panel have been installed correctly.

⚠ CAUTION

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

Whenever a starter safety trip device activates, wait at least 30 seconds before resetting the safety. The microprocessor maintains its output to the ICR relay for 10 seconds after starter safety shutdown to determine the fault mode of failure.

MECHANICAL-TYPE STARTERS

1. Check all field wiring connections for tightness, clearance from moving parts, and correct connection.
2. Check the contactor(s) to be sure they move freely. Check the mechanical interlock between contactors to ensure that 1S and 2M contactors cannot be closed at the same time. Check all other electro-mechanical devices, e.g., relays, timers, for free movement. If the devices do not move freely, contact the starter manufacturer for replacement components.
3. Some dashpot-type magnetic overload relays must be filled with oil on the job site. If the starter is equipped with devices of this type, remove the fluid cups from these magnetic overload relays. Add dashpot oil to cups per instructions supplied with the starter. The oil is usually shipped in a small container attached to the starter frame near the relays. Use only dashpot oil supplied with the starter. Do not substitute.
Factory-filled dashpot overload relays need no oil at start-up and solid-state overload relays do not have oil.
4. Reapply starter control power (*not main chiller power*) to check electrical functions. When using a reduced-voltage starter (such as a wye-delta type) check the transition timer for proper setting. The factory setting is 30 seconds (± 5 seconds), timed closing. The timer is adjustable in a range between 0 and 60 seconds and settings other than the nominal 30 seconds may be chosen as needed (typically 20 to 30 seconds are used).

When the timer has been set, check that the starter (with relay ICR closed) goes through a complete and proper start cycle.

SOLID-STATE STARTERS

⚠ WARNING

This equipment is at line voltage when AC power is connected. Pressing the Stop button does not remove voltage. Use caution when adjusting the potentiometers on the equipment.

1. Check that all wiring connections are properly terminated to the starter.
2. Verify that the ground wire to the starter is installed properly and is of sufficient size.
3. Verify that the motors are properly grounded to the starter.
4. Check that all of the relays are properly seated in their sockets.
5. Verify that the proper ac input voltage is brought into the starter per the certified drawings.
6. Verify the initial factory settings (i.e., starting torque, ramp potentiometers, etc. are set per the manufacturer's instructions.

Power Up the Controls and Check the Oil Heater

— Ensure that an oil level is visible in the compressor before energizing controls. A separate disconnect energizes the oil heater and the control circuit. When first powered, the LID 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 and is powered through a contactor in the power panel. Starters contain a separate circuit breaker to power the heater and the control circuit. This set up allows the heater to energize when the main motor circuit breaker is off for service work or extended shutdowns. The oil heater relay status can be viewed on the Status02 screen on the LID. Oil sump temperature can be viewed on the LID default screen.

SOFTWARE VERSION — The software version will always be labeled on the PSIO module, and on the back side of the LID module. On both the Controller ID and LID ID display screens, the software version number will also appear.

Set Up Machine Control Configuration

⚠ WARNING

Do not operate the machine 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 configuration of the unit is performed, write down all configuration settings. A log, such as the one shown on pages CL-1 to CL-12, provides a convenient list for configuration values.

Input the Design Set Points — Access the LID set point screen and view/modify the base demand limit set point, and *either* the LCW set point *or* the ECW set point. The PIC can control a set point to either the leaving or entering chilled water. This control method is set in the Equipment Configuration table, Config table.

Input the Local Occupied Schedule (OCCPC01S)

— Access the schedule OCCPC01S screen on the LID and set up the occupied time schedule per 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 5.

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

The Ice Build Occupied Schedule (OCCPC02S) should be configured for Ice Build applications.

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

- password
- input time and date
- LID configuration
- controller identification
- service parameters
- equipment configuration
- automated control test

PASSWORD — When accessing the Service tables, a password must be entered. All LIDs are initially set for a password of 1-1-1-1. This password may be changed in the LID configuration screen, if desired.

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. "Holiday Today" should only be configured to "Yes" if the present day is a holiday.

CHANGE LID CONFIGURATION IF NECESSARY — The LID Configuration screen is used to view or modify the LID CCN address, change to English or SI units, and to change the password. If there is more than one machine at the job-site, change the LID address on each machine so that each machine has its own address. Note and record the new address. Change the screen to SI units as required, and change the password if desired. A copy of the password should be retained for future reference.

MODIFY CONTROLLER IDENTIFICATION IF NECESSARY — The controller identification screen is used to change the PSIO module address. Change this address for each machine if there is more than one machine at the job-site. Write the new address on the PSIO module for future reference.

INPUT EQUIPMENT SERVICE PARAMETERS IF NECESSARY — The Equipment Service table has 3 service tables: Service1, Service2, and Service3.

Configure SERVICE1 Table — Access Service1 table to modify/view the following to jobsite parameters:

Chilled Medium Brine Refrigerant Trippoint	Water or Brine? Usually 3° F (1.7° C) below design refrigerant temperature Is HGBP installed?
Surge Limiting or Hot Gas Bypass Option	
Minimum Load Points (T1/P1)	Per job data — See Modify Load Points section
Maximum Load Points (T2/P2)	Per job data — See Modify Load Points section
Motor Rated Load Amps	Per job data
Motor Rated Line Voltage	Per job data
Motor Rated Line kW	Per job data (if kW meter installed)
Line Frequency	50 or 60 Hz
Compressor Starter Type	Reduced voltage or full?
Stop-to-Start Time*	Follow motor vendor recommenda- tion for time between starts. See certified prints for correct value.

*Open-drive machines only.

NOTE: Other values are left at the default values. These may be changed by the operator as required. Service2 and Service3 tables can be modified by the owner/operator as required.

Modify Minimum and Maximum Load Points ($\Delta T1/P1$; $\Delta T2/P2$) If Necessary — These pairs of machine load points, located on the Service1 table, determine when to limit guide vane travel or to open the hot gas bypass valve when surge prevention is needed. These points should be set based on individual machine operating conditions.

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.

Example of configuration: Machine operating parameters

Refrigerant used: HFC-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 maximum load points, use design load condition data. If the machine 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 ΔT_2 :

$$54 - 44 = 10^\circ \text{ F } (12.2 - 6.7 = 5.5^\circ \text{ C})$$

Maximum Load ΔP_2 :

$$120 - 37 = 83 \text{ psid } (827 - 255 = 572 \text{ kPad})$$

To avoid unnecessary surge prevention, add about 10 psid (70 kPad) to ΔP_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 minimum load conditions, estimate the temperature difference that the cooler will have at 20% 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:

$$43 \text{ F } (6.1 \text{ C}) = 38 \text{ psig } (262 \text{ kPa}) \text{ saturated refrigerant pressure (HFC-134a)}$$

Condensing Temperature:

$$70 \text{ F } (21.1 \text{ C}) = 71 \text{ psig } (490 \text{ kPa}) \text{ saturated refrigerant pressure (HFC-134a)}$$

Minimum Load ΔT_1 (at 20% Load):

$$2^\circ \text{ F } (1.1^\circ \text{ C})$$

Minimum Load ΔP_1 :

$$71 - 38 = 33 \text{ psid } (490 - 262 = 228 \text{ kPad})$$

Again, to avoid unnecessary surge prevention, add 20 psid (140 kPad) at ΔP_1 from these conditions:

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

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

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 10 psid (70 kPad)	Decrease P1 by 10 psid (70 kPad)
At high loads (>50%)	Increase P2 by 10 psid (70 kPad)	Decrease P2 by 10 psid (70 kPad)

MODIFY EQUIPMENT CONFIGURATION IF NECESSARY — The Equipment Configuration table has tables to select and view or modify. Refer to the unit certified drawings for the configuration values required for the jobsite. Modify these tables only if requested.

Config Table Modifications — Change the values in this table per job data. See certified drawings for values. Modifications include:

- chilled water reset
- entering chilled water control (Enable/Disable)
- 4 to 20 mA demand limit
- auto restart option (Enable/Disable)
- remote contact option (Enable/Disable)

Owner-Modified CCN Tables — The following tables are described for reference only.

Occdef Table Modifications — The Occdef tables contain the Local and CCN time schedules, which can be modified here, or in the Schedule screen as described previously.

Holidef Table Modifications — The Holidef tables configure the days of the year that holidays are in effect. See the Holiday Scheduling in the Controls section for more details.

Brodef Table Modifications — The Brodef table defines the outside-air temperature sensor and humidity sensor if one is to be installed. It will define the start and end of daylight savings time. Enter the dates for the start and end of daylight savings if required for the location. Brodef also will activate the Broadcast function which enables the holiday periods that are defined on the LID.

Other Tables — The Alarmdef, Cons-def, and Runt-def contain tables for use with a CCN system. See the applicable CCN manual for more information on these tables. These tables can only be defined through a CCN Building Supervisor.

CHECK VOLTAGE SUPPLY — Access the Status 01 screen and read the *LINE VOLTAGE: ACTUAL* value. This reading should be equal to the incoming power to the starter. Use a voltmeter to check incoming power at the starter power leads. If the readings are not equal, an adjustment can be made by selecting the *LINE VOLTAGE: ACTUAL* point and then increasing or decreasing the value so that the value appearing on the LID is calibrated to the incoming power voltage reading. Voltage can be calibrated only to between 90 and 100 percent of rated line voltage.

PERFORM AN AUTOMATED CONTROL TEST — Check the safety controls status by performing an automated controls test. Access the Control Test table and select the Automated Tests function (Table 6).

The Automated Control Test will check all outputs and inputs for function. It will also set the refrigerant type. The compressor must be in the OFF mode in order to operate the controls test and the 24-v input to the SMM must be in range (per line voltage percent on Status01 table). The OFF mode is caused by pressing the STOP pushbutton on the LID. Each test will ask the operator to confirm that the operation is occurring, and whether or not to continue. If an error occurs, the operator has the choice to try to address the problem as the test is being done, or to note the problem and proceed to the next test.

NOTE: If during the Control Test the guide vanes do not open, check to see that the low pressure alarm is not active. (This will cause the guide vanes to close.)

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

When the test is finished, or the **EXIT** softkey is pressed, the test will be stopped and the Control Test menu will be displayed. 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 as follows.

Automated Tests	As described above, a complete control test.
PSIO Thermistors	Check of all PSIO thermistors only.
Options Thermistors	Check of all options boards thermistors.
Transducers	Check of all transducers.
Guide Vane Actuator	Check of the guide vane operation.
Pumps	Check operation of pump outputs, either all pumps can be activated, or individual pumps. The test will also test the associated input such as flow or pressure.
Discrete Outputs	Activation of all on/off outputs or individually.
Pumpdown/Lockout	Pumpdown prevents the low refrigerant alarm during evacuation so refrigerant can be removed from the unit; locks the compressor off; and starts the water pumps.
Terminate Lockout	To charge refrigerant and enable the chiller to run after pumpdown lockout.

Table 6 — Control Test Menu Functions

TESTS TO BE PERFORMED	DEVICES TESTED
1. Automated Tests*	Operates the second through seventh tests
2. PSIO Thermistors	Entering chilled water Leaving chilled water Entering condenser water Leaving condenser water Discharge temperature Bearing temperature Motor winding temperature Oil sump temperature
3. Options Thermistors	Common chilled water supply sensor Common chilled water return sensor Remote reset sensor Temperature sensor — Spare 1 Spare 2 Spare 3 Spare 4 Spare 5 Spare 6 Spare 7 Spare 8 Spare 9
4. Transducers	Evaporator pressure Condenser pressure Oil pressure differential† Oil pump pressure**
5. Guide Vane Actuator	Open Close
6. Pumps	All pumps or individual pumps may be activated: Oil pump — Confirm pressure Chilled water pump — Confirm flow Condenser water pump — Confirm flow Auxiliary oil pump — Confirm pressure†
7. Discrete Outputs	All outputs or individual outputs may be energized: Hot gas bypass relay Oil heater relay Motor cooling relay** Tower fan relay Alarm relay Shunt trip relay
8. Pumpdown/Lockout	When using pumpdown/lockout, observe freeze up precautions when removing charge: Instructs operator as to which valves to close and when Starts chilled water and condenser water pumps and confirms flows Monitors — Evaporator pressure Condenser pressure Evaporator temperature during pumpout procedures Turns pumps off after pumpdown Locks out compressor
9. Terminate Lockout	Starts pumps and monitors flows Instructs operator as to which valves to open and when Monitors — Evaporator pressure Condenser pressure Evaporator temperature during charging process Terminates compressor lockout

During any of the tests that are not automated, an out-of-range reading will have an asterisk () next to the reading and a message will be displayed.

†On open-drive machines, differential pressure is the only oil pressure displayed.

**Displayed only on hermetic machines.

High Altitude Locations — Recalibration of the pressure transducers will be necessary as the machine was initially calibrated at sea level. Please see the calibration procedure in the Troubleshooting Guide section.

INITIAL START-UP

Preparation — Before starting the machine, check that the:

1. Power is on to the main starter, oil pump relay, tower fan starter, oil heater relay, and the machine control center.
 2. Cooling tower water is at proper level, and at or below design entering temperature.
 3. Machine is charged with refrigerant and all refrigerant and oil valves are in their proper operating position.
 4. Oil is at the proper level in the reservoir sight glasses.
 5. Oil reservoir temperature is above 140 F (60 C) or refrigerant temperature plus 50° F (28° C).
 6. Valves in the evaporator and condenser water circuits are open.
- NOTE: If pumps are not automatic, make sure water is circulating properly.
7. Check the starter to ensure it is ready to start and that all safety circuits have been reset. Be sure to keep the starter door closed.

⚠ WARNING

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 devices and result in the loss of refrigerant charge.

8. Press **[RELEASE]** to automate the chiller start/stop value on the Status01 screen to enable the chiller to start. The initial factory setting of this value is overridden to stop in order to prevent accidental start-up.

Manual Operation of the Guide Vanes — Manual operation of the guide vanes is helpful to establish a steady motor current for calibration of the motor amps value.

In order to manually operate the guide vanes, it is necessary to override the *TARGET GUIDE VANE POSITION* value which is accessed on the Status01 screen. Manual control is indicated by the word "SUPVSR!" flashing after the target value position. Manual control is also indicated on the default screen on the run status line.

1. Access the Status01 screen and look at the target guide vane position (Fig. 25). If the compressor is off, the value will read zero.
2. Move the highlight bar to the *TARGET GUIDE VANE POSITION* line and press the **[SELECT]** softkey.
3. Press **[ENTER]** to override the automatic target. The screen will now read a value of zero, and the word "SUPVSR!" will flash.
4. Press the **[SELECT]** softkey, and then press **[RELEASE]** softkey to release the vanes to AUTOMATIC mode. After a few seconds the "SUPVSR!" will disappear.

Dry Run to Test Start-Up Sequence

1. Disengage the main motor disconnect on the starter front panel. This should only disconnect the motor power. Power to the controls, oil pump, and starter control circuit should still be energized.

2. Look at the default screen on the LID: the Status message in the upper left-hand corner will show a "Manually Stopped" message. Press CCN or Local to start. If not, go to the Schedule screen and override the schedule or change the occupied time. Press the **LOCAL** softkey to begin the start-up sequences.
3. Check that chilled water and condenser water pumps energize.
4. Check that the oil pump starts and pressurizes the lubrication system. After the oil pump has run about 15 seconds, the starter will be energized and go through its start-up sequence.
5. Check the main contactor for proper operation.
6. The PIC will eventually show an alarm for motor amps not sensed. Reset this alarm and continue with the initial start-up.

Check Rotation — Be sure that the motor rotation is proper. See the unit instructions for more information.

Calibrate Motor Current Demand Setting

1. Make sure that the compressor motor rated load amps in the Service1 screen has been configured. Place an ammeter on the line that passes through the motor load current transfer on the motor side of the power factor correction capacitors (if provided).
2. Start the compressor and establish a steady motor current value between 70% and 100% RLA by manually overriding the guide vane target value on the LID and setting the chilled water set point to a low value. Do not exceed the machine's recommendation of the nameplate RLA.
3. When a steady motor current value in the desired range is met, compare the compressor motor amps value on the Status01 screen to the actual amps shown on the ammeter on the starter. Adjust the amps value on the LID to the actual value seen at the starter if there is a difference. Highlight the amps value then press **SELECT**. Press **INCREASE** or **DECREASE** to bring the value to that indicated on the ammeter. Press **ENTER** when equal.
4. Make sure that the target guide vane position is released into AUTOMATIC mode.

To Prevent Accidental Start-Up — The PIC can be set up so that start-up of the unit is more difficult than just pressing the **LOCAL** or **CCN** softkeys during machine service or when necessary. By accessing the Status01 screen, and highlighting the chiller Start/Stop line, the value can be overridden to stop by pressing **SELECT** and then the **STOP** and **ENTER** softkeys. "SUPVSR" will appear after the value. When attempting to restart, remember to release the override. The default machine message line will also state that the Start/Stop has been set to "Start" or "Stop" when the value is overridden.

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

Instruct the Customer Operator — Check to be sure that the operator(s) understands all operating and maintenance procedures. Point out the various machine parts and explain their function as part of the complete system.

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

AUXILIARY EQUIPMENT — Starters and disconnects, separate electrical sources, pumps, and cooling tower.

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 machine.

SAFETY DEVICES AND PROCEDURES — Electrical disconnects, relief device inspection, and handling refrigerant.

CHECK OPERATOR KNOWLEDGE — Start, stop, and shutdown procedures, safety and operating controls, refrigerant and oil charging, and job safety.

REVIEW THE START-UP, OPERATION, AND MAINTENANCE MANUAL

OPERATING INSTRUCTIONS

Operator Duties

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

Prepare the Machine for Start-Up — Follow the steps described in the Initial Start-Up section, page 53.

To Start the Machine

1. Start the water pumps, if they are not automatic.
2. On the LID default screen, press the **LOCAL** or **CCN** softkey to start the system. If the machine is in the OCCUPIED mode, and the 3- and 15-minute start timers have expired, the start sequence will start. Follow the procedure described in the Start-Up/Shutdown/Recycle section, page 48.

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

1. The oil reservoir temperature should be above 150 F (66 C) or refrigerant temperature plus 70° F (38° C) during shutdown, and above 125 F (52 C) during compressor operation.
2. The bearing oil temperature accessed on the Status01 LID screen should be 150 to 200 F (65 to 93 C). If the bearing temperature reads more than 210 F (99 C) with the oil pump running, stop the machine and determine the cause of the high temperature. *Do not restart* the machine until corrected.
3. The condenser pressure and temperature varies with the machine design conditions. Typically the pressure will range between 58 and 124 psig (400 and 855 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. The leaving condenser water temperature should be at least 20° F (11° C) above leaving chilled water temperature.

4. Cooler pressure and temperature also will vary with the design conditions. Typical pressure range will be between 30 and 40 psig (207 and 276 kPa), with temperature ranging between 34 and 45 F (1 and 8 C).
5. 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 1kW, 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 kW rate or temperature rate. It is accessed on the Equipment Configuration menu Config screen (Table 3, Example 5).
6. On open-drive machines, the oil pump will be energized once every 12 hours during shutdown periods to ensure that the shaft seal is filled with oil.

To Stop the Machine

1. The occupancy schedule will start and stop the machine automatically once the time schedule is set up.
2. By pressing the Stop button for one second, the alarm light will blink once to confirm that the button has been pressed, then the compressor will follow the normal shutdown sequence as described in the Controls section. The machine will not restart until the **CCN** or **LOCAL** softkey is pressed. The machine is now in the OFF mode.

NOTE: If the machine fails to stop, in addition to action that the PIC will initiate, the operator should close the guide vanes by overriding the guide vane target to zero to reduce machine load; then by opening the main disconnect. Do not attempt to stop the machine by opening an isolating knife switch. High intensity arcing may occur. *Do not restart* the machine until the problem is diagnosed and corrected.

After Limited Shutdown — No special preparations should be necessary. Follow the regular preliminary checks and starting procedures. Control power must be maintained in order to keep oil temperature hot and all control safeties operational. The oil pump on open-drive machines will operate occasionally to keep the contact seal filled with oil to prevent refrigerant loss.

Extended Shutdown — If recommended by the manufacturer, leave the oil charge in the machine with the oil heater and controls energized to maintain the minimum oil reservoir temperature.

After Extended Shutdown — Check the cooler pressure on the LID default screen, and compare to the original holding charge that was left in the machine. If (after adjusting for ambient temperature changes) any loss in pressure is indicated, check for refrigerant leaks.

Recharge the machine by transferring refrigerant from the utility vessel. Observe freeze-up precautions.

Carefully make all regular preliminary and running system checks. Perform a controls test before start-up. If the compressor oil level appears abnormally high, the oil may have absorbed refrigerant. Make sure that the oil temperature is above 150 F (66 C) or cooler refrigerant temperature plus 70° F (39° C). Follow any other precautions outlined in the manufacturer's instructions.

Cold Weather Operation — When the entering condenser water drops very low, the PIC can automatically cycle the cooling tower fans off to keep the temperature up. Piping may also have to be arranged to bypass the cooling tower as well as a tower temperature control system.

Manual Guide Vane Operation — Manual operation of the guide vanes in order to check control operation or control of the guide vanes in an emergency operation is possible by overriding the target guide vane position. Access the Status01 screen on the LID and highlight **TARGET GUIDE VANE POSITION**. To control the position, enter a percentage of guide vane opening that is desired. Zero percent is fully closed, 100% is fully open. To release the guide vanes to AUTOMATIC mode, press the **RELEASE** softkey.

NOTE: Manual control will increase the guide vanes and override the pulldown rate during start-up. Motor current above the electrical demand setting, capacity overrides, and chilled water below control point will override the manual target and close the guide vanes. For descriptions of capacity overrides and set points, see the Controls section.

Refrigeration Log — A refrigeration log, such as the one shown in Fig. 33, provides a convenient checklist for routine inspection and maintenance and provides a continuous record of machine performance. It is an aid in scheduling routine maintenance and in diagnosing machine problems.

Keep a record of the machine pressures, temperatures, and liquid levels on a sheet similar to that shown. Automatic recording of PIC data is possible through the use of CCN devices such as the Data Collection module and a Building Supervisor. Contact your Carrier representative for more information.

PUMPOUT AND REFRIGERANT TRANSFER PROCEDURES

Follow the instructions outlined in the manufacturer's instructions for operating the optional pumpout compressor.

Under the controls test, during pumpout operations, the pumps are energized to prevent freeze-ups and the vessel pressures and temperatures are displayed. The lockout feature will prevent start-up of the compressor when no refrigerant is present in the machine, or if the vessels are isolated. The lockout is then terminated by the operator by using the Terminate Lockout feature after the pumpdown procedure is reversed and refrigerant has been added.

To Read Refrigerant Pressures during pumpout or leak testing: The LID display on the machine control center is suitable for determining refrigerant-side pressures and low (soft) vacuum. For evacuation or dehydration measurement, use a quality vacuum indicator or manometer to ensure the desired range and accuracy. This can be placed on the Schrader connections on each vessel (Fig. 1 and 2) by removing the pressure transducer.

WEEKLY MAINTENANCE

Check the Lubrication System — Follow the manufacturer's instructions for oil systems.

An oil heater is controlled by the PIC to maintain oil temperature above 150 F (65.5 C) or refrigerant temperature plus 70° F (38.9° C) (see the Controls section) when the compressor is off. The LID Status02 screen displays whether the heater is energized or not. If the PIC shows that the heater is energized, but the sump is 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 will not permit compressor start-up if the oil temperature is too low. The control will continue with start-up only after the temperature is within limits.

After the initial start or a 3-hour power failure, the controls will allow the machine to start once the oil is up to proper temperature, but a slow ramp load rate of 2° F (1.6° C) per minute is used.

SCHEDULED MAINTENANCE

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

Service Ontime — The LID will display a *SERVICE ONTIME* value on the Status01 screen. This value should be reset to zero by the service person or the operator each time major service work is completed so that time between service can be viewed.

Inspect the Control Center — Maintenance is limited to general cleaning and tightening of connections. Vacuum the cabinet to eliminate dust build-up. In the event of machine control malfunctions, refer to the Troubleshooting Guide section for control checks and adjustments.

⚠ CAUTION

Be sure power to the control center is off when cleaning and tightening connections inside the control center.

Check Safety and Operating Controls Monthly

— To ensure machine protection, the Control Test Automated Test should be done at least once per month. See Table 4 for safety control settings.

Inspect the Starting Equipment — Before working on any starter or SMM Panel, shut off the machine, and open all disconnects supplying power to the starter.

⚠ WARNING

The disconnect on the starter front panel does not de-energize 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.

Inspect starter contact surfaces for wear or pitting on mechanical-type starters. Do not sandpaper or file silver-plated contacts. Follow the starter manufacturer's instructions for contact replacement, lubrication, spare parts ordering, and other maintenance requirements.

Periodically vacuum or blow off accumulated debris on the internal parts with a high-velocity, low-pressure blower.

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

⚠ CAUTION

Loose power connections can cause voltage spikes, overheating, malfunctioning, or failures.

Check Pressure Transducers — Once a year, the pressure transducers should be checked against a pressure gage reading. Check all three transducers: oil pressure, condenser pressure, cooler pressure.

Note the evaporator and condenser pressure readings on the Status01 screen on the LID. 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.

Ordering Replacement Chiller Parts — When ordering Carrier specified parts, the following information must accompany an order:

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

TROUBLESHOOTING GUIDE

Overview — The PIC has many features to aid the operator and the technician in troubleshooting a machine.

- By using the LID display, the chiller actual operating conditions can be viewed while the unit is running.
- The Control Algorithm Status screens will display various screens of information in order to diagnose problems with chilled water temperature control, chilled water temperature control overrides, hot gas bypass, surge algorithm status, and time schedule operation.
- The Control Test feature allows proper operation and testing 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 display will show the required temperatures and pressures during these operations.
- Other Service menu tables 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 LID default screen. A more detailed message — along with a diagnostic message — also is stored into the Alarm History table.

Checking the Display Messages — The first area to check when troubleshooting the is the LID display. If the alarm light is flashing, check the primary and secondary message lines on the LID default screen (Fig. 21). These messages will indicate where the fault is occurring. The Alarm History table on the LID Service menu will also carry an alarm message to further expand on this alarm. For a complete listing of messages, see Table 7. If the alarm light starts to flash while accessing a menu screen, depress **[EXIT]** to return to the Default screen to read the failure message. The compressor will not run with an alarm condition existing, unless the alarm type is an unauthorized start or a failure to shut down.

Checking Temperature Sensors — All temperature sensors are of the thermistor type. This means that the resistance of the sensor varies with temperature. All sensors have the same resistance characteristics. Determine sensor temperature by measuring voltage drop if the controls are powered, or resistance if the controls are powered off. Compare the readings to the values listed in Table 8A or 8B.

RESISTANCE CHECK — Turn off the control power and disconnect the terminal plug of the sensor in question from the module. Measure sensor resistance between receptacles designated by the wiring diagram with a digital ohmmeter. The resistance and corresponding temperature is listed in Table 8A or 8B. Check the resistance of both wires to ground. This resistance should be infinite.

VOLTAGE DROP — Using a digital voltmeter, the voltage drop across any energized sensor can be measured while the control is energized. Table 8A or 8B 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. Sensor wire should also be checked at the sensor plug connection. Check the sensor wire by removing the condenser at the sensor and measure for 5 vdc back to the module if the control is powered.

⚠ CAUTION

Relieve all refrigerant pressure or drain the water prior to replacing the temperature sensors.

CHECK SENSOR ACCURACY — Place the sensor in a medium of a 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. 1 and 2 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 — There are 2 sensing elements on each of the bearing temperature sensors (hermetic and open-drive machines) and motor temperature sensors (hermetic machines only) for servicing convenience. In case one of the dual sensors is damaged, the other one can be used by moving a wire.

The number 1 terminal in the sensor terminal box is the common line. To use the second sensor, move the wire from the number 2 position to the number 3 position.

Checking Pressure Transducers — There are 3 pressure transducers on hermetic machines. These determine cooler, condenser, and oil pressures. Open-drive machines have 4 transducers. These transducers sense cooler pressure, condenser pressure, oil supply pressure, and oil sump pressure. The oil supply pressure and the oil transmission sump pressure difference is calculated by a differential pressure power supply module on open-drive machines. The PSIO then reads this differential. In effect, then, the PSIO reads 3 pressure inputs for open-drive machines and 3 pressure inputs for hermetic machines. The cooler and condenser transducers are used by the PIC to determine refrigerant temperatures.

All pressure inputs can be calibrated, if necessary. It is not usually necessary to calibrate at initial start-up. However, at high altitude locations, calibration of the transducer will be necessary to ensure the proper refrigerant temperature/pressure relationship. Each transducer is supplied with 5 vdc power from a power supply. If the power supply fails, a transducer voltage reference alarm will occur. If the transducer reading is suspected of being faulty, check the supply voltage. It should be 5 vdc $\pm$.5 v. If the supply voltage is correct, the transducer should be recalibrated or replaced.

IMPORTANT: For hermetic machines, whenever the oil pressure or the cooler pressure transducer is calibrated, the other sensor should be calibrated to prevent problems with oil differential pressure readings.

To calibrate oil pressure differential on open-drive machines, refer to Oil Pressure Differential Calibration at the end of this section.

Calibration can be checked by comparing the pressure readings from the transducer against an accurate refrigeration gage. These readings are all viewed or calibrated from the Status01 table on the LID. The transducer can be checked and calibrated at 2 pressure points. These calibration points are 0 psig (0 kPa) and between 240 and 260 psig (1655 to 1793 kPa). To calibrate these transducers:

1. Shut down the compressor.
2. Disconnect the transducer in question from its Schrader fitting.

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 Status01 table, and view the particular transducer reading; 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 zeroed by pressing the **[SELECT]** softkey while the highlight bar is located on the transducer, and then by pressing the **[ENTER]**. The value will now go to zero.

If the transducer value is not within the calibration range, the transducer will return to the original reading. If the LID pressure value is within the allowed range (noted above), check the voltage ratio of the transducer. To obtain the voltage ratio, divide the voltage (dc) input from the transducer by the supply voltage signal, measured at the PSIO terminals J7-J34 and J7-J35. For example, the condenser transducer voltage input is measured at PSIO terminals J7-1 and J7-2. The voltage ratio must be between 0.80 vdc and 0.11 vdc 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 240 and 260 psig (1655 and 1793 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 transducer on the Status01 screen, highlighting the transducer, pressing the **[SELECT]** soft-key, and then increasing or decreasing the value to the exact pressure on the refrigerant gage. Press **[ENTER]** to finish. High altitude locations must compensate the pressure so that the temperature/pressure relationship is correct.

If the transducer reading returns to the previous value and the pressure is within the allowed range, check the voltage ratio of the transducer. Refer to Step 3 above. The voltage ratio for this high pressure calibration must be between 0.585 and 0.634 vdc to allow calibration. Change the pressure at the transducer until the ratio is within the acceptable range. Then attempt to calibrate to the new pressure input.

The PIC will not allow calibration if the transducer is too far out of calibration. A new transducer must be installed and re-calibrated.

OIL DIFFERENTIAL PRESSURE/POWER SUPPLY MODULE CALIBRATION — (See Fig. 34.) The oil reservoir in the open-drive machine is not common to cooler pressure. Therefore, a comparison of pump output to cooler pressure could not be used to provide differential oil pressure information. A different method has been developed.

Oil transmission sump pressure and oil supply pressure are fed to a comparator circuit on a 5V power supply board. The output of this circuit, which represents differential oil pressure, is fed to the PSIO. The oil differential pressure is calibrated to zero PSIO (0 kPa) by selecting the oil pressure input on the STATUS01 screen. Then, with the oil pump turned OFF and the transducers connected, press the **[ENTER]** softkey to zero the point. No high end calibration is needed or possible.

TROUBLESHOOTING TRANSDUCERS — When troubleshooting transducers, keep the negative lead of your voltmeter on terminal U4 of the power supply (or terminal 4 on power supplies without the comparator circuit).

$$\text{Voltage VO1} = (\text{VH1} - \text{VL1}) + .467 \pm .1 \text{ V}$$

For all PIC transducers:

$$\text{Measured pressure} = (507.97 \times (\text{V}_{\text{out}}/\text{V}_{\text{in}})) - 47.33$$

$$\text{V}_{\text{out}} = \text{transducer output ref. to neg. terminal (4 or U4) i.e., VH1 to U4 or VL1 to U4}$$

$$\text{V}_{\text{in}} = \text{power supply output, i.e., U3 to U4}$$

TRANSDUCER REPLACEMENT — Since the transducers are mounted on Schrader-type fittings, there is no need to remove refrigerant from the vessel. Disconnect the transducer wiring by pulling up on the locking tab while pulling up on the weather-tight connecting plug from the end of the transducer. *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

Make sure to use a backup wrench on the Schrader fitting whenever removing a transducer.

OPEN-DRIVE OIL PRESSURE INPUT

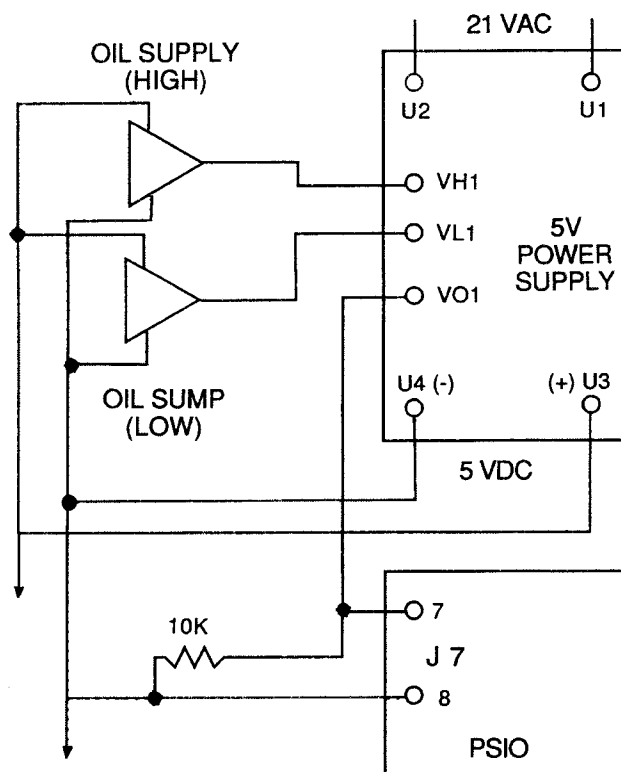


Fig. 34 — Oil Differential Pressure/Power Supply Module

Control Algorithms Checkout Procedure — In the LID Service menu, one of the tables is Control Algorithm Status. This table contains 6 screens that may be viewed in order to see how the particular control algorithm is operating.

MAINT01	Capacity Control	This table shows all values that are used to calculate the chilled water/brine control point.
MAINT02	Override Status	Details of all chilled water control override values are viewed here.
MAINT03	Surge/HGBP Status	The surge and hot gas bypass control algorithm status is viewed from this screen. All values dealing with this control are displayed.
MAINT04	LEAD/LAG Status	This screen indicates LEAD/LAG operation status.
OCCDEFM	Time Schedules Status	The Local and CCN occupied schedules are displayed here in a manner that allows the operator to 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 which can turn on the chiller and change the chilled water control point. This screen indicates the status of this system.

These maintenance tables are very useful in determining guide vane position, reaction from load changes, control point overrides, hot gas bypass reaction, surge prevention, etc.

Control Test — The Control Test feature can check all of the thermistor temperature sensors, including those on the Options modules, pressure transducers, pumps and their associated flow switches, the guide vane actuator, and other control outputs, such as hot gas bypass. The tests can help to determine whether a switch is defective, or a pump relay is not operating, among other useful troubleshooting tests. During pumpdown operations, the pumps are energized to prevent freeze-up and the vessel pressures and temperatures are displayed. The lockout feature will prevent start-up of the compressor when no refrigerant is present in the machine, or if the vessels are isolated. The lockout is then terminated by the operator by using the Terminate Lockout function after the pumpdown procedure is reversed and refrigerant is added.

LEGEND FOR TABLE 7, A - N

1CR__AUX	— Compressor Start Contact
CA__P	— Compressor Current
CCN	— Carrier Comfort Network
CDFL	— Condenser Water Flow
CHIL__S__S	— Chiller Start/Stop
CHW	— Chilled Water
CMPD	— Discharge Temperature
CRP	— Condenser Pressure
ECW	— Entering Chilled Water
ERT	— Evaporator Refrigerant Temperature
EVFL	— Chilled Water Flow
GV__TRG	— Target Guide Vane Position
LID	— Local Interface Device
MTRB	— Bearing Temperature
MTRW	— Motor Winding Temperature
OILPD	— Oil Pressure
OILT	— Oil Sump Temperature
PIC	— Product Integrated Control
PRS__TRIP	— Pressure Trip Contact
PSIO	— Processor Sensor Input/Output Module
RLA	— Rated Load Amps
RUN__AUX	— Compressor Run Contact
SMM	— Starter Management Module
SPR__PL	— Spare Protective Limit Input
STR__FLT	— Starter Fault
TXV	— Thermostatic Expansion Valve
V__P	— Line Voltage: Percent
V__REF	— Voltage Reference

Table 7 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides

A. SHUTDOWN WITH ON/OFF/RESET-OFF

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
MANUALLY STOPPED — PRESS	CCN OR LOCAL TO START	PIC in OFF mode, press the CCN or local softkey to start unit.
TERMINATE PUMPDOWN MODE	TO SELECT CCN OR LOCAL	Enter the Control Test table and select Terminate Lockout to unlock compressor.
SHUTDOWN IN PROGRESS	COMPRESSOR UNLOADING	Machine unloading before shutdown due to Soft Stop feature.
SHUTDOWN IN PROGRESS	COMPRESSOR DEENERGIZED	Machine compressor is being commanded to stop. Water pumps are deenergized within one minute.
ICE BUILD	OPERATION COMPLETE	Machine shutdown from Ice Build operation.

B. TIMING OUT OR TIMED OUT

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
READY TO START IN XX MIN	UNOCCUPIED MODE	Time schedule for PIC is unoccupied. Machines will start only when occupied.
READY TO START IN XX MIN	REMOTE CONTACTS OPEN	Remote contacts have stopped machine. Close contacts to start.
READY TO START IN XX MIN	STOP COMMAND IN EFFECT	Chiller START/STOP on Status01 manually forced to stop. Release value to start.
READY TO START IN XX MIN	RECYCLE RESTART PENDING	Machine in recycle mode.
READY TO START	UNOCCUPIED MODE	Time schedule for PIC is UNOCCUPIED. Machine will start when occupied. Make sure the time and date have been set on the Service menu.
READY TO START	REMOTE CONTACTS OPEN	Remote contacts have stopped machine. Close contacts to start.
READY TO START	STOP COMMAND IN EFFECT	Chiller START/STOP on Status01 manually forced to stop. Release value to start.
READY TO START IN XX MIN	REMOTE CONTACTS CLOSED	Machine timer counting down unit. Ready for start.
READY TO START IN XX MIN	OCCUPIED MODE	Machine timer counting down unit. Ready for start.
READY TO START	REMOTE CONTACTS CLOSED	Machine timers complete, unit start will commence.
READY TO START	OCCUPIED MODE	Machine timers complete, unit start will commence.
STARTUP INHIBITED	LOADSHED IN EFFECT	CCN loadshed module commanding chiller to stop.
READY TO START IN XX MIN	START COMMAND IN EFFECT	Chiller START/STOP on Status01 has been manually forced to start. Machine will start regardless of time schedule or remote contact status.

C. IN RECYCLE SHUTDOWN

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
RECYCLE RESTART PENDING	OCCUPIED MODE	Unit in recycle mode, chilled water temperature is not high enough to start.
RECYCLE RESTART PENDING	REMOTE CONTACT CLOSED	Unit in recycle mode, chilled water temperature is not high enough to start.
RECYCLE RESTART PENDING	START COMMAND IN EFFECT	Chiller START/STOP on Status01 manually forced to start, chilled water temperature is not high enough to start.
RECYCLE RESTART PENDING	ICE BUILD MODE	Machine in ICE BUILD mode. Chilled Water/Brine Temperature is satisfied for Ice Build Setpoint temperature.

D. PRE-START ALERTS: These alerts only delay start-up. When alert is corrected, the start-up will continue. No reset is necessary.

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM MESSAGE/PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
PRESTART ALERT	STARTS LIMIT EXCEEDED	STARTS EXCESSIVE Compressor Starts (8 in 12 hours)	Depress the RESET softkey if additional start is required. Reassess start-up requirements.
PRESTART ALERT	HIGH MOTOR TEMPERATURE	MTRW [VALUE] exceeded limit of [LIMIT]*. Check motor temperature.	Check motor cooling line for proper operation. Check for excessive starts within a short time span.
PRESTART ALERT	HIGH BEARING TEMPERATURE	MTRB [VALUE] exceeded limit of [LIMIT]*. Check thrust bearing temperature.	Check oil heater for proper operation, check for low oil level, partially closed oil supply valves, etc. Check sensor accuracy.
PRESTART ALERT	HIGH DISCHARGE TEMP	CMPTD [VALUE] exceeded limit of [LIMIT]*. Check discharge temperature.	Check sensor accuracy. Allow discharge temperature to cool. Check for excessive starts.
PRESTART ALERT	LOW REFRIGERANT TEMP	ERT [VALUE] exceeded limit of [LIMIT]*. Check refrigerant temperature.	Check transducer accuracy. Check for low chilled water/brine supply temperature.
PRESTART ALERT	LOW OIL TEMPERATURE	OILT [VALUE] exceeded limit of [LIMIT]*. Check oil temperature.	Check oil heater power, oil heater relay. Check oil level.
PRESTART ALERT	LOW LINE VOLTAGE	V___ P [VALUE] exceeded limit of [LIMIT]*. Check voltage supply.	Check voltage supply. Check voltage transformers. Consult power utility if voltage is low. Calibrate voltage reading on STATUS01 table.
PRESTART ALERT	HIGH LINE VOLTAGE	V___ P [VALUE] exceeded limit of [LIMIT]*. Check voltage supply.	Check voltage supply. Check voltage transformers. Consult power utility if voltage is low. Calibrate voltage reading on STATUS01 table.
PRESTART ALERT	HIGH CONDENSER PRESSURE	CRP [VALUE] exceeded limit of [LIMIT]*. Check condenser water and transducer.	Check for high condenser water temperature. Check transducer accuracy.

*[LIMIT] is shown on the LID as 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 7 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides (cont)

E. NORMAL OR AUTO.-RESTART

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
STARTUP IN PROGRESS	OCCUPIED MODE	Machine starting. Time schedule is occupied.
STARTUP IN PROGRESS	REMOTE CONTACT CLOSED	Machine starting. Remote contacts are closed.
STARTUP IN PROGRESS	START COMMAND IN EFFECT	Machine starting. Chiller START/STOP on Status01 manually forced to start.
AUTORESTART IN PROGRESS	OCCUPIED MODE	Machine starting. Time schedule is occupied.
AUTORESTART IN PROGRESS	REMOTE CONTACT CLOSED	Machine starting. Remote contacts are closed.
AUTORESTART IN PROGRESS	START COMMAND IN EFFECT	Machine starting. Chiller START/STOP on Status01 manually forced to start.

F. START-UP FAILURES: This is an alarm condition. A manual reset is required to clear.

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM MESSAGE/PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
FAILURE TO START	LOW OIL PRESSURE	OILPD [VALUE] exceeded limit of [LIMIT]*. Check oil pump system.	Check for closed oil supply valves. Check oil filter. Check for low oil temperature. Check transducer accuracy.
FAILURE TO START	OIL PRESS SENSOR FAULT	OILPD [VALUE] exceeded limit of [LIMIT]*. Check oil pressure sensor.	Check for excessive refrigerant in oil sump. Run oil pump manually for 5 minutes. For hermetic compressors, check both oil pressure and cooler pressure. For open-drive units, check calibration of oil pressure differential amplifier modules. Check wiring. Replace transducers if necessary.
FAILURE TO START	LOW CHILLED WATER FLOW	EVFL Evap Flow Fault: Check water pump/flow switch.	Check wiring to flow switch. Check through Control Test for proper switch operation.
FAILURE TO START	LOW CONDENSER WATER FLOW	CDFL Cond. Flow Fault: Check water pump/flow switch.	Check wiring to flow switch. Check through Control Test for proper switch operation.
FAILURE TO START	STARTER FAULT	STR_FLT Starter Fault: Check Starter for Fault Source.	A starter protective device has faulted. Check starter for ground fault, voltage trip, temperature trip, etc.
FAILURE TO START	STARTER OVERLOAD TRIP	STR_FLT Starter Overload Trip: Check amps calibration/reset overload.	Reset overloads, check ICR relay before restarting machine.
FAILURE TO START	LINE VOLTAGE DROPOUT	V_P Single-Cycle Dropout Detected: Check voltage supply.	Check voltage supply. Check transformers for supply. Check with utility if voltage supply is erratic. Monitor must be installed to confirm consistent, single-cycle dropouts. Check low oil pressure switch.
FAILURE TO START	HIGH CONDENSER PRESSURE	High Condenser Pressure [LIMIT]:* Check switch 2C aux, and water temperature/flow.	Check for proper design condenser flow and temperature. Check condenser approach. Check 2C auxiliary contacts on oil sump starter. Check high pressure switch.
FAILURE TO START	EXCESS ACCELERATION TIME	CA_P Excess Acceleration: Check guide vane closure at start-up.	Check that guide vanes are closed at start-up. Check starter for proper operation. Reduce unit pressure if possible.
FAILURE TO START	STARTER TRANSITION FAULT	RUN_AUX Starter Transition Fault: Check 1CR/1M/Interlock mechanism.	Check starter for proper operation. Run contact failed to close.
FAILURE TO START	1CR AUX CONTACT FAULT	1CR_AUX Starter Contact Fault: Check 1CR/1M aux. contacts.	Check starter for proper operation. Start contact failed to close.
FAILURE TO START	MOTOR AMPS NOT SENSED	CA_P Motor Amps Not Sensed: Check motor load signal.	Check for proper motor amps signal to SMM. Check wiring from SMM to current transformer. Check main motor circuit breaker for trip.
FAILURE TO START	CHECK REFRIGERANT TYPE	Current Refrigerant Properties Abnormal — Check Selection of refrigerant type	Pressures at transducers indicate another refrigerant type in Control Test. Make sure to access the ATTACH TO NETWORK DEVICE table after specifying HFC-134a refrigerant type.
FAILURE TO START	LOW OIL PRESSURE	Low Oil Pressure [LIMIT]:* Check oil pressure switch/pump and 2C aux.	The oil pressure differential switch is open when the compressor tried to START. Check the switch for proper operation. Also, check the oil pump interlock (2C aux) in the power panel and the high condenser pressure switch.

*[LIMIT] is shown on the LID 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 7 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages
with Troubleshooting Guides (cont)**

G. COMPRESSOR JUMPSTART AND REFRIGERANT PROTECTION

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM MESSAGE/PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
UNAUTHORIZED OPERATION	UNIT SHOULD BE STOPPED	CA...P Emergency: Compressor running without control authorization.	Compressor is running with more than 10% RLA and control is trying to shut it down. Throw power off to compressor if unable to stop. Determine cause before repowering.
POTENTIAL FREEZE-UP	EVAP PRESS/TEMP TOO LOW	ERT Emergency: Freeze-up prevention.	Determine cause. If pumping refrigerant out of machine, stop operation and go over pumpout procedures.
FAILURE TO STOP	DISCONNECT POWER	RUN...AUX Emergency: DISCONNECT POWER.	Starter and run and start contacts are energized while control tried to shut down. Disconnect power to starter.
LOSS OF COMMUNICATION	WITH STARTER	Loss of Communication with Starter: Check machine.	Check wiring from PSIO to SMM. Check SMM module troubleshooting procedures.
STARTER CONTACT FAULT	ABNORMAL 1CR OR RUN AUX	1CR...AUX Starter Contact Fault: Check 1CR/1M aux. contacts.	Starter run and start contacts energized while machine was off. Disconnect power.
POTENTIAL FREEZE UP	COND PRESS/TEMP TOO LOW	CRT [VALUE] exceeded limit of [LIMIT]* Emergency: Freeze-up prevention.	The condenser pressure transducer is reading a pressure that could freeze the water in the condenser tubes. Check for condenser refrigerant leaks, bad transducers, or transferred refrigerant. Place the unit in Pumpdown mode to eliminate ALARM if vessel is evacuated.

*[LIMIT] is shown on the LID 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.

H. NORMAL RUN WITH RESET, TEMPERATURE, OR DEMAND

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
RUNNING — RESET ACTIVE	4-20MA SIGNAL	Reset program active based upon Config table setup.
RUNNING — RESET ACTIVE	REMOTE SENSOR CONTROL	
RUNNING — RESET ACTIVE	CHW TEMP DIFFERENCE	
RUNNING — TEMP CONTROL	LEAVING CHILLED WATER	Default method of temperature control.
RUNNING — TEMP CONTROL	ENTERING CHILLED WATER	ECW control activated on Config table.
RUNNING — TEMP CONTROL	TEMPERATURE RAMP LOADING	Ramp loading in effect. Use Service1 table to modify.
RUNNING — DEMAND LIMITED	BY DEMAND RAMP LOADING	Ramp loading in effect. Use Service1 table to modify.
RUNNING — DEMAND LIMITED	BY LOCAL DEMAND SETPOINT	Demand limit setpoint is < actual demand.
RUNNING — DEMAND LIMITED	BY 4-20MA SIGNAL	Demand limit is active based on Config table setup.
RUNNING — DEMAND LIMITED	BY CCN SIGNAL	
RUNNING — DEMAND LIMITED	BY LOADSHED/REDLINE	
RUNNING — TEMP CONTROL	HOT GAS BYPASS	Hot Gas Bypass is energized. See surge prevention in the control section.
RUNNING — DEMAND LIMITED	BY LOCAL SIGNAL	Active demand limit manually overridden or Status01 table.
RUNNING — TEMP CONTROL	ICE BUILD MODE	Machine is running under Ice Build temperature control.

**Table 7 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages
with Troubleshooting Guides (cont)**

I. NORMAL RUN OVERRIDES ACTIVE (ALERTS)

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM MESSAGE/PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
RUN CAPACITY LIMITED	HIGH CONDENSER PRESSURE	CRP [VALUE] exceeded limit of [LIMIT]*. Condenser pressure override.	See Capacity Overrides, Table 5. Correct operating condition, modify set-point, or release override.
RUN CAPACITY LIMITED	HIGH MOTOR TEMPERATURE	MTRW [VALUE] exceeded limit of [LIMIT]*. Motor temperature override.	
RUN CAPACITY LIMITED	LOW EVAP REFRIG TEMP	ERT [VALUE] exceeded limit of [LIMIT]*. Check refrigerant charge level.	
RUN CAPACITY LIMITED	HIGH COMPRESSOR LIFT	Surge Prevention Override; lift too high for compressor.	
RUN CAPACITY LIMITED	MANUAL GUIDE VANE TARGET	GV ... TRG Run Capacity Limited: Manual guide vane target.	

*[LIMIT] is shown on the LID 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 temperature, pressure, voltage, etc., at which the control tripped.

J. OUT-OF-RANGE SENSOR FAILURES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM MESSAGE/PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
SENSOR FAULT	LEAVING CHW TEMPERATURE	Sensor Fault: Check leaving CHW sensor.	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	ENTERING CHW TEMPERATURE	Sensor Fault: Check entering CHW sensor.	
SENSOR FAULT	CONDENSER PRESSURE	Sensor Fault: Check condenser pressure transducer.	
SENSOR FAULT	EVAPORATOR PRESSURE	Sensor Fault: Check evaporator pressure transducer.	
SENSOR FAULT	BEARING TEMPERATURE	Sensor Fault: Check bearing temperature sensor.	
SENSOR FAULT	MOTOR WINDING TEMP	Sensor Fault: Check motor temperature sensor.	
SENSOR FAULT	DISCHARGE TEMPERATURE	Sensor Fault: Check discharge temperature sensor.	
SENSOR FAULT	OIL SUMP TEMPERATURE	Sensor Fault: Check oil sump temperature sensor.	
SENSOR FAULT	OIL PRESSURE TRANSDUCER	Sensor Fault: Check oil pressure transducer.	

Table 7 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides (cont)

K. MACHINE PROTECT LIMIT FAULTS

⚠ WARNING

Excessive numbers of the same fault can lead to severe machine damage. Seek service expertise.

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM MESSAGE/PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
PROTECTIVE LIMIT	HIGH DISCHARGE TEMP	CMPD [VALUE] exceeded limit of [LIMIT]*. Check discharge temperature.	Check discharge temperature immediately. Check sensor for accuracy; check for proper condenser flow and temperature; check oil reservoir temperature. Check condenser for fouled tubes or air in machine. Check for proper guide vane actuator operation.
PROTECTIVE LIMIT	LOW REFRIGERANT TEMP	ERT [VALUE] exceeded limit of [LIMIT]*. Check evap pump and flow switch.	Check for proper amount of refrigerant charge; check for proper water flow and temperatures. Check for proper guide vane actuator operation.
PROTECTIVE LIMIT	HIGH MOTOR TEMPERATURE	MTRW [VALUE] exceeded limit of [LIMIT]*. Check motor cooling and solenoid.	Check motor temperature immediately. Check sensor for accuracy. Check for proper condenser flow and temperature. Check motor cooling system for restrictions. Check motor cooling solenoid for proper operation. Check refrigerant filter.
PROTECTIVE LIMIT	HIGH BEARING TEMPERATURE	MTRB [VALUE] exceeded limit of [LIMIT]*. Check oil cooling control.	Check for throttled oil supply isolation valves. Valves should be wide open. Check oil cooler thermal expansion valve. Check sensor accuracy. Check journal and thrust bearings. Check refrigerant filter. Check for excessive oil sump level.
PROTECTIVE LIMIT	LOW OIL PRESSURE	OILPD [VALUE] exceeded limit of [LIMIT]*. Check oil pump and transducer.	Check power to oil pump and oil level. Check for dirty filters or oil foaming at start-up. Check for thermal overload cutout. Reduce ramp load rate if foaming noted. NOTE: This alarm is not related to pressure switch problems.
		Low Oil Pressure [OPEN]*. Check oil pressure switch/pump and 2C aux.	Check the oil pressure switch for proper operation. Check oil pump for proper pressure. Check for excessive refrigerant in oil system.
PROTECTIVE LIMIT	NO MOTOR CURRENT	CA__P Loss of Motor Current: Check sensor.	Check wiring: Check torque setting on solid-state starter. Check for main circuit breaker trip. Check power supply to PSIO module.
PROTECTIVE LIMIT	POWER LOSS	V__P Power Loss: Check voltage supply.	Check 24-vac input on the SMM (terminals 23 and 24). Check transformers to SMM. Check power to PSIO module. Check distribution bus. Consult power company.
PROTECTIVE LIMIT	LOW LINE VOLTAGE	V__P [VALUE] exceeded limit of [LIMIT]*. Check voltage supply.	
PROTECTIVE LIMIT	HIGH LINE VOLTAGE	V__P [VALUE] exceeded limit of [LIMIT]*. Check voltage supply.	Perform pumps Control Test and verify proper switch operation. Check all water valves and pump operation.
PROTECTIVE LIMIT	LOW CHILLED WATER FLOW	EVFL Flow Fault: Check evap pump/flow switch.	
PROTECTIVE LIMIT	LOW CONDENSER WATER FLOW	CDFL Flow Fault: Check cond pump/flow switch.	Check the high-pressure switch. Check for proper condenser pressures and condenser waterflow. Check for fouled tubes. Check the 2C aux. contact and the oil pressure switch in the power panel. This alarm is not caused by the transducer.
PROTECTIVE LIMIT	HIGH CONDENSER PRESSURE	High Cond Pressure [OPEN]*: Check switch, oil pressure contact, and water temp/flow.	
		High Cond Pressure [VALUE]*: Check switch, water flow, and transducer.	Check water flow in condenser. Check for fouled tubes. Transducer should be checked for accuracy. This alarm is not caused by the high pressure switch.
PROTECTIVE LIMIT	HIGH CONDENSER PRESSURE	High Cond Pressure [VALUE]*: Check switch, water flow, and transducer.	Check water flow in condenser. Check for fouled tubes. Transducer should be checked for accuracy. This alarm is not caused by the high pressure switch.
PROTECTIVE LIMIT	1CR AUX CONTACT FAULT	CR__AUX Starter Contact Fault: Check 1CR/1M aux contacts.	1CR auxiliary contact opened while machine was running. Check starter for proper operation.
PROTECTIVE LIMIT	RUN AUX CONTACT FAULT	RUN__AUX Starter Contact Fault: Check 1CR/1M aux contacts.	Run auxiliary contact opened while machine was running. Check starter for proper operation.
PROTECTIVE LIMIT	CCN OVERRIDE STOP	CHIL__S__S CCN Override Stop while in LOCAL run mode.	CCN has signaled machine to stop. Reset and restart when ready. If the signal was sent by the LID, release the Stop signal on STATUS01 table.
PROTECTIVE LIMIT	SPARE SAFTY DEVICE	SPR__PL Spare Safety Fault: Check contacts.	Spare safety input has tripped or factory-installed jumper not present.
PROTECTIVE LIMIT	EXCESSIVE MOTOR AMPS	CA__P [VALUE] exceeded limit of [LIMIT]*. High Amps; Check guide vane drive.	Check motor current for proper calibration. Check guide vane drive and actuator for proper operation.
PROTECTIVE LIMIT	EXCESSIVE COMPR SURGE	Compressor Surge: Check condenser water temp and flow.	Check condenser flow and temperatures. Check configuration of surge protection.
PROTECTIVE LIMIT	STARTER FAULT	STR__FLT Starter Fault: Check starter for fault source.	Check starter for possible ground fault, reverse rotation, voltage trip, etc.
PROTECTIVE LIMIT	STARTER OVERLOAD TRIP	STR__FLT Starter Overload Trip: Check amps calibration/reset overload.	Reset overloads and reset alarm. Check motor current calibration or overload calibration (do not field-calibrate overloads).
PROTECTIVE LIMIT	TRANSDUCER VOLTAGE FAULT	V__REF [VALUE] exceeded limit of [LIMIT]*. Check transducer power supply.	Check transformer power (5 vdc) supply to transducers. Power must be 4.5 to 5.5 vdc.

*[LIMIT] is shown on the LID 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 temperature, pressure, voltage, etc., at which the control tripped. [OPEN] indicates that an input circuit is open.

**Table 7 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages
with Troubleshooting Guides (cont)**

L. MACHINE ALERTS

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM MESSAGE/PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
RECYCLE ALERT	HIGH AMPS AT SHUTDOWN	High Amps at Recycle: Check guide vane drive.	Check that guide vanes are closing. Check motor amps correction calibration is correct. Check actuator for proper operation.
SENSOR FAULT ALERT	LEAVING COND WATER TEMP	Sensor Fault: Check leaving condenser water sensor.	Check sensor. See sensor test procedure.
SENSOR FAULT ALERT	ENTERING COND WATER TEMP	Sensor Fault: Check entering condenser water sensor.	
LOW OIL PRESSURE ALERT	CHECK OIL FILTER	Low Oil Pressure Alert: Check oil	Check oil filter. Check for improper oil level or temperature.
AUTORESTART PENDING	POWER LOSS	V... P Power Loss: Check voltage supply.	Check power supply if there are excessive compressor starts occurring.
AUTORESTART PENDING	LOW LINE VOLTAGE	V... P [VALUE] exceeded limit of [LIMIT]*. Check voltage supply.	
AUTORESTART PENDING	HIGH LINE VOLTAGE	V... P [VALUE] exceeded limit of [LIMIT]*. Check voltage supply.	
SENSOR ALERT	HIGH DISCHARGE TEMP	CMPD [VALUE] exceeded limit of [LIMIT]*. Check discharge temperature.	Discharge temperature exceeded the alert threshold. Check entering condenser water temperature.
SENSOR ALERT	HIGH BEARING TEMPERATURE	MTRB [VALUE] exceeded limit of [LIMIT]*. Check thrust bearing temperature.	Thrust bearing temperature exceeded the alert threshold. Check for closed valves, improper oil level or temperatures.
CONDENSER PRESSURE ALERT	PUMP RELAY ENERGIZED	CRP High Condenser Pressure [LIMIT]*. Pump energized to reduce pressure.	Check ambient conditions. Check condenser pressure for accuracy.
RECYCLE ALERT	EXCESSIVE RECYCLE STARTS	Excessive recycle starts.	The machine load is too small to keep the machine on line and there have been more than 5 restarts in 4 hours. Increase machine load, adjust hot gas bypass, increase RECYCLE RESTART DELTA T.

*[LIMIT] is shown on the LID 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 temperature, pressure, voltage, etc., at which the control tripped.

M. SPARE SENSOR ALERT MESSAGES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM MESSAGE/PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
SPARE SENSOR ALERT	COMMON CHWS SENSOR	Sensor Fault: Check common CHWS sensor.	Check alert temperature set points on Equipment Service, SERVICE2 LID table. Check sensor for accuracy if reading is not accurate.
SPARE SENSOR ALERT	COMMON CHWR SENSOR	Sensor Fault: Check common CHWR sensor.	
SPARE SENSOR ALERT	REMOTE RESET SENSOR	Sensor Fault: Check remote reset temperature sensor.	
SPARE SENSOR ALERT	TEMP SENSOR — SPARE 1	Sensor Fault: Check temperature sensor — Spare 1.	
SPARE SENSOR ALERT	TEMP SENSOR — SPARE 2	Sensor Fault: Check temperature sensor — Spare 2.	
SPARE SENSOR ALERT	TEMP SENSOR — SPARE 3	Sensor Fault: Check temperature sensor — Spare 3.	
SPARE SENSOR ALERT	TEMP SENSOR — SPARE 4	Sensor Fault: Check temperature sensor — Spare 4.	
SPARE SENSOR ALERT	TEMP SENSOR — SPARE 5	Sensor Fault: Check temperature sensor — Spare 5.	
SPARE SENSOR ALERT	TEMP SENSOR — SPARE 6	Sensor Fault: Check temperature sensor — Spare 6.	
SPARE SENSOR ALERT	TEMP SENSOR — SPARE 7	Sensor Fault: Check temperature sensor — Spare 7.	
SPARE SENSOR ALERT	TEMP SENSOR — SPARE 8	Sensor Fault: Check temperature sensor — Spare 8.	
SPARE SENSOR ALERT	TEMP SENSOR — SPARE 9	Sensor Fault: Check temperature sensor — Spare 9.	

**Table 7 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages
with Troubleshooting Guides (cont)**

N. OTHER PROBLEMS/MALFUNCTIONS

DESCRIPTION/MALFUNCTION	PROBABLE CAUSE/REMEDY
Chilled Water/Brine Temperature Too High (Machine Running)	Chilled water set point set too high. Access set point on LID and verify. Capacity override or excessive cooling load (machine at design capacity). Check LID status messages. Check for outside air infiltration into conditioned space. Condenser temperature too high. Check for proper flow, examine cooling tower operation, check for air or water leaks, check for fouled tubes. Refrigerant level low. Check for leaks, add refrigerant, and trim charge. Liquid bypass in waterbox. Examine division plates and gaskets for leaks. Guide vanes fail to open. Use Control Test to check operation. Chilled water control point too high. Access control algorithm status and check chilled water control operation. Guide vanes fail to open fully. Be sure that the guide vane target is released. Check guide vane linkage. Check limit switch in actuator. Check that sensor is in the proper terminals.
Chilled Water/Brine Temperature Too Low (Machine Running)	Chilled water set point set too low. Access set point on LID and verify. Chilled water control point too low. Access control algorithm status and check chilled water control for proper resets. High discharge temperature keeps guide vanes open. Guide vanes fail to close. Be sure that guide vane target is released. Check chilled water sensor accuracy. Check guide vane linkage. Check actuator operation.
Chilled Water Temperature Fluctuates. Vanes Hunt	Deadband too narrow. Configure LID for a larger deadband. Proportional bands too narrow. Either INC or DEC proportional bands should be increased. Loose guide vane drive. Adjust chain drive. Defective vane actuator. Check through Control Test. Defective temperature sensor. Check sensor accuracy.
Low Oil Sump Temperature While Running (Less than 100 F [38 C])	Check for proper oil level (not enough oil).
At Power Up, Default Screen Does Not Appear, "Tables Loading" Message Continually Appears	Check for proper communications wiring on PSIO module. Check that the COMM1 communications wires from the LID are terminated to the COMM1 PSIO connection. Check for ground or short on CCN system wiring.
SMM Communications Failure	Check that PSIO communication plugs are connected correctly. Check SMM communication plug. Check for proper SMM power supply. See Control Modules section on page 70.
High Oil Temperature While Running	Check for proper oil level (too much oil). On hermetic EX compressors, check that TXV valve is operating properly. On hermetic or open-drive FA compressors, check water supply to oil cooler.
Blank LID Screen (Minimal Contrast Visible)	Increase contrast potentiometer. See Fig. 35. Check red LED on LID for proper operation, (power supply). If LED is blinking, but green LED's are not, replace LID module, (memory failure). Check light bulb if backlit model.
"Communications Failure" Highlighted Message At Bottom of LID Screen	LID is not properly addressed to the PSIO. Make sure that "Attach to Network Device," "Local Device" is set to read the PSIO address. Check LED's on PSIO. Is red LED operating properly? Are green LED's blinking? See control module troubleshooting section.
Control Test Disabled	Press the "Stop" pushbutton. The PIC must be in the OFF mode for the Control Test to operate. Clear all alarms. Check line voltage percent on Status01 screen. The percent must be within 90% to 110%. Check voltage input to SMM, calibrate starter voltage potentiometer for accuracy.
Vaness Will Not Open in Control Test	Low pressure alarm is active. Put machine into pumpdown mode or equalize pressure. Check guide vane actuator wiring.
Oil Pump Does Not Run	Check oil pump voltage supply. Cooler vessel pressure under vacuum. Pressurize vessel. Check temperature overload cutout switch.
LID Default Screen Does Not Update	This is normal operation when an alarm is present. The screen freezes the moment the alarm is activated to aid in troubleshooting. The Status01 screen provides current information.
Machine Does Not Stop When the STOP Button is Pressed	The STOP button wiring connector on the LID module is not properly connected or the machine is in soft stop mode and the guide vanes are closing.
LID Screen Dark	Light bulb burned out. Replace as needed.

Table 8A — Thermistor Temperature (F) vs Resistance/Voltage Drop

TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
-25.0	4.821	98010	71	3.093	5781	167	0.838	719
-24.0	4.818	94707	72	3.064	5637	168	0.824	705
-23.0	4.814	91522	73	3.034	5497	169	0.810	690
-22.0	4.806	88449	74	3.005	5361	170	0.797	677
-21.0	4.800	85486	75	2.977	5229	171	0.783	663
-20.0	4.793	82627	76	2.947	5101	172	0.770	650
-19.0	4.786	79871	77	2.917	4976	173	0.758	638
-18.0	4.779	77212	78	2.884	4855	174	0.745	626
-17.0	4.772	74648	79	2.857	4737	175	0.734	614
-16.0	4.764	72175	80	2.827	4622	176	0.722	602
-15.0	4.757	69790	81	2.797	4511	177	0.710	591
-14.0	4.749	67490	82	2.766	4403	178	0.700	581
-13.0	4.740	65272	83	2.738	4298	179	0.689	570
-12.0	4.734	63133	84	2.708	4196	180	0.678	561
-11.0	4.724	61070	85	2.679	4096	181	0.668	551
-10.0	4.715	59081	86	2.650	4000	182	0.659	542
-9.0	4.705	57162	87	2.622	3906	183	0.649	533
-8.0	4.696	55311	88	2.593	3814	184	0.640	524
-7.0	4.688	53526	89	2.563	3726	185	0.632	516
-6.0	4.676	51804	90	2.533	3640	186	0.623	508
-5.0	4.666	50143	91	2.505	3556	187	0.615	501
-4.0	4.657	48541	92	2.476	3474	188	0.607	494
-3.0	4.648	46996	93	2.447	3395	189	0.600	487
-2.0	4.636	45505	94	2.417	3318	190	0.592	480
-1.0	4.624	44066	95	2.388	3243	191	0.585	473
0.0	4.613	42679	96	2.360	3170	192	0.579	467
1.0	4.602	41339	97	2.332	3099	193	0.572	461
2.0	4.592	40047	98	2.305	3031	194	0.566	456
3.0	4.579	38800	99	2.277	2964	195	0.560	450
4.0	4.567	37596	100	2.251	2898	196	0.554	445
5.0	4.554	36435	101	2.217	2835	197	0.548	439
6.0	4.540	35313	102	2.189	2773	198	0.542	434
7.0	4.527	34231	103	2.162	2713	199	0.537	429
8.0	4.514	33185	104	2.136	2655	200	0.531	424
9.0	4.501	32176	105	2.107	2597	201	0.526	419
10.0	4.487	31202	106	2.080	2542	202	0.520	415
11.0	4.472	30260	107	2.053	2488	203	0.515	410
12.0	4.457	29351	108	2.028	2436	204	0.510	405
13.0	4.442	28473	109	2.001	2385	205	0.505	401
14.0	4.427	27624	110	1.973	2335	206	0.499	396
15.0	4.413	26804	111	1.946	2286	207	0.494	391
16.0	4.397	26011	112	1.919	2239	208	0.488	386
17.0	4.381	25245	113	1.897	2192	209	0.483	382
18.0	4.366	24505	114	1.870	2147	210	0.477	377
19.0	4.348	23789	115	1.846	2103	211	0.471	372
20.0	4.330	23096	116	1.822	2060	212	0.465	367
21.0	4.313	22427	117	1.792	2018	213	0.459	361
22.0	4.295	21779	118	1.771	1977	214	0.453	356
23.0	4.278	21153	119	1.748	1937	215	0.446	350
24.0	4.258	20547	120	1.724	1898	216	0.439	344
25.0	4.241	19960	121	1.702	1860	217	0.432	338
26.0	4.223	19393	122	1.676	1822	218	0.425	332
27.0	4.202	18843	123	1.653	1786	219	0.417	325
28.0	4.184	18311	124	1.630	1750	220	0.409	318
29.0	4.165	17796	125	1.607	1715	221	0.401	311
30.0	4.145	17297	126	1.585	1680	222	0.393	304
31.0	4.125	16814	127	1.562	1647	223	0.384	297
32.0	4.103	16346	128	1.538	1614	224	0.375	289
33.0	4.082	15892	129	1.517	1582	225	0.366	282
34.0	4.059	15453	130	1.496	1550			
35.0	4.037	15027	131	1.474	1519			
36.0	4.017	14614	132	1.453	1489			
37.0	3.994	14214	133	1.431	1459			
38.0	3.968	13826	134	1.408	1430			
39.0	3.948	13449	135	1.389	1401			
40.0	3.927	13084	136	1.369	1373			
41.0	3.902	12730	137	1.348	1345			
42.0	3.878	12387	138	1.327	1318			
43.0	3.854	12053	139	1.308	1291			
44.0	3.828	11730	140	1.291	1265			
45.0	3.805	11416	141	1.289	1240			
46.0	3.781	11112	142	1.269	1214			
47.0	3.757	10816	143	1.250	1190			
48.0	3.729	10529	144	1.230	1165			
49.0	3.705	10250	145	1.211	1141			
50.0	3.679	9979	146	1.192	1118			
51.0	3.653	9717	147	1.173	1095			
52.0	3.627	9461	148	1.155	1072			
53.0	3.600	9213	149	1.136	1050			
54.0	3.575	8973	150	1.118	1029			
55.0	3.547	8739	151	1.100	1007			
56.0	3.520	8511	152	1.082	986			
57.0	3.493	8291	153	1.064	965			
58.0	3.464	8076	154	1.047	945			
59.0	3.437	7868	155	1.029	925			
60.0	3.409	7665	156	1.012	906			
61.0	3.382	7468	157	0.995	887			
62.0	3.353	7277	158	0.978	868			
63.0	3.323	7091	159	0.962	850			
64.0	3.295	6911	160	0.945	832			
65.0	3.267	6735	161	0.929	815			
66.0	3.238	6564	162	0.914	798			
67.0	3.210	6399	163	0.898	782			
68.0	3.181	6238	164	0.883	765			
69.0	3.152	6081	165	0.868	750			
70.0	3.123	5929	166	0.853	734			

Table 8B — Thermistor Temperature (C) vs Resistance/Voltage Drop

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
-40	4.896	168 230
-39	4.889	157 440
-38	4.882	147 410
-37	4.874	138 090
-36	4.866	129 410
-35	4.857	121 330
-34	4.848	113 810
-33	4.838	106 880
-32	4.828	100 260
-31	4.817	94 165
-30	4.806	88 480
-29	4.794	83 170
-28	4.782	78 125
-27	4.769	73 580
-26	4.755	69 250
-25	4.740	65 205
-24	4.725	61 420
-23	4.710	57 875
-22	4.693	54 555
-21	4.676	51 450
-20	4.657	48 536
-19	4.639	45 807
-18	4.619	43 247
-17	4.598	40 845
-16	4.577	38 592
-15	4.554	38 476
-14	4.531	34 489
-13	4.507	32 621
-12	4.482	30 866
-11	4.456	29 216
-10	4.428	27 633
-9	4.400	26 202
-8	4.371	24 827
-7	4.341	23 532
-6	4.310	22 313
-5	4.278	21 163
-4	4.245	20 079
-3	4.211	19 058
-2	4.176	18 094
-1	4.140	17 184
0	4.103	16 325
1	4.065	15 515
2	4.026	14 749
3	3.986	14 026
4	3.945	13 342
5	3.903	12 696
6	3.860	12 085
7	3.816	11 506
8	3.771	10 959
9	3.726	10 441
10	3.680	9 949
11	3.633	9 485
12	3.585	9 044
13	3.537	8 627
14	3.487	8 231
15	3.438	7 855
16	3.387	7 499
17	3.337	7 161
18	3.285	6 840
19	3.234	6 536
20	3.181	6 246
21	3.129	5 971
22	3.076	5 710
23	3.023	5 461
24	2.970	5 225
25	2.917	5 000
26	2.864	4 786
27	2.810	4 583
28	2.757	4 389
29	2.704	4 204
30	2.651	4 028
31	2.598	3 861
32	2.545	3 701
33	2.493	3 549
34	2.441	3 404
35	2.389	3 266
36	2.337	3 134
37	2.286	3 008
38	2.236	2 888
39	2.186	2 773
40	2.137	2 663
41	2.087	2 559
42	2.039	2 459
43	1.991	2 363

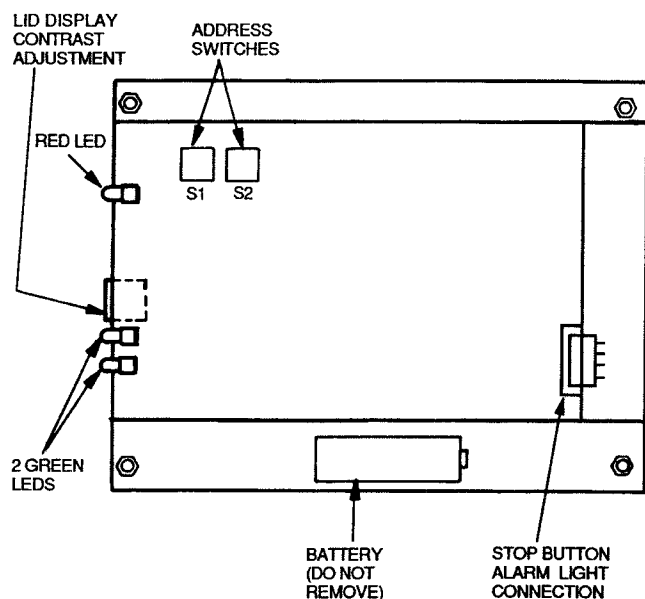
TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
44	1.944	2 272
45	1.898	2 184
46	1.852	2 101
47	1.807	2 021
48	1.763	1 944
49	1.719	1 871
50	1.677	1 801
51	1.635	1 734
52	1.594	1 670
53	1.553	1 609
54	1.513	1 550
55	1.474	1 493
56	1.436	1 439
57	1.399	1 387
58	1.363	1 337
59	1.327	1 290
60	1.291	1 244
61	1.258	1 200
62	1.225	1 158
63	1.192	1 118
64	1.160	1 079
65	1.129	1 041
66	1.099	1 006
67	1.069	971
68	1.040	938
69	1.012	906
70	0.984	876
71	0.949	836
72	0.920	805
73	0.892	775
74	0.865	747
75	0.838	719
76	0.813	693
77	0.789	669
78	0.765	645
79	0.743	623
80	0.722	602
81	0.702	583
82	0.683	564
83	0.665	547
84	0.648	531
85	0.632	516
86	0.617	502
87	0.603	489
88	0.590	477
89	0.577	466
90	0.566	456
91	0.555	446
92	0.545	436
93	0.535	427
94	0.525	419
95	0.515	410
96	0.506	402
97	0.496	393
98	0.486	385
99	0.476	376
100	0.466	367
101	0.454	357
102	0.442	346
103	0.429	335
104	0.416	324
105	0.401	312
106	0.386	299
107	0.370	285

Control Modules

⚠ CAUTION

Turn controller power off before servicing controls. This ensures safety and prevents damage to controller.

The Processor module (PSIO), 8-input (Options) modules, Starter Management Module (SMM), and the Local Interface Device (LID) module 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 side of the LID, see Fig. 35, and on the top horizontal surface of the PSIO, SMM, and 8-input modules. See Fig. 36.



NOTE: Address switches on this module can be at any position. Addresses are only changed through the LID screen or CCN.

Fig. 35 — LID Module (Rear View) and LED Locations

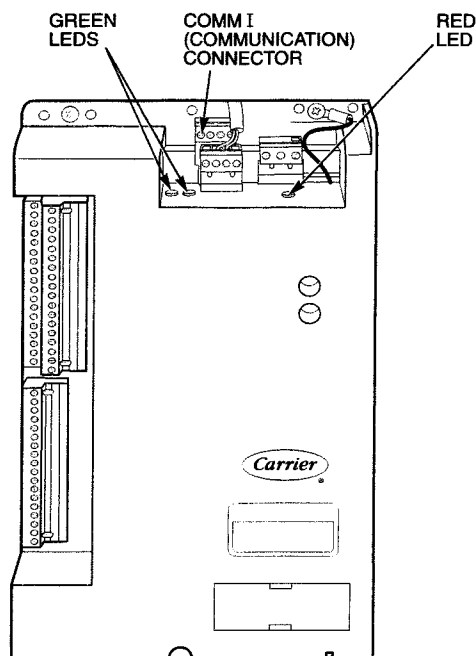


Fig. 36 — PSIO Module LED Locations

RED LED — If the LED is blinking continuously at a 2-second rate, it is indicating proper operation. If it is lit continuously it indicates a problem requiring replacement of the module. Off continuously indicates that the power should be checked. If the red LED blinks 3 times per second, a software error has been discovered and the module must be replaced. If there is no input power, check fuses and the circuit breaker. If fuse is good, check for shorted secondary of transformer, or if power is present to the module, replace the module.

GREEN LEDs — There are one or 2 green LEDs on each type of module. These LEDs indicate communication status between different parts of the controller and the network modules as follows:

LID Module

Upper LED — Communication with CCN network, if present; blinks when communication occurs.

Lower LED — Communication with PSIO module; must blink every 5 to 8 seconds when the LID default screen is displayed.

PSIO Module

Green LED Closest to Communications Connection — Communication with SMM and 8-input module; must blink continuously.

Other Green LED — Communication with LID; must blink every 3 to 5 seconds.

8-Input Modules and SMM

Green LED — Communication with PSIO module; will blink continuously.

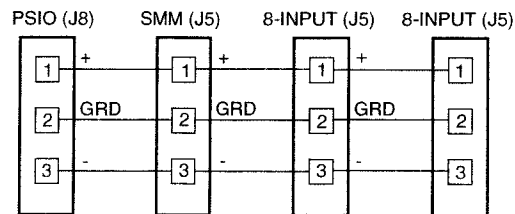
Notes on Module Operation

1. The machine operator monitors and modifies configurations in the microprocessor through the 4 softkeys and the LID. Communication with the LID and the PSIO is accomplished through the CCN bus (COMM1). The communication between the PSIO, SMM, and both 8-input modules is accomplished through the sensor bus (COMM3), which is a 3-wire cable.

On sensor bus terminal strips, Terminal 1 of PSIO module is connected to Terminal 1 of each of the other modules. Terminals 2 and 3 are connected in the same manner. See Fig. 37.

2. If a green LED is on continuously, check communication wiring. If a green LED is off, check the red LED operation. If the red LED is normal, check the module address switches (Fig. 35 and 36). Proper addresses are:

MODULE	ADDRESS	
	SW1	SW2
SMM (Starter Management Module)	3	2
8-input Options Module 1	6	4
8-input Options Module 2	7	2



LEGEND

GRD — Ground
J — Junction
SMM — Starter Management Module
PSIO — Processor/Sensor Input/Output Module
□ — Pins

Fig. 37 — Sensor Input/Output (SIO) Wiring Schematic for COMM3 Bus

If all modules indicate communications failure, check communications plug on the PSIO module for proper seating. Also check the wiring (CCN bus — 1:red, 2:wht, 3:blk; Sensor bus — 1:red, 2:blk, 3:clr/wht). If a good connection is assured and the condition persists, replace the PSIO module.

If only one 8-input module or SMM indicates communication failure, check the communications plug on that module. If a good connection is assured and the condition persists, replace the module.

All system operating intelligence rests in the PSIO module. Some safety shutdown logic resides in the SMM in case communications are lost between the 2 modules. The PSIO monitors conditions using input ports on the PSIO, the SMM, and the 8-input modules. Outputs are controlled by the PSIO and SMM as well.

3. Power is supplied to modules within the control panel via 21-vac power sources.

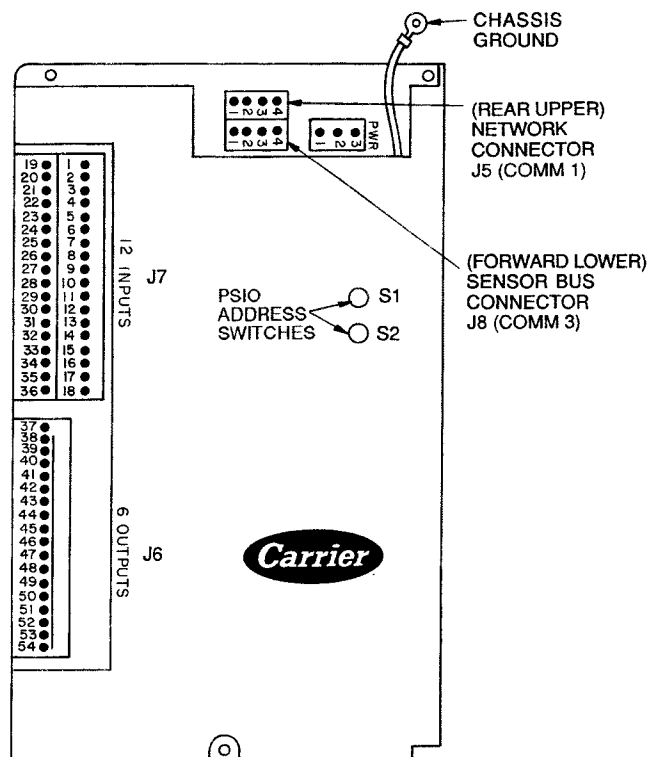
The transformers are located within the power panel, with the exception of the SMM, which operates from a 24-vac power source and has its own 24-vac transformer located within the starter.

Within the power panel, T1 supplies power to the LID, the PSIO, and the 5-vac power supply for the transducers. The other 21-vac transformer is T4, which supplies power to both 8-input modules (if present). T4 is capable of supplying power to two modules; if additional modules are added, another power supply will be required.

Power is connected to Terminals 1 and 2 of the power input connection on each module.

Processor Module (PSIO) (Fig. 38)

INPUTS — Each input channel has 3 terminals; only 2 of the terminals are used. Application of machine determines which terminals are normally used. Always refer to individual unit wiring for terminal numbers.



NOTE: Address switches on this module can be at any position. Addresses can only be changed through the LID or CCN.

Fig. 38 — Processor (PSIO) Module

OUTPUTS — Output is 20 vdc. There are 3 terminals per output, only 2 of which are used, depending on the application. Refer to the unit wiring diagram.

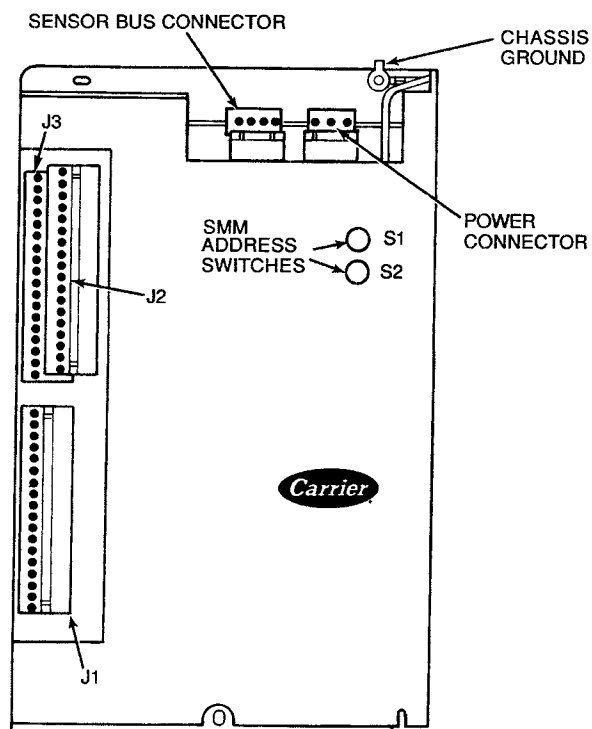
Starter Management Module (SMM) (Fig. 39)

INPUTS — Inputs on strips J2 and J3 are a mix of analog and discrete (on/off) inputs. Application of the machine determines which terminals are used. Always refer to the individual unit wiring diagram for terminal numbers.

OUTPUTS — Outputs are 24 vdc and wired to strip J1. There are 2 terminals used per output.

Options Modules (8-Input) — The options modules are optional additions to the PIC, and are used to add temperature reset inputs, spare sensor inputs, and demand limit inputs. Each option module contains 8 inputs, each input meant for a specific duty. See the wiring diagram for exact module wire terminations. Inputs for each of the options modules available include the following:

OPTIONS MODULE 1	
4 to 20 mA Auto. Demand Reset	
4 to 20 mA Auto. Chilled Water Reset	
Common Chilled Water Supply Temperature	
Common Chilled Water Return Temperature	
Remote Temperature Reset Sensor	
Spare Temperature 1	
Spare Temperature 2	
Spare Temperature 3	
OPTIONS MODULE 2	
4 to 20 mA Spare 1	
4 to 20 mA Spare 2	
Spare Temperature 4	
Spare Temperature 5	
Spare Temperature 6	
Spare Temperature 7	
Spare Temperature 8	
Spare Temperature 9	



NOTE: SMM address switches should be set as follows: S1 set at 3; S2 set at 2.

Fig. 39 — Starter Management Module (SMM)

Terminal block connections are provided on the options modules. All sensor inputs are field wired and installed. Options module 1 can be factory or field-installed. Options module 2 is shipped separately and must be field installed. For installation, refer to the unit or field wiring diagrams. Be sure to address the module for the proper module number (Fig. 40) and to configure the chiller for each feature being used.

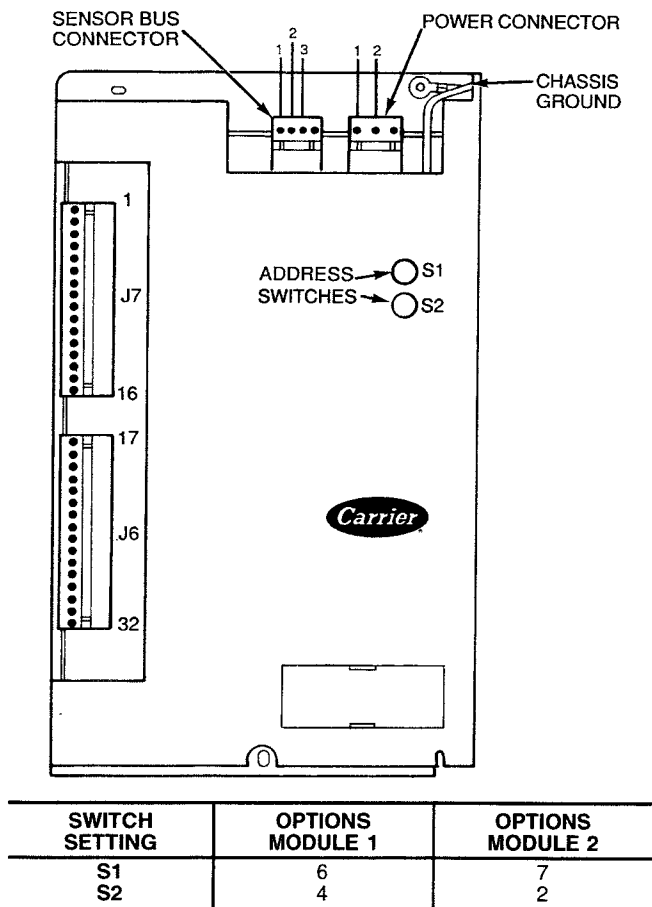


Fig. 40 — Options Module

Replacing Defective Processor Modules — The replacement part number is printed in a small label on front of the PSIO module. The model and serial numbers are printed on the unit nameplate. The proper software is factory-installed by Carrier in the replacement module. When ordering a replacement processor module (PSIO), specify complete replacement part number, full unit model number, and serial number. This new unit requires reconfiguration to the original machine data by the installer. Follow the procedures described in the Set Up Machine Control Configuration section on page 50.

⚠ CAUTION

Electrical shock can cause personal injury. Disconnect all electrical power before servicing.

INSTALLATION OF NEW PSIO MODULE

1. Verify if the existing PSIO module is defective, by using the procedure described in the Notes on Module Operation section, page 70, and Control Modules section, page 70. Do not select the Attach to Network Device table if the LID displays communication failure.
2. Data regarding the PSIO configuration should have been recorded and saved. This data will have to be reconfigured into the LID. If this data is not available, follow the procedures described in the Set Up Machine Control Configuration section. Record the TOTAL COMPRESSOR STARTS and the COMPRESSOR ONTIME from the STATUS01 table on the LID.
If a CCN Building Supervisor or Service Tool is present, the module configuration should have already been uploaded into memory; then, when the new module is installed, the configuration can be downloaded from the computer (if the software version is the same).
Any communication wires from other machines or CCN modules must be disconnected.
3. Check that all power to the unit is off. Carefully disconnect all wires from the defective module by unplugging the 6 connectors. It is not necessary to remove any of the individual wires from the connectors.
4. Remove defective PSIO by removing its mounting screw with a long-shaft Phillips screwdriver, and removing the module from the control box. Save the screw for later use. The green ground wire is held in place with the module mounting screw.
5. Package the defective module in the carton of the new module for return to Carrier.
6. Restore control system power (LID will show "COMMUNICATION FAILURE" at bottom of screen).
7. Access the SERVICE menu. Highlight and select "ATTACH TO NETWORK DEVICE." Push the **ATTACH** softkey. (The LID will show "UPLOADING TABLES. PLEASE WAIT," then show "COMMUNICATION FAILURE.") Press the **EXIT** softkey.
8. Turn off control power.
9. Mount the new module in the unit control box using a long-shaft Phillips screwdriver and the screw saved in Step 4 above. Make sure that the green grounding wire is reinstalled along with the mounting screw.
10. Connect the LID communication wires (CCN bus) and the power wires. If CCN wiring has been attached to the CCN bus, disconnect the wires. Attach the sensor bus plug and the input and output plugs.
11. Carefully check all wiring connections before restoring power.
12. Restore control power and verify that the red and green LEDs on the PSIO are functioning properly.
13. The LID should indicate "AVAILABLE MEMORY" and a value. This value should start to decrease. (If not, check LID wiring to PSIO, ensure connection to the proper plug.) The bottom of the screen will indicate "UPLOADING TABLES, PLEASE WAIT."

14. After the PSIO tables have been uploaded into the LID, access the STATUS01 screen. Move the highlight bar to the "TOTAL COMPRESSOR STARTS" value. Select this value and increase the value until it is the same as the value from the old module. Press **ENTER** to save this value.
15. Move the highlight bar to the "COMPRESSOR ONTIME" value. Select this point and increase the value until it matches the old module run hours. Press **SELECT** to save this value.
16. Change the address of the PSIO in the Controller Identification table back to the previous value. Write the address on the PSIO.
17. Use the configuration sheets to input set point, configuration, and schedule information into the PSIO. The Time

and Date table also must be set. A Building Supervisor can be used to download, the old configuration into the PSIO.

18. Perform a Control Test and verify all tests.

If the software version has been updated, a CCN download of the configuration will not be allowed. Configure the PSIO by hand, and upload the PSIO into the network by using the Attach to Network Device table.

19. Restore chiller to normal operation, calibrate motor amps.

WIRING SCHEMATICS

Figures 41-46 provide wiring schematics for operator convenience during troubleshooting.





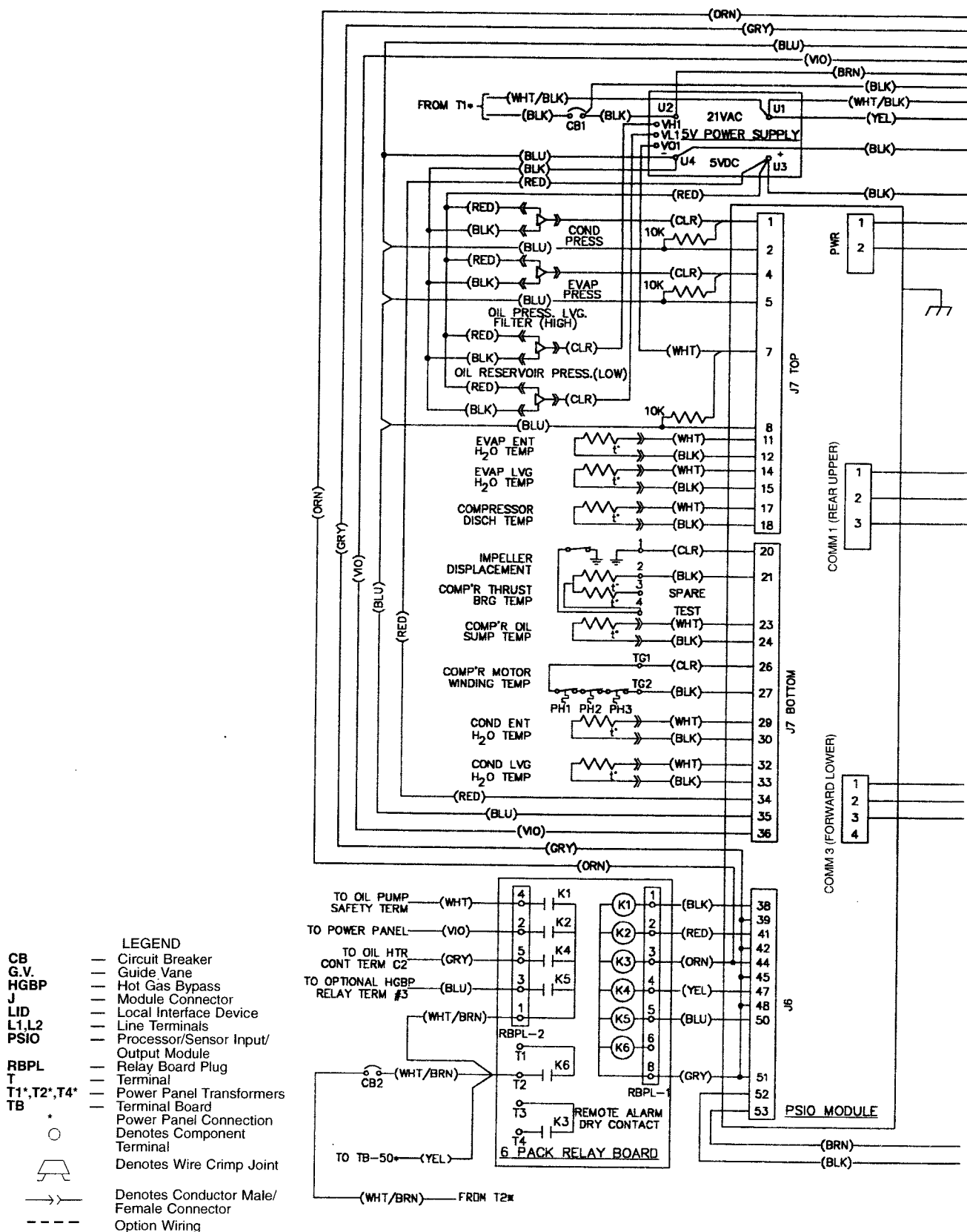


Fig. 42 — Electronic PIC Controls Wiring Schematic — Open-Drive Machine

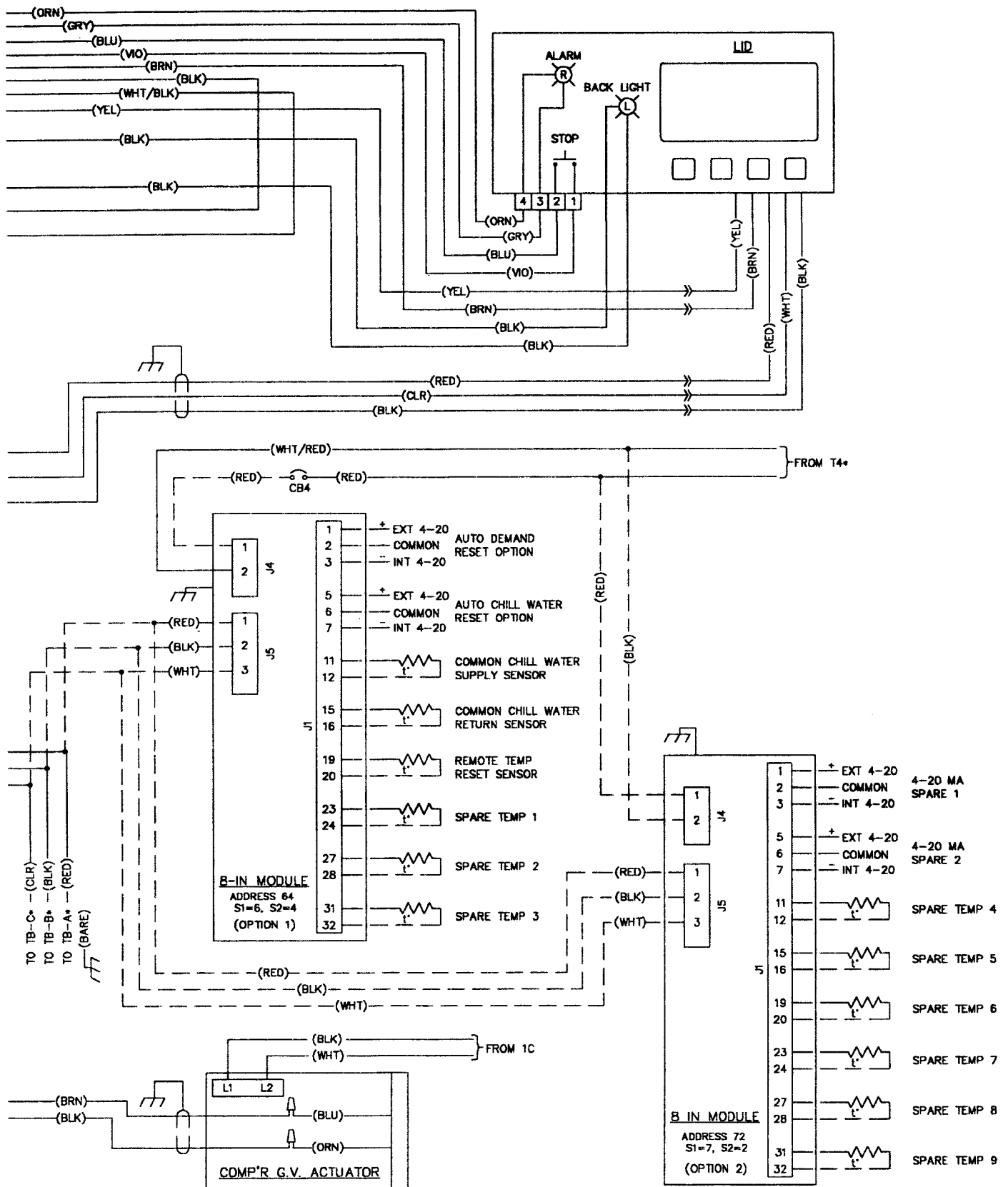
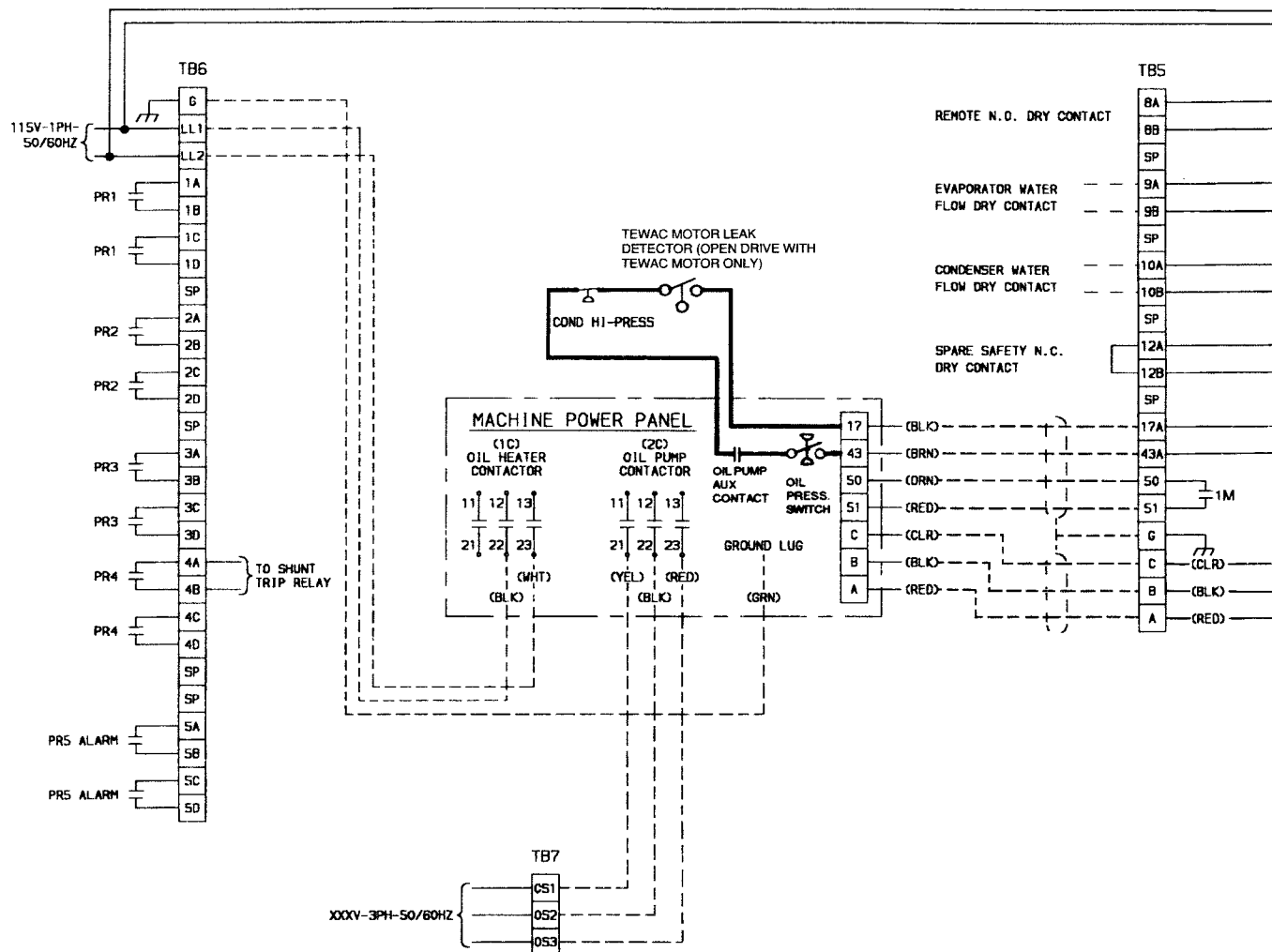


Fig. 42 — Electronic PIC Controls Wiring Schematic — Open-Drive Machine (cont)



- LEGEND**
- CB — Circuit Breaker
 - COMM — Communications
 - N.O. — Normally Open
 - N.C. — Normally Closed
 - O.L. — Overload
 - PR — Pilot Relay
 - PWR — Power
 - RLA — Rated Load Amps
 - SMM — Starter Management Module
 - TB — Terminal Block
 - TEWAC — Totally Enclosed Water-to-Air Cooled
 - Starter Vendor Supplied Wiring
 - Field Wiring
 - Carrier Factory Wiring

NOTE: Voltage to terminals LL1 and LL2 comes from a control transformer in a starter built to Carrier specifications. Do not connect an outside source of control power to the compressor motor starter (terminals LL1 and LL2). An outside power source will produce dangerous voltage at the line side of the starter, because supplying voltage at the transformer secondary terminals produces input level voltage at the transformer primary terminals.

Fig. 43 — Elementary Wiring Diagram for Starter Management Module (SMM) and Control Interface Between Starter and Machine Power Panel (For Low and Medium Free-Standing Starters)

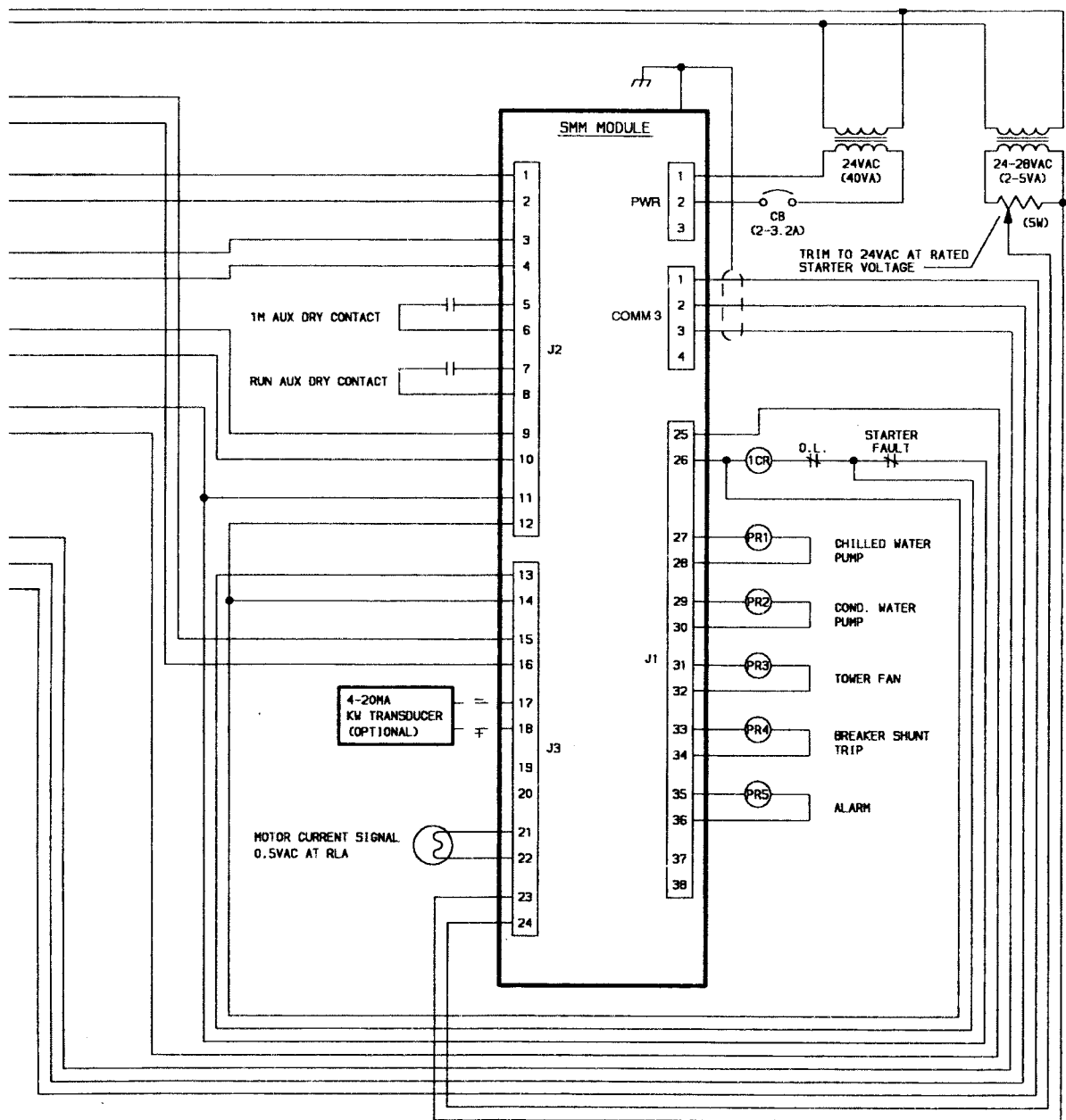
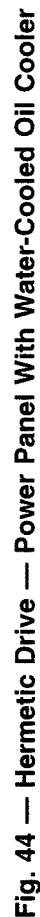
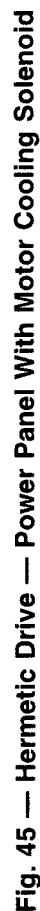


Fig. 43 — Elementary Wiring Diagram for Starter Management Module (SMM) and Control Interface Between Starter and Machine Power Panel (For Low and Medium Free-Standing Starters) (cont)







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