



30GX080-175
30HXA,HXC076-186
ECOLOGIC™ Air-Cooled and Fluid Cooled Chillers
50/60 Hz



Controls, Start-up, Operation, and Troubleshooting

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SAFETY CONSIDERATIONS

Installing, starting up, and servicing this equipment can be hazardous due to system pressures, electrical components, and equipment location (roof, elevated structures, etc.). Only trained, qualified installers and service mechanics should install, start up, and service this equipment.

When working on this equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply. Follow all safety codes. Wear safety glasses and work gloves. Use care in handling, rigging, and setting this equipment, and in handling all electrical components.

⚠ WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation and service. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

⚠ WARNING

This unit uses a microprocessor-based electronic control system. Do not use jumpers or other tools to short out components, or to bypass or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

⚠ WARNING

To prevent potential damage to heat exchanger tubes always run fluid through heat exchangers when adding or removing refrigerant charge.

DO NOT VENT refrigerant relief valves within a building. Outlet from relief valves must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigeration and Air Conditioning Engineers) 15 (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation. Provide adequate ventilation in enclosed or low overhead areas. 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.

⚠ WARNING

DO NOT attempt to unbrazed factory joints when servicing this equipment. Compressor oil is flammable and there is no way to detect how much oil may be in any of the refrigerant lines. Cut lines with a tubing cutter as required when performing service. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to system. DO NOT re-use compressor oil.

GENERAL

IMPORTANT: The 30GX/HX units use refrigerant R-134a. Compressor oil used with R-134a is NOT the same as that used with R-22 units.

This publication contains Start-up, Service, Controls, Operation and Troubleshooting data for the 30GX080-175 and 30HXA,C076-186 screw chillers.

Circuits are identified as circuits A and B, and compressors are identified as A1 in circuit A, and B1 in circuit B.

The 30GX/HX Series chillers feature microprocessor-based electronic controls and electronic expansion devices (EXD) in each refrigeration circuit. Unit sizes are shown in Table 1.

The control system cycles compressor loaders and/or compressors to maintain the selected leaving fluid temperature set point. The system automatically positions the EXD to maintain the specified refrigerant level in the cooler. The system also has capabilities to control a condenser water valve to maintain suitable leaving-water temperature for the 30HXC unit. Safeties are continuously monitored to prevent the unit from operating under unsafe conditions. A scheduling function can be programmed by the user to control the unit's occupied and unoccupied schedules. The control also operates a test function and a manual control function that allows the operator to check output signals and ensure components are operable.

The control system consists of a processor module (PSIO-1), an EXD driver module (DSIO-EXV), a high voltage relay module on air-cooled models (DSIO-HV), 2 six-pack relay boards, a keypad and display module (also called HSIO-II), 2 electronic expansion devices (EXD), 2 compressor protection modules (CPM), a PSIO-2 module, 6 thermistors, and 8 transducers. A remote enhanced display is available as an accessory.

Table 1 — Unit Sizes

UNIT MODEL 30GX	NOMINAL TONS	NOMINAL kW	UNIT MODEL 30HX	NOMINAL TONS	NOMINAL kW
080	74	252	076	74	252
090	82	280	086	82	280
105	91	310	096	92	314
115	102	348	106	102	348
125	111	379	116	112	382
135	120	409	126	121	413
150	135	461	136	134	457
160	145	495	146	143	488
175	161	549	161	154	525
			171	164	560
			186	175	597

MAJOR SYSTEM COMPONENTS

Processor Module (PSIO-1) — This module is an upgrade to the original PSIO (8088) module with superior electrical noise immunity capability. It contains the operating software and controls the operation of the machine. It has 12 input channels and 6 output channels.

The PSIO-1 continuously monitors input/output channel information received from all the modules and controls all output signals for all output channels. It also controls the relays on the six-pack relay board. The processor module also controls the EXD driver module (as required), commanding it to open or close each EXD in order to maintain the proper cooler level. Information is transmitted between the processor module, CPM modules, the EXD driver module, and the keypad and HSIO-II standard display module through a 3-wire communications bus called COMM3. The enhanced display module LID-1B (accessory) is connected to the PSIO1 module through a 3-wire communications bus, but uses a different communication bus called COMM1. The COMM1 bus is also used to communicate to other CCN devices when the unit is installed in a network application.

DSIO-HV Relay Module — The DSIO-HV module has 4 inputs and 8 outputs and is installed on 30GX units only. The module communicates the status of the inputs with the PSIO-1 module and operates the oil heater, outdoor fan, and minimum load control outputs.

Electronic Expansion Device Module — The electronic expansion device module has 4 inputs and 2 outputs. It receives signals from the PSIO-1 module and operates the electronic expansion devices. It also sends the PSIO-1 module the status of its 4 input channels.

Compressor Protection Module (CPM) — The compressor protection module monitors several of the compressor safeties and controls 4 of the outputs used to control each compressor. The CPM monitors compressor current, compressor voltage, high pressure switch status, and compressor motor temperature. The CPM controls the compressor contactors, oil solenoid, and motor cooling solenoid. Each CPM sends the PSIO-1 its circuit's motor temperature, alarm status of the module, and the compressor relay status.

PSIO-2 (8052) Module — This module is used as an input/output module only as there is no unit software downloaded in this module. It has 12 input channels and 6 output channels.

Keypad and Display Module (Also Called HSIO-II) — This device consists of a keypad with 8 function keys, 4 operative keys, 12 numeric keys, and a 2-line 24-character alphanumeric LCD (liquid crystal display). Key usage is explained in the Accessing Functions and Subfunctions section.

Control (LOR) Switch — Control of the chiller is defined by the position of the LOCAL/OFF/REMOTE (LOR) switch. This is a 3-position manual switch that allows the chiller to be put under the control of its own controls (LOCAL), manually stopped (OFF), or controlled through a set of remote contacts (REMOTE). This switch is different than the switch that is used in the Flotronic™ II controls configuration. The CCN control is done through the HSIO-II. The switch allows unit operation as shown in Table 2.

In the LOCAL position, the chiller is allowed to operate and respond to the scheduling configuration, CCN configuration and set point data. In the remote position the unit operates similar to the LOCAL position except the remote contacts must be closed for the unit to be able to operate.

Table 2 — Unit Mode from LOR Switch/CCN State

SWITCH POSITION	REMOTE CONTACTS	CCN CONFIGURATION	CCN STATE	UNIT MODE
OFF	NR	NR	NR	LOCAL OFF
LOCAL	NR	DISABLE	NR	LOCAL ON
		ENABLE	RUN	CCN ON
REMOTE	OPEN	NR	NR	LOCAL OFF
	CLOSED	DISABLE	NR	LOCAL ON
		ENABLE	RUN	CCN ON
			STOP	CCN OFF

LEGEND

CCN — Carrier Comfort Network

NR — Input Not Read by Processor

NOTE: If the unit is configured for a clock then the unit will be under clock control if it is in an ON mode.

OPERATION DATA

Electronic Expansion Device (EXD) — The microprocessor controls the EXD through the EXD driver module. The EXD will either be an EXV (electronic expansion valve) or an economizer. Inside both these devices is a linear actuator stepper motor.

EXV OPERATION — High-pressure liquid refrigerant enters the valve through the bottom. A series of calibrated slots are located inside the orifice assembly. As refrigerant passes through the orifice, the pressure drops and the refrigerant changes to a 2-phase condition (liquid and vapor). To control refrigerant flow for different operating conditions, the sleeve moves up and down over the orifice, thereby changing orifice size. The sleeve is moved by a linear stepper motor. The stepper motor moves in increments and is controlled directly by the processor module. As the stepper motor rotates, motion is transferred into linear movement by the lead screw. Through the stepper motor and lead screw, 1500 discrete steps of motion are obtained. The large number of steps and long stroke result in very accurate control of refrigerant flow. Each circuit has a liquid level sensor mounted vertically into the top of the cooler shell. The level sensor consists of a small electric resistance heater and 3 thermistors wired in series positioned at different heights inside the body of the well. The heater is designed so that the thermistors will read approximately 200 F (93.3 C) in dry air. As the refrigerant level rises (falls) in the cooler, the resistance of the closest thermistor(s) will increase (decrease) as it is cooled by the rising liquid refrigerant (heated by the heater). This large resistance difference allows the control to accurately maintain a specified level. The level sensor monitors the refrigerant liquid level in the cooler and sends this information to the PSIO-1. At initial start-up, the EXV position is at zero. After that, the microprocessor keeps accurate track of the valve position in order to use this information as input for the other control functions. It does this by initializing the EXVs at start-up. The processor sends out enough closing pulses to the valve to move it from fully open to fully closed, then resets the position counter to zero. From this point on, until the next initialization, the processor counts the total number of open and closed steps it has sent to each valve.

ECONOMIZER OPERATION — Economizers are factory installed on 30GX105-175 units and 30HXA,C161-186 units. All other sizes will use standard EXVs. The economizer improves both the chiller capacity and efficiency as well as providing compressor motor cooling. Inside the economizer are

both a linear stepper motor (same as standard EXV motor) and a float valve. The stepper motor is controlled by the PIC to maintain the desired liquid level in the cooler (as is done for non-economized chillers). The float valve maintains a liquid level in the bottom of the economizer. Liquid refrigerant is supplied from the condenser through the end to the bottom of the economizer. A bubbler tube supplies a small amount of discharge gas to ensure that the float will be able to work properly. As the refrigerant passes through the EXD, its pressure is reduced to an intermediate level of about 75 psig. This pressure is maintained inside the economizer shell. Next, the refrigerant flows through the float valve where its pressure is further reduced to slightly above the pressure in the cooler. The increase in performance is realized when some of the refrigerant passing through the EXD flashes to vapor, further subcooling the liquid that is maintained at the bottom of the economizer. This increase in subcooling provides additional capacity. Also, since the additional power required to accomplish this is minimal, the efficiency of the machine also improves. The vapor that flashes will rise to the top of the economizer where it passes to the compressor and is used to provide motor cooling. After passing over the motor windings, the refrigerant re-enters the cycle at an intermediate port in the compression cycle.

Oil Pumps — The 30GX/HX screw chillers utilize one externally mounted pre-lubricating oil pump per circuit. This pump is operated as part of the start-up sequence. On 30GX units, the pumps are mounted to the base rails on the oil separator side of the unit. The pumps are mounted to a bracket on the condensers of 30HXC units and to the oil separator of 30HXA units. When a circuit is required to start, the controls will energize the oil pump first and read the current oil pressure transducer reading. The pump will be operated for a period of 20 seconds, after which the oil solenoid will be energized to open the oil inlet valve at the compressor. The control will again read the pressure from the oil pressure trans-

ducer. If the pump has built up sufficient oil pressure, the compressor will be allowed to start. Once the compressor has started, the oil pump will be turned off within 10 seconds and will not be used again until the next start-up. If the pump was not able to build up enough oil pressure, the pump will be turned off. Within 3 seconds, the pump will be re-energized and will make one additional attempt to build oil pressure. The control will generate an alarm if the second attempt fails.

Motor Cooling — Compressor motor winding temperatures are controlled to a set point of 200 F. The control accomplishes this by cycling the motor cooling solenoid valve to allow liquid refrigerant to flow across the motor windings as needed. On units equipped with economizers, flash gas leaves the top of the economizer and continually flows to the motor windings. All refrigerant used for motor cooling re-enters the rotors through a port located midway along the compression cycle and is compressed to discharge pressure.

Back Pressure Valve (GX and HXA only) — This valve is located on the oil separator outlet on GX units and mounted on the oil separator shell of HXA units. The valve's function is to ensure that there is sufficient system differential pressure to allow for oil to be driven back to the compressor. A small copper line (economizer pressure) is connected to the top of the valve and an internal spring is connected to a valve which will close if the pressure in the oil separator is not at least 15 psig greater than the economizer pressure.

Sensors — The 30GX/HX control system (based on the Flotronic™ II chiller control system) gathers information from sensors to control the operation of the chiller. The units use 8 standard pressure transducers, 6 standard thermistors (including 2 motor temperature thermistors), and 2 liquid level thermistors to monitor and control system operation. The sensors are listed in Table 3.

Table 3 — Thermistor and Transducer Locations

THERMISTORS			
Sensor	Description	Location	Connection Terminals
T1	Cooler Leaving Fluid Temp	Cooler Head Leaving Fluid Side	PSIO-2, J7 pins 2,3
T2	Cooler Entering Fluid Temp	Cooler Head Entering Fluid Side	PSIO-2, J7 pins 5,6
Motor Temp A1	Motor Temperature A1	Compressor A1 Junction Box	CPM-A1, T terminals
Motor Temp B1	Motor Temperature B1	Compressor B1 Junction Box	CPM-B1, T terminals
T5	Discharge Gas Temp A	Top of Condenser Circuit A (30HXC Only) Top of Oil Separator Circuit A (All Other Units)	PSIO-2, J7 pins 8,9
T6	Discharge Gas Temp B	Top of Condenser Circuit B (30HXC Only) Top of Oil Separator Circuit B (All Other Units)	PSIO-2, J7 pins 11,12
LL-A (T3)	Liquid Level Circuit A	Top of Cooler Circuit A	PSIO-1, J7 pins 5,6
LL-B (T4)	Liquid Level Circuit B	Top of Cooler Circuit B	PSIO-1, J7 pins 8,9
T7 (optional)*	Outdoor Air Thermistor	Outside Air Stream	PSIO-2, J7 pins 20,21
T8 (optional)*	Condenser Entering Water Temp	Condenser Entering Fluid Line	PSIO-2, J7 pins 14,15
T9 (optional)*	Condenser Leaving Water Temp	Condenser Leaving Fluid Line	PSIO-2, J7 pins 17,18
PRESSURE TRANSDUCERS			
Sensor	Description	Location	Connection Terminals
DPT-A	Discharge Pressure Circuit A	Top of Condenser Circuit A (30HXC Only) Top of Oil Separator Circuit A (All Other Units)	PSIO-1, J7 pin 22
SPT-A	Suction Pressure Circuit A	Top of Cooler Circuit A	PSIO-1, J7 pin 19
EPT-A	Economizer Pressure Circuit A	Economizer Line Entering Comp A	PSIO-1, J7 pin 10
OPT-A	Oil Pressure Compressor A	Compressor A1 Oil Connection	PSIO-1, J7 pin 25
DPT-B	Discharge Pressure Circuit B	Top of Condenser Circuit B (30HXC Only) Top of Oil Separator Circuit B (All Other Units)	PSIO-1, J7 pin 16
SPT-B	Suction Pressure Circuit B	Top of Cooler Circuit B	PSIO-1, J7 pin 31
EPT-B	Economizer Pressure Circuit B	Economizer Line Entering Comp B	PSIO-1, J7 pin 13
OPT-B	Oil Pressure Compressor B	Compressor B1 Oil Connection	PSIO-1, J7 pin 28

*Sensors are available as accessories for field installation.

Compressor Protection Module (CPM) — Each compressor has its own CPM. The CPM provides the following functions:

- compressor main contactor control
- Wye-Delta contactor transition
- compressor ground current protection
- motor temperature reading
- high-pressure protection
- reverse rotation protection
- voltage imbalance protection
- current imbalance protection
- compressor oil solenoid control
- motor cooling solenoid control
- sensor bus communications
- starting and running overcurrent protection

The CPM has 4 output relays and 4 inputs.

OUTPUTS:

- compressor contactor
- compressor oil solenoid
- compressor motor cooling solenoid
- Wye-Delta transition relay

INPUTS:

- motor temperature
- three-phase voltage
- three-phase current
- high-pressure switch

A diagram of the CPM board is shown in Fig. 1. There are line voltage inputs at L1, L2, and L3. Below these inputs are the current toroid inputs at Plug 1. Below Plug 1 are the 3 COMM3 communication terminals. In the lower left corner of the board are the inputs for motor winding temperature. The address DIP (dual-in-line package) switch and compressor must trip amps header are factory set. For compressor A1, switches 2 and 4 should be set. For compressor B1, switches 1 and 4 should be set.

To verify proper must trip amps header configuration, press **1** **SRVC** and use the up arrow key on the HSIO to locate the must trip amp values. See Appendix A.

The CPM communicates on the COMM3 communication bus to the PSIO-1 module. Proper operation of the CPM board can be verified by observing the 3 LEDs located on the board. The top LED is red and blinks at a rate of once every 1 to 2 seconds. This indicates that the module is powered and operating correctly. The middle LED is yellow and blinks when there is an automatic reset alarm condition. The yellow LED will remain on and will not blink for manual reset alarm conditions. The bottom LED is green and will blink when the module is satisfactorily communicating with the PSIO-1 module. The CPM communicates the status of its inputs and outputs, and reports 17 different alarm conditions to the PSIO-1. The alarms are listed in Table 4.

⚠ CAUTION

The CPM module has many features that were specifically designed to protect the compressor including reverse rotation protection. Do not attempt to bypass or alter any of the factory wiring. Any compressor operation in the reverse direction will result in a compressor failure that will require replacement.

The PSIO-1 will generate an alert when it receives an alarm input from the CPM. The alert will be generated in a y.xx format where “y” refers to the compressor and “xx” to the alarm value in Table 4. For example, the HSIO would display Alert 1.65 for a single phase voltage loss occurring on compressor A1. Similarly, the display would read 5.85 for a motor overtemperature condition on compressor B1. If equipped, alerts for compressors A2 and B2 would be generated as “2.xx” and “6.xx” respectively. Alarm codes 3 and 4 are not used. Ending zeros are not displayed.

The high-pressure switch is wired in series with the relay coils of the 4 relays on the CPM. If this switch opens during operation, all relays on the CPM will be deenergized and the compressor stopped. The failure is reported to the PSIO-1 and the processor module will lock off the compressor from restarting until the alarm is manually reset.

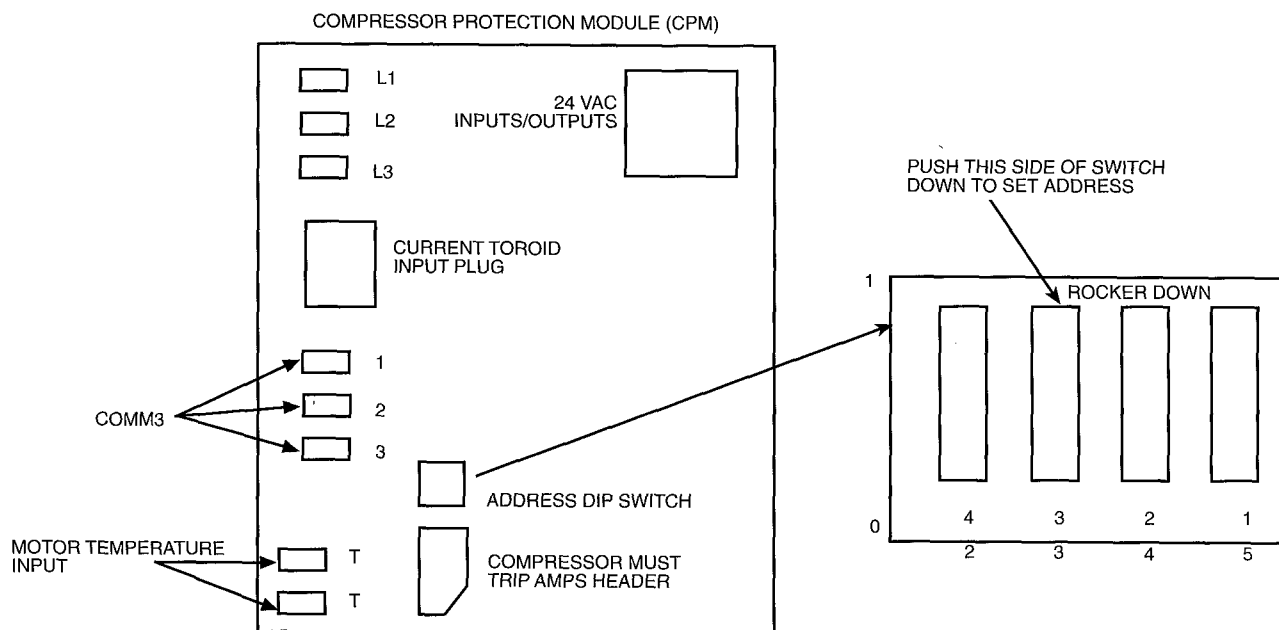


Fig. 1 — Compressor Protection Module

Table 4 — Compressor Protection Module Codes

ALARM CONDITION	VALUE
High Pressure Switch Trip	1.0
No Motor Current	2.0
Current Unbalance Warning 10%	2.5
Current Unbalance Alarm 10%	2.7
Current Unbalance 18%	3.0
Single Phase Current Loss	3.5
High Motor Current	4.0
Ground Fault	5.0
Voltage Unbalance Warning 3%	5.5
Voltage Unbalance Alarm 3%	5.7
Voltage Unbalance 7%	6.0
Single Phase Voltage Loss	6.5
Voltage Phase Reversal	7.0
Contactor Failure	7.5
Current Phase Reversal	8.0
Motor Overtemperature	8.5
Open Thermistor	9.0
Configuration Header Fault	9.5
Shorted Thermistor	10.0
No Error	0

Wye-Delta vs Across-the-line (XL) Starting Option — All 30GX/HX chillers operating at voltages of 208/230-3-60, 346-3-50 or 230-3-50 (a 3, 5, or 8 at Position 12 in model number) will be factory installed with Wye-Delta starters. All other voltage options may be ordered with

either Wye-Delta or XL starting options. The XL starting method is the most cost effective and simply starts the compressor motor in a Delta configuration (the motors are designed for continuous operation in this configuration) using a single contactor. See Fig. 2. This is the simplest starting method to use and is ideal where starting current limitations are not an issue. Where current limitations exist, the Wye-Delta option may be used. See Fig. 3. This option uses a factory-installed starter assembly for each compressor which consists of 3 contactors, labelled 1M, 2M, and S. As the compressor is started, the CPM module will energize contactors 1M and S, which connects and energizes the motor windings in a Wye configuration. The starting current required will be approximately 60% less than that required for an XL start due to the higher impedance of the motor windings when Wye connected. The compressor will attain about 100% of its normal operating speed (approximately 6 to 8 seconds) before the CPM module will deenergize the S contactor and energize the 2M contactor, switching the compressor windings to a Delta wiring configuration. The S and 2M contactors in the starter assembly are both mechanically and electrically interlocked so that they will not both be energized at the same time. It is imperative that none of the factory-installed power wiring from the control box terminal block to the compressor junction block be altered. Doing so will cause permanent damage to the compressor and will require that the compressor be replaced.

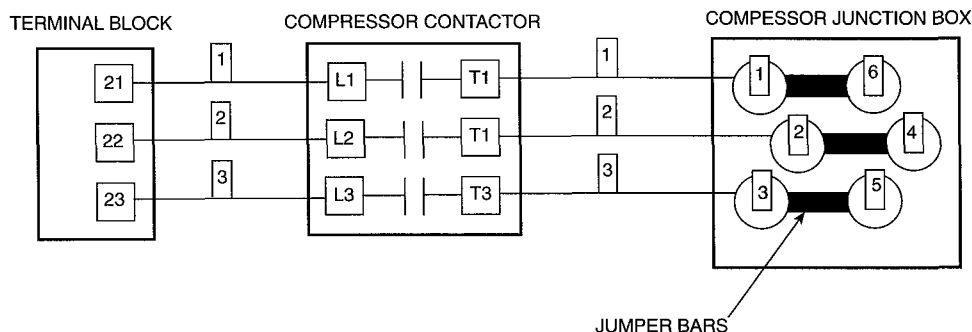


Fig. 2 — Across-the-Line (XL) Compressor Wiring

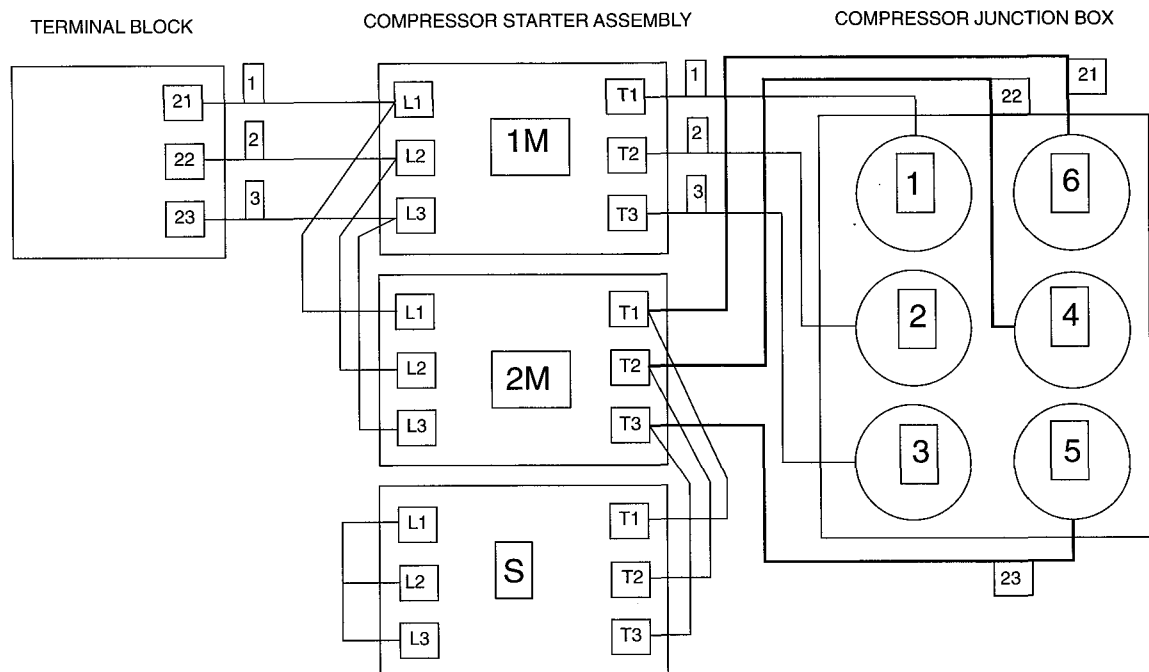


Fig. 3 — Wye-Delta Compressor Wiring

Capacity Control — The control system cycles compressors, loaders, and minimum load control system cycles compressors, loaders and minimum load control valves to maintain the user-configured leaving chilled fluid temperature set point. Entering fluid temperature is used by the microprocessor to determine the temperature drop across the cooler and is used in determining the optimum time to add or subtract capacity stages. The chilled fluid temperature set point can be automatically reset by the return temperature reset or space and outdoor-air temperature reset features. It can also be reset from an external 4 to 20 mA signal, or from a network signal.

The capacity routine runs every 30 seconds. The routine will attempt maintain the Control Point at the desired set point. Each time it runs, the control reads the entering and leaving fluid temperatures. The control determines the rate at which conditions are changing and calculates 2 variables based on these conditions. Next, a capacity ratio (Load/Unload Factor) is calculated using the 2 variables to determine whether or not to make any changes to the current stages of capacity. This ratio value ranges from - 100 to + 100%. If the next stage of capacity is a compressor, the control starts (stops) a compressor when the ratio reaches + 100% (- 100%). If the next stage of capacity is a loader, the control energizes (deenergizes) a loader when the ratio reaches + 60% (- 60%). Loaders are allowed to cycle faster than compressors to minimize the number of starts and stops on each compressor. A delay of 90 seconds occurs after each capacity step change.

MINUTES LEFT FOR START — This value is displayed in the Status subfunction and represents the amount of time to elapse before the unit will be started. This value can be zero without the machine running in many situations. This can include being unoccupied, LOR switch in the OFF position, CCN not allowing unit to start, Demand limit in effect, no call for cooling due to no load, and alarm or alert conditions present. If conditions are such that the machine should be running and none of the above are true, a minimum off time may be in effect. The machine should start normally once the time limit has expired.

MINUTES OFF TIME — This user configurable time period is used by the control to determine how long unit operation will be delayed after power is applied/restored to the unit. Typically this time period is configured when multiple machines are located on a single site. For example, this gives the user the ability to prevent all the unit from restarting at once after a power failure. A value of zero for this variable does not mean that the unit should be running.

LOADING SEQUENCE — The 30GX/HX chiller efficiency is greatest at full load. Therefore, the following sequence list will apply to capacity control.

1. The next compressor will not be started until all others are running at 100%.
2. Except when configured for close control, the second unloading stage will only be used on the initial capacity stage of the unit during start-up.
3. Whenever a compressor is started in a circuit, the loaders in the circuit will be deenergized for 15 seconds and then will be energized as needed.

CLOSE CONTROL — When configured for Close Control, the control is allowed to use any loading/capacity control devices required to maintain better leaving fluid temperature control.

LEAD/LAG DETERMINATION — This is a configurable choice and is factory set to be automatic. The value can be changed to Circuit A or Circuit B leading as desired. Set at automatic, the control will sum the current number of logged circuit starts and one-tenth of the current operating hours for each circuit. The circuit with the lowest sum will be started first. Changes to which circuit is the lead circuit and which is the lag are made only at 0% and 100% total unit capacity.

CAPACITY SEQUENCE DETERMINATION — This is configurable as equal circuit loading or staged circuit loading with the default set at staged. The control will determine the order in which the steps of capacity for each circuit will be changed. This control choice does NOT have any impact on machines with only 2 compressors.

MINIMUM LOAD VALVE — When this option is installed and configured, the first stage of capacity will be to energize the Minimum Load valve relay. The control will energize loaders as needed thereafter. Similarly, the Minimum Load valve relay will be the last stage of capacity to be used before the circuit is shut down.

CAPACITY CONTROL OVERRIDES — The following overrides will modify the normal operation of the routine.

Deadband Multiplier — The user configurable Deadband Multiplier

(snvc) has a default value of 1.0. The range is from 1.0 to 4.0. When set to other than 1.0, this factor is applied to the capacity Load/Unload Factor. The larger this value is set to, the longer the control will delay between adding/removing stages of capacity. Figure 4 shows how compressor starts can be reduced over time if the leaving water temperature is allowed to drift a larger amount above and below the set point.

First Stage Override — If the current capacity stage is zero, the control will modify the routine with a 1.2 factor on adding the first stage to reduce cycling. This factor is also applied when the control is attempting to remove the last stage of capacity.

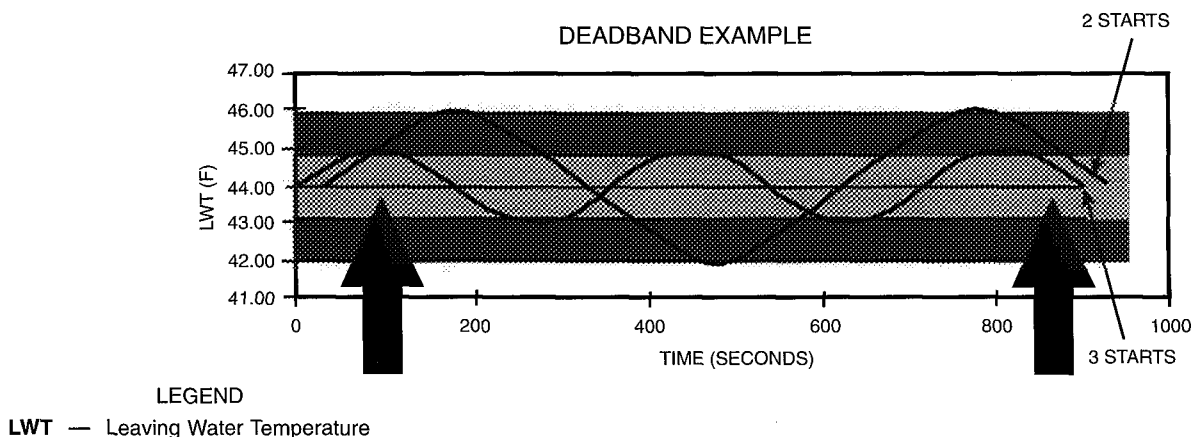


Fig. 4 — Deadband Multiplier

Slow Change Override — The control will prevent the capacity stages from being changed when the leaving fluid temperature is close to the set point (within an adjustable dead-band) and moving towards the set point.

Ramp Loading — Limits the rate of change of leaving fluid temperature. If the unit is in a cooling mode and configured for Ramp Loading, the control will make 2 comparisons before deciding to change stages of capacity. The control calculates a temperature difference between the control point and leaving fluid temperature. If the difference is greater than 4° F (2.2° C) and the rate of change (°F or °C per minute) is less than the configured Cooling Ramp Loading value ($\boxed{1} \boxed{\text{SET}}$), the control will not allow any changes to the current stage of capacity.

Low Entering Fluid Temperature Unloading — When the entering fluid temperature is below the control point, the control will attempt to remove 25% of the current stages being used. If exactly 25% can not be removed, the control will remove an amount greater than 25%, but no more than is necessary. The lowest stage will not be removed.

Low Discharge Superheat — If a circuit's discharge superheat is less than 15° F (8.3° C), the control will not increase the current capacity stage and the EXD will not be opened any further. If the discharge superheat is less than 10° F (5.6° C) and decreasing, the EXD will be closed 50 steps every 10 seconds. If the discharge superheat is less than 5° F (2.8° C) and decreasing, the circuit will be unloaded every 30 seconds until the superheat is greater than 5° F (2.8° C). The final capacity stage will not be unloaded unless an alarm condition exists. This override will be ignored for the first 3 minutes after a compressor is started.

Low Saturated Suction Temperature — To avoid freezing the cooler, the control will compare the circuit Saturated Suction temperature with a pre-determined freeze point. For water circuits, the freeze point is 30 F (-1.1 C). For brine circuits, the freeze point is 8° F (4.4° C) below the cooling set point (lower of 2 cooling set points for dual configuration). If the saturated suction temperature is below the freeze point, the unit capacity will not be allowed to increase. If the saturated suction temperature is more than 6° F (3.3° C) below the freeze point for 90 seconds, all loaders in the circuit will

be turned off. If the saturated suction temperature is more than 6° F (3.3° C) below the freeze point for 3 minutes, the circuit will be shut down.

High Condensing Temperature Unloading — Every 10 seconds the control will check for the conditions below. Loaders will be cycled as needed to control the saturated condensing temperature below the configured maximum condensing temperature. Configured maximums are 154 F (67.8 C) for 30GX, 152 F (66.7 C) for 30HXA, and 122 F (50 C) for 30HXC units. If a circuit's saturated condensing temperature is more than 12° F (6.7 C) below the maximum condensing temperature, the circuit capacity will not be allowed to increase. If the saturated condensing temperature is more than 2° F (1.1° C) above the maximum condensing temperature for 60 seconds, a loader will be turned off. If the saturated condensing temperature rises to more than 5° F (2.8° C) above the maximum condensing temperature during the 60 seconds, a loader will be turned off immediately. If all the loaders were already off, the compressor will be shut down and an alarm will be generated.

MOP (Maximum Operating Pressure) Override — The control monitors saturated condensing and suction temperature for each circuit as well as differential oil pressure. Based on a configurable maximum operating set point (saturated suction temperature), set maximum condensing temperature, and minimum differential oil pressure, the control may reduce the number of capacity stages being used and/or may lower the EXD position when system pressures approach the set parameters.

Head Pressure Control

GENERAL — The microprocessor controls the condenser fans (30GX) or analog water valve (30HXC) to maintain the saturated condensing temperature to a configurable set point. The fans will be staged or speed varied (30GX) or water valve controlled (30HX) based on each circuit's saturated condensing temperature and compressor status. Water cooled units (30HXC) operating at less than 70 F (21.1 C) for entering condenser water require the use of head pressure control.

The chiller must be field configured for the options shown in Table 5. Fan stage settings are shown in Table 6.

Table 5 — Field Configured Chiller Options

CONFIGURATION OPTION	DESCRIPTION	HSIO LOCATION	FACTORY CONFIGURED?
Fan Staging Select	Air cooled staging method	$\boxed{1} \boxed{\text{SRVC}}$	Yes. See Table 6.
Motormaster® Select	Applies to air cooled units only	$\boxed{2} \boxed{\text{SRVC}}$	Yes. 0 = None. Set to 1 to enable (Motormaster only)
Water Valve Type	Applies to water cooled unit only	$\boxed{2} \boxed{\text{SRVC}}$	Yes. 0 = None. Set to 1 = 4 – 20 mA, 2 = 0 – 10 V, 3 = 20 – 4 mA, 4 = 10 – 0 V

Table 6 — Fan Staging Settings for Air Cooled Units

UNIT MODEL NUMBER	DESCRIPTION	OPTION NUMBER
30GX080-105	1st stage compressor status 2nd stage common control based on highest SCT	12
30GX115-135	1st stage compressor status 2nd and 3rd stage common control based on highest SCT	14
30GX150-160	1st stage compressor status 2nd through 4th stage common control based on highest SCT	16
30GX175	1st stage each circuit, compressor status 2nd stage Circuit 1 independent 2nd and 3rd stage Circuit 2 independent	7

LEGEND

SCT — Saturated Condensing Temperature

AIR COOLED UNITS — See Fig. 5 for condenser fan locations.

No Motormaster® Device — The fans are controlled based on Saturated Condensing Temperature. The first fan stage for each circuit will be turned on whenever the compressor is turned on. A fan stage will be added when the Saturated Condensing Temperature (SCT) exceeds the Head Pressure Set Point. The Head Pressure Set Point is configurable in the Set Point Subfunction. The default is 113 F (45 C). Once a fan stage has been added, the software will temporarily modify the head pressure set point by adding 15 F (8.3 C) for 35 seconds. A fan stage will be removed when the Saturated Condensing Temperature has been less than the Head Pressure Set point - 35 F (19.4 C) for 2 minutes. The control will use the higher of the 2 Saturated Condensing Temperature values for 30GX080-160 units. For the 30GX175 units, each circuit's fan stages are independently controlled based on the circuit Saturated Condensing Temperature. Refer to Table 7 for condenser fan control information. See Fig. 6.

With Motormaster Device — For low-ambient operation, the lead fan in each circuit can be equipped with the optional or accessory Motormaster III head pressure controller. This controller can be used in one of 2 ways. If factory installed, the controller will be configured for 4 to 20 mA control. With the Motormaster III option enabled, the PSIO-1 module will calculate the required output based on Saturated Condensing temperature, Head Pressure set point and a PID (proportional integral derivative) loop calculation. This 4 to 20 mA output will be driven through the PSIO-2 module. To obtain this accessory for field installation, order by part number 30GX-900---012 for a single controller package (30GX080-160). Order a 30GX-900---014 package for a dual controller package (30GX175). These packages contain all the hardware required to install the accessory using a 4 to 20 mA input signal. The control will use the higher of the 2 Saturated Condensing Temperature values for 30GX080-160 units. For the 30GX175 units, each circuit's fan stages are independently controlled based on the circuit Saturated Condensing Temperature. Refer to Table 8 for condenser fan staging information.

Water Cooled Head Pressure Control — The 30HX chillers can be configured to control direct or reverse acting water valves that are controlled by a 4 to 20 mA signal. A 2 to 10 VDC signal can be used by installing a 500-ohm resistor across the 2 output terminals of the 4 to 20 mA signal. This control scheme reads the Condenser Leaving Water temperature and uses a PID loop to control the head pressure. Proportional, Integral and Derivative gain parameters for both the water and air cooled controls are adjustable and can be found in the Service subfunction. Checkout and adjustment of the PID loop should only be performed by certified Carrier Comfort Network technicians.

Table 7 — 30GX 080-175 Condenser Fan Control

FAN CONTACTOR	UNIT SIZE	FAN TYPE	FANS CONTROLLED
FC-1	30GX080-175	Standard	1,2
FC-2			3,4
FC-1			1
FC-1A		High Static	2
FC-2			3
FC-2A			4
FC-3	30GX115-175	Standard	5,6
FC-3		High Static	5
FC-3A			6
FC-4	30GX150-175	Standard	7,8
FC-4		High Static	7
FC-4A			8
FC-5	30GX175	Standard	9,10
FC-5		High Static	9
FC-5A			10

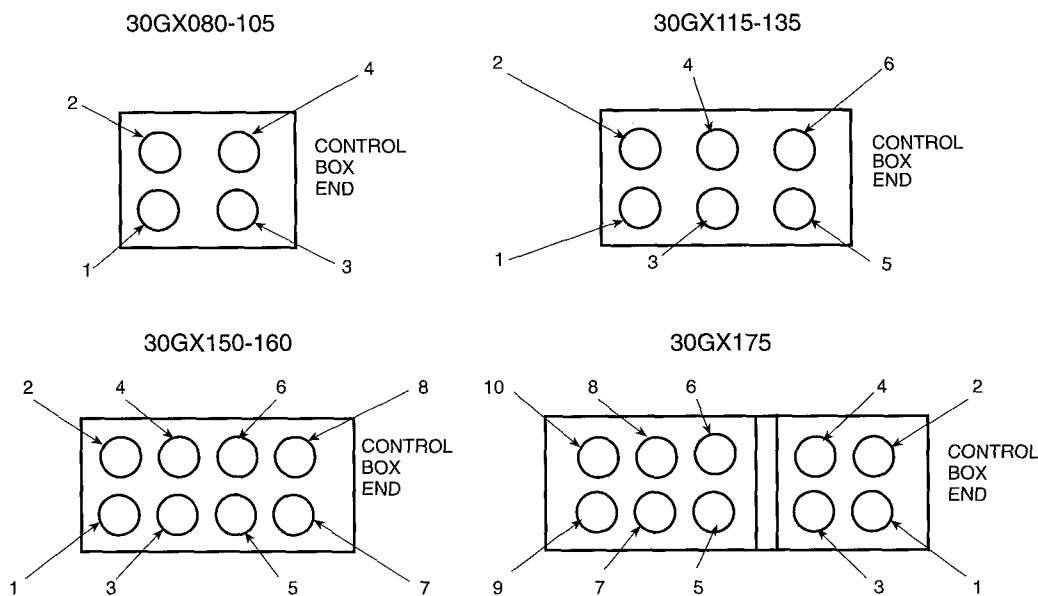
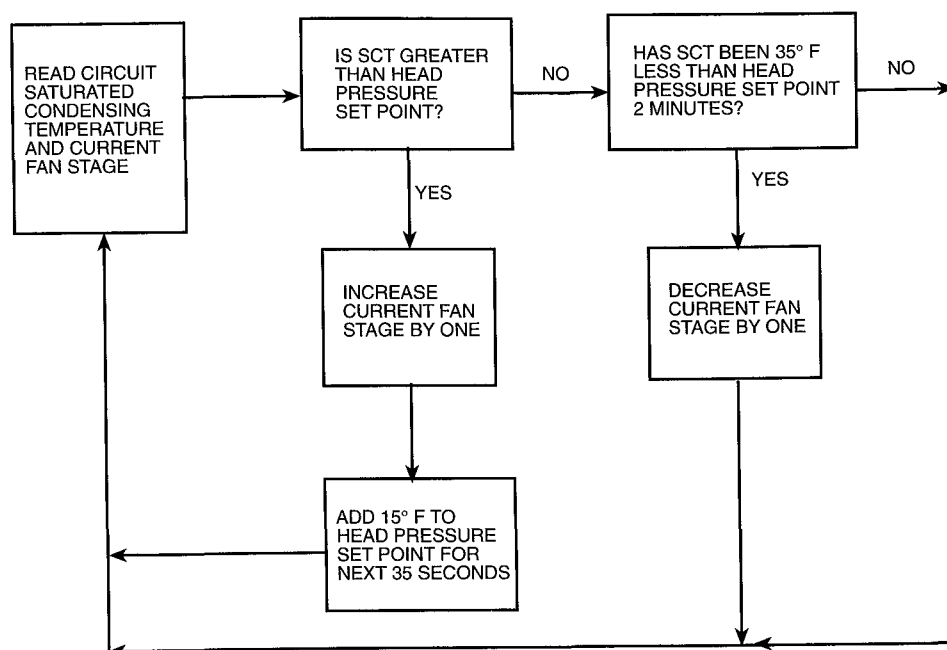


Fig. 5 — 30GX Condenser Fan Locations

30GX UNITS — MOTORMASTER® III DEVICE NOT INSTALLED



LEGEND

SCT — Saturated Condensing Temperature

Fig. 6 — 30GX Head Pressure Control

Table 8 — 30GX Condenser Fan Staging (PSIO-1 Controlled)

UNIT SIZE	FAN RELAY NUMBER*	FANS CONTROLLED
30GX080-105	5	1,2
	1	3,4
30GX115-135	5	1,2
	1	3,4
	2	5,6
30GX150-160	5	1,2
	1	3,4
	2	5,6,7,8
	1	3,4
30GX175 Circuit A	—	7,8
	1	9,10
30GX175 Circuit B	—	1,2
	3	3,4

*Fan relay number is used when accessing test function.

Keypad and Display Module (Also Called HSIO-II)

The only function of this module is to allow the operator to communicate with the processor. It is used to enter configurations and set points and to read data, perform tests, and set schedules. This device consists of a keypad with 8 function keys, 4 operative keys, 12 numeric keys (0 to 9, ., and -), and a 2-line, 24-character alphanumeric liquid crystal display. See Fig. 7.

ACCESSING FUNCTIONS AND SUBFUNCTIONS — Table 9 shows a brief description of the keypad buttons. Table 10 shows the 6 functions (identified by name) and the subfunctions (identified by number). Table 11 shows a brief example on how to access subfunctions.

AUTOMATIC DEFAULT DISPLAY — When the keypad has not been used for 10 minutes, the display automatically switches to the rotating automatic default display. This display contains the 5 parts shown below.

Entering Fluid Temp
xx.x° F

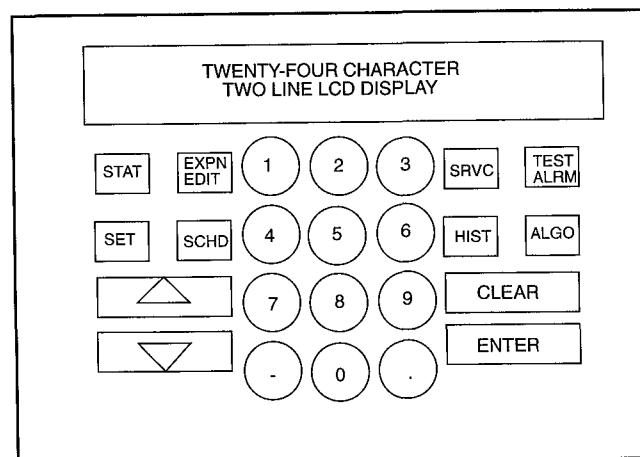
Leaving Fluid Temp
xx.x° F

Percent Total Capacity
xxx.x%

Total Number of Alarms
xx

MODES : MODE_TBL
Current active modes

All functions are made up of a group of subfunctions. To enter a subfunction, first press the subfunction number desired. Then press the function key in which the subfunction resides. To move within that subfunction, press the up or down arrow keys. Another subfunction may be entered at any time by pressing the subfunction number, then the function key. Depending on system type and configuration, all displays may not be shown.



LEGEND

LCD — Liquid Crystal Display

Fig. 7 — Keypad and Display Module

Table 9 — Keypad and Display Module Usage

FUNCTION KEYS	USE
	STATUS — For displaying diagnostic codes and current operating information about the machine.
	HISTORY — For displaying run time, cycles and previous alarms.
	SERVICE — For entering specific unit configuration information and enabling manual control function.
	SCHEDULE — For entering occupied/unoccupied schedules for unit operation.
	ALGORITHM — Not used.
	SET POINT — For entering operating set points and day/time information.
	TEST — For testing operating of the analog and discrete outputs.
OPERATIVE KEYS	USE
	EXPAND — For displaying a non-abbreviated expansion of the display.
	CLEAR — For clearing the screen of all displays.
	UP ARROW — For returning to previous display position.
	DOWN ARROW — For advancing to next display position.
	ENTER — For entering data.

Table 10 — Functions and Subfunctions

SUBFUNCTION NO.	FUNCTIONS					
	Status 	Test 	Schedule 	Service 	History 	Set Point 
1	Alarm Display	Circuit A Discrete Outputs	Ice Build Occupancy Schedule	Factory Configuration	Operating Hours	Set Points
2	General Parameters Display	Circuit B Discrete Outputs	Local/Normal Occupancy Schedule	Options Configuration 1	Alarm History	English/Metric
3	Circuit A Analog Values	Unit Discrete Outputs	Remote CCN Occupancy Schedule	Options Configuration 2	—	Bus Address
4	Circuit A Discrete Inputs/Outputs Table	Valves and Motormaster® Device	Holiday 01 Configuration	Reset/Demand Limit Configuration	—	Time/Date Configuration
5	Circuit B Analog Values	—	Holiday 02 Configuration	Machine Configuration Codes	—	CCN Enable/Disable
6	Circuit B Discrete Inputs/Outputs Table	—	Holiday 03 Configuration	—	—	—
7	Unit Analog Parameters	—	Holiday 04 Configuration	Transducer Calibration	—	—
8	Miscellaneous Inputs/Outputs	—	Holiday 05 Configuration	Manual Control	—	—
9	Operating Modes	—	Holiday 06 Configuration	—	—	—
10	Capacity Control	—	Holiday 07 Configuration*	—	—	—

*Subfunctions   through    are for configuring Holidays 08 through 30.

Table 11 — Accessing Functions and Subfunctions

OPERATION	KEYPAD ENTRY	DISPLAY RESPONSE
To access a function, press subfunction no. and function name key. Display shows subfunction group.	 	Circuit A Discrete Outputs Loader A1 Relay is OFF
To move to other elements, scroll up or down using arrow keys.	       	Loader A2 Relay is OFF Minimum Load Valve A Relay is OFF Circuit A Oil Heater Relay is OFF A1 Mtr. Cooling Solenoid Relay is OFF A2 Mtr. Cooling Solenoid Relay is OFF Circuit A Oil Pump Relay is OFF Oil Solenoid A1 Relay is OFF Oil Solenoid A2 Relay is OFF
When the last element in a subfunction has been displayed, the first element is repeated.		Loader A1 Relay is OFF
To move to next subfunction it is not necessary to use subfunction number. Press function name key to advance display through all subfunctions within a function and then back to the first.	   	Circuit B Discrete Outputs Loader B1 Relay is OFF Unit Discrete Outputs Valves and Motor Master Circuit A Discrete Outputs
To move to another function, either depress function name key for desired function (display shows the first subfunction), or Access a specific subfunction by using the subfunction number and the function name key.	  	Alarms : xx Reset Alarms : 1 <ENTER> CIR. A DISCRETE OUTPUTS

STATUS FUNCTION — This function shows the rotating display, current status of alarm and alert (diagnostic) codes, capacity stages, operating modes, chilled water set point, all measured system temperatures and pressures, analog inputs, and switch inputs. Refer to Table 12 for a complete description of the function.

Alarms/Alerts — Alarms and alerts are messages that one or more faults have been detected. The alarms and alerts indicate failures that cause the unit to shut down, terminate an option (such as reset) or result in the use of a default value such as a set point. Refer to the Troubleshooting section for more information.

Up to 10 alarms/alerts can be stored at once. To view them press **1** **STAT**. The control will display the current total number of alarms/alerts. Use the arrow keys to scroll through the list. Press the **EXPN** key when needed to view the full description of an alarm or alert. Press **1** **ENTR** to clear all the alarms. See Table 13.

IMPORTANT: Do not clear the alarms without first reviewing the full list and investigating and correcting the cause of the alarms.

When an alarm or alert is stored in the display and the machine automatically resets, the alarm/alert is deleted. Codes for safeties which do not automatically reset are not deleted until the problem is corrected and the machine is reset. To clear manual reset alarms from the CPM modules, the reset button on the HSIO bracket must be pressed. Next, switch the LOR switch to OFF and back to Local or Remote position (default alarm clearing method). Press **1** **STAT** and then **1** **ENTR** to clear the alarm from the PSIO if the default LOR reset function has been disabled.

General Parameters — General operating parameters are displayed including control mode, run status, CCN status, and the 5 most current alarms. Press **2** **STAT** to display these and the other values as shown in Table 12.

Circuit A and B Analog and Discrete Information — Circuit

A Analog values can be viewed by pressing **3** **STAT** and scrolling down to see current system operating conditions such as pressures and temperatures. Pressing **4** **STAT** will bring up Circuit A Discrete Inputs and Outputs. Scroll down to view the On/Off status of the compressor(s), loaders, solenoids, and pumps. Oil switch and feedback inputs are also displayed. Press **5** and **6** **STAT** to view the identical analog values and discrete inputs and outputs for Circuit B. See Table 12 for a complete display.

Unit Analog Parameters and Temperature Reset — Press the **7** and **STAT** keys and scroll down to display the unit entering and leaving fluid temperatures as well as the temperature reset signal and calculated values.

Miscellaneous Inputs and Outputs — Pressing **8** **STAT** and scrolling down will reveal the On/Off status of the condenser fans (30GX only). Also found here are the Demand Limit settings, pump relay and switch status, and miscellaneous items such as Heat/Cool and Dual Set Point switch positions. See Table 12 for a complete list.

Modes — The operating modes are displayed to indicate the operating status of the unit at a given time. See Table 14 for a complete list of all modes.

To enter the MODES subfunction, press **9** **STAT** and use the **↓** key to view all current modes of operation. See Table 15.

Capacity Control — Pressing **10** **STAT**, this subfunction displays the load/unload factor, control point, and leaving water temperature. Scrolling down will also reveal the liquid level sensor values in degrees format.

Table 12 — Status Function and Subfunction Directory

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
1 Alarms	 	Alarm : xx Reset Alarms: 1 <ENTER>	
		All current alarms are displayed	Use  as needed
2 General Parameters	 	GENERAL PARAMETERS	
		Control Mode	Displays LOCAL ON/OFF or CCN ON/OFF
		Run Status Off/On	
		Occupied ? Yes/No	
		CCN Enable Off/On	
		CCN Chiller Start/Stop Start/Stop	
		Alarm State Normal/Alarm	
		Current Alarm 1 x.xx	
		Current Alarm 2 x.xx	
		Current Alarm 3 x.xx	
		Current Alarm 4 x.xx	
		Current Alarm 5 x.xx	
		Active Demand Limit xxx.x%	
		Percent Total Capacity xxx.x%	
		Water/Brine Setpoint xx.x dF	
		Control Point xx.x dF	
		Entering Fluid Temperature xx.x dF	
		Leaving Fluid Temperature xx.x dF	
		Emergency Stop Emstop	
		Minutes Left for Start xx min	
		Heat-Cool Status Heat/Cool	
3 Circuit A Analog Values	 	CIRCUIT A ANALOG VALUES	
		Total Capacity xxx.x%	
		Available Capacity xxx.x%	
		Discharge Pressure xxx.x PSI	
		Suction Pressure xxx.x PSI	
		A1 Oil Pressure Diff. xxx.x PSI	
		A2 Oil Pressure Diff. xxx.x PSI	
		A1 Oil Pressure xxx.x PSI	
		A2 Oil Pressure xxx.x PSI	
		Discharge Gas Temperature xxx.x dF	
		A1 Motor Temperature xxx.x dF	
		A2 Motor Temperature xxx.x dF	

See Legend on page 18.

Table 12 — Status Function and Subfunction Directory (cont)

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
3 Circuit A Analog Valves (cont)	↓	SAT Condensing Temp xxx.x dF	
	↓	Saturated Suction Temp xxx.x dF	
	↓	EXV Percent Open xxx.x%	
	↓	Motormaster Speed xxx.x%	
	↓	Water Valve Position xxx.x%	
	↓	Cooler Level Indicator x.xx	
	↓	CPM A1 Feedback x.x Volts	See Table 4.
	↓	CPM A2 Feedback x.x Volts	See Table 4.
	↓	Circuit A Econ Pressure xxx.x PSI	
4 Circuit A Discrete Inputs/Outputs	4 STAT	CIR. A DISCRETE OUTPUTS	
	↓	Compressor A1 Off/On	
	↓	Compressor A2 Off/On	
	↓	Loader A1 Off/On	
	↓	Loader A2 Off/On	
	↓	Minimum Load Valve A Off/On	
	↓	Circuit A Oil Heater Off/On	
	↓	A1 Mtr Cooling Solenoid Off/On	
	↓	A2 Mtr Cooling Solenoid Off/On	
	↓	Circuit A Oil Pump Off/On	
	↓	Oil Solenoid A1 Off/On	
	↓	Oil Solenoid A2 Off/On	
	↓	CIR. A DISCRETE INPUTS	
	↓	Circuit A Oil Switch Open/Close	
	↓	Compressor A1 Feedback Off/On	
	↓	Compressor A2 Feedback Off/On	
5 Circuit B Analog Values	5 STAT	CIRCUIT B ANALOG VALUES	
	↓	Total Capacity xxx.x%	
	↓	Available Capacity xxx.x%	
	↓	Discharge Pressure xxx.x PSI	
	↓	Suction Pressure xxx.x PSI	
	↓	B1 Oil Pressure Diff. xxx.x PSI	
	↓	B2 Oil Pressure Diff. xxx.x PSI	
	↓	B1 Oil Pressure xxx.x PSI	
	↓	B2 Oil Pressure xxx.x PSI	
	↓	Discharge Gas Temperature xxx.x dF	

Table 12 — Status Function and Subfunction Directory (cont)

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
5 Circuit B Analog Valves (cont)	↓	B1 Motor Temperature xxx.x dF	
	↓	B2 Motor Temperature xxx.x dF	
	↓	SAT Condensing Temp xxx.x dF	
	↓	Saturated Suction Temp xxx.x dF	
	↓	EXV Percent Open xxx.x%	
	↓	Motormaster Speed xxx.x%	
	↓	Water Valve Position xxx.x%	
	↓	Cooler Level Indicator x.xx	
	↓	CPM B1 Feedback x.x Volts	
	↓	CPM B2 Feedback x.x Volts	
	↓	Circuit B Econ Pressure xxx.x PSI	
6 Circuit B Discrete Inputs/Outputs	6 STAT	CIR. B DISCRETE OUTPUTS	
	↓	Compressor B1 Off/On	
	↓	Compressor B2 Off/On	
	↓	Loader B1 Off/On	
	↓	Loader B2 Off/On	
	↓	Minimum Load Valve B Off/On	
	↓	Circuit B Oil Heater Off/On	
	↓	B1 Mtr Cooling Solenoid Off/On	
	↓	B2 Mtr Cooling Solenoid Off/On	
	↓	Circuit B Oil Pump Off/On	
	↓	Oil Solenoid B1 Off/On	
	↓	Oil Solenoid B2 Off/On	
	↓	CIR. B DISCRETE INPUTS	
	↓	Circuit B Oil Switch Open/Close	
	↓	Compressor B1 Feedback Off/On	
	↓	Compressor B2 Feedback Off/On	
7 Unit Analog Parameters	7 STAT	UNIT ANALOG PARAMETERS	
	↓	Cooler Entering Fluid xx.x dF	
	↓	Cooler Leaving Fluid xx.x dF	
	↓	Condenser Entering Fluid xx.x dF	
	↓	Condenser Leaving Fluid xx.x dF	
	↓	Reclaim Entering Fluid xx.x dF	
	↓	Reclaim Leaving Fluid xx.x dF	
	↓	5 Volt Supply x.x Volts	

See Legend on page 18.

Table 12 — Status Function and Subfunction Directory (cont)

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
7 Unit Analog Parameters (cont)	↓	TEMPERATURE RESET	
	↓	4-20 mA Reset Signal xx.x mA	
	↓	Return Reset Signal xx.x dF	
	↓	External Reset Signal xx.x dF	
	↓	Outdoor Air Temp xx.x dF	
	↓	Calculated Reset xx.x dF	
8 Misc. Inputs/Outputs	8 STAT	MISC INPUTS/OUTPUTS	
	↓	FAN_1 Off/On	
	↓	FAN_2 Off/On	
	↓	FAN_3 Off/On	
	↓	FAN_4 Off/On	
	↓	FAN_5 Off/On	
	↓	FAN_6 Off/On	
	↓	DEMAND LIMIT	
	↓	4-20 mA Demand Signal xx.x mA	
	↓	Demand Switch 1 Off/On	
	↓	Demand Switch 2 Off/On	
	↓	CCN Loadshed Signal Normal/Alarm	
	↓	Max Allowable CAP xxx.x%	
	↓	PUMPS	
	↓	Cooler Pump Relay Off/On	
	↓	Cooler Pump Flow Switch Off/On	
	↓	Condenser Pump Relay Off/On	
	↓	Condenser Pump Flow Switch Off/On	
	↓	MISCELLANEOUS	
	↓	Ice Valve Off/On	
	↓	Ice Build Complete Yes/No	
	↓	Heat/Cool Switch Heat/Cool	
	↓	Dual Set point Switch Off/On	
	↓	Cooler Heater Off/On	
	↓	Options Temperature 1 xx.x dF	
	↓	Options Temperature 2 xx.x dF	
9 Operating Modes	9 STAT	MODES :MODE_TBL mode name ON/OFF	Only active modes displayed
	↓	LOCAL OFF	Scroll with down arrow key to display
	↓	CCN OFF	

Table 12 — Status Function and Subfunction Directory (cont)

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
9 Operating Modes (cont)		CLOCK OFF	
		LOCAL ON	
		CCN ON	
		CLOCK ON	
		DUAL SP ACTIVE (1st SP)	
		DUAL SP ACTIVE (2nd SP)	
		TEMPERATURE RESET ACTIVE	
		DEMAND LIMIT ACTIVE	
		LOAD LIMIT ACTIVE	
		LOW SOURCE TEMP PROTECT	
		RAMP LOADING ACTIVE	
		TIMED OVERRIDE ACTIVE	
		LOW COOLER SUCTION TEMP	
		WSM CONTROLLING	
		SLOW CHANGE OVERRIDE	
		OFF TO ON DELAY ACTIVE	
		FSM CONTROLLING	
		2 CHILLR LEAD LAG ACTIVE	
		2 CHILLR LL COMM FAILURE	
		CIR A LOW DISCHG SUPERHT	
		CIR B LOW DISCHG SUPERHT	
10 Capacity Control		CAPACITY CONTROL	
		Load/Unload Factor xxx.x%	
		Control Point xx.x dF	
		Leaving Water Temp xx.x dF	
		MISC. INDICATORS	
		Liquid Lvl Sensor Cir. A xx.x dF	
		Liquid Lvl Sensor Cir. B xx.x dF	

LEGEND

CCN — Carrier Comfort Network
CPM — Compressor Protection Module
dF — Degrees Fahrenheit
EXV — Electronic Expansion Valve
FSM — Flotronic™ System Manager
LL — Lead/Lag
SDT — Saturated Discharge Temperature
SP — Set Point
WSM — Water System Manager

Table 13 — Reading and Clearing Alarms

KEYPAD ENTRY	DISPLAY	COMMENT
1 STAT ↓ EXPN ↓ EXPN ↓ 1 ENTR	Alarm: 02 Reset Alarms: 1 <ENTER> Comp A1 Fail - 1.65 Sing Alarm : 15:12 04/15/96 Comp A1 Fail - 1.65 Single Ph Volts Low Alarm : 15:12 04/15/96 Compressor A1 Low Oil Pr Alarm : 10:34 04/15/96 Compressor A1 Low Oil Pressure Alarm : 10:34 04/15/96 Alarm: 02 Reset Alarms: 1 <ENTER> Alarm: 00 Reset Alarms: 1 <ENTER>	Press Reset button first Alarms reset and cleared

Table 14 — Operational and Mode Display Codes

CODE	DESCRIPTION
LOCAL OFF	Unit is off. LOCAL/OFF/REMOTE switch is in OFF position or LOCAL/OFF/REMOTE switch is in REMOTE position and remote contacts are open.
CCN OFF	Unit is off. LOCAL/OFF/REMOTE switch is in LOCAL position and CCN control is enabled (Stop state) or CCN is enabled (Stop state) with LOR switch in REMOTE position and remote contacts closed.
CLOCK OFF	Unit is off due to internal clock schedule. LOR switch is in LOCAL position.
LOCAL ON	Unit is on. LOR switch is in LOCAL position and CCN is disabled or LOR switch is in REMOTE position with contacts closed and CCN is disabled.
CCN ON	Unit is on due to CCN command. LOR switch is in LOCAL position and CCN is enabled (Run state) or LOR switch is in REMOTE position with contacts closed and CCN is enabled (Run state)
CLOCK ON	Unit is on due to internal clock schedule or occupied override function. LOR switch is in LOCAL position.
DUAL SP ACTIVE (1st SP)	Dual set point is in effect. In this mode, unit continues to run in an occupied condition, and leaving fluid set point is automatically controlled to the CSP1 set point in the SET function.
DUAL SP ACTIVE (2nd SP)	Dual set point is in effect. In this mode, unit continues to run in unoccupied condition, but leaving fluid set point is automatically increased to a higher level (CSP2 set point is in SET function).
TEMPERATURE RESET ACTIVE	Temperature reset is in effect. In this mode, unit is using temperature reset to adjust leaving fluid set point upward, and unit is currently controlling to the modified set point. The set point can be modified based on return fluid, outdoor-air temperature, or space temperature.
DEMAND LIMIT ACTIVE	Demand limit is in effect. This indicates that capacity of unit is being limited by demand limit control option. Because of this limitation, the unit may not be able to produce the desired leaving fluid temperature.
FSM CONTROLLING	Flotronic™ System Manager (FSM) is controlling the chiller.
RAMP LOADING ACTIVE	Ramp load (pulldown) limiting is in effect. In this mode, the rate at which leaving fluid temperature is dropped is limited to a predetermined value to prevent compressor overloading. See CRAMP set point in the SET function in Table 12. The pulldown limit can be modified, if desired, to any rate from .2° F to 2° F (.1° to 1° C)/minute.
TIMED OVERRIDE ACTIVE	Timed override is in effect. This is a 1 to 4 hour temporary override of the programmed schedule, forcing unit to occupied mode. Override can be implemented with unit under LOCAL/REMOTE or CCN control. Override expires after each use.
WSM CONTROLLING	Water System Manager is controlling the chiller.
SLOW CHANGE OVERRIDE	Slow change override is in effect. The leaving fluid temperature is close to and moving towards the control point.

CODE	DESCRIPTION
OFF TO ON DELAY ACTIVE	Chiller is being held off by Minutes Off Time found by keying 1 SET . Also, normal operation of the chiller includes a minimum 1.5 minute delay after a capacity stage change has been made. This delay is adjustable from 1.5 to 6 minutes.
LOAD LIMIT ACTIVE	This function determines the maximum allowable capacity that can be running and is accomplished through the Flotronic System Manager. The unit may not be able to produce the desired leaving fluid temperature.
2 CHILLR LEAD LAG ACTIVE	Future Use.
2 CHILLR LL COMM FAILURE	Future Use.
CIRCUIT A LOW DISCHARGE SUPERHT	If the circuit discharge superheat is less than 15° F (8.3° C), the capacity control routine will not add any stages (to either circuit). If the compressor has been running for at least 3 minutes, the EXV will not be opened any further. If the circuit discharge superheat is less than 10° F (5.6° C) and falling, the circuit EXV will be closed 50 steps every 10 seconds. If the discharge superheat is less than 5° F (2.8° C) and falling, a circuit loader will be deenergized every 30 seconds. The final stage will not be unloaded unless an alarm condition is present.
CIRCUIT B LOW DISCHARGE SUPERHT	See description for Circuit A above.
CIRCUIT A HIGH SCT	If the circuit is running and the Saturated Condensing Temperature (SCT) is greater than the Maximum Condensing Temperature Set point (MCT_SP) minus 12° F (6.7° C), the control will not add any stages. If the SCT is greater than the MCT_SP plus 5° F (2.8° C), the circuit will be unloaded and shut down if necessary. If the SCT is greater than the MCT_SP plus 2° F (1.1° C) for one minute, a loader will be deenergized. If the SCT is greater than the MCT_SP minus 4° F (2.2° C), the control will compare the maximum operating pressure set point (MOP_SP) with the modified MOP_SP (MOP_CTRL). If the MOP_CTRL is greater than the MOP_SP, the mode will be cleared. Otherwise the control will display the high SCT override mode. The capacity control routine will not add any stages. If the circuit is at its lowest capacity, this mode will be ignored.
CIRCUIT B HIGH SCT	See description for Circuit A above.

LEGEND

CCN — Carrier Comfort Network
LOR — Local/Off/Remote
WSM — Water System Manager

Table 15 — Reading Current Operating Modes

KEYPAD ENTRY	DISPLAY
9 STAT	MODES :MODE_TBL CCN ON
↓	DEMAND LIMIT ACTIVE

TEST FUNCTION — The test function operates the diagnostic program. To initiate the test function, the LOCAL/OFF/REMOTE switch must be in the OFF position.

To reach a particular test, press its subfunction number followed by the **ENTR** key then scroll to the desired test by pressing the down arrow key. Refer to Table 16 for a complete description of the test function.

To start a test of discrete outputs, press **1** **ENTR**. To end the test, simply press the **↓** key or press **0** **ENTR**. Pressing the **↓** key after a test has started advances the system to the next test, whether the current test is operating or has timed out. Circuit A discrete outputs can be tested in **1** **TEST** and include loaders, minimum load valve valve and oil heater (if equipped), motor cooling solenoids, oil pump, and oil solenoids. Similarly, Circuit B discrete outputs can be tested in **2** **TEST**. Additional discrete outputs, including condenser fans, cooler heater, water pumps, and remote alarms can be tested in **3** **TEST**.

Press **4** **TEST** to access Valves and Motormaster® analog outputs. Scroll down to display Circuit A EXV Valve with a target percent of 0%. Press **1** **ENTR** to step the EXV to 25%. Pressing **1** **ENTR** three additional times will move the EXV to 50%, 75%, and 100%. The EXV may be closed in 25% steps by pressing **0** **ENTR** for each desired step. Wait 30 seconds between each step when opening and closing for the valve to stop moving. Pressing the down arrow will display Circuit B EXV Valve and it is tested in the same manner as Circuit A. Also available for test are Circuit A water valve (if equipped) and the Circuit A and B Fan speed % (direct control Motormaster device) outputs for 30GX chillers. These are tested in the same manner as the EXV valves.

While the unit is in test, you may leave the test function and access another display or function by pressing the appropriate keys. However, a component that is operating when another function is accessed remains operating. You must re-enter the test function and press **0** **ENTR** to shut down the component. Components with a timed operating limit time out normally even if another function is accessed.

Since the Test function checks only certain outputs, it is a good practice to also check all inputs and outputs accessible through the status function. These can be located by pressing **3** through **8** **STAT**. If keypad is not used for 10 minutes, the unit automatically leaves the test function and resumes the normal rotating display. See Table 17.

HISTORY FUNCTION — Pressing **1** **HIST** displays total machine operating hours. Scroll down to display machine run time and starts, and total run time and starts for each compressor. Refer to Table 18 for a complete description of the function.

Pressing **2** and **HIST** displays the last 10 alarms along with a description and time and date of occurrence of each alarm.

SET POINT FUNCTION — Set points are entered through the keypad. Set points can be changed within the upper and lower limits, which are fixed. The ranges are listed below. Refer to Table 19 for a complete description of the function.

Cooling Set Point 1,2

Water:	Medium Temperature Brine:	Low Temperature Brine:
38 to 70 F (3.3 to 21.1 C)	14 to 70 F (-10 to 21.1 C)	-13 to 70 F (-25 to 21.1 C)

Reset Set Points

Maximum Reset Range:	External Temperature Reset:	Chiller Fluid Δ: 0° to 15 F (0° to 8 C)
-30 to 30 F (-17 to 17 C)	-40 to 240 F (-40 to 118 C)	
External Signal Reset 4 to 20 mA		

Demand Limit Set Points

Switch Input: Step 1 — 0 to 100% Capacity Reduction
Step 2 — 0 to 100% Capacity Reduction
External Signal: Maximum Demand Limit 4 to 20 mA
Minimum Demand Limit 4 to 20 mA
Loadshed Demand Delta: 0 to 60%
Maximum Loadshed Time: 0 to 120 min.

Head Pressure Set Points

Air cooled chillers (30GX): 80 to 135 F (26.7 to 57.2 C)
Water cooled chillers (30HX): 80 to 128 F (26.7 to 53.3 C)

Set Point Table — The unit operating set points can be found under **1** **SET**. Use the down arrow key to scroll through the set points. The first set point is Cool Set Point 1. This is the occupied chilled fluid set point. Scroll down to Cool Set Point 2 and then to the Cooling Ramp load multiplier which is configurable from 0.2 to 2.0° F/min. (0.11 to 1.1° C/min.). This value is the maximum rate at which the leaving fluid temperature is allowed to drop without adding a stage. Cooling Set Point 2 is used in conjunction with the dual set point switch function. This is used as the low temperature set point for ice duty or as the unoccupied set point. Press the down arrow key to display the Circuit A and B head pressure set points. The remaining set points in this subfunction include Demand Limit, LCW (leaving chilled water) Delta alarm limit, Minutes off time and motor temperature set point.

Display Units — Press **2** **SET** to display the units of measure being used. Type 0 is for English and type 1 is for Metric.

Address — For CCN configurations, press **3** **SET** and scroll down to display the address and bus number of the chiller.

Time — Press **4** **SET** and scroll down to read and change the unit day of week, time, day of month, month of year and year of century. See the examples in Table 19 for making changes to these values.

CCN Enable/Disable — Press **5** **SET** to enable or disable

CCN control of the chiller. Press **1** **ENTR** to enable, **0** **ENTR** to disable.

Reading and Changing Set Points — Table 20 shows how to read and change the chilled fluid set point. Other set points can be changed by following the same procedure. Refer to Table 19 for the sequence of display of set points in each subfunction.

Table 16 —Test Function and Subfunction Directory

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
1 Circuit A Discrete Output	 	Circuit A Discrete Output Loader A1 Relay is OFF	Similarly, use   to test remaining outputs. Press the down arrow key or   to turn an output off.
	 	Loader A1 Relay is ON	
		Loader A2	
		Minimum Load Valve A	
		Circuit A Oil Heater	
		A1 Mtr. Cooling Solenoid	
		A2 Mtr. Cooling Solenoid	
		Circuit A Oil Pump	
		Oil Solenoid A1	
		Oil Solenoid A2	
			NOTE: Output will display Relay is ABSENT when not configured
2 Circuit B Discrete Outputs	 	Circuit B Discrete Outputs	Similarly, use   to test remaining outputs. Press the down arrow key or   to turn the output off.
		Loader B1 Relay is OFF	
	 	Loader B1 Relay is ON	
		Loader B2	
		Minimum Load Valve B	
		Circuit B Oil Heater	
		B1 Mtr. Cooling Solenoid	
		B2 Mtr. Cooling Solenoid	
		Circuit B Oil Pump	
		Oil Solenoid B1	
			NOTE: Output will display Relay is ABSENT when not configured
3 Unit Discrete Output	 	Unit Discrete Output Fan 1 Relay is OFF	Similarly use   to test remaining outputs. Press the down arrow key or   to turn output off.
	 	Fan 1 Relay is ON	
		Fan 2	
		Fan 3	
		Fan 4	
		Fan 5	
		Fan 6	
		Cooler Pump	
		Condenser Pump	
		Cooler Heater	
		Alarm	
		Remote Alarm 1	
			Currently not supported.

Table 16 —Test Function and Subfunction Directory (cont)

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
3 Unit Discrete Output (cont)		Remote Alarm 2	Currently not supported.
		Remote Alarm 3	Currently not supported.
		Remote Alarm 4	Currently not supported.
		Remote Alarm 5	Currently not supported.
		Remote Alarm 6	Currently not supported.
		Remote Alarm 7	Currently not supported.
		Remote Alarm 8	Currently not supported.
		Remote Alarm 9	Currently not supported.
		Remote Alarm 10	Currently not supported.
		Remote Alarm 11	Currently not supported.
		Remote Alarm 12	Currently not supported.
		Remote Alarm 13	Currently not supported.
		Remote Alarm 14	Currently not supported.
		Remote Alarm 15	Currently not supported.
		Remote Alarm 16	Currently not supported.
4 Valves and Motormaster		Valves and Motor Master Circuit A EXV Valve Target Percent = 0%	Step in 25% increments. Wait 30 seconds between each step for valve to stop moving. Valve may be closed in 25% increments by keying in . Wait 30 seconds between each step for valve to stop moving.
		Circuit A EXV Valve Target Percent = 25%	
		Circuit A EXV Valve Target Percent = 50%	
		Circuit A EXV Valve Target Percent = 75%	
		Circuit A EXV Valve Target Percent = 100%	Test same method as for Circuit A Test same method as for EXV valves Test same method as for EXV valves Test same method as for EXV valves
		Circuit B EXV Valve Target Percent = 0%	
		Circuit A Water Valve Target Percent = 0%	
		Circuit A% Fan Speed	
		Circuit B% Fan Speed	Test same method as for EXV valves

LEGEND

EXV — Electronic Expansion Valve

Table 17 — Using Test Function

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
	Circuit A Discrete Output Loader A1 Relay is OFF	Appears on screen momentarily, then will switch to Loader A1.
	Loader A1 Relay is ON	Compressor Loader A1 solenoid energized
	Loader A1 Relay is OFF	Compressor Loader A1 solenoid deenergized
	Valves and Motor Master Circuit A EXV Valve Target Percent = 0%	Continue pressing to step to 50%, 75%, and 100%.
	Circuit A EXV Valve Target Percent = 25%	
	Circuit A EXV Valve Target Percent = 0	Continue pressing to step closed.

LEGEND

EXV — Electronic Expansion Valve

Table 18 — History Function and Subfunction Directory

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
1 Operating Hours	 	Machine Operating Hours xxx.x hours	
		Machine Starts xxx	
		Circuit A	
		Operating Hours xxx.x hours	
		Compressor A1 Hours xxx.x hours	
		Compressor A2 Hours xxx.x hours	
		Starts	
		Compressor A1 Starts xxx	
		Compressor A2 Starts xxx	
		Circuit B	
		Operating Hours xxx.x hours	
		Compressor B1 Hours xxx.x hours	
		Compressor B2 Hours xxx.x hours	
		Starts	
		Compressor B1 Starts xxx	
		Compressor B2 Starts xxx	
2 Alarm History	 	Previous Alarm 1 - description Alarm description, time/day of occurrence	Lists 10 most recent alarms. Use  key when necessary
		Previous Alarm 2 - description Alarm description, time/day of occurrence	
		Previous Alarm 3 - description Alarm description, time/day of occurrence	
		Previous Alarm 4 - description Alarm description, time/day of occurrence	
		Previous Alarm 5 - description Alarm description, time/day of occurrence	
		Previous Alarm 6 - description Alarm description, time/day of occurrence	
		Previous Alarm 7 - description Alarm description, time/day of occurrence	
		Previous Alarm 8 - description Alarm description, time/day of occurrence	
		Previous Alarm 9 - description Alarm description, time/day of occurrence	
		Previous Alarm 10- description Alarm description, time/day of occurrence	

Table 19 — Set Point Function and Subfunction Directory

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
1 Set Point Table	1 SET	COOLING	
	↓	Cool Setpoint 1 xx.x dF	Default: 44.0
	↓	Cool Setpoint 2 xx.x dF	Default: 44.0
	↓	Cooling Ramp Loading xx.x dF	Default: 0.5
	↓	HEATING	NOT SUPPORTED
	↓	Heat Setpoint 1 xx.x dF	NOT SUPPORTED Default: 98.0
	↓	Heat Setpoint 2 xx.x dF	NOT SUPPORTED Default: 98.0
	↓	Heating Ramp Loading xx.x dF	NOT SUPPORTED Default: 0.5
	↓	HEAD PRESSURE	
	↓	Head Pressure Setpoint A xxx.x dF	Default: 113.0 (GX) 100.0 (HXA,C)
	↓	Head Pressure Setpoint B xxx.x dF	Default: 113.0 (GX) 100.0 (HXA,C)
	↓	DEMAND LIMIT	
	↓	Demand Switch 1 Setpoint xxx.x%	Default: 80.0%
	↓	Demand Switch 2 Setpoint xxx.x%	Default: 50.0%
	↓	LCW Delta Alarm Limit xxx.x dF	Default: 50.0 dF
	↓	Minutes Off Time xxx min	Default: 0 min
	↓	Motor Temp Set Point xxx.x dF	Default: 200.0 dF
2 Units	2 SET	US IMPERIAL/METRIC 0	0 = English (Default) 1 = Metric
3 Address	3 SET	TARGET ADDRESS x	Default: 1
	↓	TARGET BUS NUMBER x	Default: 0
4 Time	4 SET	Day of Week Monday	Mon=1, Tues=2, etc.
	3 ENTR	Day of Week Wednesday	Day of week set
	↓	TIME (HOUR:MIN) 00:00	Enter military format
	1 0 . 3 0 ENTR	TIME (HOUR:MIN) 10:30	Time of day set
	↓	DAY OF MONTH xx	
	2 0 ENTR	DAY OF MONTH 20	Day of month set
	↓	MONTH OF YEAR xx	
	0 5 ENTR	MONTH OF YEAR 05	Month of year set
	↓	YEAR OF CENTURY xx	
	9 6 ENTR	YEAR OF CENTURY 96	Year of century set
5 CCN Disable	5 SET	Disable CCN Control x	0=no, 1=yes Default: 0

LEGEND

CCN — Carrier Comfort Network
LCW — Leaving Chilled Water

NOTE: If metric option is selected under **2** **SET**, temperature will be expressed in degrees Celsius and pressures will be expressed in kPa.

Table 20 — Reading and Changing Chilled Fluid Set Point

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
[1] [SET]	COOLING	Change set point from default to 48 F.
[↓]	Cool Set point 1 44.0 F default	
[4] [8] [ENTR]	Cool Set point 1 48.0 F	Set point change complete

SERVICE FUNCTION — This function allows the technician to view and input configuration data. Factory configuration data, field configuration data, and service configuration data may be viewed or entered through the keypad and display module. See Table 21 for a complete listing of configurable items. Whenever a processor module is replaced in the field, the complete list of configuration codes must be entered. The current software version can be displayed. See Table 22.

Scroll down in this function to display configuration information including number of compressors, tonnage, and compressor must trip amps.

Password Protection of HSIO Configurable Service Points

— To modify configurations, values and to use the manual control subfunction, the password will need to be entered before the first change can be made. For example, the factory default for Lead/Lag configuration is automatic (control decides which circuit to start first). Follow the procedure in Table 23 to change this so that Circuit A leads. The password is set to [1][1][1][1].

Options Configuration Tables 1 and 2 — These subfunctions can be accessed by pressing [2] or [3] [SRVC] and scrolling down to display the configuration options. See Table 21 for a complete list of these options.

Temperature Reset, Demand Limit and Head Pressure PID

Configurations — Press [4] [SRVC] and scroll down to view the configuration information. See Table 21 for a complete list.

Factory Configuration Codes — Pressing [5] [SRVC] allows entry into the factory and service configuration codes

subfunction. Under this subfunction, there are 5 configuration codes that are downloaded at the factory. Each code is made up of 8 digits. If the processor module is replaced in the field, these 5 configuration codes should be checked using the keypad and HSIO display module. See Table 24 for a description of the factory configuration codes (codes 1 through 3) and service configuration codes (codes 4 and 5).

The factory and service configuration codes are found by pressing [5] [SRVC]. These are preset from the factory. They can be verified by following the description in Table 24. These codes **MUST** be entered in the field if the PSIO-1 module is replaced. A label is applied to a control box panel with a list of factory and service codes for particular units. Table 25 will configure a new PSIO-1 module for use in a 30HXC-106---501CA water cooled chiller.

SCHEDULE FUNCTION — This function provides a means to automatically switch the chiller from an occupied mode to an unoccupied mode. Refer to Table 26 for a complete description of the function.

The schedules consist of 8 user-configurable occupied time periods. The control supports time schedules for local control, remote control and ice building. These time periods can be flagged to be in effect or not in effect on each day of the week. The day begins at 00.00 and ends at 24.00. The machine is in unoccupied mode unless a scheduled time period is in effect. If an occupied period is to extend past midnight, it must be programmed in the following manner: occupied period must end at 24:00 hours (midnight); a new occupied period must be programmed to begin at 00:00 hours.

NOTE: This is true only if the occupied period starts at 00:00 (midnight). If the occupied period starts at a time other than midnight, then the occupied period must end at 24:00 hours (midnight) and new occupied period must be programmed to start at 00:00 in order for the chiller to stay in the occupied mode past midnight. Each time schedule can be overridden to keep the chiller in an Occupied mode for 1, 2, 3 or 4 hours on a one-time basis.

Table 21 — Service Function and Subfunction Directory

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
1 Service Configuration		Software CESR_500100 Ver xxx	
		Unit Type x	1 = Air-cooled, 2 = Water-cooled 3 = Split system
		Number of Cir A Comp x	
		Compressor A1 Tonnage xx	
		Compressor A2 Tonnage xx	
		Oil Switch Configuration x	
		Number of Cir B Comp x	
		Compressor B1 Tonnage xx	
		Compressor B2 Tonnage xx	
		Max. Cond. Temp Setpoint xxx.x dF	30GX = 154 F (68 C) 30HXA = 152 F (67 C) 30HXC = 122 F (50 C)
		MOP Set point xx.x dF	Default = 52 F (11.1 C)
		Fan Staging Select x	Displays "Not Used" or a number. See Table 6
		CPM Board Used? Yes	
		Compr. A1 Must Trip Amps xxx.x	Verify with Appendix A
		Compr. A2 Must Trip Amps xxx.x	Verify with Appendix A
		Compr. B1 Must Trip Amps xxx.x	Verify with Appendix A
		Compr. B2 Must Trip Amps xxx.x	Verify with Appendix A
2 Options Configuration 1		Cooler Fluid Select x	1 = Water (Default), 2 = Medium Temp Brine 3 = Low Temp Brine (HX only)
		Min. Load Valve Select x	Displays Enable/Dsable Default: Dsable
		Loading Sequence Select x	1 = Equal circuit, 2 = Staged circuit Default: 2
		Lead/Lag Sequence Select x	1 = Automatic (Default), 2 = Circuit A leads, 3 = Circuit B leads
		Head Press. Control Type x	0 = None (Default, HX), 1 = Air cooled (Default, GX), 2 = Water cooled
		Motormaster Select x	0 = None (Default), 1 = Direct control
		Water Valve Type x	0 = None (Default), 1 = 4-20 mA, 2 = 0-10 V, 3 = 20-4 mA, 4 = 10-0 V
		Ext. Reset Sensor Select x	0 = Space Temp Thermistor (Default) 1 = Outside Air Thermistor
		Cooler Pump Interlock x	0 = No interlock 1 = Interlock enabled (Default)
		Cooler Pump Control x	0 = Not controlled 1 = On/Off Control (Default)
		Condenser Pump Control x	0 = Not controlled (Default) 1 = On/Off Control 2 = Off when stages equal 0 (unit off)
		Condenser Flow Switch x	Displays Enable/Dsable Default: Dsable
		Condenser Water Sensors x	0 = Not used (Default), 1 = Used
		Heat Reclaim Sensors x	0 = Not used (Default), 1 = Used
3 Options Configuration 2		OPTIONS 2	
		Cooling Setpoint Select x	0 = Single set point (Default), 1 = Dual set point (switch controlled), 2 = Dual set point (clock controlled)
		Heating Setpoint Select x	0 = Single set point (Default), 1 = Dual set point (switch controlled), 2 = Dual set point (clock controlled) CURRENTLY NOT SUPPORTED

Table 21 — Service Function and Subfunction Directory (cont)

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
3 Options Configuration 2 (cont)		Ramp Load Select x	0 = Disabled, 1 = Enabled (Default)
		Clock Control Select x	0 = No clock control (Default) 1 = Local clock control 65 = CCN Clock Control
		Ice Configuration Select x	0 = Disabled (Default) 1 = Clock Control 2 = Demand Limit Control
		OAT Sensor Select x	0 = Disabled, 1 = Enabled Default: 0
		Remote Alarm Select x	0 = Disabled, 1 = Enabled Default: 0
		Alarm Reset Select x	0 = Not selected, 1 = Selected (Default, allows use of LOR switch to reset alarms)
		Close Control Select x	0 = Disabled, 1 = Enabled Default: 0
		Deadband Multiplier x.x	Default: 1.0
		Current Unbalance Alarm x	0 = Disabled, 1 = Enabled Default: 1
		Voltage Unbalance Alarm x	0 = Disabled, 1 = Enabled Default: 1
4 Reset Configuration Table		COOLING RESET TYPE 1	
		Degrees Reset at 20 mA xx.x dF	Default: 0
		COOLING RESET TYPE 2	
		Remote temp=No Reset xx.x dF	Default: 20
		Remote temp=Full Reset xx.x dF	Default: 125
		Degrees Reset xx.x dF	Default: 0
		COOLING RESET TYPE 3	
		CHW Delta T=No Reset xx.x dF	Default: 15
		CHW Delta T=Full Reset xx.x dF	Default: 0
		Degrees Reset xx.x dF	Default: 0
		COOLING RESET	
		Select/Enable Reset Type x	0 = No Reset (Default) , 1 = 4-20 mA Reset, 2 = External reset, 3 = Return Fluid reset
		HEATING RESET TYPE 1	CURRENTLY NOT SUPPORTED
		Degrees Reset at 20 mA xx.x dF	Default: 0
		HEATING RESET TYPE 2	CURRENTLY NOT SUPPORTED
		Remote temp=No Reset xx.x dF	Default: 125
		Remote temp=Full Reset xx.x dF	Default: 20
		Degrees Reset xx.x dF	Default: 0
		HEATING RESET TYPE 3	CURRENTLY NOT SUPPORTED
		HTW Delta T=No Reset xx.x dF	Default: 15
		HTW Delta T=Full Reset xx.x dF	Default: 0
		Degrees Reset xx.x dF	Default: 0
		HEATING RESET	
		Select/Enable Reset Type x	0 = No Reset (Default), 1 = 4-20 mA reset, 2 = External reset, 3 = Return Fluid reset
		DEMAND LIMIT	
		Demand Limit at 20 mA xxx.x%	Enter 0-100, Default: 0%

Table 21 — Service Function and Subfunction Directory (cont)

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
4 Reset Configuration Table (cont)		Demand Limit Select x	0 = None (Default), 1 = Two step switch, 2 = 4-20 mA, 3 = CCN Loadshed
		Loadshed Group Number x	0-99, Default: 0
		Loadshed Demand Delta xxx%	0-60%,Default: 0
		Maximum Loadshed Time xx min	0-120 min, Default: 60 min
		WATER VALVE PID	
		Proportional PID Gain x.x	Default = 1.0 Adjustable from -20.0 to 20.0
		Integral PID Gain x.x	Default = 1.0 Adjustable from -20.0 to 20.0
		Derivative PID Gain x.x	Default = 1.0 Adjustable from -20.0 to 20.0
		AIR MOTOR MASTER PID	
		Proportional PID Gain x.x	Default = 1.0 Adjustable from -20.0 to 20.0
		Integral PID Gain x.x	Default = 1.0 Adjustable from -20.0 to 20.0
		Derivative PID Gain x.x	Default = 1.0 Adjustable from -20.0 to 20.0
5 Factory Configuration Codes		FACTORY CODES	
		Configuration Code 1 xxxxxxx	Factory set. See Table 24.
		Configuration Code 2 xxxxxxx	Factory set. See Table 24.
		Configuration Code 3 xxxxxxx	Factory set. See Table 24.
		SERVICE CODES	
		Configuration Code 4 xxxxxxx	Factory set. See Table 24.
		Configuration Code 5 xxxxxxx	Factory set. See Table 24.
6 NOT USED			
7 Transducer Calibration		CALIBRATION OFFSET	
		CIRCUIT A PRESSURE	
		Discharge Pressure xxx.x PSI	
		Suction Pressure xxx.x PSI	
		A1 Oil Pressure xxx.x PSI	
		A2 Oil Pressure xxx.x PSI	
		Economizer Pressure xxx.x PSI	
		CALIBRATION OFFSET	
		CIRCUIT B PRESSURE	
		Discharge Pressure xxx.x PSI	
		Suction Pressure xxx.x PSI	
		B1 Oil Pressure xxx.x PSI	
		B2 Oil Pressure xxx.x PSI	
		Economizer Pressure xxx.x PSI	
		Calibrate All at 0 PSIG No	
		Last Calibration Date mmm dd - yy	

See Legend on page 30.

Table 21 — Service Function and Subfunction Directory (cont)

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
8 Manual Control Table	8 SVC	Manual Control Enable Dsable	LOR switch should be in OFF position
	1 ENTR	Password Protected Enter:	Will be displayed if not entered earlier in current HSIO use
	1 1 1 1 ENTR	Manual Control Enable Dsable	
	1 ENTR	Manual Control Enable Enable	Switch LOR switch to Local before proceeding
	↓	Circuit A Compressor 1 Off	
	1 ENTR	Circuit A Compressor 1 On	Provided no alarms exist, control will attempt circuit start within 2 minutes. Press 0 ENTR to stop circuit.
	↓	Circuit A Compressor 2 Off	1 ENTR to enable, 0 ENTR to stop
	↓	Circuit A Loader 1 Off	1 ENTR to enable, 0 ENTR to stop
	↓	Circuit A Loader 2 Off	1 ENTR to enable, 0 ENTR to stop
	↓	Circuit A Min Load Valve Off	1 ENTR to enable, 0 ENTR to stop
	↓	Circuit B Compressor 1 Off	1 ENTR to enable, 0 ENTR to stop
	↓	Circuit B Compressor 2 Off	1 ENTR to enable, 0 ENTR to stop
	↓	Circuit B Loader 1 Off	1 ENTR to enable, 0 ENTR to stop
	↓	Circuit B Loader 2 Off	1 ENTR to enable, 0 ENTR to stop
	↓	Circuit B Min Load Valve Off	1 ENTR to enable, 0 ENTR to stop

LEGEND

CCN — Carrier Comfort Network
 CHW — Chilled Water
 CPM — Compressor Protection Module
 HSIO — Standard Keypad
 LOR — Local/Off/Remote
 MOP — Maximum Operating Pressure
 OAT — Outdoor-Air Temperature
 PID — Proportional Integral Derivative

Table 22 — Displaying Current Software Version

FUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
Software Version	1 	Software CESR_500100 Ver XXX	Carrier Software Part Number, where XXX is the revision number.

Table 23 — Compressor Lead/Lag Configuration

SUB-FUNCTION	KEYPAD ENTRY	DISPLAY
Options Configuration 1	 	Cooler Fluid Select 1
		Min. Load Valve Select Dsable
		Loading Sequence Select 1
		Lead/Lag Sequence Select 1
	 	PASSWD PROTECTED FUNC Enter Password:
	    	Lead/Lag Sequence Select 0
	 	Lead/Lag Sequence Select 2

NOTE: Configurations may be modified at this time. The password will only be required to be entered once. After a period of 10 minutes of no HSIO activity, the user will be automatically logged out and the control will require that the password be entered on the next use.

Table 24 — Factory and Service Configuration Code Values

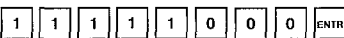
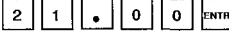
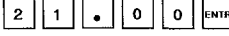
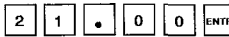
UNIT MODEL NUMBER	CONF. CODE 1*	CONF. CODE 2	CONF. CODE 3	CONF. CODE 4	CONF. CODE 5
30GX080	11460010	13900000	00000170	15400521	12000093
30GX090,105	11560010	13900000	00000180	15400521	12000093
30GX115	11660010	13900000	00000190	15400521	14000095
30GX125	11660010	14600000	00000161	15400521	14000095
30GX135	11660010	15600000	00000162	15400521	14000095
30GX150	11560010	18000000	00000095	15400521	16000097
30GX160	11660010	18000000	00000105	15400521	16000097
30GX175	11800010	18000000	00000119	15400521	07000088
30HXA076	31390010	13900000	00000183	15200521	00000061
30HXA086	31460010	13900000	00000190	15200521	00000061
30HXA096	31560010	13900000	00000200	15200521	00000061
30HXA106	31660010	13900000	00000210	15200521	00000061
30HXA116	31660010	14600000	00000181	15200521	00000061
30HXA126	31660010	15600000	00000182	15200521	00000061
30HXA136	31800010	15600000	00000196	15200521	00000061
30HXA146	31800010	16600000	00000197	15200521	00000061
30HXA161	31800010	15600000	00000196	15200521	00000061
30HXA171	31660010	18000000	00000125	15200521	00000061
30HXA186	31800010	18000000	00000139	15200521	00000061
30HXC076	21390010	13900000	00000173	12200521	00000058
30HXC086	21460010	13900000	00000180	12200521	00000058
30HXC096	21560010	13900000	00000190	12200521	00000058
30HXC106	21660010	13900000	00000200	12200521	00000058
30HXC116	21660010	14600000	00000171	12200521	00000058
30HXC126	21660010	15600000	00000172	12200521	00000058
30HXC136	21800010	15600000	00000186	12200521	00000058
30HXC146	21800010	16600000	00000187	12200521	00000058
30HXC161	21800010	15600000	00000186	12200521	00000058
30HXC171	21660010	18000000	00000115	12200521	00000058
30HXC186	21800010	18000000	00000129	12200521	00000058

*Unit Type will be listed as air cooled, water cooled, or remote split system. Unit type is first digit in Configuration Code 1 and is 1 for 30GX units, 2 for 30HXC units, and 3 for 30HXA cooling only chillers. For other options, see Table 21 under the Service subfunction. A label listing configuration codes is located on the control box door/panel.

Table 25 — Entering Configuration Codes

KEYPAD ENTRY	DISPLAY RESPONSE
5 	FACTORY CODES
	Configuration Code 1 00000000
2 1 6 6 0 0 1 0 	Configuration Code 1 21660010
	Configuration Code 2 00000000
1 3 9 0 0 0 0 0 	Configuration Code 2 13900000
	Configuration Code 3 00000000
0 0 0 0 0 2 0 0 	Configuration Code 3 00000200
	SERVICE CODES
	Configuration Code 4 00000000
1 2 2 0 0 5 2 1 	Configuration Code 4 12200521
	Configuration Code 5 00000000
0 0 0 0 0 0 5 8 	Configuration Code 5 00000058

Table 26 — Schedule Function and Subfunction Directory

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
1 Ice Build Schedule*	 	SCHEDULES: OCCPC01S Timed Override: 00	Extended Occupied Time
	 	SCHEDULES: OCCPC01S Timed Override: 02	Two hour override entered
		MTWTFSSH OCC UNOCC 01- 00000000 00:00 00:00	Displays current stored schedule (First 2 numbers are schedule, 01-08)
	 	MTWTFSSH OCC UNOCC 01- 11111000 00:00 00:00	Monday-Friday now occupied
	 	MTWTFSSH OCC UNOCC 01- 11111000 21:00 00:00	Occupied time now set
	 	MTWTFSSH OCC UNOCC 01- 11111000 21:00 06:30	Unoccupied time now set Ice Build schedule completed
		MTWTFSSH OCC UNOCC 02- 00000000 00:00 00:00	Can enter up to 7 additional ice build schedules
2 Local Schedule†	 	SCHEDULES: OCCPC02S Timed Override: 00	Extended Occupied Time
		MTWTFSSH OCC UNOCC 01- 00000000 00:00 00:00	Displays current stored schedule (First 2 numbers are schedule, 01-08)
	 	MTWTFSSH OCC UNOCC 01- 11111000 00:00 00:00	Monday-Friday now occupied
	 	MTWTFSSH OCC UNOCC 01- 11111000 06:30 00:00	Occupied time now set
	 	MTWTFSSH OCC UNOCC 01- 11111000 06:30 21:00	Unoccupied time now set Local schedule completed
		MTWTFSSH OCC UNOCC 02- 00000000 00:00 00:00	Can enter up to 7 additional local schedules
3 Remote Schedule	 	SCHEDULES: OCCPC65S Timed Override: 00	Extended Occupied Time
		MTWTFSSH OCC UNOCC 01- 00000000 00:00 00:00	Displays current stored schedule (First 2 numbers are schedule, 01-08)
	 	MTWTFSSH OCC UNOCC 01- 11111000 00:00 00:00	Monday-Friday now occupied
	 	MTWTFSSH OCC UNOCC 01- 11111000 06:30 00:00	Occupied time now set
	 	MTWTFSSH OCC UNOCC 01- 11111000 06:30 21:00	Unoccupied time now set Remote schedule completed
		MTWTFSSH OCC UNOCC 02- 00000000 00:00 00:00	Can enter up to 7 additional remote schedules
4 Holiday Configuration	 	HOLIDAYS : HOLDY_01 Starts on 00/00 00 days	Can configure holiday start day and duration
	 	HOLIDAYS : HOLDY_01 Starts on 12/23 00 days	Holiday duration set
	 	HOLIDAYS : HOLDY_01 Starts on 12/23 10 days	
5-33 Holiday Configuration	 through   	HOLIDAYS : HOLDY_02 Starts on 00/00 00 days	Allows configuration of 29 additional holiday periods

*Ice configuration select must be set to 1 for clock control.

†Clock control select must be set to 1 for clock control.

Temperature Reset — The control system is capable of providing leaving fluid temperature reset based on return fluid temperature. Because the temperature difference between leaving and return temperature is a measure of the building load, return fluid temperature reset is essentially an average building load reset method.

Under normal operation, the chiller maintains a constant leaving fluid temperature approximately equal to the chilled fluid set point. As building load drops from 100% down to 0%, entering cooler fluid temperature drops in proportion to load. Thus, the temperature drop across the cooler drops from a typical 10° F (5.5° C) at full load to a theoretical 0° F (0° C) at no load. See Fig. 8.

At partial load, leaving chilled fluid temperature may be lower than required. If this is allowed to increase (reset), the efficiency of the chiller increases. Amount of reset can be defined as a function of cooler temperature drop. This is a simple linear function that requires 3 pieces of input data for the set function that will vary depending on measurement method used as follows (see Table 27).

NOTE: Reset set points are not accessible unless the reset function is enabled first. The Control Point will be recalculated taking into account the set point plus the amount of reset. This is done as a field configuration. Select one of the 3 choices for type of reset: Return Fluid Reset, External Temperature Reset, or 4 to 20 mA Signal Reset. See Table 27.

If dual set point control is enabled, the amount of reset is applied to whichever set point is in effect at the time.

Tables 28-30 demonstrate how to activate reset.

EXTERNAL TEMPERATURE RESET — In this example, the unit set point is reset from full load at 90 F (32 C) to a maximum reset value of 10° F (5.5° C) at 25 F (–6.7 C) outdoor ambient. This means that if the chilled fluid set point is 44 F (6.7 C), there is no reset if the temperature is 90 F (32 C). At a temperature of 25 F (–6.7 C), the chilled fluid set point would be reset to 54 F (12.2 C). See Fig. 8 and Table 28.

INTERNALLY POWERED RESET (4 to 20 mA) — In this example, the unit set point is reset from full load at 4 mA to a maximum reset value of 10° F (5.5° C) at 20 mA. See Fig. 9 and Table 29.

RETURN FLUID TEMPERATURE RESET — In this example, the unit set point is reset from full load based on the chilled fluid return temperature. The example uses a reset value of 10 degrees at full reset. Full reset is at a 2-degree temperature difference across the cooler and no reset would be at a 10° F difference across the cooler. See Fig. 10 and Table 30.

Demand Limit — Demand Limit is a feature that allows the unit capacity to be limited during periods of peak energy usage. There are 3 types of Demand Limit which can be configured. The first type is through 2 switch inputs, which will reduce the maximum capacity to 2 user-configurable percentages. The second type is by a 4 to 20 mA signal input which will reduce the maximum capacity linearly between 100% at a 4 mA input signal (no reduction) down to the user-configurable level at a 20 mA input signal. The third type uses the CCN Loadshed module and has the ability to limit the current operating capacity to maximum and further reduce the capacity if required.

To use Demand Limit, select the type of demand limit to use. Then configure the demand limit set points based on the type selected. For Demand Limit by switch control, closing the first stage demand limit contact will put the unit on the first demand limit level. The unit will not exceed the percentage of capacity entered as demand switch 1 set point. Closing contacts on the second demand limit switch prevents the unit from exceeding the capacity entered as demand switch 2 set point. The demand limit stage that is set to the lowest demand takes priority if both demand limit inputs are closed. If the demand limit percentage does not match unit staging, the unit will limit capacity to the closest capacity stage.

DEMAND LIMIT (Switch Controlled) — Demand limit by switch control will be configured and the switch set points will be set at 75% and 40%. Capacity steps are controlled by 2 relay switch inputs field wired to PSIO-2, terminal 28 for switch 1 and terminal 25 for switch 2. See Table 31.

To Disable Demand Limit: Enter as shown in Table 30. Scroll down to Demand Limit Select and press

to select no Demand Limit control.

Table 27 — Temperature Reset Set Point Limits

INPUT DATA DESCRIPTION	MEASUREMENT METHOD					
	4-20 mA		OAT/Occupied Space or Internal/External		Return Fluid	
	Variable	Limits	Variable	Limits	Variable	Limits
Maximum Reset Amount — Allowable range for maximum amount which LWT set point is reset.	Degrees Reset at 20 mA	(–30 to 30 F) –34 to –1 C	Degrees Reset	(–30 to 30 F) –34 to –1 C	Degrees Reset	(–30 to 30 F) –34 to –1 C
Maximum Reset Reference — Temperature at which maximum reset occurs.	—	—	Remote temp = Full Reset	(20 to 125 F) –7 to 52 C	CHW Delta T = Full Reset	(0 to 15 degrees F) 0 to 8° C cooler temperature rise
Minimum Reset Reference — Temperature at which no reset occurs.	—	—	Remote temp = No Reset	(20 to 125 F) –7 to 52 C	CHW Delta T = No Reset	(0 to 15 degrees F) 0 to 8° C cooler temperature rise

LEGEND

CHW — Chilled Water
OAT — Outdoor-Air Temperature
LWT — Leaving Fluid Temperature

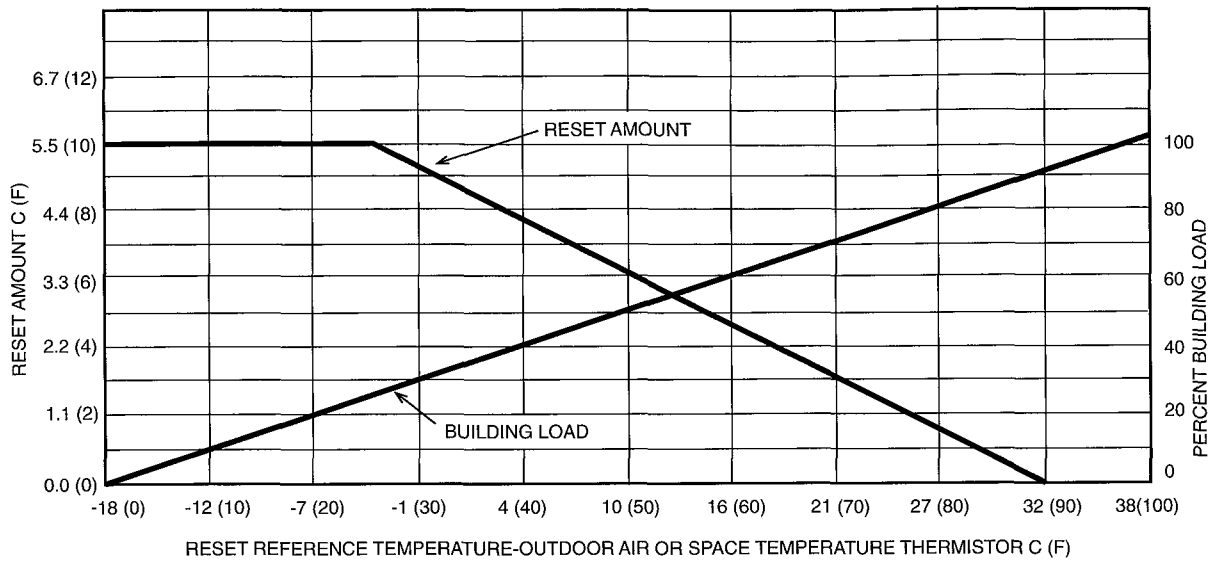


Fig. 8 — Cooling External Temperature Reset

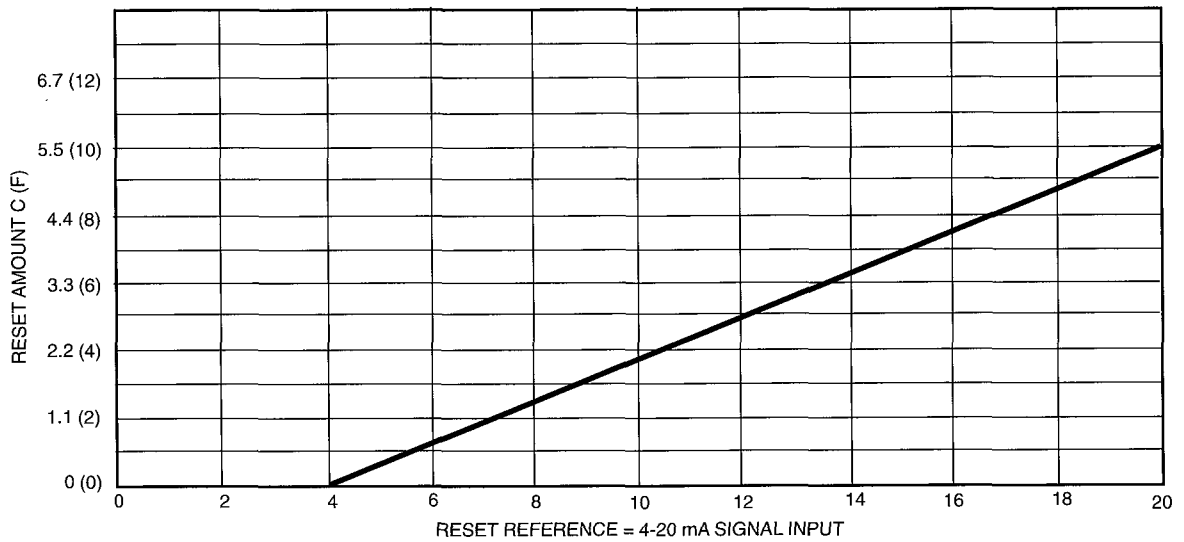


Fig. 9 — 4 to 20 mA Cooling Temperature Reset

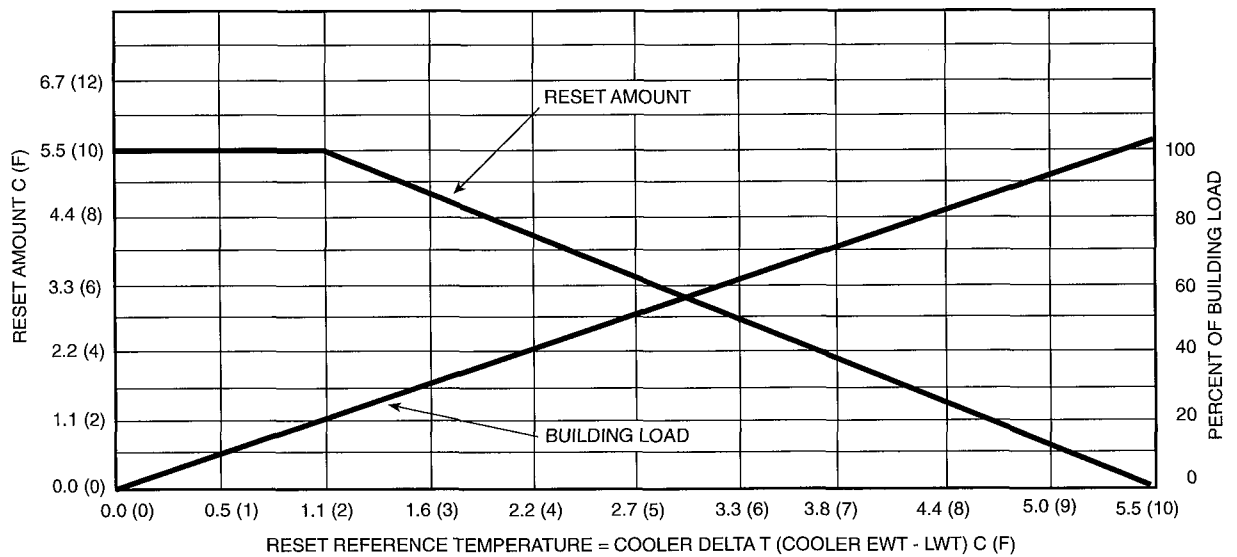


Fig. 10 — Cooling Return Water Reset

Table 28 — Setting External Temperature Reset

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
2 SRVC	OPTIONS 1	
↓	Cooler Fluid Select 1	
↓	Min. Load Valve Select Disable	
↓	Loading Sequence Select 1	
↓	Lead/Lag Sequence Select 1	
↓	Head Press. Control Type 0	
↓	Motormaster Select 0	
↓	Water Valve Type 0	
↓	Ext. Reset Sensor Select 0	
1 ENTR	Ext. Reset Sensor Select 1	Outdoor Ambient sensor selected for reset
3 SRVC	OPTIONS 2	
↓	Cooling Setpoint Select 0	
↓	Heating Setpoint Select 0	
↓	Ramp Load Select 0	
↓	Clock Control Select 1	
↓	Ice Configuration Select 0	
↓	OAT Sensor Select 0	
1 ENTR	OAT Sensor Select 1	OAT sensor enabled
4 SRVC	COOLING RESET TYPE 1	
↓	Degrees Reset at 20 mA 0.0 dF	
↓	COOLING RESET TYPE 2	
↓	Remote temp = No Reset 20.0 dF	
2 5 ENTR	Remote temp = No Reset 25.0 dF	
↓	Remote temp = Full Reset 125.0 dF	
9 0 ENTR	Remote temp = Full Reset 90.0 dF	
↓	Degrees Reset 0.0 dF	
1 0 ENTR	Degrees Reset 10.0 dF	
↓	COOLING RESET	Scroll down to this point.
↓	Select/Enable Reset Type 0	
2 ENTR	Select/Enable Reset Type 2	External reset selected

Table 29 — Setting Internally Powered Reset

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	COOLING RESET TYPE 1	
↓	Degrees Reset at 20 mA 0.0 dF	
1 0 ENTR	Degrees Reset at 20 mA 10.0 dF	
↓	COOLING RESET	Scroll down to this point
↓	Select/Enable Reset Type 0	
1 ENTR	Select/Enable Reset Type 1	4-20 mA reset selected

Table 30 — Setting Return Fluid Temperature Reset

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	COOLING RESET TYPE 1	
↓	COOLING RESET TYPE 3	Scroll down to this point.
↓	CHW Delta T = No Reset 15.0 dF	
1 0 ENTR	CHW Delta T = No Reset 10.0 dF	
↓	CHW Delta T = Full Reset 0.0 dF	
2 ENTR	CHW Delta T = Full Reset 2.0 dF	
↓	Degrees Reset 0.0 dF	
1 0 ENTR	Degrees Reset 10.0 dF	
↓	COOLING RESET	
↓	Select/Enable Reset Type 0	
3 ENTR	Select/Enable Reset Type 3	Return Fluid reset selected

DEMAND LIMIT (4-20 mA controlled) — The 4-20 mA Demand Limit will be configured and the 20 mA demand limit percentage will be set to 50%. See Table 32 and Fig. 11.

The CCN Loadshed Demand Limit will be configured. The loadshed group will be set to 1, demand delta will be set to 40% and the maximum loadshed time will be set to 90 minutes. See Table 33.

The Loadshed Group number is established by the CCN system designer. The PIC will respond to a Redline command from the Loadshed control. When the redline command is received, the current stage of capacity is set to the maximum stages available. Should the Loadshed control send a Loadshed command, the PIC will reduce the current stages by the value entered for Loadshed Demand delta. For the above example the loadshed demand delta is 40%. If the chiller is operating at 80% of total capacity when a redline command is received, the maximum available capacity is set to 80%. When a loadshed command is received, the chiller capacity will be reduced by 40%. The chiller can now operate at a total capacity of no more than 48% $[80\% - (80\% \times 40\%)]$ until a cancel redline or cancel loadshed command is received. The control will disable the redline/loadshed command if no cancel command has been received within the configured maximum loadshed time limit.

Table 31 — Setting Switch Controlled Demand Limit

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	COOLING RESET TYPE 1	
↓	DEMAND LIMIT	Scroll down to this point
↓	Demand Limit at 20 mA 0.0%	
↓	Demand Limit Select 0	
1 ENTR	Demand Limit Select 1	Two step switch configured
1 SET	COOLING	
↓	DEMAND LIMIT	Scroll down to this point
↓	Demand Switch 1 Setpoint 80.0%	
7 5 ENTR	Demand Switch 1 Setpoint 75.0	
↓	Demand Switch 2 Setpoint 50.0%	
4 0 ENTR	Demand Switch 2 Setpoint 40.0%	Configuration complete

Table 32 — Setting Demand Limit (4-20 mA Controlled)

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	COOLING RESET TYPE 1	
↓	DEMAND LIMIT	Scroll down to this point
↓	Demand Limit at 20 mA 0.0%	
5 0 ENTR	Demand Limit at 20 mA 50.0%	
↓	Demand Limit Select 0	
2 ENTR	Demand Limit Select 2	4-20 mA control configured

Table 33 — Setting Demand Limit (CCN Loadshed Controlled)

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	COOLING RESET TYPE 1	
↓	DEMAND LIMIT	Scroll down to this point
↓	Demand Limit at 20 mA 0.0%	
↓	Demand Limit Select 0	
3 ENTR	Demand Limit Select 3	CCN Loadshed control configured
↓	Loadshed Group Number 0	
1 ENTR	Loadshed Group Number 1	
↓	Loadshed Demand Delta 0	
4 0 ENTR	Loadshed Demand Delta 40%	
↓	Maximum Loadshed Time 60 min	
9 0 ENTR	Maximum Loadshed Time 90 min	Configuration complete

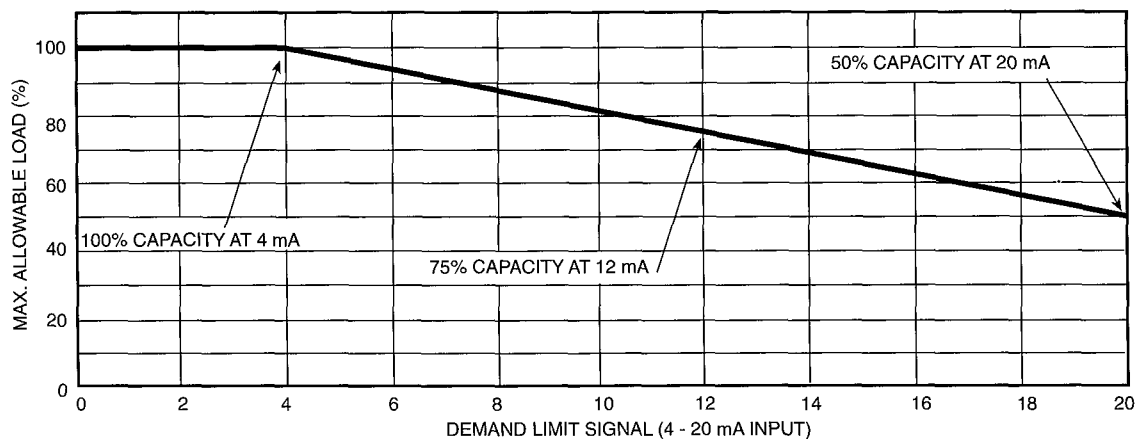


Fig. 11 — 4-20 mA Demand Limiting

TROUBLESHOOTING

The 30GX/HX Screw chiller control has many features to aid in troubleshooting. By using the keypad and display module and the status function, actual operating conditions of the chiller are displayed while the unit is running. The Test function allows for operational checkout of compressor loaders, fans, EXVs, solenoids, and other components while the chiller is stopped. The Service function displays how configurable items are configured and provides a manual control mode where the compressors can be started and loaded. If an operating fault is detected, an alarm is generated and an alarm code is displayed under the subfunction **1 STAT** along with an explanation of the fault. Up to 10 current alarm codes are stored under this subfunction. For checking specific items, see Table 12.

Checking Display Codes — To determine how the machine has been programmed to operate, check the diagnostic information displayed in the Status function and the configuration information displayed in the Service function.

Unit Shutoff — To shut the unit off, move the LOCAL/OFF/REMOTE switch to OFF position. All compressors and solenoids stop immediately.

Complete Unit Stoppage — Complete unit stoppage can be caused by any of the following conditions:

- cooling load satisfied
- remote on/off contacts open
- programmed schedule
- emergency stop command from CCN
- general power failure
- blown fuse in control power feed disconnect
- open control circuit fuse(s)
- LOCAL/OFF/REMOTE switch moved to OFF position
- freeze protection trip
- low flow protection trip
- open contacts in chilled water flow switch (optional)
- Open contacts in any auxiliary interlock. Terminals that are jumpered from factory are in series with control switch. Opening the circuit between these terminals places unit in Stop mode, similar to moving the control switch to OFF position. Unit cannot start if these contacts are open. If they open while unit is running, the unit stops.
- cooler entering or leaving fluid thermistor failure
- low/high transducer supply voltage
- loss of communications between processor module and other control modules
- low refrigerant pressure
- off-to-on delay is in effect.

Single Circuit Stoppage — Single circuit stoppage can be caused by the following:

- low oil pressure
- open contacts in high pressure switch
- low refrigerant pressure
- thermistor failure
- transducer failure
- alarm condition from CPM module
- Overload relay trip. Stoppage of one circuit by a safety device action does not affect other circuit. When a safety device trips, the circuit is shut down immediately and EXV closes.

⚠ CAUTION

If a stoppage occurs more than once as a result of any of the above safety devices, determine and correct the cause before attempting another restart.

Restart Procedure — After the cause for stoppage has been corrected, restart is either automatic or manual, depending on the fault. Manual reset requires that the alarm(s) be reset via the HSIO. Press **1 STAT** and then **1 ENTR** to clear manual reset alarms. If the Alarm Reset Select feature is selected (**3 BRVC**), a manual reset alarm can also be reset by switching the LOR switch from LOCAL/REMOTE to OFF and back to LOCAL/REMOTE again. If an alarm was from the CPM module, depress the reset button located on the HSIO or fuse bracket before clearing the alarm through the HSIO. Some typical fault conditions are described in Table 34. For a complete list of fault conditions, codes, and reset type, see Table 35.

POWER FAILURE EXTERNAL TO THE UNIT — Unit restarts automatically when power is restored.

Table 34 — Typical Stoppage Faults and Reset Types

STOPPAGE FAULT	RESET TYPE
Loss of Condenser Flow (30HXC)	Manual reset
Cooler Freeze Protection (Chilled Fluid, Low Temperature)	Auto reset first time, manual if repeated in same day
Chilled Fluid Pump Interlock	Automatic reset (Manual for closed contacts when pump is off)
Control Circuit Fuse Blown	Unit restarts automatically when power is restored
High-Pressure Switch Open	Manual reset
Low Sat. Suction Temperature	Manual reset
Low Oil Pressure	Manual reset
Loss of Communications with WSM or FSM controller	Automatic reset

LEGEND

FSM — Flotronic™ System Manager
WSM — Water System Manager

Alarms and Alerts — These are warnings of abnormal or fault conditions, and may cause either one circuit or the whole unit to shut down. They are assigned code numbers as described below. The alarm descriptions are displayed on the HSIO when the **1 STAT** subfunction is entered. When a communication loss occurs to a hardware point, an alert or alarm may be generated. Refer to Table 36. The PSIO also recognizes illegal configurations. Illegal configurations are shown in Table 37.

Table 35 contains a detailed description of each alarm and alert code error and possible cause. Manual reset is accomplished by entering **1 STAT** from the HSIO and pressing **1 ENTR** or moving the LOCAL/OFF/REMOTE Switch to the OFF position, then back to LOCAL or REMOTE position (If Alarm Reset Select is enabled). See Table 35 for listing of each alarm and alert code.

Compressor Alarm/Alert Circuit — Each compressor is controlled by its own CPM processor which closes contacts between plug terminals PL2-3 and PL2-6 to start the compressor. Power is supplied to the CPM logic circuit through each compressor high-pressure switch and into plug terminal PL2-2. If the high-pressure switch opens, the CPM will generate an alarm.

NOTE: Similar connections for each compressor can be followed on the unit wiring diagrams located on the unit.

START-UP CHECKLIST FOR 30GX/HX LIQUID CHILLERS
(Remove and use for job file.)

A. Preliminary Information

JOB NAME _____

LOCATION _____

INSTALLING CONTRACTOR _____

DISTRIBUTOR _____

START-UP PERFORMED BY _____

EQUIPMENT:

MODEL _____

S/N _____

COMPRESSORS:

CIRCUIT A

1) MODEL # _____

S/N _____

2) MODEL # _____

S/N _____

CIRCUIT B

1) MODEL # _____

S/N _____

2) MODEL # _____

S/N _____

COOLER:

MODEL # _____

S/N _____

CONDENSER: (30HX ONLY)

MODEL # _____

S/N _____

AIR-HANDLING EQUIPMENT:

MANUFACTURER _____

MODEL # _____

S/N _____

ADDITIONAL AIR-HANDLING UNITS AND ACCESSORIES _____

B. Preliminary Equipment Check

IS THERE ANY SHIPPING DAMAGE? _____ IF SO, WHERE _____

WILL THIS DAMAGE PREVENT UNIT START-UP? _____

- ☐ UNIT IS LEVEL IN ITS INSTALLATION
- ☐ UNIT IS SUPPLIED WITH THE PROPER CONTROL VOLTAGE _____ VAC
- ☐ ELECTRICAL CIRCUIT WIRING HAS BEEN SIZED AND INSTALLED PROPERLY
- ☐ UNIT GROUND WIRE HAS BEEN CONNECTED
- ☐ ELECTRICAL CIRCUIT PROTECTION HAS BEEN SIZED AND INSTALLED PROPERLY
- ☐ ALL TERMINALS ARE TIGHT
- ☐ ALL CABLES AND THERMISTORS HAVE BEEN INSPECTED FOR CROSSED WIRES
- ☐ ALL PLUG ASSEMBLIES ARE TIGHT

CHECK AIR-HANDLING SYSTEM

- ☐ ALL AIR HANDLERS ARE OPERATING
- ☐ ALL CHILLED WATER VALVES ARE OPEN
- ☐ ALL FLUID PIPING IS CONNECTED PROPERLY
- ☐ ALL AIR HAS BEEN VENTED FROM THE SYSTEM
- ☐ CHILLED WATER PUMP (CWP) IS OPERATING WITH THE CORRECT ROTATION

CWP AMPERAGE: RATED: _____ ACTUAL: _____

PUMP PRESSURES: INLET: _____ OUTLET: _____

CHECK CONDENSER SYSTEM (30HX ONLY)

- ☐ ALL CONDENSER WATER VALVES ARE OPEN
- ☐ ALL CONDENSER PIPING IS CONNECTED PROPERLY

ALL AIR HAS BEEN VENTED FROM THE SYSTEM

- ☐ CONDENSER WATER PUMP IS OPERATING WITH THE CORRECT ROTATION

CONDENSER WATER PUMP AMP: RATED: _____ ACTUAL: _____

PUMP PRESSURES: INLET: _____ OUTLET: _____

CHECK REMOTE CONDENSER SYSTEM (30HXA ONLY)

- ☐ ALL CONDENSER PIPING IS CONNECTED PROPERLY
- ☐ CONDENSER LINES/CONDENSER HAS BEEN EVACUATED, AS REQUIRED

C. Unit Start-Up

- ☐ CWP STATER HAS BEEN PROPERLY INTERLOCKED WITH THE CHILLER
- ☐ OIL HEATERS HAVE BEEN ENERGIZED FOR AT LEAST 24 HOURS
- ☐ ALL LIQUID VALVES ARE BACKSEATED
- ☐ ALL DISCHARGE VALVES ARE OPEN (30GX ONLY)
- ☐ ALL SUCTION VALVES ARE OPEN, IF EQUIPPED
- ☐ ALL OIL LINE VALVES ARE OPEN
- ☐ UNIT HAS BEEN LEAK CHECKED

LOCATE, REPAIR, AND REPORT ANY REFRIGERANT LEAKS _____

- ☐ CHECK VOLTAGE IMBALANCE: AB _____ AC _____ BC _____

AVERAGE VOLTAGE = _____ (SEE INSTALLATION INSTRUCTIONS)

MAXIMUM DEVIATION = _____ (SEE INSTALLATION INSTRUCTIONS)

VOLTAGE IMBALANCE = _____ (SEE INSTALLATION INSTRUCTIONS)

- ☐ VOLTAGE IMBALANCE IS LESS THAN 2%

DO NOT START CHILLER IF VOLTAGE IMBALANCE IS GREATER THAN 2%. CONTACT LOCAL POWER COMPANY FOR ASSISTANCE.

- ☐ ALL INCOMING POWER VOLTAGE IS WITHIN RATED VOLTAGE RANGE

CHECK COOLER WATER LOOP:

WATER LOOP DESIGN VOLUME: _____ GALLONS (LITERS)

CALCULATED VOLUME _____ GALLONS (LITERS)

3 GALLONS/NOMINAL TON FOR AIR CONDITIONING

6 GALLONS/NOMINAL TON FOR PROCESS COOLING

- ☐ PROPER LOOP VOLUME ESTABLISHED
- ☐ PROPER LOOP CORROSION INHIBITOR INCLUDED _____ GALLONS (LITERS) OF _____
- ☐ PROPER LOOP FREEZE PROTECTION INCLUDED, IF REQUIRED
_____ GALLONS (LITERS) OF _____
- ☐ PIPING INCLUDES ELECTRIC HEATER TAPE, IF EXPOSED TO THE OUTSIDE
- ☐ INLET PIPING TO COOLER INCLUDES A 40 MESH STRAINER

CHECK PRESSURE DROP ACROSS THE COOLER

ENTERING COOLER: _____ PSIG (kPa)

LEAVING COOLER: _____ PSIG (kPa)

(LEAVING - ENTERING) $\times$ 2.31 FT OF H₂O/PSIG = _____ FT OF H₂O

(LEAVING - ENTERING) $\times$ 0.334 M OF H₂O/kPa = _____ M OF H₂O

PLOT COOLER PRESSURE DROP ON PERFORMANCE DATA CHART (IN PRODUCT DATA LITERATURE) TO DETERMINE TOTAL GALLONS/MINUTE (GPM) OR LITERS PER SECOND (L/S) AND FIND UNIT'S MINIMUM FLOW RATE.

TOTAL GPM: _____

GPM/NOMINAL TON = _____

- ☐ TOTAL GPM IS GREATER THAN UNIT'S MINIMUM FLOW RATE
- ☐ TOTAL GPM MEETS JOB SPECIFIED REQUIREMENT OF _____ GPM (L/S)
- ☐ COOLER HEATER FUSE INSTALLED, AND HEATERS ARE ACTIVE (IF USED)

CHECK CONDENSER WATER LOOP:

- ☐ PROPER LOOP CORROSION INHIBITOR INCLUDED

_____ GALLONS (LITERS) OF _____

- ☐ INLET PIPING TO CONDENSER INCLUDES A 40 MESH STRAINER

CHECK PRESSURE DROP ACROSS THE CONDENSER (30HXC ONLY)

ENTERING CONDENSER: _____ PSIG (kPa)

LEAVING CONDENSER: _____ PSIG (kPa)

(LEAVING - ENTERING) $\times$ 2.31 FT OF H₂O = _____ FT OF H₂O

(LEAVING - ENTERING) $\times$ 0.334 M OF H₂O/kPa = _____ M OF H₂O

PLOT CONDENSER PRESSURE DROP ON PERFORMANCE DATA CHART (IN PRODUCT DATA LITERATURE) TO DETERMINE TOTAL GALLONS/MINUTE (GPM) OR LITERS PER SECOND (L/S) AND FIND UNIT'S MINIMUM FLOW RATE.

TOTAL GPM: _____

GPM/NOMINAL TON = _____

- ☐ TOTAL CONDENSER GPM IS GREATER THAN UNIT'S MINIMUM FLOW RATE
- ☐ TOTAL GPM MEETS JOB SPECIFIED REQUIREMENT OF _____ GPM (L/S)

PERFORM TEST FUNCTION: (INDICATE POSITIVE RESULT)

ONCE POWER IS SUPPLIED TO THE UNIT, CHECK THE DISPLAY FOR ANY ALARMS, SUCH AS PHASE REVERSAL. FOLLOW THE TEST FUNCTION INSTRUCTIONS IN THE CONTROLS AND TROUBLESHOOTING LITERATURE. BE SURE TO CHECK FOR PROPER FAN ROTATION WITH THE FAN TEST SECTIONS. BE SURE ALL SERVICE VALVES ARE OPEN BEFORE BEGINNING THE COMPRESSOR TEST SECTION. ITEMS MARKED WITH “†” WILL APPEAR ONLY IF THE UNIT IS CONFIGURED FOR THIS OPTION. DO NOT RUN OIL PUMPS FOR MORE THAN 20 SECONDS.

1 **TEST**
ALARM

☐ LOADER A1

☐ LOADER A2

☐ MINIMUM LOAD VALVE A†

☐ CIRCUIT A OIL HEATER

☐ A1 MOTOR COOLING SOLENOID

☐ A2 MOTOR COOLING SOLENOID†

☐ CIRCUIT A OIL PUMP

☐ OIL SOLENOID A1

☐ OIL SOLENOID A2†

4 **TEST**
ALARM

☐ CIRCUIT A EXV

☐ CIRCUIT B EXV

☐ CIRCUIT A WATER VALVE†

☐ CIRCUIT A% FAN SPEED (GX)†

☐ CIRCUIT B% FAN SPEED (GX)†

8 **SRVC**

☐ COMPRESSOR A1

☐ COMPRESSOR A2†

☐ COMPRESSOR B1

☐ COMPRESSOR B2†

2 **TEST**
ALARM

☐ LOADER B1

☐ LOADER B2

☐ MINIMUM LOAD VALVE B†

☐ CIRCUIT B OIL HEATER

☐ B1 MOTOR COOLING SOLENOID

☐ B2 MOTOR COOLING SOLENOID†

☐ CIRCUIT B OIL PUMP

☐ OIL SOLENOID B1

☐ OIL SOLENOID B2†

3 **TEST**
ALARM

☐ FAN 1 (30GX)†

☐ FAN 2 (30GX)†

☐ FAN 3 (30GX)†

☐ FAN 4 (30GX)†

☐ FAN 5 (30GX)†

☐ FAN 6 (30GX)†

☐ COOLER PUMP†

☐ CONDENSER PUMP†

☐ COOLER HEATER†

☐ ALARM RELAY†

☐ REMOTE ALARMS 1-16†

☐ CHECK FOR COMMUNICATING MODULES (BLINKING RED AND GREEN LEDs)

☐ CORRECT FLUID SET POINTS ARE ENTERED

1 **SET**

COOL SET POINT 1 _____

COOL SET POINT 2 _____

☐ CORRECT DATE, TIME, AND OPERATING SCHEDULE(S) ARE SET

☐ REVIEW AND RECORD FACTORY CONFIGURATION CODES, ☐ 5 ☐ SRVC

CONFIGURATION CODE 1: _____

CONFIGURATION CODE 2: _____

CONFIGURATION CODE 3: _____

CONFIGURATION CODE 4: _____

CONFIGURATION CODE 5: _____

☐ REVIEW AND RECORD SOFTWARE VERSION, ☐ 1 ☐ SRVC

SOFTWARE CESR500100 VERSION _____

☐ REVIEW AND RECORD FIELD CONFIGURATION, ☐ 2 ☐ SRVC

COOLER FLUID SELECT _____

COOLER PUMP _____

MIN LOAD VALVE SELECT _____

CONDENSER PUMP CONTROL† _____

LOADING SEQ. SELECT _____

CONDENSER FLOW SWITCH† _____

LEAD/LAG SEQ. SELECT _____

CONDENSER WATER SENSORS† _____

HEAD PRESSURE CONTROL _____

MOTORMASTER SELECT _____

WATER VALVE TYPE† _____

EXTERNAL RESET SENSOR _____

COOLER PUMP INTERLOCK _____

TO START THE CHILLER:

BE SURE THAT ALL SERVICE VALVES ARE OPEN, AND ALL PUMPS ARE ON BEFORE ATTEMPTING TO START THIS MACHINE. ONCE ALL CHECKS HAVE BEEN MADE, MOVE THE SWITCH TO "LOCAL" OR "REMOTE" FROM "STOP."

☐ UNIT STARTS AND OPERATES PROPERLY.

TEMPERATURES AND PRESSURES:

ONCE THE MACHINE HAS BEEN OPERATING FOR A WHILE AND THE TEMPERATURES AND PRESSURES HAVE STABILIZED, RECORD THE FOLLOWING:

COOLER EWT _____

CIR. A DISCHARGE TEMP _____

COOLER LWT _____

CIR. A LIQUID LINE TEMP _____

AMBIENT TEMPERATURE _____

CIR. B OIL PRESS _____

CONDENSER EWT _____

CIR. B SUCTION PRESS _____

CONDENSER LWT _____

CIR. B DISCHARGE PRESS _____

CIR. A OIL PRESS _____

CIR. B DISCHARGE TEMP _____

CIR. A SUCTION PRESS _____

CIR. B LIQUID LINE TEMP _____

CIR. A DISCHARGE PRESS _____

NOTES:



Table 35 — Alarm and Alert Codes

ALARM/ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE		
0	—	No Alarms or Alerts Exist	—	—	—	—		
1.xx	Alert	Compressor A1 failure	See CPM subcodes below	See CPM subcodes below	Manual	See CPM subcodes below		
2.xx		Compressor A2 failure	See CPM subcodes below	See CPM subcodes below	Manual	See CPM subcodes below		
5.xx		Compressor B1 failure	See CPM subcodes below	See CPM subcodes below	Manual	See CPM subcodes below		
6.xx		Compressor B2 failure	See CPM subcodes below	See CPM subcodes below	Manual	See CPM subcodes below		
CPM SUBCODES (xx)	All are alarm codes							
x.0	—	No Error	—	—	—	—		
x.1		High Pressure Switch Trip	HPS input to CPM module open	Comp. shut down	Manual/Button	Loss of condenser air/water flow. Operation beyond chiller capability. Liquid valve not open.		
x.2		No Motor Current	CPM module reads less than 10% of MTA on all legs for >3 seconds	Comp. shut down	Manual/Button	Power supply disconnected, blown fuse(s), wiring error, contactor not energized, faulty current toroid, motor overload tripped		
x.25		Current Imbalance >10% (Alarm)	CPM measures current balance between phases greater than 10% for 25 minutes	Circuit shut down	Manual/Button	Loose terminals on power wires. Poor power supply. Disabled only if alarm feature is enabled in <table><tr><td>3</td><td>SRVC</td></tr></table>	3	SRVC
3		SRVC						
x.27		Current Imbalance >10% (Warning)	CPM measures current balance between phases greater than 10% for 25 minutes	None	—	Loose terminals on power wires. Poor power supply. Displayed only if alarm feature is disabled in <table><tr><td>3</td><td>SRVC</td></tr></table>	3	SRVC
3		SRVC						
x.3		Current Imbalance >18%	CPM measures current balance between phases greater than 18% for 25 minutes	Circuit shut down	Manual/Button	Loose terminals on power wires. Poor power supply.		
x.35		Single Phase Current Loss	CPM measures current imbalance between phases greater than 20%	Circuit shut down	Manual/Button	Blown fuse, wiring error.		
x.4		High Motor Current	CPM detects high current compared to MTA setting	Comp. shut down	Manual/Button	Operation beyond chiller capability, improperly punched configuration header, blown fuse		
x.5		Ground Fault	CPM detects ground current (2.5 ± 2.0 amps)	Comp. shut down	Manual/Button	Motor winding(s) gone to ground, wiring error		
x.55		Voltage Imbalance >3% (Alarm)	CPM measures voltage imbalance between phases greater than 3% for 25 minutes	Circuit shut down	Manual/Button	Compressor fault, local utility supply imbalance, Poor power supply. Displayed only if alarm feature is enabled in <table><tr><td>3</td><td>SRVC</td></tr></table>	3	SRVC
3		SRVC						
x.57		Voltage Imbalance >3% (Warning)	CPM measures voltage imbalance between phases greater than 3% for 25 minutes	None	—	Compressor fault, local utility supply imbalance. Displayed only if alarm feature is disabled in <table><tr><td>3</td><td>SRVC</td></tr></table>	3	SRVC
3		SRVC						
x.6		Voltage Imbalance >7%	CPM measures voltage imbalance between phases greater than 7% for 25 minutes	Circuit shut down	Manual/Button	Compressor fault, local utility supply imbalance		
x.65		Single Phase Volts Loss	CPM measures voltage imbalance between phases greater than 20%	Circuit shut down	Manual/Button	Blown fuse, wiring error.		
x.7		Volt Phase Reversal	CPM detects incoming power supply out of phase	Chiller shut down and not allowed to start	Manual/Button	Supply power not in phase. Interchange any 2 incoming leads.		
x.75		Contactor Failure	CPM detects min. 10% of MTA for 10 seconds after shutting off compressor contactor. Oil solenoid is energized.	All remaining compressors shut down. All loaders deenergized. Min. load valve of affected circuit energized (if equipped)	Manual/Button	Faulty contactor, contactor welded, wiring error.		
x.8		Current Phase Reversal	CPM detects phase reversal from toroid reading	Circuit shut down	Manual/Button	Multiple terminal block power supply leads not in phase. Toroid wire harness crossed, toroid not all facing same direction		

Table 35 — Alarm and Alert Codes (cont)

ALARM/ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
x.85		Motor Over Temperature	CPM detects high motor temperature	Comp. shut down	Manual/Button	Solenoid failure, low refrigerant charge.
x.9		Open Thermistor	CPM detects open circuit in motor temp thermistor	Comp. shut down	Manual/Button	Wiring error or faulty thermistor.*
x.95		Config. Header Fault	CPM finds error with MTA value punched out in header	Comp. shut down	Manual/Button	Header pins on CPM board either all or none punched out, header not fully seated in CPM board.
x.10		Shorted Thermistor	CPM detects short circuit in motor temp thermistor	Comp. shut down	Manual/Button	Wiring error or faulty thermistor.*
7	Alert	Cir. A Discharge Gas Thermistor Failure	Thermistor outside range of -40 to 245 F (-40 to 118 C) or DGT >210 F (98.9 C)	Circuit A shut down	Manual	Thermistor failure, motor cooling solenoid failure or wiring error.
8	Alert	Cir. B Discharge Gas Thermistor Failure	Thermistor outside range of -40 to 245 F (-40 to 118 C) or DGT >210 F (98.9 C)	Circuit B shut down	Manual	Thermistor failure, motor cooling solenoid failure or wiring error.
9	Alarm	Cooler Leaving Fluid Thermistor Failure	Thermistor outside range of -40 to 245 F (-40 to 118 C)	Chiller shut down.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
10	Alarm	Cooler Entering Fluid Thermistor Failure	Thermistor outside range of -40 to 245 F (-40 to 118 C).	Uses 0.1° F/% Total Capacity as rise/ton.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
11	Alert	Condenser Leaving Fluid Thermistor Failure	Thermistor outside range of -40 to 245 F (-40 to 118 C)	None. Chiller continues to run.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
12	Alert	Condenser Entering Fluid Thermistor Failure	Thermistor outside range of -40 to 245 F (-40 to 118 C)	None. Chiller continues to run.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
15	Alert	Compressor A1 High Motor Temperature	Thermistor outside range of -39.9 to 245 F (-39.9 to 118 C) for 5 consecutive readings	Compressor A1 shut down	Manual	Thermistor failure, faulty motor cooling solenoid
16	Alert	Compressor A2 High Motor Temperature	Thermistor outside range of -39.9 to 245 F (-39.9 to 118 C) for 5 consecutive readings	Compressor A2 shut down	Manual	Thermistor failure, faulty motor cooling solenoid
17	Alert	Compressor B1 High Motor Temperature	Thermistor outside range of -39.9 to 245 F (-39.9 to 118 C) for 5 consecutive readings	Compressor B1 shut down	Manual	Thermistor failure, faulty motor cooling solenoid
18	Alert	Compressor B2 High Motor Temperature	Thermistor outside range of -39.9 to 245 F (-39.9 to 118 C) for 5 consecutive readings	Compressor B2 shut down	Manual	Thermistor failure, faulty motor cooling solenoid
19	Alert	Circuit A Low Oil Temp at Startup	DGT/Oil Temp less than SCT + oil rise	Air cooled chillers not allowed to start	Automatic	Failed Oil Heater
20	Alert	Circuit B Low Oil Temp at Startup	DGT/Oil Temp less than SCT + oil rise	Air cooled chillers not allowed to start	Automatic	Failed Oil Heater
21	Alert	External Reset Temperature Thermistor Failure	Thermistor outside range of -40 to 245 F (-40 to 118 C)	Reset disabled. Runs under normal control/set points.	Automatic	Thermistor failure or wiring error.
22	Alert	Circuit A Discharge Pressure Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Circuit A shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.
23	Alert	Circuit B Discharge Pressure Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Circuit B shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.
24	Alert	Circuit A Suction Pressure Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Circuit A shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.
25	Alert	Circuit B Suction Pressure Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Circuit B shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.
26	Alert	Comp A1 Oil Pressure Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Comp A1 shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.
27	Alert	Comp A2 Oil Pressure Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Comp A2 shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.

Table 35 — Alarm and Alert Codes (cont)

ALARM/ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
28	Alert	Comp B1 Oil Pressure Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Comp B1 shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.
29	Alert	Comp B2 Oil Pressure Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Comp B2 shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.
30	Alert	Circuit A Economizer Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Circuit A shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.
31	Alert	Circuit B Economizer Transducer Failure	Calibration offset more than 6 PSIG or Voltage ratio (volts read/ref. voltage) more than 99.9% or less than 0.5%.	Circuit B shut down	Automatic	Transducer failure, power supply failure or wiring damage/error.
32	Alarm	Transducer Supply Outside 4.5 to 5.5 Volts	Reference voltage measured at PSIO-1, J7-34,35 less than 4.5 V or greater than 5.5 V.	Chiller shut down	Automatic	Power supply failure or wiring error. Low transformer voltage.
34	Alert	4-20 mA Reset Input Out of Range	If configured and input signal to PSIO-2, J7-22,23 less than 2 mA or greater than 20 mA	Reset function disabled. Normal set point used	Automatic	Faulty signal generator, wiring error
35	Alert	4-20 mA Demand Limit Input Out of Range	If configured and input signal to PSIO-2, J7-28,29 less than 2 mA or greater than 20 mA	Demand limit ignored. Runs under normal control based on 100% demand limit.	Automatic	Faulty signal generator, wiring error
36	Alarm	Loss of communication with "Hardware point"	PSIO-1 has lost communication with one of the points in Table 36.	See Table 36.	Automatic	Failed module, wiring error, failed transformer, loose connection plug, wrong address
37	Alert	Circuit A Low Saturated Suction Temperature	SST reads 6 F (3.3 C) or more below the freeze point for 3 minutes. Point is 30 F (-1.1 C) for water, set point minus 8 F (4.4 C) for brines.	Circuit A shut down	Manual	Low refrigerant charge, plugged strainer, faulty expansion valve. Low water flow.
38	Alert	Circuit B Low Saturated Suction Temperature	SST reads 6 F (3.3 C) or more below the freeze point for 3 minutes. Point is 30 F (-1.1 C) for water, cooling set point minus 8 F (4.4 C) for brines.	Circuit B shut down	Manual	Low refrigerant charge, plugged strainer, faulty expansion valve. Low water flow.
40	Alert	Compressor A1 Low Oil Pressure	See Note 1.	Comp A1 shut down	Manual	Low Water Temperature, plugged oil filter, closed oil valve, bad oil solenoid, compressor oil check valve stuck, oil line check valve stuck, plugged oil strainer.
41	Alert	Compressor A2 Low Oil Pressure	See Note 1.	Comp A2 shut down	Manual	Low Water Temperature, plugged oil filter, closed oil valve, bad oil solenoid, compressor oil check valve stuck, oil line check valve stuck, plugged oil strainer
42	Alert	Compressor B1 Low Oil Pressure	See Note 1.	Comp B1 shut down	Manual	Low Water Temperature, plugged oil filter, closed oil valve, bad oil solenoid, compressor oil check valve stuck, oil line check valve stuck, plugged oil strainer
43	Alert	Compressor B2 Low Oil Pressure	See Note 1.	Comp B2 shut down	Manual	Low Water Temperature, plugged oil filter, closed oil valve, bad oil solenoid, compressor oil check valve stuck, oil line check valve stuck, plugged oil strainer
44	Alarm	Circuit A Condenser Freeze Protection	For W/C chillers only, if SCT <34 F (1.1 C)	Chiller shut down. Turn Cond pump On if Chiller is Off	Automatic	Failed/bad discharge pressure transducer, refrigerant leak
45	Alarm	Circuit B Condenser Freeze Protection	For W/C chillers only, if SCT <34 F (1.1 C)	Chiller shut down. Turn Cond pump On if Chiller is Off	Automatic	Failed/bad discharge pressure transducer, refrigerant leak
46	Alarm	Cooler Freeze Protection	Cooler EWT or LWT less than freeze point. Freeze point is 34 F (1.1 C) for water, cooling set point minus 8 F (4.4 C) for brines.	Chiller shut down. Leave Cooler pump on. Turn Cooler pump On if Chiller is Off.	Automatic†	Faulty thermistor, low water flow

Table 35 — Alarm and Alert Codes (cont)

ALARM/ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
47	Alert	Circuit A High Saturated Suction Temperature	After first 90 seconds, SST > 55 F (12.8 C) and EXV < 1%	Circuit A shut down	Manual	Faulty expansion valve, liquid level sensor or transducer.
48	Alert	Circuit B High Saturated Suction Temperature	After first 90 seconds, SST > 55 F (12.8 C) and EXV < 1%	Circuit B shut down	Manual	Faulty expansion valve, liquid level sensor or transducer.
49	Alarm	Loss of Condenser Flow	Flow switch not closed within 1 minute after pump is started	Chiller shut down	Manual	Low condenser water flow, failed condenser pump
50	Alarm	Illegal Configuration x	Illegal Configuration has been entered. Correction needed.	Chiller cannot start. See Table 37.	Manual	Configuration error.
51	Alarm	Initial Configuration Required	No configuration has been entered.	Chiller cannot start	Manual	Configuration omitted.
52	Alarm	Unit is in Emergency Stop	CCN command received to shut unit down.	Chiller shut down	CCN/ Automatic	Network command.
53	Alarm	Cooler Pump Interlock Failed at Startup	Interlock did not close within 1 minute after transition	Chiller shut down. Pump turned off.	Automatic	Failure of cooler pump or controls
54	Alarm	Cooler Pump Interlock Opened Unexpectedly	Interlock opened for at least 5 seconds during operation	Chiller shut down. Pump turned off.	Automatic	Failure of cooler pump or controls
55	Alarm	Cooler Pump Interlock Closed When Pump OFF	Interlock closed when pump relay is off	Cooler pump remains off. Unit prevented from starting.	Manual	Failure of cooler pump relay or interlock, welded contacts
56	Alert	Loss of Communication with WSM	No communications have been received by PSIO-1 within 5 minutes of last transmission.	WSM forces removed. Runs under own control	Automatic	Failed module, wiring error, failed transformer, loose connection plug, wrong address
57	Alert	Circuit A Liquid Level Sensor Failure	Sensor reads 245 F (118 C) or -40 F (-40 C) with SST > 9 F (-12.8 C)	Runs, but controls EXV based on Disch. Superheat	Automatic	Thermistor circuit open, faulty liquid level sensor, wiring error
58	Alert	Circuit B Liquid Level Sensor Failure	Sensor reads 245 F (118 C) or -40 F (-40 C) with SST > 9 F (-12.8 C)	Runs, but controls EXV based on Disch. Superheat	Automatic	Thermistor circuit open, faulty liquid level sensor, wiring error
59	Alarm	Compressor A1 Pre-start Oil Pressure	Oil Pump did not build sufficient pressure during pre-lube cycle.	Circuit cannot start	Manual	Low oil, oil pump failure, oil solenoid failure, oil transducer failure, check valve failed open, oil shutoff valve closed
60	Alarm	Compressor A2 Pre-start Oil Pressure	Oil Pump did not build sufficient pressure during pre-lube cycle.	Circuit cannot start	Manual	Low oil, oil pump failure, oil solenoid failure, oil transducer failure, check valve failed open, oil shutoff valve closed
61	Alarm	Compressor B1 Pre-start Oil Pressure	Oil Pump did not build sufficient pressure during pre-lube cycle.	Circuit cannot start	Manual	Low oil, oil pump failure, oil solenoid failure, oil transducer failure, check valve failed open, oil shutoff valve closed
62	Alarm	Compressor B2 Pre-start Oil Pressure	Oil Pump did not build sufficient pressure during pre-lube cycle.	Circuit cannot start	Manual	Low oil, oil pump failure, oil solenoid failure, oil transducer failure, check valve failed open, oil shutoff valve closed
63	Alarm	Circuit A&B OFF for Alerts. Unit down	Control has shut down both circuits due to alerts.	None	Automatic	Check individual alarms
64	Alert	Circuit A Loss of Charge	Discharge pressure reading <10 PSIG for 30 seconds	Circuit A shut down	Manual	Refrigerant leak or transducer failure
65	Alert	Circuit B Loss of Charge	Discharge pressure reading <10 PSIG for 30 seconds	Circuit B shut down	Manual	
66	Alarm	Loss of Communication with FSM	No communications have been received by PSIO-1 within 5 minutes of last transmission.	FSM forces removed Runs under own control	Automatic	Wiring faulty or module failure
67	Alert	Circuit A High Discharge Pressure	SCT > MCT_SP + 5 F (2.8 C)	Circuit shut down	Automatic†	Faulty transducer/high pressure switch, low/restricted condenser air/water flow.**
68	Alert	Circuit B High Discharge Pressure	SCT > MCT_SP + 5 F (2.8 C)	Circuit shut down	Automatic†	Faulty transducer/high pressure switch, low/restricted condenser air/water flow.**
70	Alert	High Leaving Chilled Water Temperature	LCW read > LCW Delta Alarm limit and total capacity is 100% and current LCW > LCW reading 1 minute ago	Alert only. None	Automatic	Building load greater than unit capacity, low water/brine flow, or compressor fault. Check for other alarms or alerts.
71	Alert	Circuit A Low Oil Level	Level switch input open.	Circuit A shut down	Manual	Low oil level, failed switch, wiring error, failed DSIO module

Table 35 — Alarm and Alert Codes (cont)

ALARM/ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
72	Alert	Circuit B Low Oil Level	Level switch input open.	Circuit B shut down	Manual	Low oil level, failed switch, wiring error, failed DSIO module
73	Alert	Circuit A Low Discharge Superheat	Superheat <5 F (2.8 C) for 10 minutes	Circuit A shut down	Manual	Faulty thermistor, transducer or EXV or Economizer
74	Alert	Circuit B Low Discharge Superheat	Superheat <5 F (2.8 C) for 10 minutes	Circuit B shut down	Manual	Faulty thermistor, transducer or EXV or Economizer
75	Alarm	Comp. A1 Max. Oil Delta P, check oil line	(Discharge press – Oil press) >100 PSI for more than 5 seconds	Comp. A1 shut down	Manual	Plugged oil filter, closed oil valve, bad oil solenoid, compressor oil check valve stuck, oil line check valve stuck, plugged oil strainer
76	Alarm	Comp. A2 Max. Oil Delta P, check oil line	(Discharge press – Oil press) >100 PSI for more than 5 seconds	Comp. A2 shut down	Manual	Plugged oil filter, closed oil valve, bad oil solenoid, compressor oil check valve stuck, oil line check valve stuck, plugged oil strainer
77	Alarm	Comp. B1 Max. Oil Delta P, check oil line	(Discharge press – Oil press) >100 PSI for more than 5 seconds	Comp. B1 shut down	Manual	Plugged oil filter, closed oil valve, bad oil solenoid, compressor oil check valve stuck, oil line check valve stuck, plugged oil strainer
78	Alarm	Comp. B2 Max. Oil Delta P, check oil line	(Discharge press – Oil press) >100 PSI for more than 5 seconds	Comp. B2 shut down	Manual	Plugged oil filter, closed oil valve, bad oil solenoid, compressor oil check valve stuck, oil line check valve stuck, plugged oil strainer
79	Alarm	Comp. A1 Failed Oil Solenoid	Diff. Oil pressure >2.5 PSI during period after oil pump starts and before oil solenoid opens	Comp. A1 not allowed to start	Manual	Faulty oil solenoid valve
80	Alarm	Comp. A2 Failed Oil Solenoid	Diff. Oil pressure >2.5 PSI during period after oil pump starts and before oil solenoid opens	Comp. A2 not allowed to start	Manual	Faulty oil solenoid valve
81	Alarm	Comp. B1 Failed Oil Solenoid	Diff. Oil pressure >2.5 PSI during period after oil pump starts and before oil solenoid opens	Comp. B1 not allowed to start	Manual	Faulty oil solenoid valve
82	Alarm	Comp. B2 Failed Oil Solenoid	Diff. Oil pressure >2.5 PSI during period after oil pump starts and before oil solenoid opens	Comp. B2 not allowed to start	Manual	Faulty oil solenoid valve

LEGEND

CPM — Compressor Protection Module
DGT — Discharge Gas Temperature
EWT — Entering Water Temperature
EXV — Electronic Expansion Valve
HPS — High-Pressure Switch
LCW — Leaving Chilled Water
LWT — Leaving Water Temperature
MCT — Motor Circuit Temperature
MTA — Compressor Must Trip Amps
SCT — Saturated Condensing Temperature
SST — Saturated Suction Temperature
W/C — Water-Cooled
WSM — Water System Manager

*Compressors are equipped with 2 motor winding temperature thermistors. Verify first that the problem is not a wiring error before using backup thermistor.

†Reset automatic first time, manual if repeated on the same date.

**Note that the high-pressure switch should trip before this alert is generated. Check HPS operation if this alert is generated.

NOTES:

1. Low Oil Pressure Alert Criteria and Set Points

Two oil pressure set points are used. Oil Set point 1 is always 15 psig.

1. If $(P_d - P_s) < 125$, then Oil Set point 2 = $0.235 \times (P_d - P_s) + 0.588$

2. If $(P_d - P_s) \geq 125$ and < 165 , then Oil Set point 2 = $2.0 \times (P_d - P_s) - 220.0$

3. If $(P_d - P_s) \geq 165$, then Oil Set point 2 = $0.6364 \times (P_d - P_s) + 5.0$

The 2 set points are used by the control for the Low Oil Pressure alert trip criteria below:

a. Oil Pressure is ignored during the first 5 seconds after a compressor is started.

b. In period between 5 and 30 seconds after starting, the alert will be generated if $(P_o - P_e) < [(Oil\ Set\ point\ 1)/30] \times (Compressor\ Run\ time\ in\ seconds)$ for 3 consecutive readings

c. After 30 seconds run time, the alert will be generated if:

1) $(P_o - P_e) < Oil\ Set\ point\ 1$ for 15 seconds OR

2) $(P_o - P_s) < Oil\ Set\ point\ 2$ for 25 seconds

Where: P_d = Discharge pressure, P_s = Suction pressure,

P_o = Oil pressure and P_e = Economizer pressure

2. $(P_o - P_e)$ is the Oil pressure differential displayed in 3 STAT for Circuit A

and 5 STAT for Circuit B.

Table 36 — Hardware Point Communications Loss/Action Taken

HARDWARE POINT	CONTROL POINT NAME	ACTION TAKEN UNTIL COMMUNICATION RESTORED
ALARM	Alarm Relay	No Action
CFLOW_SW	Cooler Flow Switch	Chiller shut down
COND_ENT	Condenser Entering Water Thermistor	Same as Alert 12
COND_LWT	Condenser Leaving Water Thermistor	Same as Alert 11
COND_PMP	Condenser Pump Relay	Chiller shut down
COOL_EWT	Cooler Entering Water Thermistor	Same as Alarm 10
COOL_LWT	Cooler Leaving Water Thermistor	Chiller shut down
COOL_HTR	Cooler Heater	Turn ON Cooler Pump relay
COOL_PMP	Cooler Pump Relay	No Action
DFLOW_SW	Condenser Flow Switch	Chiller shut down
DISTMP_A	Discharge Gas Temp Circuit A (Oil Temp)	Circuit shut down
DISTMP_B	Discharge Gas Temp Circuit A (Oil Temp)	Circuit shut down
DISTMP_B	Discharge Gas Temp Circuit B (Oil Temp)	Circuit shut down
DMD_SW1	Demand Limit Switch 1	No Action
DMD_SW2	Demand Limit Switch 2	No Action
DPA	Discharge Pressure Circuit A	Circuit shut down
DPB	Discharge Pressure Circuit B	Circuit shut down
DUAL	Dual Setpoint Switch	Control to Setpoint 1
ECN_PR_A	Circuit A Economizer Pressure	Circuit shut down
ECN_PR_B	Circuit B Economizer Pressure	Circuit shut down
EXVA	Expansion Valve, Circuit A	Circuit shut down
EXVB	Expansion Valve, Circuit B	Circuit shut down
FAN_1	Fan Relay 1	No Action
FAN_2	Fan Relay 2	No Action
FAN_3	Fan Relay 3	No Action
FAN_4	Fan Relay 4	No Action
FAN_5	Fan Relay 5	No Action
FAN_6	Fan Relay 6	No Action
HC_SW	Heat/Cool Switch	Chiller shut down
HR_EWT	Heat Reclaim Entering Water Thermistor	No Action
HR_LWT	Heat Reclaim Leaving Water Thermistor	No Action
ICE_DONE	Ice Complete Indicator	Disable function
ICE_VALV	Ice Valve	Disable function
K_A1_FBK	Compressor A1 Feedback	Compressor shut down
K_A1_RLY	Compressor A1 Relay	Compressor shut down
K_A2_FBK	Compressor A2 Feedback	Compressor shut down
K_A2_RLY	Compressor A2 Relay	Compressor shut down
K_B1_FBK	Compressor B1 Feedback	Compressor shut down
K_B1_RLY	Compressor B1 Relay	Compressor shut down
K_B2_FBK	Compressor B2 Feedback	Compressor shut down
K_B2_RLY	Compressor B2 Relay	Compressor shut down
LOADR_A1	Compressor A1 Loader	No Action
LOADR_A2	Compressor A2 Loader	No Action
LOADR_B1	Compressor B1 Loader	No Action
LOADR_B2	Compressor B2 Loader	No Action
LMT_MA	Demand Limit 4-20 mA Input	Disable function
LOR_SW	Local/Off/Remote Switch	Chiller shut down
MLV_A	Min. Load Valve Relay Circuit A	Disable function
MLV_B	Min. Load Valve Relay Circuit B	Disable function
MOTOR_A	Circuit A Motormaster® Output	Disable function
MOTOR_B	Circuit B Motormaster Output	Disable function
MTRCL_A1	Compressor A1 Motor Cooling	Compressor shut down
MTRCL_A2	Compressor A2 Motor Cooling	Compressor shut down
MTRCL_B1	Compressor B1 Motor Cooling	Compressor shut down
MTRCL_B2	Compressor B2 Motor Cooling	Compressor shut down
OAT	Outside Air Temperature	Disable function
OIL_A1	Compressor A1 Oil Pressure Transducer	Compressor shut down
OIL_A2	Compressor A2 Oil Pressure Transducer	Compressor shut down
OIL_B1	Compressor B1 Oil Pressure Transducer	Compressor shut down
OIL_B2	Compressor B2 Oil Pressure Transducer	Compressor shut down
OILA_HTR	Circuit A Oil Heater	Disable function
OILA_SW	Circuit A Oil Level	Circuit shut down
OILB_HTR	Circuit B Oil Heater	Disable function
OILB_SW	Circuit B Oil Level	Circuit shut down
OILPMP_A	Circuit A Oil Pump	No Action
OILPMP_B	Circuit B Oil Pump	No Action
OILSOL_A	Circuit A Oil Solenoid	Circuit shut down
OILSOL_B	Circuit B Oil Solenoid	Circuit shut down
P_REF	5 Volt Transducer Reference	Chiller shut down
RALARMx	Remote Alarm Relay x (1-16)	Disable function
RST_MA	Temp. Reset 4-20 mA signal	Disable function
SPA	Circuit A Suction Transducer	Circuit shut down
SPB	Circuit B Suction Transducer	Circuit shut down
TLEV_A	Circuit A Cooler Level Sensor	Control EXV-A by discharge superheat
TLEV_B	Circuit B Cooler Level Sensor	Control EXV-B by discharge superheat
TMTR_A1	Compressor A1 Motor Thermistor	Compressor shut down
TMTR_A2	Compressor A2 Motor Thermistor	Compressor shut down
TMTR_B1	Compressor B1 Motor Thermistor	Compressor shut down
TMTR_B2	Compressor B2 Motor Thermistor	Compressor shut down
T_SPACE	External Space Temp Thermistor	Disable function
VALVE_A	Circuit A Water Valve Control	Circuit shut down
VALVE_B	Circuit B Water Valve Control	Circuit shut down

Table 37 — Illegal Configurations Recognized by PSIO-1

CODE NUMBER	ILLEGAL CONFIGURATION DESCRIPTION
1	Incorrect Check Sum in configuration code (factory or service code)
2	Unit type outside range of (1-3)
3	Number of compressors in a circuit outside the range of 0-1
4	Air cooled chiller with a fan type outside the range of 1-16
5	Air cooled chiller with Low Temperature Brine fluid
6	Water cooled chiller configured for air cooled head pressure
7	Selecting both OAT and Space Temp sensors for External Reset operation
8	Air cooled chiller with condenser water pump
9	Air cooled chiller with condenser thermistors
10	MOP Set point is outside the range of 40 - 55 F (4.4 - 12.8 C)
11	Maximum Condensing Temperature Set point (MCT_SP) is outside the range of 0 - 158 F (-17.8 - 70 C)

LEGEND

MOP — Minimum Operating Temperature
OAT — Outdoor-Air Temperature

EXD Troubleshooting Procedure — Follow steps below to diagnose and correct EXV/Economizer problems.

On 30HX units with economizers, verify that the valve for the bubbler tube (bottom of economizer) is open. Check EXV motor operation first. Press **4** **TEST** on the HSIO II key pad and select the appropriate EXV. Press **1** **ENTR** to move the valve to 25%. You should be able to feel the actuator moving by placing your hand on the EXV or economizer body (the actuator is located about one-half to two-thirds of the way up from the bottom of the economizer shell). Repeat pressing **1** **ENTR** three more times until the display reads 100% for a Target Percent (waiting until actuator stops

each time). A hard knocking should be felt from the actuator when it reaches the top of its stroke (can be heard if surroundings are relatively quiet). Press **1** **ENTR** again if necessary to confirm this. Press **0** **ENTR** four times to step the actuator closed in 25% increments, waiting again in between each move. The actuator should knock when it reaches the bottom of its stroke. If it is believed that the valve is not working properly, continue with the checkout procedure below:

Check the EXV output signals at appropriate terminals on EXV driver module (see Fig. 12). Connect positive test lead to terminal 1 on the EXV driver for Circuit A and to terminal 7 for Circuit B. Set meter for approximately 20 vdc. Enter Valves and Motormaster® test subfunction by pressing **4** **TEST** on the HSIO. The EXV for Circuit A will be displayed, or press the down arrow key for Circuit B. When at the desired valve, press **1** **ENTR**. The display should change to show a Target Percent of 25%. The driver should drive the Circuit EXV under test. During the next several seconds, connect negative test lead to pins 2, 3, 4, and 5 in succession (pins 8, 9, 10 and 11 for Circuit B). Voltage should rise and fall at each pin. If it remains constant at a voltage or shows 0 volts, remove the connector to the valve and recheck.

Press **0** **ENTR** to close the Circuit EXV. Check the DSIO address setting (the address should be 50). If a problem still exists, replace the EXV driver module. If the voltage reading is correct, the expansion valve and EXV wiring should be checked. Check the EXV terminal strip and interconnecting wiring.

1. Check color coding and wire connections. Make sure they are connected to the correct terminals at the EXV driver and EXV plug and that the cables are not crossed.
2. Check for continuity and tight connection at all pin terminals.

Check the resistance of the EXV motor windings. Remove the DSIO-EXV plug J4 terminal strip and check the resistance between the common lead (red wire, terminal D) and remaining leads, A, B, C, and E (see Fig. 12). The resistance should be 25 ohms $\pm$ 2 ohms.

EXV DRIVER BOARD, J4

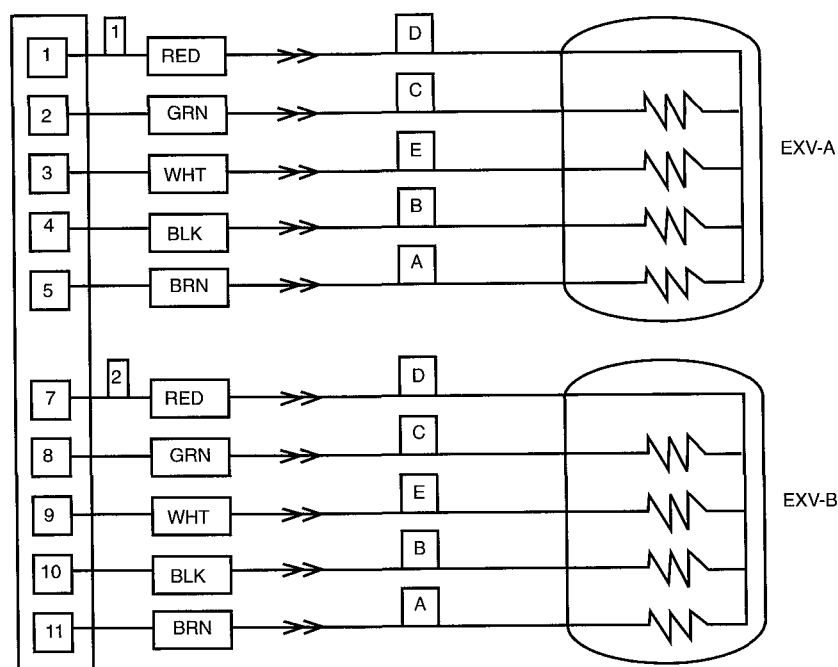


Fig. 12 — EXV Cable Connections to EXV Driver Module, DSIO-EXV

INSPECTING/OPENING ELECTRONIC EXPANSION VALVES

IMPORTANT: Obtain replacement O-ring before opening EXV. Do not reuse O-rings.

To check the physical operation of an EXV, the following steps must be performed:

1. Close the liquid line service valve of the circuit to be checked. Put the LOR switch in the OFF position. Using the HSIO, enter the manual service mode by pressing **8** **SRVC**. Enable the mode by pressing **1** **ENTR**. Switch the LOR switch to the Local position. Scroll down to the desired compressor and press **1** **ENTR** to turn it on. Let compressor run until gage on suction pressure port reads between 5 and 10 psig. Press **0** **ENTR** to turn the compressor off. Immediately after the compressor shuts off, close the discharge valve.
2. Remove any remaining refrigerant from the system low side using proper reclaiming techniques. Drain oil from cooler using Schrader port in cooler inlet line. Turn off the line voltage power supply to the compressors and control circuit power.
3. Remove screws holding top cover of EXV. Carefully remove the top cover from the EXV making sure EXV plug is still connected.

IMPORTANT: When removing top cover from EXVs, be careful to avoid damage to motor leads.

4. Enter the appropriate EXV test step for EXV-A or EXV-B by pressing **4** **TEST** on the HSIO. Scroll down to display the desired EXV. Press **1** and **ENTR** to initiate the test. Observe the operation of the valve motor and lead screw. The motor should turn counterclockwise, and the lead screw should move up out of the motor hub until the valve is fully open. Lead screw movement should be smooth and uniform from fully closed to fully open position. Press **1** **ENTR** as needed to reach 100% open. Wait 30 seconds in between each step for motor to stop moving. Press **0** **ENTR** to check open to closed operation. If the valve is properly connected to the processor and receiving correct signals, yet does not operate as described above, the valve should be replaced.

INSPECTING/OPENING ECONOMIZERS — To check the physical operation of an economizer (see Fig. 13), the following steps must be performed:

1. Close the liquid line service valve of the circuit to be checked. Put the LOR switch in the OFF position. Using the HSIO, enter the manual service mode by pressing **8** **SRVC**. Enable the mode by pressing **1** **ENTR**. Switch the LOR switch to the Local position. Scroll down to the desired compressor and press **1** **ENTR** to turn it on. Let compressor run until gage on suction pressure port reads between 5 and 10 psig. Press **0** **ENTR** to turn the compressor off. Immediately after the compressor shuts off, close the discharge valve and the bubbler valve on 30HX units (located on under side of economizer).

2. Remove any remaining refrigerant from the system low side using proper reclaiming techniques. Drain oil from cooler using Schrader port in cooler inlet line. Turn off the line voltage power supply to the compressors and control circuit power.
3. Remove the shell retaining bolts on the bottom of the economizer and the bolts that secure the shell to the unit frame or mounting bracket. Cut the motor cooling line leaving the top of the economizer. Carefully remove the shell from the economizer. Make sure EXV plug is still connected.

IMPORTANT: When removing shell from economizer, it must be lifted off as close to vertical as possible to prevent damage to any of the internal parts. Use a catch pan beneath the economizer as oil will come out when the shell is removed. Be careful to avoid damage to motor leads.

4. Enter the appropriate EXV test step for EXV-A or EXV-B by pressing **4** **TEST** on the HSIO. Scroll down to display the desired EXV. Press **1** and **ENTR** to initiate the test. Observe the operation of the valve motor and lead screw. The motor should turn counterclockwise, and the lead screw should move up out of the motor hub until the valve is fully open. Lead screw movement should be smooth and uniform from fully closed to fully open position. Press **1** **ENTR** as needed to reach 100% open. Wait 30 seconds in between each step for motor to stop moving. Press **0** **ENTR** to check open to closed operation. If the valve is properly connected to the processor and receiving correct signals, yet does not operate as described above, the economizer should be replaced.
5. Additional items to check for:
 - a. Verify that float assembly (see cross section view in Fig. 13) moves up and down freely. It should take only a minimal force (less than one pound) to move the float and there should be no binding.
 - b. Check the bubbler tube (found by carefully lifting the float) for crimps, etc. and verify that the end of the tube is open.

If operating problems persist after reassembly, they may be due to a bad liquid level sensor, suction pressure transducer or intermittent connections between the processor board terminals and EXV plug. Recheck all wiring connections and voltage signals.

Other possible causes of improper refrigerant flow control could be restrictions in the liquid line. Check for plugged strainer(s) or restricted metering slots in the EXV or economizer. Formation of ice or frost on lower body of electronic expansion valve is one symptom of restricted metering slots. However, frost or ice formation is normally expected when leaving fluid temperature from the cooler is below 40 F. Clean or replace valve if necessary.

NOTE (non-economizer units only): Frosting of valve is normal during compressor test steps and at initial start-up. Frost should dissipate after 5 to 10 minutes operation in a system that is operating properly. If valve is to be replaced, wrap valve with a wet cloth to prevent excessive heat from damaging internal components.

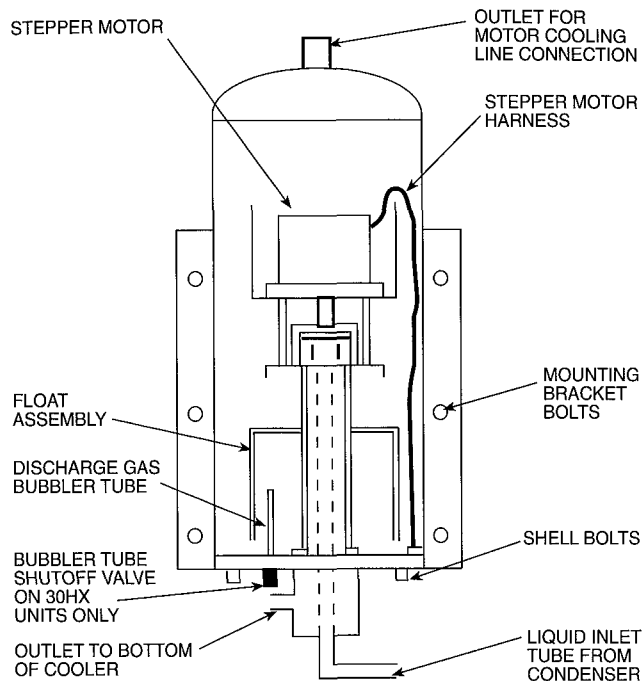


Fig. 13 — 30GX/HX Cutaway View of Economizer Assembly

SERVICE

Servicing the Cooler — When cooler heads and partition plates are removed, tube sheets are exposed showing the ends of tubes. The 30GX,HX units use a flooded cooler design. Water flows inside the tubes.

TUBE PLUGGING — A leaky tube can be plugged until retubing can be done. The number of tubes plugged determines how soon the cooler must be retubed. All tubes in the 30GX and 30HX coolers and 30HX condensers can be removed. Loss of unit capacity and efficiency as well as increased pump power will result from plugging tubes. Failed tubes should be replaced as soon as possible. If several tubes require plugging, check with your local Carrier representative to find out how number and location can affect unit capacity. Figure 14 shows an Elliot tube plug and a cross-sectional view of a plug in place. See Table 38.

⚠ CAUTION

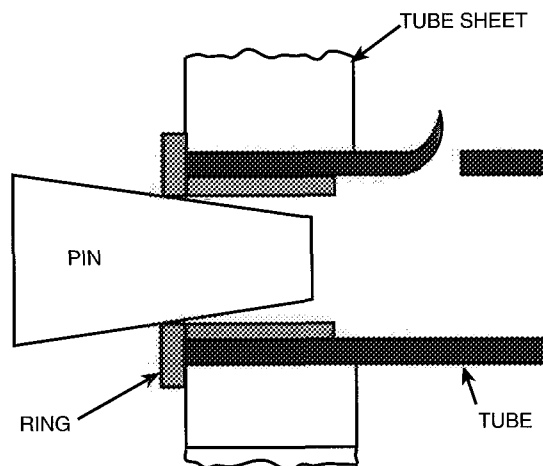
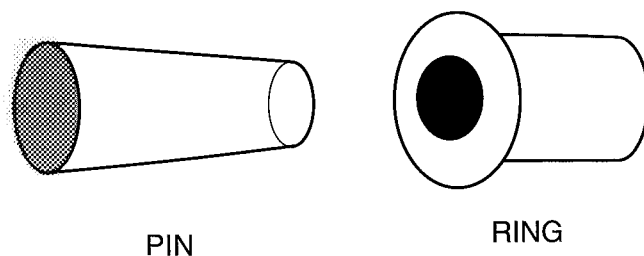
Use extreme care when installing plugs to prevent damage to the tube sheet section between the holes.

RETUBING (See Table 39) — When retubing is to be done, obtain service of qualified personnel experienced in boiler maintenance and repair. Most standard procedures can be followed when retubing the 30GX and 30HX heat exchangers. An 7% crush is recommended when rolling replacement tubes into the tubesheet. An 7% crush can be achieved by setting the torque on the gun at 48 to 50 in.-lb (5.4 to 5.6 N-m).

The following Elliot Co. tube rolling tools are required:

B3400 Expander Assembly	B3405 Mandrel
B3401 Cage	B3408 Rolls

Place one drop of Loctite No. 675 or equivalent on top of tube prior to rolling. This material is intended to "wick" into the area of the tube that is not rolled into the tube sheet, and prevent fluid from accumulating between the tube and the tube sheet. New tubes must be rolled into the center tube sheet as well.



PIN AND RING INSTALLED

Fig. 14 — Tube Plugging

Table 38 — Plugging Components

COMPONENTS FOR PLUGGING	PART NUMBER
For Tubes	
Brass Pin	853103-1A*
Brass Ring	853002-640*
For Holes without Tubes	
Brass Pin	853103-1A*
Brass Ring	853002-738*
Roller Extension	S82-112/11
Loctite	No. 675†
Locquic	"N"†

*Order directly from: Elliot Tube Company, located in Dayton, Ohio.
†Can be obtained locally.

Table 39 — Tube Diameters

ITEM	INCHES	MILLIMETERS
Tube sheet hole diameter:	0.756	19.20
Tube OD	0.750	19.05
Tube ID after rolling:	0.704	17.88
(includes expansion due to clearance)	to 0.710	to 18.03

NOTE: Tubes replaced along heat exchanger head partitions must be flush with tube sheet.

TIGHTENING COOLER/CONDENSER HEAD BOLTS

O-ring Preparation — When reassembling cooler and condenser heads, always check the condition of the O-ring(s) first. The O-ring should be replaced if there are any visible signs of deterioration, cuts or damage. Apply a thin film of grease to the O-ring before installation. This will aid in holding the O-ring into the groove while the head is installed. Torque all bolts to the following specification and in the sequence shown in Fig.15.

3/4-in. Diameter Perimeter and	
Plate Bolts	200 to 225 ft-lb. (271 to 305 N-m)

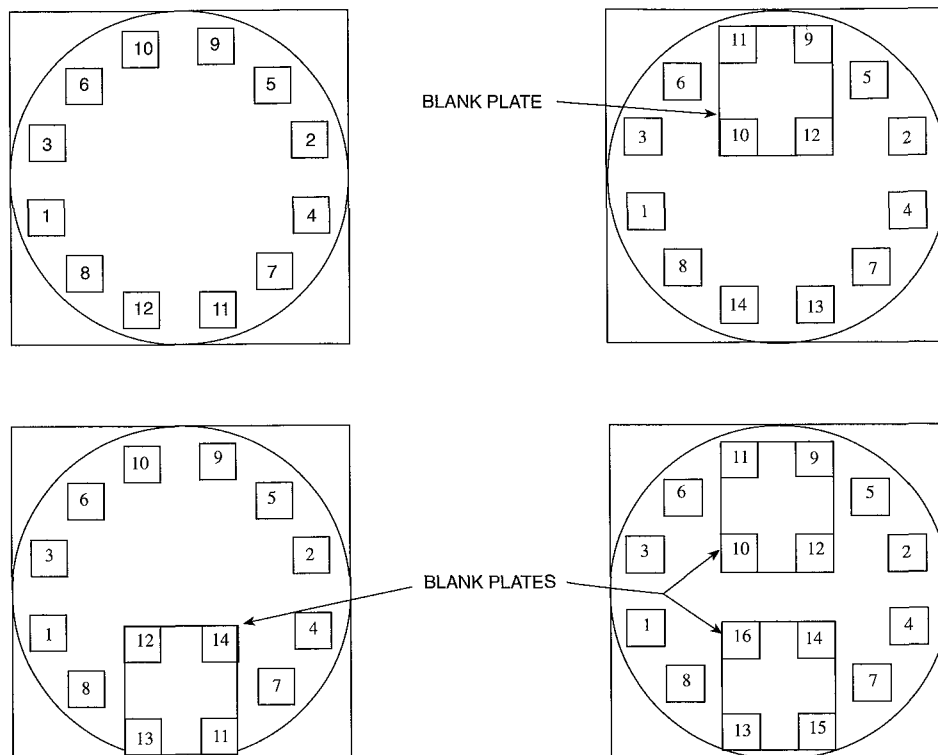


Fig. 15 — Cooler and Condenser Head Recommended Bolt Torque Sequence

1. Install all bolts finger tight.
2. Follow numbered sequence shown for head type being installed. This will apply even pressure to the O-ring.
3. Apply torque in one-third steps until required torque is reached. Load all bolts to each one-third step before proceeding to the next one-third step.
4. No less than one hour later, retighten all bolts to required torque values.
5. Check for leaks when water/brine flow is restored. Replace insulation (on cooler heads only).

Inspecting/Cleaning Heat Exchangers

COOLERS — 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 thermistors for signs of corrosion or scale. Replace the sensor if corroded or remove any scale if found.

CONDENSERS (30HX Only) — 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 regular intervals, and more often if the water is contaminated. Inspect the entering and leaving condenser water thermistors (if installed) 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 the pressure in the R-134a system, air usually will not enter the machine, the refrigerant will leak 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 procedures.

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 or condenser damage resulting from untreated or improperly treated water.

Condenser Coils (30GX Only)

COIL CLEANING — Clean coils with a vacuum cleaner, fresh water, compressed air, or a bristle brush (not wire). Units installed in corrosive environments should have coil cleaning as part of a planned maintenance schedule. In this type of application, all accumulations of dirt should be cleaned off the coil.

⚠ CAUTION

Do not use high-pressure water or air to clean coils as fin damage may result.

Condenser Fans (30GX Only) — Each fan is supported by a formed wire mount bolted to a fan deck and covered with a wire guard. The exposed end of the fan motor shaft is protected from weather by grease. If the fan motor must be removed for service or replacement, be sure to regrease fan shaft and reinstall fan guard. For proper performance, the fans should be positioned as shown in Fig. 16 or 17. Tighten setscrews to 18 ± 1 ft-lb (25 ± 1.3 N-m).

Check for proper rotation of the fan(s) once reinstalled (clockwise for high static and counterclockwise for standard viewed from above). If necessary to reverse, switch leads at contactor(s) in control box.

Refrigerant Charging/Adding Charge

IMPORTANT: These units are designed for use with R-134a only. **DO NOT USE ANY OTHER** refrigerant in these units without first consulting your Carrier representative.

⚠ CAUTION

When adding or removing charge, circulate water through the condenser (30HX) and cooler at all times to prevent freezing. Freezing damage is considered abuse and may void the Carrier warranty.

⚠ CAUTION

DO NOT OVERCHARGE system. Overcharging results in higher discharge pressure with higher cooling fluid consumption, possible compressor damage and higher power consumption.

Indication of low charge on a 30HXC system:

NOTE: To check for low refrigerant charge on a 30HXC, several factors must be considered. A flashing liquid-line sight glass is not necessarily an indication of inadequate charge. There are many system conditions where a flashing sight glass occurs under normal operation. The 30HXC metering device is designed to work properly under these conditions.

1. Make sure that the circuit is running at a full-load condition. To check whether circuit A is fully loaded, enter **3** **STAT** on the HSIO keypad. The display will read "CIRCUIT A ANALOG VALUES." Using the down arrow key on the keypad, scroll down once to "Total Capacity." If this value is 100%, the circuit is at full load. To check circuit B, follow the same procedure, but enter **5** **STAT** on the keypad.
2. It may be necessary to use the Manual Control feature to force the circuit into a full-load condition. If this is the case, see the instructions for using the Manual Control feature in Table 21 of this manual.
3. With the circuit running at full load, verify that the cooler leaving fluid temperature is in the range of 42 to 46 F (5.6 to 7.8 C).
4. At this condition, observe the refrigerant in the liquid line sight glass. If there is a clear sight glass, and no signs of flashing, then the circuit is adequately charged. Skip the remaining steps.
5. If the refrigerant appears to be flashing, the circuit is probably low on charge. Verify this by checking the EXV

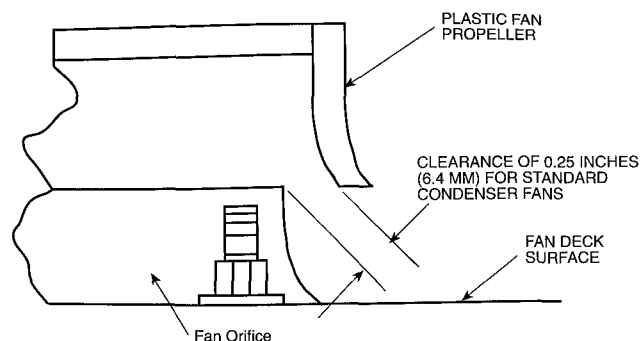


Fig. 16 — Condenser Fan Position (Standard Fan)

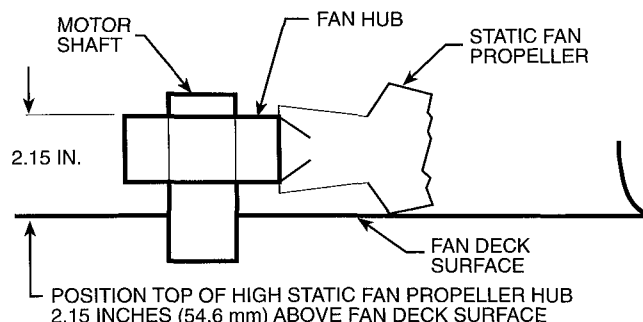


Fig. 17 — Condenser Fan Position (High Static Fan)

Percent Open. This information can be accessed by entering **3** **STAT** on the HSIO keypad for Circuit A, or **5** **STAT** for Circuit B. Scroll down using the down arrow key on the keypad, until EXV Percent Open is displayed.

6. If the EXV Percent Open is greater than 60%, and the liquid-line sight glass is flashing, then the circuit is low on charge. Follow the procedure for adding charge for 30HXC units.

To add charge to the 30HXC systems:

1. Make sure that the unit is running at full load, and that the cooler leaving fluid temperature is in the range of 42 to 46 F (5.6 to 7.8 C).
2. At these operating conditions, check the liquid line sight glass. If there is a clear sight glass, then the unit has sufficient charge. If the sight glass is flashing, then check the EXV Percent Open. If this is greater than 60%, then begin adding charge.

NOTE: A flashing liquid line sight glass at operating conditions other than those mentioned above is not necessarily an indication of low refrigerant charge.

3. Add 5 lb of liquid charge into the cooler using the 1/4-in. Schrader-type fitting located on the tube entering the bottom of the cooler. This fitting is located between the Electronic Expansion Valve (EXV) (076-146 units), or the economizer (161-186 units) and the cooler.
4. Observe the EXV Percent Open value. The EXV should begin closing as charge is being added. Allow the unit to stabilize. If the EXV Percent Open remains above 60%, and the sight glass continues flashing, add an additional 5 lb of liquid charge.
5. Allow the unit to stabilize, and again check the EXV Percent Open. Continue adding 5 lb at a time of liquid refrigerant charge, and allow the unit to stabilize before checking the EXV position.

- When the EXV Percent Open is in the range of 40 to 60%, check the liquid line sight glass. Slowly add enough additional liquid charge to ensure a clear sight glass. This should be done slowly to avoid over-charging the unit.
- Verify adequate charge by continuing to run at full load with 42 to 46 F (5.6 to 7.8 C) cooler leaving fluid temperature. Check that the refrigerant is not flashing in the liquid-line sight glass. The EXV Percent Open should be between 40 and 60%. The cooler level indicator should be in the range of 1.5 to 2.2.

Indication of low charge on a 30HXA, GX systems:

- Make sure that the circuit is running at a full load condition and all condenser fans are energized and running at full speed. To check whether circuit A is fully loaded, enter **3** **STAT** on the HSIO keypad. The display will read "CIRCUIT A ANALOG VALUES." Using the down arrow key on the keypad, scroll down once to "Total Capacity." If this value is 100%, the circuit is at full load. To check circuit B, follow the same procedure, but enter **5** **STAT** on the keypad.
- It may be necessary to use the Manual Control feature to force the circuit into a full-load condition. If this is the case, see the instructions for using the Manual Control feature in Table 21 on page 27 of this manual.
- With the circuit running at full-load, verify that the cooler leaving fluid temperature is in the range of 38 to 48 F (5.6 to 7.8 C).
- Measure the air temperature entering the condenser coils. Measure the liquid temperature entering the expansion device of the circuit in question for 30HXA units. For 30GX units, measure the liquid temperature after the tee where the 2 coil liquid lines join. The liquid temperature should be 15° F (8.3° C) above the air temperature entering the coils. If the difference is more than this and the sight glass is flashing, the circuit is undercharged. Proceed to Step 5.
- Add 5 lb of liquid charge into the cooler using the 1/4-in. Schrader-type fitting located on the tube entering the bottom of the cooler. This fitting is located between the Electronic Expansion Valve (EXV) (30HXA076-146 units, 30GX080-090 units), or the economizer (30HXA161-186 units, 30GX105-175 units) and the cooler.
- Allow the system to stabilize and then recheck the liquid temperature. Repeat Step 5 as needed allowing the system to stabilize between each charge addition. Slowly add charge as the sight glass begins to clear to avoid overcharging.

Oil Charging/Low Oil Recharging

Addition of oil charge to 30HX/GX systems:

- If the 30HX/GX unit shuts off repeatedly on Low Oil Level (Alarm number 71 or 72), this may be an indication of inadequate oil charge. It could also mean simply that oil is in the process of being reclaimed from the low-side of the system.
- Begin by running the unit at full load for an hour and a half. It is recommended to use the Manual Control feature of the software if the unit does not normally run at full load.
- After running for 1½ hours allow the unit to restart and run normally. If the Low Oil Level alarms persist, continue following this procedure.
- Stop the unit, and jumper the oil level safety switch. This is done by placing a jumper wire between TB2 - pin 12, and DSIO-EXV J3-5 (for Circuit A), or DSIO-EXV J3-7 (for Circuit B).
- Close the liquid line service valve, and place a pressure gage on top of the cooler. Enable the manual control

feature using the HSIO keypad, and turn the LOR switch to local. Start the desired compressor by pressing **1** **ENTR** on the keypad, at the appropriate line on the display.

- Before starting the compressor, the unit will go through its normal pre-lube pump routine. If there is an insufficient level of oil in the oil separator, the compressor will not start, and a pre-start oil pressure alarm will be posted. Skip to Step 9.
- If the compressor starts successfully, observe the cooler pressure gage. When this gage reads approximately 10 psig, press **0** **ENTR** on the HSIO keypad, and move the LOR switch to the off position.
- Open the liquid line service valve and allow the unit to restart and run normally. If the Low Oil Level alarms persist, continue following this procedure.
- If none of the previous steps were successful, the unit is low on oil charge. Add oil to the oil separator using the 1/4-in. Schrader-type fitting on the discharge line entering the top of the oil separator (30HX units) or through the Schrader fitting on the top of the oil separator (30GX units).

CAUTION

Do not add oil at any other location as improper unit operation may result.

- Make sure that the unit is not running when adding oil, as this will make the oil charging process easier. Because the system is under pressure even when the unit is not running, it will be necessary to use a suitable pump (hand pump or electric pump) to add oil to the system.
- Using a suitable pump, add ½ gal. (1.89 L) of Castrol Icematic® SW-220 Polyolester oil to the system. Make sure that the oil level safety switch is NOT jumpered, and allow the unit to restart and run normally.
- If low oil level problems persist, add another 1.89 L (½ gal.) of oil. Continue adding oil in 1.89 L (½ gal.) increments until the problem is resolved. If it is necessary to add more than 3.785 L (1 gallon) of oil to the system, then contact your Carrier distributor service department.

Compressor Changeout Sequence

NOTE: Compressor service requires metric tools and hardware.

- Turn off all main and control circuit power supplying the machine.
- Close the discharge and liquid valve, suction valve, and cooler inlet line service valve (if equipped), oil line shutoff valve, economizer bubble tube valve (30HXA, C161-186 only) and Minimum load shutoff valve (if equipped) for circuit to be changed. Disconnect the oil inlet line from the compressor. Disconnect oil filter with fitting at shutoff valve side and set filter and compressor inlet line assembly aside.
- Remove any remaining refrigerant in the compressor and refrigerant lines using proper reclaiming techniques. All of the refrigerant that is in the cooler will need to be removed if there is no suction service valve installed on the cooler.
- Remove junction box cover of compressor to be changed. Check main power leads for marked numbers. If no numbers are visible on leads, mark leads with appropriate numbers to match those printed on the ends of the terminal lugs. **This is extremely important as power leads**

MUST be installed on the exact terminals from which they were removed.

- Disconnect main power leads from compressor terminal lugs. Mark remaining control circuit wires (connected together with wire nuts) for ease of reconnecting later. The following color scheme applies (verify with label diagram on panel):

Loader 1	2 Violet wires
Loader 2	2 Pink wires
Motor Cooling Solenoid	1 Blue wire, 1 Brown wire *
Oil Solenoid	1 Orange wire, 1 Brown wire*
High-Pressure Switch	2 Red wires

*One lead from the motor cooling and oil solenoids are connected together with a single brown wire.

- Remove loader (mark solenoids no. 1 and 2 for replacement) and oil solenoids and high-pressure switch from compressor. Using 2 wrenches, carefully remove the oil pressure transducer from the compressor. These will all be reconnected to the replacement compressor.

NOTE: Some oil will leak out of the transducer fitting when the transducer is removed. See Fig. 18.

- Mark motor temperature leads (2 blue wires) and remove from quick connect terminals in the junction box.

⚠ CAUTION

The next steps involve compressor unbolting and removal. Compressor seals are made using O-rings. Use care when removing bolts and disconnecting flanges. The O-rings may NOT be re-used. New O-rings are provided with the replacement compressor. **The 06N screw compressors weigh approximately 900 pounds.** Be sure that an appropriate lifting cart or hoist is used to avoid injury. See Fig. 19 for lifting locations and center of gravity dimensions. Make sure compressor is properly rigged before unbolting.

- Remove the 2 bolts securing the motor cooling/economizer line flange to the compressor.
- Remove the four M14 bolts securing the discharge line flange to the compressor. Two of the bolts also secure the mounting bracket for the external oil filter. Support the oil line to prevent damage to the line while the compressor is being changed.
- Move lifting apparatus into place and attach to the 2 lifting rings on the compressor. Apply minimal tension to hold the compressor while the remaining bolts are removed.
- Remove the 3/8-in. holddown bolt securing the foot at the discharge end of the compressor to the mounting bracket on the cooler. A foot bracket will be mounted to the replacement compressor.
- Remove the 4 lockwashers and nuts securing the compressor to the suction flange of the cooler. The compressor is held in place using four M14 x 2 studs through the suction nozzle of the cooler. The studs have an E-12 external Torx drive head. If possible, remove studs; if studs hit the cooler insulation, let them just sit there — they will not interfere with compressor removal or installation. Save all the hardware as it will be needed to install the replacement compressor.
- After checking to ensure all lines, wires, conduits, etc. are free and out of the way, remove compressor from cooler. Apply a light film of O-ring grease to new O-ring and place back into groove in mounting flange of compressor. If the new compressor is the A1 (30HX units)

compressor, it will be necessary to remove the compressor junction box and rotate it 180 degrees. Tighten screws to 6.8 to 9.5 N-m (5 to 7 ft-lb). The A1 compressor is on the right side of the unit when facing the unit control box.

- Remove suction cover plate and bolts from new compressor and set compressor on unit flange. Thread the studs all the way back into the compressor. Install the 4 lockwashers and nuts finger tight. Tighten bolts in a crossing pattern to a range of 81.4 to 135.6 N-m (60 to 100 ft-lb). Do NOT overtighten as damage may result to O-ring. Install and tighten hold down bolt in mounting foot.
- Remove motor cooling/economizer and discharge line cover plates from new compressor.
- Apply a light film of O-ring grease to motor cooling/economizer and discharge line O-rings, place back into grooves and install flange bolts. Tighten discharge line bolts in a crossing pattern to a range of 81.4 to 135.6 N-m (60 to 100 ft-lb). Tighten motor cooling/economizer bolts to a range of 81.4 to 108.5 N-m (60 to 80 ft-lb). Do NOT overtighten as damage may result to O-rings.
- Reconnect the oil filter to the shutoff valve and oil line to the compressor. Install oil line straight into fitting until ferrule seats against fitting. Thread packing nut onto fitting and tighten finger tight. Use a backup wrench to finish tightening the nut. Do not overtighten.
- Reinstall the loader and oil solenoids, high-pressure switch, and oil pressure transducer. Make sure the loader solenoids are installed on the correct number loader.
- Reconnect conduits back into compressor junction box. Reconnect all wiring that was removed in Steps 4, 5, and 7. The replacement compressor comes with a reverse rotation switch. This switch must be wired in series with the high-pressure switch for compressor protection. Reconnect these wires as shown in Fig. 20.

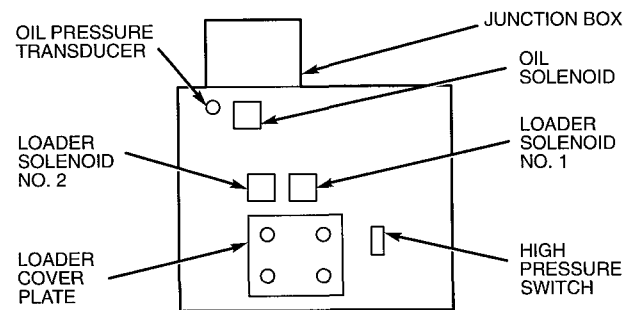


Fig. 18 — Transducer Removal

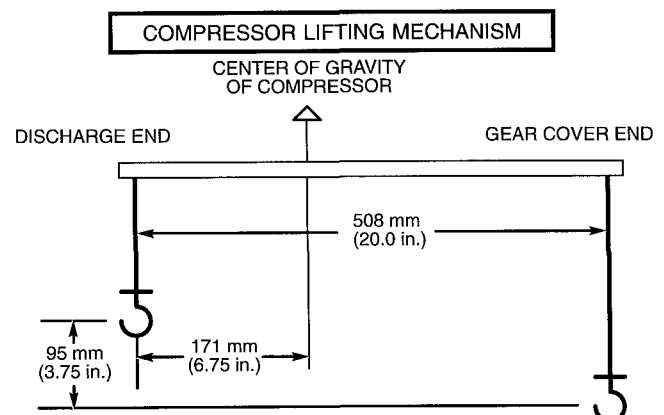
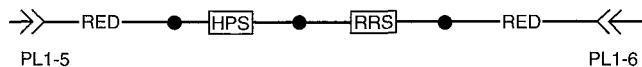


Fig. 19 — Compressor Lifting Diagram



LEGEND

HPS — High-Pressure Switch
PL — Plug
RRS — Reverse Rotation Switch

Fig. 20 — High-Pressure Switch Wiring

20. Leak check compressor and refrigerant lines with nitrogen. Repair any leaks found. Remove nitrogen from system. Evacuate compressor and refrigerant lines. Refer to the Refrigerant and Oil Charging sections on pages 49 and 50 for recharging procedures.
21. Open all shutoff valves and leak check the circuit and all fittings and joints. Repair any leaks found.
22. Restore main and control power to the machine. Using the HSIO, enter the quick test function by pressing **1** **TEST** (for compressor A1 replacement) or **2** **TEST** (for compressor B1 replacement). Test the operation of the 4 solenoids. Press **1** **ENTR** to test each loader solenoid, then use the down arrow key to find the motor cooling and oil solenoids and test them in the same manner. Pressing the down arrow key after each output will turn the solenoid off or press **0** **ENTR**. It is important that the loaders are located properly (loader 1 on right hand side when viewed from side opposite control box on 30HX units, on left hand side when reaching over compressor to far side on 30GX units).
23. Start the compressor using the Manual mode. Press **8** **SRVC** at the HSIO. Press **1** **ENTR** to enable the Manual mode. When display changes to "Enable," switch the Local-Off-Remote switch to the Local position. Select the desired compressor using the down arrow key. Press **1** **ENTR** to start the compressor. Use the down arrow key and press **1** **ENTR** to energize both loaders. Let the circuit stabilize with both loaders energized. Refer to the Refrigerant and Oil charging section of this document for recharging procedures and performance criteria.

Moisture-Liquid Indicator — Clear flow of liquid refrigerant indicates sufficient charge in the system. Note, however, that bubbles in the sight glass do not necessarily indicate insufficient charge. Moisture in the system is measured in parts per million (ppm), changes of color of indicator are:

Green — moisture is below 80 ppm;
Yellow-green (chartreuse) — 80 to 225 ppm (caution);
Yellow (wet) — above 225 ppm.

Change filter drier at the first sign of moisture in the system.

IMPORTANT: Unit must in operation for at least 12 hours before moisture indicator can give an accurate reading. With the unit running, the indicating element must be in contact with liquid refrigerant to give true reading.

Filter Drier — Whenever moisture-liquid indicator shows presence of moisture, replace filter drier. Refer to Carrier Standards Service Technique Manual, Chapter 1, Refrigerants, for details on servicing filter driers.

Liquid Line Service Valve — This valve is located ahead of the filter drier and provides a 1/4-in. Schrader connection (30GX only) for field charging. In combination with compressor discharge service valve, each circuit can be pumped down into the high side for servicing.

Thermistors — All thermistors (except liquid level sensor thermistors) are identical in their temperature vs resistance performance. Resistance at various temperatures are listed in Tables 40A and 40B.

LOCATION — General location of thermistor sensors and terminal connections in the control box are listed in Table 3.

THERMISTOR REPLACEMENT

⚠ CAUTION

Liquid level thermistors are installed in the top of the cooler using compression fittings to secure in well. All other thermistors are installed in wells and will slide out of the wells easily. The wells are under refrigerant pressure (Cooler EWT and LWT are under waterside pressure) and do not need to be removed to replace a faulty thermistor.

To replace thermistors T1, T2, T5 or T6 (Entering, Leaving Water; Discharge Gas Temperature):

Disconnect appropriate wires from PSIO-2 in unit control box. Remove thermistor cable from harness. Remove and discard original thermistor from well. Insert new thermistor in well body to its full depth. Add a small amount of thermal conductive grease to thermistor probe and well. Thermistors are friction-fit thermistors and will slip back into well located at the cooler head (T1, T2) or at the top of the condenser shell (T5, T6). Secure thermistor to well body with a wire tie to prevent thermistor from working its way out of the well. See Fig. 21.

To replace thermistors T3 or T4 (Liquid Level Sensors):

NOTE: A new packing nut and ferrule will be required as the old one is not removable from the old thermistor. Cut wire nuts apart to appropriate blue leads at PSIO-1 (J7-5,6 for T3; J7-8,9 for T4) and red leads connecting wires to TRAN-7. Remove old leads from control box harness. Loosen the packing nut fully from the well threads. Remove and discard old thermistor and packing nut. Slide new packing nut then ferrule up onto new thermistor probe from inserted end. Insertion depth is dependent on unit model number. See Fig. 22 and Table 41.

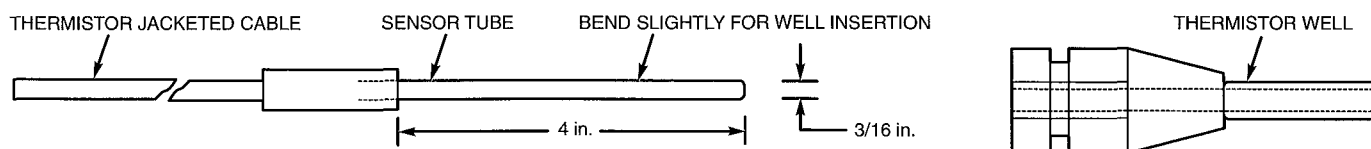


Fig. 21 — Thermistor Replacement (T1, T2, T5, or T6)

Table 40A — Thermistor Temperatures (°F) vs Resistance/Voltage Drop
(NOTE: These values do NOT Apply to the Motor Temperature Thermistors)

TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
-25	4.821	98,010	59	3.437	7,868	143	1.250	1,190
-24	4.818	94,707	60	3.409	7,665	144	1.230	1,165
-23	4.814	91,522	61	3.382	7,468	145	1.211	1,141
-22	4.806	88,449	62	3.353	7,277	146	1.192	1,118
-21	4.800	85,486	63	3.323	7,091	147	1.173	1,095
-20	4.793	82,627	64	3.295	6,911	148	1.155	1,072
-19	4.786	79,871	65	3.267	6,735	149	1.136	1,050
-18	4.779	77,212	66	3.238	6,564	150	1.118	1,029
-17	4.772	74,648	67	3.210	6,399	151	1.100	1,007
-16	4.764	72,175	68	3.181	6,238	152	1.083	986
-15	4.757	69,790	69	3.152	6,081	153	1.064	965
-14	4.749	67,490	70	3.123	5,929	154	1.047	945
-13	4.740	65,272	71	3.093	5,781	155	1.029	925
-12	4.734	63,133	72	3.064	5,637	156	1.012	906
-11	4.724	61,070	73	3.034	5,497	157	0.995	887
-10	4.715	59,081	74	3.005	5,361	158	0.978	868
-9	4.705	57,162	75	2.977	5,229	159	0.962	850
-8	4.696	55,311	76	2.947	5,101	160	0.945	832
-7	4.688	53,526	77	2.917	4,976	161	0.929	815
-6	4.676	51,804	78	2.884	4,855	162	0.914	798
-5	4.666	50,143	79	2.857	4,737	163	0.898	782
-4	4.657	48,541	80	2.827	4,622	164	0.883	765
-3	4.648	46,996	81	2.797	4,511	165	0.868	750
-2	4.636	45,505	82	2.766	4,403	166	0.853	734
-1	4.624	44,066	83	2.738	4,298	167	0.838	719
0	4.613	42,679	84	2.708	4,196	168	0.824	705
1	4.602	41,339	85	2.679	4,096	169	0.810	690
2	4.592	40,047	86	2.650	4,000	170	0.797	677
3	4.579	38,800	87	2.622	3,906	171	0.783	663
4	4.567	37,596	88	2.593	3,814	172	0.770	650
5	4.554	36,435	89	2.563	3,726	173	0.758	638
6	4.540	35,313	90	2.533	3,640	174	0.745	626
7	4.527	34,231	91	2.505	3,556	175	0.734	614
8	4.514	33,185	92	2.476	3,474	176	0.722	602
9	4.501	32,176	93	2.447	3,395	177	0.710	591
10	4.487	31,202	94	2.417	3,318	178	0.700	581
11	4.472	30,260	95	2.388	3,243	179	0.689	570
12	4.457	29,351	96	2.360	3,170	180	0.678	561
13	4.442	28,473	97	2.332	3,099	181	0.668	551
14	4.427	27,624	98	2.305	3,031	182	0.659	542
15	4.413	26,804	99	2.277	2,964	183	0.649	533
16	4.397	26,011	100	2.251	2,898	184	0.640	524
17	4.381	25,245	101	2.217	2,835	185	0.632	516
18	4.366	24,505	102	2.189	2,773	186	0.623	508
19	4.348	23,789	103	2.162	2,713	187	0.615	501
20	4.330	23,096	104	2.136	2,655	188	0.607	494
21	4.313	22,427	105	2.107	2,597	189	0.600	487
22	4.295	21,779	106	2.080	2,542	190	0.592	480
23	4.278	21,153	107	2.053	2,488	191	0.585	473
24	4.258	20,547	108	2.028	2,436	192	0.579	467
25	4.241	19,960	109	2.001	2,385	193	0.572	461
26	4.223	19,393	110	1.973	2,335	194	0.566	456
27	4.202	18,843	111	1.946	2,286	195	0.560	450
28	4.184	18,311	112	1.919	2,239	196	0.554	445
29	4.165	17,796	113	1.897	2,192	197	0.548	439
30	4.145	17,297	114	1.870	2,147	198	0.542	434
31	4.125	16,814	115	1.846	2,103	199	0.537	429
32	4.103	16,346	116	1.822	2,060	200	0.531	424
33	4.082	15,892	117	1.792	2,018	201	0.526	419
34	4.059	15,453	118	1.771	1,977	202	0.520	415
35	4.037	15,027	119	1.748	1,937	203	0.515	410
36	4.017	14,614	120	1.724	1,898	204	0.510	405
37	3.994	14,214	121	1.702	1,860	205	0.505	401
38	3.968	13,826	122	1.676	1,822	206	0.499	396
39	3.948	13,449	123	1.653	1,786	207	0.494	391
40	3.927	13,084	124	1.630	1,750	208	0.488	386
41	3.902	12,730	125	1.607	1,715	209	0.483	382
42	3.878	12,387	126	1.585	1,680	210	0.477	377
43	3.854	12,053	127	1.562	1,647	211	0.471	372
44	3.828	11,730	128	1.538	1,614	212	0.465	367
45	3.805	11,416	129	1.517	1,582	213	0.459	361
46	3.781	11,112	130	1.496	1,550	214	0.453	356
47	3.757	10,816	131	1.474	1,519	215	0.446	350
48	3.729	10,529	132	1.453	1,489	216	0.439	344
49	3.705	10,250	133	1.431	1,459	217	0.432	338
50	3.679	9,979	134	1.408	1,430	218	0.425	332
51	3.653	9,717	135	1.389	1,401	219	0.417	325
52	3.627	9,461	136	1.369	1,373	220	0.409	318
53	3.600	9,213	137	1.348	1,345	221	0.401	311
54	3.575	8,973	138	1.327	1,318	222	0.393	304
55	3.547	8,739	139	1.308	1,291	223	0.384	297
56	3.520	8,511	140	1.291	1,265	224	0.375	289
57	3.493	8,291	141	1.289	1,240	225	0.366	282
58	3.464	8,076	142	1.269	1,214			

Table 40B — Thermistor Temperatures (°C) vs Resistance/Voltage Drop
(NOTE: These Values do NOT Apply to the Motor Temperature Thermistors)

TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)	TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
-40	4.896	168 230	10	3.680	9 949	60	1.291	1 244
-39	4.889	157 440	11	3.633	9 485	61	1.258	1 200
-38	4.882	147 410	12	3.585	9 044	62	1.225	1 158
-37	4.874	138 090	13	3.537	8 627	63	1.192	1 118
-36	4.866	129 410	14	3.487	8 231	64	1.160	1 079
-35	4.857	121 330	15	3.438	7 855	65	1.129	1 041
-34	4.848	113 810	16	3.387	7 499	66	1.099	1 006
-33	4.838	106 880	17	3.337	7 161	67	1.069	971
-32	4.828	100 260	18	3.285	6 840	68	1.040	938
-31	4.817	94 165	19	3.234	6 536	69	1.012	906
-30	4.806	88 480	20	3.181	6 246	70	0.984	876
-29	4.794	83 170	21	3.129	5 971	71	0.949	836
-28	4.782	78 125	22	3.076	5 710	72	0.920	805
-27	4.769	73 580	23	3.023	5 461	73	0.892	775
-26	4.755	69 250	24	2.970	5 225	74	0.865	747
-25	4.740	65 205	25	2.917	5 000	75	0.838	719
-24	4.725	61 420	26	2.864	4 786	76	0.813	693
-23	4.710	57 875	27	2.810	4 583	77	0.789	669
-22	4.693	54 555	28	2.757	4 389	78	0.765	645
-21	4.676	51 450	29	2.704	4 204	79	0.743	623
-20	4.657	48 536	30	2.651	4 028	80	0.722	602
-19	4.639	45 807	31	2.598	3 861	81	0.702	583
-18	4.619	43 247	32	2.545	3 701	82	0.683	564
-17	4.598	40 845	33	2.493	3 549	83	0.665	547
-16	4.577	38 592	34	2.441	3 404	84	0.648	531
-15	4.554	38 476	35	2.389	3 266	85	0.632	516
-14	4.531	34 489	36	2.337	3 134	86	0.617	502
-13	4.507	32 621	37	2.286	3 008	87	0.603	489
-12	4.482	30 866	38	2.236	2 888	88	0.590	477
-11	4.456	29 216	39	2.186	2 773	89	0.577	466
-10	4.428	27 633	40	2.137	2 663	90	0.566	456
-9	4.400	26 202	41	2.087	2 559	91	0.555	446
-8	4.371	24 827	42	2.039	2 459	92	0.545	436
-7	4.341	23 532	43	1.991	2 363	93	0.535	427
-6	4.310	22 313	44	1.944	2 272	94	0.525	419
-5	4.278	21 163	45	1.898	2 184	95	0.515	410
-4	4.245	20 079	46	1.852	2 101	96	0.506	402
-3	4.211	19 058	47	1.807	2 021	97	0.496	393
-2	4.176	18 094	48	1.763	1 944	98	0.486	385
-1	4.140	17 184	49	1.719	1 871	99	0.476	376
0	4.103	16 325	50	1.677	1 801	100	0.466	367
1	4.065	15 515	51	1.635	1 734	101	0.454	357
2	4.026	14 749	52	1.594	1 670	102	0.442	346
3	3.986	14 026	53	1.553	1 609	103	0.429	335
4	3.945	13 342	54	1.513	1 550	104	0.416	324
5	3.903	12 696	55	1.474	1 493	105	0.401	312
6	3.860	12 085	56	1.436	1 439	106	0.386	299
7	3.816	11 506	57	1.399	1 387	107	0.370	285
8	3.771	10 959	58	1.363	1 337			
9	3.726	10 441	59	1.327	1 290			

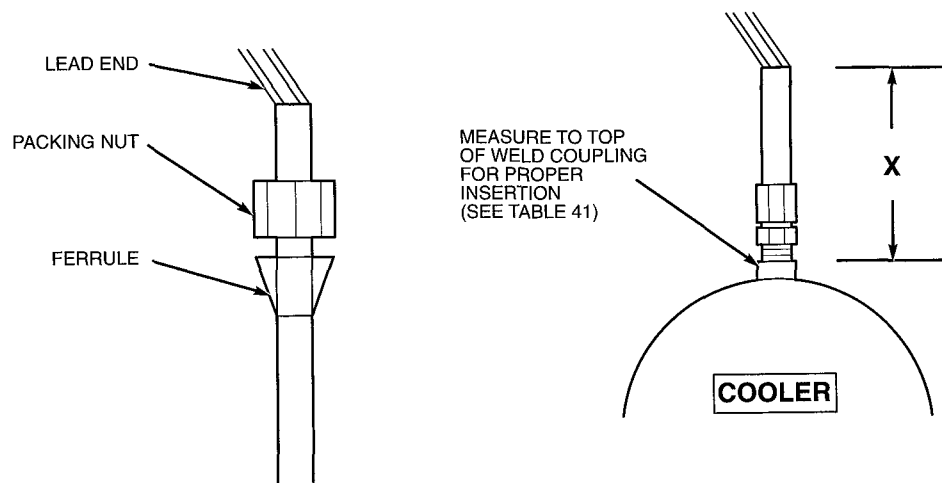


Fig. 22 — Thermistor (Liquid Level Sensor) Replacement

Table 41 — Thermistor Depth

UNIT MODEL NUMBER	THERMISTOR DEPTH "X" (in.)
30GX080-090	6.12
30GX105-115	4.07
30GX125-135	5.38
30GX150	6.12
30GX160	4.07
30GX175	4.07
30HXA,C076-086	5.13
30HXA,C096	6.00
30HXA,C106	4.25
30HXA,C116-126	5.13
30HXA,C136-146	6.00
30HXA,C161-171	4.25
30HXA,C186	5.56

Hand tighten packing nut to position ferrule while holding thermistor in position. With wrench, tighten enough to firmly secure thermistor in place in well. Run new harness wires into main control box. Reconnect blue wires at PSIO-1 for thermistor reading and red wires to TRAN-7.

Pressure Transducers — A single style of pressure transducer is used for both high- and low-pressure sensing on the 30GX/HX chillers. The transducers operate on a 5 VDC supply. The power supply for this is a 24 VAC to 5 VDC full wave rectified power supply, PS1. See unit component arrangement label for mounting location and terminal connections in the control box. Refer to Fig. 23A and 23B for pressure transducer locations.

PRESSURE TRANSDUCER CALIBRATION — Pressure transducers are factory installed on all models to read Discharge, Suction, Economizer (reads leaving condenser pressure on Non-Economized models), and Oil pressure. DO NOT attempt to calibrate any of these transducers by the pressure gage method unless the transducer is connected to a fully charged refrigerant system. A more accurate method of calibration is used by the 30GX/HX software and corrects for ambient temperature when calibrating. Calibrating a transducer when the system is under nitrogen charge will result in an incorrect offset being applied to the reading (due to temperature correction). Although these transducers are calibrated at the factory, replacement transducers require calibration for accurate readings. Calibration is also required when replacing a PSIO. Access to the transducer calibration area is through the Service function and the transducers can

be calibrated at the current system pressure using a pressure gage at the same point or exposed to atmospheric pressure. In Table 42, the Circuit A Discharge Pressure transducer has been replaced and needs to be calibrated. A pressure gage has been installed at the transducer and reads 85 PSI (must be in the range of -5.0 to 185.0 PSI). See Table 42.

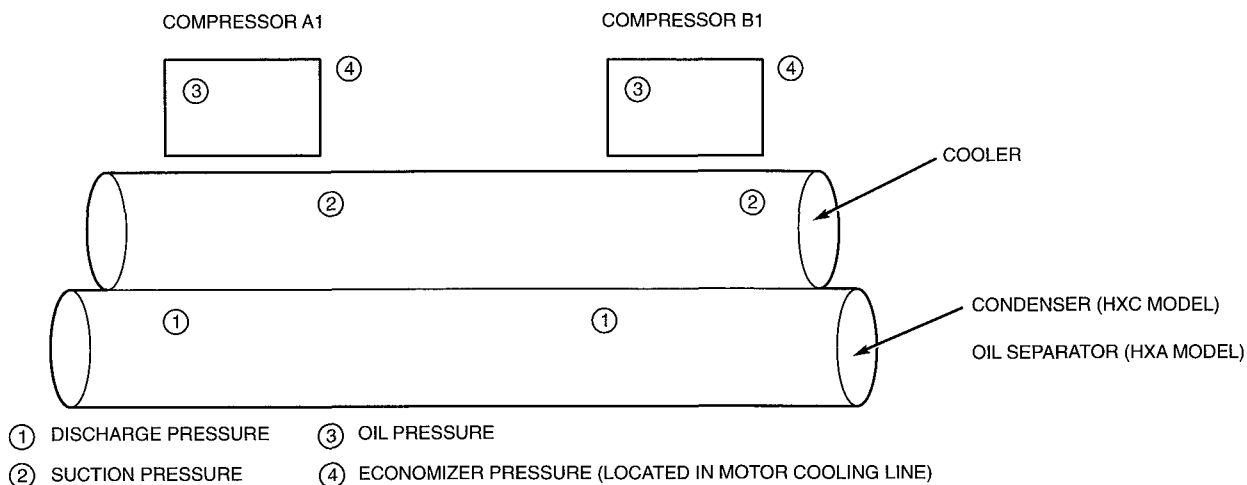
CAUTION

Use care when removing the oil pressure transducers from the compressor fitting. The fitting that the transducers mount to is sealed with an O-ring Schrader fitting into the compressor casting. Do NOT overtighten the transducer when replacing after calibration. Hold both fittings with wrenches when removing and reinstalling.

Table 42 — Calibrating Pressure Transducers (Pressure Gage Installed)

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
7 [SRVC]	CALIBRATION OFFSET	
↓	CIRCUIT A PRESSURE	
↓	Discharge Pressure 84.2 PSI	Current reading is displayed.
8 5 . 0 [ENTR]	Discharge Pressure 85.0 PSI	Enter gage pressure reading to nearest tenth. Control will allow offset of up to 6 PSIG. Transducer calibration is now complete.

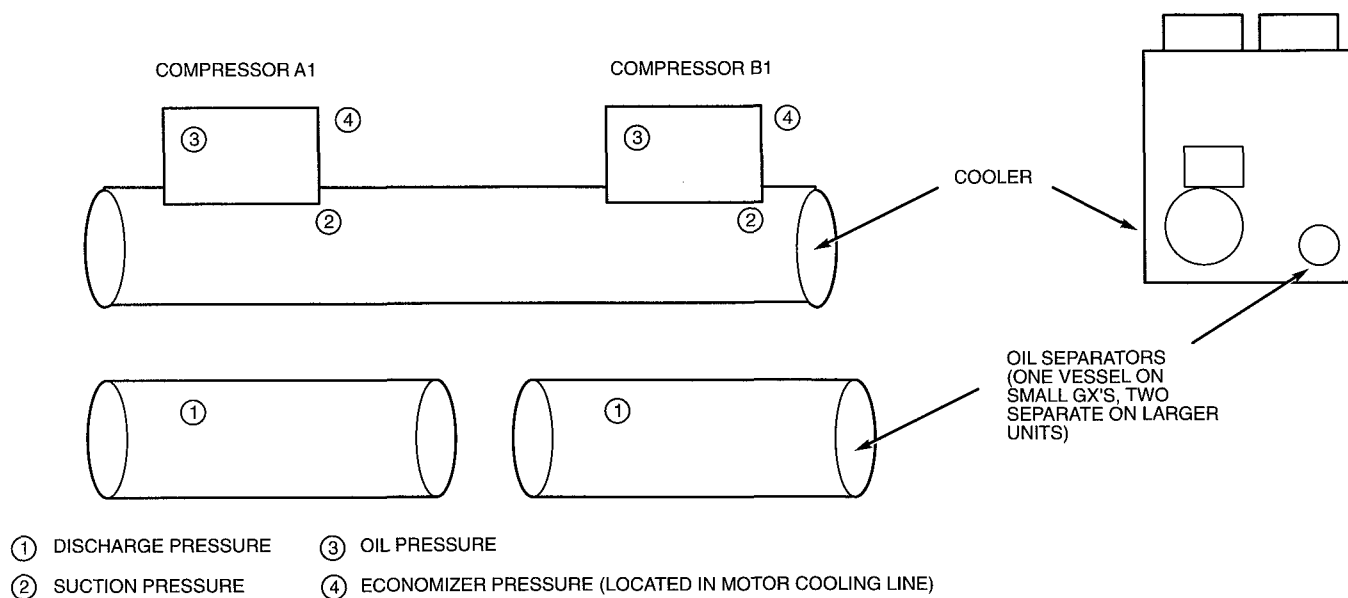
The control will apply the 0.8 PSI offset from the calibration example above to all future readings. The calibration process for any of the other pressure transducers is done in a similar manner. A transducer may be calibrated at atmospheric pressure by removing the transducer from the system. To do this, carefully unplug the transducer connector. Unscrew the transducer from its mounting location and reconnect the connector. Follow the steps in Table 42 to read the current pressure and enter 0.0 PSIG as the gage pressure. Remove the connector from the transducer, thread the transducer back onto the fitting from which it was removed (do NOT use thread sealant/compound), and reinstall the connector.



LEGEND

- 1 — Discharge Pressure
- 2 — Suction Pressure
- 3 — Oil Pressure
- 4 — Economizer Pressure
(Located in motor cooling line)

Fig. 23A — 30HX Pressure Transducer Locations



LEGEND

- 1 — Discharge Pressure
- 2 — Suction Pressure
- 3 — Oil Pressure
- 4 — Economizer Pressure
(Located in motor cooling line)

Fig. 23B — 30GX Pressure Transducer Locations

If it is necessary, all of the transducers may be calibrated at 0.0 PSIG. All of the transducers must be removed from the system and reconnected in atmosphere as described above. When complete, scroll down under **7** **SHVC** to "Calibrate All at 0 PSIG" and press **1** **ENTR**. A "Yes" will be displayed at this step and will automatically change back to "No" once all transducers have been successfully calibrated. Reconnect the transducers and connectors as described above. When removing transducers from a charged system for calibration, the refrigerant in the system must first be removed using proper reclaiming equipment and procedures. Use a catch pan when removing the oil pressure transducer for calibration as oil will leak out through the Schrader fitting.

TROUBLESHOOTING — If transducer is suspected of being faulty, first check supply voltage to transducer. Supply voltage should be 5 vdc $\pm$.2 v. If supply voltage is correct, compare pressure reading displayed on keypad and display module against pressure shown on a calibrated pressure gage. If the 2 pressure readings are not reasonably close, replace pressure transducer.

Safety Devices — The 30GX/HX chillers contain many safety devices and protection logic built into the electronic control. Following is a description of the major safeties.

COMPRESSOR PROTECTION

Motor Overload — One factory preset solid-state overload protects each compressor against overcurrent. Do not bypass the overload or make any changes to the overload setting. Determine the cause for trouble and correct the problem before resetting a tripped overload. In addition to the overload, each compressor is further protected by the Compressor Protection Module. Each module has a factory installed and configured 8-pin header. The configuration of this header defines the Must Trip Amps at which the CPM will turn the compressor off.

Each CPM board also reads the status of each compressor's high-pressure switch. All compressors have factory-installed high-pressure switches. For 30GX units, the switch is set to trip at 303 $\pm$ 7 psig (2089 $\pm$ 48 kPa). The setting for 30HXA units is 275 $\pm$ 7 psig (1896 $\pm$ 48 kPa) and for 30HXC units the setting is 191 $\pm$ 7 psig (1317 $\pm$ 48 kPa). If the switch opens during operation, the compressor will be shut down. The CPM will reset automatically when the switch closes, however, a manual reset is required to restart the compressor.

OIL SEPARATOR HEATERS (30GX) — Each oil separator circuit has a heater mounted on the underside of the vessel. The heater is energized with control circuit power. After a prolonged shutdown or a service job, allow 24 hours before starting the unit. Failure to do so may result in problems during the pre-lubrication cycle.

COOLER PROTECTION

Low Water Temperature — Microprocessor is programmed to shut the chiller down if the leaving fluid temperature drops below 34 F (1.1 C) for water or more than 8° F (4.4° C) below set point for brine units. When the fluid temperature rises 6° F (3.3° C) above the leaving fluid set point, the safety resets and the chiller restarts. Reset is automatic as long as this is the first occurrence of the day.

IMPORTANT: If the unit is installed in an area where ambient temperatures fall below 32 F (0° C), it is recommended that inhibited ethylene glycol or other suitable solution be used in the chilled fluid circuit.

Relief Devices — Fusible plugs are located in each circuit (30GX only) between the condenser and the liquid line shutoff valve.

PRESSURE RELIEF VALVES — Valves are installed in each circuit and are located on all coolers. One relief valve is also installed on each 30HXC condenser. Both circuits' oil separators on 30GX and 30HXA units have factory-installed relief valves as well. These valves are designed to relieve if an abnormal pressure condition arises. The valves are designed to relieve at 450 psig (3103 kPa). *These valves should not be capped.* If a valve relieves, it should be replaced. If the valve is not replaced, it may relieve at a lower pressure, or leak due to trapped dirt from the system which may prevent resealing.

Pressure relief valves located on cooler and condenser shells and 30HXA oil separator shells have 3/4-in. NPT connections for relief. The 30GX oil separators have 1/2-in. male flare connections. Some local building codes require that relieved gases be removed. This connection will allow conformance to this requirement.

Control Modules

⚠ CAUTION

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

PROCESSOR MODULE (PSIO-1), HIGH-VOLTAGE RELAY MODULE (DSIO-HV), AND EXV DRIVER MODULE (DSIO-EXV), 12/6 MODULE (PSIO-2) — The PSIO and DSIO modules all perform continuous diagnostic evaluations of the condition of the hardware. Proper operation of these modules is indicated by LEDs (light-emitting diodes) on the front surface of the DSIOs, and on the top horizontal surface of the PSIOs.

RED LED — Blinking continuously at a 1 to 2 second rate indicates proper operation. Lighted continuously indicates a problem requiring replacement of module. Off continuously indicates power should be checked. If there is no input power, check fuses. If fuse is bad, check for shorted secondary of transformer, tripped circuit breaker or for a bad module. On the PSIO module, if the light is blinking at a rate of twice per second, the module should be replaced.

GREEN LED — On a PSIO module, this is the green LED closest to COMM connectors. The other green LED on module indicates external communications, when used. Green LED should always be blinking when power is on. It indicates modules are communicating properly. If green LED is not blinking, check red LED. If red LED is normal, check module address switches. Proper addresses are:

PSIO-1 (Processor Module)	— 01
CPM-A1 (Protection Module)	— 21
CPM-B1 (Protection Module)	— 37
DSIO (EXV Driver Module)	— 50
DSIO-HV (Relay Module)	— 62
PSIO-2 (12/6 I/O Module)	— 74

The first number of the address for a DSIO module should be set on the switch closest to the silver mounting plate.

If *all* modules indicate communication failure, check COMM plug on PSIO-1 module for proper seating. If a good connection is assured and condition persists, replace PSIO-1 module.

If only a DSIO module indicates communication failure, check COMM plug on that module for proper seating. If a good connection is assured and the condition persists, replace the DSIO module.

All system operating intelligence rests in the PSIO-1 module, the module that controls unit. This module monitors conditions through input and output ports and through DSIO modules (high-voltage relay module and EXV driver module).

The machine operator communicates with microprocessor through keypad and display module. Communication between PSIO and other modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module.

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. 24. If a terminal 2 wire is connected to terminal 1, system does not work.

In the 30GX/HX control box, the processor module (PSIO-1), DSIO-HV, keypad and display module and 5 VDC power supply are all powered from a common 21 VAC power source (PSIO-1 and HSIO powered from 24 VAC source on 30HX units) which connects to terminals 1 and 2 of the power connector on each module. A separate source of 21 VAC power is used to power the PSIO-2 module and liquid level sensor heaters. A separate 12.5 VDC power source is used for the DSIO-EXV module through terminals 1 and 2 on the power connector. The CPM modules are connected to 24 VAC power sources. Refer to Table 43 for control troubleshooting information.

Carrier Comfort Network (CCN) Interface — The 30GX/HX chiller units can be connected to the CCN if desired. The communication bus wiring is a shielded, 3-conductor cable with drain wire and is supplied and installed in the field. The system elements are connected to the communication bus in a daisy chain arrangement as shown in Fig. 24. 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. This is also required for the negative and signal ground pins of each system element. Wiring connections for CCN should be made at the COMM1 plug on the PSIO-1 module. Consult the CCN Contractor's Manual for further information.

NOTE: Conductors and drain wire must be 20 AWG (American Wire Gage) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of -20 C to 60 C is required. Wire manufactured by Alpha (2413 or 5463), American (A22503), Belden (8772), or Columbia (02525) meets the above mentioned requirements.

It is important when connecting to a CCN communication bus that a color coding scheme be used for the entire network to simplify the installation. It is recommended that red be used for the signal positive, black for the signal negative, and white for the signal ground. Use a similar scheme for cables containing different colored wires.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only). To connect the unit to the network:

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground), and black (-) conductors. (Substitute appropriate colors for different colored cables.)
3. Remove the 4-pin female plug from the PSIO-1 COMM1 plug and connect the red wire to terminal 1 of the plug, the white wire to terminal 2, and the black wire to terminal 3.
4. Insert the plug back into the COMM1 plug.

IMPORTANT: A shorted CCN bus cable will prevent some routines from running and may prevent the unit from starting. If abnormal conditions occur, unplug the connector. If conditions return to normal, check the CCN connector and cable. Run new cable if necessary. A short in one section of the bus can cause problems with all system elements on the bus.

PROCESSOR MODULE (PSIO-1)

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

Outputs — Output is 20 VDC or 4-20 mA. There are 3 terminals, only 2 of which are used, depending on the application. Refer to unit wiring diagram.

NOTE: The 12/6 Input/Output module (PSIO-2) has identical input and output configurations as the PSIO-1. There is NO operating software in the PSIO-2 module.

HIGH VOLTAGE RELAY MODULE (DSIO-HV)

Inputs — Inputs on strip J3 are discrete inputs (ON/OFF). When 24-vac power is applied across the 2 terminals in a channel it reads the input as an On signal. Zero volts input is read as an Off signal.

Outputs — Terminal strips J4 and J5 are internal relays whose coils are signaled to be turned on and off by the microprocessor (PSIO-1). The relays switch the circuit to which they are connected. No power is supplied to these connections by DSIO-HV module.

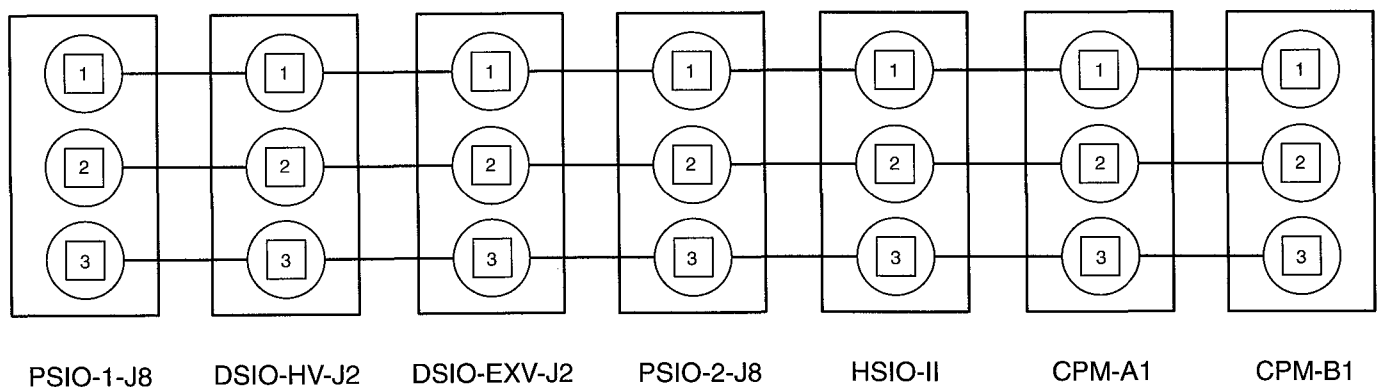


Fig. 24 — Sensor Bus Wiring (Communications)

Table 43 — Compressor Control Troubleshooting

SYMPTOMS	CAUSE	REMEDY
COMPRESSOR DOES NOT RUN	Power line open Control fuse open High-Pressure Switch (HPS) tripped Tripped motor overload Loose terminal connection Improperly wired controls Low line voltage Compressor motor defective Seized compressor Pre-lubrication not successful	Check main disconnect. Check control circuit for ground or short. Replace fuse. Move LOCAL/OFF/REMOTE switch to OFF position then back to LOCAL or REMOTE position. Check the controls. Find cause of trip. Reset overload. Check connections. Check wiring and rewire. Check line voltage. Determine location of voltage drop and remedy deficiency. Check motor winding for open or short. Replace compressor if necessary. Replace compressor. Check oil pump operation, oil pressure transducer, verify oil level/flow switch operation.
COMPRESSOR CYCLES OFF ON LOW PRESSURE	Loss of charge Bad transducer Low refrigerant charge Failed expansion device	Repair leak and recharge. Replace transducer. Add refrigerant. Repair/replace as needed.
COMPRESSOR SHUTS DOWN ON HIGH PRESSURE CONTROL	High-pressure switch erratic in action Compressor discharge valve partially closed Condenser fan(s) not operating (air cooled units) Condenser coil plugged or dirty (air cooled units) Condenser water valve not operating (water cooled units) Condenser tubes badly fouled (water cooled units) Circuit overcharged	Replace switch. Open valve or replace if defective. Check wiring. Repair or replace motor(s) if defective. Clean coil. Check wiring. Repair or replace valve if defective Clean condenser. Reduce system charge
UNIT OPERATES LONG OR CONTINUOUSLY	Low refrigerant charge Control contacts fused Partially plugged or plugged expansion valve or filter drier Defective insulation Service load exceeding design capacity Inefficient compressor	Add refrigerant. Replace control. Clean or replace. Replace or repair. Keep doors and windows closed. Check loader solenoid valves. Replace if necessary.
SYSTEM NOISES	Piping vibration Expansion valve hissing Compressor noisy	Support piping as required. Add refrigerant. Check for plugged liquid line filter drier. Replace compressor (worn bearings). Check for loose compressor bolts securing compressor to cooler.
COMPRESSOR LOSES OIL	Leak in system Mechanical damage to rotors	Find and repair leak. Replace compressor.
HOT LIQUID LINE	Shortage of refrigerant due to leak	Repair leak and recharge.
FROSTED LIQUID LINE	Shutoff valve partially closed or restricted	Open valve or remove restriction.
COMPRESSOR LOADERS NOT WORKING PROPERLY	Burned out coil Defective capacity control valve Miswired solenoid	Replace coil. Replace valve. Rewire correctly.

Replacing Defective Processor Module — The replacement part number is printed on a small label on the front of the PSIO-1 module. The model and serial numbers are printed on the unit nameplate located on an exterior corner post (30GX) or the corner of the control box (30HX). The proper software and unit configuration data is factory installed by Carrier in the replacement module. Therefore, when ordering a replacement processor module (PSIO-1), specify the complete replacement part number, *full* unit model number and serial number. The cooler fluid type will also need to be specified when ordering for correct module configuration. If these numbers are not provided, the replacement module will be downloaded with only the base software. This requires reconfiguration of the module by the installer.

⚠ CAUTION

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

Verify the existing PSIO-1 module is defective by using the procedure described in the Control Modules section.

Refer to Start-up Checklist for 30GX/HX Chiller Systems (completed at time of original start-up) found in the job folder. This information is needed later in this procedure. If the checklist does not exist, fill out the current factory and service configuration codes () sections on a new checklist. Tailor the various options and configurations as needed for this particular installation.

1. 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. Remove the screw securing the green ground wire. Save the screw.
2. Remove the defective PSIO-1 module by removing its mounting screws with a Phillips screwdriver, and removing the module from the control box. Save the screws for later use.
3. Use a small screwdriver to set the address switches S1 and S2 on the new PSIO module to exactly match the settings on the defective module.
4. Package the defective module in the carton of the new module for return to Carrier.

5. Mount the new module in the unit control box using a Phillips screwdriver and the screws saved in Step 2 on page 59.
6. Reinstall all 6 wire connectors and the green ground wire.
7. Carefully check all wiring connections before restoring power.
8. Verify the LOCAL/OFF/REMOTE is in the OFF position.
9. Restore control power. Verify the red and green lights on top of the PSIO-1 and on front of each DSIO module respond as described in Control Modules section. The keypad and display module should also begin its rotating display.
Using the keypad and display module, press to verify that the software version number matches the ER (engineering requirement) number shown on the PSIO-1 label.
10. Press , scroll down one at a time and check the 3 factory and 2 service configuration codes as recorded on checklist. These codes must exactly match the codes stored in the previous PSIO-1 module for proper unit operation. These should already be downloaded if the proper information was supplied when ordering the replacement module. If the codes do not match, the codes must be entered by the procedure described in the factory service code section of Table 24.
11. Once all codes have been verified, and all configurations, set points, and schedules re-entered, return the LOCAL/OFF/REMOTE switch to its previous position.

PRE-START-UP PROCEDURE

IMPORTANT Before beginning Pre-Start-Up or Start-Up, complete the Start-Up Checklist for the 30GX/HX Liquid Chillers Systems on pages CL-1 to CL-8. This Checklist assures proper start-up of the chiller, and provides a record of unit condition, application requirements, system information and operation at initial start-up. The checklist should be removed from the manual and kept with the job file for future reference.

DO NOT ATTEMPT TO START THE CHILLER UNTIL THE FOLLOWING CHECKS HAVE BEEN COMPLETED.

System Check

1. Check all auxiliary components such as the chilled fluid circulating pump, air-handling equipment, or other equipment to which the chiller supplies liquid. Consult the manufacturer's instructions. If the unit has field-installed accessories, be sure all are properly installed and wired correctly. Refer to the unit wiring diagrams.
2. Check the cooler flow switch for proper configuration and operation (from HSIO). Ensure the switch closes when the pump is on and opens when the pump is turned off. A flow switch must be installed.

3. Open the discharge and liquid valves in each circuit. The discharge shutoff valves are in-line ball type and are open when parallel with the refrigerant flow.
4. If factory-installed option is installed, open the suction service valves in each circuit. Service valve is located below the compressor in the cooler suction connection flange.
5. Open the oil shutoff valves located by the oil pre-filter. Open bubbler tube valve on 30HX machines equipped with economizers.
6. Check the tightness of all electrical connections. Check incoming power supply for proper nameplate voltage.
7. Check to ensure the unit is level per the installation instructions.
8. Check the incoming power supply for proper phasing. This can be done by turning on both the line voltage and control voltage power supplies. Leave the LOCAL/OFF/REMOTE switch in the OFF position. If the incoming power is not phased correctly, the CPM will generate an alarm for voltage phase reversal. Press for

Circuit A and for Circuit B at the HSIO to check for this alarm. Scroll up and locate the Feedback value (displayed in units of volts). If a value of 7.0 appears, a voltage phase reversal has been identified and requires incoming power supply phase change. If this is the case, shut down all power supplies and switch any 2 incoming power leads at the control box terminal block. **DO NOT make any changes to the factory installed compressor power wiring in the control box or at the compressor junction box. Doing so will cause permanent damage to the compressor and will require compressor replacement. Proper phasing has already been checked at the factory.**

For those units with 2 incoming terminal blocks, the voltage sequence is sensed at one terminal block only. Check the phasing to ensure that both circuits match. If the incoming power is still phased incorrectly at the second terminal block, a current phase reversal alarm will be generated when an attempt is made to start this compressor. The compressor will be shutdown within 15 milliseconds. To correct this, interchange 2 power leads at this terminal block only.

9. Check all field configuration data and set points.
10. Enter correct date, time and operating schedule(s).
11. Verify operation of solenoids, pumps, valves, compressors, fans, etc. as listed in the Checklist.
12. Open condenser water valves. Check condenser water pump for proper operation (30HX).

START-UP AND OPERATION

Actual Start-Up — *Actual start-up should be done only under supervision of a qualified refrigeration mechanic and qualified Carrier Comfort Network personnel.*

1. Set leaving fluid temperature. No cooling range adjustment is necessary.
2. Start chilled fluid pump and condenser pump (30HXC) if not controlled by unit.
3. Switch LOCAL/OFF/REMOTE switch to LOCAL or REMOTE.
4. Provided there is a load on the chiller, allow the machine to operate and confirm that everything is functioning properly. Verify that the leaving fluid temperature agrees with the cooling set point (1 or 2), or if reset is being used, the modified set point. Chiller is controlling to the Control Point displayed under 2 STAT.

Operating Sequence — The chiller is started by switching the LOCAL/OFF/REMOTE switch to either LOCAL or REMOTE. On a command for cooling, the oil pump will be turned on to start the pre-lubrication process. After 20 seconds, the oil solenoid will be opened and the control will read the oil pressure from the transducer and determine if sufficient pressure has been built up. If there is not sufficient pressure, an alarm will be generated after the second attempt and the compressor will not be started. Upon building pressure, the compressor will be allowed to start. For across-the-line (XL) start chillers, the compressor will start and come up to full speed within 1 to 3 seconds. For Delta-Wye start chillers, contactors 1M and S (starter contactor assembly) will be closed and the compressor will be started in a Wye configuration. This method reduces the locked rotor current requirements by approximately 60% while maintaining enough torque to bring the compressor up to full speed. After 8 seconds, the CPM module will switch out contactor S and bring in contactor 2M, which will run the motor in a Delta configuration (same configuration that XL units run). The oil pump will shut off within 10 seconds after the compressor is started. Once the compressor is successfully running, the control will load the compressor and add additional stages of capacity as needed to satisfy the leaving fluid set point. Head pressure is controlled by fan cycling (30GX) or can be controlled with a field installed accessory Motor-master® III controller (30GX) or field installed condenser water valves (30HX).

FIELD WIRING

Field wiring is shown in Fig. 25-37.

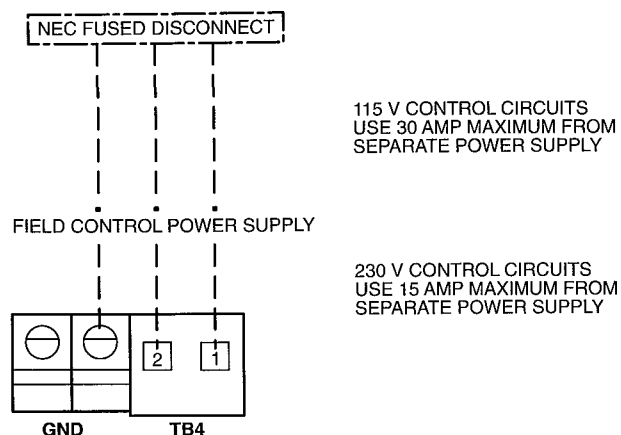
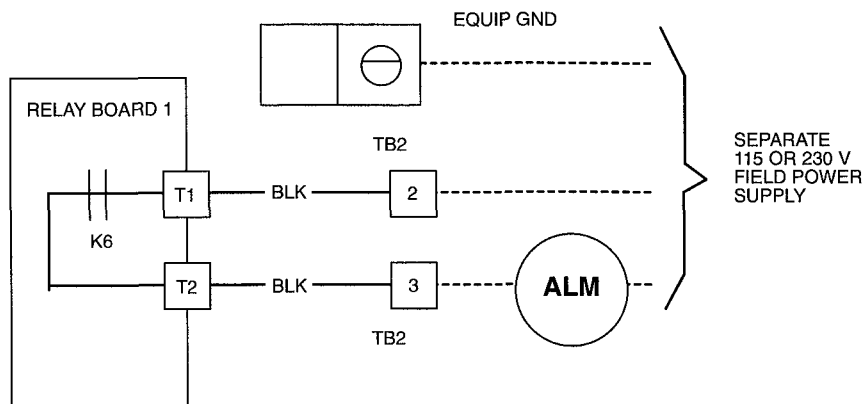


Fig. 25 — Power Supply Wiring

LEGEND FOR FIG. 25-36

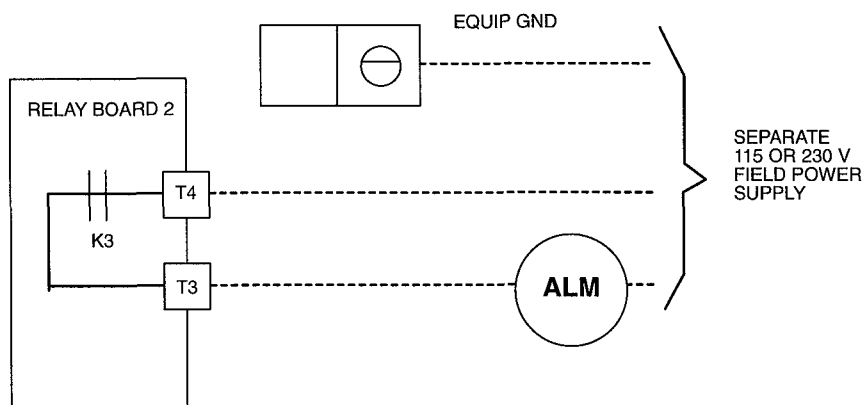
ALM	— Alarm
C	— Contactor
CPR	— Condenser Pump Relay
CWP	— Chilled Water Pump
DSIO	— High Voltage Relay Module
EQUIP	— Equipment
EXV	— Electronic Expansion Valve
FU	— Fuse
GFI-CO	— Ground Fault Interrupt Convenience Outlet
GND	— Ground
NEC	— National Electrical Code
RCF	— Remote Condenser Fan Switch
TB	— Terminal Block
----	Field-Wired
—	Factory Wired



MAX. LOAD ALLOWED FOR THE ALARM RELAY IS
125 VA SEALED, 1250 VA INRUSH AT 115 OR 230 VOLT.

FIELD SUPPLIED

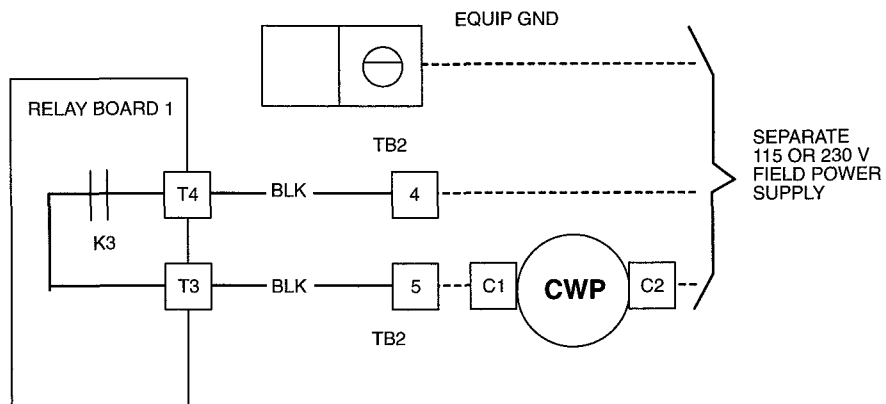
Fig. 26 — Remote Alarm Relay Accessory Wiring, 30HXA,C



MAX. LOAD ALLOWED FOR THE ALARM RELAY IS
125 VA SEALED, 1250 VA INRUSH AT 115 OR 230 VOLT.

FIELD SUPPLIED

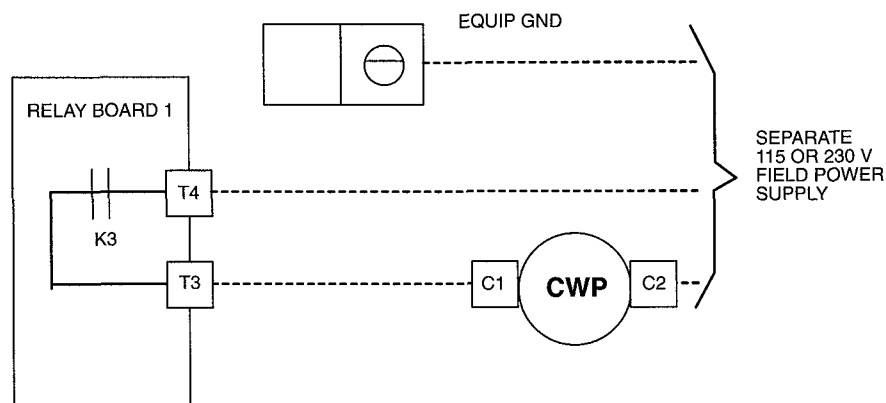
Fig. 27 — Remote Alarm Relay Accessory Wiring, 30GX



MAX. LOAD ALLOWED FOR THE CWP RELAY IS
125 VA SEALED, 1250 VA INRUSH AT 115 OR 230 VOLT.

ACCESSORY ONLY

Fig. 28 — Chilled Water Pump Relay Wiring, 30HXA,C



MAX. LOAD ALLOWED FOR THE CWP RELAY IS
125 VA SEALED, 1250 VA INRUSH 115 OR 230 VOLT.

ACCESSORY ONLY

Fig. 29 — Chilled Water Pump Relay Wiring, 30GX

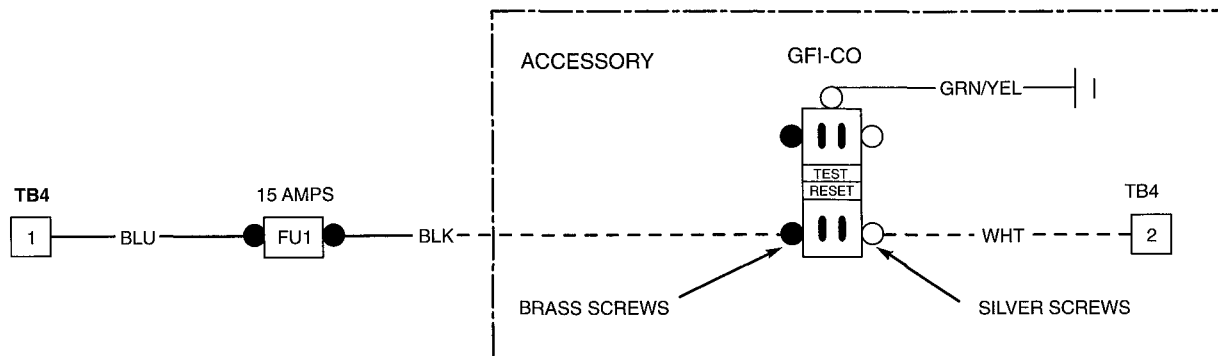
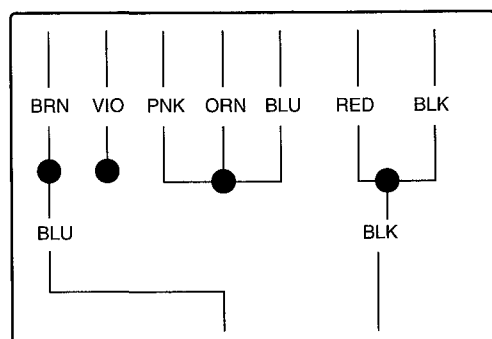


Fig. 30 — Ground Fault Interrupt Accessory Wiring

50 Hz MOTOR WIRING



60 Hz MOTOR WIRING

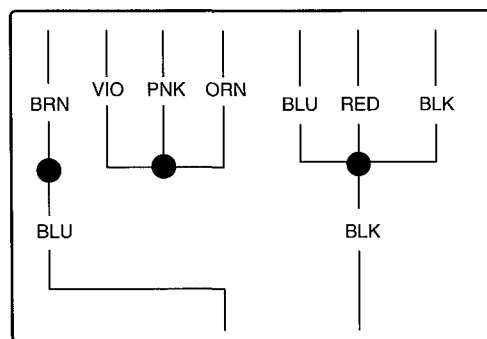
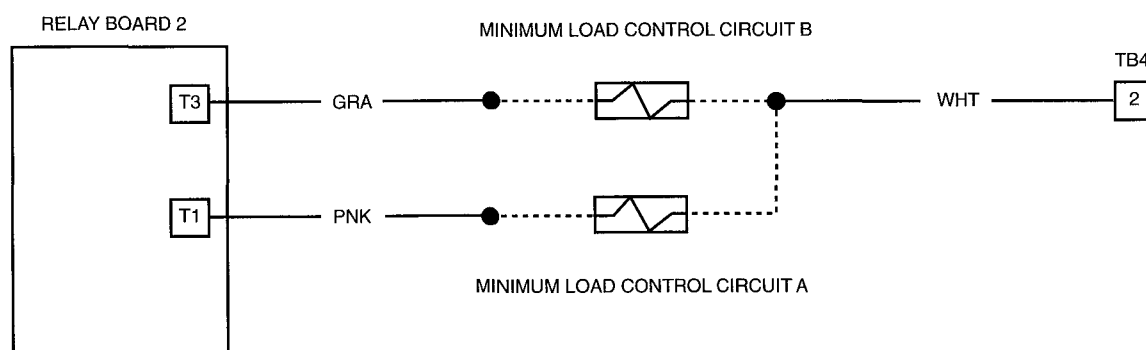
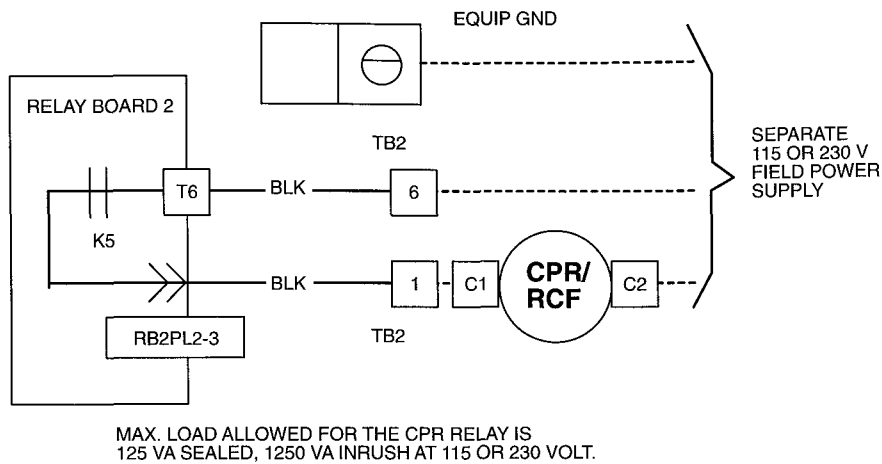


Fig. 31 — Oil Pump Motor Junction Box Wiring



NOTE: Gray, Pink, and White wires are included in the control box as part of the factory wire harness. Field supplied and installed wire is needed from control box to solenoid valves.

Fig. 32 — Minimum Load Valve Accessory Wiring



FIELD SUPPLIED

Fig. 33 — Condenser Pump Relay Wiring, 30HXC and Remote Condenser Fan On/Off Wiring, 30HXA

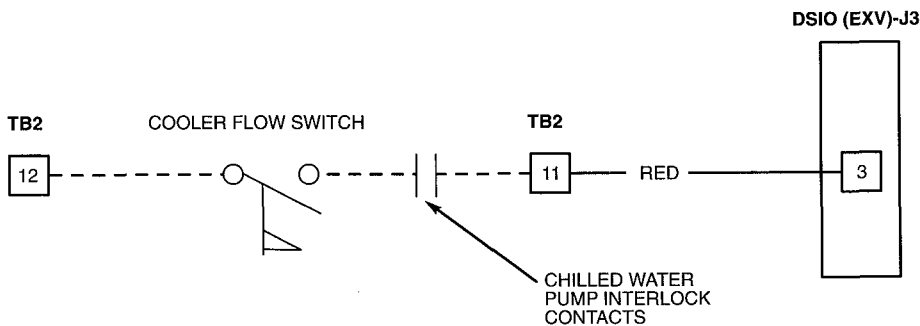


Fig. 34 — Chilled Water Interlock and Flow Switch Input Wiring

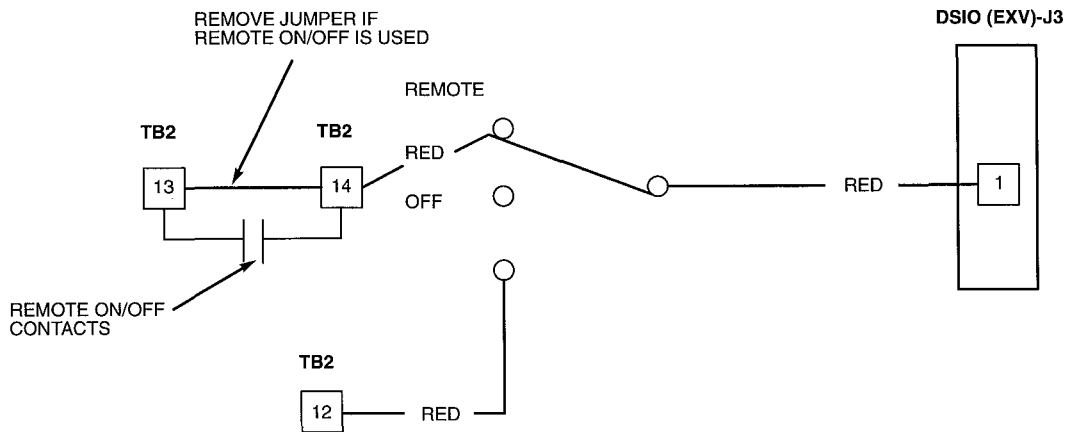


Fig. 35 — Remote On/Off Switch Input Wiring

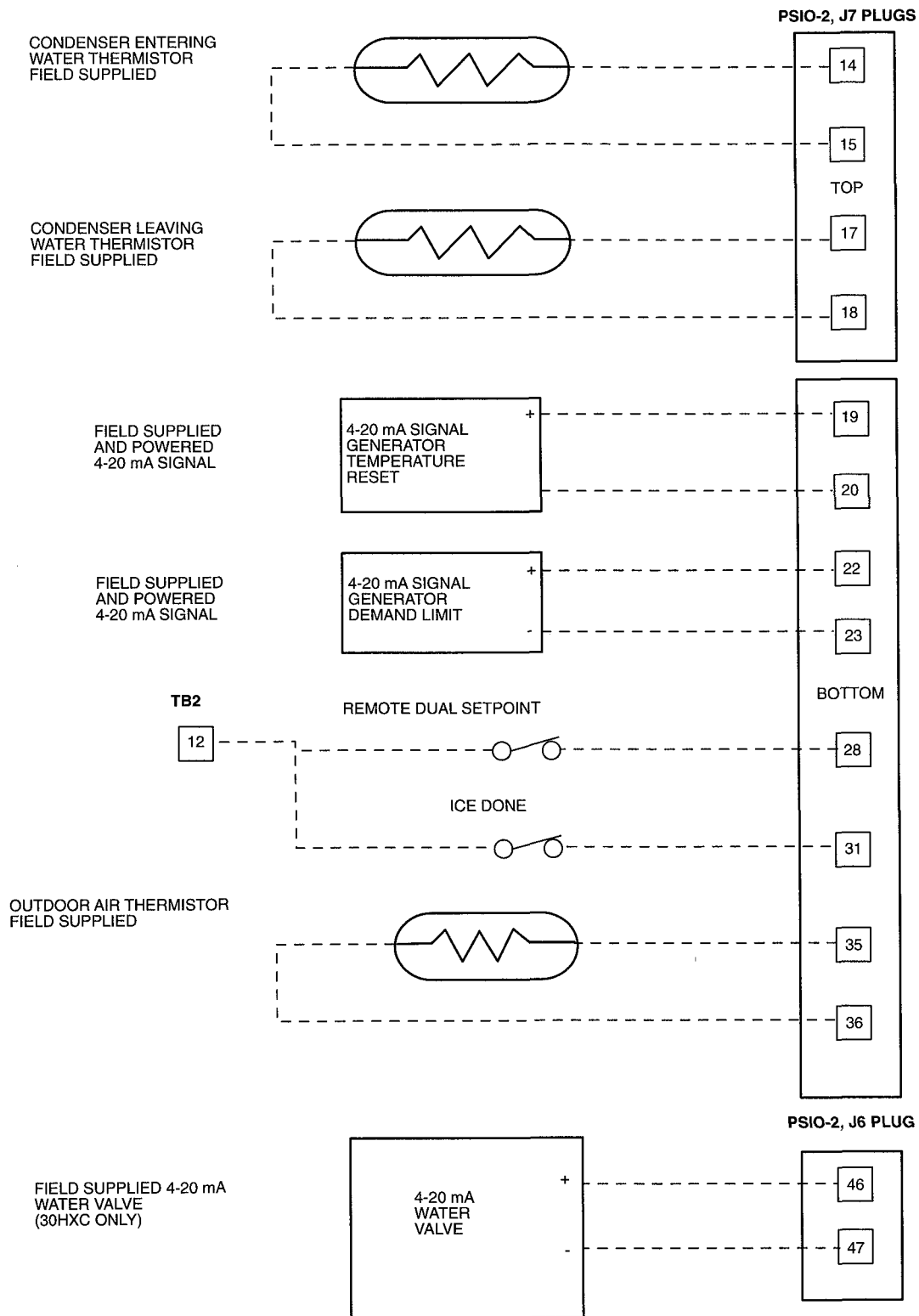


Fig. 36 — PSIO-2 Wiring for Accessories and Field-Installed Options, 30HX Units

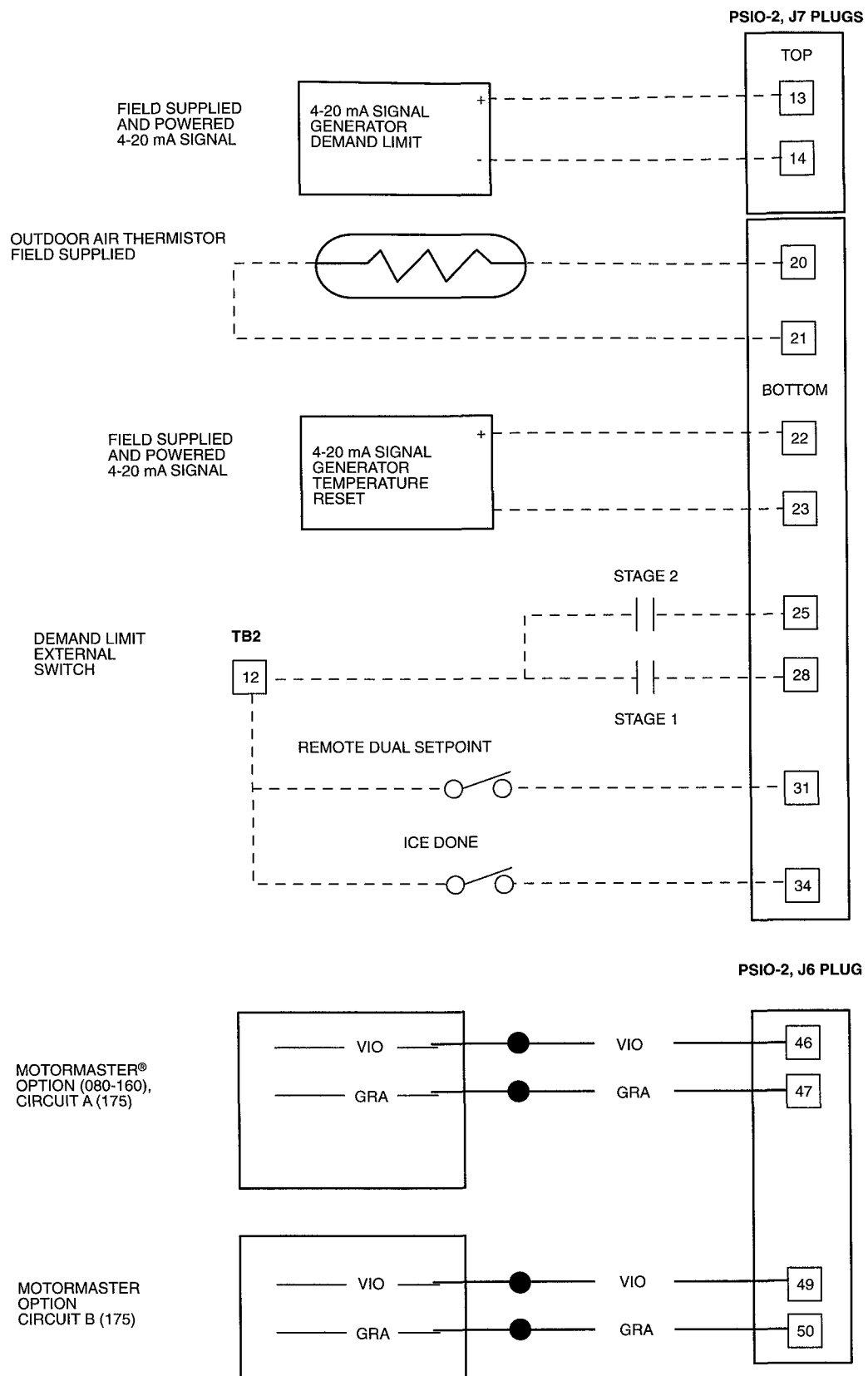


Fig. 37 — PSIO-2 Wiring for Accessories and Field-Installed Options, 30GX Units

APPENDIX A

COMPRESSOR MUST TRIP AMPS		
Unit Size	Unit Voltage	Compressor A1, B1 Must Trip Amps
30GX080 30HXA086	575-3-60	98, 82
	380-3-60	148,124
	346-3-50	170,140
	208/230-3-60	270,226
	460-3-60	122,102
	230-3-50	256,212
30GX090 30HXA096	380/415-3-50	156,128
	575-3-60	120, 82
	380-3-60	180,124
	346-3-50	206,140
	208/230-3-60	328,226
	460-3-60	148,102
30GX105	230-3-50	310,212
	380/415-3-50	188,128
	575-3-60	134, 92
	380-3-60	202,140
	346-3-50	228,158
	208/230-3-60	368,254
30GX115	460-3-60	168,114
	230-3-50	344,238
	380/415-3-50	208,144
	575-3-60	162, 92
	380-3-60	246,140
	346-3-50	278,158
30GX125	208/230-3-60	448,254
	460-3-60	204,114
	230-3-50	418,238
	380/415-3-50	254,144
	575-3-60	162,110
	380-3-60	246,168
30GX135	346-3-50	278,192
	208/230-3-60	448,306
	460-3-60	204,138
	230-3-50	418,288
	380/415-3-50	254,174
	575-3-60	162,134
30GX150	380-3-60	246,202
	346-3-50	278,228
	208/230-3-60	448,368
	460-3-60	204,168
	230-3-50	418,344
	380/415-3-50	254,208
30GX160 30HXA171	575-3-60	134,198
	380-3-60	202,300
	346-3-50	228,344
	208/230-3-60	368,546
	460-3-60	168,248
	230-3-50	344,520
30GX175 30HXA186	380/415-3-50	208,314
	575-3-60	162,198
	380-3-60	246,300
	346-3-50	278,344
	208/230-3-60	448,546
	460-3-60	204,248
30HXA076	230-3-50	418,520
	380/415-3-50	254,314
	575-3-60	198,198
	380-3-60	300,300
	346-3-50	344,344
	208/230-3-60	546,546
30HXA186	460-3-60	248,248
	230-3-50	520,520
	380/415-3-50	314,314
	575-3-60	82, 82
	380-3-60	124,124
	346-3-50	140,140
30HXA076	208/230-3-60	226,226
	460-3-60	102,102
	230-3-50	212,212
	380/415-3-50	128,128
	575-3-60	82, 82
	380-3-60	124,124

COMPRESSOR MUST TRIP AMPS		
Unit Size	Unit Voltage	Compressor A1, B1 Must Trip Amps
30HXC076	575-3-60	56, 56
	380-3-60	84, 84
	346-3-50	96, 96
	208/230-3-60	154,154
	460-3-60	70, 70
	230-3-50	144,144
30HXC086	380/415-3-50	88, 88
	575-3-60	68, 56
	380-3-60	102, 84
	346-3-50	116, 96
	208/230-3-60	186,154
	460-3-60	84, 70
30HXC096	230-3-50	176,144
	380/415-3-50	106, 88
	575-3-60	82, 56
	380-3-60	124, 84
	346-3-50	140, 96
	208/230-3-60	226,154
30HXA106	460-3-60	104, 70
	230-3-50	212,144
	380/415-3-50	128, 88
	575-3-60	144, 82
	380-3-60	218,124
	346-3-50	250,140
30HXC106	208/230-3-60	400,226
	460-3-60	180,102
	230-3-50	376,212
	380/415-3-50	228,128
	575-3-60	100, 56
	380-3-60	150, 84
30HXA116	346-3-50	168, 96
	208/230-3-60	274,154
	460-3-60	124, 70
	230-3-50	254,144
	380/415-3-50	154, 88
	575-3-60	144, 98
30HXC116	380-3-60	218,148
	346-3-50	250,170
	208/230-3-60	400,270
	460-3-60	180,122
	230-3-50	376,256
	380/415-3-50	228,156
30HXA126	575-3-60	100, 68
	380-3-60	150,102
	346-3-50	168,116
	208/230-3-60	274,186
	460-3-60	124, 84
	230-3-50	254,176
30HXC126	380/415-3-50	154,106
	575-3-60	144,120
	380-3-60	218,180
	346-3-50	250,206
	208/230-3-60	400,328
	460-3-60	180,148
30HXA136	230-3-50	376,310
	380/415-3-50	228,188
	575-3-60	100, 82
	380-3-60	150,124
	346-3-50	168,140
	208/230-3-60	274,226
30HXA186	460-3-60	124,104
	230-3-50	254,212
	380/415-3-50	154,128
	575-3-60	176,120
	380-3-60	266,180
	346-3-50	306,206
30HXA186	208/230-3-60	486,328
	460-3-60	220,148
	230-3-50	462,310
	380/415-3-50	280,188
	575-3-60	176,120
	380-3-60	266,180

APPENDIX A (cont)

COMPRESSOR MUST TRIP AMPS		
Unit Size	Unit Voltage	Compressor A1, B1 Must Trip Amps
30HXC136	575-3-60	120, 82
	380-3-60	180,124
	346-3-50	204,140
	208/230-3-60	328,226
	460-3-60	148,104
	230-3-50	308,212
	380/415-3-50	186,128
30HXA146	575-3-60	176,144
	380-3-60	266,218
	346-3-50	306,250
	208/230-3-60	486,400
	460-3-60	220,180
	230-3-50	462,376
	380/415-3-50	280,228
30HXC146	575-3-60	120,100
	380-3-60	180,150
	346-3-50	204,168
	208/230-3-60	328,274
	460-3-60	148,124
	230-3-50	308,254
	380/415-3-50	186,154
30HXA161	575-3-60	198,134
	380-3-60	300,202
	346-3-50	344,228
	208/230-3-60	546,368
	460-3-60	248,168
	230-3-50	520,344
	380/415-3-50	314,208

COMPRESSOR MUST TRIP AMPS		
Unit Size	Unit Voltage	Compressor A1, B1 Must Trip Amps
30HXC161	575-3-60	130, 90
	380-3-60	196,136
	346-3-50	220,152
	208/230-3-60	358,246
	460-3-60	162,112
	230-3-50	332,228
	380/415-3-50	202,138
30HXC171	575-3-60	108,130
	380-3-60	164,196
	346-3-50	182,220
	208/230-3-60	298,358
	460-3-60	136,162
	230-3-50	274,332
	380/415-3-50	166,202
30HXC186	575-3-60	130,130
	380-3-60	196,196
	346-3-50	220,220
	208/230-3-60	358,358
	460-3-60	162,162
	230-3-50	332,332
	380/415-3-50	202,202

APPENDIX B

Capacity Loading Sequence Example

The following tables show the loading sequence for a 30HX161 (160 ton) unit. Each compressor has 2 loaders. To

determine tonnage at stages for other units, multiply total tonnage by percent of total capacity for that stage.

**STANDARD LOADING SEQUENCE
(CIRCUIT A LEAD CIRCUIT)**

Stage 1	Comp A1	Loader A1	Loader A2	Comp B1	Loader B1	Loader B2	Total Capacity* (Tons)	% Total Capacity
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	OFF	OFF	OFF	OFF	OFF	32	20
2	ON	ON	OFF	OFF	OFF	OFF	52.8	33
3	ON	ON	ON	OFF	OFF	OFF	80	50
4	ON	ON	ON	ON	OFF	OFF	105.6	66
5	ON	ON	ON	ON	ON	OFF	132.8	83
6	ON	ON	ON	ON	ON	ON	160	100

*160 Ton unit.

**CLOSE CONTROL LOADING SEQUENCE
(CIRCUIT A LEAD CIRCUIT)**

Stage 1	Comp A1	Loader A1	Loader A2	Comp B1	Loader B1	Loader B2	Total Capacity* (Tons)	% Total Capacity
0	OFF	OFF	OFF	OFF	OFF	OFF	0	0
1	ON	OFF	OFF	OFF	OFF	OFF	32	20
2	ON	ON	OFF	OFF	OFF	OFF	52.8	33
3	ON	ON	ON	OFF	OFF	OFF	80	50
3A	ON	OFF	OFF	ON	OFF	OFF	64	40
4	ON	OFF	OFF	ON	ON	OFF	84.8	53
5	ON	OFF	OFF	ON	ON	ON	112	70
6	ON	ON	OFF	ON	ON	ON	132.8	83
7	ON	ON	ON	ON	ON	ON	160	100

*160 Ton unit.

NOTE: Stage 3A would not be chosen by the algorithm when increasing stages. Stage 3A would be used when decreasing stages and Stage 3 would be skipped.

APPENDIX C

The following are the available accessories for 30GX/HXA/HXC units.

ACCESSORY PART NUMBER	USED ON	DESCRIPTION OF ACCESSORY	COMMENTS
30GX-900---001	30GX080-105	Condenser grille package	
30GX-900---002	30GX115-135	Condenser grille package	
30GX-900---003	30GX150-160	Condenser grille package	
30GX-900---013	30GX175	Condenser grille package	
30GX-900---004	30GX, 60 Hz (115 V)	Minimum Load Valve	single circuit
30GX-900---005	30GX, 50 Hz (230 V)	Minimum Load Valve	single circuit
30GX-900---006	30GX (460 V)	Control Transformer	
30GX-900---007	30GX (575 V)	Control Transformer	
30GX-900---012	30GX080-160	3 Phase MotorMaster	single controller
30GX-900---014	30GX175	3 Phase MotorMaster	two controllers
30HX-900---001	30HX116-186	Sound enclosure panels	
30HX-900---011	30HX076-106	Sound enclosure panels	
30HX-900---002	30GX080-090, 150 30HX076-096, 30HX116-146	Victaulic Cooler (14 in.)	
30HX-900---003	30GX105-135 30GX160-175 30HX106, 161-186	Victaulic Cooler (16 in.)	
30HX-900---004	30HX076-146	Victaulic Condenser (18 in.)	
30HX-900---005	30HX161-186	Victaulic Condenser (20 in.)	
30HX-900---006	30HX (230, 460 V)	Control Transformer	
30HX-900---013	30HX (575 V)	Control Transformer	
30HX-900---007	30GX,HX all	LID 1B Controller	
30HX-900---008	30HX, 60 Hz (115 V)	Minimum Load Valve	single circuit
30HX-900---009	30HX, 50 Hz (230 V)	Minimum Load Valve	single circuit
30HX-900---010	30HX076-186	Vibration isolation pad	

APPENDIX D

Compressor Protection Module Configuration Header Punch Outs and Overload Settings

UNIT MODEL NUMBER	PUNCH OUTS FOR CPM-A	PUNCH OUTS FOR CPM-B	COMP A1 OVERLOAD SETTING	COMP B1 OVERLOAD SETTING
30GX-080---1	1,2,3,6,7,8	1,2,3,5,6,7,8	85	71
30GX-080---2	1,2,5,6,7	1,2,4,5,7	128	107
30GX-080---3	1,2,7,8	1,2,4,7	148	122
30GX-080---5	1,4,8	1,3,6,7,8	234	195
30GX-080---6	1,2,4,5,7,8	1,2,3,6,8	106	88
30GX-080---8	1,4,5	1,3,5,6,7	223	183
30GX-080---9	1,2,5,7	1,2,4,5	135	111
30GX-090---1	1,2,4,5,6	1,2,3,5,6,7,8	103	71
30GX-090---2	1,3,4,5,6,7	1,2,4,5,7	156	107
30GX-090---3	1,3,4,8	1,2,4,7	179	122
30GX-090---5	2,3,4,6	1,3,5,7,8	285	195
30GX-090---6	1,2,5,6,7	1,2,3,6,8	129	88
30GX-090---8	2,3,4,5,6,8	1,3,5,6,7	269	183
30GX-090---9	1,3,4,5,7	1,2,4,5	163	111
30GX-105---1	1,2,4,6,8	1,2,3,5,7	116	80
30GX-105---2	1,3,4,7,8	1,2,4,7	175	120
30GX-105---3	1,3,6,7	1,2,5,8	199	137
30GX-105---5	2,3	1,4,5,8	320	220
30GX-105---6	1,2,6	1,2,4,5,6,7,8	145	100
30GX-105---8	2,3,5,6	1,3,8	299	207
30GX-105---9	1,3,4	1,2,4	181	125
30GX-115---1	1,2,6,7,8	1,2,3,5,7	141	80
30GX-115---2	1,4,5,6,8	1,2,4,7	213	120
30GX-115---3	1,5,6,8	1,2,5,8	241	137
30GX-115---5	3,4,5	1,4,5,8	390	220
30GX-115---6	1,3,4,7	1,2,4,5,6,7,8	176	100
30GX-115---8	2,6,7,8	1,3,8	363	207
30GX-115---9	1,4,5,8	1,2,4	220	125
30GX-125---1	1,2,6,7,8	1,2,3,8	141	96
30GX-125---2	1,4,5,6,8	1,2,6	213	145
30GX-125---3	1,5,6,8	1,3,4,5	241	166
30GX-125---5	3,4,5	2,3,4,5,6,7,8	390	265
30GX-125---6	1,3,4,7	1,2,4,7,8	176	120
30GX-125---8	2,6,7,8	1,5	363	250
30GX-125---9	1,4,5,8	1,2,8	220	151
30GX-135---1	1,2,6,7,8	1,2,4,6,8	141	116
30GX-135---2	1,4,5,6,8	1,3,4,7,8	213	175
30GX-135---3	1,5,6,8	1,3,6,7	241	199
30GX-135---5	3,4,5	2,3	390	320
30GX-135---6	1,3,4,7	1,2,6	176	145
30GX-135---8	2,6,7,8	2,3,5,6	363	299
30GX-135---9	1,4,5,8	1,3,4	220	181
30GX-150---1	1,2,4,6,8	1,3,4,6,8	116	172
30GX-150---2	1,3,4,7,8	1,7	175	260
30GX-150---3	1,3,6,7	2,3,5,6	199	299
30GX-150---5	2,3	6,7,8	320	475
30GX-150---6	1,2,6	1,4,5,6	145	215
30GX-150---8	2,3,5,6	4,6	299	451
30GX-150---9	1,3,4	2,3,4,5,7,8	181	273
30GX-160---1	1,2,6,7,8	1,3,4,6,8	141	172
30GX-160---2	1,4,5,6,8	1,7	213	260
30GX-160---3	1,5,6,8	2,3,5,6	241	299
30GX-160---5	3,4,5	6,7,8	390	475
30GX-160---6	1,3,4,7	1,4,5,6	176	215
30GX-160---8	2,6,7,8	4,6	363	451
30GX-160---9	1,4,5,8	2,3,4,5,7,8	220	273
30GX-175---1	1,3,4,6,8	1,3,4,6,8	172	172
30GX-175---2	1,7	1,7	260	260
30GX-175---3	2,3,5,6	2,3,5,6	299	299
30GX-175---5	6,7,8	6,7,8	475	475
30GX-175---6	1,4,5,6	1,4,5,6	215	215
30GX-175---8	4,6	4,6	451	451
30GX-175---9	2,3,4,5,7,8	2,3,4,5,7,8	273	273
30HXA076---1	1,2,3,5,6,7,8	1,2,3,5,6,7,8	71	71
30HXA076---2	1,2,4,5,7	1,2,4,5,7	107	107
30HXA076---3	1,2,4,7	1,2,4,7	122	122
30HXA076---5	1,3,6,7,8	1,3,6,7,8	195	195
30HXA076---6	1,2,3,6,8	1,2,3,6,8	88	88
30HXA076---8	1,3,5,6,7	1,3,5,6,7	183	183
30HXA076---9	1,2,4,5	1,2,4,5	111	111
30HXA086---1	1,2,3,6,7,8	1,2,3,5,6,7,8	85	71
30HXA086---2	1,2,5,6,7	1,2,4,5,7	128	107
30HXA086---3	1,2,7,8	1,2,4,7	148	122
30HXA086---5	1,4,8	1,3,6,7,8	234	195
30HXA086---6	1,2,4,5,7,8	1,2,3,6,8	106	88
30HXA086---8	1,4,5	1,3,5,6,7	223	183
30HXA086---9	1,2,5,7	1,2,4,5	135	111

APPENDIX D (cont)

Compressor Protection Module Configuration Header Punch Outs and Overload Settings (cont)

UNIT MODEL NUMBER	PUNCH OUTS FOR CPM-A	PUNCH OUTS FOR CPM-B	COMP A1 OVERLOAD SETTING	COMP B1 OVERLOAD SETTING
30HXA096---1	1,2,4,5,6	1,2,3,5,6,7,8	103	71
30HXA096---2	1,3,4,5,6,7	1,2,4,5,7	156	107
30HXA096---3	1,3,4,8	1,2,4,7	179	122
30HXA096---5	2,3,4,6	1,3,6,7,8	285	195
30HXA096---6	1,2,5,6,7	1,2,3,6,8	129	88
30HXA096---8	2,3,4,5,6,8	1,3,5,6,7	269	183
30HXA096---9	1,3,4,5,7	1,2,4,5	163	111
30HXA106---1	1,2,4	1,2,3,5,6,7,8	125	71
30HXA106---2	1,3,5,7,8	1,2,4,5,7	190	107
30HXA106---3	1,4,5,7,8	1,2,4,7	217	122
30HXA106---5	2,4	1,3,6,7,8	347	195
30HXA106---6	1,3,4,5,6,7	1,2,3,6,8	157	88
30HXA106---8	2,4,5,6	1,3,5,6,7	326	183
30HXA106---9	1,3,6,7	1,2,4,5	198	111
30HXA116---1	1,2,4	1,2,3,6,7,8	125	85
30HXA116---2	1,3,5,7,8	1,2,5,6,7	190	128
30HXA116---3	1,4,5,6,8	1,2,7,8	217	148
30HXA116---5	2,4	1,4,8	347	234
30HXA116---6	1,3,4,5,6,7	1,2,4,5,7,8	157	106
30HXA116---8	2,4,5,6	1,4,5	326	223
30HXA116---9	1,3,6,7	1,2,5,7	198	135
30HXA126---1	1,2,4	1,2,4,5,6	125	103
30HXA126---2	1,3,5,7,8	1,3,4,5,6,7	190	156
30HXA126---3	1,4,5,7,8	1,3,4,8	217	179
30HXA126---5	2,4	2,3,4,6	347	285
30HXA126---6	1,3,4,5,6,7	1,2,5,6,7	157	129
30HXA126---8	2,4,5,6	2,3,4,5,6,8	326	269
30HXA126---9	1,3,6,7	1,3,4,5,7	198	163
30HXA136---1	1,2	1,2,4,5,6	153	103
30HXA136---2	1,4,7,8	1,3,4,5,6,7	231	156
30HXA136---3	2,3,4,5,6,7,8	1,3,4,8	266	179
30HXA136---5	3,6,8	2,3,4,6	423	285
30HXA136---6	1,3,5,7	1,2,5,6,7	191	129
30HXA136---8	3,4,8	2,3,4,5,6,8	401	269
30HXA136---9	1,5,6	1,3,4,5,7	243	163
30HXA146---1	1,2	1,2,4	153	125
30HXA146---2	1,4,7,8	1,3,5,7,8	231	190
30HXA146---3	2,3,4,5,6,7,8	1,4,5,7,8	266	217
30HXA146---5	3,6,8	2,4	423	347
30HXA146---6	1,3,5,7	1,3,4,5,6,7	191	157
30HXA146---8	3,4,8	2,4,5,6	401	326
30HXA146---9	1,5,6	1,3,6,7	243	198
30HXA161---1	1,3,4,6,8	1,2,4,6,8	172	116
30HXA161---2	1,7	1,3,4,7,8	260	175
30HXA161---3	2,3,4,5	1,3,6,7	299	199
30HXA161---5	6,7,8	2,3	475	320
30HXA161---6	1,4,5,6	1,2,6	215	145
30HXA161---8	4,6	2,3,5,6	451	299
30HXA161---9	2,3,4,5,7,8	1,3,4	273	181
30HXA171---1	1,2,6,7,8	1,3,4,6,8	141	172
30HXA171---2	1,4,5,6,8	1,7	213	260
30HXA171---3	1,5,6,8	2,3,5,6	241	299
30HXA171---5	3,4,5	6,7,8	390	475
30HXA171---6	1,3,4,7	1,4,5,6	176	215
30HXA171---8	2,6,7,8	4,6	363	451
30HXA171---9	1,4,5,8	2,3,4,5,7,8	220	273
30HXA186---1	1,3,4,6,8	1,3,4,6,8	172	172
30HXA186---2	1,7	1,7	260	260
30HXA186---3	2,3,5,6	2,3,5,6	299	299
30HXA186---5	6,7,8	6,7,8	475	475
30HXA186---6	1,4,5,6	1,4,5,6	215	215
30HXA186---8	4,6	4,6	451	451
30HXA186---9	2,3,4,5,7,8	2,3,4,5,7,8	273	273
30HXC076---1	1,2,3,4,5,6	1,2,3,4,5,6	50	50
30HXC076---2	1,2,3,5,6,7	1,2,3,5,6,7	73	73
30HXC076---3	1,2,3,5	1,2,3,5	83	83
30HXC076---5	1,2,5,7,8	1,2,5,7,8	133	133
30HXC076---6	1,2,3,4,6,8	1,2,3,4,6,8	60	60
30HXC076---8	1,2,4	1,2,4	125	125
30HXC076---9	1,2,3,5,6	1,2,3,5,6	76	76
30HXC086---1	1,2,3,4,6,7	1,2,3,4,5,6	58	50
30HXC086---2	1,2,3,6,8	1,2,3,5,6,7	88	73
30HXC086---3	1,2,4,5,6,7	1,2,3,5	101	83
30HXC086---5	1,3,4,5,7,8	1,2,5,7,8	161	133
30HXC086---6	1,2,3,5,6,7	1,2,3,4,6,8	73	60
30HXC086---8	1,2	1,2,4	152	125
30HXC086---9	1,2,3,7,8	1,2,3,5,6	92	76

APPENDIX D (cont)

Compressor Protection Module Configuration Header Punch Outs and Overload Settings (cont)

UNIT MODEL NUMBER	PUNCH OUTS FOR CPM-A	PUNCH OUTS FOR CPM-B	COMP A1 OVERLOAD SETTING	COMP B1 OVERLOAD SETTING
30HXC096---1	1,2,3,5,6,7,8	1,2,3,4,5,6	71	50
30HXC096---2	1,2,4,5,7	1,2,3,5,6,7	108	73
30HXC096---3	1,2,4,7	1,2,3,5	122	83
30HXC096---5	1,3,6,7,8	1,2,5,7,8	197	133
30HXC096---6	1,2,3,6	1,2,3,4,6,8	89	60
30HXC096---8	1,3,5,6,7	1,2,4	183	125
30HXC096---9	1,2,4,5	1,2,3,5,6	111	76
30HXC106---1	1,2,3,6,7	1,2,3,4,5,6	86	50
30HXC106---2	1,2,5,6,8	1,2,3,5,6,7	130	73
30HXC106---3	1,2,6	1,2,3,5	146	83
30HXC106---5	1,5,6,7,8	1,2,5,7,8	238	133
30HXC106---6	1,2,4,5,7	1,2,3,4,6,8	108	60
30HXC106---8	1,4,5,8	1,2,4	220	125
30HXC106---9	1,2,5,7,8	1,2,3,5,6	133	76
30HXC116---1	1,2,3,6,7	1,2,3,4,6,7	86	58
30HXC116---2	1,2,5,6,8	1,2,3,6,8	130	88
30HXC116---3	1,2,6	1,2,4,5,6,7	146	101
30HXC116---5	1,5,6,7,8	1,3,4,5,7,8	238	161
30HXC116---6	1,2,4,5,7	1,2,3,5,6,7	108	73
30HXC116---8	1,4,5,8	1,2	220	152
30HXC116---9	1,2,5,7,8	1,2,3,7,8	133	92
30HXC126---1	1,2,3,6,7	1,2,3,5,6,7,8	86	71
30HXC126---2	1,2,5,6,8	1,2,4,5,7	130	108
30HXC126---3	1,2,6	1,2,4,7	146	122
30HXC126---5	1,5,6,7,8	1,3,6,7,8	238	197
30HXC126---6	1,2,4,5,7	1,2,3,6	108	89
30HXC126---8	1,4,5,8	1,3,5,6,7	220	183
30HXC126---9	1,2,5,7,8	1,2,4,5	133	111
30HXC136---1	1,2,4,5,6	1,2,3,5,6,7,8	103	71
30HXC136---2	1,3,4,5,6,7	1,2,4,5,7	156	108
30HXC136---3	1,3,4,7	1,2,4,7	177	122
30HXC136---5	2,3,4,6	1,3,6,7,8	285	197
30HXC136---6	1,2,5,6,7	1,2,3,6	129	89
30HXC136---8	2,3,4,5,6,7	1,3,5,6,7	267	183
30HXC136---9	1,3,4,5,7,8	1,2,4,5	162	111
30HXC146---1	1,2,4,5,6	1,2,3,6,7	103	86
30HXC146---2	1,3,4,5,6,7	1,2,5,6,8	156	130
30HXC146---3	1,3,4,7	1,2,6	177	146
30HXC146---5	2,3,4,6	1,5,6,7,8	285	238
30HXC146---6	1,2,5,6,7	1,2,4,5,7	129	108
30HXC146---8	2,3,4,5,6,7	1,4,5,8	267	220
30HXC146---9	1,3,4,5,7,8	1,2,5,7,8	162	133
30HXC161---1	1,2,4,6,7,8	1,2,3,5,7,8	112	78
30HXC161---2	1,3,4,6,7	1,2,4,6	170	117
30HXC161---3	1,3,5,7	1,2,5,6	192	132
30HXC161---5	2,3,6,8	1,4,5,6,8	310	214
30HXC161---6	1,2,6,7,8	1,2,3	140	97
30HXC161---8	2,4,5,7	1,3,6,7	289	198
30HXC161---9	1,3,4,7,8	1,2,4,7,8	175	120
30HXC171---1	1,2,3,7	1,2,4,6,7,8	94	112
30HXC171---2	1,2,6,7	1,3,4,6,7	142	170
30HXC171---3	1,3,4,5,6,8	1,3,5,7	158	192
30HXC171---5	1,7,8	2,3,6,8	259	310
30HXC171---6	1,2,4,6	1,2,6,7,8	117	140
30HXC171---8	1,5,6,7,8	2,3,4,7	237	289
30HXC171---9	1,2,6,8	1,3,4,7,8	144	175
30HXC186---1	1,2,4,6,7,8	1,2,4,6,7,8	112	112
30HXC186---2	1,3,4,6,7	1,3,4,6,7	170	170
30HXC186---3	1,3,5,7	1,3,5,7	192	192
30HXC186---5	2,3,6,8	2,3,6,8	310	310
30HXC186---6	1,2,6,7,8	1,2,6,7,8	140	140
30HXC186---8	2,3,4,7	2,3,4,7	289	289
30HXC186---9	1,3,4,7,8	1,3,4,7,8	175	175



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