

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 ANSI/ASHRAE 15 (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.

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

DO NOT USE OXYGEN to purge lines or to pressurize a 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 de-energized before resuming work.

DO NOT syphon refrigerant by mouth

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 ANSI/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 water boxes containing industrial brines, liquid, gases, or semisolids without permission of your process control group.

DO NOT LOOSEN water box cover bolts until the water box 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.

CONTENTS

	Page	Page
SAFETY CONSIDERATIONS	1	
INTRODUCTION	4	
ABBREVIATIONS	4	
19XL MACHINE FAMILIARIZATION	4,5	
Machine Information Plate	4	
System Components	4	
Cooler	4	
Condenser	4	
Motor-Compressor	4	
Control Center	4	
Factory-Mounted Starter (Optional)	4	
19XL Storage Vessels (Optional)	4	
REFRIGERATION CYCLE	6	
MOTOR/OIL REFRIGERATION		
COOLING CYCLE	7	
LUBRICATION CYCLE	7,8	
Summary	7	
Details	7	
Oil Reclaim System	7	
• DURING NORMAL MACHINE OPERATION		
• DURING LIGHT LOAD CONDITIONS		
SOLID-STATE STARTER (Optional)	9	
CONTROLS	10-27	
Definitions	10	
• ANALOG SIGNAL		
• DIGITAL SIGNAL		
• VOLATILE MEMORY		
General	10	
19XL PIC System Components	10	
• PROCESSOR MODULE (PSIO)		
• STARTER MANAGEMENT MODULE (SMM)		
• LOCAL INTERFACE DEVICE (LID)		
• 6-PACK RELAY BOARD		
• 8-INPUT MODULE		
• OIL HEATER CONTACTOR (1C)		
• OIL PUMP CONTACTOR (2C)		
• HOT GAS BYPASS RELAY (3C) (Optional)		
• CONTROL TRANSFORMERS (T1-T4)		
• CONTROL AND OIL HEATER VOLTAGE SELECTOR (S1)		
LID Operator and Menus	12	
• GENERAL		
• MENU STRUCTURE		
• TO VIEW POINT STATUS		
• OVERRIDE OPERATIONS		
• TIME SCHEDULE OPERATION		
• TO VIEW AND CHANGE SET POINTS		
• SERVICE OPERATION		
PIC System Functions	23	
• CAPACITY CONTROL		
• ENTERING CHILLED WATER CONTROL		
• DEADBAND		
• PROPORTIONAL BANDS AND GAIN		
• DEMAND LIMITING		
• MACHINE TIMERS		
• OCCUPANCY SCHEDULE		
Safety Controls	24	
• SHUNT TRIP		
Motor Cooling Control	25	
Ramp Loading Control	25	
Capacity Override	25	
Oil Sump Temperature Control	26	
Oil Cooler	26	
Remote Start/Stop Controls	26	
Spare Safety Inputs	26	
Condenser Pump Control	26	
Cooling Tower Control	26	
Auto.-Restart After Power Failure	26	
Water/Brine Reset	26	
Service Operation	26	
• TO LOG ON		
• TO LOG OFF		
• HOLIDAY SCHEDULING		
START-UP/SHUTDOWN/RECYCLE SEQUENCE	28,29	
Local Start-Up	28	
Shutdown Sequence	28	
Chilled Water Recycle Mode	28	
Safety Shutdown	28	
BEFORE INITIAL START-UP	29-39	
Job Data Required	29	
Equipment Required	29	
Using the Optional Storage Tank and Pumpout System	29	
Remove Shipping Packaging	29	
Open Oil Circuit Valves	29	
Check Machine Tightness	29	
Refrigerant Tracer	29	
Measuring Vessel Pressure	30	
Check Machine Condition	30	
Leak Test Machine	30	
• PROCEDURE A		
Standing Vacuum Test	34	
Machine Dehydration	34	
Inspect Piping	34	
Check Optional Pumpout Compressor Water Piping	34	
Check Relief Devices	34	
Inspect Wiring	34	
Carrier Comfort Network Interface	35	
Check Starter	35	
• MECHANICAL-TYPE STARTERS		
• SOLID-STATE STARTERS		
Oil Charge	36	
Power Up the Controls and Check the Oil Heater	36	
Set Up Machine Control Configuration	36	
High Altitude Locations	37	
Input the Design Set Points	37	
Input the Local Occupied Schedule (OCCPCO1S)	37	
Check Voltage Supply	37	
Input Service Configurations	37	
• PASSWORD		
• INPUT TIME AND DATE		
• CHANGE LID CONFIGURATION AS NECESSARY		
• MODIFY CONTROLLER IDENTIFICATION AS NECESSARY		
• INPUT EQUIPMENT SERVICE PARAMETERS AS NECESSARY		
• MODIFY EQUIPMENT CONFIGURATION AS NECESSARY		
• PERFORM AN AUTOMATED CONTROLS TEST		
Check Optional Pumpout System Controls and Compressor	39	
Charge Refrigerant Into Machine	39	
• BRING REFRIGERANT TO NORMAL OPERATING CONDITIONS		
• TRIMMING REFRIGERANT CHARGE		

CONTENTS (cont)

	Page		Page
INITIAL START-UP	40-41		
Preparation	40		
Manual Operation of the Guide Vanes	40		
Dry Run to Test Start-Up Sequences	40		
Check Rotation	40		
• IF ROTATION IS PROPER			
• IF THE MOTOR ROTATION IS NOT CLOCKWISE			
• NOTES ON SOLID-STATE STARTERS			
Check Oil Pressure and Compressor Stop	41		
Calibrate Motor Current Demand Setting To Prevent Accidental Start-Up	41		
Check Machine Operating Condition	41		
Instruct the Customer Operator	41		
• COOLER-CONDENSER			
• OPTIONAL STORAGE TANK AND PUMPOUT SYSTEM			
• MOTOR COMPRESSOR ASSEMBLY			
• MOTOR COMPRESSOR LUBRICATION SYSTEM			
• CONTROL SYSTEM			
• AUXILIARY EQUIPMENT			
• DESCRIBE MACHINE CYCLES			
• REVIEW MAINTENANCE			
• SAFETY DEVICES AND PROCEDURES			
• CHECK OPERATOR KNOWLEDGE			
• REVIEW THE START-UP, OPERATION, AND MAINTENANCE MANUAL			
OPERATING INSTRUCTIONS	41,43		
Operator Duties	41		
Prepare the Machine for Start-Up To Start the Machine	41		
Check the Running System To Stop the Machine	42		
After Limited Shutdown	42		
Extended Shutdown	42		
After Extended Shutdown	42		
Cold Weather Operation	42		
Manual Guide Vane Operation	42		
Refrigeration Log	42		
PUMPOUT AND REFRIGERANT TRANSFER PROCEDURES	44-46		
Preparation	44		
Operating the Optional Pumpout Compressor	44		
• TO READ REFRIGERANT PRESSURES			
Machines with Storage Tanks	44		
• TRANSFER REFRIGERANT FROM STORAGE TANK TO MACHINE			
• TRANSFER THE REFRIGERANT FROM MACHINE TO STORAGE TANK			
Machines with Isolation Valves	45		
• TRANSFER ALL REFRIGERANT TO COOLER/COMPRESSOR VESSEL			
Return Refrigerant to Normal Operating Conditions	45		
GENERAL MAINTENANCE	46-47		
Refrigerant Properties	46		
Adding Refrigerant	46		
Removing Refrigerant	46		
Adjusting the Refrigerant Charge	46		
Refrigerant Leak Testing	46		
Leak Rate	46		
Test After Service, Repair, or Major Leak	46		
• REFRIGERANT TRACER			
• TO PRESSURIZE WITH DRY NITROGEN			
Repair the Leak, Retest, and Apply Standing Vacuum Test	47		
Checking Guide Vane Linkage	47		
• CHECKING THE AUXILIARY SWITCH ON GUIDE VANE ACTUATOR			
Trim Refrigerant Charge	47		
WEEKLY MAINTENANCE	47		
Check the Lubrication System	47		
SCHEDULED MAINTENANCE	47-50		
Service Overtime	47		
Inspect the Control Center	47		
Check Safety and Operating Controls	47		
Monthly	47		
Changing Oil Filter	48		
Oil Specification	48		
Oil Changes	48		
• TO CHANGE THE OIL			
Refrigerant Filter	48		
Oil Reclaim Filters	48		
Inspect Refrigerant Float System	48		
Inspect Relief Valves and Piping	48		
Compressor Bearing and Gear Maintenance	49		
Inspect the Heat Exchanger Tubes	49		
• COOLER			
• CONDENSER			
Water Leaks	49		
Water Treatment	49		
Inspect the Starting Equipment	49		
Check Pressure Transducers	49		
Optional Pumpout System Maintenance	49		
• OPTIONAL PUMPOUT COMPRESSOR OIL CHARGE			
• OPTIONAL PUMPOUT SAFETY CONTROL SETTINGS			
Ordering Replacement Chiller Parts	50		
TROUBLESHOOTING GUIDE	50 -71		
Overview	50		
Checking the Display Messages	50		
Checking Temperature Sensors	50		
• RESISTANCE CHECK			
• VOLTAGE DROP			
• CHECK SENSOR ACCURACY			
• DUAL TEMPERATURE SENSORS			
Checking Pressure Transducers	51		
• TRANSDUCER REPLACEMENT			
Control Algorithms Checkout Procedure	51		
Controls Test	51		
Control Modules	60		
• RED LED			
• GREEN LEDs			
Notes on Module Operation	60		
Processor Module (PSIO)	61		
• INPUTS			
• OUTPUTS			
Starter Management Module (SMM)	61		
• INPUTS			
• OUTPUTS			
Options Modules (8-Input)	61		
Replacing Defective Processor Modules	62		
• INSTALLATION			
Solid-State Starter	63		
• TESTING SILICON CONTROL RECTIFIERS IN SOLID-STATE STARTERS			
19XL Physical Data	67		

INTRODUCTION

Everyone involved in the start-up, operation, and maintenance of the 19XL machine should be thoroughly familiar with these instructions and other necessary job data before initial start-up. This book is outlined so that you may become familiar with the control system before performing start-up procedures. Procedures are arranged in the sequence required for proper 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 edges and avoid touching components and connections.

This equipment uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Always store and transport replacement or defective boards in anti-static shipping bag.

ABBREVIATIONS

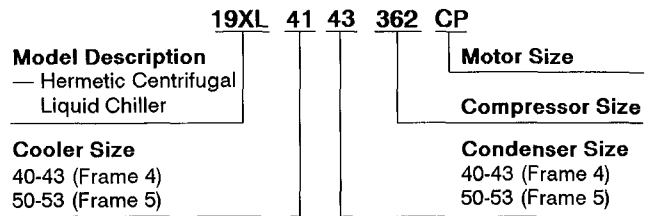
Frequently used abbreviations in this manual include:

CCN	— Carrier Comfort Network
CCW	— Counterclockwise
CW	— Clockwise
ECW	— Entering Chilled Water
ECDW	— Entering Condenser Water
HGBP	— Hot Gas Bypass
I/O	— Input/Output
LCD	— Liquid Crystal Display
LCDW	— Leaving Condenser Water
LED	— Light Emitting Diode
LID	— Local Interface Device
LCW	— Leaving Chilled Water
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	— Thermal Expansion Valve

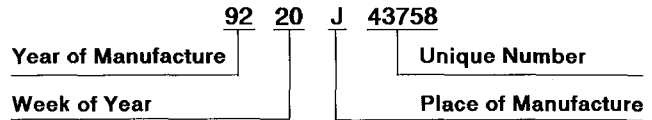
19XL MACHINE FAMILIARIZATION (Fig. 1 and 2)

Machine Information Plate — Located on the right side of the machine control center panel.

System Components include cooler and condenser heat exchangers in separate vessels, motor-compressor, lu-



MODEL NUMBER NOMENCLATURE



SERIAL NUMBER BREAKDOWN

Fig. 1 — 19XL Identification

brication package, control center, and motor starter. All connections from pressure vessels have external threads to enable each component to be pressure tested with a threaded pipe cap during factory assembly.

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

Condenser — This vessel, operating at a higher temperature/pressure than the cooler, has water flowing through its internal tubes in order to remove heat from the refrigerant.

Motor-Compressor maintains system temperature/pressure differences and moves the heat carrying refrigerant from the cooler to the condenser.

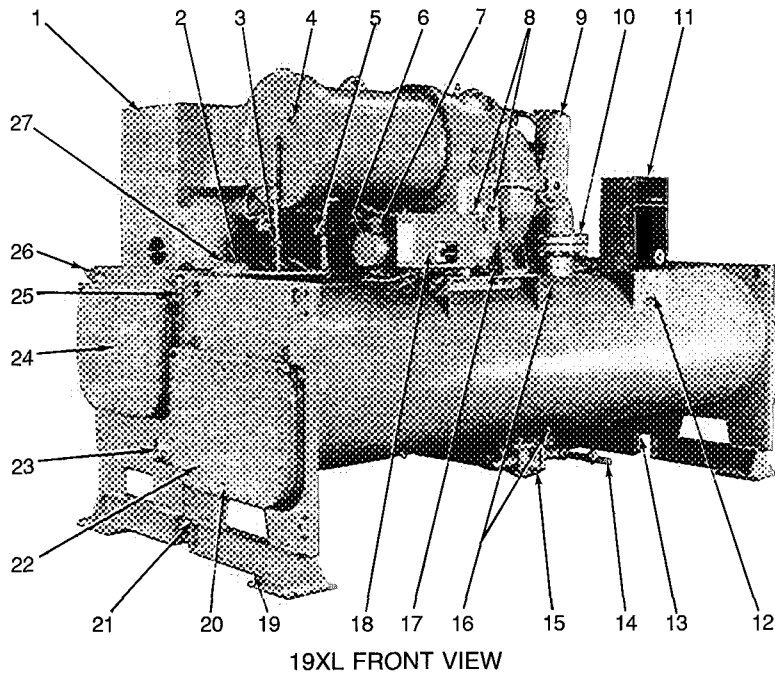
Control Center is the user interface for controlling machine and regulates the machine capacity as required to maintain proper leaving chilled water temperature. The control center:

- 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 microprocessor control.
- provides access to other Carrier Comfort Network devices.

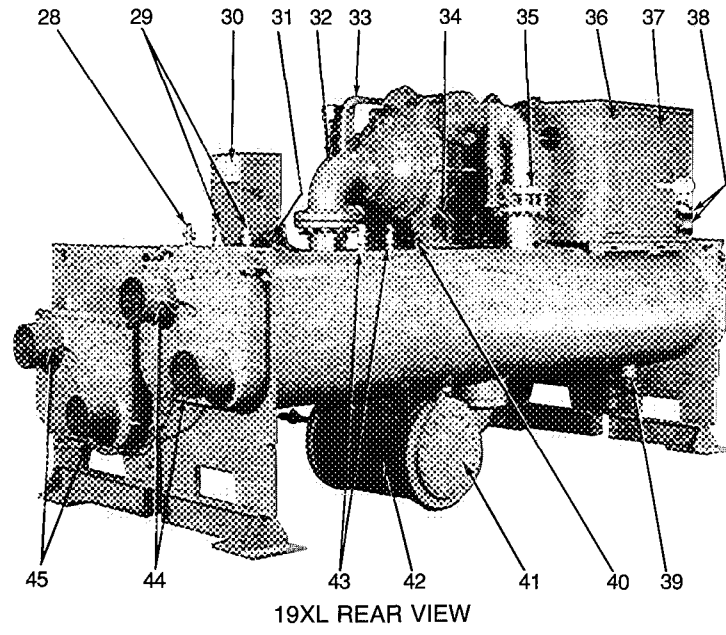
Factory-Mounted Starter (Optional) provides for the proper starting and disconnecting of the electrical energy for the compressor-motor, oil pump, oil heater, and control panels.

19XL Storage Vessel (Optional) — Two sizes of storage vessels are available. The small size is designed to hold one 500-ton R-22 19XL refrigerant charge. The large vessel holds the charge for two machines. The vessels have double relief valves, a magnetically coupled dial-type refrigerant level gage, a one-inch FPT drain valve, and a ½-in. male flare vapor connection for the pumpout unit. A 30-in.-0-400 psi (-101-0-2750 kPa) gage also is supplied with each unit.

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



- 1 — Unit-Mounted Starter
- 2 — Refrigerant Filter/Drier
- 3 — Refrigerant Dry-Eye Indicator
- 4 — Motor Sight Glass
- 5 — Refrigerant Motor Drain
- 6 — Oil Filter Access Cover
- 7 — Refrigerant Oil Cooler
- 8 — Oil Level Sight Glasses
- 9 — Guide Vane Actuator
- 10 — Typical Flange Connection
- 11 — Local Interface Display Control
- 12 — ASME Nameplate, Cooler
- 13 — Take-Apart, Rabbit-Fit Connector (Lower)
- 14 — Refrigerant Charging Valve
- 15 — Cooler Refrigerant Isolation Valve
- 16 — Cooler Pressure Schrader Fittings
- 17 — Oil Drain/Charging Valve
- 18 — Auxiliary Power Panel
- 19 — Retro-Fit, Rig-in-Place Beams
- 20 — Typical Water Box Drain Port
- 21 — Take-Apart, Shell Leveling Feet
- 22 — Cooler Return-End Water Box Cover
- 23 — ASME Nameplate, Condenser
- 24 — Condenser Return-End Water Box Cover
- 25 — Take-Apart, Rabbit-Fit Connector (Upper)
- 26 — Protective Truck Hold-Down Lugs
- 27 — Refrigerant Cooling Isolation Valve (Hidden)



- 28 — Pumpdown System Connection
- 29 — Cooler Auto.-Reset, Relief Valves
- 30 — Machine Identification Nameplate
- 31 — Cooler Pressure Transducer
- 32 — Suction Elbow
- 33 — Oil Reclaim Demister Line
- 34 — Discharge Pressure Switch and Discharge Pressure Transducer
- 35 — Condenser Isolation Valve
- 36 — Low-Voltage Access Door, Starter
- 37 — Medium-Voltage Access Door, Starter
- 38 — Amp/Volt Gages
- 39 — Refrigerant Supply Sump
- 40 — Condenser Pressure Transducer
- 41 — Liquid Seal Float Chamber
- 42 — ASME Nameplate, Float Chamber
- 43 — Condenser Auto.-Reset, Relief Valves
- 44 — Condenser In/Out Temperature Sensors
- 45 — Cooler In/Out Temperature Sensors

Fig. 2 — 19XL Components

REFRIGERATION CYCLE

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

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

Relatively cool (typically 65 to 85 F [18 to 29 C]) water

flowing into the condenser tubes removes heat from the refrigerant and the vapor condenses to liquid.

The liquid refrigerant passes through orifices into the FLASC (Flash Subcooler) chamber (Fig. 3). Since the FLASC chamber is at a lower pressure, part of the liquid refrigerant flashes to vapor, thereby cooling the remaining liquid. The FLASC vapor is recondensed on the tubes which are cooled by entering condenser water. The liquid drains into a float chamber between the FLASC chamber and cooler. Here a float valve forms a liquid seal to keep FLASC chamber vapor from entering the cooler. When liquid refrigerant passes through the valve, some of it flashes to vapor in the reduced pressure on the cooler side. In flashing, it removes heat from the remaining liquid. The refrigerant is now at a temperature and pressure at which the cycle began.

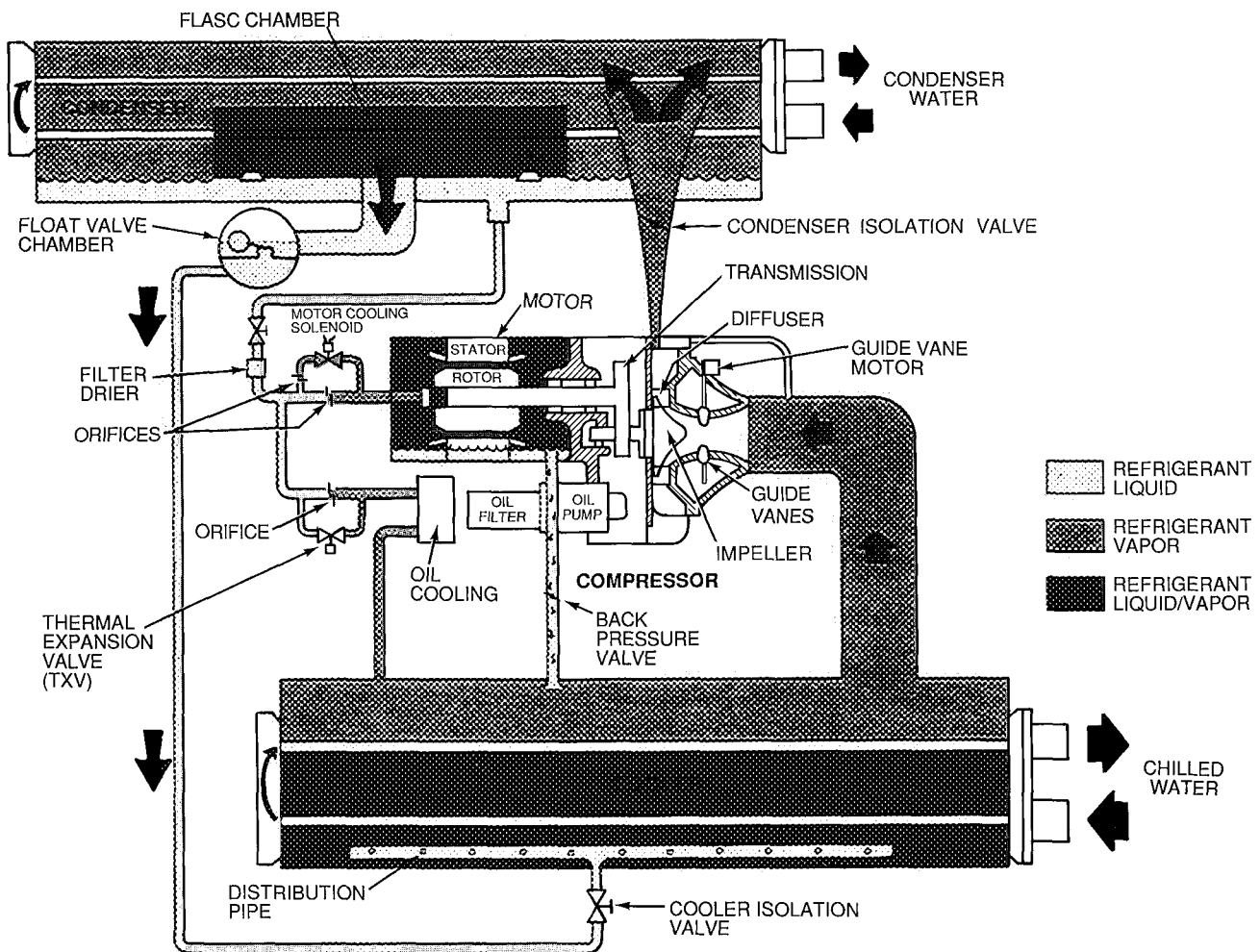


Fig. 3 – Refrigerant, Motor Cooling, and Oil Cooling Cycles

MOTOR/OIL REFRIGERATION COOLING CYCLE

The motor and the lubricating oil are cooled by liquid refrigerant taken from the bottom of the condenser vessel (Fig. 3). Flow of refrigerant is maintained by the pressure differential that exists due to compressor operation. After the refrigerant flows past an isolation valve, an in-line filter, and a sight glass/moisture indicator, the flow is split between motor cooling and oil cooling systems.

Flow to the motor flows through an orifice and into the motor. There is also another orifice and a solenoid valve which will open if additional motor cooling is required. Once past the orifice, the refrigerant is directed over the motor by a spray nozzle. The refrigerant collects in the bottom of the motor casing and then is drained back into the cooler through the motor refrigerant drain line. A back pressure valve in this line maintains a higher pressure in the motor shell than in the cooler/oil sump. The motor is protected by a temperature sensor imbedded in the stator windings. Higher motor temperatures (above 125 F [51 C]) energize a solenoid to provide additional motor cooling. A further increase in temperature past the motor override set point will override the temperature capacity control to hold, and if the motor temperature rises 10° F (5.5° C) above this set point, will close the inlet guide vanes. If the temperature rises above the safety limit, the compressor will shut down.

Refrigerant that flows to the oil cooling system is regulated by a thermostatic expansion valve. There is always a minimum flow bypassing the TXV, which flows through an orifice. The TXV valve regulates flow into the oil/refrigerant plate and frame-type heat exchanger. The bulb for the expansion valve controls oil temperature to the bearings. The refrigerant leaving the heat exchanger then returns to the cooler.

LUBRICATION CYCLE

Summary — The oil pump, oil filter, and oil cooler make up a package located partially in the transmission casting of the compressor-motor assembly. The oil is pumped into a filter assembly to remove foreign particles, and is then forced into an oil cooler heat exchanger where the oil is cooled to proper operational temperatures. After the oil cooler, part of the flow is directed to the gears and the high speed shaft bearings; the remaining flow is directed to the motor shaft bearings. Oil drains into the transmission oil sump to complete the cycle (Fig. 4).

Details — Oil is charged into the lubrication system through a hand valve. Two sight glasses in the oil reservoir permit oil level observation. Oil level should be maintained at the middle of the upper sight glass when the compressor is shut down, or between the two sight glasses during operation.

The oil pump suction is fed from the oil reservoir. An oil pressure relief valve maintains 15 to 25 psi (103 to 172 kPa) differential pressure in the system at the pump discharge. This differential pressure can be read directly from the Local Interface Device (LID) default screen. The oil pump discharges oil to the oil filter assembly. This filter is capable of being valved closed to permit removal of the filter without draining the entire oil system (see Maintenance sections for details). The oil is then piped to the oil cooler. This heat exchanger uses refrigerant from the condenser as the coolant. The refrigerant cools the oil to a temperature between 135 and 145 F (57 to 62 C).

As the oil leaves the oil cooler, it passes the oil pressure transducer and the thermal bulb for the refrigerant expansion valve on the oil cooler. The oil is then divided, with a portion flowing to the thrust bearing, forward pinion bearing, and gear spray. The balance then lubricates the motor shaft bearings and the rear pinion bearing. As the oil leaves the thrust and forward journal bearings, its temperature is measured before leaving the bearing housing, and the oil drains into the oil reservoir at the base of the compressor. 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). 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 pressure is verified before starting the compressor. During shutdown, the oil pump will run for 30 seconds after the compressor shuts down for post-lubrication. The oil pump can also be energized for testing purposes in the 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 13 psi (90 kPa) differential, the PIC will shut down the compressor.

Oil Reclaim System — The oil reclaim system operates to return oil back to the oil reservoir by recovering it from 2 areas on the machine. The primary area of recovery is from the guide vane housing. Oil also is recovered, along with refrigerant, from the cooler.

DURING NORMAL MACHINE OPERATION, oil is entrained with the refrigerant. As the compressor pulls the refrigerant into the guide vane housing to be compressed, the oil will normally drop out at this point and fall to the bottom of the housing where it accumulates. Using discharge gas pressure to power an eductor, the oil is vacuumed from the housing by the eductor and is discharged into the oil reservoir. Oil and refrigerant also are recovered from the top of the cooler refrigerant level and are discharged into the guide vane housing where the oil will drop to the bottom of the housing and be recovered by the eductor system.

DURING LIGHT LOAD CONDITIONS, the suction gas into the compressor does not have enough velocity to return oil floating in the cooler back to the compressor, and the eductor does not have enough power to pull the oil in the guide vane housing into the oil reservoir due to extremely low pressure at the guide vanes. Two solenoids, located on the oil reclaim piping, are switched during light loads so that the eductor now pulls oil and refrigerant directly from the cooler and discharges the mixture into the oil reservoir. The oil reclaim solenoids are switched when an auxiliary contact integral to the guide vane actuator is switched. This switchover occurs when the guide vanes are opened beyond 30 degrees from the closed position. Any refrigerant that enters the oil reservoir/transmission area is flashed into gas. The demister line at the top of the casing will vent this refrigerant into the suction of the compressor. Oil entrained in the refrigerant is eliminated by the demister filter.

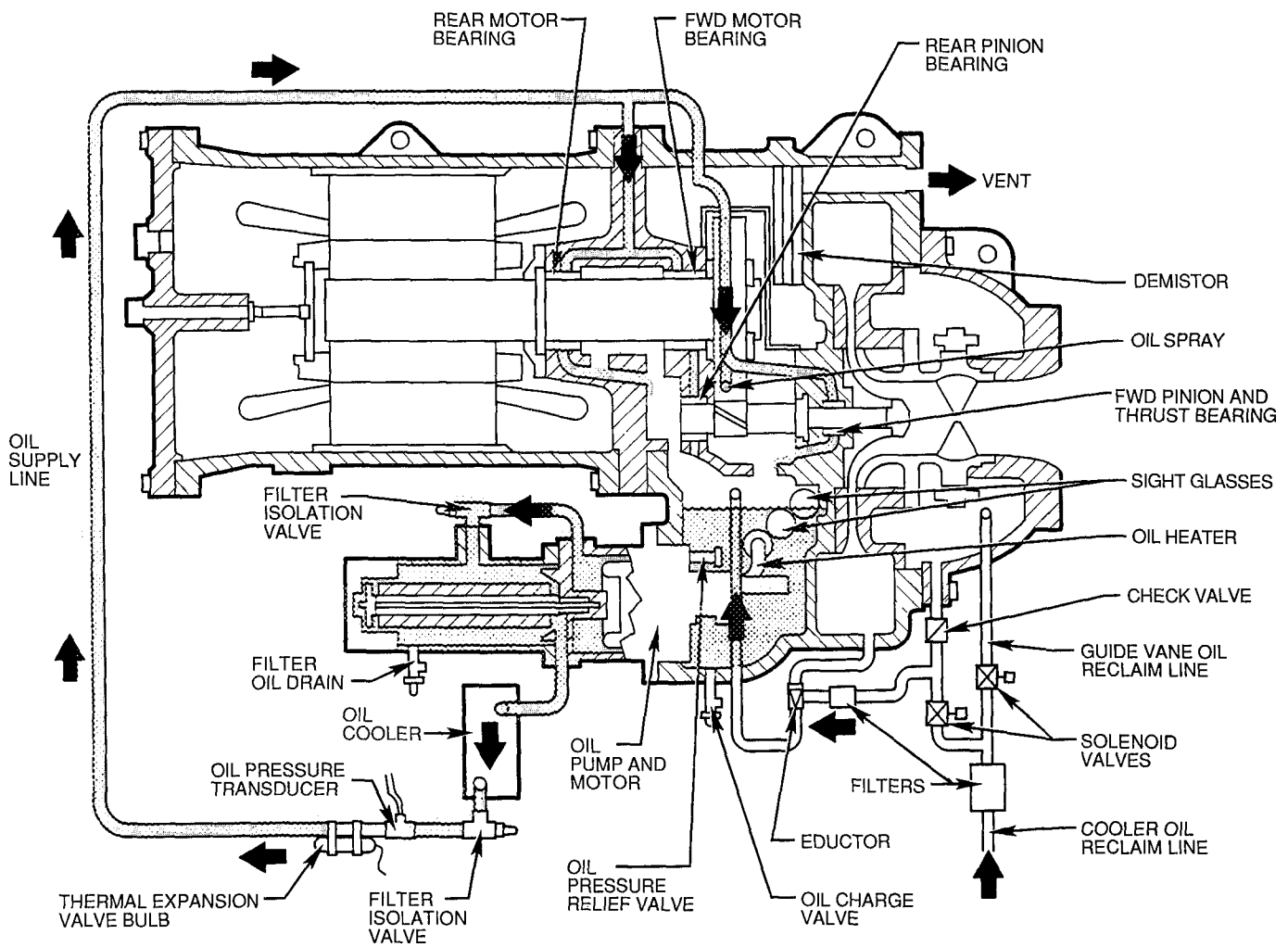


Fig. 4 – Lubrication System

SOLID-STATE STARTER (Optional)

The 19XL may be equipped with a solid-state, reduced-voltage starter (Fig. 5 and 6). This starter provides on-off control of the compressor motor as its primary function. Using this type of starter reduces the peak starting torque, reduces the motor inrush current, and decreases mechanical shock. This is summed up by the phrase "soft starting."

These types of starters operate by reducing the starting voltage. The starting torque of a motor at full voltage is typically 125% to 175% of the running torque. When the voltage and the current are reduced at start-up, the starting torque is reduced as well. The object is to reduce the starting voltage to just that voltage necessary to develop the torque required to get the motor moving. The voltage and current are then ramped up in a desired period of time. The voltage is reduced through the use of silicon controlled rectifiers (SCR). Once full voltage is reached, a bypass contactor is energized to bypass the SCRs.

⚠ WARNING

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

Inside the starter are 3 separate circuit breakers. Circuit breaker CB1 is the compressor motor circuit breaker. The disconnect switch on the starter front cover is connected to this breaker. Circuit breaker CB1 supplies power to portions of the solid-state circuits and the compressor motor.

⚠ WARNING

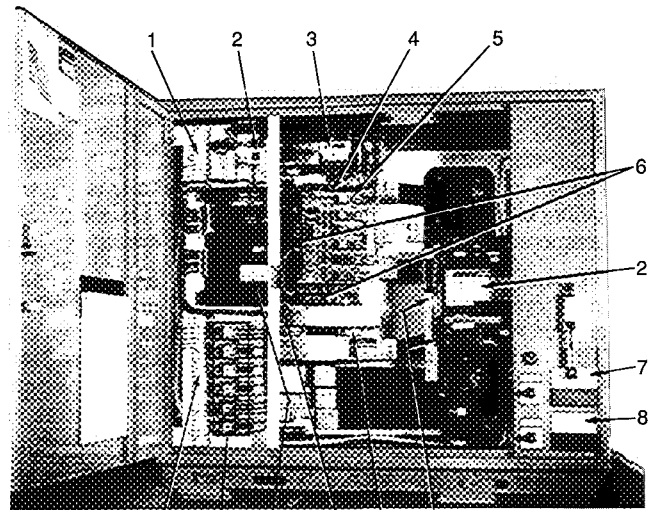
When voltage is supplied to the solid-state circuitry, the heat sinks within the starter are at line voltage. Do not touch these heat sinks while voltage is present or serious injury will result.

Circuit breaker CB2 is the control and oil heater power supply circuit breaker. Circuit breaker CB3 is the circuit breaker for the oil pump. Both of these breakers are wired in parallel with CB1 so that power is supplied to them if the CB1 disconnect is open.

There are also a number of LEDs that are useful in troubleshooting and starter check-out. These are used to indicate:

- voltage to the SCRs
- SCR control voltage
- power indication
- proper phasing for rotation
- start circuit energized
- overtemperature
- ground fault
- current unbalance
- run state

These LEDs are further explained in the Check Starter and Troubleshooting Guide sections.



- 1 — Field Wiring Terminal Strips (TB2 and TB3)
- 2 — Circuit Breakers 1,2,3,4
- 3 — Overload Calibration Unit
- 4 — Solid-State Controller
- 5 — SCR LED (One of 6)
- 6 — Starter Fault and Run LEDs
- 7 — Voltmeter (Optional)
- 8 — Ammeter (Optional)
- 9 — Silicone Controlled Rectifier (SCR) (One of 6)
- 10 — Starter Management Module (SMM)
- 11 — Voltage LED
- 12 — Pilot Relays (PR1 to PR5)

Fig. 5 — Solid-State Starter, Internal View

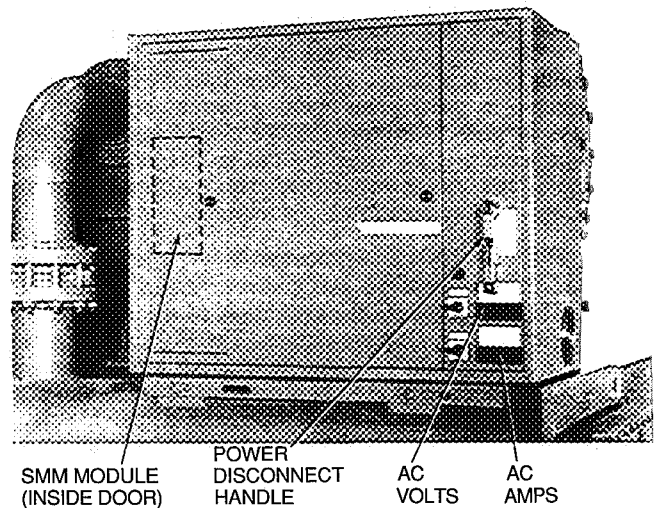


Fig. 6 — Solid-State Starter, Front View

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 and LID modules are volatile. If the battery in a module is removed or damaged, all programming will be lost.

General — The 19XL hermetic centrifugal liquid chiller contains a microprocessor-based control center that 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 monitoring the digital and analog inputs and then executing capacity overrides or safety shutdowns, if required.

19XL PIC System Components — The Product Integrated Control (PIC) is the control system of the machine. 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 panels which house the major components. The panel names and the control voltage contained in each panel include the following (see also Table 1):

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

Table 1 — 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-Output Modules (Optional)	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
Thermistors	See Fig 7
Pressure Transducers	See Fig 7

*See Fig 5, Fig. 7 - 11.

PROCESSOR MODULE (PSIO) — The PSIO is the brain of the PIC. This module contains all of the operating software needed to control the machine. The 19XL uses 3 pressure transducers and 8 thermistors to sense pressures and temperatures. These 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 space 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 within 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 programming to safely shut down the machine if communications with the PSIO are lost.

LOCAL INTERFACE DEVICE (LID) — The LID is mounted to the control center panel and allows the operator to interface with the PIC. 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 located in the control center panel and is used as a pilot relay, energized by the PSIO, for the oil pump, oil heater, spare alarm, optional hot gas bypass relay, and motor cooling solenoid.

8-INPUT MODULES — These optional modules are factory installed, when ordered, in the control center panel. 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.

OIL HEATER CONTACTOR (1C) — This contactor is located in the power panel and operates the heater at either 115 or 230 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.

HOT GAS BYPASS 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.

CONTROL TRANSFORMERS (T1-T4) — These transformers convert incoming control voltage to either 21-v supply power for the PSIO module, or 24-v power supply for 3 power panel contactor relays, and the guide vane actuator and Options modules. They are located in the power panel.

CONTROL AND OIL HEATER VOLTAGE SELECTOR (S1) — It is possible to utilize either 115 v or 230 v incoming control power in the power panel. The switch is set to the voltage for the particular application.

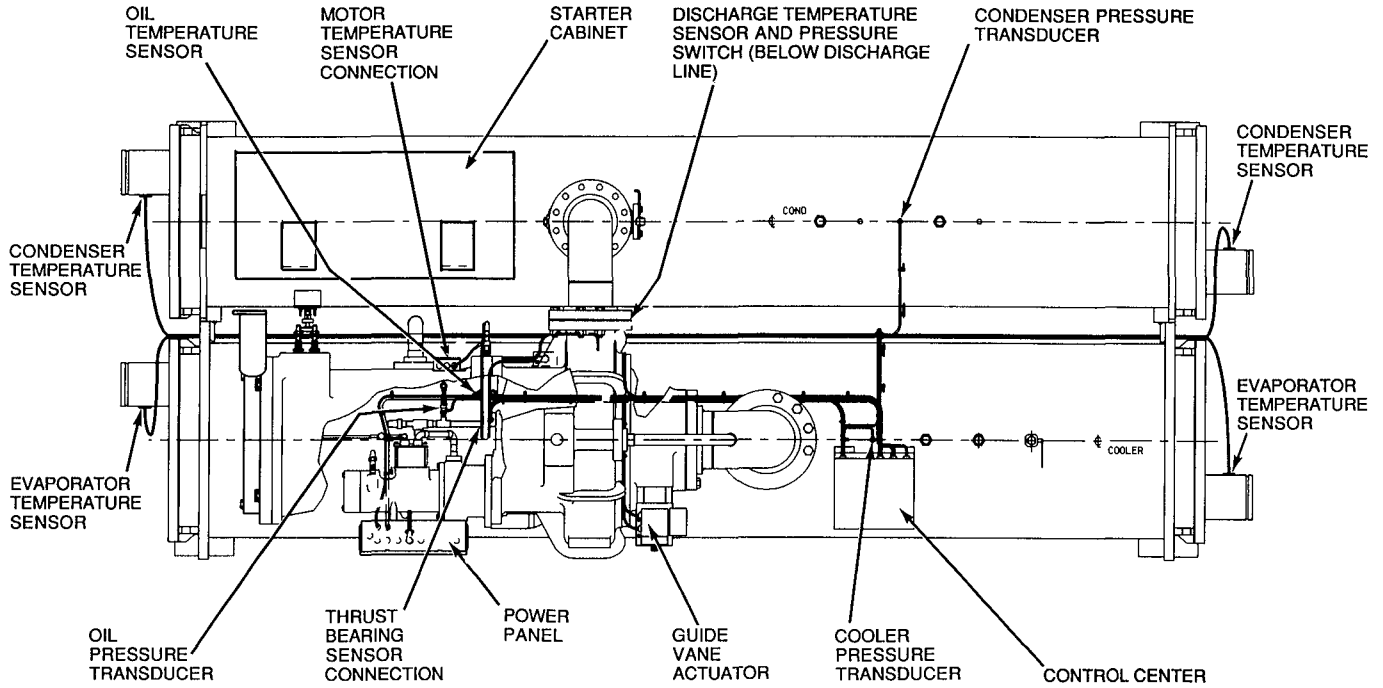


Fig. 7 - 19XL Controls and Sensor Locations

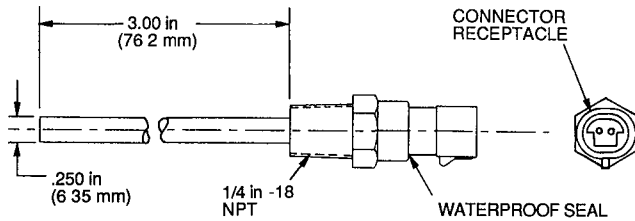


Fig. 8 - Control Sensors (Temperature)

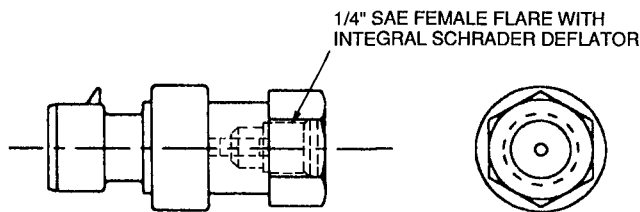
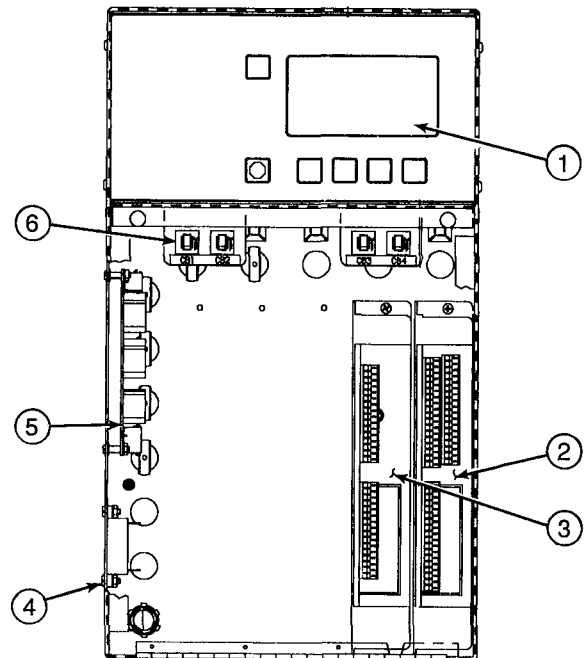


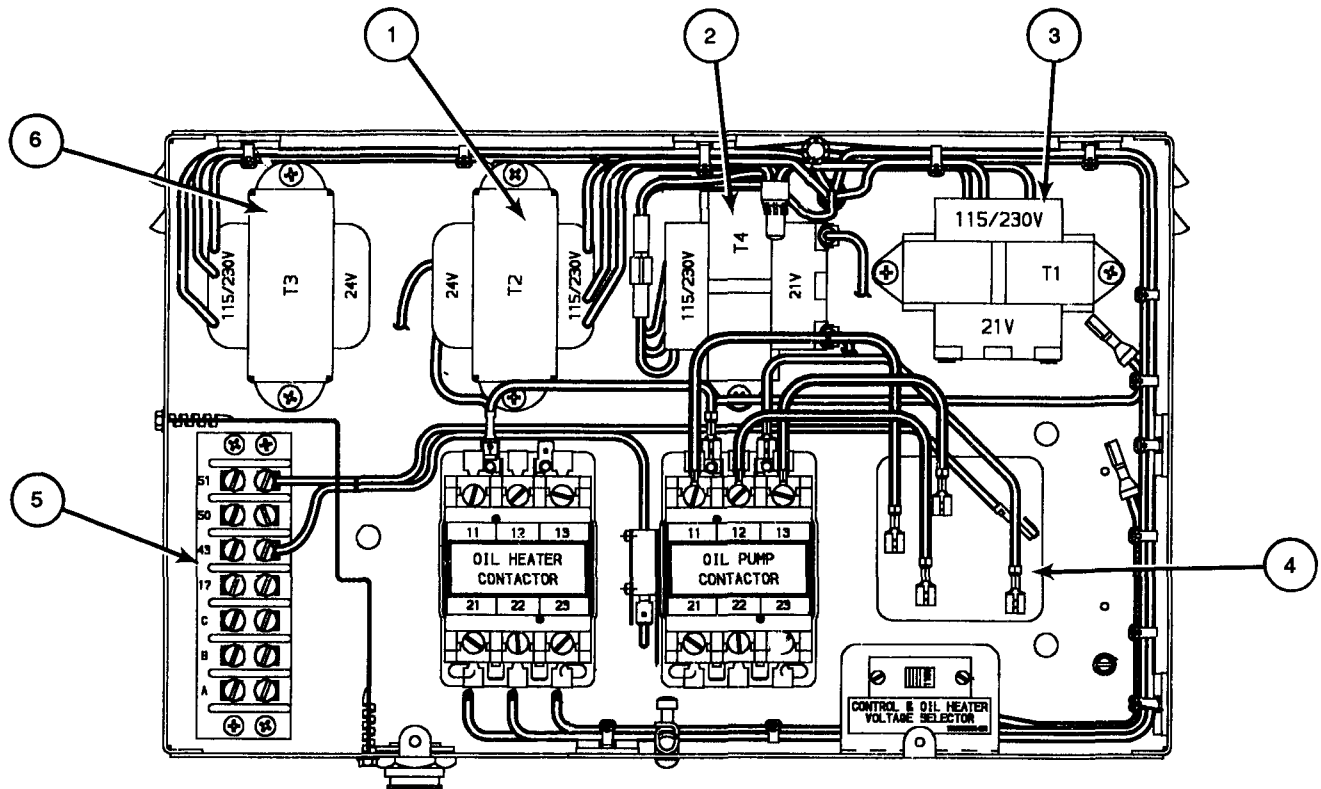
Fig. 9 - Control Sensors, (Pressure Transducer, Typical)



LEGEND

- 1 - LID
 - 2 - PSIO
 - 3 - 8-Input Module
 - 4 - Power Transformer
 - 5 - 6-Pack Relay Board
 - 6 - Circuit Breakers (4)
- (One of 2 Available)

Fig. 10 - Control Panel (Front View), with Options



LEGEND

- | | |
|--|--|
| 1 - T2 - HGBP, Relay, Oil Pump Relay and Oil Heater Relay, Power Transformer | 4 - Oil Pump Terminal Block |
| 2 - T4 - 8-Input Modules Transformer | 5 - Factory Terminal Connections |
| 3 - T1 - Control Center Transformer | 6 - T3 - Guide Vane Actuator Transformer |

Fig. 11 - Power Panel with Options

LID Operation and Menus (Fig. 12 - 16)

GENERAL

- The LID screen will automatically revert to the default screen after 15 minutes if no softkey activity takes place and if machine is not in the pumpdown mode (Fig. 12).
- When not in the default screen, the upper right-hand corner of the LID always displays the name of the screen that you have entered (Fig. 13).
- Alarms are indicated by the alarm light flashing on the control center. An alarm message is viewed on the default screen, and an additional message and troubleshooting information is sent to the alarm history screen.
- Alarm (*) and alert (!) status are indicated on the status screens.
- The LID may be configured in English or SI units, as required, through the LID configuration screen.
- Local Operation - By pressing the **LOCAL** softkey, the PIC is now in the LOCAL operation mode, and the control will accept modification to programming from the LID only. The PIC will use the Local time schedule to determine machine start and stop times.
- CCN Operation - By pressing the **CCN** softkey, the PIC is now in the CCN operation mode, and the control will accept modifications from any CCN interface or module as well as the LID. The PIC will use the CCN time schedule to determine start and stop times.

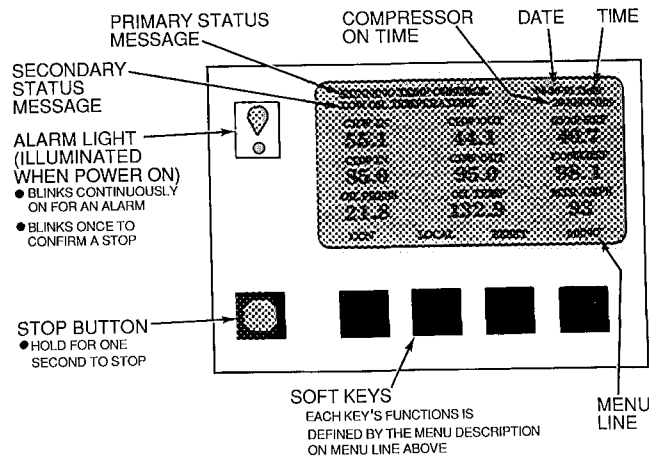


Fig. 12 - LID Default Screen

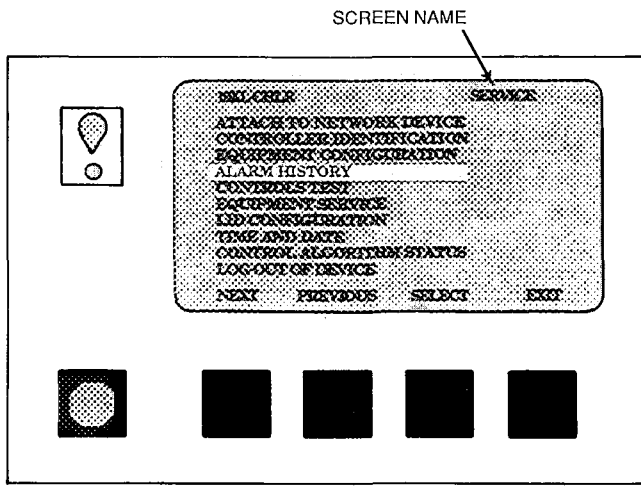
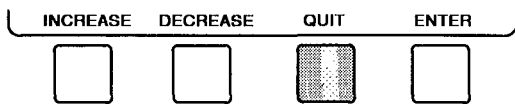


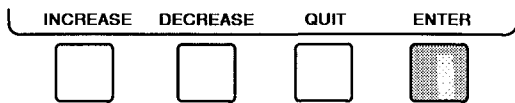
Fig. 13 – LID Service Screen

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

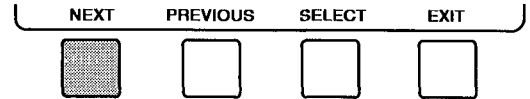
- Press **QUIT** to leave the selected decision or field without saving any changes.



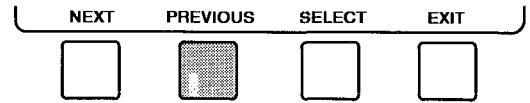
- Press **ENTER** to leave the selected decision or field and save changes.



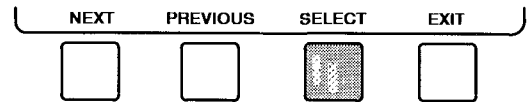
- Press **NEXT** to scroll the cursor bar down in order to highlight a point or to view more points below the current screen.



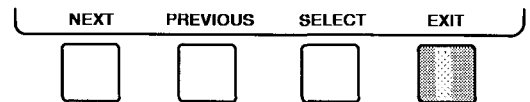
- Press **PREVIOUS** to scroll the cursor bar up in order to highlight a point or to view points above the current screen.



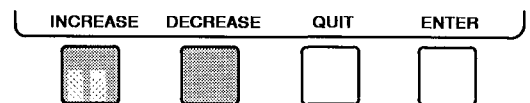
- Press **SELECT** to view the next screen level (highlighted with the cursor bar), or to override (if allowable) the highlighted point value.



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

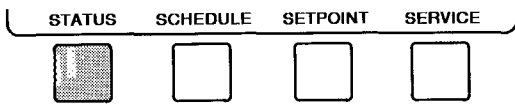


- Press **INCREASE** to **DECREASE** to change the highlighted point value.



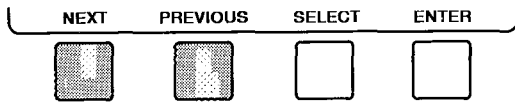
TO VIEW POINT STATUS (Fig. 14) — Point Status is the actual value of all of the temperatures, pressures, relays, and actuators sensed and controlled by the PIC.

1. On the Menu screen, press **STATUS** to view the list of Point Status screens.

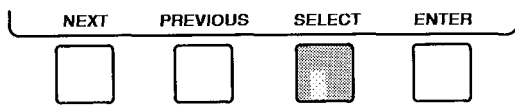


2. Press **NEXT** or **PREVIOUS** to highlight the desired status screen. The list of screens is:

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



3. Press **SELECT** to view Point Status screen desired.



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

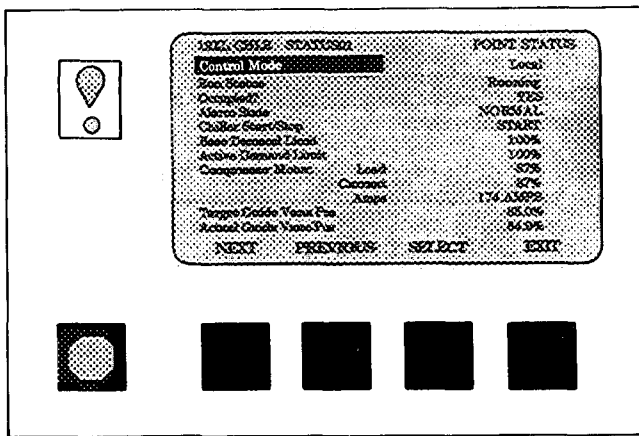
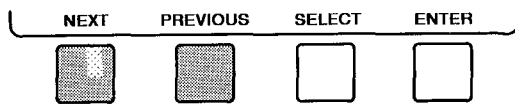
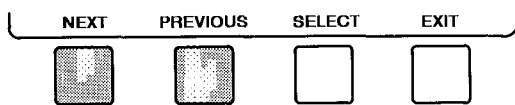


Fig. 14 — Example of Point Status Screen (Status01)

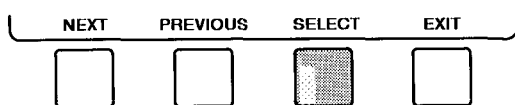
OVERRIDE OPERATIONS

To Override a Value or Status

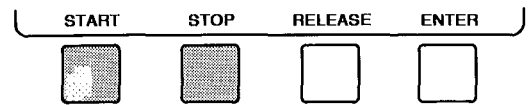
1. On the Point Status screen press **NEXT** or **PREVIOUS** to highlight the desired point.



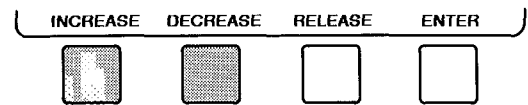
2. Press **SELECT** to select the highlighted point. Then:



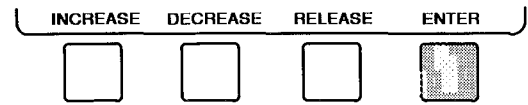
For Discrete Points — Press **START** or **STOP** to select the desired state.



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

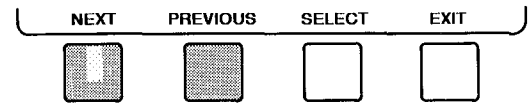


3. Press **ENTER** to register new value.

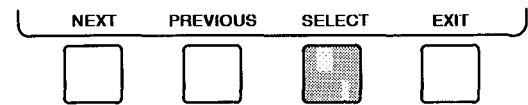


To Remove an Override

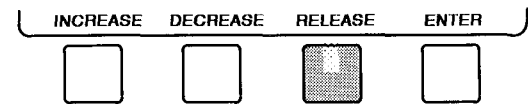
1. On the Point Status screen press **NEXT** or **PREVIOUS** to highlight the desired point.



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



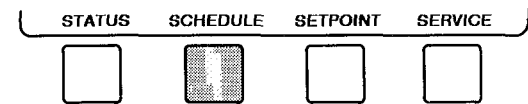
3. Press **RELEASE** to remove the override and return the point to the PIC's automatic control.



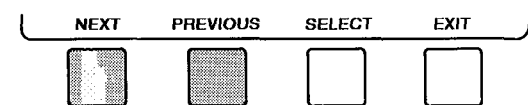
Override Indication — An override value is indicated by "SUPVSR", "SERVC", or "BEST" flashing next to the point value on the status screen.

TIME SCHEDULE OPERATION (Fig. 17)

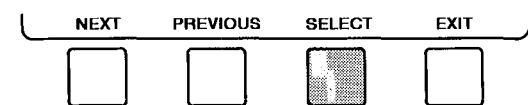
1. On the Menu screen, press **SCHEDULE**.



2. Press **NEXT** or **PREVIOUS** to highlight the desired schedule. OCCPC01S is the time schedule for Local operation. OCCPC02S is the time schedule for CCN operation.



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



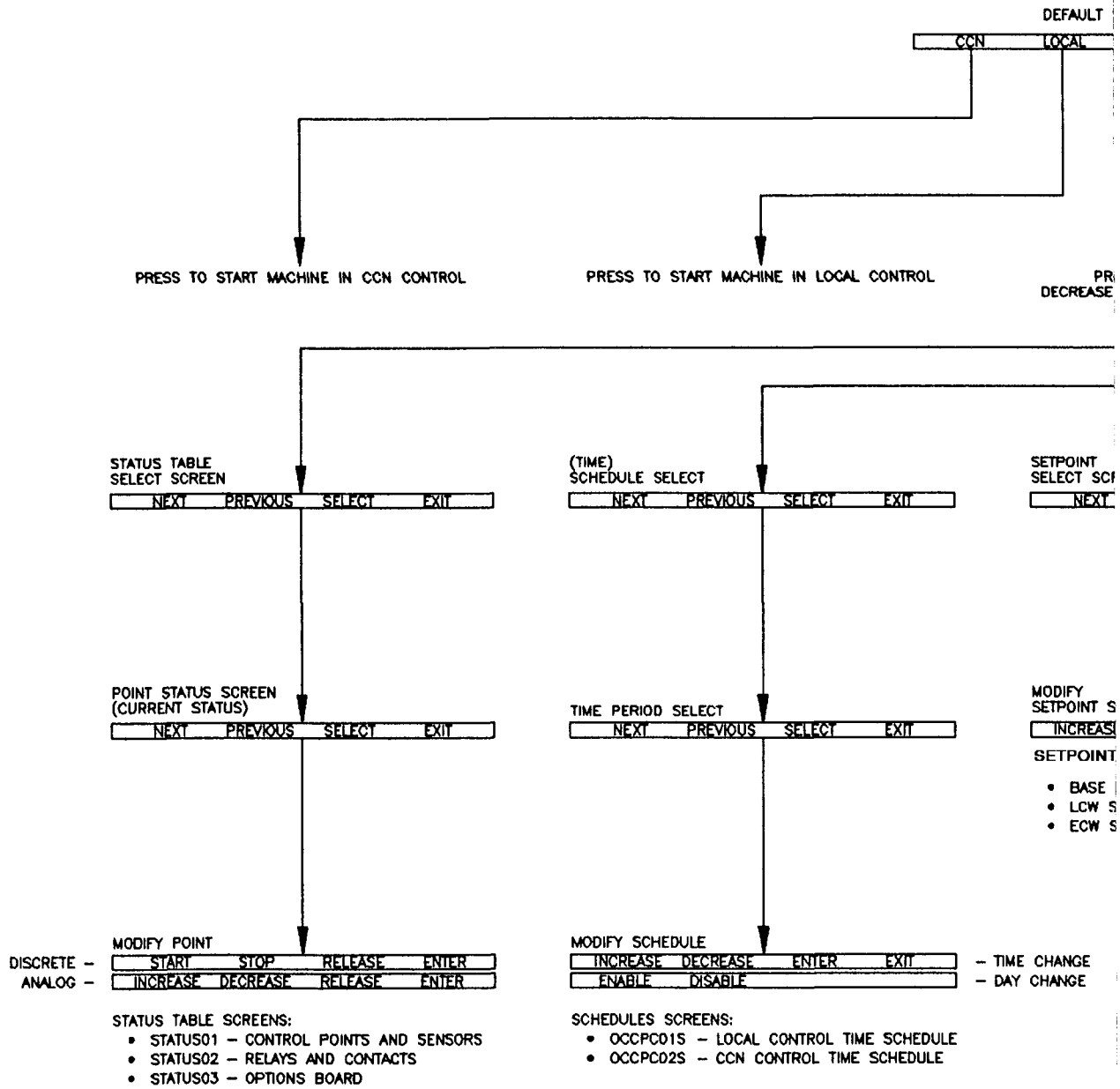
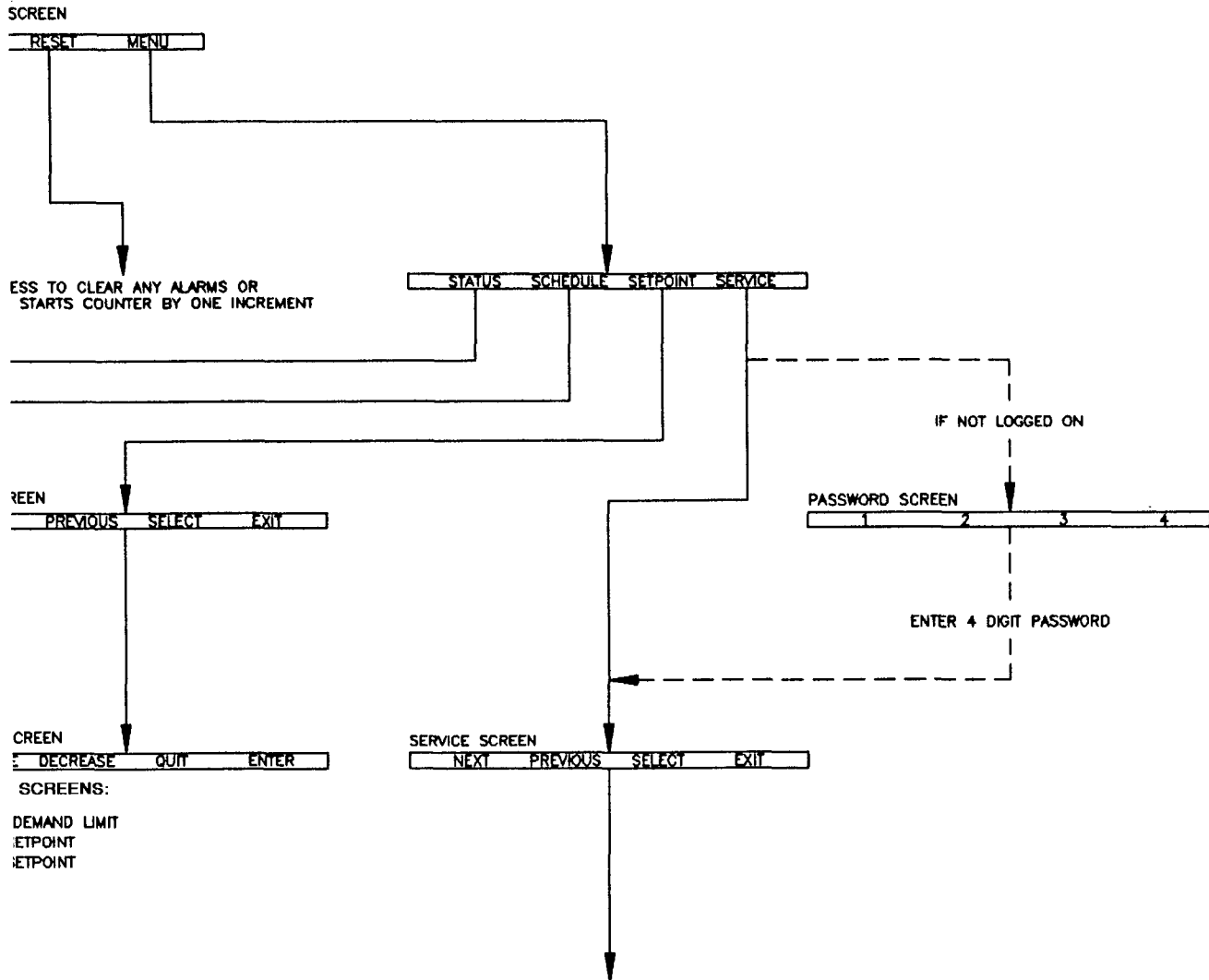


Fig. 15 - 19XL

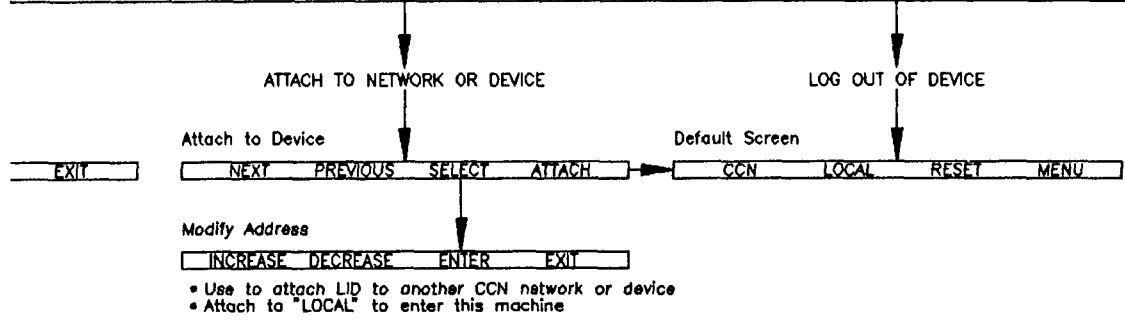
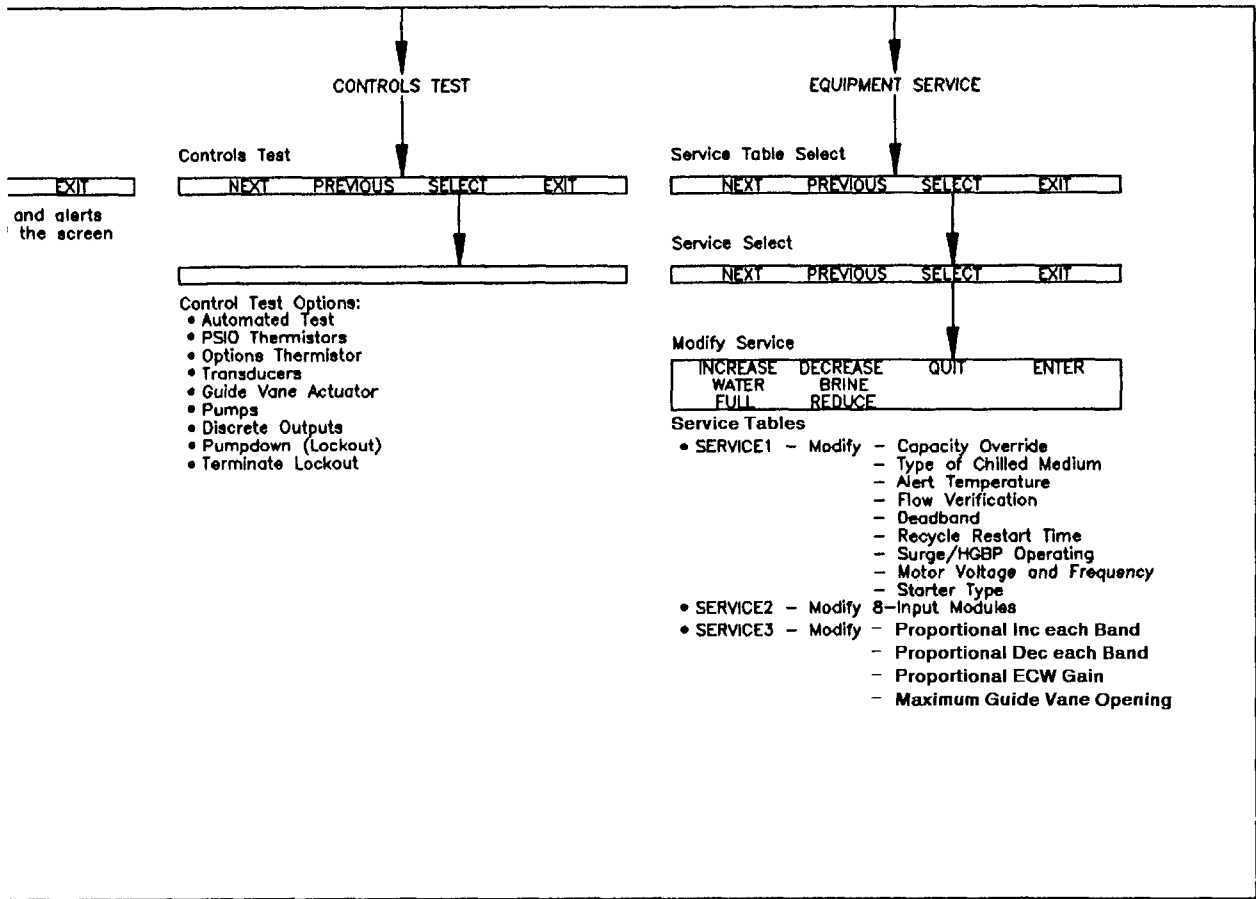
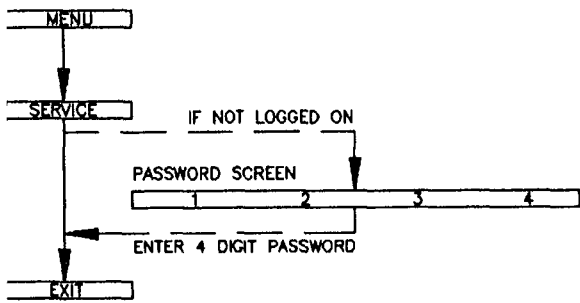


SEE SERVICE SCREEN MENU STRUCTURE (Fig. 16)

SERVICE MENU SCREENS:

- ALARM HISTORY
- CONTROLS TEST
- CONTROL ALGORITHM STATUS
- EQUIPMENT CONFIGURATION
- EQUIPMENT SERVICE
- TIME AND DATE
- ATTACH TO NETWORK DEVICE
- LOG OUT OF DEVICE
- CONTROLLER IDENTIFICATION
- LID CONFIGURATIONS

. Menu Structure



e Menu Structure

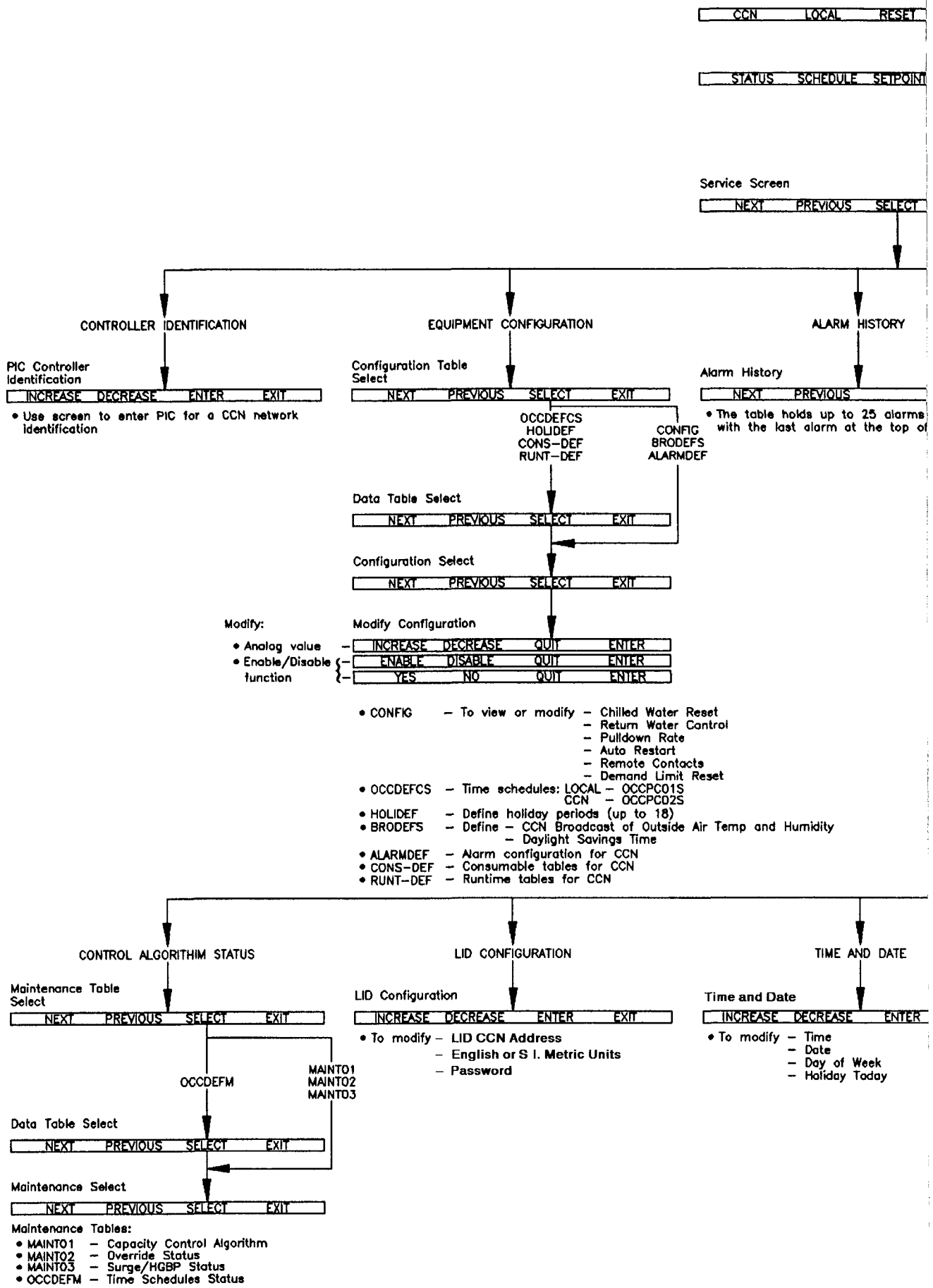
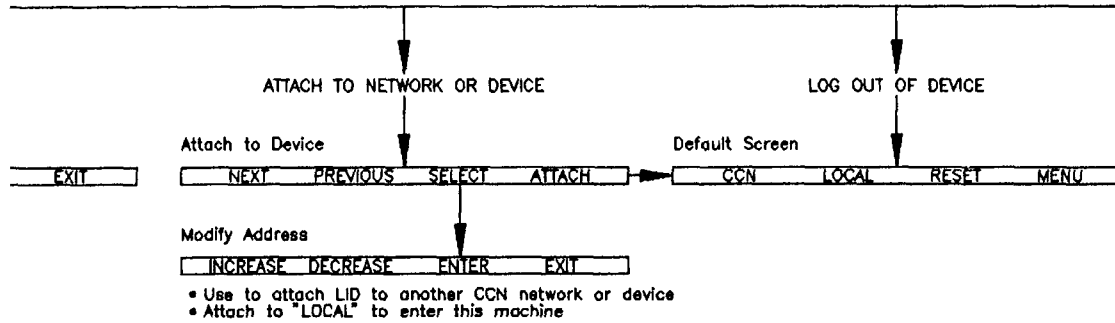
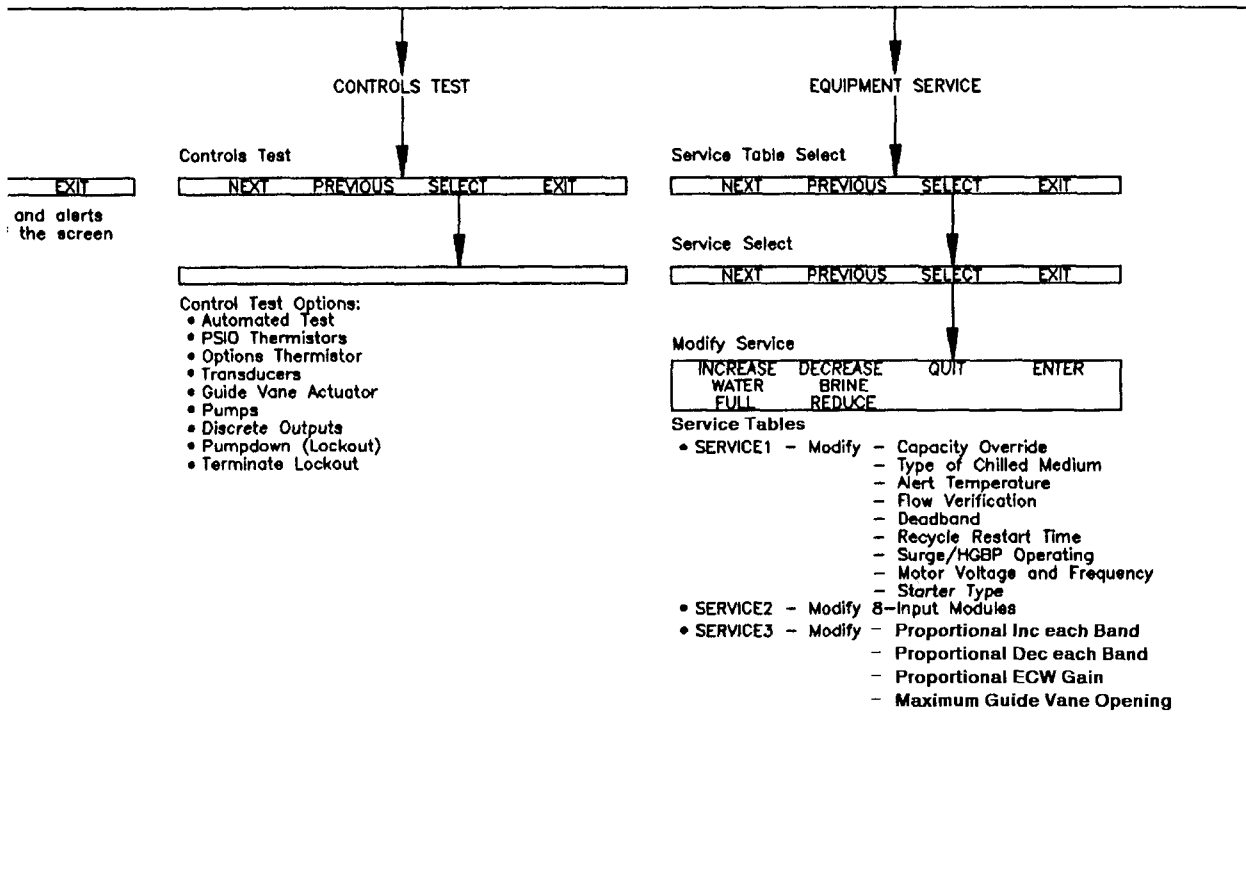
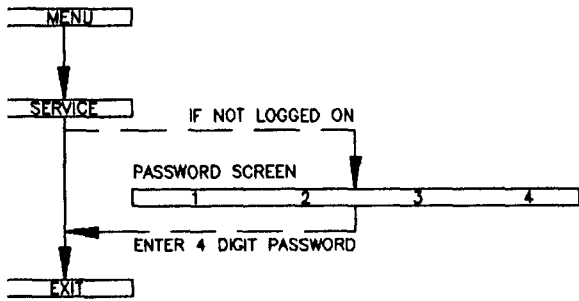
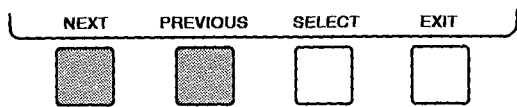


Fig. 16 - 19XL Service

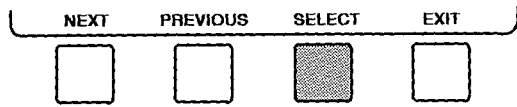


e Menu Structure

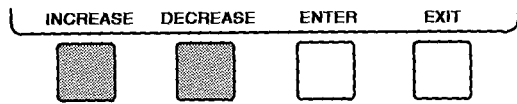
4. Press **NEXT** or **PREVIOUS** to highlight the desired period or override that you wish to change.



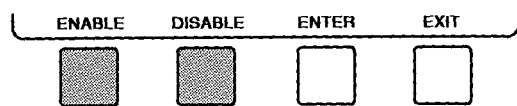
5. Press **SELECT** to access the highlighted period or override.



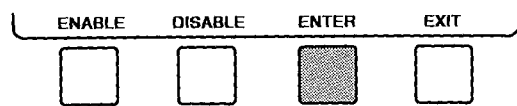
6. a. Press **INCREASE** or **DECREASE** to change the time values. Override values are in one-hour increments, up to 4 hours.



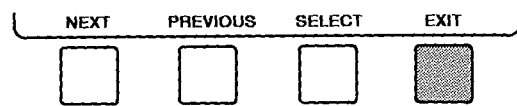
- b. Press **ENABLE** to select days in the day-of-week fields. Press **DISABLE** to eliminate days from the period.



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.

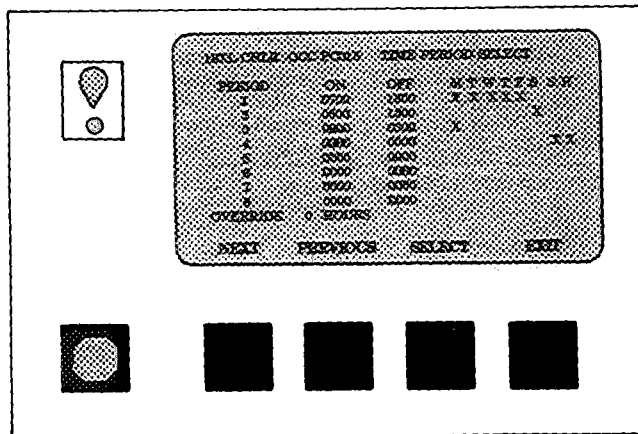
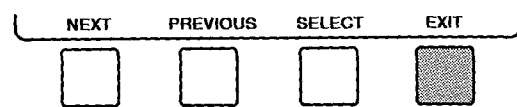
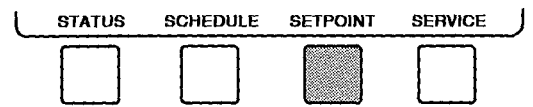


Fig. 17 – Example of Time Schedule Operation Screen

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

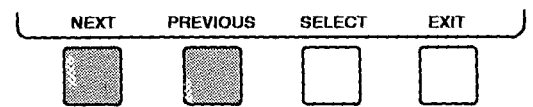
TO VIEW AND CHANGE SET POINTS (Fig. 18)

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

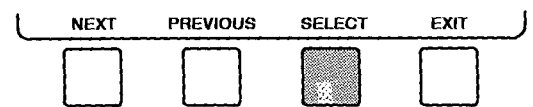


2. There are 3 set points on this screen: Base Demand Limit; LCW Set Point (leaving chilled water set point); and ECW Set Point (entering chilled water set point). Only one of the chilled water set points can be active, and the type of set point is activated in the Service menu.

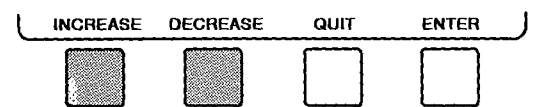
3. Press **NEXT** or **PREVIOUS** to highlight the desired set point entry.



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.

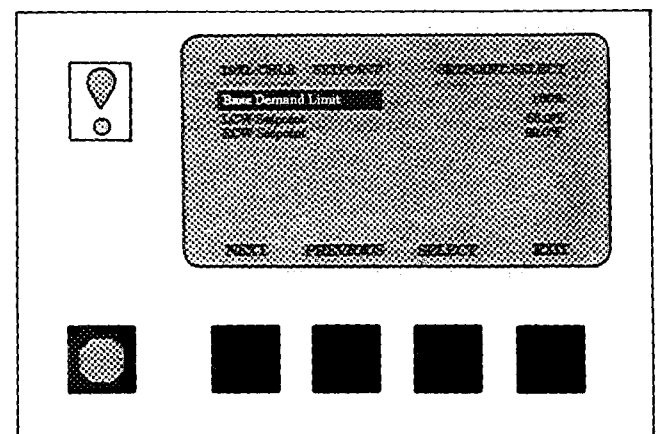
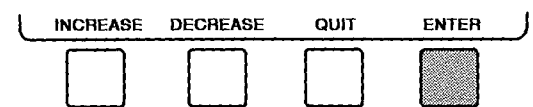


Fig. 18 – Example of Set Point Screen

SERVICE OPERATION — To view the menu-driven programs available for Service Operation, see Service Operation section.

Table 2 – 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	0-999	AMPS	CA__A
*Target Guide Vane Pos	0-100	%	GV__TRG
Actual Guide Vane Pos	0-100	%	GV__ACT
Water/Brine: Setpoint	20-120 (-6.7-48.9)	DEG F (DEG C)	SP
* Control Point	20-120 (-6.7-48.9)	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	0-420 (0-2896)	PSI (kPa)	ERP
Condenser Refrig Temp	-40-245 (-40-118)	DEG F (DEG C)	CRT
Condenser Pressure	0-420 (0-2896)	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
Oil Sump Temperature	-40-245 (-40-118)	DEG F (DEG C)	OILT
Oil Pressure Transducer	0-420 (0-2896)	PSI (kPa)	OILP
Oil Pressure	0-420 (0-2896)	PSID (kPa)	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__A

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

Table 2 – 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	UNITS	REFERENCE POINT NAME (ALARM HISTORY)
Hot Gas Bypass Relay	OFF/ON	HGBR
*Chilled Water Pump	OFF/ON	CHWP
Chilled Water Flow	NO/YES	EVFL
*Condenser Water Pump	OFF/ON	CDP
Condenser Water Flow	NO/YES	CDFL
Compressor Start Relay	OFF/ON	CMPR
Compressor Start Contact	OPEN/CLOSED	1CR__AUX
Compressor Run Contact	OPEN/CLOSED	RUN__AUX
Starter Fault Contact	OPEN/CLOSED	STR__FLT
Pressure Trip Contact	OPEN/CLOSED	PRS__TRIP
Single Cycle Dropout	NORMAL/ALARM	V1__CYCLE
Oil Pump Relay	OFF/ON	OILR
Oil Heater Relay	OFF/ON	OILH
Motor Cooling Relay	OFF/ON	MTRC
*Tower Fan Relay	OFF/ON	TFR
Compr. Shunt Trip Relay	OFF/ON	TRIPR
Alarm Relay	NORMAL/ALARM	ALM
Spare Prot Limit Input	ALARM/NORMAL	SPR__PL

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

EXAMPLE 4 – SET POINT 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	%	dim	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)

Table 2 – LID Screens (cont)

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	10^(6^)
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	10^(6^)
RESET TYPE 3 CHW Delta T (No Reset)	0-15 (0-8)	DEG F (DEG C)	restd__1	10^(6^)
CHW Delta T (Full Reset)	0-15 (0-8)	DEG F (DEG C)	restd__2	0^(-18^)
Degrees Reset	-30-30 (-17-17)	DEG F (DEG C)	deg__chw	5^(3^)
Select/Enable Reset Type	0-3		res__sel	0
ECW CONTROL OPTION	0/1	DISABLE/ENABLE	ew__opt	0
Demand Limit At 20 mA	40-100	%	dem__20mA	40
20mA Demand Limit Option	0/1	DISABLE/ENABLE	dem__sel	0
Auto Restart Option	0/1	DISABLE/ENABLE	astart	0
Remote Contacts Option	0/1	DISABLE/ENABLE	r__contact	0
Temp Pulldown Deg/Min	2-10		tmp__ramp	3
Load Pulldown %/Min	5-20		kw__ramp	10
Select Ramp Type: Temp = 0, Load = 1	0/1		ramp__opt	1
Loadshed Group Number	0-99		idsgrp	0
Loadshed Demand Delta	0-60	%	idsdelta	20
Maximum Loadshed Time	0-120	MIN	maxidstm	60

EXAMPLE 6 – 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	150-245 (1034-1689)	PSI (kPa)	cp__over	195 (1345)
Refrig Override Delta T	2-5 (1-3)	DEG F (DEG C)	ref__over	2^(1^)
Chilled Medium	Water/Brine		medium	WATER
Brine Refrig Trippoint	0-40 (-16-4)	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	175-185 (79-85)	DEG F (DEG C)	tb__alert	175 (79)
Water Flow Verify Time	1-5	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	2.0-5.0 (1.1-2.8)	DEG F (DEG C)	rcyc__dt	5 (2.8)
Surge Limit/HGBP Option	0/1		srg__hgbp	0
Select: Surge=0, HGBP=1				
Surge/HGBP Delta T1	0.5-10 (0.3-5.6)	DEG F (DEG C)	hgb__dt1	1.5 (0.8)
Surge/HGBP Delta P1	50-200 (345-1379)	PSI (kPa)	hgb__dp1	75 (517)
Min. Load Points (T1/P1)				
Surge/HGBP Delta T2	0.5-10 (0.3-5.6)	DEG F (DEG C)	hgb__dt2	10 (5.6)
Surge/HGBP Delta P2	50-200 (345-1379)	PSI (kPa)	hgb__dp2	200 (1379)
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	0/1	REDUCE/FULL	starter	0

Table 2 – LID Screens (cont)

EXAMPLE 7 – 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
SPARE ALERT ENABLE				
OPTIONS BOARD 1				
CHWS Temp Enable	0-2		chws__en	0
CHWS Temp Alert	-40-245 (-40-118)	DEG F (DEG C)	chws__al	245 (118)
CHWR Temp Enable	0-2		chwr__en	0
CHWR Temp Alert	-40-245 (-40-118)	DEG F (DEG C)	chwr__al	245 (118)
Reset Temp Enable	0-2		rres__en	0
Reset Temp Alert	-40-245 (-40-118)	DEG F (DEG C)	rres__al	245 (118)
Spare Temp 1 Enable	0-2		spr1__en	0
Spare Temp 1 Alert	-40-245 (-40-118)	DEG F (DEG C)	spr1__al	245 (118)
Spare Temp 2 Enable	0-2		spr2__en	0
Spare Temp 2 Alert	-40-245 (-40-118)	DEG F (DEG C)	spr2__al	245 (118)
Spare Temp 3 Enable	0-2		spr3__en	0
Spare Temp 3 Alert	-40-245 (-40-118)	DEG F (DEG C)	spr3__al	245 (118)
OPTIONS BOARD 2				
Spare Temp 4 Enable	0-2		spr4__en	0
Spare Temp 4 Alert	-40-245 (-40-118)	DEG F (DEG C)	spr4__al	245 (118)
Spare Temp 5 Enable	0-2		spr5__en	0
Spare Temp 5 Alert	-40-245 (-40-118)	DEG F (DEG C)	spr5__al	245 (118)
Spare Temp 6 Enable	0-2		spr6__en	0
Spare Temp 6 Alert	-40-245 (-40-118)	DEG F (DEG C)	spr6__al	245 (118)
Spare Temp 7 Enable	0-2		spr7__en	0
Spare Temp 7 Alert	-40-245 (-40-118)	DEG F (DEG C)	spr7__al	245 (118)
Spare Temp 8 Enable	0-2		spr8__en	0
Spare Temp 8 Alert	-40-245 (-40-118)	DEG F (DEG C)	spr8__al	245 (118)
Spare Temp 9 Enable	0-2		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 Alert" threshold for each point listed. If the "Enable" is set to 1, a value above the "Temp Alert" 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.

EXAMPLE 8 – 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	5-10		gv__inc	6.5
Proportional Dec Band	5-10		gv__de	6.0
Proportional ECW Gain	1-3		gv__ecw	2.0
Guide Vane Travel Limit	50-100	%	gv__lim	85

Table 2 – LID Screens (cont)

EXAMPLE 9 – MAINTENANCE (MAINT01) DISPLAY SCREEN

To access this display from the LID default screen:

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

DESCRIPTION	CONFIGURABLE RANGE	UNITS	REFERENCE POINT NAME	DEFAULT VALUE
CAPACITY CONTROL				
Control Point	20-120 (-6.7-48.9)	DEG F (DEG C)	ctript	
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	5-10		gv__inc	6.5
Proportional Dec Band	5-10		gv__dec	6.0
Proportional ECW Gain	1-3		gv__ecw	2.0
Water/Brine Deadband	0.5-2 (0.3-1.1)	DEG F (DEG C)	cwdb	1.0

NOTE: Overriding shall be supported only from the LID for the values shown (*). Only values with capital letter point names shall be variables available for read operation.

EXAMPLE 10 – 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	CONFIGURABLE RANGE	UNITS	REFERENCE POINT NAME	DEFAULT VALUE
OVERRIDE/ALERT STATUS				
MOTOR WINDING TEMP				
Override Threshold	-40-245 (-40-118)	DEG F (DEG C)	MTRW	
CONDENSER PRESSURE	150-200 (66-93)	DEG F (DEG C)	mt__over	200
Override Threshold	0-420 (0-2896)	PSI (kPa)	CRP	
EVAPORATOR REFRIG TEMP	150-245 (1034-1689)	PSI (kPa)	cp__over	190
Override Threshold	-40-245 (-40-118)	DEG F (DEG C)	ERT	
DISCHARGE TEMPERATURE	2-45 (1-7.2)	DEG F (DEG C)	rt__over	35
Alert Threshold	-40-245 (-40-118)	DEG F (DEG C)	CMPD	
BEARING TEMPERATURE	125-200 (52-93)	DEG F (DEG C)	cd__alert	200
Alert Threshold	-40-245 (-40-118)	DEG F (DEG C)	MTRB	
	175-185 (79-85)	DEG F (DEG C)	tb__alert	175

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

Table 2 – LID Screens (cont)

EXAMPLE 11 – 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	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 shall not be supported on this maintenance screen. Only values with capital letter point names shall be variables available for read operation.

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 2 for examples of LID screens. Values are listed in the Description column. An overview of LID operation and menus is given in Fig. 12 - 16.

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 Status01 screen.

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 menu Config screen.

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 screen.

For example, a 1° F (0.6° C) deadband setting controls the water temperature within ±0.5° F (0.3° C) of the control point. This may cause frequent guide vane movement if the chilled water load fluctuates frequently. A setting 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 5 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 5 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 for values of 1, 2, or 3, with a default setting of 2. Increase this setting to increase guide vane response to a change in entering cooler temperature. The proportional bands and gain may be viewed/modified on the Equipment Service3 screen.

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 screen. 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 15-minute start-to-start timer and a 3-minute stop-to-start timer. These timers limit how soon the machine can be started. See the Start-Up/Shutdown/Recycle Sequence section for operational information.

OCCUPANCY SCHEDULE — This schedule determines when the chiller is either occupied or unoccupied. Whenever the chiller is in the LOCAL mode, the machine will start when Occupancy Schedule 01 indicates occupied. When in CCN mode, Occupancy Schedule 02 is used. The machine will shut down when the schedule goes to unoccupied. The schedule can be set up to follow the building schedule or to be 100% occupied if the operator wishes the machine to start whenever the PIC is in LOCAL mode. The schedule also can be bypassed by forcing the Start/Stop command on the PIC status screen to start. The schedule also can be overridden to keep the unit in an OCCUPIED mode for up to 4 hours, on a one-time basis.

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.

Figure 17 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.

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
- 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 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 display with a primary and a secondary message, and energizes an alarm relay in the starter and blinks the alarm light on the control center panel. The alarm is stored in memory and can be viewed in the PIC alarm 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 3. Alarm and alert messages are listed in the Troubleshooting Guide section.

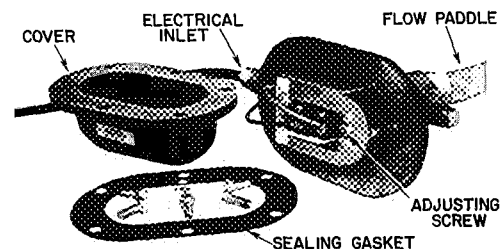
SHUNT TRIP — The shunt trip function of the PIC is a safety trip. The shunt trip is wired from an output on the SMM to the motor circuit breaker. If the PIC tries to shut-down the compressor through normal shutdown procedure but is unsuccessful for 30 seconds, the shunt trip output is energized and causes the circuit breaker to trip off.

Table 3 – 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	>185 F (85 C)	Preset, alert setting configurable
EVAPORATOR REFRIGERANT TEMPERATURE	<33 F (for water chilling) (0.6° C)	Preset, configure chilled medium for water (Service1 screen)
	<1°F (0.8°C) below Design Refrigerant Temperature (set point adjustable from 0 to 40 F [-18 to 4 C] for brine chilling)	Configure chilled medium for brine (Service1 screen) Adjust brine refrigerant trippoint for proper cutout
TRANSDUCER VOLTAGE	<4.5 vdc > 5.5 vdc	Preset
CONDENSER PRESSURE — SWITCH — CONTROL	>263 ± 7 psig (1813 ± 48 kPa), reset at 180 ± 10 (1241 ± 69 kPa)	Preset
	>260 psig (1793 kPa)	Preset
OIL PRESSURE	<13 psi (90 kPa)	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
	<90% for one minute or ≤85% for 3 seconds	
	<50% for one cycle	
COMPRESSOR MOTOR LOAD	>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 screen)
STARTER TRANSITION	>75 seconds	Reduced voltage starters only

Flow Switches (Field Supplied)

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



Motor Cooling Control – 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 always is a minimum flow of refrigerant when the compressor is operating for motor cooling; the relay only controls additional refrigerant to the motor.

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.
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 menu Config screen (see Table 2). Motor load is the default type.

Capacity Override (Table 4) – These can prevent some safety shutdowns caused by exceeding motor amperage limit, refrigerant low temperature safety limit, motor high temperature safety limit, compressor high lift (surge protection), 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 two-step process. Exceeding 110% of the rated load amps for more than 30 seconds will initiate a safety shutdown.

The 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.

Table 4 – Capacity Overrides

OVERRIDE CAPACITY CONTROL	FIRST STAGE SET POINT			SECOND STAGE SET POINT	OVERRIDE TERMINATION
	View/Modify on LID Screen	Default Value	Configurable Range	Value	Value
HIGH CONDENSER PRESSURE	Equipment Service1	>195 psi (1345 kPa)	150 to 245°F (66 to 118°C)	>Override Set Point + 4 psi (28 kPa)	<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 at Temperature)	Equipment Service1	<2° F (1° C) (Above Trippoint)	2 to 5°F (1 to 3°C)	≤Trippoint + Override ΔT -1°F (0.56° C)	>Trippoint and Override at +2° F (1.2° C)
HIGH COMPRESSOR LIFT	Equipment Service1	Min: T1 – 1.5° F (0.8° C) P1 – 75 psi (517 kPa) Max: T2 – 10° F (5.6° C) P2 – 200 psi (1379 kPa)	0.5 to 10° F (0.3 to 5.6° C) 50 to 200 psi (345 to 1379 kPa) 0.5 to 15° F (0.3 to 5.6° C) 200 psi (345 to 1379 kPa)	None	Within Lift Limits
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%	≥105% of Set Point	2% Lower Than Set Point

Oil Sump Temperature Control is regulated by the PIC using the oil heater relay when the machine is shut down. The oil heater relay is energized whenever the chiller compressor is off, and the oil sump temperature is less than 140 F (60 C) or sump temperature is less than the cooler refrigerant temperature plus 60°F (15.6°C). The heater is then turned off when the oil sump temperature is: 1) more than 160 F (71.1 C); or 2) the sump temperature is more than 145 F (62.8 C), and more than the cooler refrigerant temperature plus 65°F (18.3°C). The heater is always off during start-up or when the compressor is running.

Oil Cooler — When the compressor is running, the oil must be cooled. This is accomplished through a small, plate-type heat exchanger located behind the oil pump. This heat exchanger uses liquid condenser refrigerant as the cooling liquid. A refrigerant thermal expansion valve (TXV) regulates refrigerant flow to control oil temperature entering the bearings. There is always a flow of refrigerant bypassing the TXV. The bulb for the expansion valve is strapped to the oil supply line leaving the heat exchanger and the valve is set to maintain 150 F (66 C).

Remote Start/Stop Controls — A remote device, such as a time clock, 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 alert is displayed, preventing the machine from starting. The operator must reset the alert 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 sound an alarm because of the loss of voltage.

Spare Safety Inputs — Normally closed 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.

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.

Condenser Pump Control — Whenever the compressor is shut down, the machine will monitor the *CONDENSER PRESSURE* and may turn on this pump if the pressure becomes too high. *CONDENSER PRESSURE OVERRIDE* is used to determine this pressure point. This value is found on the Equipment Service1 LID screen and is initially set at 195 psi (1344 kPa) (Table 4). 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.

Cooling Tower Control — The tower fan relay, located in the starter, is controlled by the PIC to energize and de-energize 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* is turned on whenever the *CONDENSER WATER PUMP* is running, flow is verified, and the difference between cooler and condenser pressure is more than 45 psi (310 kPa). The *TOWER FAN RELAY* is de-energized when the condenser pump is off, flow is lost, or the differential pressure is less than 40 psi (279 kPa) and entering condensing water is less than 75 F (24 C).

Auto.-Restart After Power Failure — This option may be enabled or disabled, and may be viewed/modified on the Equipment Configuration menu Config screen. If enabled, the chiller will start up automatically after a single cycle dropout, low, high, or loss of voltage has occurred, and the power is within ±10% of normal. The 15- and 3-minute inhibit timers are ignored during this type of start-up.

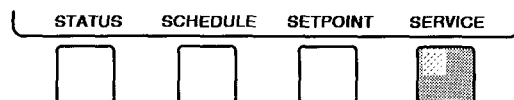
Water/Brine Reset — Three types of chilled water or brine reset are available and can be viewed or modified on the Equipment Configuration menu Config screen.

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 (±16° 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. The signal may either be internally powered by the PIC and wired to pins 1J2 and 1J3 (see wiring diagrams or certified prints), or may be externally powered and wired to pins 1J1 and 1J2.
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 prints).
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.

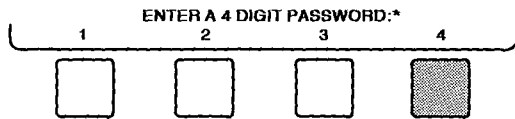
Service Operation — An overview of the menu-driven programs available for Service Operation is shown in Fig. 15.

TO LOG ON

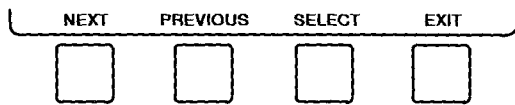
1. On the Menu screen, press **SERVICE**. The keys now correspond to the numerals 1, 2, 3, 4.



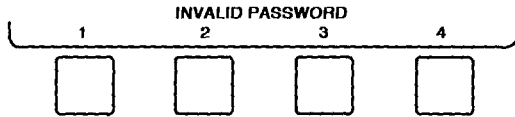
- Press the four digits of your password, one at a time. An asterisk (*) appears as you enter each digit.



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



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



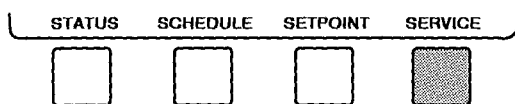
NOTE: The initial power-up password is 1-1-1-1.

TO LOG OFF — Access the Log Out of Device screen on 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.

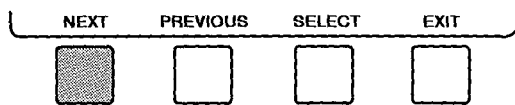
HOLIDAY SCHEDULING (Fig. 19) — The time schedules may be configured for special operation during a holiday period. When modifying a time period, the “H” at the end of the days of the week field signifies that the period is applicable to a holiday. (See Time Schedule Operation section for information.) The Broadcast function must be activated for the holidays configured in the Holidef tables to work properly. Access the Brodefs table in the Equipment Configuration menu and answer “Yes” to the activated function.

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

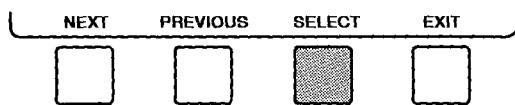
- At the Menu screen, press **SERVICE** to access the Service screen.



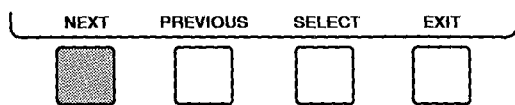
- If not logged on, follow the instructions for To Log On/To Log Off. Once logged on, press **NEXT** until Equipment Configuration is highlighted.



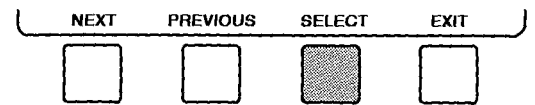
- Once Equipment Configuration is highlighted, press **SELECT** to access.



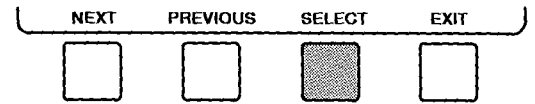
- Press **NEXT** until Holidef is highlighted. This is the Holiday Definition table.



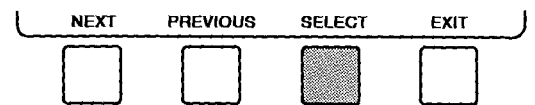
- Press **SELECT** to enter the Data Table Select screen. This screen lists 18 holiday tables.



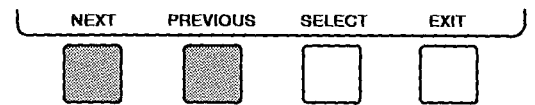
- Press **NEXT** to highlight the holiday table that you wish to view or change. Each table is one holiday period, starting on a specific date, and lasting up to 99 days.



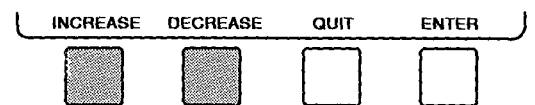
- Press **SELECT** to access the holiday table. The Configuration Select screen now shows the holiday start month and day, and how many days the holiday period will last.



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



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



- Press **ENTER** to save the changes and return to the previous menu.

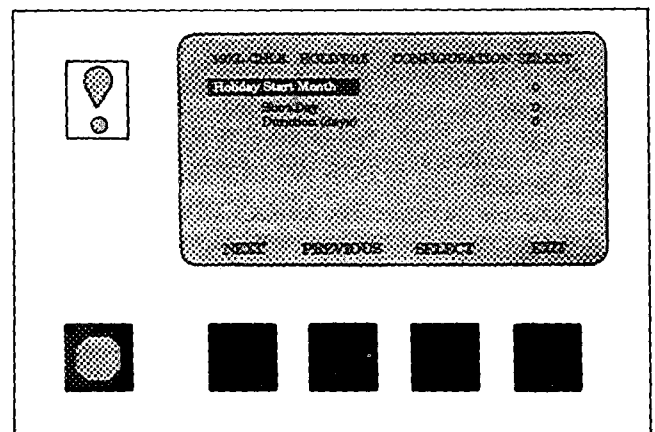
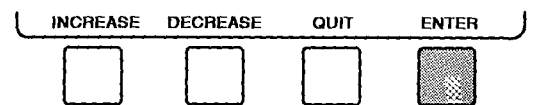


Fig. 19 — Example of Holiday Period Screen

START-UP/SHUTDOWN/ RECYCLE SEQUENCE (Fig. 20)

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 and the 3-minute stop-to-start inhibit timers have expired.

The chiller start/stop status point on the Status01 screen 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 limits (Table 3). 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. One minute 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, 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 3 psi (21 kPa), 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 15 psi (103 kPa). 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 (machine protective limit has been reached and machine is in alarm)
- 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 de-activating the start relay. 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 con-

denser water pump will be shut down when the *CONDENSER REFRIGERANT TEMP* is less than the *CONDENSER PRESSURE OVERRIDE* minus 5 psi (34 kPa) or is less than or equal to the *ENTERING CONDENSER WATER TEMP* plus 3° F (2° C). The 3-minute stop-to-start timer will now begin to count down. If the 15-minute start-to-start timer is still greater than 3 minutes, then this time is now displayed.

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)

Chilled Water Recycle Mode — When the compressor is running in a lightly loaded condition, the machine may cycle off and wait until the load increases to restart again. 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:

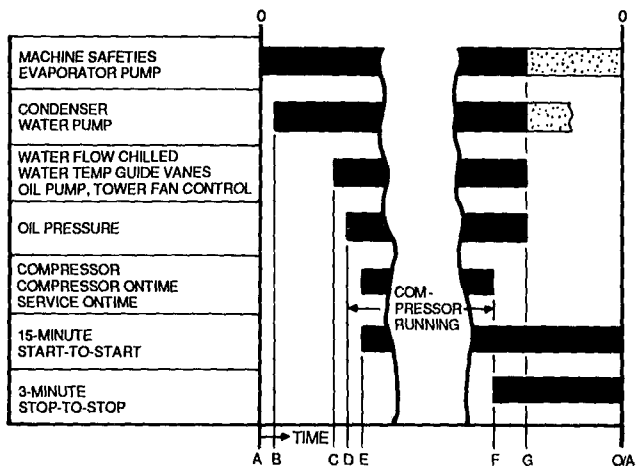
- when in LCW control, the *LEAVING CHILLED WATER* temperature is more than 5° F (3° C) below the control point, and the *CONTROL POINT* has not increased in the last 5 minutes
- when *ECW CONTROL OPTION* is enabled, the *ENTERING CHILLED WATER* temperature is more than 5° F (3° C) below the *CONTROL 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 screen. 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.

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.



- A — START INITIATED — Prestart checks made; evaporator pump started
- B — Condenser water pump started (5 seconds after A)
- C — Water flows verified (one minute to 5 minutes maximum) Chilled water temperatures checked against control point. Guide vanes checked for closure. Oil pump started; tower fan control enabled.
- D — Oil pressure verified (one second minimum, 300 seconds maximum after C)
- E — Compressor motor starts, compressor ontime and service ontime starts, 15-minute inhibit timer starts (10 seconds after D)
- F — SHUTDOWN INITIATED — Compressor motor stops, compressor ontime and service ontime stops, 3 minute inhibit timer starts
- G — Oil pump and evaporator pumps de-energized (60 seconds after F) Condenser pump and tower fan control may continue to operate if condenser pressure is high. Evaporator pump may continue if in RECYCLE mode.
- O/A — Restart permitted (both inhibit timers expired) (minimum of 15 minutes after E; minimum of 3 minutes after F)

Fig. 20 — Control Sequence

BEFORE INITIAL START-UP

Job Data Required

- list of applicable design temperatures and pressures (product data submittal)
- machine certified prints
- starting equipment details and wiring diagrams
- diagrams and instructions for special controls or options
- 19XL Installation Instructions

Equipment Required

- mechanic's tools (refrigeration)
- digital volt-ohmmeter (DVM)
- clamp-on ammeter
- electronic leak detector
- absolute pressure manometer or wet-bulb vacuum indicator (Fig. 21)
- 500 v insulation tester (megohmmeter) for compressor motors with nameplate voltage of 600 v or less, or a 5000-v insulation tester for compressor motor rated above 600 v

Using the Optional Storage Tank and Pumpout System — Refer to Pumpout and Refrigerant Transfer Procedures section for pumpout system preparation, refrigerant transfer, and machine evacuation.

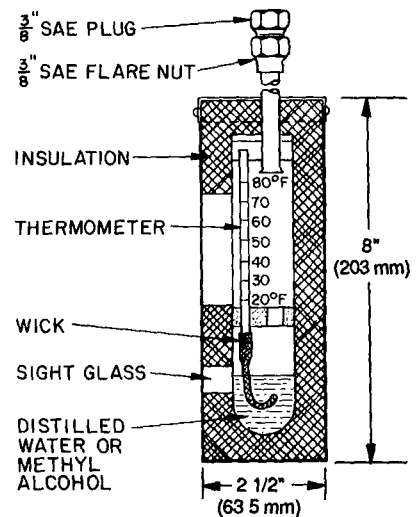


Fig. 21 — Typical Wet-Bulb Type Vacuum Indicator

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

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

Check Machine Tightness — Figure 22 outlines the proper sequence and procedures for leak testing.

19XL machines are shipped with the refrigerant contained in the condenser shell and the oil charge shipped in the compressor. Units may be ordered with the refrigerant shipped separately, and a 10 psig (69 kPa) nitrogen-holding charge in each vessel. To determine if there are any leaks, the machine should be charged with refrigerant. Use an electronic leak detector to check all flanges and solder joints after the machine is pressurized. If any leaks are detected, follow the leak test procedure.

If the machine is spring isolated, keep all springs blocked in both directions to prevent possible piping stress and damage when refrigerant is transferred from vessel to vessel during the leak test process, or any time refrigerant is transferred. Adjust the springs when the refrigerant is in operating condition, and the water circuits are full.

Refrigerant Tracer — Carrier recommends the use of HCFC-22 as a refrigerant tracer for leak testing with an electronic detector or halide torch. Refrigerant HFC-134a does not react with all types of detectors.

Ultrasonic leak detectors also can be used if the machine is under pressure.

▲ WARNING

Do not use air or oxygen as a means of pressurizing the machine. Air rich mixtures of R-22 and air can undergo combustion.

Measuring Vessel Pressure — The 19XL is equipped with Schrader-type pressure connections on the cooler and condenser to attach refrigerant pressure gages easily. If the PIC control unit is not powered, accurate refrigerant pressure gages should be used to reach these pressures. See Fig. 7 for the pressure tap locations. All pressure transducers also use Schrader-type connections so that they may be removed for calibration or repair. Whenever determining heat exchanger approaches, use of an accurate, refrigerant-type pressure gage is recommended.

Check Machine Condition — Attach an accurate 30-in.-0-300 psi (-101-0-3000 kPa) or higher refrigeration gage to the Schrader connections on both the cooler and condenser. Note the ambient air temperature and, if the machine is charged with refrigerant, compare to saturated pressure. If the machine was shipped with a nitrogen-holding charge, compare to the factory 10 psi (69 kPa) charge.

Leak Test Machine — Follow the leak test procedure as outlined in Fig. 22. Valve numbers and locations are shown in Fig. 23 and 24. Refer to Table 5A or B for refrigerant pressure temperature values. Leak Test Procedure A cited in Fig. 22 is as follows:

PROCEDURE A

1. Evacuate the holding charge from the vessels, if present.
2. Raise machine pressure to 68 psig (469 kPa), if necessary, by adding refrigerant to the machine. Follow the pumpout procedures in the Transferring Refrigerant From Storage Tank to Machine section, Steps 1a - 3.

▲ WARNING

Never charge liquid refrigerant into the machine if the pressure in the machine is less than 68 psig (469 kPa). Charge as a gas only, with the cooler and condenser pumps running, until this pressure is reached, using PUMPDOWN and TERMINATE PUMPDOWN modes on the PIC. Flashing of liquid refrigerant at low pressures can cause tube freeze-up and considerable damage.

3. Check the entire machine carefully with an electronic leak detector or halide torch.
4. Leak Determination — During initial start-up procedures, if an electronic leak detector indicates a leak, use a soap bubble solution, if possible, to confirm. Total all leak rates for the entire machine. Leakage at rates greater than 1 lb/year (.45 kg/year) for the entire machine must be repaired. Note total machine leak rate on the start-up report.
5. a. If no leak is found, complete the transfer of refrigerant gas from the storage tank to the machine (see Pumpout and Refrigerant Transfer Procedures section, Step 1e). Retest.
 b. If a leak is found, pump the refrigerant back into the storage tank, or if isolation valves are present, into the non-leaking vessel (see Pumpout and Refrigerant Transfer Procedures section).
6. Transfer the refrigerant until machine pressure is at 0 psig (0 kPa).
7. Repair the leak and repeat procedure to ensure a leak-tight repair. (If machine is opened to atmosphere for an extended period, evacuate it before repeating leak test.)

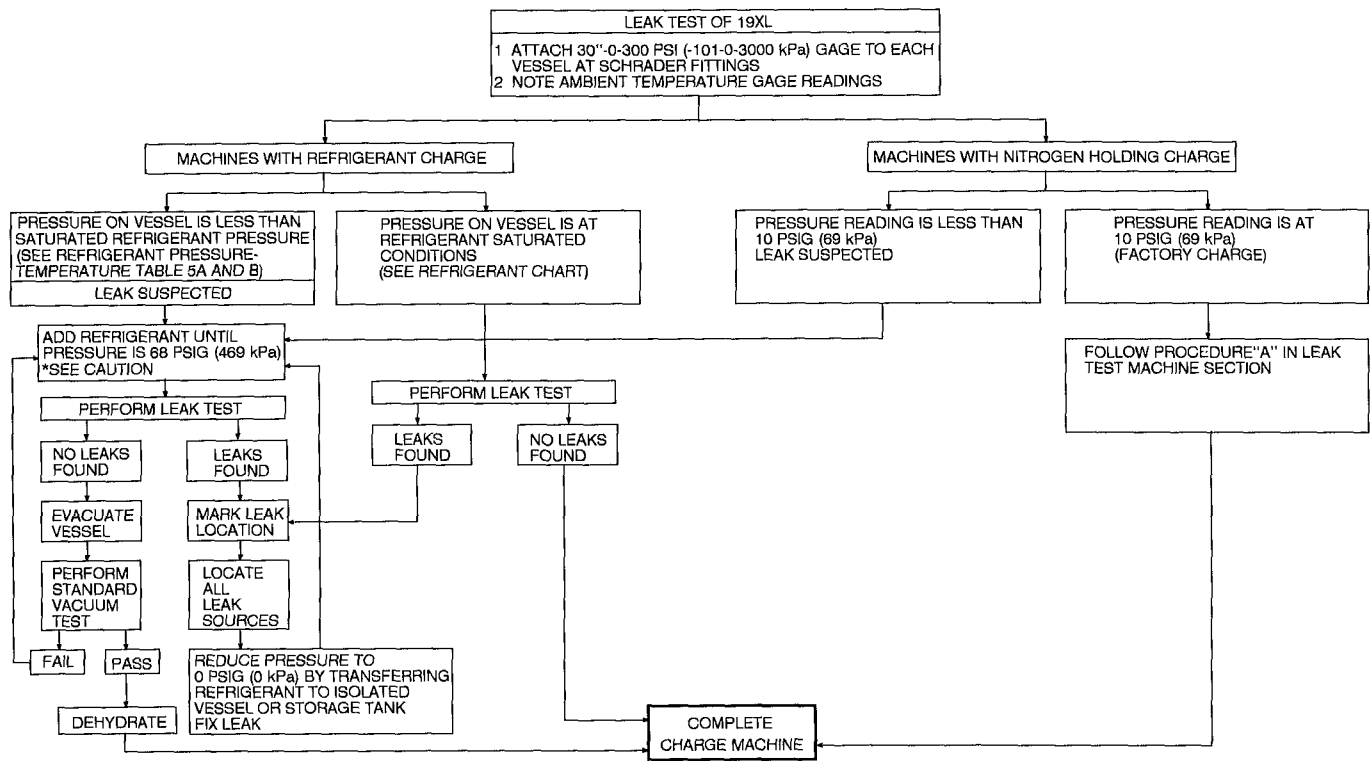


Fig. 22 — 19XL Leak Test Procedures

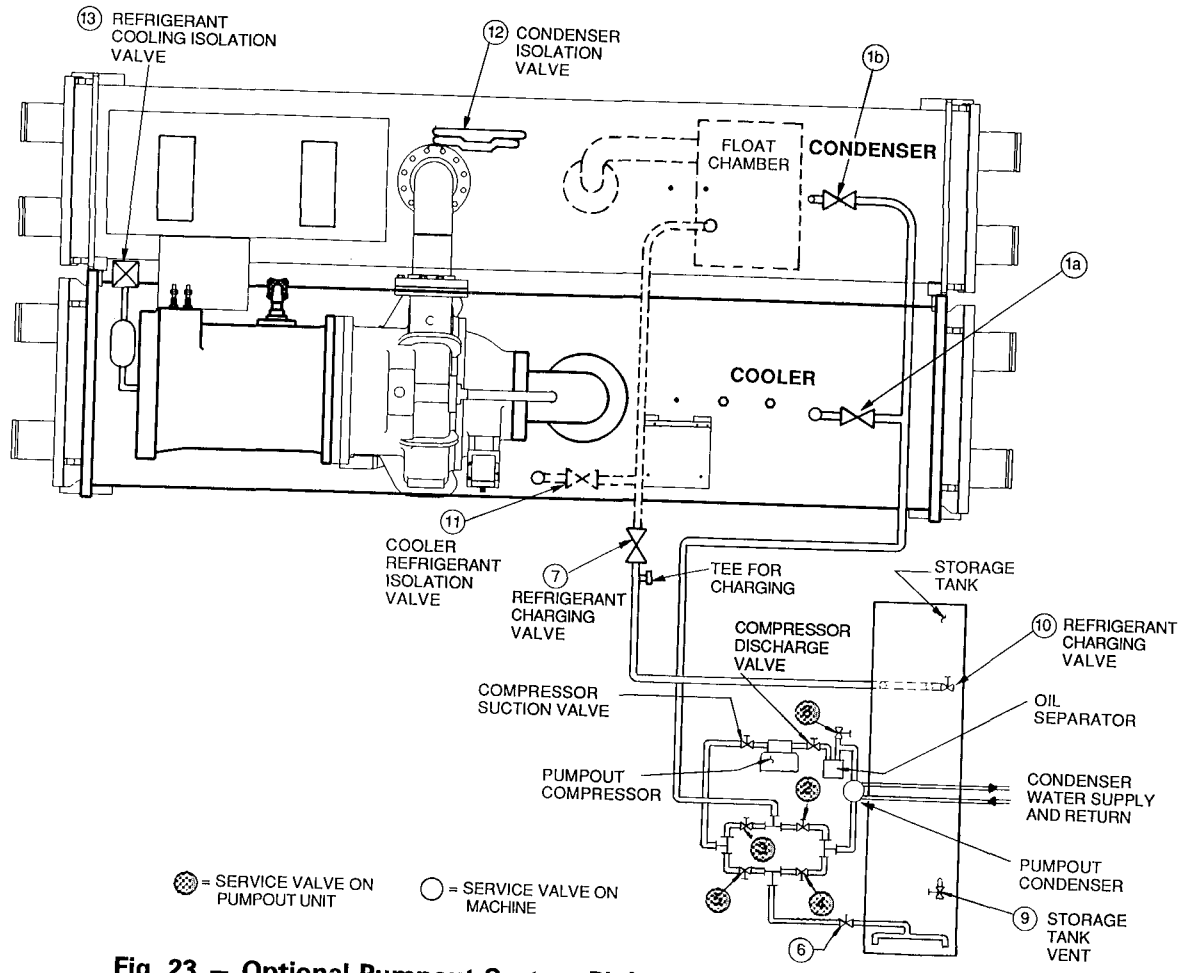


Fig. 23 – Optional Pumpout System Piping Schematic with Storage Tank

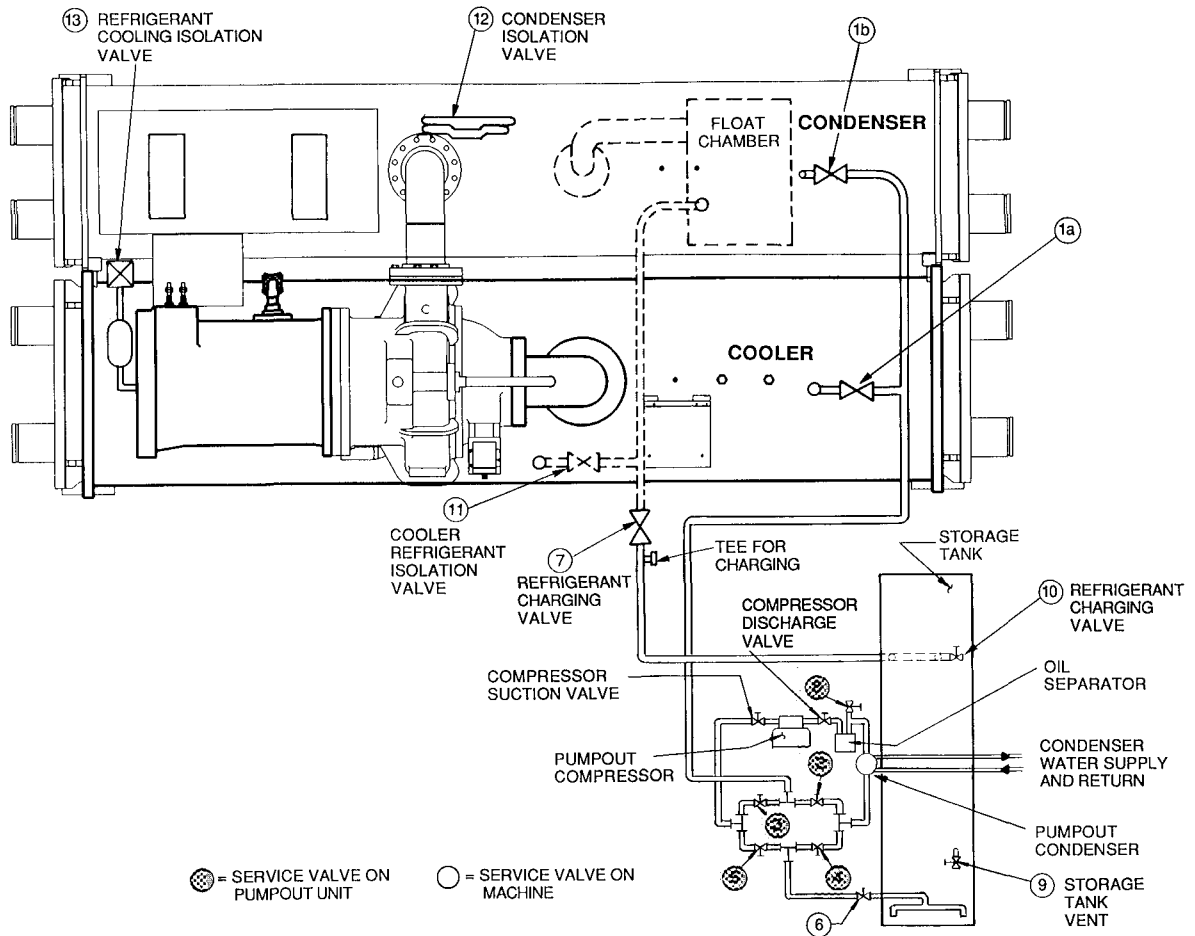


Fig. 23 – Optional Pumpout System Piping Schematic with Storage Tank

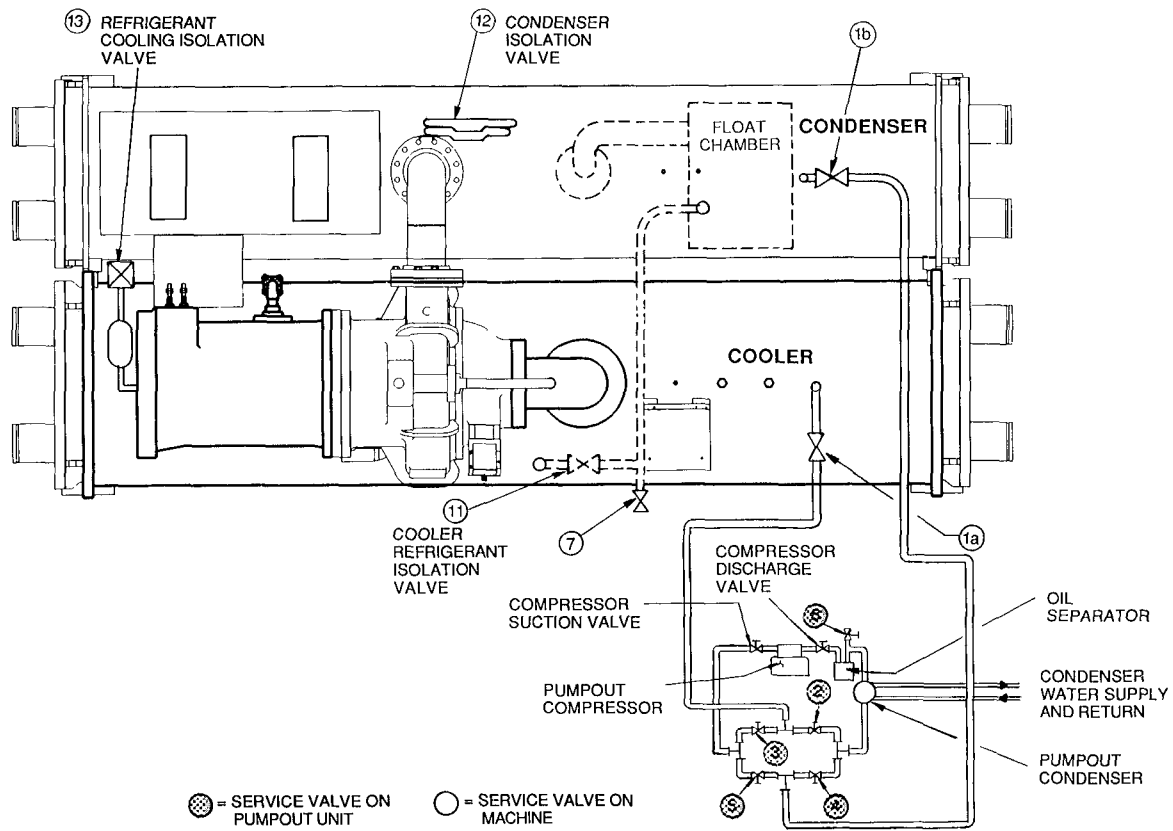


Fig. 24 – Optional Pumpout System Piping Schematic without Storage Tank

Table 5A – R-22 Pressure-Temperature (F)

TEMPERATURE (F)	PRESSURE (psi)		TEMPERATURE (F)	PRESSURE (psi)		TEMPERATURE (F)	PRESSURE (psi)	
	Absolute	Gage		Absolute	Gage		Absolute	Gage
-50	11.67	6.154*	30	69.59	54.90	110	241.04	226.35
-48	12.34	4.829*	32	72.17	57.47	112	247.50	232.80
-46	13.00	3.445*	34	74.82	60.12	114	254.08	239.38
-44	13.71	2.002*	36	77.54	62.84	116	260.79	246.10
-42	14.45	0.498*	38	80.34	65.64	118	267.63	252.94
-40	15.22	0.526	40	83.21	68.51	120	274.60	259.91
-38	16.02	1.328	42	86.15	71.46	122	281.71	267.01
-36	16.86	2.163	44	89.18	74.48	124	288.95	274.25
-34	17.73	3.032	46	92.28	77.58	126	296.33	281.63
-32	18.63	3.937	48	95.46	80.77	128	303.84	289.14
-30	19.57	4.877	50	98.73	84.03	130	311.50	296.80
-28	20.55	5.853	52	102.07	87.38	132	319.29	304.60
-26	21.56	6.868	54	105.50	90.81	134	327.23	312.54
-24	22.62	7.921	56	109.02	94.32	136	335.32	320.63
-22	23.71	9.015	58	112.62	97.93	138	343.56	328.86
-20	24.85	10.15	60	116.31	101.62	140	351.94	337.25
-18	26.02	11.32	62	120.09	105.39	142	360.48	345.79
-16	27.24	12.54	64	123.96	109.26	144	369.17	354.48
-14	28.50	13.81	66	127.92	113.22	146	378.02	363.32
-12	29.81	15.11	68	131.97	117.28	148	387.03	372.33
-10	31.16	16.47	70	136.12	121.43	150	396.19	381.50
- 8	32.56	17.87	72	140.37	125.67	152	405.52	390.83
- 6	34.01	19.32	74	144.71	130.01	154	415.02	400.32
- 4	35.51	20.81	76	149.15	134.45	156	424.68	409.99
- 2	37.06	22.36	78	153.69	138.99	158	434.52	419.82
0	38.66	23.96	80	158.33	143.63	160	444.53	420.83
2	40.31	25.61	82	163.07	148.37			
4	42.01	27.32	84	167.92	153.22			
6	43.78	29.08	86	172.87	158.17			
8	45.59	30.90	88	177.93	163.23			
10	47.46	32.77	90	183.09	168.40			
12	49.40	34.70	92	188.37	173.67			
14	51.39	36.69	94	193.76	179.06			
16	53.44	38.74	96	199.26	184.56			
18	55.55	40.86	98	204.87	190.18			
20	57.73	43.03	100	210.60	195.91			
22	59.97	45.27	102	216.45	201.76			
24	62.27	47.58	104	222.42	207.72			
26	64.64	49.95	106	228.50	213.81			
28	67.08	52.39	108	234.71	220.02			

*Inches of mercury below one atmosphere.

Table 5B – R-22 Pressure-Temperature (C)

TEMPERATURE (C)	PRESSURE (kPa)		TEMPERATURE (C)	PRESSURE (kPa)		TEMPERATURE (C)	PRESSURE (kPa)	
	Absolute	Gage		Absolute	Gage		Absolute	Gage
-18	264	163	11	701	600	41	1570	1470
-17	274	173	12	723	622	42	1610	1510
-16	284	183	13	744	643	43	1650	1550
-15	296	195	14	766	665	44	1690	1590
-14	307	206	15	789	688	45	1730	1630
-13	318	217	16	812	711	46	1770	1670
-12	330	229	17	836	735	47	1810	1710
-11	342	241	18	860	759	48	1850	1750
-10	354	253	19	885	784	49	1900	1800
- 9	367	266	20	910	809	50	1940	1840
- 8	380	279	21	936	835	51	1980	1890
- 7	393	292	22	962	861	52	2030	1930
- 6	407	306	23	989	888	53	2080	1980
- 5	421	320	24	1020	919	54	2130	2030
- 4	436	335	25	1040	939	55	2170	2070
- 3	451	350	26	1070	969	56	2220	2120
- 2	466	365	27	1100	1000	57	2270	2170
- 1	482	381	28	1130	1030	58	2320	2220
0	498	397	29	1160	1060	59	2370	2270
1	514	413	30	1190	1090	60	2430	2330
2	531	430	31	1220	1120	61	2480	2380
3	548	447	32	1260	1160	62	2530	2430
4	566	465	33	1290	1190	63	2590	2490
5	584	483	34	1320	1220	64	2640	2540
6	602	501	35	1360	1260	65	2700	2600
7	621	520	36	1390	1290	66	2760	2660
8	641	540	37	1420	1320	67	2820	2720
9	660	559	38	1460	1360	68	2870	2770
10	681	580	39	1500	1400	69	2930	2830
			40	1530	1430	70	3000	2900

Standing Vacuum Test — When performing the standing vacuum test, or machine dehydration, use a manometer or a wet bulb indicator; dial gages cannot indicate the small amount of leakage acceptable during a short period of time.

1. Attach an absolute pressure manometer or wet bulb indicator to the machine.
2. Evacuate the vessel (see Pumpout and Refrigerant Transfer Procedures section) to 22 in. Hg vac, ref 30-in. bar (4.0 psia) (28 kPa), using a vacuum pump or the pumpout unit.
3. Valve off the pump to hold the vacuum and record the manometer or indicator reading.
4.
 - a. If the leakage rate is less than 0.05 in. Hg (.17 kPa) in 24 hours, the machine is sufficiently tight.
 - b. If the leakage rate exceeds 0.05 in. Hg (.17 kPa) in 24 hours, repressurize the vessel and test for leaks. If refrigerant is available in the other vessel, pressurize by following Steps 2 - 10 of Return Refrigerant To Normal Operating Conditions section. If not, use nitrogen and a refrigerant tracer. Raise the vessel pressure in increments until the leak is detected. If refrigerant is used, the maximum gas pressure is approximately 120 psig (827 kPa) at normal ambient temperature; with nitrogen, limit the leak test pressure to 230 psig (1585 kPa) maximum.
5. Repair leak, retest, and proceed with dehydration.

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

▲ WARNING

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

Dehydration is readily accomplished at room temperatures. Use of a cold trap (Fig. 25) may substantially reduce the time required to complete the dehydration. The higher the room temperature, the faster dehydration takes place. At low room temperatures, a very deep vacuum is required for boiling off any moisture. If low ambient temperatures are involved, contact a qualified service representative for the dehydration techniques required.

Perform dehydration as follows:

1. Connect a high capacity vacuum pump (5 cfm [.002 m³/s] or larger is recommended) to the refrigerant charging valve (Fig. 2, Item 14). Tubing from the pump to the machine should be as short and as large a diameter as possible to provide least resistance to gas flow.
2. Use an absolute pressure manometer or a wet bulb vacuum indicator to measure the vacuum. Open the shutoff valve to the vacuum indicator only when taking a reading. Leave the valve open for 3 minutes to allow the indicator vacuum to equalize with the machine vacuum.
3. Open all isolation valves, if present, if the entire machine is to be dehydrated.
4. With the machine ambient temperature at 60 F (15.6 C) or higher, operate the vacuum pump until the manometer reads 29.8 in. Hg vac, ref 30 in. bar. (0.1 psia) (-100.61 kPa) or a vacuum indicator reads 35 F (1.7 C). Operate the pump an additional 2 hours.

Do not apply greater vacuum than 29.82 in. Hg vac (757.4 mm Hg) or go below 33 F (.56 C) on the wet

bulb vacuum indicator. At this temperature/pressure, isolated pockets of moisture can turn into ice. The slow rate of evaporation (sublimation) of ice at these low temperatures/pressures greatly increases dehydration time.

5. Valve off the vacuum pump, stop the pump, and record the instrument reading.
6. After a 2-hour wait, take another instrument reading. If the reading has not changed, dehydration is complete. If the reading indicates vacuum loss, repeat Steps 4 and 5.
7. If the reading continues to change after several attempts, perform a leak test up to the maximum 230 psig (1585 kPa) pressure. Locate and repair the leak, and repeat dehydration.

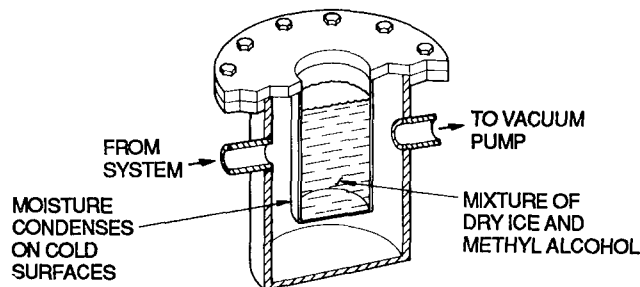


Fig. 25 — Dehydration Cold Trap

Inspect Piping — Refer to piping diagrams provided in the certified prints, and the piping instructions in the 19XL Installation Instructions manual. Inspect the piping to the cooler and condenser. Be sure that flow directions are correct and that all piping specifications have been met.

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

▲ CAUTION

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

Check Optional Pumpout Compressor Water Piping — If the optional storage tank and/or pumpout system are installed, check to ensure the pumpout condenser water has been piped in. Check for field-supplied shutoff valves and controls as specified in the job data. Check for refrigerant leaks on field-installed piping. See Fig. 23 and 24.

Check Relief Devices — Be sure that relief devices have been piped to the outdoors in compliance with the latest edition of ASHRAE Standard 15 and applicable local safety codes. Piping connections must allow for access to the valve mechanism for periodic inspection and leak testing.

Inspect Wiring

▲ WARNING

Do not check high voltage supply (over 600 v) without proper equipment and precautions. Serious injury may result. Follow power company recommendations.

▲ CAUTION

Do not apply any kind of test voltage, even for a rotation check, if the machine is under a dehydration vacuum. Insulation breakdown and serious damage may result.

1. Examine wiring for conformance to job wiring diagrams and to all applicable electrical codes.
2. On low voltage compressors (600 v or less) connect voltmeter across the power wires to the compressor starter and measure the voltage. Compare this reading with the voltage rating on the compressor and starter nameplates.
3. Compare the ampere rating on the starter nameplate with the compressor nameplate. The overload trip amps must be 108% of the rated load amps.
4. The starter for a centrifugal compressor motor must contain the components and terminals required for PIC refrigeration control. Check certified prints.
5. Check the voltage to the following components and compare to the nameplate values: oil pump contact, pumpout compressor starter, and power panel.
6. Be sure that fused disconnects or circuit breakers have been supplied for the oil pump, power panel, and pumpout unit.
7. Check that all electrical equipment and controls are properly grounded in accordance with job drawings, certified prints, and all applicable electrical codes.
8. Make sure that the customer's contractor has verified proper operation of the pumps, cooling tower fans, and associated auxiliary equipment. This includes ensuring that motors are properly lubricated and have proper electrical supply and proper rotation.
9. For field-installed starters only, test the machine compressor motor and its power lead insulation resistance with a 500-v insulation tester such as a megohmmeter. (Use a 5000-v tester for motors rated over 600 v.) Factory-mounted starters do not require a megohm test.
 - a. Open the starter main disconnect switch and follow lockout/tagout rules.

▲ CAUTION

If the motor starter is a solid-state starter, the motor leads must be disconnected from the starter before an insulation test is performed. The voltage generated from the tester can damage the starter's solid-state components.

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

6-Lead Motor — Tie all 6 leads together and test between the lead group and ground. Next tie leads in pairs, 1 and 4, 2 and 5, and 3 and 6. Test between each pair while grounding the third pair.

3-Lead Motor — Tie terminals 1, 2, and 3 together and test between the group and ground.
- c. Divide the 60-second resistance reading by the 10-second reading. The ratio, or polarization index, must be one or higher. Both the 10- and 60-second readings must be at least 50 megohms.

If the readings on a field-installed starter are unsatisfactory, repeat the test at the motor with the power leads disconnected. Satisfactory readings in this second test indicate the fault is in the power leads.

NOTE: Unit-mounted starters do not have to be megohm tested.

10. Tighten up all wiring connections to the plugs on the SMM, 8-input, and PSIO modules.
11. Ensure that the voltage selector switch inside the power panel is switched to the incoming voltage rating.

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

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system element on either side of it; the negative pins must be wired to the negative pins; the signal ground pins must be wired to signal ground pins.

To attach the CCN communication bus wiring; refer to the certified prints and wiring diagrams. The wire is inserted into the CCN communications plug (COMM1) on the PSIO module. This plug also is referred to as J5.

NOTE: Conductors and drain wire must be 20 AWG 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 -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	PSIO MODULE COMM 1 PLUG (J5) PIN NO.
+	RED	1
Ground	WHITE	2
-	BLACK	3

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 has been installed correctly.

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. Where a reduced-voltage starter, such as a wye-delta type, is used, 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 1CR closed, goes through a complete and proper start cycle.

SOLID-STATE STARTERS

▲ WARNING

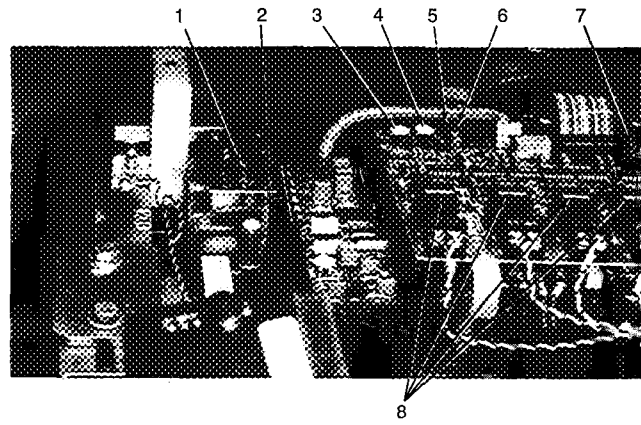
This equipment is at line voltage when AC power is connected. Pressing the Stop button does not remove voltage. Use caution when adjusting the potentiometers on the equipment.

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 prints.
6. Verify the initial factory settings of the starting torque and ramp potentiometers are set per the note on the schematic for the starters.

NOTE: The potentiometers are located at the lower left hand corner on the circuit board mounted in front of the starter power stack (Fig. 26).

The starting torque potentiometer should be set so that when the PIC calls for the motor to start, the rotor should just start to turn to approximately the 11:30 position. The ramp potentiometer should be set so that the motor is up to full speed in 15 to 20 seconds, the bypass contactors have energized, and the auxiliary LCD is energized (approximately the 11:30 position).

7. Proceed to apply power to the starter.
8. The Power + 15 and Phase Correct LEDs should be on. If not, see the starter Troubleshooting Guide section.



LEGEND

- | | |
|------------------------------------|--------------------------------------|
| 1 — Phase Voltage Indicator | 3 — Starting Torque Potentiometer |
| 2 — Starter Fault and Run LEDs (5) | 4 — Ramp Up Potentiometer |
| • Overtemp | 5 — Phase Correct LED |
| • Ground Fault | 6 — Relay On LED |
| • Current Unbalance (CUB) | 7 — Power +15 and Auxiliary (Starter |
| • While Stopped | in RUN State) LEDs (Hidden) |
| • Current Unbalance | 8 — SCR Indicator LEDs (Hidden) |
| • Run (Start Initiated) | |

Fig. 26 — Solid-State Starter Power Stack

Oil Charge — The 19XL compressor holds approximately 10 gallons (37.8 L) of oil. The machine will be shipped with oil in the compressor. When full, the oil level should be somewhere in the upper sight glass (Fig. 2, Item 8). If oil is added, it must meet Carrier's specification for centrifugal compressor usage as described in the Oil Changes section. Charge the oil through the oil charging valve, located near the bottom of the transmission housing (Fig. 2, Item 17). The oil must be pumped from the oil container through the charging valve due to higher refrigerant pressure. The pumping device must be able to lift from 0 to 200 psig (0 to 1380 kPa) or above unit pressure. Oil should only be charged or removed when the machine is shut down.

Power Up the Controls and Check the Oil Heater

— Ensure that an oil level is visible in the compressor before energizing controls. A circuit breaker in the starter energizes the oil heater and the control circuit. When first powered, the LID should display the default screen within 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. Minimum oil sump temperature set point when the compressor is shut down is 140 F (60 C).

Set Up Machine Control Configuration

▲ WARNING

Do not operate the machine before the control configurations have been checked and a controls test has been satisfactorily completed. Protection by safety controls cannot be assumed until all control configurations have been confirmed.

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



MACHINE INFORMATION:

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

DESIGN CONDITIONS:

	TONS	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: Type: R-_____ Charge _____ Lbs

CARRIER OBLIGATIONS: Assemble Yes No
 Leak Test Yes No
 Dehydrate Yes No
 Charging Yes No
 Operating Instructions _____ Hrs.

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

JOB DATA REQUIRED:

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

INITIAL MACHINE PRESSURE: _____

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

CHECK OIL LEVEL AND RECORD. A

E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	F
---	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	---

 B

E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	F
---	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	---

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 Vac _____ Starter Amps _____

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

FIELD-INSTALLED STARTERS ONLY:

Check continuity T1 to T1, etc. (Motor to starter, disconnect motor leads T4, T5, T6.)

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

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. (IN ACCORDANCE WITH BULLETIN C-8912.) CONTROL PANEL GROUND 14 GAGE MINIMUM TWISTED SHIELDED PAIR CABLE **MUST** BE USED BETWEEN SIGNAL RESISTOR IN STARTER AND CONTROL PANEL. SHIELD GROUNDED ON ONE END.

Yes _____

DRY 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 _____ Counterclockwise _____

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

*If yes determine cause

START MACHINE AND OPERATE. COMPLETE THE FOLLOWING:

- A: Trim Charge and Record Under Charge Refrigerant Section on page 39.
- B: Complete Any Remaining Control Calibration and Record Under Control Section (pages 10-27).
- C: Take At Least 2 Sets of Operational Log Readings and Record.
- E: After Machine Has Been Successfully Run and Set Up, Shut Down and Mark Shutdown Oil and Refrigerant Levels.
- F: Give Operating Instructions to Owner's Operating Personnel. Hours Given: _____ Hours



19XL
HERMETIC CENTRIFUGAL LIQUID CHILLER
CONFIGURATION SETTINGS LOG
(Remove and use for job file.)

Controller Name: _____ Bus # _____ Element # _____

Table Description: _____ Table Name: SETPOINT

19XL SET POINT TABLE CONFIGURATION SHEET			
DESCRIPTION	RANGE	UNITS	VALUE
Base Demand Limit	40-100	%	
LCW Setpoint	20-120 (-6.7-48.9)	DEG F (DEG C)	
ECW Setpoint	20-120 (-6.7-48.9)	DEG F (DEG C)	



Controller Name: _____ Bus # _____ Element # _____

Table Description: _____ Table Name: OCCPC01S

19XL PIC 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:																	

19XL PIC 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:																	



Controller Name: _____ Bus # _____ Element # _____

Table Description: _____ Table Name: CONFIG

19XL PIC CONFIG TABLE CONFIGURATION SHEET			
DESCRIPTION	RANGE	UNITS	VALUE
RESET TYPE 1			
Degrees Reset at 20 mA	-30-30 (-17-17)	DEG F (DEG C)	
RESET TYPE 2			
Remote Temp (No Reset)	-40-245 (-40-118)	DEG F (DEG C)	
Remote Temp (Full Reset)	-40-245 (-40-118)	DEG F (DEG C)	
Degrees Reset	-30-30 (-17-17)	DEG F (DEG C)	
RESET TYPE 3			
CHW Temp (No Reset)	0-15 (0-8)	DEG F (DEG C)	
CHW Temp (Full Reset)	0-15 (0-8)	DEG F (DEG C)	
Degrees Reset	-30-30 (-17-17)	DEG F (DEG C)	
Select/Enable Reset Type	0-3		
ECW Control Option	Disable/Enable		
Demand Limit at 20 mA	40-100	%	
20 mA Demand Limit Option	Disable/Enable		
Auto Restart Option	Disable/Enable		
Remote Contacts Option	Disable/Enable		
Temp Pulldown Deg/Min	2-10		
Load Pulldown %/Min	5-20		
Select Ramp Type: Temp = 0/Load = 1	0/1		
Loadshed Group Number	0-99		
Loadshed Demand Delta	0-60	%	
Maximum Loadshed Time	0-120	Min	

Controller Name: _____ Bus # _____ Element # _____

Table Description: _____ Table Name: SERVICE1

19XL PIC SERVICE1 TABLE CONFIGURATION SHEET			
DESCRIPTION	RANGE	UNITS	VALUE
Motor Temp Override	150-200 (66-93)	DEG F (DEG C)	
Cond Pressure Override	150-245 (1034-1639)	psi (kPa)	
Refrig Override Delta T	2-5 (1-3)	DEG F (DEG C)	
Chilled Medium	Water/Brine		
Brine Refrig Trippoint	0-40 (-16-4)	DEG F (DEG C)	
Compr Discharg Alert	125-200 (52-93)	DEG F (DEG C)	
Bearing Temp Alert	175-185 (79-85)	DEG F (DEG C)	
Water Flow Verify Time	1-5	MIN	
Oil Press Verify Time	15-300	SEC	
Water/Brine Deadband	0.5-2.0 (0.3-1.1)	DEG F (DEG C)	
Recycle Restart Delta T	2.0-5.0 (1.1-2.8)	DEG F (DEG C)	
Surge Limit/HGBP Option Surge = 0/HGBP = 1	0/1		
Surge/HGBP Delta T1	0.5-15.0 (0.3-5.6)	DEG F (DEG C)	
Surge/HGBP Delta P1	50-200 (345-1379)	psi (kPa)	
Surge/HGBP Delta T2	0.5-15.0 (0.3-5.6)	DEG F (DEG C)	
Surge/HGBP Delta P2	50-200 (345-1379)	psi (kPa)	
Surge/HGBP Deadband	1-3 (0.6-1.6)	DEG F (DEG C)	
Surge Delta Percent Amps	10-50	%	
Surge Time Period	1-5	MIN	
Demand Limit Source Amps = 0/Load = 1	0/1		
Amps Correction Factor	1-8		

Controller Name: _____ Bus # _____ Element # _____

Table Description: _____ Table Name: SERVICE1

19XL PIC SERVICE1 TABLE CONFIGURATION SHEET			
DESCRIPTION	RANGE	UNITS	VALUE
Motor Rated Load Amps	1-9999	AMPS	
Motor Rated Line Voltage	1-9999	VOLTS	
Meter Rated Line kW	1-9999	kW	
Line Frequency 0 = 60 Hz/1 = 50 Hz	0/1		
Compressor Starter Type	0/1	REDUCE/FULL	



Controller Name: _____ Bus # _____ Element # _____

Table Description: _____ Table Name: SERVICE2

19XL PIC SERVICE2 TABLE CONFIGURATION SHEET			
DESCRIPTION	RANGE	UNITS	VALUE
CHWS Temp Enable	0-2		
CHWS Temp Alert	-40-245 (-40-118)	DEG F (DEG C)	
CHWR Temp Enable	0-2		
CHWR Temp Alert	-40-245 (-40-118)	DEG F (DEG C)	
Reset Temp Enable	0-2		
Reset Temp Alert	-40-245 (-40-118)	DEG F (DEG C)	
Spare Temp 1 Enable	0-2		
Spare Temp 1 Alert	-40-245 (-40-118)	DEG F (DEG C)	
Spare Temp 2 Enable	0-2		
Spare Temp 2 Alert	-40-245 (-40-118)	DEG F (DEG C)	
Spare Temp 3 Enable	0-2		
Spare Temp 3 Alert	-40-245 (-40-118)	DEG F (DEG C)	
Spare Temp 4 Enable	0-2		
Spare Temp 4 Alert	-40-245 (-40-118)	DEG F (DEG C)	
Spare Temp 5 Enable	0-2		
Spare Temp 5 Alert	-40-245 (-40-118)	DEG F (DEG C)	
Spare Temp 6 Enable	0-2		
Spare Temp 6 Alert	-40-245 (-40-118)	DEG F (DEG C)	
Spare Temp 7 Enable	0-2		
Spare Temp 7 Alert	-40-245 (-40-118)	DEG F (DEG C)	
Spare Temp 8 Enable	0-2		
Spare Temp 8 Alert	-40-245 (-40-118)	DEG F (DEG C)	
Spare Temp 9 Enable	0-2		
Spare Temp 9 Alert	-40-245 (-40-118)	DEG F (DEG C)	

Controller Name: _____ Bus # _____ Element # _____

Table Description: _____ Table Name: SERVICE3

19XL PIC SERVICE3 TABLE CONFIGURATION SHEET			
DESCRIPTION	RANGE	UNITS	VALUE
Proportional Inc Band	5-10		
Proportional Dec Band	5-10		
Proportional ECW Gain	1-3		
Guide Vane Travel Limit	50-100	%	

Controller Name: _____ Bus # _____ Element # _____

Table Description: _____ Table Name: HOLIDEF__S

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

Table Description: _____ Table Name: HOLIDEF__S

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

Table Description: _____ Table Name: HOLIDEF__S

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

Controller Name: _____ Bus # _____ Element # _____

Table Description: _____ Table Name: BRODEFS

BROADCAST (BRODEFS) CONFIGURATION SHEET			
DESCRIPTION	RANGE	UNITS	VALUE
Activate	Yes/No		
OAT Broadcast			
Controller Name	8 characters	Text	
Bus Number	0-239	Bus #s	
Element Number	0-239	SE #s	
OARH Broadcast			
Controller Name	8 characters	Text	
Bus Number	0-239	Bus #s	
Element Number	0-239	SE #s	
Daylight Savings Start			
Month	1-12		
Day	1-31		
Time	00:00-23:59	HH:MM	
Minutes To Add	1-1440	MIN	
Daylight Savings Stop			
Month	1-12		
Day	1-31		
Time	00:00-23:59	HH:MM	
Minutes To Subtract	1-1440	MIN	

As configuration of the 19XL machine is performed, write down all configuration settings. A log, such as the one shown on pages CL-1 - CL-12, provides a convenient list for configuration values.

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.

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 menu Config screen.

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, set it for 24 hours occupied/7 days per week including holidays. This is also the default setting of the schedule. For this schedule, modify Period 1 for on at 0000 and off at 2400, and enable the period to be in effect for all days and holidays. For more information about how to set up a time schedule, read the Controls section.

The CCN Occupied Schedule (OCCPC02S) should be configured if a CCN system is being installed. It normally is input through the CCN Building Supervisor, but it can also be modified at the LID.

Check Voltage Supply — Access the Status01 screen and read the actual line voltage. 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 to the 24-v input to the SMM at a potentiometer located in the low voltage section of the starter.

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 controls test

PASSWORD — When accessing the Service screens, 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 screen 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 AS 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 jobsite, change the LID address on each machine so that none is the same. Note and write down the new address. Change to SI units as required. Change the password if desired.

MODIFY CONTROLLER IDENTIFICATION AS 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.

Change the LID address if there is more than one machine on the jobsite. Access the LID configuration screen to view or modify this address.

INPUT EQUIPMENT SERVICE PARAMETERS AS NECESSARY — The Equipment Service screen has three service tables: Service1, Service2, and Service3.

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

Chilled Medium Brine Refrigerant Trip Point	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
Amps Correction Factor	See Table 6
Motor Rated Load Amps	Per job data
Motor Rated Line Voltage	Per job data
Motor Rated Line KW	Per job data
Line Frequency	50 or 60 Hz
Compressor Starter Type	Reduced voltage or full?

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 (ΔT1/P1: Δ T2/P2) — These pairs of machine load points, located on the Service1 screen, 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 valve 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

Estimated Minimum Load Conditions:

- 44 F (6.7 C) LCW
- 45.5 F (7.5 C) EWC
- 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 10°F (5.6°C), estimate the refrigerant suction and condensing temperatures at this difference.

Suction Temperature:

$$42 \text{ F (5.6 C)} = 71.5 \text{ psig (521 kPa) saturated refrigerant pressure}$$

Condensing Temperature:

$$98 \text{ F (36.7 C)} = 190 \text{ psig (1310 kPa) saturated refrigerant pressure}$$

Maximum Load ΔT2:

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

Maximum Load ΔP2:

$$190 - 71.5 = 118.5 \text{ psi (1310 - 521 = 789 kPa)}$$

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

$$\Delta T2 = 10 \text{ F (5.5 C)}$$

$$\Delta P2 = 130 \text{ psi (900 kPa)}$$

Calculate Minimum Load — To calculate minimum load conditions, estimate the temperature difference that the cooler will have at 10% load, then estimate what the suction and condensing temperatures will be at this point.

Suction Temperature:

$$43 \text{ F (6.1 C)} = 73 \text{ psig (503 kPa) saturated refrigerant pressure}$$

Condensing Temperature:

$$70 \text{ F (21.1 C)} = 121 \text{ psig (834 kPa) saturated refrigerant pressure}$$

Minimum Load $\Delta T1$:

$$45.5 - 44 = 1.5 \text{ F (7.5 - 6.7 = 0.8 C)}$$

Minimum Load $\Delta P1$:

$$121 - 73 = 48 \text{ psig (834 - 503 = 331 kPa)}$$

Again, to avoid unnecessary surge prevention, add 10 psi (70 kPa) at $\Delta P1$ from these conditions:

$$\Delta T1 = 1.5 \text{ F (0.8 C)}$$

$$\Delta P1 = 60 \text{ psi (410 kPa)}$$

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 T1 by .5° F (.2° C) or increase P1 by 10 psi (70 kPa)	Decrease T1 by 5° F (2° C) or decrease P2 by 10 psi (70 kPa)
At high loads (>50%)	Increase P2 by 10 psi (70 kPa)	Decrease P2 by 10 psi (70 kPa)

Table 6 — Amps Correction Factors for 19XL Motors

VOLT/ HZ	MOTOR CODE						
	CD	CE	CL	CM	CN	CP	CQ
200/60	3	6	3	2	3	2	2
208/60	5	8	4	2	4	2	2
220/60	2	2	2	3	1	1	1
230/60	4	4	3	5	2	2	2
240/60	4	4	3	8	2	2	2
360/60	4	2	2	2	1	1	1
380/60	6	4	4	5	3	2	2
400/60	8	4	4	5	3	2	3
440/60	2	2	1	1	1	1	3
460/60	3	2	2	2	2	2	5
480/60	4	3	3	3	3	3	7
550/60	3	2	1	2	3	2	2
575/60	4	2	2	3	4	3	3
600/60	6	4	3	4	6	5	4
3300/60	4	1	2	3	3	3	2
2400/60	3	3	2	3	2	2	3
4160/60	3	3	2	3	2	2	3
220/50	2	2	2	3	2	1	1
230/50	2	3	2	4	3	2	1
240/50	5	4	3	5	3	3	2
320/50	2	2	1	1	1	1	3
346/50	3	3	3	2	1	2	3
360/50	4	4	4	2	2	2	8
380/50	3	3	3	2	4	2	2
400/50	4	5	4	3	6	4	3
415/50	5	6	5	4	7	5	4
3000/50	2	3	2	3	1	2	1
3300/50	3	3	3	4	2	2	1
6000/50	4	4	4	4	4	4	4

MODIFY EQUIPMENT CONFIGURATION AS NECESSARY — The Equipment Configuration screen has tables to select and view or modify. Carrier's certified prints will have 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 prints for values. Modifications include:

- chilled water reset
- entering chilled water control (Enable/Disable)

- 4-20 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 paragraphs in the Controls section for more details.

Brodef Table Modifications — The Brodef screen 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.

PERFORM AN AUTOMATED CONTROLS TEST — Check the safety controls status by performing an automated controls test. Access the Controls Test menu in the Service section, and select the Automated Tests function (Table 7).

The automated controls test will check all outputs and inputs for function. The compressor must be off 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 screen). Each test will ask the operator to confirm that the operation is happening, and whether or not to continue. If an error occurs, the operator has the choice to try to fix the problem as the test is being done, or to note the problem and continue on to the next test.

When the test is finished, or the **EXIT** softkey is pressed, the test will be stopped and the Controls Test menu will be displayed. If a specific automated test procedure is not completed, access that particular controls test when ready to test that function. The Controls Test menu is described as follows.

Automated Tests	As described above, a complete controls 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	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 7 – Controls 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
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
8. Pumpdown	When using pumpdown lockout, observe freeze up precautions when removing charge: Instructs operator as to which values 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 values 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.

Check Optional Pumpout System Controls and Compressor — Controls include an on/off switch, a 3-amp fuse, the compressor overloads, an internal thermostat, a compressor contactor, and a refrigerant high pressure cutout. The high pressure cutout is factory set to open at 220 ± 5 psig (1250 ± 34 kPa), and automatically reset at $185 +0, -7$ ($1280 +0, -48$ kPa). Check that the water-cooled condenser has been connected. Loosen the compressor holddown bolts to allow free spring travel. Open the compressor suction and discharge service valves. Check that oil is visible in the compressor sight glass. Add oil if necessary.

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

Charge Refrigerant into Machine

⚠ CAUTION

The transfer, addition, or removal of refrigerant in spring isolated machines may place severe stress on external piping if springs have not been blocked in both up and down directions.

The standard 19XL machine will have the refrigerant already charged in the vessels. If isolation valves are installed, use the following procedure if the charge is isolated in the condenser.

BRING REFRIGERANT TO NORMAL OPERATING CONDITIONS

1. Access the Controls Test function Terminate Lockout. This test will operate the water pumps. If pumps are not controlled by the machine, turn them on.
2. Crack open the refrigerant cooling isolation valve (Fig. 23 and 24, valve 13). Slowly open the valve, to equalize the pressure between the two shells. This step will take approximately 15 minutes. Observe the pressures from the LID display, or attach a refrigerant gage to the cooler shell.
3. Once the pressures have equalized, open the refrigerant cooling isolation valve fully. Open the compressor discharge valve fully. Open the cooler refrigerant isolation valve fully (Fig. 23 and 24, valves 11 and 13).

The full refrigerant charge on the 19XL will vary with machine components and the design conditions, and must therefore be found on the job data specifications. An approximate charge may be found by adding the condenser charge to the cooler charge listed in Table 8.

Always operate the condenser and chilled water pumps during charging operations to ensure against freeze-ups. Use the Controls Test Terminate Lockout to monitor conditions and start the pumps.

If the machine has been shipped with a holding charge, the refrigerant will be added through the refrigerant charging valve (Fig. 23 and 24, valve 7) or to the pumpout charging connection. Charge the refrigerant as a gas until the system pressure exceeds 68 psig (469 kPa). After the machine is beyond 68 psig (469 kPa), the refrigerant should be charged as a liquid until all of the recommended refrigerant charge has been added.

TRIMMING REFRIGERANT CHARGE — The 19XL is shipped with the correct charge for the design duty of the machine. Trimming the charge can be best accomplished when design load is available. To trim, check the temperature difference between leaving chilled water temperature and cooler refrigerant temperature at full load design conditions. If necessary, add or remove refrigerant to bring the temperature difference to design conditions or minimum differential. *Do not overcharge.*

Table 8 – Refrigerant Charges*

COOLER SIZE 19XL	REFRIGERANT CHARGE R-22		CONDENSER SIZE 19XL	REFRIGERANT CHARGE R-22	
	lb	kg		lb	kg
40	832	377	40	377	171
41	954	433	41	381	173
42	974	442	42	388	176
43	1106	502	43	391	177
50	1115	506	50	391	177
51	1206	547	51	396	180
52	1334	605	52	401	182
53	1338	607	53	411	186

*Add condenser charge to cooler charge to obtain total machine charge.

INITIAL START-UP

Preparation — Before starting the machine, check that:

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. Solid-state starter checks: The Power +15 and the Phase Current LEDs must be lit before the starter will energize. If the Power +15 LED is not on, incoming voltage is not present or is incorrect. If the Phase Current LED is not lit, rotate any 2 incoming phases to correct the phasing.

▲ WARNING

Do not permit water or brine 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. 16). 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 that the machine is in the OCCUPIED mode, and is ready 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 11 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

1. Engage the main motor disconnect on the front of the starter panel. The motor is now ready for rotation check.
2. After the default screen Status message states “Ready for “Start” press the **[LOCAL]** softkey; start-up checks will be made by the control.
3. When the starter is energized and the motor begins to turn over, check for clockwise rotation (Fig. 27).

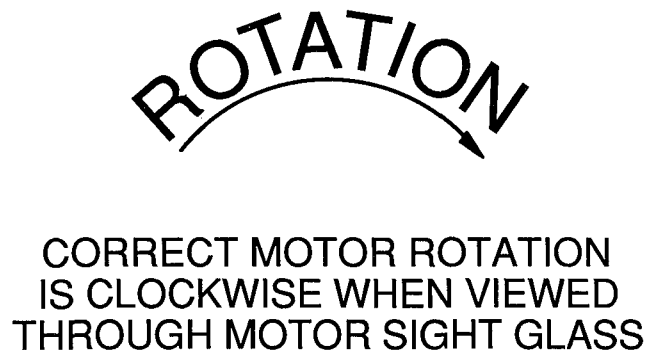
IF ROTATION IS PROPER, allow the compressor to come up to speed.

IF THE MOTOR ROTATION IS NOT CLOCKWISE (as viewed through the sight glass), reverse any 2 of the 3 incoming power leads to the starter and recheck rotation.

NOTE: Starters also have phase protection and will not allow a start if the phase is not correct. Instead, a Starter Fault message will occur if this happens.

▲ CAUTION

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



CORRECT MOTOR ROTATION IS CLOCKWISE WHEN VIEWED THROUGH MOTOR SIGHT GLASS

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

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

Fig. 27 – Correct Motor Rotation

NOTES ON SOLID-STATE STARTERS

1. When the compressor is energized to start by the 1CR relay, confirm that the Relay On LED is lit on the starter SCR control board. The compressor motor should start to turn immediately when this light comes on. If not, adjust the start torque potentiometer in a clockwise direction.

2. Observe that all 6-gate LEDs are lit on the starter SCR control board.
3. The factory setting should bring the motor to full voltage in 15 to 30 seconds. If the setting is not correct, adjust the ramp potentiometer counterclockwise for a shorter time, clockwise for a longer time. (See Fig. 5 for starter component placement.)

Check Oil Pressure and Compressor Stop

1. When the motor is up to full speed, note the differential oil pressure reading on the LID default screen. It should be between 15 and 30 psid (103 to 206 kPad).
2. Press the Stop button and listen for any unusual sounds from the compressor as it coasts to a stop.

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 setpoint to a low value. Do not exceed 105% 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 — During machine service or when necessary, the PIC can be set up so that start-up of the unit is more difficult than just pressing the **[LOCAL]** or **[CCN]** softkeys. 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]** soft-keys. "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 — Be sure machine temperatures, pressures, water flows, and oil and refrigerant levels indicate that the system is functioning properly.

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

COOLER-CONDENSER — Float chamber, relief devices, refrigerant charging valve, temperature sensor locations, pressure transducer locations, Schrader fittings, water boxes and tubes, and vents and drains.

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

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

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

CONTROL SYSTEM — CCN and Local start, reset, menu, softkey functions, 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.

DESCRIBE MACHINE CYCLES — Refrigerant, motor cooling, lubrication, and oil reclaim.

REVIEW MAINTENANCE — Scheduled, routine, and extended shutdowns, importance of a log sheet, importance of water treatment and tube cleaning, and importance of maintaining a leak-free 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. Be able to 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 recognize any abnormal readings.
4. Inspect the equipment, make routine adjustments, and perform a controls test. Maintain the proper oil and refrigerant levels.
5. Protect the system from damage during shutdown periods.
6. Maintain set point, time schedules, and other PIC functions.

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

To Start the Machine

1. Start the water pumps, if 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.

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 140 F (60 C) or refrigerant temperature plus 50° F (27° C) during shutdown, and above 120 F (49 C) during compressor operation.
2. The bearing oil temperature accessed on the Status01 LID screen should be 140 to 165 F (60 to 74 C). If the bearing temperature reads more than 180 F (83 C) with the oil pump running, stop the machine and determine the cause. *Do not restart* the machine until corrected.
3. The oil level should be visible in the upper sight glass when the compressor is running.
4. The oil pressure should be between 15 and 30 psi (103 to 207 kPa) differential, as seen on the LID default screen. Typically the reading will be 18 to 25 psi (124 to 172 kPa) at initial start-up.
5. The dry-eye sight glass on the refrigerant motor cooling line should indicate refrigerant flow and a dry condition.
6. The condenser pressure and temperature varies with the machine design conditions. Typically the pressure will range between 100 and 210 psig (690 to 1450 kPa) with a corresponding temperature range of 60 to 105 F (15 to 41 C). The condenser entering water temperature should be controlled below the specified design entering water temperature to save on compressor kilowatt requirements.
7. Cooler pressure and temperature also will vary with the design conditions. Typical pressure range will be between 60 and 80 psig (410 and 550 kPa), with temperature ranging between 34 and 45 F (1 and 8 C).
8. The compressor may operate at full capacity for a short time after the pulldown ramping has ended, even though the building load is small. The active electrical demand setting can be overridden to limit the compressor IKW, or the pulldown rate can be decreased to avoid a high demand charge for the short period of high demand operation. Pulldown rate can be based on kW rate or temperature rate. It is accessed on the Equipment Configuration menu Config screen (Table 2, Example 5).

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.

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 restrict* 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.

Extended Shutdown — Refrigerant 22 should be transferred into the storage vessel (if supplied; see Pumpout and

Refrigerant Transfer Procedures) in order to reduce machine pressure and possibility of leaks. Maintain a holding charge of 5 to 10 lbs (2.27 to 4.5 kg) of refrigerant to prevent air from leaking into the machine.

If freezing temperatures are likely to occur in the machine area, drain the chilled water, condenser water, and the pumpout condenser water circuits to avoid freeze-up. Keep the water box drains open.

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

After Extended Shutdown — Be sure that the water system drains are closed. It may be advisable to flush the water circuits to remove any soft rust which may have formed. This is a good time to brush the tubes if necessary.

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. See Check Machine Tightness section.

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

Carefully make all regular preliminary and running system checks. 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 140 F (60 C) or refrigerant temperature plus 50° F (27° C).

Cold Weather Operation — When the entering condenser water drops very low (55 F [13 C] minimum), the PIC can automatically cycle the cooling tower fans off to keep the temperature up. Piping may also be arranged to bypass the cooling tower.

Manual Guide Vane Operation — Manual operation of the guide vanes to check control operation or controlling the 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 vane opening that is desired. Zero percent is fully closed, 100% is fully open. To release the vanes to AUTOMATIC mode, press the **RELEASE** softkey.

NOTE: Manual control will increase the 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. 28, 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

Preparation — The 19XL may come equipped with isolation valves, an optional storage tank and a pumpout system, and a storage tank. If isolation valves are supplied, the refrigerant can be pumped for service work to either the cooler/compressor vessel or the condenser vessel by using the optional pumpout system. If a storage tank is supplied, the refrigerant can be isolated there. The following procedures are used to describe how to transfer refrigerant from vessel to vessel and perform machine evacuations.

Operating the Optional Pumpout Compressor

1. Be sure that the suction and the discharge service valves on the optional pumpout compressor are open (back-seated) during operation. Rotate the valve stem fully counterclockwise to open. Frontseating the valve closes off the refrigerant line and opens the gage port to compressor pressure.
2. Make sure that the compressor holddown bolts have been loosened to allow free spring travel.
3. Open the refrigerant inlet valve on the pumpout compressor.
4. Oil should be visible in the compressor sight glass under all operating conditions and during shutdown. If oil is low, add oil as described under Optional Pumpout System Maintenance section. The pumpout unit control wiring schematic is detailed in Fig. 29.

TO READ REFRIGERANT PRESSURES during pumpout or leak testing:

1. 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. 7) by removing the pressure transducer.
2. To determine storage tank pressure, a 30 in.-0-400 psi (-101-0-2760 kPa) gage is attached to the vessel.
3. Refer to Fig. 23, 24, and 30 for valve locations and numbers.

⚠ CAUTION

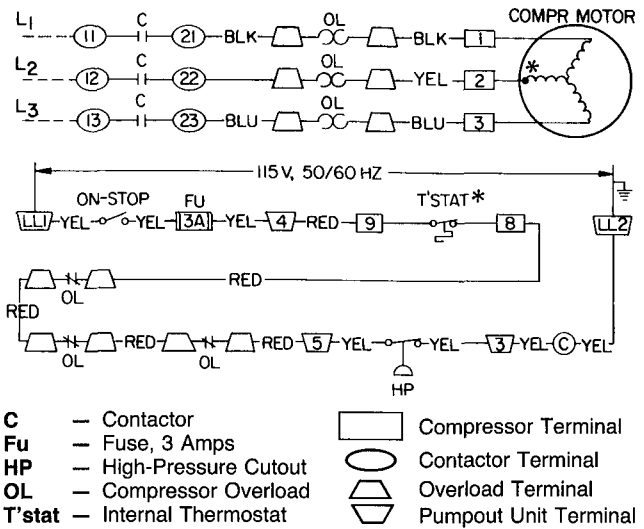
Transfer, addition, or removal of refrigerant in spring-isolated machines may place severe stress on external piping if springs have not been blocked in both up and down directions.

Machines with Storage Tanks — If the machine has isolation valves, leave them open for the following procedures. A “C” describes a closed valve. Valves 9 and 10 on the storage tank are always closed.

TRANSFER REFRIGERANT FROM STORAGE TANK TO MACHINE

1. Equalize refrigerant pressure.
 - a. Use the Controls Test Terminate Lockout to turn on water pumps and monitor pressures.
 - b. Close pumpout/storage tank valves 2, 4, 5, and 8, and close machine charging valve 7, open machine isolation valves 11, 12, and 13 (if present).
 - c. Open pumpout/storage tank valves 3 and 6, open machine valves 1a and 1b.

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION			C	C	C	C		C	C			



- C — Contactor
- Fu — Fuse, 3 Amps
- HP — High-Pressure Cutout
- OL — Compressor Overload
- T*stat — Internal Thermostat
- Compressor Terminal
- Contactor Terminal
- Overload Terminal
- Pumpout Unit Terminal

*Bimetal thermal protector imbedded in motor winding

Fig. 29 — 19XL Pumpout Unit Wiring Schematic

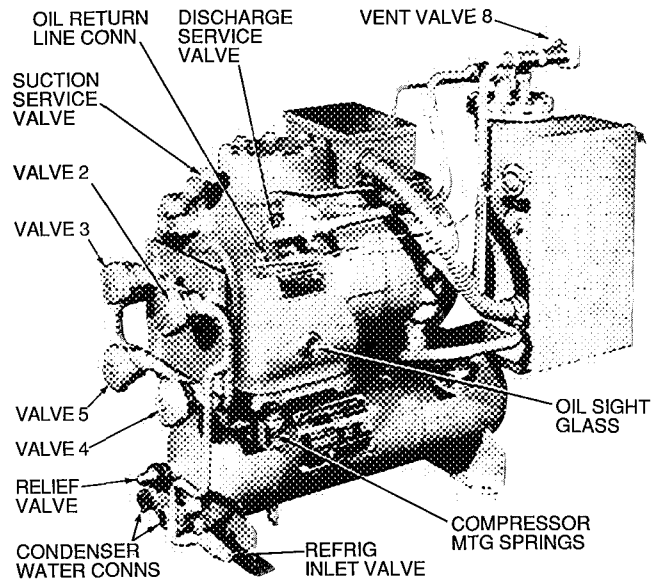


Fig. 30 — Optional Pumpout System

- d. Gradually crack open valve 5 to increase machine pressure to 68 psig (469 kPa). Slowly feed refrigerant to prevent freeze up.
- e. Open valve 5 fully after 68 psig (469 kPa) is reached. Open liquid line valve 7 until refrigerant pressure equalizes.

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION			C	C					C			

2. Transfer remaining refrigerant.
 - a. Close valve 5 and open valve 4.

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION			C		C			C				

- b. Turn off the water pumps through the LID.
- c. Turn off the pumpout condenser water, and turn on the pumpout compressor to push liquid out of the storage tank.
- d. Close liquid line valve 7.
- e. Turn off the pumpout compressor.
- f. Close valves 3 and 4.

- g. Open valves 2 and 5.

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION			C	C				C	C			

- h. Turn on pumpout condenser water.
 i. Run the pumpout compressor until the storage tank pressure reaches 5 psig (34 kPa) (0 psig [0 kPa] if repairing the tank).
 j. Turn off the pumpout compressor.
 k. Close valves 1a, 1b, 2, 5, and 6.
 l. Turn off pumpout condenser water.

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION	C	C	C	C	C	C	C	C	C			

TRANSFER THE REFRIGERANT FROM MACHINE TO STORAGE TANK

1. Equalize refrigerant pressure.

- a. Valve positions:

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION			C		C	C		C	C			

- b. Slowly open valve 5 and liquid line valve 7 to allow liquid refrigerant to drain by gravity into the storage tank.

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION			C		C				C			

2. Transfer the remaining liquid.

- a. Turn off pumpout condenser water. Place valves in the following positions:

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION				C	C				C			

- b. Run the pumpout compressor for 30 minutes then close valve 7.
 c. Turn off the pumpout compressor.

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION				C	C			C	C			

3. Remove any remaining refrigerant.

- a. Turn on water pumps through the use of the Controls Test Pumpdown.
 b. Turn on pumpout condenser water.
 c. Place valves in the following positions:

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION			C			C		C	C			

- d. Run the pumpout compressor until the machine pressure reaches 65 psig (448 kPa), then shut off the pumpout. Warm condenser water will boil off any entrapped liquid refrigerant and machine pressure will rise.
 e. When the pressure rises to 70 psig (483 kPa), turn on the pumpout compressor until the pressure again reaches 65 psig (448 kPa), and then turn off the compressor. Repeat this process until the pressure no longer rises, then turn on the pumpout compressor and pumpout until the pressure reaches zero psig (zero kPa).
 f. Close valves 1a, 1b, 3, 4, and 6.

VALVE	1a	1b	2	3	4	5	6	7	8	11	12	13
CONDITION	C	C	C	C	C	C	C	C	C			

- g. Turn off the pumpout condenser water and continue with the Controls Test for Pumpdown, which will lock out the machine compressor for operation.

4. Establish vacuum for service.

- a. The machine may be opened for service at zero psig (zero kPa), but to conserve refrigerant, it may be desirable to operate the pumpout compressor until the machine pressure is reduced to 22 in. Hg vac., ref 30 in. bar. (4 psia) (27.6 kPa. abs.) following Step 3e.

Machines with Isolation Valves — Transfer all refrigerant to condenser vessel.

1. Push refrigerant into condenser.

- a. Valve positions:

VALVE	1a	1b	2	3	4	5	8	11	12	13
CONDITION				C	C		C		C	C

- b. Turn off machine water pumps and pumpout condenser water.
 c. Turn on pumpout compressor to push liquid out of the cooler/compressor.
 d. When all liquid has been pushed into the condenser, close cooler isolation valve 11.
 e. Access the Controls Test Pumpdown on the LID display to turn on the machine water pumps.
 f. Turn off the pumpout compressor.

2. Evacuate gas from cooler/compressor vessel.

- a. Close pumpout valves 2 and 5, and open valves 3 and 4.

VALVE	1a	1b	2	3	4	5	8	11	12	13
CONDITION			C			C	C	C	C	C

- b. Turn on pumpout condenser water.
 c. Run pumpout until the compressor reaches 22 in. Hg vac (4 psia) (27.6 kPa abs.). Monitor pressures on the LID and on refrigerant gauges.
 d. Close valve 1a.
 e. Turn off pumpout compressor.
 f. Close valves 1b, 3, and 4.
 g. Turn off pumpout condenser water.

VALVE	1a	1b	2	3	4	5	8	11	12	13
CONDITION	C	C	C	C	C	C	C	C	C	C

- h. Proceed to Pumpdown test on the LID to turn off machine water pumps and lock out machine compressor.

TRANSFER ALL REFRIGERANT TO COOLER/COMPRESSOR VESSEL

1. Push refrigerant into the cooler vessel.

- a. Valve positions:

VALVE	1a	1b	2	3	4	5	8	11	12	13
CONDITION			C			C	C		C	C

- b. Turn off machine water pumps and pumpout condenser water.
 c. Turn on pumpout compressor to push refrigerant out of the condenser.
 d. When all liquid is out of the condenser close cooler isolation valve 11.
 e. Turn off the pumpout compressor.

2. Evacuate gas from the condenser vessel.

- a. Access the Controls Test Pumpdown on the LID display to turn on the machine water pumps.
 b. Close pumpout valves 3 and 4; open valves 2 and 5.

VALVE	1a	1b	2	3	4	5	8	11	12	13
CONDITION				C	C		C	C	C	C

- c. Turn on pumpout condenser water.

- d. Run the pumpout until the compressor reaches 22 in. Hg vac (4 psia). Monitor pressure at the LID and refrigerant gages.
- e. Close valve 1b.
- f. Turn off pumpout compressor.
- g. Close valves 1a, 2, and 5.

VALVE	1a	1b	2	3	4	5	8	11	12	13
CONDITION	C	C	C	C	C	C	C	C	C	C

- h. Turn off pumpout condenser water.
- i. Proceed to Pumpdown test on the LID to turn off machine water pumps and lockout machine compressor.

Return Refrigerant to Normal Operating Conditions

1. Be sure that the vessel that was opened has been evacuated.
2. Access the Controls Test Terminate Lockout to view vessel pressures and turn on machine water pumps.
3. Open valves 1a, 1b, and 3.

VALVE	1a	1b	2	3	4	5	8	11	12	13
CONDITION			C		C	C	C	C	C	C

4. Crack open valve 5, gradually increasing pressure in the evacuated vessel to 68 psig (469 kPa). Feed refrigerant slowly to prevent tube freeze up.
5. Leak test to ensure vessel integrity.
6. Open valve 5 fully.

VALVE	1a	1b	2	3	4	5	8	11	12	13
CONDITION			C		C		C	C	C	C

7. Open valve 11 to equalize the liquid refrigerant level between vessels.
8. Close valves 1a, 1b, 3, and 5.
9. Open isolation valves 12 and 13.

VALVE	1a	1b	2	3	4	5	8	11	12	13
CONDITION	C	C	C	C	C	C	C			

10. Proceed to Terminate Pumpdown Lockout test to turn off water pumps and enable the machine compressor for start-up.

GENERAL MAINTENANCE

Refrigerant Properties — Refrigerant 22 is the standard refrigerant in the 19XL. At normal atmospheric pressure, this refrigerant will boil at -41 F (-40 C) and must, therefore, be kept in pressurized containers or storage tanks. The refrigerant is practically odorless when mixed with air. R-22 is non-combustible at atmospheric pressure. Read the Material Safety Data Sheet and the latest ASHRAE Safety Guide for Mechanical Refrigeration to learn more about safely handling this refrigerant.

▲ DANGER

R-22 will dissolve oil and some non-metallic materials, dry the skin, and, in heavy concentrations, may displace enough oxygen to cause asphyxiation. In handling this refrigerant, protect the hands and eyes and avoid breathing fumes.

Adding Refrigerant — Follow the procedures described in Refrigerant Charging section.

▲ WARNING

Always use the compressor pumpdown function in the CONTROLS TEST mode to turn on the evaporator pump and lock out the compressor when transferring refrigerant. Liquid refrigerant may flash into a gas and cause possible freeze-up when the machine pressure is below 65 psig (448 kPa).

Removing Refrigerant — Using the optional pumpout system, the 19XL refrigerant charge may be transferred to a storage vessel, or within the condenser or cooler sections if isolation valves are present. Follow procedures in the Pumpout and Refrigerant Transfer Procedures section when removing refrigerant from the storage tank to the machine.

Adjusting the Refrigerant Charge — If the addition or removal of refrigerant is required for improved machine performance, follow the procedures given under the Trim Refrigerant Charge section.

Refrigerant Leak Testing — Because Refrigerant 22 is above atmospheric pressure at room temperature, leak testing can be performed with refrigerant in the machine. Use an electronic or halide leak detector. Be sure that the room is well ventilated and free from concentration of refrigerant to keep false readings to a minimum. Before making any necessary repairs to a leak, transfer all refrigerant from the leaking vessel. Soap bubble solution can also be used to spot leaks.

Leak Rate — ASHRAE recommends that machines should be immediately taken off line and repaired if the refrigerant leakage rate for the entire machine is more than 10% of the operating refrigerant charge per year.

Carrier recommends that leaks totalling less than the above rate but more than a rate of 1 lb (0.5 kg) per year should be repaired during annual maintenance or whenever the refrigerant is pumped over for other service work.

Test After Service, Repair, or Major Leak — If all refrigerant has been lost or if the machine has been opened for service, the machine or the affected vessels must be pressurized and leak tested. The best method to accomplish this, since the machine is already free of refrigerant, is to pressurize with a refrigerant tracer of R-22. Refer to the Leak Test Machine section to perform a leak test.

▲ WARNING

Refrigerant 22 should not be mixed with air or oxygen and pressurized for leak testing. In general, R-22 should not be allowed to be present with high concentrations of air or oxygen above atmospheric pressures, as the mixture can undergo combustion.

REFRIGERANT TRACER — Use R-22 as a refrigerant tracer for leak test procedures.

TO PRESSURIZE WITH DRY NITROGEN — Another method of leak testing is to pressure with nitrogen only and use soap bubble solution or an ultrasonic leak detector to determine if leaks are present.

1. Connect a copper tube from the pressure regulator on the cylinder to the refrigerant charging valve. Never apply full cylinder pressure to the pressurizing line. Follow the listed sequence.
2. Open the charging valve fully.

- Slowly open the cylinder regulating valve.
- Observe the pressure gage on the machine and close the regulating valve when the pressure reaches test level. *Do not exceed 140 psig (965 kPa).*
- Close the charging valve on the machine. Remove the copper tube if no longer required.

Repair the Leak, Retest, and Apply Standing Vacuum Test — After pressurizing the machine, test for leaks with an electronic or halide leak detector. Bring the machine back to atmospheric pressure, repair any leaks found, and retest.

After retesting and finding no leaks, apply a standing vacuum test, and then dehydrate the machine. Refer to the Standing Vacuum Test and Machine Dehydration in the Before Initial Start-Up section.

Checking Guide Vane Linkage — When the machine is off, the guide vanes are closed and the actuator mechanism is in the position shown in Fig. 31. If slack develops in the drive chain, backlash can be eliminated as follows:

- With the machine shut down and the actuator fully closed, remove the chain guard and loosen the actuator bracket holddown bolts.
- Loosen guide vane sprocket adjusting bolts.
- Pry bracket upwards to remove slack. Then retighten the bracket holddown bolts.
- Retighten the guide vane sprocket adjusting bolts. Make sure that the guide vane shaft is rotated fully in the clockwise direction to be fully closed.

CHECKING THE AUXILIARY SWITCH ON GUIDE VANE ACTUATOR — The auxiliary switch used to activate the oil reclaim system solenoids should move to the OPEN position when the actuator is 70 degrees open. (At this point the guide vanes should be 30 degrees open.)

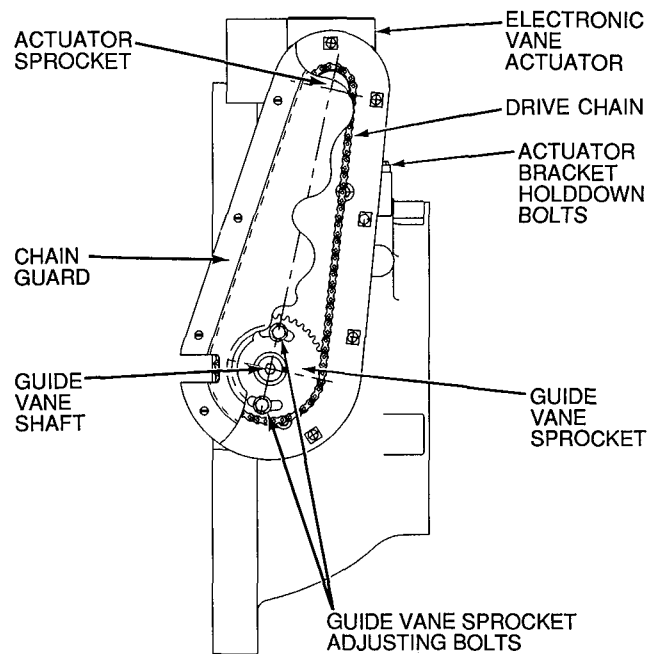


Fig. 31 — Guide Vane Actuator Linkage

Trim Refrigerant Charge — If it becomes necessary to adjust the refrigerant charge to obtain optional machine performance, operate the machine at design load and then add or remove refrigerant slowly until the difference between leaving chilled water temperature and the cooler re-

frigerant temperature reaches design conditions or becomes a minimum. *Do not overcharge.*

Refrigerant may be added either through the storage tank or directly into the machine as described in the section entitled, Refrigerant Charging.

To remove any excess refrigerant, follow the procedure in Transfer Refrigerant from Machine to Storage Tank section, Steps 1a, b.

WEEKLY MAINTENANCE

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

If the level goes below the lower sight glass, the oil reclaim system will need to be checked for proper operation. If additional oil is required, add it through the oil drain charging valve (Fig. 2, Item 17). A pump is required for adding oil against refrigerant pressure. The oil charge is approximately 10 gallons (38 L). The added oil *must* meet Carrier's specifications for the 19XL. Refer to Changing Oil Filter and Oil Changes section. Any additional oil that is added should be logged by noting the amount and date. Any oil that is added due to oil loss not related to service will eventually return to the sump, and must be removed when the level is high.

A 1200-watt oil heater is controlled by the PIC to maintain oil temperature above 140 F (60 C) or refrigerant temperature plus 50°F (27°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.

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 seen.

Inspect the Control Center — Maintenance is generally 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 Controls Test 1 Automated Test should be done at least once per month. See Table 3 for calibration procedures.

Changing Oil Filter — Change the oil filter on a yearly basis or when the machine is opened for repairs. The 19XL has an isolatable oil filter, so that the filter may be changed with the refrigerant still in the machine. Use the following procedure:

1. Make sure that the compressor is off, and the disconnect for the compressor is open.
2. Disconnect the power to the oil pump.
3. Close the oil filter isolation valves (Fig. 4).
4. Connect an oil charging hose from the oil charging valve (Fig. 4), and place other end in a clean container suitable for used oil. The oil drained from the filter housing should be used as an oil sample to be sent to a lab for proper analysis. *Do not contaminate this sample.*
5. Slowly open the charging valve to drain the oil from the housing.

⚠ CAUTION

The oil filter housing is at a high pressure. Relieve this pressure slowly.

6. Once all oil has been drained, place some rags or absorbent material under the oil filter housing to catch any drips once the filter is opened. Remove the 4 bolts from the end of the filter housing and remove the filter cover.
7. Remove the filter retainer by unscrewing the retainer nut. The filter may now be removed and disposed of properly.
8. Replace the old filter with a new filter. Install the filter retainer and tighten down the retainer nut. Install the filter cover and tighten the 4 bolts.
9. Evacuate the filter housing by placing a vacuum pump on the charging valve. Follow the normal evacuation procedures. Shut the charging valve when done, and reconnect the valve so as to pump new oil into the filter housing. Fill with the same amount as taken out, then close the charging valve.
10. Remove the hose from the charging valve, open the isolation valves to the filter housing, and turn on the power to the pump and the motor.

Oil Specification — If oil is to be added, it must meet the following Carrier specifications:

- Oil type Alkyl-benzene-based synthetic compressor oil specifically formatted for use in R-22 gear-driven machines
- Viscosity at 100 F 400 ± 255 SSU (at 38 C) (80.8 to 91.6 mm²/s)
- Viscosity at 210 F 46 to 54 SSU (at 99 C) (6.7 to 8.6 mm²/s)
- Floc point (maximum) -60 F (-51 C)
- Pour point (maximum) -30 F (-34 C)
- Flash point (minimum) 347 F (175 C)
- Moisture content 30 ppm
- Rust inhibiting characteristics The oil must pass ASTM Rust test D665, latest revision. It must pass the 24 test for both Procedures A and B.
- Oxidation Resistance The oil shall pass ASTM Oxidation Test D943, latest revision, for a minimum of 2000 hours. Acid number at the end of the test shall not exceed 2.0 mg KOH/gram oil.

This oil (part number PP23BZ101) may be ordered from your local Carrier representative.

Oil Changes — Carrier recommends a yearly oil change

as a minimum along with an oil analysis. However, if a continuous oil monitoring system along with a yearly oil analysis is performed, time between oil changes can be extended for up to 3 years.

TO CHANGE THE OIL

1. Transfer the refrigerant into the condenser (for isolatable vessels) or a storage tank.
2. Open the control and oil heater circuit breaker.
3. When the machine pressure is 5 psi (34 kPa) or less, drain the oil reservoir by opening the oil charging valve (Fig. 2, Item 17). Slowly open the valve against refrigerant pressure.
4. Change the oil filter at this time. See changing Oil Filter section.
5. Change the refrigerant filter at this time. See the next section, Refrigerant Filter.
6. Charge the machine with oil. The 19XL uses approximately 10 gallons (38 L) to bring the level to the middle of the upper sight glass (Fig. 2, Item 8). Turn on the power to the oil heater and let the PIC warm it up to at least 140 F (60 C). Operate the oil pump manually, through the Controls Test, for 2 minutes. Add oil if required to keep the level up. Oil level should be full in the lower sight glass and one-half full in the upper sight glass for shutdown conditions.

Refrigerant Filter — A refrigerant filter drier, located on the refrigerant cooling line to the motor (Fig. 2, Item 2), should be changed once a year, or more often if filter condition indicates a need for more frequent replacement. Change the filter with the machine pressure at 0 psig (0 kPa) by transferring the refrigerant to the condenser vessel, if isolation valves are present, or a storage tank. A dry-eye sight glass is located beyond this filter to indicate the volume and moisture in the refrigerant. If the dry-eye indicates moisture, locate the source of water immediately by performing a thorough leak check.

Oil Reclaim Filters — The oil reclaim system has a strainer on the eductor suction line and a filter on the cooler scavenging line. Replace these filters once per year, or more often if filter condition indicates a need for more frequent replacement. Change these filters with the cooler/compressor vessel at 0 psig (0 kPa) by transferring the refrigerant charge to a storage vessel or the condenser.

Inspect Refrigerant Float System — Perform inspection yearly or if the machine is opened for service. Transfer the refrigerant into the cooler vessel, if isolation valves are present, or into a storage tank. Remove the float access cover. Clean the chamber and valve assembly thoroughly. Be sure that the valve moves freely. See that all openings are free of obstructions. Examine the cover gasket and replace if necessary.

Inspect Relief Valves and Piping — The relief valves on this machine protect the system against the potentially dangerous effects of overpressure. To ensure against damage to the equipment and possible injury to personnel, these devices must be kept in peak operating condition.

As a minimum, the following maintenance is required.

1. At least once a year, disconnect the vent piping at the valve outlet and carefully inspect the valve body and mechanism for any evidence of internal corrosion or rust, dirt, scale, leakage, etc.
2. If corrosion or foreign material is found, do not attempt to repair or recondition. *Replace the valve.*
3. If the machine is installed in a corrosive atmosphere or the relief valves vent into a corrosive atmosphere, make valve inspections at more frequent intervals.

Compressor Bearing and Gear Maintenance —

The key to good bearing and gear maintenance is proper lubrication. Use the proper grade of oil, maintained at recommended level, temperature, and pressure. Inspect the lubrication system regularly and thoroughly.

To inspect the bearings, a complete compressor teardown is required. Only a trained service technician should remove and examine the bearings. The cover plate on early vintage compressor bases was used for factory-test purposes, and is not usable for bearing or gear inspection. The bearings and gears should be examined on a scheduled basis for signs of wear. The frequency of examination is determined by the hours of machine operation, load conditions during operation, and the condition of the oil and the lubrication system. Excessive bearing wear can sometimes be detected through increased vibration or increased bearing temperature. If either symptom appears, contact an experienced and responsible service organization for assistance.

Inspect the Heat Exchanger Tubes

COOLER — Inspect and clean the cooler tubes at the end of the first operating season. Because these tubes have internal ridges, a rotary-type tube cleaning system is necessary to fully clean the tubes. Tube condition in the cooler at this time will determine the scheduled frequency for cleaning, and will indicate whether water treatment is adequate in the chilled water/brine circuit. Inspect the entering and leaving chilled water temperature sensors for signs of corrosion or scale. Replace the sensor if corroded or remove any scale if found.

CONDENSER — Since this water circuit is usually an open-type system, the tubes may be subject to contamination and scale. Clean the condenser tubes with a rotary tube cleaning system at least once per year, and more often if the water is contaminated. Inspect the entering and leaving condenser water sensors for signs of corrosion or scale. Replace the sensor if corroded or remove any scale if found.

Higher than normal condenser pressures, together with inability to reach full refrigeration load, usually indicate dirty tubes or air in the machine. If the refrigeration log indicates a rise above normal condenser pressures, check the condenser refrigerant temperature against the leaving condenser water temperature. If this reading is more than what the design difference is supposed to be, then the condenser tubes may be dirty, or water flow may be incorrect. Due to R-22 being a high-pressure refrigerant, air usually does not enter the machine, the refrigerant leaks out.

During the tube cleaning process, use brushes especially designed to avoid scraping and scratching the tube wall. Contact your Carrier representative to obtain these brushes. Do not use wire brushes.

▲ CAUTION

Hard scale may require chemical treatment for its prevention or removal. Consult a water treatment specialist for proper treatment.

Water Leaks — Water is indicated during machine operation by the refrigerant dry-eye indicator (Fig. 2, Item 3) on the refrigerant motor cooling line. Water leaks should be repaired immediately.

▲ CAUTION

Machine must be dehydrated after repair of water leaks. See Machine Dehydration section.

Water Treatment — Untreated or improperly treated water may result in corrosion, scaling, erosion, or algae. The services of a qualified water treatment specialist should

be obtained to develop and monitor a treatment program.

▲ CAUTION

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

Inspect the Starting Equipment — Before working on any starter, shut off the machine, and open all disconnects supplying power to 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 2 readings. If there is a difference in readings, the transducer can be calibrated, as described in the Troubleshooting Guide section.

Optional Pumpout System Maintenance — For compressor maintenance details, refer to the 06D, 07D Installation, Start-Up, and Service Instructions.

OPTIONAL PUMPOUT COMPRESSOR OIL CHARGE — Use oil conforming to Carrier specifications for reciprocating compressor usage. Oil requirements are as follows:

Viscosity at 100 F	.....	150 ± 10 SSU
(at 38 C)		(29.5 to 33.9 mm ² /sec)
Viscosity at 210 F	.....	40 to 45 SSU
(at 99 C)		(4.2 to 5.7 mm ² /sec)
Dielectric (minimum)	.....	.25 kv
Floc Point (maximum)	.....	-60 F (-51 C)
Pour Point (maximum)	.....	-35 F (-18 C)
Neutralization number (maximum)	.....	.005
Flash point (minimum)	.....	330 F (149 C)
Moisture content (maximum)	.....	.30 ppm

The total oil charge, 4.5 pints (2.6 L), consists of 3.5 pints (2.0 L) for the compressor and one additional pint (0.6 L) for the oil separator.

Oil should be visible in the compressor sight glass both during operation and at shutdown. Always check the oil level before operating the compressor. Before adding or changing oil, relieve the refrigerant pressure as follows:

1. Attach a pressure gage to the gage port of either compressor service valve (Fig. 30).
2. Close the suction service valve and open the discharge line to the storage tank or the machine.
3. Operate the compressor until the crankcase pressure drops to 2 psig (13 kPa).
4. Stop the compressor and isolate the system by closing the discharge service valve.
5. Slowly remove the oil return line connection (Fig. 30). Add oil as required.
6. Replace the connection and reopen the compressor service valves.

OPTIONAL PUMPOUT SAFETY CONTROL SETTINGS (Fig. 32) — The optional pumpout system high-pressure switch should open at 220 ± 5 psig (1517 ± 34 kPa) and should reset automatically on pressure drop to 190 psig (1310 kPa). Check the switch setting by operating the pumpout compressor and slowly throttling the pumpout condenser water.

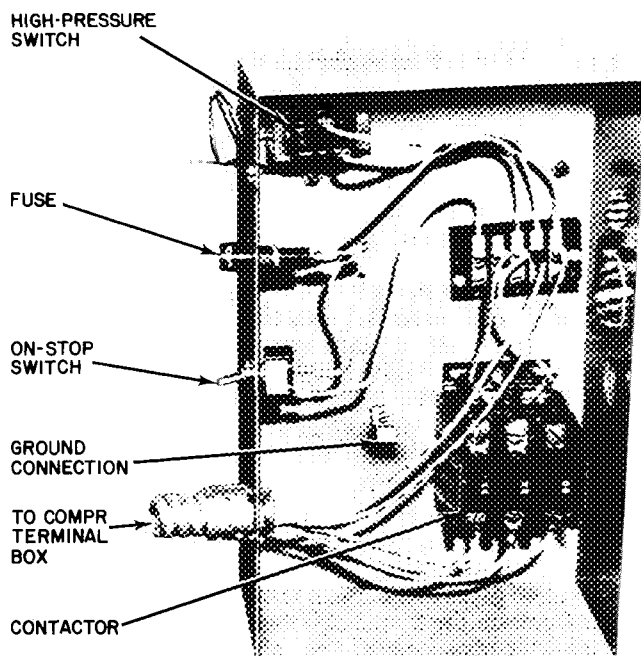


Fig. 32 — Optional Pumpout System Controls

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

1. Machine model number and serial number;
2. Name, quantity, and part number of the part required; and,
3. Delivery address and method of shipment.

TROUBLESHOOTING GUIDE

Overview — The PIC has many features to aid the operator and the technician in troubleshooting a 19XL machine.

- By using the LID display, the chiller's actual operating conditions are displayed 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 Controls 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 thing to check when troubleshooting the 19XL is the LID display. If the alarm light is flashing, check the primary and secondary message lines on the LID default screen (Fig. 12). These messages will tell 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 9. 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, and compare the readings to the values listed in Table 10A or B.

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 10A or B. 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 10A or B lists the relationship between temperature and sensor voltage drop (volts dc measured across the energized sensor). Exercise care when measuring voltage to prevent damage to the sensor leads, connector plugs, and modules. Sensors should also be checked at the sensor plugs. Check the sensor wire at the sensor for 5 vdc if the control is powered.

⚠ CAUTION

When replacing temperature sensors, relieve all refrigerant pressure or drain the water before removing.

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 a laboratory quality with 0.5°F ($.25^\circ\text{C}$) graduations. The sensor in question should be accurate to within 2°F (1.2°C).

See Fig. 7 for sensor locations. The sensors are immersed directly in the refrigerant or water circuits. The wiring at each sensor is easily disconnected by unlatching the connector. These connectors allow only one-way connection to the sensor. When installing a new sensor, apply a pipe sealant or thread sealant to the sensor threads.

DUAL TEMPERATURE SENSORS — There are 2 sensors each on the bearing and motor temperature sensors 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 the 19XL. These determine cooler, condenser, and oil pressure. The cooler and condenser transducers also are used by the PIC to determine the refrigerant temperatures. All 3 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 refrigerant's proper 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.

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 screen on the LID. The transducer can be checked and calibrated at 2 pressure points. These calibration points are 0 psig (0 kPa) and between 225 and 275 psig (1550 to 1890 kPa). To calibrate these transducers:

1. Shut down the compressor.
2. Disconnect the transducer in question from its Schrader fitting.
3. Access the Status01 screen, 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.
4. A high pressure point can also be calibrated between 225 and 275 psig (1550 and 1890 kPa) by attaching a regulated 250 psig (1720 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]** softkey, 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. The maximum calibration tolerance at this high pressure is \pm 25 psia (172 kPa).

If the transducer is too far out of calibration, the PIC will not allow calibration, and a new transducer must be installed and re-calibrated.

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.

Control Algorithms Checkout Procedure — In the LID Service menu, one of the tables is Control Algorithm Status. This table contains 4 maintenance tables which may be viewed in order to see how the particular control algorithm is operating. The 4 tables are:

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.
OCCDEFM	Time Schedules Status	The Local and CCN occupied schedules are displayed here in a manner that the operator can quickly determine whether the schedule is in the OCCUPIED mode or not.

These tables are very useful in determining how the control temperature is calculated, guide vane positioning, reaction from load changes, control point overrides, hot gas bypass reaction, surge prevention, etc.

Controls Test — The Controls Test feature can check out 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 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 9, A - N

1CR__AUX	— Compressor Start Contact
CA__P	— Compressor Current
CDFL	— Condenser Water Flow
CHIL__S__S	— Chiller Start/Stop
CMPD	— Discharge Temperature
CRP	— Condenser Pressure
ERT	— Evaporator Refrigerant Temperature
EVFL	— Chilled Water Flow
GV__TRG	— Target Guide Vane Position
MTRB	— Bearing Temperature
MTRW	— Motor Winding Temperature
OILPD	— Oil Pressure
OILT	— Oil Sump Temperature
PRS__TRIP	— Pressure Trip Contact
RUN__AUX	— Compressor Run Contact
SPR__PL	— Spare Protective Limit Input
STR__FLT	— Starter Fault
V__P	— Line Voltage : Percent
V__REF	— Voltage Reference

Table 9 – 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	Not Applicable
TERMINATE PUMPDOWN MODE	TO SELECT CCN OR LOCAL	Enter the Controls Test menu and select Terminate Lockout to unlock compressor.

B. TIMING OUT OR TIMED OUT

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
READY TO START IN XX MIN READY TO START IN XX MIN READY TO START IN XX MIN READY TO START IN XX MIN READY TO START READY TO START READY TO START READY TO START READY TO START IN XX MIN READY TO START IN XX MIN READY TO START READY TO START STARTUP INHIBITED READY TO START IN XX MIN	UNOCCUPIED MODE REMOTE CONTACTS OPEN STOP COMMAND IN EFFECT RECYCLE RESTART PENDING UNOCCUPIED MODE REMOTE CONTACTS OPEN STOP COMMAND IN EFFECT REMOTE CONTACTS CLOSED OCCUPIED MODE REMOTE CONTACTS CLOSED OCCUPIED MODE LOADSHED IN EFFECT START COMMAND IN EFFECT	Not Applicable

C. IN RECYCLE SHUTDOWN

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
RECYCLE RESTART PENDING RECYCLE RESTART PENDING RECYCLE RESTART PENDING	OCCUPIED MODE REMOTE CONTACT CLOSED START COMMAND IN EFFECT	Not Applicable

D. PRE-START FAILURES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE	PROBABLE CAUSE/REMEDY
PRESTART ALERT	STARTS LIMIT EXCEEDED	STARTS EXCESSIVE Compressor Starts (8 in 12 hours)	Depress the reset softkey if additional start is required.
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 cooler for proper operation, check for low oil pressure, partially closed oil supply valves, etc. Check sensor accuracy
PRESTART ALERT	HIGH DISCHARGE TEMP	CMPD VALUE exceeded limit of LIMIT*. Check discharge temperature.	Check sensor accuracy.
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.
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.
PRESTART ALERT	HIGH LINE VOLTAGE	V__ P VALUE exceeded limit of LIMIT*. Check voltage supply.	Same as above.
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., predefined or selected by the operator as an override or an alert

Table 9 – 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 STARTUP IN PROGRESS STARTUP IN PROGRESS AUTORESTART IN PROGRESS AUTORESTART IN PROGRESS AUTORESTART IN PROGRESS	OCCUPIED MODE REMOTE CONTACT CLOSED START COMMAND IN EFFECT OCCUPIED MODE REMOTE CONTACT CLOSED START COMMAND IN EFFECT	Not Applicable

F. START-UP FAILURES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE	PROBABLE 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. Check transducer for power supply. Check wiring. Replace transducer 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 controls test for proper switch operation.
FAILURE TO START	LOW CONDENSER WATER FLOW	CDFL Cond. Flow Fault: Check water pump/flow switch.	Same as above.
FAILURE TO START	STARTER FAULT	STR_FLT Starter Fault: Check Starter for Fault Source.	Starter fault switch has opened. 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 before restart. Check motor current calibration.
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.
FAILURE TO START	HIGH CONDENSER PRESSURE	CRP High Condenser Pressure: Check switch and water temp/flow, 2C auxiliary.	Check for proper design condenser flow and temperature. Check condenser approach. Check 2C auxiliary contacts.
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
FAILURE TO START	1CR AUX CONTACT FAULT	1CR_AUX Starter Contact Fault: Check 1CR/1M aux. contacts	Check starter for proper operation
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

*LIMIT is shown on the LID as temperature, pressure, voltage, etc., predefined or selected by the operator as an override or an alert.

G. COMPRESSOR JUMPSTART AND REFRIGERANT PROTECTION

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE	PROBABLE CAUSE/REMEDY
UNAUTHORIZED OPERATION	UNIT SHOULD BE STOPPED	CA_P Emergency: Compressor running without control authorization.	Compressor is running with more than 10% RLR 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.

Table 9 – LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides (cont)

H. NORMAL RUN WITH RESET, TEMPERATURE, OR DEMAND

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
RUNNING – RESET ACTIVE	4-20MA SIGNAL	Not Applicable
RUNNING – RESET ACTIVE	REMOTE SENSOR CONTROL	
RUNNING – RESET ACTIVE	CHW TEMP DIFFERENCE	
RUNNING – TEMP CONTROL	LEAVING CHILLED WATER	
RUNNING – TEMP CONTROL	ENTERING CHILLED WATER	
RUNNING – TEMP CONTROL	TEMPERATURE RAMP LOADING	
RUNNING – DEMAND LIMITED	BY DEMAND RAMP LOADING	
RUNNING – DEMAND LIMITED	BY LOCAL DEMAND SETPOINT	
RUNNING – DEMAND LIMITED	BY 4-20MA SIGNAL	
RUNNING – DEMAND LIMITED	BY CCN SIGNAL	
RUNNING – DEMAND LIMITED	BY LOADSHED/REDLINE	
RUNNING – TEMP CONTROL	HOT GAS BYPASS	
RUNNING – DEMAND LIMITED	BY LOCAL SIGNAL	

I. NORMAL RUN OVERRIDES ACTIVE (ALERTS)

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE	PROBABLE CAUSE/REMEDY
RUN CAPACITY LIMITED	HIGH CONDENSER PRESSURE	CRP VALUE exceeded limit of LIMIT*. Condenser pressure override.	See Capacity Overrides, Table 4. Correct operating condition.
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	6V__TR6 Run Capacity Limited: Manual guide vane target	

*LIMIT is shown on the LID as temperature, pressure, voltage, etc., predefined or selected by the operator as an override or an alert.

J. OUT-OF-RANGE SENSOR FAILURES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE	PROBABLE 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 9 – LID Primary and Secondary Messages and Custom Alarm/Alert Messages
with Troubleshooting Guides (cont)**

K. MACHINE PROTECT LIMIT FAULTS

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE	PROBABLE 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.
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
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 for other checks OK. Check refrigerant filter.
PROTECTIVE LIMIT	LOW OIL PRESSURE	OILPD VALUE exceeded limit of LIMIT*. Check oil pump and transducer.	Check power to oil pump. Check oil level, check for dirty filters. Check for oil forming at start-up. Reduce ramp load rate if foaming noted.
PROTECTIVE LIMIT	NO MOTOR CURRENT	CA__P Loss of Motor Current: Check sensor.	Check wiring; Check torque setting on solid state starter.
PROTECTIVE LIMIT	POWER LOSS	V__P Power Loss: Check voltage supply	Check 24-vdc input sensor on the SMM; adjust potentiometer if necessary. Check transformers to SMM. 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.	
PROTECTIVE LIMIT	LOW CHILLED WATER FLOW	EVFL Flow Fault: Check evap pump/flow switch.	Perform pumps control test and verify proper switch operation. Check all water valves and pump operation
PROTECTIVE LIMIT	LOW CONDENSER WATER FLOW	CDFL Flow Fault: Check cond. pump/flow switch.	
PROTECTIVE LIMIT	HIGH CONDENSER PRESSURE	PRS__TRIP High Condenser Pressure: Check switch and water temp/flow.	Check discharge pressure switch. Check for proper condenser flow and temperature. Check for fouled tubes.
PROTECTIVE LIMIT	HIGH CONDENSER PRESSURE	CRP VALUE exceeded limit of LIMIT*. Check condenser water and transducer, 2C auxiliary.	Condenser pressure transducer tripped machine. Check for proper condenser water flows and temperature. Check transducer for accuracy. Check 2C auxiliary contact.
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 screen.
PROTECTIVE LIMIT	SPARE SAFTY DEVICE	SRP__PL Spare Safty Fault: Check contacts.	Spare safty 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 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

*LIMIT is shown on the LID as temperature, pressure, voltage, etc., predefined or selected by the operator as an override or an alert.

Table 9 – LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides (cont)

L. MACHINE ALERTS

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE	PROBABLE 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 alert temperature set point on Equipment Service Service1 LID screen. Check for alert set points on the Equipment Service Service1 LID screen.
SENSOR FAULT ALERT	LEAVING COND WATER TEMP	Sensor Fault: Check leaving condenser water sensor.	
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 filter.	
AUTORESTART PENDING	POWER LOSS	V__P Power Loss: Check voltage supply.	
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.	
SENSOR ALERT	HIGH BEARING TEMPERATURE	MTRB VALUE exceeded limit of LIMIT*. Check thrust bearing temperature.	
CONDENSER PRESSURE ALERT	PUMP RELAY ENERGIZED	CRP High Condenser Pressure: Pump energized to reduce pressure	

*LIMIT is shown on the LID as temperature, pressure, voltage, etc., predefined or selected by the operator as an override or an alert.

M. SPARE SENSOR ALERT MESSAGES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE	POSSIBLE CAUSE/REMEDY
SPARE SENSOR ALERT	COMMON CHWS SENSOR	Sensor Fault Check common CHWS sensor.	Check alert temperature set points on Equipment Service Service2 LID screen
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 9 – 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 water box. Examine division plates and gaskets for leaks. Guide vanes fail to open. Use Controls 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. 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 widened. Loose guide vane drive. Adjust chain drive. Defective vane actuator. Check through Controls Test. Defective temperature sensor. Check sensor accuracy.
Low Oil Temperature While Running	Check that the oil heater is energized and heating. Check for proper oil level.
At Power Up, Default Screen Does Not Appear, "Tables Loading" Message Continually Appears	Check for proper communications wiring on PSIO module. Check that the Level 1 communications wires are terminated to the Level 1 PSIO connection.
SMM Communications Failure	Check that PSIO communication plugs are connected correctly. Check SMM communication plug. Check for proper SMM power supply. See Controls Troubleshooting section.
High Oil Temperature While Running	Check for proper oil level. Check that TXV valve is operating properly.

Table 10A – 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 10B – Thermistor Temperature (C) vs Resistance/Voltage Drop

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
-40	4.896	168 230	44	1.944	2 272
-39	4.889	157 440	45	1 898	2 184
-38	4.882	147 410	46	1.852	2 101
-37	4 874	138 090	47	1.807	2 021
-36	4 866	129 410	48	1.763	1 944
-35	4 857	121 330	49	1.719	1 871
-34	4.848	113 810	50	1.677	1 801
-33	4.838	106 880	51	1.635	1 734
-32	4.828	100 260	52	1.594	1 670
-31	4.817	94 165	53	1 553	1 609
-30	4.806	88 480	54	1.513	1 550
-29	4.794	83 170	55	1 474	1 493
-28	4.782	78 125	56	1.436	1 439
-27	4.769	73 580	57	1.399	1 387
-26	4.755	69 250	58	1.363	1 337
-25	4 740	65 205	59	1.327	1 290
-24	4.725	61 420	60	1.291	1 244
-23	4.710	57 875	61	1.258	1 200
-22	4.693	54 555	62	1.225	1 158
-21	4.676	51 450	63	1.192	1 118
-20	4.657	48 536	64	1 160	1 079
-19	4.639	45 807	65	1.129	1 041
-18	4 619	43 247	66	1 099	1 006
-17	4.598	40 845	67	1 069	971
-16	4.577	38 592	68	1.040	938
-15	4.554	38 476	69	1.012	906
-14	4 531	34 489	70	0.984	876
-13	4 507	32 621	71	0.949	836
-12	4 482	30 866	72	0.920	805
-11	4.456	29 216	73	0.892	775
-10	4.428	27 633	74	0.865	747
-9	4.400	26 202	75	0 838	719
-8	4 371	24 827	76	0.813	693
-7	4.341	23 532	77	0 789	669
-6	4 310	22 313	78	0.765	645
-5	4 278	21 163	79	0.743	623
-4	4 245	20 079	80	0.722	602
-3	4.211	19 058	81	0 702	583
-2	4.176	18 094	82	0.683	564
-1	4 140	17 184	83	0.665	547
0	4 103	16 325	84	0 648	531
1	4 065	15 515	85	0 632	516
2	4.026	14 749	86	0.617	502
3	3.986	14 026	87	0.603	489
4	3 945	13 342	88	0 590	477
5	3.903	12 696	89	0.577	466
6	3 860	12 085	90	0.566	456
7	3.816	11 506	91	0.555	446
8	3.771	10 959	92	0.545	436
9	3 726	10 441	93	0 535	427
10	3 680	9 949	94	0 525	419
11	3.633	9 485	95	0 515	410
12	3.585	9 044	96	0.506	402
13	3 537	8 627	97	0 496	393
14	3.487	8 231	98	0.486	385
15	3.438	7 855	99	0.476	376
16	3.387	7 499	100	0.466	367
17	3.337	7 161	101	0.454	357
18	3.285	6 840	102	0 442	346
19	3.234	6 536	103	0 429	335
20	3.181	6 246	104	0 416	324
21	3.129	5 971	105	0.401	312
22	3 076	5 710	106	0.386	299
23	3 023	5 461	107	0 370	285
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			

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, and on the top horizontal surface of the PSIO, SMM, and 8-input modules.

RED LED — Blinking continuously at a 3- to 5-second rate indicates proper operation. Lit continuously indicates a problem requiring replacement of module. Off continuously indicates power should be checked. 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 3 to 5 seconds.

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 every second.

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 (Level II) bus. The communication between the PSIO, SMM, and both 8-input modules is accomplished through the sensor bus, which is a 3-wire cable. This sensor bus runs in parallel between modules.

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. 33 - 37. If a Terminal 2 wire is connected to Terminal 1, the system does not work.

2. If a green LED is solid on, check communication wiring. If a green LED is off, check the red LED. If the red LED is normal, check the module's address switches (Fig. 33 - 37). 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

If all modules indicate communications failure, check communications plug on the PSIO module for proper seating. Also check the wiring (Level II — 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 is lost between the 2 modules. The PSIO monitors conditions through input ports on the PSIO, the SMM, and the 8-input modules. Outputs are controlled by the PSIO and SMM.

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.

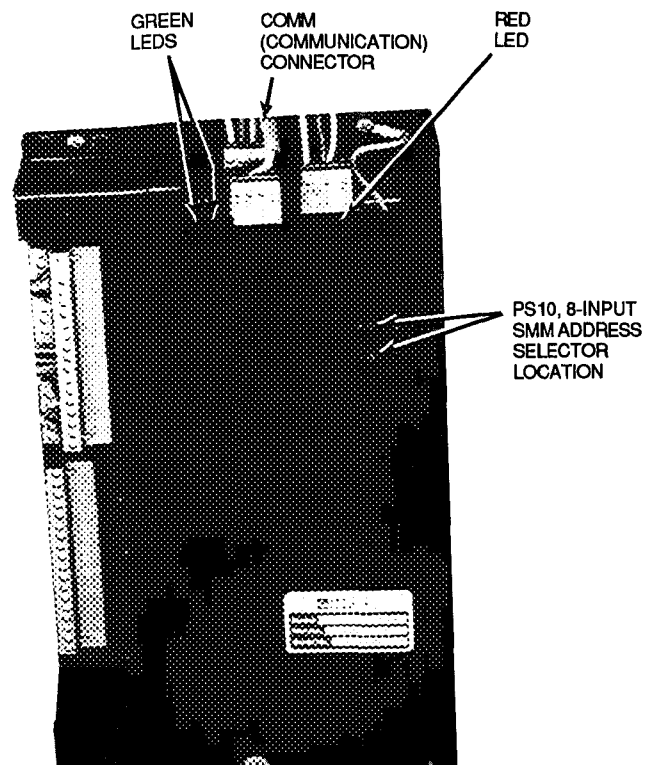
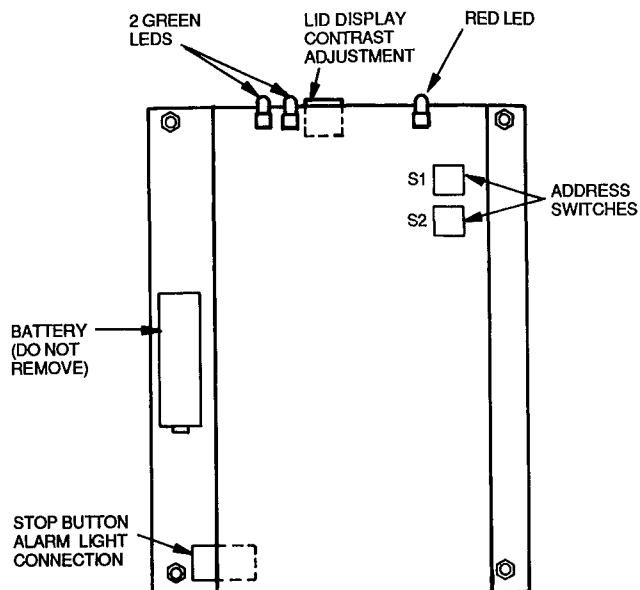


Fig. 33 — PSIO Module Address Selector Switch Locations and LED Locations



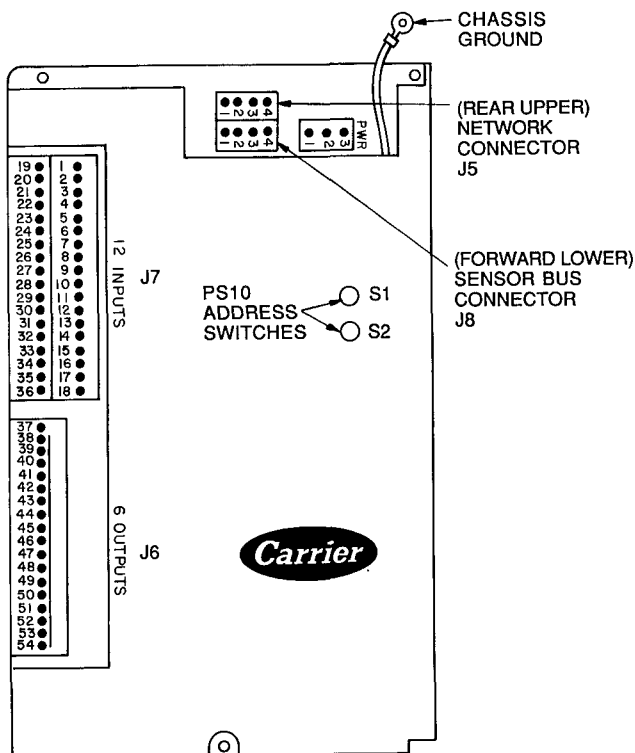
NOTE: LID address switches are factory set as follows: S1 is set at E; S2 is set at 6.

Fig. 34 – LID Module and Address Selector Switch Locations (Rear View) and LED Locations

Processor Module (PSIO) (Fig. 35)

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.

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



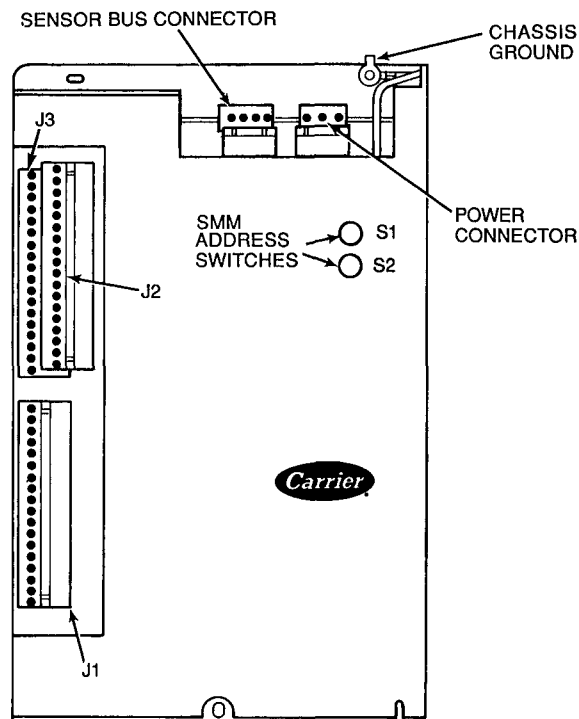
NOTE: PSIO address switches are factory set as follows: S1 is set at 5; S2 is set at A.

Fig. 35 – Processor (PSIO) Module

Starter Management Module (SMM) (Fig. 36)

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's wiring for terminal numbers.

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



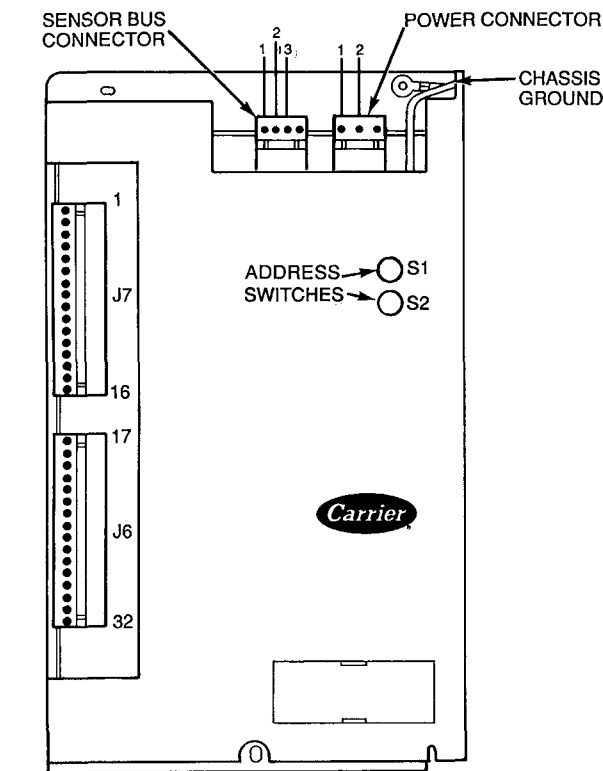
NOTE: SMM address switches should be set as follows: S1 set at 3; S2 set at 2.

Fig. 36 – Starter Management Module (SMM)

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:

OPTION 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	
OPTION 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	

Terminal block connections are provided on the options modules. All sensor inputs are field wired and installed. Options module number 1 can be factory or field installed. Options module 2 is shipped separately and must be field installed. For installation, refer to unit or field wiring diagrams. Be sure to address the module for the proper module number (Fig. 37) and to configure the chiller for each feature being used.



NOTE: Options module address switches should be set as follows:

SWITCH SETTING	OPTION MODULE 1	OPTION MODULE 2
S1	6	7
S2	4	2

Fig. 37 – 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 located on an exterior corner post. 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's data by the installer.

⚠ CAUTION

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

INSTALLATION

1. Verify the existing PSIO module is defective, by using the procedure described in Troubleshooting Guide section, Control Modules. Do not select the Attach to Network Device menu if the LID displays communication failure.
2. Data regarding the PSIO configuration should have been written down and saved. This data will have to be re-configured into the LID. If this data is not available, follow the procedures described in the Set Up Machine Control Configuration section.
If a CCN Building Supervisor or Service Tool is present, the module's configuration should have already been uploaded into memory; then, when the new module is installed, the configuration can be downloaded from the computer.
3. Check that all power to unit is off. Carefully disconnect all wires from 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. 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 re-installed along with the mounting screw.
7. Connect the LID communication wires (Level II bus) and the power wires only. If CCN wiring has been attached to the Level II bus, disconnect the wires.
8. Carefully check all wiring connections before restoring power.
9. Restore control power and verify that the red and green LEDs on the PSIO are functioning properly.
10. Access the Attach to Network Device function on the LID Service menu. Set the local device address to Bus 0, Address 90. Press the **ATTACH** softkey to upload the PSIO into the LID.
11. Change the address of the PSIO in the Config table of the Equipment Configuration menu back to the old value. Write the address on the PSIO.
12. Use the configuration sheets to input setpoint, configuration, and schedule information into the PSIO. Time and date also must be set. A Building Supervisor can be used to download the old configuration into the PSIO.
13. Perform a Controls Test and verify all tests.
14. Restore chiller to normal operation.

Solid-State Starters — Troubleshooting guides pertaining to the operation of the solid-state starter may be found in Fig. 38 and 39 and Table 11.

TESTING SILICON CONTROL RECTIFIERS IN SOLID-STATE STARTERS — If a silicone control rectifier (SCR) is suspected of being defective, use the following procedure as part of a general troubleshooting guide.

IMPORTANT: Before performing the SCR check below, remove power from the starter and disconnect the motor terminals T1, T2, and T3.

1. Connect ohmmeter across terminals L1 and T1. Resistance reading should be greater than 50K ohm.
2. If reading is less than 50K ohm, remove connecting bus heatsink between SCR3 and SCR6 and check anode to cathode of SCR3 and SCR6 separately to determine which device is defective. Replace defective device and retest controller.
3. Repeat Steps 1 and 2 across terminals L2 and T2 for SCRs 2 and 5.
4. Repeat Steps 1 and 2 across terminals L3 and T3 for SCRs 1 and 3.

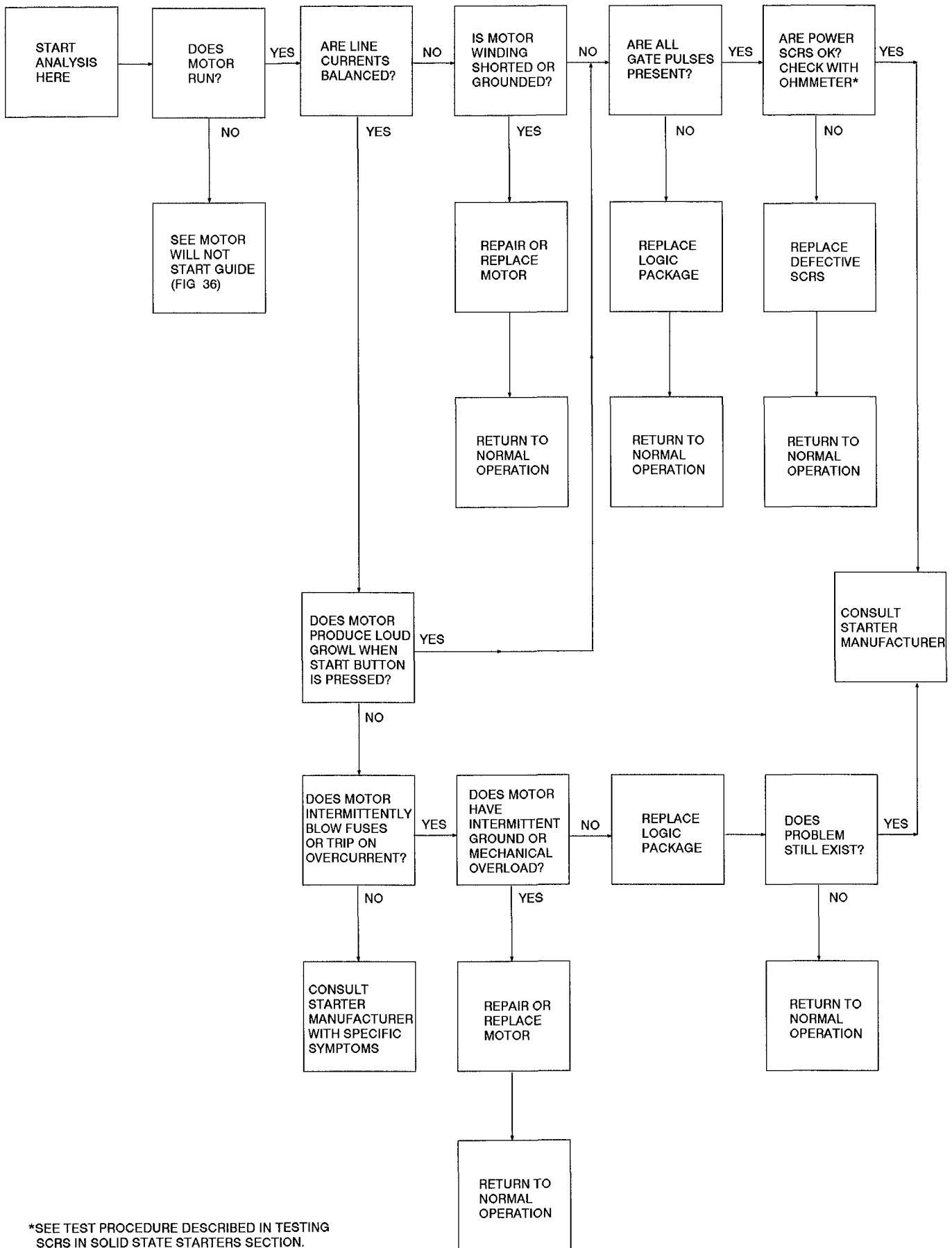
If the SCRs tested all right but problem still persists, refer to Steps 5 and 6.

5. Disconnect the SCR1 from the white gate and red cathode wires on the control logic card BIPCRS6. With an ohmmeter set on Rx1, check between white and red wires. Resistance should normally be between 20 and 50 ohms average. Excessively high or low resistance may be indicative of a defective device. Replace and retest.
6. Repeat Step 5 for SCR leads 2 through 6. Care should be taken to ensure the gate and cathode wires are replaced exactly as they were: white wire to gate (G1 through G6); red wire to cathode (K1 through K6).

⚠ CAUTION

Damage to the starter may result if wires are reversed.

If problem is still not resolved, consult starter manufacturer for maintenance.



*SEE TEST PROCEDURE DESCRIBED IN TESTING SCRS IN SOLID STATE STARTERS SECTION.

Fig. 38 – Solid-State Starter, General Operation Troubleshooting Guide

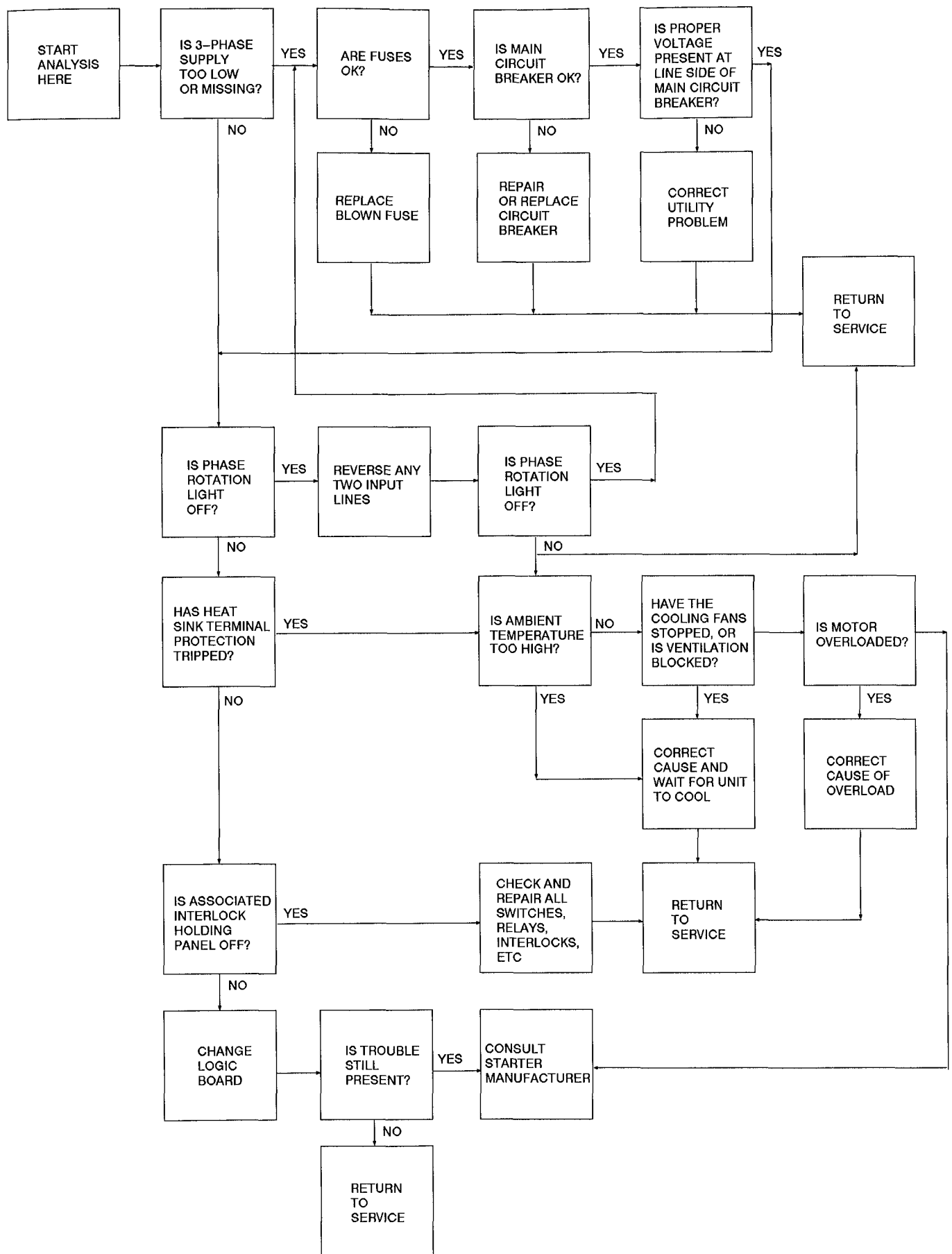


Fig. 39 – Solid-State Starter, Starter Fault (Motor Will Not Start) Troubleshooting Guide

Table 11 – Solid-State Starter Troubleshooting Guide

PROBLEM	POSSIBLE CAUSES	AREA OF CORRECTION
POWER + 15 LED NOT ON	<ol style="list-style-type: none"> 1. The ac line voltage not present or of improper voltage 2. Synchronizing transformer fusing failure 3. Synchronizing transformer secondary wired incorrectly 4. Defective synchronizing transformer 	<ol style="list-style-type: none"> 1. Check voltage at L1, L2 and L3 lugs for proper voltage. 2. Check voltage at H1, H2, and H3 of synchronizing transformer for proper voltage. 3. Ensure on BIPCRS6AK firing card that X-1 goes to Terminal 1, X-2 to Terminal 2, X-3 to Terminal 3; and X-0 to Terminal 4. 4. Measure for 18 vac from X-0 to X-1, X-2, X-3.
PHASE CORRECT LED NOT ON	<ol style="list-style-type: none"> 1. Incorrect phase sequence 2. One phase missing 3. Low ac line voltage 	<ol style="list-style-type: none"> 1. Rotate incoming L1 and L3 phases. 2. Check voltage at L1, L2, L3 lugs for proper voltage. 3. Verify ac line voltage.
RELAY ON LED DOES NOT TURN ON	<ol style="list-style-type: none"> 1. Protective devices tripped (starter fault) 2. Continuity between terminals 7 and 8 not present (starter fault) 3. Start/stop circuit incorrect 	<ol style="list-style-type: none"> 1. Check all trip functions. 2. Disconnect power and check continuity with ohmmeter between Terminals 7 and 8. 3. Disconnect power and check continuity with ohmmeter between terminals 5 and 8 with start pushbuttons pressed.
MOTOR DOES NOT TURN	<ol style="list-style-type: none"> 1. Six SCR LEDs not lit 2. Six SCR LEDs lit 	<ol style="list-style-type: none"> 1. Change BIPCRS6AK firing card. 2. Defective SCR.
OVERLOAD TRIPPING	<ol style="list-style-type: none"> 1. Motor load too high or overload adjusted incorrectly 2. Acceleration time too long or cooler/condenser pressure too high 3. Incorrect motor sizing 	<ol style="list-style-type: none"> 1. Check and adjust overload for correct setting. 2. Decrease ramp time. 3. Verify rating to motor.
HEATSINK OVERTEMPERATURE TRIPS	<ol style="list-style-type: none"> 1. Fans not operating 2. Airflow blockage 3. Too high motor hp being used 4. Voltage and/or current exceeds rated limitations of OT switch 5. Defective OT switch 	<ol style="list-style-type: none"> 1. Check for proper fan operation. 2. Clear area. 3. Verify rating to motor being used. 4. Designed for 115 vac, .5 amp make, 1 amp carry and break current. 5. Replace.
BYPASS CONTACTOR DOES NOT ENERGIZE	<ol style="list-style-type: none"> 1. Excessive ramp-up speed 	<ol style="list-style-type: none"> 1. Decrease ramp-up potentiometer setting.

OT — Overtemperature Trip
 SCR — Silicone Control Rectifier

19XL Physical Data — For operator convenience during troubleshooting, additional details regarding compressor fits and clearances, physical and electrical data, and

wiring schematics may be found in Tables 12-15 and Fig. 40-42.

Table 12 — Heat Exchanger Data

HEAT EXCHANGER CODE		WEIGHTS						VOLUME OF WATER		NUMBER OF TUBES
		Total Dry		Refrigerant		Water Box Cover		Gal	L	
		Lb	Kg	Lb	Kg	Lb	Kg			
COOLER	40	5000	2275	832	378	300	136	54	245	201
	41	5150	2350	954	433			60	273	227
	42	5325	2425	974	442			66	300	257
	43	5500	2500	1106	502			72	327	290
	50	6625	3000	1115	506	425	193	81	368	314
	51	6850	3100	1206	547			87	396	355
	52	7100	3225	1334	606			96	436	400
53	7375	3350	1338	607			105	477	445	
CONDENSER	40	5050	2100	377	171	325	147	57	259	218
	41	5200	2350	381	173			63	286	246
	42	5375	2450	388	176			69	314	279
	43	5575	2525	391	178			75	341	315
	50	7050	3200	391	178	425	193	87	396	347
	51	7275	3300	396	180			93	423	387
	52	7500	3400	401	182			102	464	432
	53	7775	3525	411	187			111	505	484

Table 13 — 19XL Data Tables

COMPRESSOR WEIGHTS

COMPONENT	WEIGHT	
	Lb	Kg
SUCTION ELBOW	55	25
DISCHARGE ELBOW	50	23
TRANSMISSION	730	331
SUCTION HOUSING	350	159
IMPELLER SHROUD	80	36
COMPRESSOR BASE	1050	476
DIFFUSER	70	32
OIL PUMP	150	68
TOTAL WEIGHT (Less Motor)	2660	1207

MOTOR WEIGHTS

COMPONENT	WEIGHT	
	Lb	Kg
END BELL COVER	250	113
ROTOR — 60 HZ	275	125
ROTOR — 50 HZ	290	132
STATOR HOUSING — 60 HZ	1310	595
STATOR HOUSING — 50 HZ	1375	624
FOR HIGH VOLTAGE MOTORS (Above 600 v) ADD:	145	66

Table 14 – Optional Storage Tank and/or Pumpout System Physical Data

ENGLISH

SIZE CODE	TANK OD (in.)	DRY WEIGHT* (lb)	MAXIMUM REFRIGERANT CAPACITY (lb)					
			ASHRAE/ANSI 15			ARI 495		
			(R-22)	(R-12)	(R-500)	(R-22)	(R-12)	(R-500)
28	24.00	2200	1840	2025	1785	1645	1810	1595
52	27.25	3270	3525	3880	3420	3155	3465	3055

SI

SIZE CODE	TANK OD (mm)	DRY WEIGHT (kg)	MAXIMUM REFRIGERANT CAPACITY (kg)					
			ASHRAE/ANSI 15			ARI 495		
			(R-22)	(R-12)	(R-500)	(R-22)	(R-12)	(R-500)
28	610	998	835	928	810	747	822	724
52	692	1606	1599	1760	1551	1431	1572	1386

OD – Outside Diameter

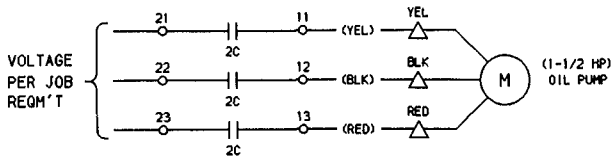
*The above dry weight includes the pumpout condensing unit weight of 210 lbs (95 kg).

Table 15 – Optional Storage Tank and/or Pumpout System Electrical Data

MOTOR CODE	CONDENSER UNIT	VOLTS-PH-HZ	MAX RLA	LRA
1	19EA47-748	575-3-60	3.8	23.0
4	19EA42-748	200/208-3-60	10.9	63.5
5	19EA44-748	230-3-60	9.5	57.5
6	19EA46-748	400/460-3-50/60	4.7	28.8

LRA – Locked Rotor Amps

RLA – Rated Load Amps



LEGEND

- CARRIER FACTORY WIRING
- - - OPTIONAL (FACTORY OR FIELD-INSTALLED) WIRING

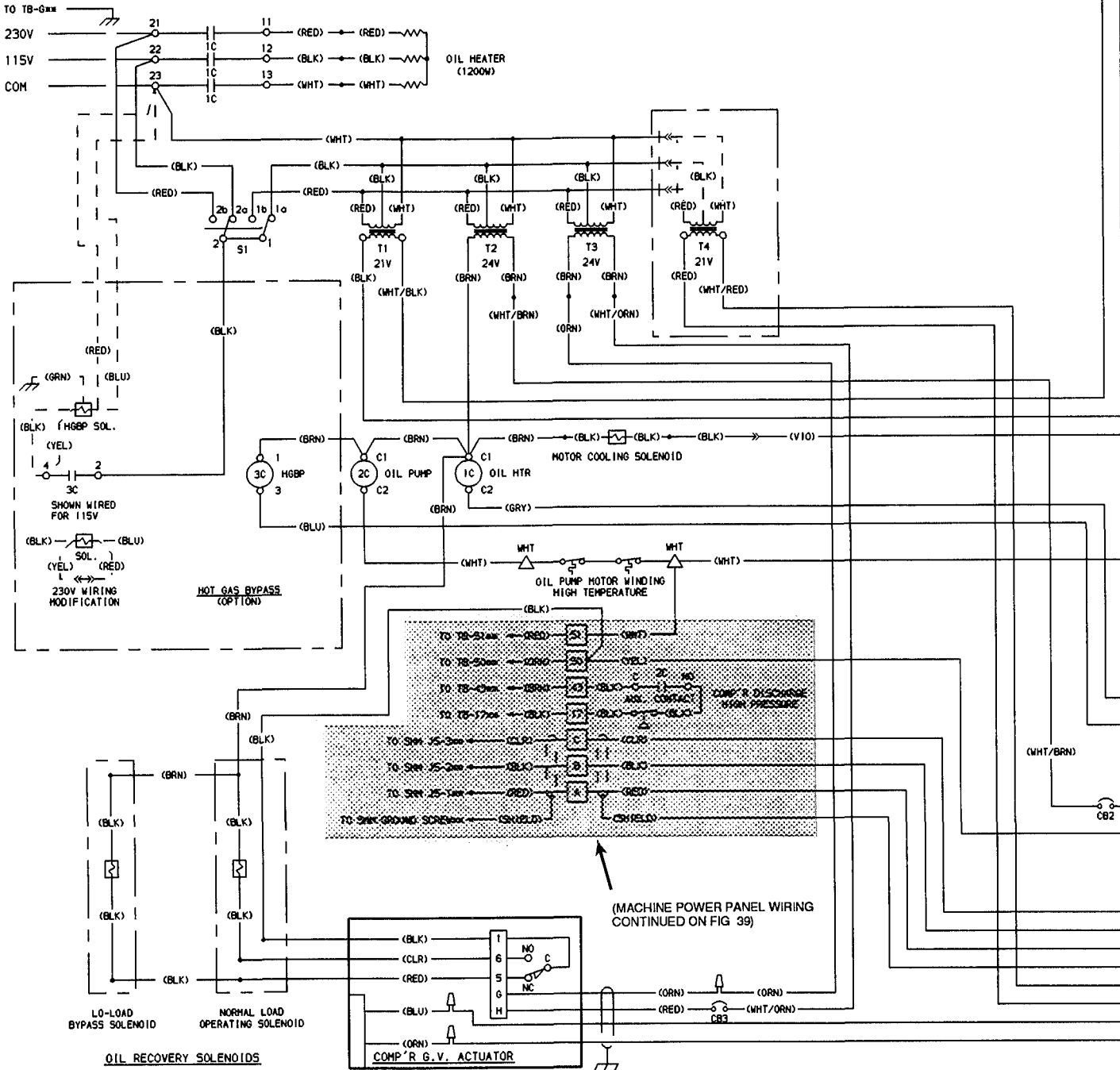
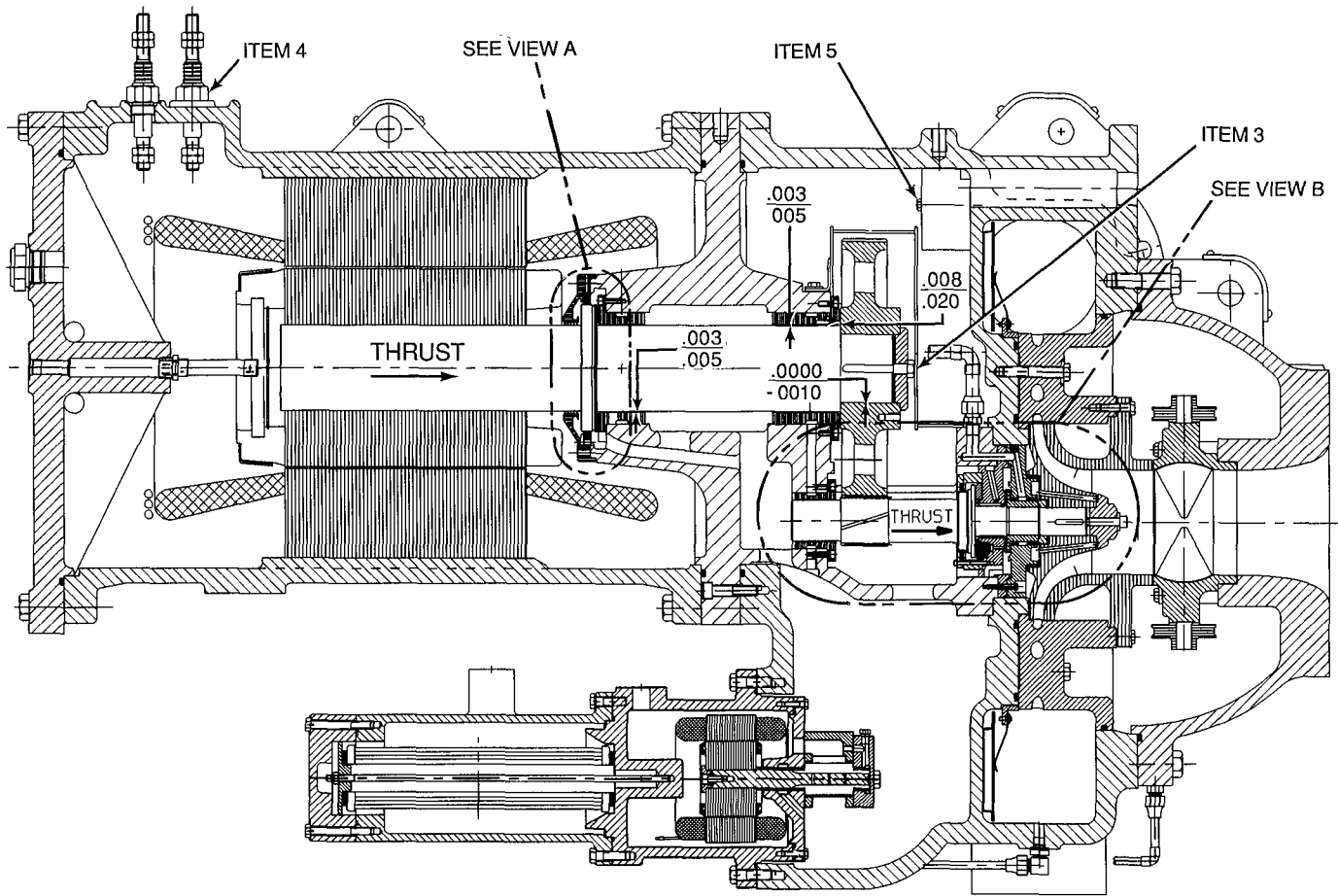


Fig. 41 — Electronic P



NOTES:
 1 Dimensions are in inches with rotor in the thrust position
 2 All clearances listed are new machine tolerances.

COMPRESSOR ASSEMBLY TORQUES

ITEM	DESCRIPTION	TORQUE	
		ft-lb	N·m
1*	Oil Heater Grommet Nut	50	68
2	Impeller Retaining Bolt	44-46	60-62
3	Bull Gear Retaining Bolt	80-85	108-115
4	Motor Terminals	80	108
5	Demister Bolts	15-19	20-26
6*	Guide Vane Shaft Seal Nut	25	34

LEGEND

N·m — Newton meters

*Not shown

Fig. 40 — Compressor Fits and Clearances

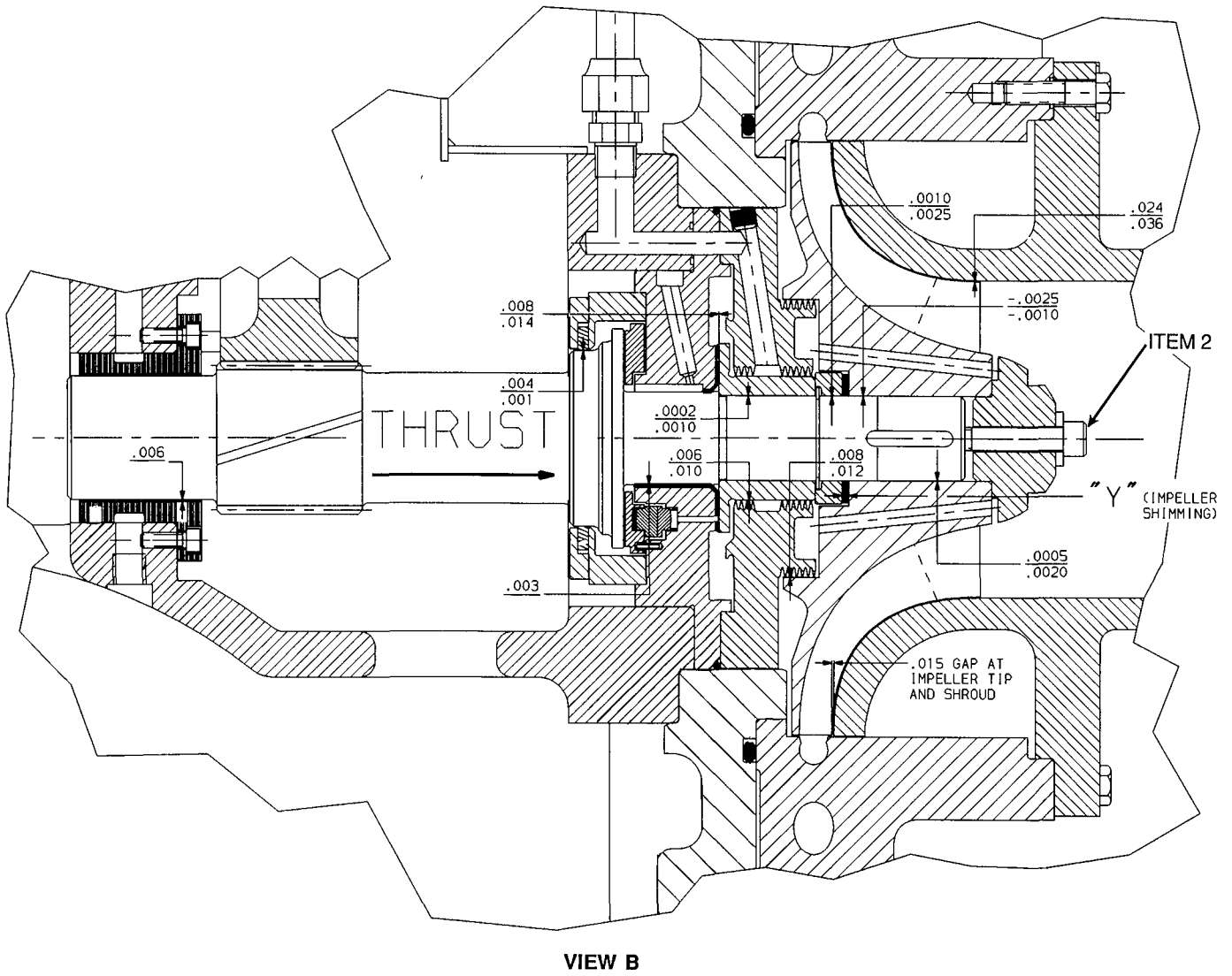
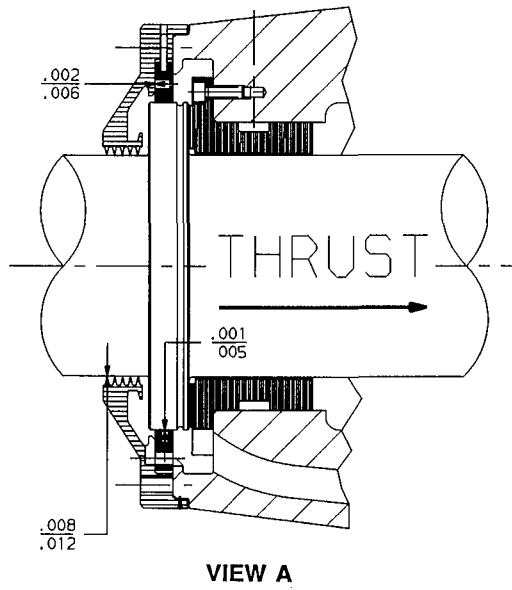
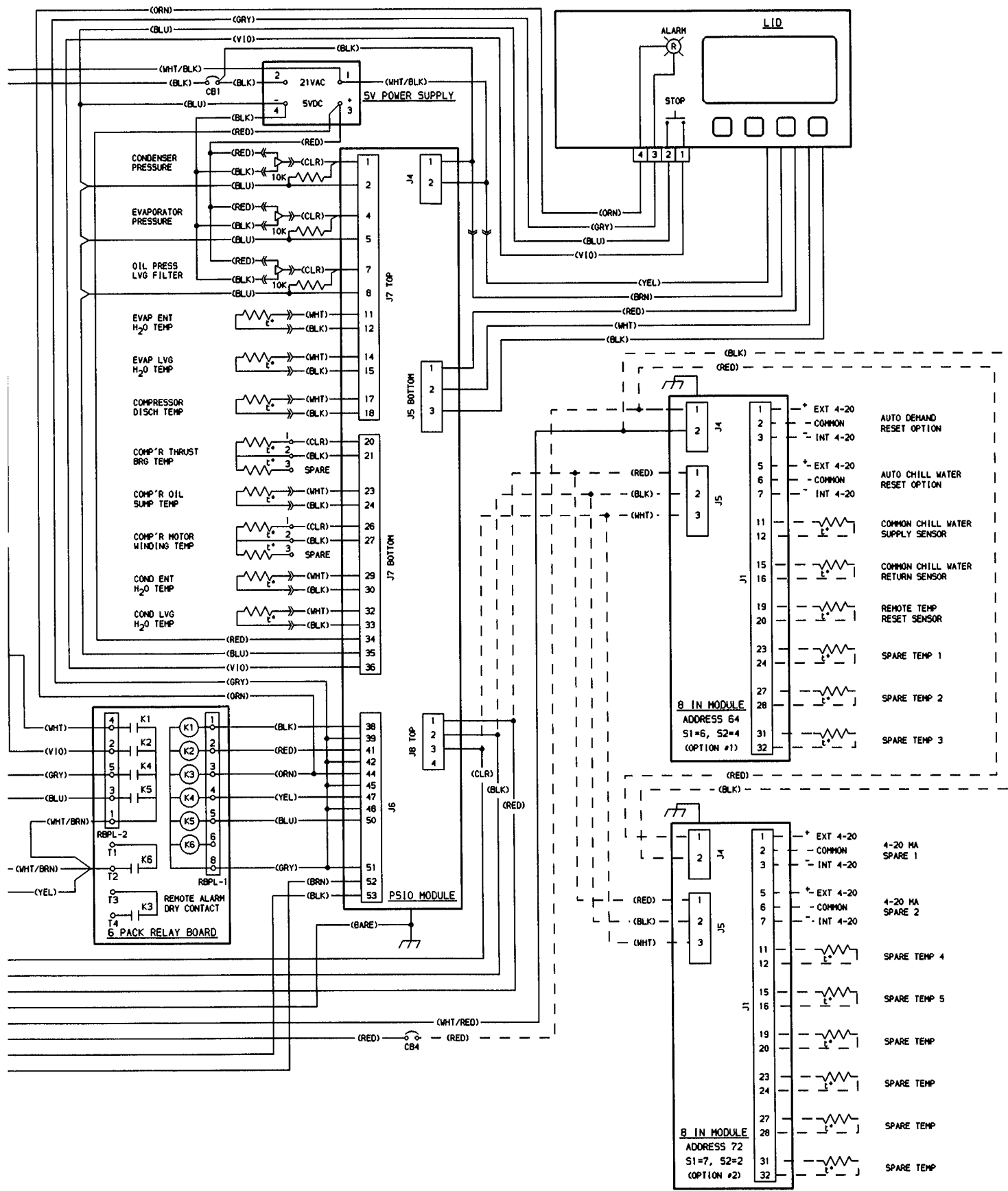


Fig. 40 – Compressor Fits and Clearances (cont)



IC Controls Wiring Schematic

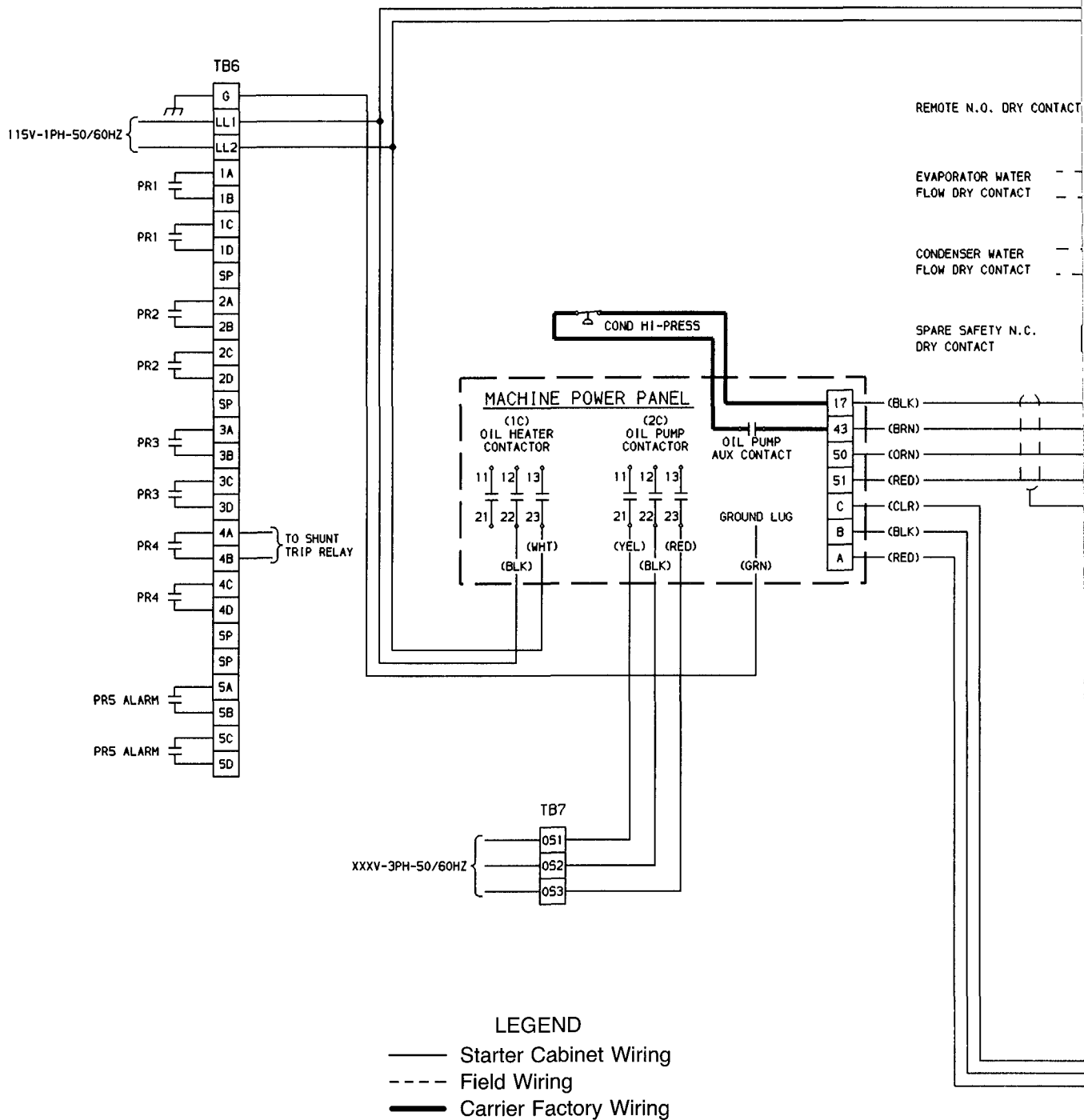
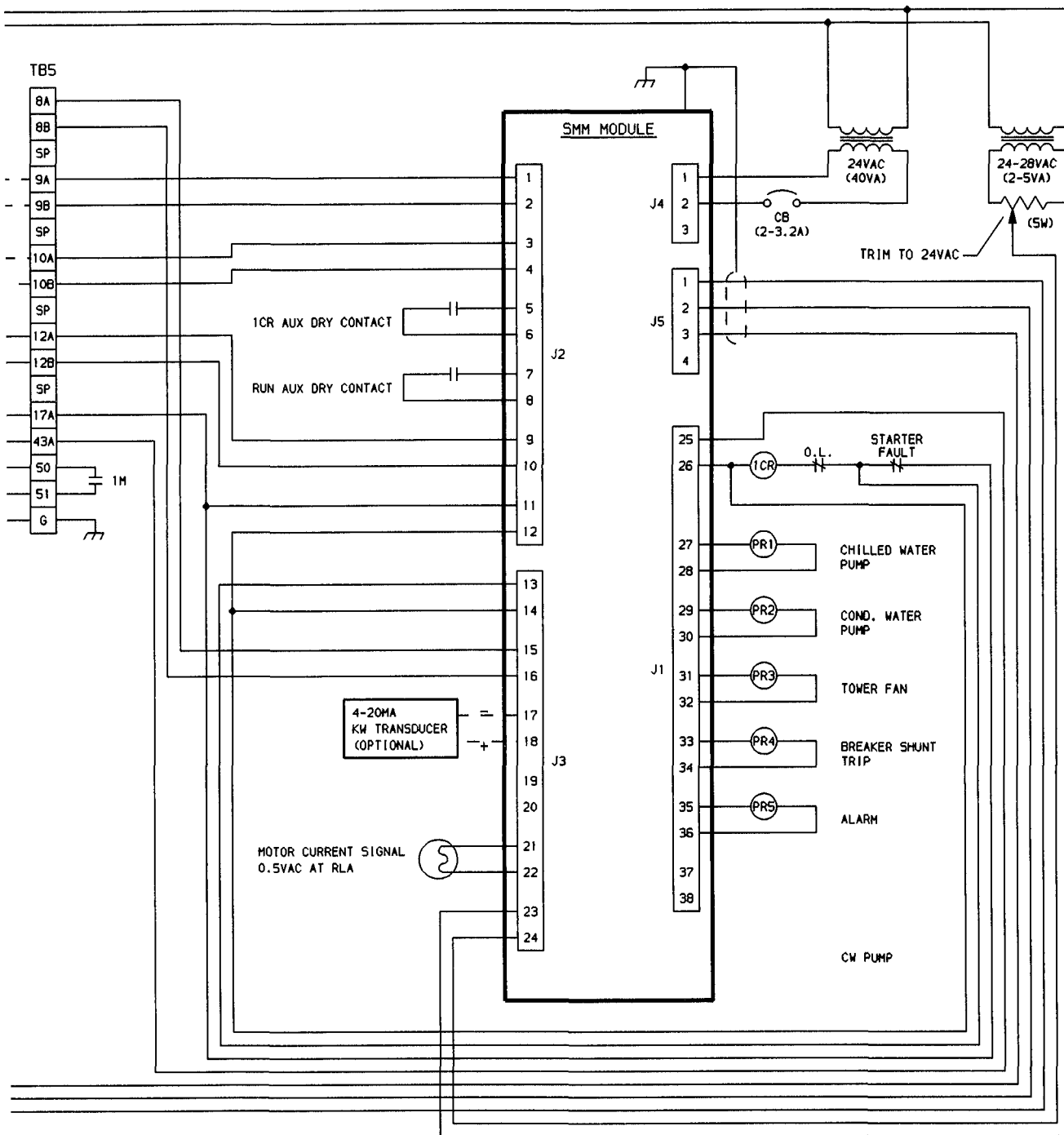


Fig. 42 – Machine Power Panel, Starter A



assembly, and Motor Wiring Schematic

