

Controls, Operation and Troubleshooting

50 and 60 Hz
with Microprocessor Controls and Electronic Expansion Valves

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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, 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.

GENERAL

IMPORTANT: This publication contains controls, operation and troubleshooting data for 30GB040-200 and 30GT225-280 Flotronic™ II chillers.

30GB and 30GT circuits are identified as circuits A and B, and compressors are identified as A1-A4 in circuit A, and B1-B4 in circuit B.

Use this guide in conjunction with separate Installation Instructions booklet packaged with the unit.

The 30GB,GT Flotronic™ II chillers feature microprocessor-based electronic controls and an electronic expansion valve (EXV) in *each* refrigeration circuit.

The Flotronic™ II control system cycles compressor unloaders and/or compressors to maintain the selected leaving water temperature set point. It automatically positions the EXV to maintain the specified refrigerant superheat entering the compressor cylinders. It also cycles condenser fans on and off to maintain suitable head pressure for each circuit. Safeties are continuously monitored to prevent the unit from operating under unsafe conditions. A scheduling function, programmed by the user, controls the unit occupied/unoccupied schedule. The control also operates a Test program that allows the operator to check output signals and ensure components are operable.

The control system consists of a processor module (PSIO), a low voltage relay module (DSIO-LV), 2 electronic expansion valves (EXV), an EXV driver module (DSIO-EXV), a 6-pack relay board, a keyboard and display module (also called HSIO or LID), plus thermistors on 30GB units, and transducers plus thermistors on 30GT units, to provide inputs to the microprocessor. An options module (SIO) is used to provide additional functions. This module is standard on 30GB models and an accessory on 30GT models.

MAJOR SYSTEM COMPONENTS

Processor Module — This module contains the operating software, and controls the operation of the machine. It continuously monitors information received from the various transducers and/or thermistors and communicates with the relay module and 6-pack relay board to increase or decrease the active stages of capacity. The processor module also controls the EXV driver module, commanding it to open or close each EXV in order to maintain the proper superheat entering the cylinders of each lead compressor. Information is transmitted between the processor module and the relay module, the EXV driver module and the keyboard and display module through a 3-wire communications bus. When used, the options module is also connected to the communications bus.

For the 30GT chillers only, the processor monitors system pressure by means of six transducers, 3 in each lead compressor. Compressor suction pressure, discharge pressure, and oil pressure are sensed. If the processor senses high discharge pressure or low suction pressure, it immediately shuts down all compressors in the affected circuit. During operation, if low oil pressure is sensed for longer than one minute, all compressors in the affected circuit are shut down. At start-up the oil pressure signal is ignored for two minutes. If shutdown occurs due to any of these pressure faults, the circuit is locked out and the appropriate fault code is displayed.

Low Voltage Relay Module — This module closes contacts to energize compressor unloaders and/or compressors. It also senses the status of the safeties for compressors A1, A2, B3, B4 and transmits this information to the processor.

Electronic Expansion Valve Module — This module receives signals from the processor and operates the electronic expansion valves. It also monitors the status of the safeties for compressors B1, B2, A3, A4 and transmits this information to the processor.

Options Module — This module allows the use of Flotronic™ II features such as dual set point, remote reset, demand limit and accessory unloaders. The options module also allows for reset and demand limit to be activated from a remote 4-20 mA signal.

The options module is installed at the factory on the 30GB chillers when the Flotronic™ II option is ordered. It is offered as an accessory on the 30GT chillers and must be field installed. For more details on installation and configuration of each feature offered, see separate Accessory Options Module Installation Instructions.

Keyboard and Display Module (also called HSIO or LID) — See Fig 1. This device consists of a keyboard with 6 function keys, 5 operative keys, 12 numeric keys, and an alphanumeric 8-character LCD. Key usage is explained in Keyboard and Display Module section (functions and subfunctions).

Control Switch — Control of the chiller is defined by the position of the LOCAL/STOP/CCN switch. This is a 3-position manual switch that allows the chiller to be (1) put under the control of its own Flotronic™ II controls, (2) manually stopped, or (3) put under the control of a Carrier Comfort Network (CCN). Switch allows unit operation as shown in Table 1.

Table 1 — LOCAL/STOP/CCN Switch Positions and Operation

SWITCH POSITION	UNIT OPERATION	CONFIGURATION AND SET POINT CONTROL	
		Keypad Control	CCN Control
STOP	Unit Cannot Run	Read/Write	Read Only
LOCAL	Unit Can Run	Read/Limited Write	Read Only
CCN Stop	Unit Cannot Run	Read Only	Read/Write
Run	Unit Can Run	Read Only	Read/Limited Write

In the LOCAL position, the chiller is under local control and responds to the scheduling configuration and set point data input at its own local interface device (keyboard and display module).

In the CCN position, the chiller is under remote control and responds only to CCN network commands. The occupied/unoccupied conditions are defined by the network. All keyboard and display functions can be read at the chiller regardless of position of the switch.

CCN run or stop condition is established by a command from the CCN network. It is not possible to force outputs by the CCN network, except that an emergency stop command shuts down the chiller immediately and causes "ALARM 52" to be displayed.

Electronic Expansion Valve (EXV) — The microprocessor controls the electronic expansion valve through the EXV driver module. Inside the expansion valve is a linear actuator stepper motor.

30GB040-200 — To control the stepper motor's position, the thermistor in the cooler and the thermistor in the lead compressor in each circuit are used to maintain 20 degrees F (11.1 degrees C) superheat. Because the compressor sensor is after the compressor motor, which adds approximately 15 degrees F (8.3 degrees C) superheat, the 20 degrees F (11.1 degrees C) control temperature results in 0 to 5 degrees F (2.8 degrees C) superheat leaving the cooler. This assures maximum cooler performance.

30GT225-280 — The lead compressor in each circuit has a thermistor and a pressure transducer located in the suction manifold after the compressor motor. The thermistor measures the temperature of the superheated gas entering the compressor cylinders. The pressure transducer measures the refrigerant pressure in the suction manifold. The microprocessor converts the pressure reading to a saturated temperature. The difference between the temperature of the superheated gas and the saturation temperature is the superheat. The microprocessor controls the position of the electronic expansion valve stepper motor to maintain 29 degrees F (16 degrees C) superheat.

At initial unit 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. The control monitors the superheat and the rate of change of superheat to control the position of the valve. The valve stroke is very large, which results in very accurate control of the superheat.

Sensors — The Flotronic™ II chiller control system gathers information from sensors to control the operation of the chiller. The 30GB040-200 uses 8 thermistors to monitor system temperatures at various points within the chiller. The 30GT225-280 uses 6 pressure transducers and four thermistors to monitor system pressures and temperatures at various points within the chiller. Sensors are listed in Table 2 and locations shown in Fig. 10 - 13.

Table 2 — Thermistor and Transducer Locations

THERMISTORS — 30GB040-200	
Sensor	Location
T1	Cooler Leaving Water Temp
T2	Cooler Entering Water Temp.
T3	Saturated Condensing Temp. Circuit A
T4	Saturated Condensing Temp. Circuit B
T5	Cooler Saturated Suction Temp. Circuit A
T6	Cooler Saturated Suction Temp. Circuit B
T7	Compr. Suction Gas Temp. Circuit A
T8	Compr. Suction Gas Temp. Circuit B
T10	Reset Temperature Sensor (Accessory)
PRESSURE TRANSDUCERS 30GT225-280	
Sensor	Location
DPT-A	Compr. A1 Discharge Pressure
SPT-A	Compr. A1 Suction Pressure
OPT-A	Compr. A1 Net Oil Pressure
DPT-B	Compr. B1 Discharge Pressure
SPT-B	Compr. B1 Suction Pressure
OPT-B	Compr. B1 Net Oil Pressure
Thermistors	
T1	Cooler Leaving Water Temp.
T2	Cooler Entering Water Temp.
T7	Compr. Suction Gas Temp. Circuit A
T8	Compr. Suction Gas Temp. Circuit B
T10	Reset Temperature Sensor (Accessory)

OPERATION DATA

Capacity Control — The control system cycles compressor to give capacity control steps as shown in Table 3. The unit controls leaving chilled water temperature. Entering water temperature is used by the microprocessor in determining the optimum time to add or subtract steps of capacity, but is not a control set point.

The chilled water temperature set point can be automatically reset by the return temperature reset or space and outside air temperature reset features. It can also be reset from an external 4 - 20 mA signal or from a network signal.

Table 3 – Capacity Control Steps

UNIT 30GB	CONTROL STEPS	% DISPLACEMENT		LOADING SEQUENCE A				LOADING SEQUENCE B			
				Operating				Operating			
				Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B	Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B
040 Standard (One Unloader)	1	25.0		1	2	A1*	—	—	—	—	—
	2	50.0		1	4	A1	—	—	—	—	—
	3	75.0		2	6	A1*	B1	—	—	—	—
	4	100.0		2	8	A1	B1	—	—	—	—
040 Accessory Unloader Added to Compressor No. B1	1	25.0		1	2	A1*	—	1	2	—	B1*
	2	50.0		1	4	A1	—	1	4	—	B1
	3	75.0		2	6	A1	B1*	2	6	A1*	B1
	4	100.0		2	8	A1	B1	2	8	A1	B1
045, 046 Standard (One Unloader)	1	20.0		1	2	A1*	—	—	—	—	—
	2	40.0		1	4	A1	—	—	—	—	—
	3	80.0		2	8	A1*	B1	—	—	—	—
	4	100.0		2	10	A1	B1	—	—	—	—
045, 046 Accessory Unloader Added to Compressor No. B1	1	A 20.0 B 40.0		1	2	A1*	—	1	4	—	B1*
	2	40.0 60.0		1	4	A1	—	1	6	—	B1
	3	60.0 —		2	6	A1*	B1*	—	—	—	—
	4	80.0		2	8	A1*	B1	2	8	A1	B1*
	5	100.0		2	10	A1	B1	2	10	A1	B1
050, 055 (60 Hz) Standard (One Unloader)	1	33.3		1	4	A1*	—	—	—	—	—
	2	50.0		1	6	A1	—	—	—	—	—
	3	83.3		2	10	A1*	B1	—	—	—	—
	4	100.0		2	12	A1	B1	—	—	—	—
050, 055 (60 Hz) Accessory Unloader Added to Compressor No. B1	1	33.3		1	4	A1*	—	1	4	—	B1*
	2	50.0		1	6	A1	—	1	6	—	B1
	3	66.6		2	8	A1*	B1*	2	8	A1*	B1*
	4	83.3		2	10	A1	B1*	2	10	A1*	B1
	5	100.0		2	12	A1	B1	2	12	A1	B1
055 (50 Hz), 060 Standard (One Unloader)	1	28.7		1	4	A1*	—	—	—	—	—
	2	43.1		1	6	A1	—	—	—	—	—
	3	85.6		2	10	A1*	B1	—	—	—	—
	4	100.0		2	12	A1	B1	—	—	—	—
055 (50 Hz), 060 Accessory Unloader Added to Compressor No. B1	1	A 28.7 B 37.9		1	4	A1*	—	1	4	—	B1*
	2	43.1 56.8		1	6	A1	—	1	6	—	B1
	3	66.6		2	8	A1*	B1*	2	8	A1*	B1*
	4	85.6		2	10	A1*	B1	2	10	A1*	B1
	5	100.0		2	12	A1	B1	2	12	A1	B1
070 (60 Hz) Standard (One Unloader)	1	25.0		1	4	A1*	—	—	—	—	—
	2	37.5		1	6	A1	—	—	—	—	—
	3	62.5		2	10	A1*	B1	—	—	—	—
	4	75.0		2	12	A1	B1	—	—	—	—
	5	87.5		3	14	A1*,A2	B1	—	—	—	—
	6	100.0		3	16	A1, A2	B1	—	—	—	—
070 (60 Hz) Accessory Unloader Added to Compressor No. B1	1	25.0		1	4	A1*	—	1	4	—	B1*
	2	37.5		1	6	A1	—	1	6	—	B1
	3	50.0		2	8	A1*	B1*	2	8	A1*	B1*
	4	62.5		2	10	A1	B1	2	10	A1	B1*
	5	75.0		2	12	A1	B1	2	12	A1	B1
	6	87.5		3	14	A1*,A2	B1*	3	14	A1,A2	B1*
	7	100.0		3	16	A1,A2	B1	3	16	A1,A2	B1
070 (50 Hz), 075, 080 Standard (One Unloader)	1	22.2		1	4	A1*	—	—	—	—	—
	2	33.3		1	6	A1	—	—	—	—	—
	3	55.5		2	10	A1*	B1	—	—	—	—
	4	66.6		2	12	A1	B1	—	—	—	—
	5	88.8		3	16	A1*,A2	B1	—	—	—	—
	6	100.0		3	18	A1,A2	B1	—	—	—	—
070 (50 Hz), 075, 080 Accessory Unloader Added to Compressor No. B1	1	22.2		1	4	A1*	—	1	4	—	B1*
	2	33.3		1	6	A1	—	1	6	—	B1
	3	44.4		2	8	A1*	B1*	2	8	A1*	B1*
	4	55.5		2	10	A1	B1*	2	10	A1	B1*
	5	66.6		2	12	A1	B1	2	12	A1	B1
	6	77.7		3	14	A1*,A2	B1*	3	14	A1*,A2	B1*
	7	88.8		3	16	A1*,A2	B1	3	16	A1*,A2	B1
	8	100.0		3	18	A1,A2	B1	3	18	A1,A2	B1
090 (60 Hz), 100 Standard	1	25.0		1	6	A1	—	1	6	—	B1
	2	50.0		2	12	A1	B1	2	12	A1	B1
	3	75.0		3	18	A1,A2	B1	3	18	A1	B1,B2
	4	100.0		4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
090 (50 Hz) Standard	1	21.5		1	6	A1	—	1	6	—	B1
	2	50.0		2	12	A1	B1	2	12	A1	B1
	3	71.5		3	18	A1,A2	B1	3	18	A2	B1,B2
	4	100.0		4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2

*Unloaded compressor.

Table 3 – Capacity Control Steps (cont)

UNIT 30GB	CONTROL STEPS	% DISPLACEMENT	LOADING SEQUENCE A				LOADING SEQUENCE B			
			Operating				Operating			
			Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B	Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B
090 (60 Hz), 100 Accessory Unloader Added to Compressor No. A1	1	16.6	1	4	A1*	—	—	—	—	—
	2	25.0	1	6	A1	—	—	—	—	—
	3	41.6	2	10	A1*	B1	—	—	—	—
	4	50.0	2	12	A1	B1	—	—	—	—
	5	66.6	3	16	A1*,A2	B1	—	—	—	—
	6	75.0	3	18	A1,A2	B1	—	—	—	—
	7	91.6	4	22	A1*,A2	B1,B2	—	—	—	—
	8	100.0	4	24	A1,A2	B1,B2	—	—	—	—
090 (50 Hz) Accessory Unloader Added to Compressor No. A1	1	14.3	1	4	A1*	—	—	—	—	—
	2	21.5	1	6	A1	—	—	—	—	—
	3	35.9	2	10	A1*	B1	—	—	—	—
	4	43.1	2	12	A1	B1	—	—	—	—
	5	64.3	3	16	A1*,A2	B1	—	—	—	—
	6	71.5	3	18	A1,A2	B1	—	—	—	—
	7	92.8	4	22	A1*,A2	B1,B2	—	—	—	—
	8	100.0	4	24	A1,A2	B1,B2	—	—	—	—
090 (60 Hz), 100 Accessory Unloaders Added to Compressors A1 and B1	1	16.6	1	4	A1*	—	1	4	—	B1*
	2	25.0	1	6	A1	—	1	6	—	B1
	3	33.3	2	8	A1*	B1*	2	8	A1*	B1*
	4	41.6	2	10	A1	B1*	2	10	A1*	B1
	5	50.0	2	12	A1	B1	2	12	A1	B1
	6	58.3	3	14	A1*,A2	B1*	3	14	A1*	B1*,B2
	7	66.6	3	16	A1*,A2	B1	3	16	A1	B1*,B2
	8	75.0	3	18	A1,A2	B1	3	18	A1	B1,B2
	9	83.3	4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	91.6	4	22	A1,A2	B1*,B2	4	22	A1*,A2	B1,B2
	11	100.0	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
090 (50 Hz) Accessory Unloaders Added to Compressors A1 and B1	1	14.3	1	4	A1*	—	1	4	—	B1*
	2	21.5	1	6	A1	—	1	6	—	B1
	3	28.7	2	8	A1*	B1*	2	8	A1*	B1*
	4	35.9	2	10	A1	B1*	2	10	A1*	B1
	5	43.1	2	12	A1	B1	2	12	A1	B1
	6	57.1	3	14	A1*,A2	B1*	3	14	A1*	B1*,B2
	7	64.3	3	16	A1*,A2	B1	3	16	A1	B1*,B2
	8	71.5	3	18	A1,A2	B1	3	18	A1	B1,B2
	9	85.6	4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	92.8	4	22	A1,A2	B1*,B2	4	22	A1*,A2	B1,B2
	11	100.0	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2

When there are three or more compressors per refrigeration circuit, the Flotron™ II control is programmed to randomly start the lag compressors. For simplicity, only one lag compressor starting sequence will be shown for the 30GB110 through 30GB200 and the 30GT225 through 30GT280

110 Standard	1	A 18.8 B 21.7	1	6	A1	—	1	6	—	B1
	2	A 40.5 B 40.5	2	12	A1	B1	2	12	A1	B1
	3	A 59.4 B 62.3	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	81.1	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	100.0	5	30	A1,A2,A3	B1,B2	5	30	A1,A2,A3	B1,B2
110 Accessory Unloader Added to Compressor No. A1	1	12.5	1	4	A1*	—	—	—	—	—
	2	18.8	1	6	A1	—	—	—	—	—
	3	34.2	2	10	A1*	B1	—	—	—	—
	4	40.5	2	12	A1	B1	—	—	—	—
	5	53.1	3	16	A1*,A2	B1	—	—	—	—
	6	59.4	3	18	A1,A2	B1	—	—	—	—
	7	74.8	4	22	A1*,A2	B1,B2	—	—	—	—
	8	81.1	4	24	A1,A2	B1,B2	—	—	—	—
	9	93.7	5	28	A1*,A2,A3	B1,B2	—	—	—	—
	10	100.0	5	30	A1,A2,A3	B1,B2	—	—	—	—
110 Accessory Unloaders Added to Compressors A1 and B1	1	A 12.5 B 14.4	1	4	A1*	—	1	4	—	B1*
	2	18.8	1	6	A1	—	1	6	—	B1
	3	27.0	2	8	A1*	B1*	2	8	A1*	B1*
	4	33.3	2	10	A1	B1*	2	10	A1	B1*
	5	40.5	2	12	A1	B1	2	12	A1	B1
	6	45.8	3	14	A1*,A2	B1*	3	14	A1*,A2	B1*
	7	53.1	3	16	A1*,A2	B1	3	16	A1*,A2	B1
	8	59.4	3	18	A1,A2	B1	3	18	A1,A2	B1
	9	67.6	4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	73.9	4	22	A1,A2	B1*,B2	4	22	A1,A2	B1*,B2
	11	81.1	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	12	86.4	5	26	A1*,A2,A3	B1*,B2	5	26	A1*,A2,A3	B1*,B2
	13	93.7	5	28	A1*,A2,A3	B1,B2	5	28	A1*,A2,A3	B1,B2
	14	100.0	5	30	A1,A2,A3	B1,B2	5	30	A1,A2,A3	B1,B2

*Unloaded compressor.

Table 3 – Capacity Control Steps (cont)

UNIT 30GB	CONTROL STEPS	% DISPLACEMENT	LOADING SEQUENCE A				LOADING SEQUENCE B			
			Operating				Operating			
			Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B	Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B
125 (60 Hz) Standard	1	20.0	1	6	A1	—	1	6	—	B1
	2	40.0	2	12	A1	B1	2	12	A1	B1
	3	60.0	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	80.0	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	100.0	5	30	A1,A2,A3	B1,B2	5	30	A1,A2,A3	B1,B2
125 (50 Hz) Standard	1	A 22.1 B 16.7	1	6	A1	—	1	6	—	B1
	2	A 38.9 B 38.9	2	12	A1	B1	2	12	A1	B1
	3	A 61.0 B 55.7	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	77.8	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	100.0	5	30	A1,A2,A3	B1,B2	5	30	A1,A2,A3	B1,B2
125 (60 Hz) Accessory Unloader Added to Compressor No. A1	1	13.3	1	4	A1*	—	—	—	—	—
	2	20.0	1	6	A1	—	—	—	—	—
	3	33.3	2	10	A1*	B1	—	—	—	—
	4	40.0	2	12	A1	B1	—	—	—	—
	5	53.3	3	16	A1*,A2	B1	—	—	—	—
	6	60.0	3	18	A1,A2	B1	—	—	—	—
	7	73.3	4	22	A1*,A2	B1,B2	—	—	—	—
	8	80.0	4	24	A1,A2	B1,B2	—	—	—	—
	9	93.3	5	28	A1*,A2,A3	B1,B2	—	—	—	—
	10	100.0	5	30	A1,A2,A3	B1,B2	—	—	—	—
125 (50 Hz) Accessory Unloader Added to Compressor No. A1	1	14.7	1	4	A1*	—	—	—	—	—
	2	22.1	1	6	A1	—	—	—	—	—
	3	31.5	2	10	A1*	B1	—	—	—	—
	4	38.9	2	12	A1	B1	—	—	—	—
	5	53.6	3	16	A1*,A2	B1	—	—	—	—
	6	61.0	3	18	A1,A2	B1	—	—	—	—
	7	70.4	4	22	A1*,A2	B1,B2	—	—	—	—
	8	77.8	4	24	A1,A2	B1,B2	—	—	—	—
	9	92.6	5	28	A1*,A2,A3	B1,B2	—	—	—	—
	10	100.0	5	30	A1,A2,A3	B1,B2	—	—	—	—
125 (60 Hz) Accessory Unloaders Added to Compressors A1 and B1	1	14.7	1	4	A1*	—	1	4	—	B1*
	2	22.1	1	6	A1	—	1	6	—	B1
	3	26.6	2	8	A1*	B1*	2	8	A1*	B1*
	4	31.5	2	10	A1	B1*	2	10	A1	B1*
	5	38.9	2	12	A1	B1	2	12	A1	B1
	6	46.6	3	14	A1*,A2	B1*	3	14	A1*,A2	B1*
	7	53.6	3	16	A1*,A2	B1	3	16	A1*,A2	B1
	8	61.0	3	18	A1,A2	B1	3	18	A1,A2	B1
	9	66.6	4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	70.4	4	22	A1,A2	B1*,B2	4	22	A1,A2	B1*,B2
	11	77.8	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	12	86.6	5	26	A1*,A2,A3	B1*,B2	5	26	A1*,A2,A3	B1*,B2
	13	92.6	5	28	A1*,A2,A3	B1,B2	5	28	A1*,A2,A3	B1,B2
	14	100.0	5	30	A1,A2,A3	B1,B2	5	30	A1,A2,A3	B1,B2
125 (50 Hz) Accessory Unloaders Added to Compressors A1 and B1	1	11.1	1	4	A1*	—	1	4	—	B1*
	2	16.7	1	6	A1	—	1	6	—	B1
	3	22.3	2	8	A1*	B1*	2	8	A1*	B1*
	4	27.9	2	10	A1	B1*	2	10	A1	B1*
	5	33.5	2	12	A1	B1	2	12	A1	B1
	6	44.5	3	14	A1*,A2	B1*	3	14	A1*,A2	B1*
	7	50.1	3	16	A1*,A2	B1	3	16	A1*,A2	B1
	8	55.7	3	18	A1,A2	B1	3	18	A1,A2	B1
	9	66.6	4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	72.2	4	22	A1,A2	B1*,B2	4	22	A1,A2	B1*,B2
	11	77.8	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	12	88.8	5	26	A1*,A2,A3	B1*,B2	5	26	A1*,A2,A3	B1*,B2
	13	94.4	5	28	A1*,A2,A3	B1,B2	5	28	A1*,A2,A3	B1,B2
	14	100.0	5	30	A1,A2,A3	B1,B2	5	30	A1,A2,A3	B1,B2
150 (60 Hz) Standard	1	16.6	1	6	A1	—	1	6	—	B1
	2	33.3	2	12	A1	B1	2	12	A1	B1
	3	50.0	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	66.6	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	83.3	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	100.0	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
150 (50 Hz) Standard	1	13.7	1	6	A1	—	1	6	—	B1
	2	27.4	2	12	A1	B1	2	12	A1	B1
	3	45.6	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	63.7	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	81.8	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	100.0	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3

*Unloaded compressor.

Table 3 – Capacity Control Steps (cont)

UNIT 30GB	CONTROL STEPS	% DISPLACEMENT	LOADING SEQUENCE A				LOADING SEQUENCE B			
			Operating				Operating			
			Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B	Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B
150 (60 Hz) Accessory Unloader Added to Compressor No. A1	1	11.1	1	4	A1*	—	—	—	—	—
	2	16.6	1	6	A1	—	—	—	—	—
	3	27.7	2	10	A1*	B1	—	—	—	—
	4	33.3	2	12	A1	B1	—	—	—	—
	5	44.4	3	16	A1*,A2	B1	—	—	—	—
	6	50.0	3	18	A1,A2	B1	—	—	—	—
	7	61.1	4	22	A1*,A2	B1,B2	—	—	—	—
	8	66.6	4	24	A1,A2	B1,B2	—	—	—	—
	9	77.7	5	28	A1*,A2,A3	B1,B2	—	—	—	—
	10	83.3	5	30	A1,A2,A3	B1,B2	—	—	—	—
	11	94.4	6	34	A1*,A2,A3	B1,B2,B3	—	—	—	—
	12	100.0	6	36	A1,A2,A3	B1,B2,B3	—	—	—	—
150 (50 Hz) Accessory Unloader Added to Compressor No. A1	1	9.1	1	4	A1*	—	—	—	—	—
	2	13.7	1	6	A1	—	—	—	—	—
	3	22.8	2	10	A1*	B1	—	—	—	—
	4	27.4	2	12	A1	B1	—	—	—	—
	5	41.0	3	16	A1*,A2	B1	—	—	—	—
	6	45.6	3	18	A1,A2	B1	—	—	—	—
	7	59.1	4	22	A1*,A2	B1,B2	—	—	—	—
	8	63.7	4	24	A1,A2	B1,B2	—	—	—	—
	9	77.2	5	28	A1*,A2,A3	B1,B2	—	—	—	—
	10	81.8	5	30	A1,A2,A3	B1,B2	—	—	—	—
	11	95.4	6	34	A1*,A2,A3	B1,B2,B3	—	—	—	—
	12	100.0	6	36	A1,A2,A3	B1,B2,B3	—	—	—	—
150 (60 Hz) Accessory Unloaders Added to Compressors A1 and B1	1	11.1	1	4	A1*	—	1	4	—	B1*
	2	16.6	1	6	A1	—	1	6	—	B1
	3	22.2	2	8	A1*	B1*	2	8	A1*	B1*
	4	27.7	2	10	A1	B1*	2	10	A1*	B1
	5	33.3	2	12	A1	B1	2	12	A1	B1
	6	38.8	3	14	A1*,A2	B1*	3	14	A1*	B1*,B2
	7	44.4	3	16	A1*,A2	B1	3	16	A1	B1*,B2
	8	50.0	3	18	A1,A2	B1	3	18	A1	B1,B2
	9	55.5	4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	61.1	4	22	A1,A2	B1*,B2	4	22	A1*,A2	B1,B2
	11	66.6	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	12	72.2	5	26	A1*,A2,A3	B1*,B2	5	26	A1*,A2	B1*,B2,B3
	13	77.7	5	28	A1*,A2,A3	B1,B2	5	28	A1,A2	B1*,B2,B3
	14	83.3	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	15	88.8	6	32	A1*,A2,A3	B1*,B2,B3	6	32	A1*,A2,A3	B1*,B2,B3
	16	94.4	6	34	A1,A2,A3	B1*,B2,B3	6	34	A1*,A2,A3	B1,B2,B3
	17	100.0	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
150 (50 Hz) Accessory Unloaders Added to Compressors A1 and B1	1	9.1	1	4	A1*	—	1	4	—	B1*
	2	13.7	1	6	A1	—	1	6	—	B1
	3	18.3	2	8	A1*	B1*	2	8	A1*	B1*
	4	22.8	2	10	A1	B1*	2	10	A1*	B1
	5	27.4	2	12	A1	B1	2	12	A1	B1
	6	36.4	3	14	A1*,A2	B1*	3	14	A1*	B1*,B2
	7	41.0	3	16	A1*,A2	B1	3	16	A1	B1*,B2
	8	45.6	3	18	A1,A2	B1	3	18	A1	B1,B2
	9	54.5	4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	59.1	4	22	A1,A2	B1*,B2	4	22	A1*,A2	B1,B2
	11	63.7	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	12	72.7	5	26	A1*,A2,A3	B1*,B2	5	26	A1*,A2	B1*,B2,B3
	13	77.2	5	28	A1*,A2,A3	B1,B2	5	28	A1,A2	B1*,B2,B3
	14	81.8	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	15	90.8	6	32	A1*,A2,A3	B1*,B2,B3	6	32	A1*,A2,A3	B1*,B2,B3
	16	95.4	6	34	A1,A2,A3	B1*,B2,B3	6	34	A1*,A2,A3	B1,B2,B3
	17	100.0	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
175 (60 Hz) Standard	1	14.2	1	6	A1	—	1	6	—	B1
	2	28.5	2	12	A1	B1	2	12	A1	B1
	3	42.8	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	57.1	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	71.4	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	85.7	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	7	100.0	7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3,A4	B1,B2,B3
175 (50 Hz) Standard	1	11.6	1	6	A1	—	1	6	—	B1
	2	23.2	2	12	A1	B1	2	12	A1	B1
	3	38.6	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	53.9	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	69.3	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	84.6	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	7	100.0	7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3,A4	B1,B2,B3

*Unloaded compressor.

Table 3 – Capacity Control Steps (cont)

UNIT 30GB	CONTROL STEPS	% DISPLACEMENT	CONTROL SEQUENCE A				CONTROL SEQUENCE B			
			Operating				Operating			
			Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B	Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B
200 (60 Hz) Standard Unloaders cannot be added to the 30GB175 and 200	1	12.5	1	6	A1	—	1	6	—	B1
	2	25.0	2	12	A1	B1	2	12	A1	B1
	3	37.5	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	50.0	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	62.5	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	75.0	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	7	87.5	7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3	B1,B2,B3,B4
	8	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4
200 (50 Hz) Standard Unloaders cannot be added to the 30GB175 and 200	1	10.0	1	6	A1	—	1	6	—	B1
	2	20.1	2	12	A1	B1	2	12	A1	B1
	3	33.4	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	46.7	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	60.0	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	73.3	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	7	86.6	7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3	B1,B2,B3,B4
	8	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4
30GT										
225 (60 Hz) Standard	1	11.5	1	6	A1	—	1	6	—	B1
	2	23.1	2	12	A1	B1	2	12	A1	B1
	3	34.7	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	46.2	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	57.8	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	69.4	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	7	84.7	7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3	B1,B2,B3,B4
	8	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4
225 (50 Hz) Standard	1	A 9.7 B 12.8	1	6	A1	—	1	6	—	B1
	2	22.6	2	12	A1	B1	2	12	A1	B1
	3	35.5	3	18	A1,A2	B1	3	18	A1	B1,B2
	4	48.4	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	61.3	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	74.2	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	7	87.1	7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3	B1,B2,B3,B4
	8	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4
225 (60 Hz) Accessory Unloader Added to Compressor No. A1	1	7.7	1	4	A1*	—	—	—	—	—
	2	11.5	1	6	A1	—	—	—	—	—
	3	19.2	2	10	A1*	B1	—	—	—	—
	4	23.1	2	12	A1	B1	—	—	—	—
	5	30.8	3	16	A1*,A2	B1	—	—	—	—
	6	34.7	3	18	A1,A2	B1	—	—	—	—
	7	42.4	4	22	A1*,A2	B1,B2	—	—	—	—
	8	46.2	4	24	A1,A2	B1,B2	—	—	—	—
	9	54.0	5	28	A1*,A2,A3	B1,B2	—	—	—	—
	10	57.8	5	30	A1,A2,A3	B1,B2	—	—	—	—
	11	65.5	6	34	A1*,A2,A3	B1,B2,B3	—	—	—	—
	12	69.4	6	36	A1,A2,A3	B1,B2,B3	—	—	—	—
	13	80.8	7	40	A1*,A2,A3,A4	B1,B2,B3	—	—	—	—
	14	84.7	7	42	A1,A2,A3,A4	B1,B2,B3	—	—	—	—
	15	96.1	8	46	A1*,A2,A3,A4	B1,B2,B3,B4	—	—	—	—
	16	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	—	—	—	—
225 (50 Hz) Accessory Unloader Added to Compressor No. A1	1	6.5	1	4	A1*	—	—	—	—	—
	2	9.7	1	6	A1	—	—	—	—	—
	3	19.4	2	10	A1*	B1	—	—	—	—
	4	22.6	2	12	A1	B1	—	—	—	—
	5	32.2	3	16	A1*,A2	B1	—	—	—	—
	6	35.5	3	18	A1,A2	B1	—	—	—	—
	7	45.1	4	22	A1*,A2	B1,B2	—	—	—	—
	8	48.4	4	24	A1,A2	B1,B2	—	—	—	—
	9	58.0	5	28	A1*,A2,A3	B1,B2	—	—	—	—
	10	61.3	5	30	A1,A2,A3	B1,B2	—	—	—	—
	11	70.9	6	34	A1*,A2,A3	B1,B2,B3	—	—	—	—
	12	74.2	6	36	A1,A2,A3	B1,B2,B3	—	—	—	—
	13	83.8	7	40	A1*,A2,A3,A4	B1,B2,B3	—	—	—	—
	14	87.1	7	42	A1,A2,A3,A4	B1,B2,B3	—	—	—	—
	15	96.7	8	46	A1*,A2,A3,A4	B1,B2,B3,B4	—	—	—	—
	16	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	—	—	—	—

*Unloaded compressor

Table 3 – Capacity Control Steps (cont)

UNIT 30GT	CONTROL STEPS	% DISPLACEMENT		LOADING SEQUENCE A				LOADING SEQUENCE B			
				Operating				Operating			
				Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B	Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B
225 (60 Hz) Accessory Unloaders Added to Compressors A1 and B1	1	7.7		1	4	A1*	—	1	4	—	B1*
	2	11.5		1	6	A1	—	1	6	—	B1
	3	15.4		2	8	A1*	B1*	2	8	A1*	B1*
	4	19.2		2	10	A1	B1*	2	10	A1*	B1
	5	23.1		2	12	A1	B1	2	12	A1	B1
	6	27.0		3	14	A1*,A2	B1*	3	14	A1*	B1*,B2
	7	30.8		3	16	A1*,A2	B1	3	16	A1	B1*,B2
	8	34.7		3	18	A1,A2	B1	3	18	A1	B1,B2
	9	38.5		4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	42.4		4	22	A1,A2	B1*,B2	4	22	A1*,A2	B1,B2
	11	46.2		4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	12	50.1		5	26	A1*,A2,A3	B1*,B2	5	26	A1*,A2	B1*,B2,B3
	13	54.0		5	28	A1*,A2,A3	B1,B2	5	28	A1,A2	B1*,B2,B3
	14	57.8		5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	15	61.7		6	32	A1*,A2,A3	B1*,B2,B3	6	32	A1*,A2,A3	B1*,B2,B3
	16	65.5		6	34	A1,A2,A3	B1*,B2,B3	6	34	A1*,A2,A3	B1,B2,B3
	17	69.4		6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	18	77.0		7	38	A1*,A2,A3,A4	B1*,B2,B3	7	38	A1*,A2,A3	B1*,B2,B3,B4
	19	80.8		7	40	A1*,A2,A3,A4	B1,B2,B3	7	40	A1,A2,A3	B1*,B2,B3,B4
	20	84.7		7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3	B1,B2,B3,B4
	21	92.2		8	44	A1*,A2,A3,A4	B1*,B2,B3,B4	8	44	A1*,A2,A3,A4	B1*,B2,B3,B4
	22	96.1		8	46	A1,A2,A3,A4	B1*,B2,B3,B4	8	46	A1*,A2,A3,A4	B1,B2,B3,B4
	23	100.0		8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4
225 (50 Hz) Accessory Unloaders Added to Compressors A1 and B1	1	A 6.5 B 8.5		1	4	A1*	—	1	4	—	B1*
	2	9.7	12.8	1	6	A1	—	1	6	—	B1
	3	15.1		2	8	A1*	B1*	2	8	A1*	B1*
	4	18.3		2	10	A1	B1*	2	10	A1	B1*
	5	22.6		2	12	A1	B1	2	12	A1	B1
	6	27.9		3	14	A1*,A2	B1*	3	14	A1*,A2	B1*
	7	32.2		3	16	A1*,A2	B1	3	16	A1*,A2	B1
	8	35.5		3	18	A1,A2	B1	3	18	A1,A2	B1
	9	40.8		4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	44.1		4	22	A1,A2	B1*,B2	4	22	A1,A2	B1*,B2
	11	48.4		4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	12	53.7		5	26	A1*,A2,A3	B1*,B2	5	26	A1*,A2,A3	B1*,B2
	13	58.0		5	28	A1*,A2,A3	B1,B2	5	28	A1*,A2,A3	B1,B2
	14	61.3		5	30	A1,A2,A3	B1,B2	5	30	A1,A2,A3	B1,B2
	15	66.6		6	32	A1*,A2,A3	B1*,B2,B3	6	32	A1*,A2,A3	B1*,B2,B3
	16	70.9		6	34	A1*,A2,A3	B1,B2,B3	6	34	A1*,A2,A3	B1,B2,B3
	17	74.2		6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	18	79.5		7	38	A1*,A2,A3,A4	B1*,B2,B3	7	38	A1*,A2,A3,A4	B1*,B2,B3
	19	83.8		7	40	A1*,A2,A3,A4	B1,B2,B3	7	40	A1*,A2,A3,A4	B1,B2,B3
	20	87.1		7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3,A4	B1,B2,B3
	21	92.4		8	44	A1*,A2,A3,A4	B1*,B2,B3,B4	8	44	A1*,A2,A3,A4	B1*,B2,B3,B4
	22	96.7		8	46	A1*,A2,A3,A4	B1,B2,B3,B4	8	46	A1*,A2,A3,A4	B1,B2,B3,B4
	23	100.0		8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4
250 (60 Hz) Standard	1	10.7		1	6	A1	—	1	6	—	B1
	2	21.5		2	12	A1	B1	2	12	A1	B1
	3	32.3		3	18	A1,A2	B1	3	18	A1	B1,B2
	4	43.1		4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	57.3		5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	71.5		6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	7	85.7		7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3	B1,B2,B3,B4
	8	100.0		8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4
250 (50 Hz) 280 (60 Hz) Standard	1	12.5		1	6	A1	—	1	6	—	B1
	2	25.0		2	12	A1	B1	2	12	A1	B1
	3	37.5		3	18	A1,A2	B1	3	18	A1	B1,B2
	4	50.0		4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	5	62.5		5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	6	75.0		6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	7	87.5		7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3,A4	B1,B2,B3
	8	100.0		8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4

*Unloaded compressor.

Table 3 – Capacity Control Steps (cont)

UNIT 30GT	CONTROL STEPS	% DISPLACEMENT	LOADING SEQUENCE A				LOADING SEQUENCE B			
			Operating				Operating			
			Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B	Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B
250 (60 Hz) Accessory Unloader Added to Compressor No. A1	1	7.1	1	4	A1*	—	—	—	—	—
	2	10.7	1	6	A1	—	—	—	—	—
	3	17.9	2	10	A1*	B1	—	—	—	—
	4	21.5	2	12	A1	B1	—	—	—	—
	5	28.7	3	16	A1*,A2	B1	—	—	—	—
	6	32.3	3	18	A1,A2	B1	—	—	—	—
	7	39.5	4	22	A1*,A2	B1,B2	—	—	—	—
	8	43.1	4	24	A1,A2	B1,B2	—	—	—	—
	9	53.7	5	28	A1*,A2,A3	B1,B2	—	—	—	—
	10	57.3	5	30	A1,A2,A3	B1,B2	—	—	—	—
	11	67.9	6	34	A1*,A2,A3	B1,B2,B3	—	—	—	—
	12	71.5	6	36	A1,A2,A3	B1,B2,B3	—	—	—	—
	13	82.1	7	40	A1*,A2,A3,A4	B1,B2,B3	—	—	—	—
	14	85.7	7	42	A1,A2,A3,A4	B1,B2,B3	—	—	—	—
	15	96.4	8	46	A1*,A2,A3,A4	B1,B2,B3,B4	—	—	—	—
	16	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	—	—	—	—
250 (50 Hz), 280 Accessory Unloader Added to Compressor No. A1	1	8.3	1	4	A1*	—	—	—	—	—
	2	12.5	1	6	A1	—	—	—	—	—
	3	20.8	2	10	A1*	B1	—	—	—	—
	4	25.0	2	12	A1	B1	—	—	—	—
	5	33.3	3	16	A1*,A2	B1	—	—	—	—
	6	37.5	3	18	A1,A2	B1	—	—	—	—
	7	45.8	4	22	A1*,A2	B1,B2	—	—	—	—
	8	50.0	4	24	A1,A2	B1,B2	—	—	—	—
	9	58.3	5	28	A1*,A2,A3	B1,B2	—	—	—	—
	10	62.5	5	30	A1,A2,A3	B1,B2	—	—	—	—
	11	70.8	6	34	A1*,A2,A3	B1,B2,B3	—	—	—	—
	12	75.0	6	36	A1,A2,A3	B1,B2,B3	—	—	—	—
	13	83.3	7	40	A1*,A2,A3,A4	B1,B2,B3	—	—	—	—
	14	87.5	7	42	A1,A2,A3,A4	B1,B2,B3	—	—	—	—
	15	95.8	8	46	A1*,A2,A3,A4	B1,B2,B3,B4	—	—	—	—
	16	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	—	—	—	—
250 (60 Hz) Accessory Unloaders Added to Compressors A1 and B1	1	7.1	1	4	A1*	—	1	4	—	B1*
	2	10.7	1	6	A1	—	1	6	—	B1
	3	14.3	2	8	A1*	B1*	2	8	A1*	B1*
	4	17.9	2	10	A1	B1*	2	10	A1*	B1
	5	21.5	2	12	A1	B1	2	12	A1	B1
	6	25.1	3	14	A1*,A2	B1*	3	14	A1*	B1*,B2
	7	28.7	3	16	A1*,A2	B1	3	16	A1	B1*,B2
	8	32.3	3	18	A1,A2	B1	3	18	A1	B1,B2
	9	35.9	4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	39.5	4	22	A1,A2	B1*,B2	4	22	A1*,A2	B1,B2
	11	43.1	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	12	50.1	5	26	A1*,A2,A3	B1*,B2	5	26	A1*,A2	B1*,B2,B3
	13	53.7	5	28	A1*,A2,A3	B1,B2	5	28	A1,A2	B1*,B2,B3
	14	57.3	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	15	64.3	6	32	A1*,A2,A3	B1*,B2,B3	6	32	A1*,A2,A3	B1*,B2,B3
	16	67.9	6	34	A1,A2,A3	B1*,B2,B3	6	34	A1*,A2,A3	B1,B2,B3
	17	71.5	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	18	78.5	7	38	A1*,A2,A3,A4	B1*,B2,B3	7	38	A1*,A2,A3	B1*,B2,B3,B4
	19	82.1	7	40	A1*,A2,A3,A4	B1,B2,B3	7	40	A1,A2,A3	B1*,B2,B3,B4
	20	85.7	7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3	B1,B2,B3,B4
	21	92.8	8	44	A1*,A2,A3,A4	B1*,B2,B3,B4	8	44	A1*,A2,A3,A4	B1*,B2,B3,B4
	22	96.4	8	46	A1,A2,A3,A4	B1*,B2,B3,B4	8	46	A1*,A2,A3,A4	B1,B2,B3,B4
	23	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4

*Unloaded compressor.

Table 3 — Capacity Control Steps (cont)

UNIT 30GT	CONTROL STEPS	% DISPLACEMENT	LOADING SEQUENCE A				LOADING SEQUENCE B			
			Operating				Operating			
			Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B	Qty of Compr	No. of Cyl	Compr No. Circuit A	Compr No. Circuit B
250 (50 Hz), 280 Accessory Unloaders Added to Compressors A1 and B1	1	8.3	1	4	A1*	—	1	4	—	B1*
	2	12.5	1	6	A1	—	1	6	—	B1
	3	16.6	2	8	A1*	B1*	2	8	A1*	B1*
	4	20.8	2	10	A1	B1*	2	10	A1*	B1
	5	25.0	2	12	A1	B1	2	12	A1	B1
	6	29.1	3	14	A1*,A2	B1*	3	14	A1*	B1*,B2
	7	33.3	3	16	A1*,A2	B1	3	16	A1	B1*,B2
	8	37.5	3	18	A1,A2	B1	3	18	A1	B1,B2
	9	41.6	4	20	A1*,A2	B1*,B2	4	20	A1*,A2	B1*,B2
	10	45.8	4	22	A1,A2	B1*,B2	4	22	A1*,A2	B1,B2
	11	50.0	4	24	A1,A2	B1,B2	4	24	A1,A2	B1,B2
	12	54.1	5	26	A1*,A2,A3	B1*,B2	5	26	A1*,A2	B1*,B2,B3
	13	58.3	5	28	A1*,A2,A3	B1,B2	5	28	A1,A2	B1*,B2,B3
	14	62.5	5	30	A1,A2,A3	B1,B2	5	30	A1,A2	B1,B2,B3
	15	66.6	6	32	A1*,A2,A3	B1*,B2,B3	6	32	A1*,A2,A3	B1*,B2,B3
	16	70.8	6	34	A1,A2,A3	B1*,B2,B3	6	34	A1*,A2,A3	B1,B2,B3
	17	75.0	6	36	A1,A2,A3	B1,B2,B3	6	36	A1,A2,A3	B1,B2,B3
	18	79.1	7	38	A1*,A2,A3,A4	B1*,B2,B3	7	38	A1*,A2,A3	B1*,B2,B3,B4
	19	83.3	7	40	A1*,A2,A3,A4	B1,B2,B3	7	40	A1,A2,A3	B1*,B2,B3,B4
	20	87.5	7	42	A1,A2,A3,A4	B1,B2,B3	7	42	A1,A2,A3	B1,B2,B3,B4
	21	91.6	8	44	A1*,A2,A3,A4	B1*,B2,B3,B4	8	44	A1*,A2,A3,A4	B1*,B2,B3,B4
	22	95.8	8	46	A1,A2,A3,A4	B1*,B2,B3,B4	8	46	A1*,A2,A3,A4	B1,B2,B3,B4
	23	100.0	8	48	A1,A2,A3,A4	B1,B2,B3,B4	8	48	A1,A2,A3,A4	B1,B2,B3,B4

*Unloaded compressor.

Head Pressure Control — The microprocessor controls the condenser fans in order to maintain the lowest condensing temperature possible, thus the highest unit efficiency. Instead of using the conventional head pressure control methods, the fans are controlled by the position of the electronic expansion valves and suction superheat.

As the condensing temperature drops, the electronic expansion valve opens to maintain the proper suction superheat. Once the electronic expansion valve is fully open, if the condensing temperature continues to drop, the suction superheat begins to rise. Once the suction superheat is greater than 40°F (22.2°C), a fan stage is removed after 2 minutes.

As the condensing temperature rises, the electronic expansion valve closes to maintain the proper suction superheat. Once the electronic expansion valve has closed to 39.5% open (300 steps open), a fan stage is added after 2 minutes.

During start-up, all the condenser fans are started when the condensing temperature reaches 95 F (35 C) to prevent excessive discharge pressure during pulldown. See Table 4 for condenser fan sequence of operation.

Table 4 – Condenser Fan Sequence

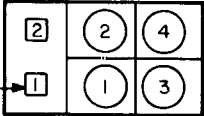
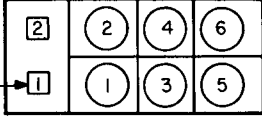
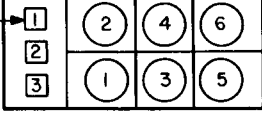
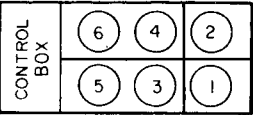
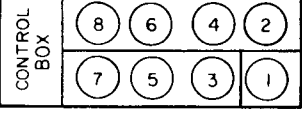
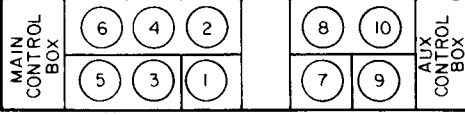
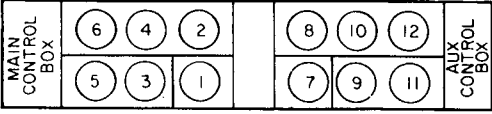
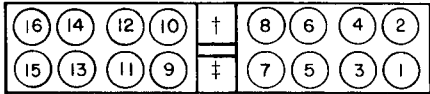
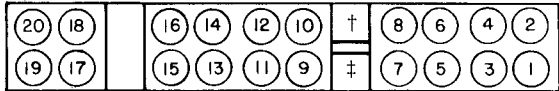
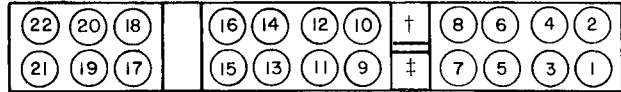
FAN ARRANGEMENT	FAN NO.	FAN CONTACTOR	CONTROLLED BY
30GB040,046 □ – COMPRESSOR 	1	FC1	Compressor No. A1
	2	FC2	Compressor No. B1
	3, 4	FC3	First Stage of Microprocessor
30GB045,050,055,060 □ – COMPRESSOR 	1	FC1	Compressor No. A1
	2	FC2	Compressor No. B1
	3, 4	FC3	First Stage of Microprocessor
	5, 6	FC4	Second Stage of Microprocessor
30GB070 □ – COMPRESSOR 	1, 2	FC1	Compressor No. A1
	1, 2	FC2	Compressor No. B1
	3, 4	FC3	First Stage of Microprocessor
	5, 6	FC4	Second Stage of Microprocessor
30GB075,080 	1	FC1	Compressor No. A1
	2	FC4	Compressor No. B1
	3, 5	FC2	First Stage of Microprocessor
	4, 6	FC3	Second Stage of Microprocessor
30GB090, 100 	1	FC1 FC4	Compressor No. A1 or B1
	3, 5, 7	FC2	First Stage of Microprocessor
	2, 4, 6, 8	FC3	Second Stage of Microprocessor
30GB110,125 	1	FC1	Compressor No. A1
	7	FC4	Compressor No. B1
	3, 5, 9	FC2 FC5	First Stage of Microprocessor
	2, 4, 6, 8, 10	FC3 FC6	Second Stage of Microprocessor
30GB150,175,200 	1	FC1	Compressor No. A1
	7	FC4	Compressor No. B1
	3, 5, 9, 11	FC2 FC5	First Stage of Microprocessor
	2, 4, 6, 8, 10, 12	FC3 FC6	Second Stage of Microprocessor

Table 4 – Condenser Fan Sequence (cont)

FAN ARRANGEMENT	FAN NO. (CKT)	FAN CONTACTOR	CONTROLLED BY
30GT225 	7, 8 (A)	FC1	Compressor A1
	9, 10 (B)	FC4	Compressor B1
	5, 6 (A)	FC2	First Stage of Microprocessor
	11, 12 (B)	FC5	
	1, 2, 3, 4 (5, 6 Off) (A)	FC3	Second Stage of Microprocessor
	13, 14, 15, 16 (11, 12 Off) (B)	FC6	
	1, 2, 3, 4, 5, 6 (A)	FC2 FC3	Third Stage of Microprocessor
	11, 12, 13, 14, 15, 16 (B)	FC5 FC6	
30GT250 – (60 Hz) 	7, 8, 10 (A)	FC1	Compressor A1
	9, 17, 18 (B)	FC4	Compressor B1
	5, 6 (A)	FC2	First Stage of Microprocessor
	11, 12, 19 (B)	FC5	
	1, 2, 3, 4, 13, 14, 15, 16, 20 (A)	FC3 FC6 FC7	Second Stage of Microprocessor
	1, 2, 3, 4, 13, 14, 15, 16, 20 (B)	FC3 FC6 FC7	
30GT280 AND 30GT250 – 50 Hz 	7, 8, 10 (A)	FC1	Compressor A1
	9, 17, 18 (B)	FC4	Compressor B1
	5, 6 (A)	FC2	First Stage of Microprocessor
	11, 12, 19, 20 (B)	FC5	
	1, 2, 3, 4, 13, 14, 15, 16, 21, 22 (A)	FC3 FC6 FC7	Second Stage of Microprocessor
	1, 2, 3, 4, 13, 14, 15, 16, 21, 22 (B)	FC3 FC6 FC7	

†Control box

‡Power box.

Pumpout — When the lead compressor in each circuit is started or stopped, that circuit goes through a pumpout cycle to purge the cooler and refrigerant suction lines of refrigerant. The method of controlling the pumpout cycle is different between the 30GB and the 30GT units.

30GB — The solenoid valve (if used) opens immediately upon starting the lead compressor. However, the electronic expansion valve remains in the closed position for 10 seconds. After 10 seconds, the EXV opens gradually to provide a controlled start-up to prevent liquid flood-back to the compressor. If the lead compressor has been shut down for less than 15 minutes, the pumpout cycle is omitted at start-up.

At shutdown, the pumpout cycle begins when the electronic expansion valve has been driven closed to a position of less than 35% (266 steps open) open. The compressor then continues to run for 10 seconds before shutting down. When the compressor shuts down, the solenoid valve (if used) closes and the EXV continues to move until fully closed.

30GT — The pumpout cycle starts immediately upon starting the lead compressor and continues until the saturated suction temperature is 20 degrees F (11.1 degrees C) below the saturated suction temperature at start-up or is 10 degrees F (5.5 degrees C) below the cooler leaving fluid temperature. At this point, the EXV starts to open and continues to open gradually to provide a controlled start-up to prevent liquid flood-back to the compressor.

At shut down, the pumpout cycle continues until the saturated suction temperature for that circuit is 20 degrees F (11.1 degrees C) below the saturated suction temperature when pumpout is initiated. At that point, the compressor shuts down and the EXV continues to move until fully closed.

Keyboard and Display Module (Also called HSIO or LID) — 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 keyboard with 6 function keys, 5 operative keys, 12 numeric keys (0 to 9, • and –), and an alphanumeric 8-character LCD. See Fig. 1. See Table 5 for key usage.

ACCESSING FUNCTIONS AND SUBFUNCTIONS — See Tables 5, 6, and 7. Table 6 shows the 6 functions (identified by name) and the subfunctions (identified by number).

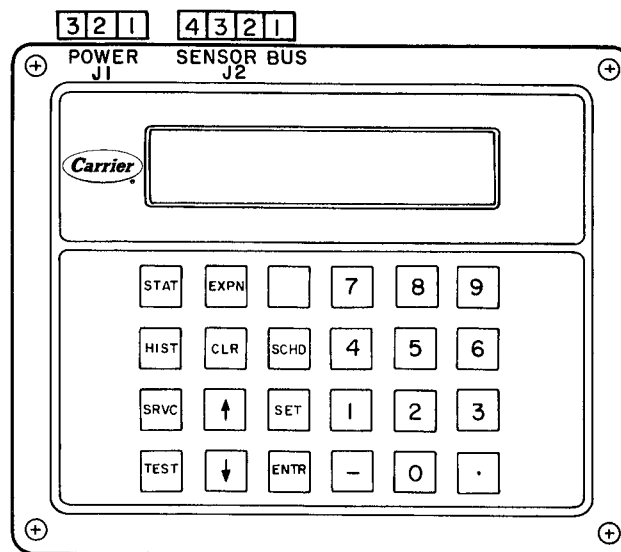


Fig. 1 — Keyboard and Display Module

Table 5 — Keyboard and Display Module Usage

FUNCTION KEYS	USE
STAT	STATUS — For displaying diagnostic codes and current operating information about the machine.
TEST	TEST — For checking inputs and outputs for proper operation.
HIST	HISTORY — For displaying run time, cycles and previous alarms
SRVC	SERVICE — For entering specific unit configuration information.
SET	SET POINT — For entering operating set points and day/time information
SCHD	SCHEDULE — For entering Occupied/Unoccupied schedules for unit operation
OPERATIVE KEYS	
EXPN	EXPAND — For displaying a non-abbreviated expansion of the display.
CLR	CLEAR — For clearing the screen of all displays.
↑	UP ARROW — For returning to previous display position.
↓	DOWN ARROW — For advancing to next display position.
ENTR	ENTER — For entering data

Table 6 – Functions and Subfunctions

SUBFUNCTIONS NO.	FUNCTIONS					
	Status 	Test 	Service 	Set Point 	Schedule 	History 
1	Rotating Display	Test of Outputs	Log on and Log off	System (Chilled Water)	Occupied Mode Override	Run Time
2	Alarm Displays	Test of Compressors and Unloaders	Software Version	Reset	Schedule Type	Starts
3	Operating Mode Displays	—	Factory Configuration	Demand Limit	Period 1	Alarms
4	Capacity Stages	—	Field Configuration	Time	Period 2	—
5	Current Operating Set Points	—	Service Configuration	—	Period 3	—
6	System Temperatures	—	—	—	Period 4	—
7	System Pressures	—	—	—	Period 5	—
8	Analog	—	—	—	Period 6	—
9	Inputs	—	—	—	Period 7	—
10	Outputs	—	—	—	Period 8	—
11	—	—	—	—	HOLIDAYS	—

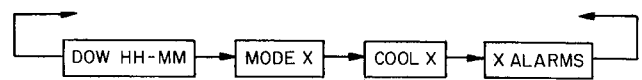
Table 7 – Accessing Functions and Subfunctions

OPERATION	KEYBOARD ENTRY	DISPLAY RESPONSE	DESCRIPTION
To access a function, press subfunction no. and function name key. Display shows subfunction group.	 	RESET	Reset Set Points
To move to other elements, scroll up or down using arrow keys. NOTE: These displays do not show if control is not configured for reset.		CRST2xx	Cooling Max Reset xx
		CREF2xx	Cooling Max Reference xx
		CRST1xx	Cooling Min Reference xx
		CREF1xx	Cooling Min Reference xx
When the last element in a subfunction has been displayed, the first element is repeated.		RESET	Reset Set
		CRST2xx	Cooling Max Reset xx
To move to next subfunction it is not necessary to use subfunction no. Press function name key to advance display through all subfunctions within a function and then back to the first.		DEMAND	Demand Set Points
		TIME	Current Time and Day of Week
		SET	Unit Set Points
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		X ALARMS	Rotating Display
	 	STAGE	Capacity Stages

SUMMARY DISPLAY — When keyboard has not been used for 10 minutes, display automatically switches to the rotating summary display. This display has 4 parts, listed below, which appear in continuous rotating sequence.

DISPLAY	EXPANSION
TUE 15:45	TODAY IS TUE, TIME IS 15:45 (3:45 PM)
CLOCK ON	UNIT IS ON VIA CLOCK SCHEDULE
COOL 1	NUMBER OF STAGES IS 1
2 ALARMS	2 ALARMS DETECTED

AUTOMATIC DISPLAY OPERATION/DEFAULT DISPLAY — In this mode the keyboard displays the current time (24-hour format), current operating modes, cooling capacity stages, and total number of alarms.



The default display is displayed every 2 seconds if there has been no manual input from the keyboard for 10 minutes. To return to automatic display at any time **1** **STAT** can be entered.

KEYBOARD OPERATING INSTRUCTIONS (Refer to Keyboard Directory, Table 8.)

1. White keys on left side of keyboard are shown and operated in these instructions according to the following example: keyboard entry **1** **SRVC** means press the **1** , then the white key marked **SRVC** .
2. The standard display uses abbreviations. Expanded information scrolls through the display whenever **EXPN** key is pressed.
3. All functions are made up of a group of subfunctions. To enter a subfunction, first press subfunction number desired. Then press the function key in which the subfunction resides. To move within that subfunction, press the up **↑** or down **↓** arrow. For example, a **6** **STAT** enters the Temperature Information subfunction.
4. At any time, another subfunction may be entered by simply entering the subfunction number, then the function key.
5. Prior to starting unit, check leaving fluid set point for correct setting. Refer to Set Point Function Information.
6. Depending on chiller model (30GB, 30GT) and configuration, all displays may not be shown. All displays are shown unless marked with one of the following symbols.

*Must be configured. †30GB only. **30GT only

For additional unit start-up procedures, see separate Installation, Start-Up and Service Instructions supplied with unit.

Table 8 – Keyboard Directory

STATUS			
SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
1 AUTOMATIC DISPLAY		Refer to Automatic Display Operation. See previous page.	
2 ALARMS		X ALARMS	Number of Tripped Alarms
		ALARM X	} Displays Tripped Alarms
		ALARM X	
		ALARM X	
		ALARM X	
		ALARM X	
3 MODES		X MODES	Number of Modes in Effect
		MODE X	} Displays Mode in Effect
		MODE X	
		MODE X	
		MODE X	
4 STAGE		STAGE	Capacity Staging Information
		STAGE X	Number of Requested Stages
		CAPT X	Percent of Total Capacity
		CAPA X	Percent Circuit A Capacity
		CAPB X	Percent Circuit B Capacity
		*LMT X	Demand Limit Set Point
		*LOAD X	Load Limit Set Point
		CIRA X	Circuit A Compressor Relay Status
		CIRB X	Circuit B Compressor Relay Status
		SMZ X	Load/Unload Factor for Compressors Factor = 1 Unloader Factor = 0.6
5 SET POINT		SET POINT	Fluid Set Point Information
		SP X	Set Point
		MSP X	Modified Set Point = Set Point + Reset
		TW X	Cooler Leaving Fluid Temp
6 TEMPERATURE		TEMPS	Temperature Information
		EWT X	Cooler Entering Fluid Temp
		LWT X	Cooler Leaving Fluid Temp
		SCTA X	Circuit A Saturated Condenser Temp
		SSTA X	Circuit A Saturated Suction Temp
		CTA X	Compressor A1 Suction Temp
		SHA X	Circuit A Suction Superheat

Table 8 Keyboard Directory (cont)

STATUS (cont)			
SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
6 TEMPERATURE (cont)		SCTB X	Circuit B Saturated Condenser Temp
		SSTB X	Circuit B Saturated Suction Temp
		CTB X	Compressor B1 Suction Temp
		SHB X	Circuit B Suction Superheat
		*RST X	Reset Temperature
7 PRESSURE		PRESSURE	Refrigerant System Pressure (psig)
		†NONE	None Available
		**DPA X	Circuit A Discharge Pressure
		**SPA X	Circuit A Suction Pressure
		**XXXX	Circuit A Discharge/Suction
		**OPA X	Circuit A Oil Pressure Differential
		**DPB X	Circuit B Discharge Pressure
		**SPB X	Circuit B Suction Pressure
		**XXXX	Circuit B Discharge/Suction
		**OPB X	Circuit B Oil Pressure Differential
8 ANALOG		ANALOG	Status of Analog Inputs
		†NONE	None Available
		*REF X	Transducer Supply Voltage
		*LMT X	Demand 4-20 mA Signal
		*RST X	Reset 420 mA Signal
9 INPUTS		INPUT	Status of Switch Inputs
		*SPW X	Dual Set Point Switch
		*OPSA X	Oil Pressure Switch 1
		*OPSB X	Oil Pressure Switch 2
		*DL1 X	Demand Limit Switch 1
		*DL2 X	Demand Limit Switch 2

Table 8 – Keyboard Directory (cont)

STATUS (cont)			
SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
10 OUTPUTS	10 STAT	OUTPUTS	Status of Outputs
	↓	ALMR X	Alarm Relay K3
	↓	FRA1 X	Fan Relay K1
	↓	FRA2 X	Fan Relay K2
	↓	**FRB1 X	Fan Relay K4
	↓	**FRB2 X	Fan Relay K5
	↓	*CHWP X	Cooler Water Pump Relay K6
	↓	*ULA1 X	Unloader A1
	↓	*ULA2 X	Unloader A2
	↓	*ULB1 X	Unloader B1
	↓	*ULB2 X	Unloader B2
	↓	EXVA X	EXVA Percent Open
	↓	EXVB X	EXVB Percent Open
	↓	*HGBA X	Hot Gas Bypass Relay Circuit A
	↓	*HGBB X	Hot Gas Bypass Relay Circuit B
	↓	*MMA X	Motormaster® A Output Percent
	↓	*MMB X	Motormaster B Output Percent

TEST

To use Test function, LOCAL/STOP/CCN switch must be in STOP position. To operate a test, scroll to desired test
Then, press to start test Press to stop test.

SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
1 OUTPUTS	1 TEST	OUTPUTS	Test Outputs
	↓	8.8.8.8.8.8.8	Display Check
	↓	ALMR X	Energize Alarm Relay K3
	↓	FRA1 X	Energize Fan Relay A1 K1
	↓	FRA2 X	Energize Fan Relay A2 K2
	↓	FRB1 X	Energize Fan Relay B1 K4
	↓	FRB2 X	Energize Fan Relay B2 K5
	↓	*CHWP X	Energize Cooler Water Pump K6
	↓	EXVA X	Enter Desired EXVA Position
	↓	EXVB X	Enter Desired EXVB Position
	↓	*HGBRA X	Energize Hot Gas Bypass Relay A
	↓	*HGBRB X	Energize Hot Gas Bypass Relay B
	↓	*MMA X	Enter Desired Motormaster® A Output Signal
	↓	*MMB X	Enter Desired Motormaster B Output Signal

Table 8 – Keyboard Directory (cont)

TEST (cont)

⚠ WARNING

During compressor test, compressors start and run for 10 seconds. Compressor service valves and liquid line valves must be open. Energize crankcase heaters 24 hours prior to performing compressor tests.

SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
2 COMPRESSORS	2 TEST	COMP	Compressor and Unloader Test
	↓	CPA1 X	Test Comp A1
	↓	*CPA2 X	Test Comp A2
	↓	*CPA3 X	Test Comp A3
	↓	*CPA4 X	Test Comp A4
	↓	CPB1 X	Test Comp B1
	↓	*CPB2 X	Test Comp B2
	↓	*CPB3 X	Test Comp B3
	↓	*CPB4 X	Test Comp B4
	↓	*ULA1 X	Energize Unloader A1
	↓	*ULA2 X	Energize Unloader A2
	↓	*ULB1 X	Energize Unloader B1
	↓	*ULB2 X	Energize Unloader B2

SCHEDULE

The Schedule function key **SCHD** is used to configure the unit's occupancy schedule. The clock select subfunction can be used for Unoccupied shutdown or Unoccupied setback depending on the cooling set point control configuration. The Schedule function described is for clock 1, which is the internal clock. Password required for all subfunctions except override.

SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
1 OVERRIDE	1 SCHD	OVRD X	Number of Override Hrs (0 - 4 Hrs)
	Example, to extend current Occupied mode for 3 hrs, press:	.	
	3 ENTR	OVRD 3	Extended Occupied Time
2 CLOCK SELECT	2 SCHD	CLOCK XX	Type of Clock Control 0 = No Clock, 1 = Clock 1 (Internal)

Table 8 – Keyboard Directory (cont)

SCHEDULE (cont)			
SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
3 PERIOD 1	3 SCHD	PERIOD 1	Period 1 Time Schedule
Yes = Schedule Operational for that day	↓	OCC HH.MM	Occupied Time
	↓	UNO HH.MM	Unoccupied Time
	↓	MON X	Monday Flag
	↓	TUE X	Tuesday Flag
	↓	WED X	Wednesday Flag
	↓	THU X	Thursday Flag
	↓	FRI X	Friday Flag
	↓	SAT X	Saturday Flag
	↓	SUN X	Sunday Flag
	↓	HOL X	Holiday Flag

To toggle between inputs (Yes/No) Press:

4 PERIOD 2	4 SCHD	PERIOD 2	Period 2 Time Schedule
10 PERIOD 8	10 SCHD	PERIOD 8	Period 8 Time Schedule
11 HOLIDAYS	11 SCHD	HOLIDAYS	Define Calendar Holidays
New = Unassigned Holiday Date	↓	DAT MM DD	Holiday Date 1
	↓		
	↓		
	↓	DAT MM.DD.NN	Holiday Date 30

Example: To enter July 4th holiday press: 07.04.01 Display shows Jul 04 For further information on the Schedule function and its operation refer to Schedule Function section in this guide.

SERVICE

To view and modify configurations, the password must be entered under the log on subfunction.

SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
1 LOG ON	1 SRVC	LOG ON	Enter Password/Disable Password Protection
	1 1 1 1 ENTR	LOGGEDON	Logged On
2 VERSION	↓	LOG OFF	Disable Password Protection
	ENTR	EXIT LOG	Logged Off/Enable Password Protection
	2 SRVC	VERSION	Software Information
	↓	XXXXXXXX	Version No. of Software (CESRXX)
	↓	X	Language Options

At this time configurations may be modified. When finished viewing and/or modifying configurations, log out as follows:

Table 8 – Keyboard Directory (cont)

SERVICE (cont)

The next 3 subfunctions provide the ability to modify configurations. Refer to separate Installation, Start-Up, and Service Instructions supplied with unit for further information on changing configurations

To change a configuration enter the new configuration and press **ENTR** while on the correct configuration

SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
3 FACTORY CFG	3 	FACT CFG	Factory Configuration Codes
		X	Configuration Code 1
		X	Configuration Code 2
		X	Configuration Code 3
		X	Configuration Code 4
		X	Configuration Code 5
		X	Configuration Code 6
4 FIELD CFG	4 	FLD CFG	Adjustable Field Configuration
		ENO X	CCN Element Address
		BUS X	CCN Bus Number
		BAUD X	CCN Baud Rate
		FLUID X	Cooler Fluid Select
		UNITS X	Display Unit Select
		LANG X	Display Language Select
		NULA X	No. Circuit A Unloaders
		NULB X	No. Circuit B Unloader
		HGB X	Hot Gas Bypass Select
		SEQT X	Loading Sequence Select
		SEQF X	Lead/Lag Sequence Select
		OPS X	Oil Pressure Switch Select
		HEADT X	Head Pressure Control Type
		HEADM X	Head Pressure Control Method
		MM X	Motormaster® Select
		CSPTYP X	Cooling Set Point Control Select
		CRTYP X	Cooling Reset Control Select
		ERTYP X	External Reset Sensor Select
		LSTYP X	Demand Limit Control Select
		RAMP X	Ramp Load Select
	LOCK X	Cooler Pump Interlock Select	
	CPC X	Cooler Pump Control Select	
5 SERVICE CFG	5 	SRV CFG	Service Configurations
		X	Configuration Code 7
		X	Configuration Code 8
		REFRIG X	Refrigerant
		TDTYP X	Pressure Transducer Select
		OPS X	Oil Transducer Set Point
		LPS X	Low Pressure Set Point
		FANTYP X	Fan Staging Select
		SH X	EXV Superheat Set Point
		MOP X	EXV MOP Set Point

HISTORY			
SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
1 RUN TIME	1 HIST	RUN TIME	Run Time Information
	↓	HR X	Total Hrs Unit Has a Comp Operating
	↓	HRA X	Cir A Run Time
	↓	HRB X	Cir B Run Time
2 STARTS	2 HIST	STARTS	Starts Information
	↓	CY X	Cycles from Stage 0 to Stage 1
	↓	CYA X	Cir A Starts
	↓	CYB X	Cir B Starts
3 ALARM HISTORY	3 HIST	ALRMHIST	Last 5 Alarms
	↓	ALARM X	} Alarm Description
	↓	ALARM X	
	↓	ALARM X	
	↓	ALARM X	
	↓	ALARM X	

SET POINT

To read a set point go to proper subfunction and read desired set point. To change a set point, enter new set point value, then press . LOCAL/STOP/CCN switch must be in LOCAL or STOP position.

SUBFUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
1 SET POINTS	1 SET	SET POINT	Unit Set Point
	↓	CSP1 X	Chiller Fluid Set Point 1
	↓	CSP2 X	Chiller Fluid Set Point 2
	↓	HSPA X	Head Pressure Set Point Circuit A
	↓	HSPB X	Head Pressure Set Point Circuit B
	↓	CRAMP X	Pulldown Limit
2 RESET SET POINTS	2 SET	RESET	Reset Set Points
	↓	*CRST2 X	Cooling Max Reset
	↓	*CREF2 X	Max Reset Occurs at X mA or Degree
	↓	*CRST1 X	Cooling Min Reset
	↓	*CREF1 X	Min Reset Occurs at X mA or Degree
3 DEMAND SET POINTS	3 SET	DEMAND	Demand Set Points
	↓	*DLS1 X	Demand Switch 1 Set Point
	↓	*DLS2 X	Demand Switch 2 Set Point
	↓	*DMAX X	4-20 mA Max Demand Limit
	↓	*RMAX X	Max Demand Limit Occurs at X mA
	↓	*DMIN X	4-20 mA Min Demand Limit
	↓	*RMIN X	Min Demand Limit Occurs at X mA
	↓	*SHED X	CCN Loadshed Amount
4 DATE AND TIME	4 SET	DATE.TIME	Date, Time and Day of Week
	↓	DAY.HR.MIN	Day 1 = Mon, 2 = Tues. 7 = Sun Hours are displayed in 24-hr time. Decimal point serves as colon.
	↓	MM DD YR	Month Day Year. When entering date enter a decimal point between entries Each entry must be two numbers.

STATUS FUNCTION — This function shows the rotating display, current status of alarm (diagnostic) codes, capacity stages, operating modes, chilled water set point, all measured system temperatures and pressures, superheat values, pressure switch positions, analog inputs, switch inputs. These subfunctions are defined on pages 24 and 25.

1 **STAT** (Rotating Display)

2 **STAT** (Alarms) — Alarms are messages that one or more faults have been detected. Each fault is assigned a code number which is reported with the alarm. See Table 9 for code definitions. The codes indicate failures that cause the unit to shut down, terminate an option (such as reset) or result in the use of a default value as set point.

Up to 5 alarm codes can be stored at once. To view them in sequence, press **2** **STAT** to enter the alarm displays and then press **↓** to move to the individual alarm displays. Press **EXPN** after a code has been displayed. The meaning of the code scrolls across the screen. See Example 1.

Example 1 — Reading Alarm Codes

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
	TUE 12:45 MODE 26 0 STAGES 2 ALARMS	Keyboard has not been used for at least 10 minutes. Alternating summary display appears on screen
2 STAT	2 ALARMS	2 alarms detected
↓	ALARM 9	First alarm code
EXPN	COOLER LEAVING FLUID THERMISTOR FAILURE	Explanation of alarm code
↓	ALARM 42	Second alarm code Cooler freeze protection
EXPN	COOLER FREEZE PROTECTION	Explanation of alarm code

When a diagnostic (alarm) code is stored in the display and the machine automatically resets, the code is deleted. Codes for safeties which do not automatically reset are not deleted until the problem is corrected and the machine is switched to STOP, then back to LOCAL or CCN.

3 **STAT** (Modes) — The operating mode codes are displayed to indicate the operating status of the unit at a given time. See Table 9.

Table 9 — Operational and Mode Display Codes

The operating modes are displayed by name or code number, to indicate the operating status of the unit at a given time. The modes are:

CODE	DESCRIPTION
LOCAL # OFF	Unit is off. LOCAL/STOP/CCN switch is in OFF position, or LOCAL/STOP/CCN switch may be in LOCAL position with external ON/OFF switch in OFF position.
CCN OFF	Unit is off due to CCN network command. LOCAL/STOP/CCN switch is in CCN position.
CLOCK # OFF	Unit is off due to internal clock schedule. LOCAL/STOP/CCN switch is in LOCAL position.
LOCAL ON	Unit is on. LOCAL/STOP/CCN switch is in LOCAL position. If external ON/OFF switch is used, it will be in ON position.
CCN ON	Unit is on due to CCN command. LOCAL/STOP/CCN switch is in CCN position.
CLOCK ON	Unit is on due to internal clock schedule or Occupied override function. LOCAL/STOP/CCN switch is in LOCAL position.
MODE 7	Dual set point is in effect. In this mode, unit continues to run in Unoccupied condition, but leaving water set point is automatically increased to a higher level (CSP2 set point is in SET function).
MODE 8	Temperature reset is in effect. In this mode, unit is using temperature reset to adjust leaving water set point upward, and unit is currently controlling to the modified set point. The set point can be modified based on return water, outside air temperature or space temperature.
MODE 9	Demand Limit is in effect. This indicates that capacity of unit is being limited by Demand Limit control option. Because of this limitation, unit may not be able to produce the desired leaving water temperature.
MODE 10	Load limit is in effect. This indicates that capacity of a system of units is being limited by a CCN Load-shed command. Due to this limitation, unit may not be able to produce the desired leaving water temperature.
MODE 11	Not applicable
MODE 12	Ramp load (pulldown) limiting is in effect. In this mode, the rate at which leaving water temperature is dropped is limited to a predetermined value to prevent compressor overloading. See CRAMP set point in the SET function. The pulldown limit can be modified, if desired, to any rate from .2°F to 2°F (1° to 1°C)/minute.
MODE 13	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 or CCN control. Override expires after each use.
MODE 14	Low cooler suction protection is in effect. In this mode, unit capacity is reduced if cooler saturated suction temperature is 20 F (11 C) degrees or more below leaving water temperature, and leaving water temperature is less than 32 F (0°C). If these conditions persist beyond ten minutes, circuit is shut down and fault code 44 or 45 is displayed.

To enter the MODES subfunction, depress **3** **STAT** and use the **↓** key to determine if more than one mode applies. See Example 2 to read current mode with expansion.

Example 2 – Reading Current Operating Modes

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
	TUE 15:45 LOCAL ON COOL 1 0 ALARMS	Keyboard has not been used for at least 10 minutes. Rotating summary display appears on screen
3 STAT	2 MODES	There are 2 modes currently in effect
↓	LOCAL ON	Unit is on by remote on/off switch
↓	MODE 8	Temperature reset is in effect

4 **STAT** (Stages) — This subfunction displays the capacity stage number, from 1 to 23. See Table 3 for compressor loading sequence. To enter the STAGES subfunction, depress **4** **STAT** and use the **↓** to display the stage number. Additional **↓** provides the following information:

- Percent of total unit capacity being utilized.
- Percent of each circuit capacity being utilized.
- Demand limit set point in effect (can be any value between 0% and 100%).
- Load limit set point in effect. This is a CCN function for controlling operation of multiple units between 0% and 100% of total capacity of all units combined.
- Status of each compressor relay. When a compressor is on, the number of that compressor is displayed. If a compressor is off, a 0 is displayed. Example: In a given circuit, if compressors 1 and 3 are running, and 2 and 4 are not running, 1030 is displayed for that circuit.
- Load/Unload factor for compressors. This factor is an indication of when a step of capacity is added or subtracted. Its value can range from slightly less than -1.0 to slightly more than +1.0. When load/unload factor reaches +1.0, a compressor is added. When the load/unload factor reaches -1.0, a compressor is subtracted. If compressor unloaders are used, at -.6 a compressor is unloaded and at +.6, a compressor is loaded up.

5 **STAT** (Set Point) — This subfunction displays leaving water temperature and leaving chilled water set point. If unit is programmed for dual set point, the chilled water set point currently in effect (either Occupied or Unoccupied) is displayed. If reset is in effect, the unit operates to the modified chilled water set point. This means the leaving water temperature may not equal the chilled water set point. The modified chilled water set point can also be displayed in the Status function. To enter the set point subfunction, depress **5** **STAT** and use the **↓** to display modified leaving chilled water set point followed by leaving water set point and actual cooler leaving fluid temperature.

6 **STAT** (Temperature) — The temperature subfunction displays the readings at temperature sensing thermistors. To read a temperature, enter **6** **STAT**, then scroll to desired temperature using the **↓** key. See Keyboard Directory for the order of readouts.

7 **STAT** (Pressure) — This subfunction displays suction, discharge and net oil pressure at lead compressor of each circuit of 30GT units.

8 **STAT** (Analog Inputs) — This subfunction displays analog inputs, if any. Enter **8** **STAT**, then use the **↓**. The transducer supply voltage, 4-20 mA reset signal can be displayed. This is useful for problem diagnosis as preliminary to the Test function.

9 **STAT** (Switch Inputs) — This subfunction displays status (ON/OFF) of input switch where applicable. Status of dual set point switch, and demand limit switch 1 and 2 can be displayed. This is useful for problem diagnosis as preliminary to the Test Function

10 **STAT** This function displays ON/OFF status of alarm relay, all fan relays and chilled water pump relay. It also displays ON/OFF status of compressor unloaders (if used). The position of each EXV (in percent open) can be displayed.

TEST FUNCTION — The Test function operates the diagnostic program. To initiate Test function, the LOCAL/STOP/CCN switch must be in STOP position. When Test function is initiated, the local alarm light is on.

To reach a particular test, enter its subfunction number, then scroll to desired test with the **↓** key. A test is started by pressing **ENTR**. A test is terminated by pressing the **↓** or **↑** or **ENTR**. Pressing the **↓** key after a test has started advances system to next test, whether current test is operating or has timed out. Once in the next step, you may start test by pressing **ENTR** or advance past it by pressing **↓**.

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

Keyboard entry **1** **TEST** allows the operator to make the following checks by using **↓**:

- LID display check. Proper display is 8.8.8.8.8.8.8.8.
- Operation of remote alarm.
- Operation of condenser fans.
- Operation of chilled water pump.
- Operation of EXV's. To drive EXV fully open, enter **1** **0** **0** (100% open). To drive EXV fully closed, enter **•** (0% open).

Keyboard entry **2** **TEST** accesses the compressor and compressor unloader operational tests.

⚠ WARNING

During compressor operational tests, compressor starts and runs for 10 seconds. Compressor service valves and liquid line valves must be open. Energize crankcase heaters 24 hours prior to performing compressor tests.

Since Test function checks only certain outputs, it is good practice to also check all inputs and outputs accessible through the Status function. These are located at **8** **STAT**, **9** **STAT**, and **10** **STAT** (see Keyboard Directory). If keyboard is not used for 10 minutes, unit automatically leaves Test function and resumes rotating display. See Example 3.

Example 3 – Using Test Function

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
2 TEST	COMP	Factory/field test of compressors subfunction of test function
↓	CPA 1 OFF	Circuit A, Compressor 1A test
ENTR	CPA 1 ON	Pressing ENTR starts the test: when the compressor should be running the display shows CPA 1 on
	CPA 1 OFF	If the test is allowed to time out (10 seconds) the display will show CPA1 Off
↓	CPA 2 OFF	Pressing the down arrow key advances the system to Circuit A, compressor 2 test

NOTE: Once a compressor has been run using the **TEST** function, it is not allowed to run again for 30 seconds

HISTORY FUNCTION — Keystrokes **1** **HIST** and subsequent **↓** keystrokes display total unit run time and total run time for each circuit.

Keystrokes **2** **HIST** and subsequent **↓** keystrokes display total unit starts and the total starts for each circuit. Keystrokes **3** **HIST** and subsequent **↓** keystrokes display the last five alarms along with a description of each alarm.

SET POINT FUNCTION — Set points are entered through the keyboard. Set points can be changed within the upper and lower limits, which are fixed. The ranges are listed below.

Chilled Water Set Point

Water:

38 to 70 F (3.3 to 21 C)

Brine:

15 to 70 F (–9.4 to 21 C)

Pulldown Set Point

0.2 to 2.0 degrees F (.11 to 1.1 degrees C)/min

Reset Set Points

Maximum Reset Range:

0 to 20 degrees F (0 to 11 degrees C)

Maximum Reset Reference Range:

Return Fluid Reset 0 to 20 degrees F
(0 to 11 degrees C)

External Temperature Reset 20 to 125 degrees F
(11 to 69 degrees C)

External Signal Reset 4 to 20 mA

Minimum Reset Reference Range:

Return Fluid Reset 0 to 20 degrees F
(0 to 11 degrees C)

External Temperature Reset 20 to 125 degrees F
(11 to 69 degrees 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

Set points are grouped in subfunctions as follows:

- 1** **SET** Displays chiller water, and cooling ramp set points.
 - The first value shown is the Occupied chilled water set point.
 - The next value displayed depends on how the Schedule function has been programmed. (See pages 32-34.) If dual set point has been selected, the next set point after **↓** has been pressed is the Unoccupied chilled water set point. If single set point or inactive schedule has been selected in the Schedule function, then when **↓** is depressed the display shows the modified chilled water set point.
 - The final value displayed when the **↓** is depressed is the cooling ramp loading rate. This is the maximum rate at which the leaving chilled water is allowed to drop, and can be field set from 0.2 to 2.0 degrees F (.11 to 1.1 degrees C)/minute. This value is not displayed unless the function is enabled (see Adjustable Field Configurations page 32).

Reading and Changing Set Points — Example 4 shows how to read and change the chilled water set point. Other set points can be changed by following the same procedure. Refer to Keyboard Directory for the sequence of display of set points in each subfunction.

Example 4 – Reading and Changing Chilled Water Set Point

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
1 SET	SET POINT	System set points
↓	CSP1 44.0	Present Occupied chilled water set point is 44.0 F
4 2 ENTR	CSP1 42.0	Key in 42 and press the ENTR key. Display shows new Occupied chilled water set point is 42.0 F
↓	CSP2 44.0	Present Unoccupied chilled water set point is 44.0 F
5 0 ENTR	CSP2 50.0	Key in 50 and press the ENTR key. Display shows new Unoccupied chilled water set point is 50.0 F
2 SET	RESET	Displays the maximum reset and minimum reset set points. The minimum and maximum reference reset set points can also be displayed. These set points are not accessible when reset type has been configured for NONE in the Service function

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

Under normal operation, the chiller maintains a constant leaving water temperature approximately equal to chilled water set point. As building load drops from 100% down to 0%, entering cooler water temperature drops in proportion to load. Thus, temperature drop across the cooler drops from a typical 10 degrees F (5.5 degrees C) at full load to a theoretical 0 degrees F (–18 degrees C) at no load. See Fig. 2.

At partial load, leaving chilled water 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, as shown in Fig. 2. This is a simple linear function that requires four pieces of input data for the Set function:

1. **Maximum Reset Amount (CRST2)** — allowable range 0 to 20 degrees F (0 to 11 degrees C). This is maximum amount leaving chilled water set point is to be increased.
2. **Maximum Reset Reference (CREF2)** — allowable range 0 to 20 degrees F (0 to 11 degrees C). This is the cooler temperature drop at which reset reaches its maximum value.
3. **Minimum Reset Amount (CRST1)** — allowable range 0 to 20 degrees F (0 to 11 degrees C). This is minimum amount leaving chilled water set point is to be increased when reset is initiated.
4. **Minimum Reset Reference (CREF1)** — allowable range 0 to 20 degrees F (0 to 11 degrees C). This is the cooler temperature drop at which reset is at its minimum value. (Reset begins here.)

NOTE: Reset set points are not accessible unless the reset function is enabled first. This is done as a field configuration. Select one of the three choices for type of reset: Return Fluid Reset, External Temperature Reset, or 4-20 mA External Signal Reset.

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

Example 5 demonstrates how to activate reset. Assume that reset is to be based on return water temperature, the desired reset range is to be 2 to 10 degrees F (1 to 5.5 degrees C) and full load is a 10-degree F (5.5-degree C) drop across the cooler. See Fig. 2.

Activating reset based on external temperature or 4-20 mA signal is done the same way, except the reference set point range is 20 to 125 degrees F (11 to 69 degrees C), or 4 to 20 mA depending on which method was selected at the field configuration step.

Example 5 — Using Return Water Temperature Reset

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
4 [SRVC]	FLD CFG	Field configuration subfunction of Service function
↓	CSPTYP X	Scroll past single/dual
↓	CRTYP 0	Display shows no reset type has been selected
1 [ENTR]	CRTYP 1	Return water temperature is selected and activated
1 [SET]	SET POINT	System set points
↓	CPS1 44.0	Present Occupied chilled water set point
4 5 . 6 [ENTR]	CPS1 45.6	Enter new chilled water set point
2 [SET]	RESET	Reset set points
↓	CRST2 0.0	Cooling maximum reset is 0 degrees F
1 0 [ENTR]	CRST2 10.0	Cooling maximum reset is 10 degrees F
↓	CREF2 0.0	Cooling maximum reset reference is 0 degrees F
1 [ENTR]	CREF2 1.0	Cooling maximum reset reference is 1 degree F
↓	CRST1 0.0	Cooling minimum reset is 0 degrees F
2 [ENTR]	CRST1 2.0	Cooling minimum reset is 2 degrees F
↓	CREF1 0.0	Cooling minimum reset reference is 0 degrees F
8 [ENTR]	CREF1 8.0	Cooling minimum reset reference is 8 degrees F

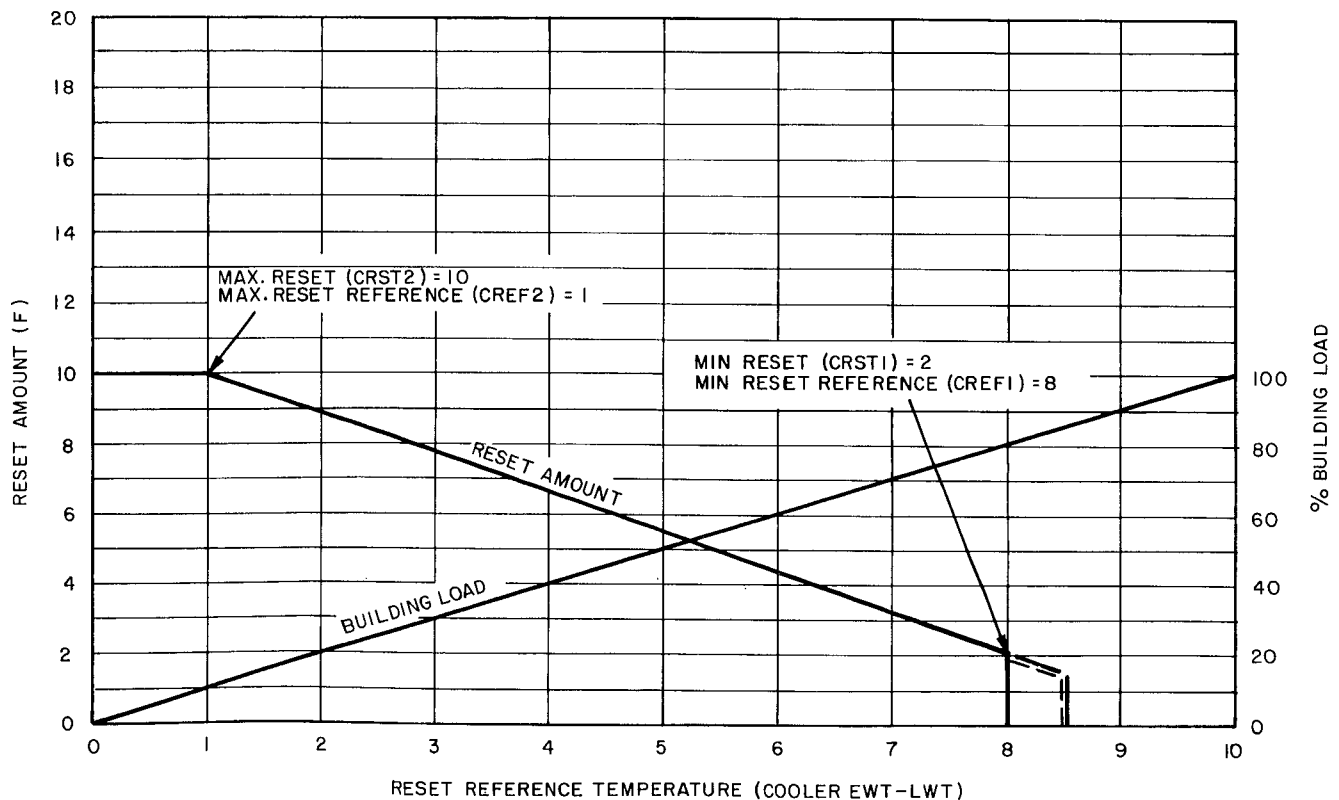


Fig. 2 — Cooling Return Water Reset

Temperature Reset Based on External Temperature — If desired, temperature reset can be based on an external temperature, such as space or outdoor air temperature. This requires a thermistor (T10, Part No. 30GB660002) located in the space or outside air and wired to terminals as follows:

30GB040-060 — Terminals 1 and 2 of TB3

30GB070 — Terminals 1 and 2 of TB5

30GB075-200 — Terminals 4 and 5 of TB8

30GB225-280 — Terminals 5 and 6 of TB11

At the field configuration step, select external temperature reset by entering **2** when CRTYP 0 appears. Then enter set points as described previously in Example 5. See Fig. 3.

Temperature Reset Based on 4-20 mA Signal — If desired, temperature reset can be based on a 4-20 mA signal. For proper connections, refer to Field Wiring section in this guide.

At the field configuration step, select 4-20 mA reset by entering **3** when CRTYP 0 appears. Then enter set points as described previously in example 5. See Fig. 4.

Example 6 — Changing Reset Type

To change type of reset, first log on as shown in Table 10 and Example 6 below. Also refer to Set Point Function section, page 26, for information on entering reset set points using reset feature.

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	FLD CFG	Field configuration subfunction of Service function
↓	CSPTYP 0	Scroll past single cooling set point
↓	CRTYP 0	No reset has been selected
1 ENTR	CRTYP 1	Return water temperature reset is selected and activated
2 ENTR	CRTYP 2	Reset type is changed to space or outside air temperature reset and activated
3 ENTR	CRTYP 3	Reset type is changed to 4-20 mA Signal Reset and activated
. ENTR	CRTYP 0	Reset is deactivated

Demand Limit, 2-Stage Switch Control — This control has been designed to accept demand limit signals from a building load shedding control. The Demand Limit function provides for 2 capacity steps. The keyboard is used to set the 2 demand limit set points, which range from 100 to 0% of capacity. Capacity steps are controlled by 2 field-supplied relay contacts connected to the designated chiller terminals. See Field Wiring section.

To use Demand Limit, first enable Loadshed, then enter demand limit set points. See Example 7. Closing the first stage demand limit contact puts unit on the first demand limit level, that is, the unit does not exceed the percentage

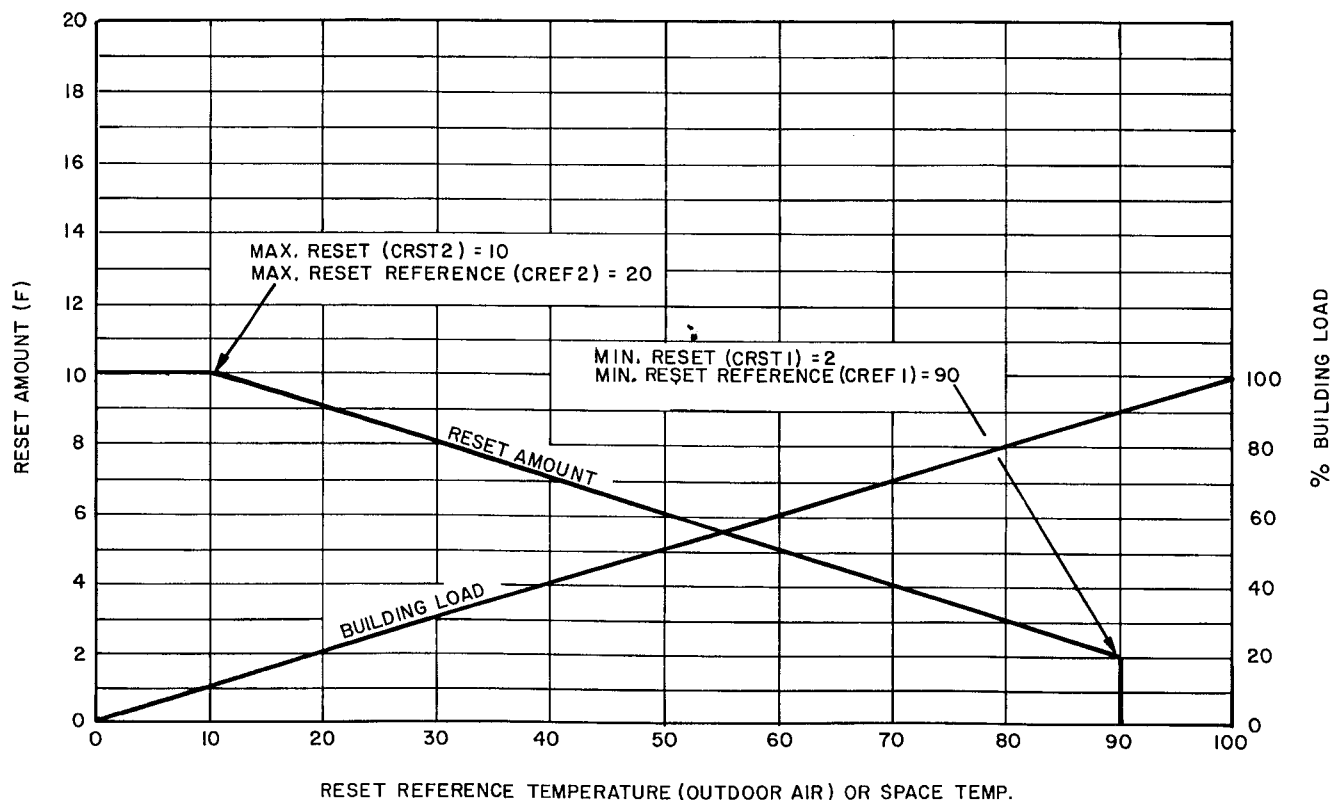


Fig. 3 — Cooling External Temperature Reset

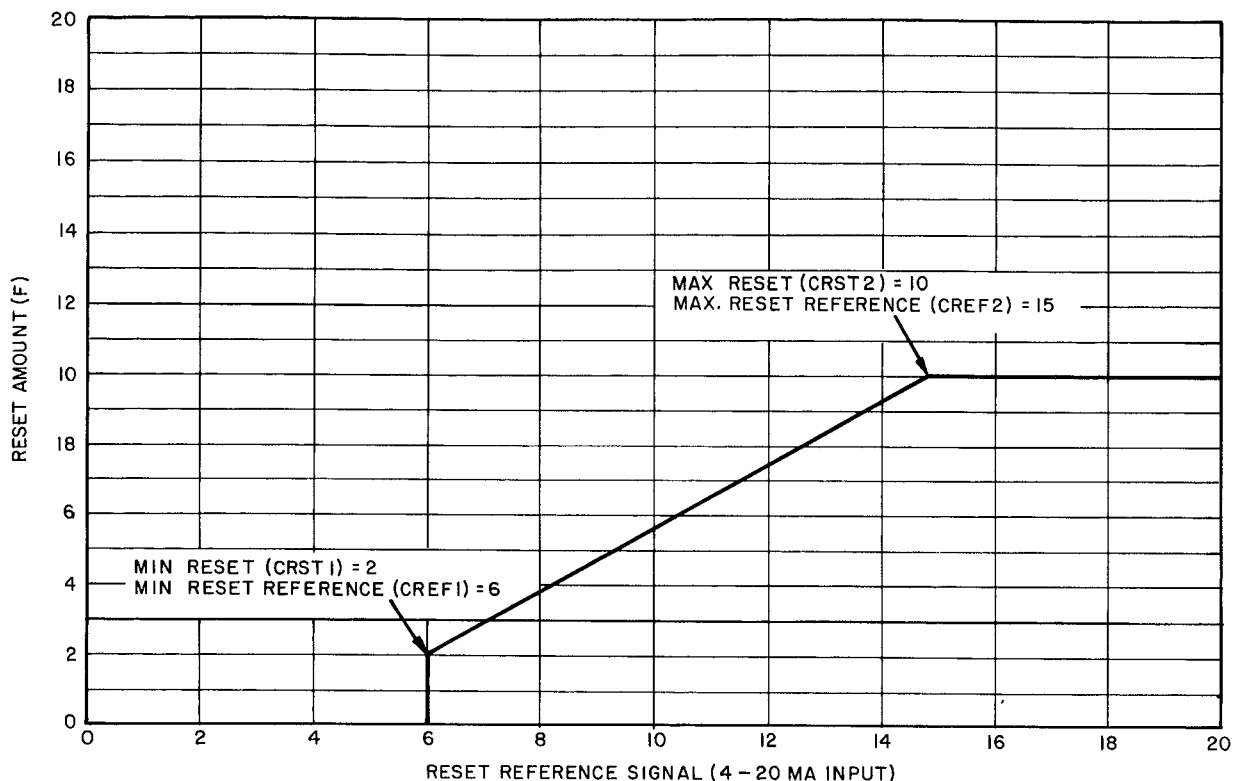


Fig. 4 — 4-20 mA Cooling Temperature Reset

of capacity entered as demand limit stage 1. Closing contacts on second-stage demand limit relay prevents unit from exceeding capacity entered as demand limit stage 2. The demand limit stage that is set to the lowest demand takes priority if both demand limit inputs are closed.

The Demand Limit function must be enabled in order to function and may be turned off when its operation is not desired. The demand limit relays can, in off condition, remain connected without affecting machine operation.

Example 7 — Using Demand Limit (First Log On as Shown in Table 10)

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	FLD CFG	Field configuration subfunction of Service function
↓	ERTYP 0	Scroll past other elements in the subfunction
↓	LSTYP 0	Loadshed is not enabled
1 ENTR	LSTYP 1	Loadshed is now enabled for 2-stage switch control
3 SET	DEMAND	Demand Limit set points subfunction of Set Point function
↓	DLS1 100	Loadshed 1 currently set at 100%
6 0 ENTR	DLS1 60	Loadshed 1 reset to 60%
↓	DLS2 100	Loadshed 2 currently set at 100%
4 0 ENTR	DLS2 40	Loadshed 2 reset to 40%

To Disable Demand Limit:

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	FLD CFG	Field configuration subfunction of Service function
↓	ERTYP 0	Scroll past other elements in the subfunction
↓	LSTYP 1	Loadshed is enabled for 2-stage switch control
• ENTR	LSTYP 0	Loadshed is now disabled

NOTE: Select 3 for CCN load limiting.
Select 4 for CCN demand limiting.

Demand Limit, 4-20 mA Signal — The controls can also accept a 4-20 mA signal for load shedding. Input for the signal are terminals 3 and 4 of TB10 on 30GB and terminals 3 and 4 of TB7 on 30GT. At field configuration step, select 4-20 mA loadshed by entering **2** when the LSTYP 0 display appears. See Example 7A. Then enter set points as follows. In this example, set points are coordinates of the demand limit curve shown in Fig. 5.

**Example 7A — Using Demand Limit (4-20 mA)
(First Log On As Shown in Table 10)**

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
[4] [SRVC]	FLD CFG	Field configuration subfunction of Service function
[↓]	ERTYP 0	Scroll past other elements in the subfunction
[↓]	LSTYP 0	Loadshed is not enabled
[1] [ENTR]	LSTYP 2	Loadshed is now enabled for 4-20 mA signal control
[3] [SET]	DEMAND	Demand Limit set points
[↓]	DMAX 100	Maximum Demand Limit is 100%
[9] [0] [ENTR]	DMAX 90	Maximum Demand Limit is 90%
[↓]	RMAX 20	Maximum Demand Limit reference is 20 mA
[1] [5] [ENTR]	RMAX 15	Maximum Demand Limit reference is 15 mA
[↓]	DMIN 0	Minimum Demand Limit is 0%
[2] [0] [ENTR]	DMIN 20	Minimum Demand Limit is 20%
[↓]	RMIN 4	Minimum Demand Limit reference is 4 mA
[6] [ENTR]	RMIN 6	Minimum Demand Limit reference is 6 mA

Reading and Changing Time Display — Time is entered and displayed in 24-hour time. The day of the week is entered as a number.

1 = Mon, 2 = Tue, 7 = Sun, etc.

[.] Key is used as the colon when entering time. See Example 8.

Example 8 — Setting Time of Day and Day of Week

KEYBOARD ENTRY	DISPLAY RESPONSE	COMMENTS
[4] [SET]	TIME	Time display subfunction of Set Point Function
[↓]	MON 16 00	Current setting is Monday, 4:00 p m
[2] [.] [1] [3] [.] [0] [5] [ENTR]	TUE 13 05	New setting of Tuesday, 1:05 p m is entered and displayed
[↓]	JAN 01 90	Current date is Jan 1, 1990
[4] [.] [1] [5] [.] [9] [0] [ENTR]	APR 15 90	New setting April 15, 1990 is entered and displayed

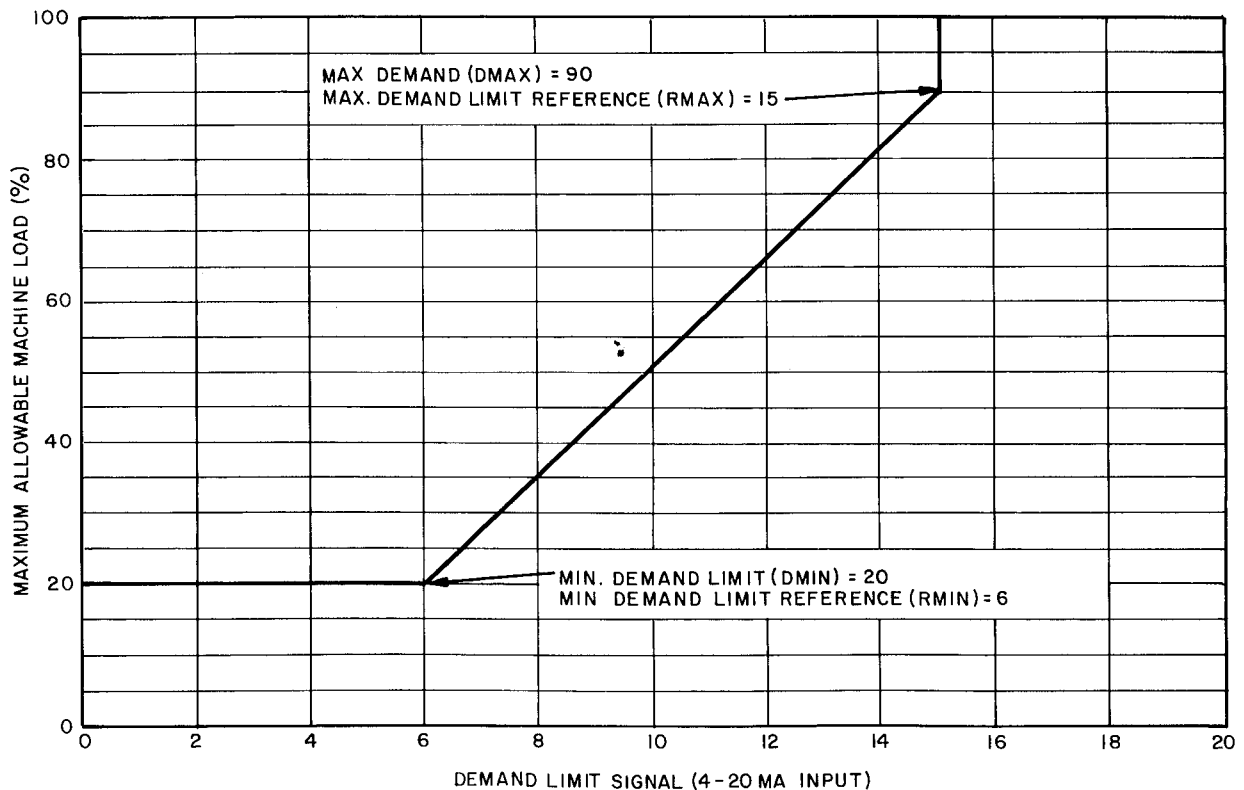


Fig. 5 — 4-20 mA Demand Limiting

SERVICE FUNCTION — This function allows the technician to view, as well as input configuration data. Factory configuration data, field configuration data and service configuration data may be viewed or entered through the keyboard and display module. See the Keyboard Directory (Table 8) 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.

Logging On/Logging Off — The Service function is password protected. Therefore, to gain entry to this function, this password must be entered. allows the technician to view, change or enter configuration codes. To log off, perform the following keystrokes: . The Service function is again password protected.

Software Information — displays the version number of the software that resides in the Processor Module. A second displays the language options that are available in the field configuration group.

The and subfunctions are summarized in Table 10.

Table 10 — Service Function

To view and modify configurations, the password must be entered under the log on subfunction.

SUB-FUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENT
1 Log On	1 SRVC	PASSWORD	Enter Password/ Disable Password
	1 1 1 1 ENTR	LOGGED ON	Logged On

NOTE: At this time configurations may be modified. When finished viewing and/or modifying configurations, log out as follows:

2 Version	1 SRVC	LOGGED ON	
	↓	LOG OFF	Disable Password Protection
	ENTR	EXIT LOG	Logged Off/ Enable Password Protection
	2 SRVC	VERSION	Software Information
	↓	XXXXXXXX	Version No. of Software
	↓	X	Language Options

Factory Configuration Codes — allows entry into the factory configuration subfunction. Under this subfunction, there are six groups of configuration codes that are downloaded at factory. Each group is made up of eight digits. If Processor Module is replaced in the field, these six groups of configuration codes must be entered through the keyboard and display module. Factory configuration codes (groups 1 through 6) that apply to the particular 30GB or 30GT Flotron™ II chiller being serviced are found on a label located inside the control box cover. See Table 11 for a summary of factory configuration subfunction keystrokes.

Table 11 — Factory Configuration Keystrokes

To change a configuration enter the new configuration and press while on the correct configuration.

SUB-FUNCTION	KEYBOARD ENTRY	DISPLAY	COMMENTS
3 FACTORY CFG	3 SRVC	FACT CFG	FACTORY CONFIGURATION CODES
	↓	XXXXXXXX	Configuration Code 1
	↓	XXXXXXXX	Configuration Code 2
	↓	XXXXXXXX	Configuration Code 3
	↓	XXXXXXXX	Configuration Code 4
	↓	XXXXXXXX	Configuration Code 5
5 SERVICE CFG	5 SRVC	SRV CFG	SERVICE CONFIGURATION CODES
	↓	XXXXXXXX	Configuration Code 6
	↓	XXXXXXXX	Configuration Code 7
	↓	XXXXXXXX	Configuration Code 8

Table 12 — Adjustable Field Configurations

FIELD CONFIGURATION ITEM AND CODES	FACTORY CONFIGURATION CODE	SERVICE REPLACEMENT CODE
CCN element address (entered by CCN Technician)	001	001
CCN Buss Number (Entered by CCN Technician)	000	000
CCN Baud Rate (Entered by CCN Technician)	9600	9600
Cooler Fluid Select 1 = Water (38 to 70 F [3.3 to 21 C] Set Point) 2 = Medium Brine (15 to 70 F [-9 to 21 C] Set Point)	1 = Standard Models 2 = Brine Models	1
Display Unit Select 0 = English 1 = Metric SI	0	0
Display Language Select 1 = English	1	1
No. Circuit A Unloaders 0 = No Unloaders 1 = One Unloader 2 = Two Unloaders	0 = 30GB090-200; 30GT225-280 1 = 30GB040-080	0
No. Circuit B Unloaders 0 = No Unloaders 1 = One Unloader 2 = Two Unloaders	0	0
Hot Gas Bypass Select 0 = No Valve	0	0
Loading Sequence Select 1 = Equal Circuit Loading 2 = Staged Circuit Loading	1	1
Lead/Lag Sequence Select 1 = Automatic	1	1
Oil Pressure Switch Select 0 = Not Used 1 = Used	0 = 30GT225-280 1 = 30GB040-200	0
Head Pressure Control Type 0 = Not Used 1 = Air Cooled	1	0
Head Pressure Control Method 1 = EXV Controlled	1	1
Motormaster® Select 0 = None (Staged Fans Only) 2 = Motormaster (1 Phase) With Indirect Control	0 = Standard Models 2 = Brine Models	0
Cooling Set Point Control Select 0 = Single Set Point Control 1 = External Switch Controlled Set Point 2 = Clock Controlled Set Point	0	0
Cooling Reset Control Select 0 = No Reset 1 = Return Fluid Reset 2 = External Temperature Reset 3 = 4-20 mA Controlled Reset	0	0
External Reset Sensor Select 0 = Thermistor Connected to Options Module 1 = Obtained Through CCN	0	0
Demand Limit Control Select 0 = No Demand Limiting 1 = Two External Switch Inputs 2 = External 4-20 mA Input 3 = CCN Load Limiting (Multi-Unit) 4 = CCN Loadshed Interface	0	0
Ramp Load Select (Pulldown Control) 0 = Disabled 1 = Enabled	1	0
Cooler Pump Interlock Select 0 = No Interlock 1 = With Interlock	1	0
Cooler Pump Control Select 0 = Not Controlled 1 = ON/OFF Controlled	1	0

Adjustable Field Configurations — After logging on, key-

strokes **4** **SRVC** allow entry into this subfunction. The subfunction allows operation of the chiller to be customized to meet the particular needs of the application. The chiller comes from the factory preconfigured to meet needs of most applications. Each item should be checked to determine which configuration alternative best meets the needs of a particular application. See Table 12 for factory loaded configuration codes and alternative configurations.

If Processor Module is replaced, service replacement module is preloaded with configuration codes. Each configuration code must be checked and, if necessary, reconfigured to meet needs of the application. See Table 12 for pre-loaded service replacement configuration codes.

Service Configuration Codes — **5** **SRVC** allows entry into the service configuration subfunction. The first two items under this subfunction are two groups of eight digits each of configuration codes that are downloaded at the factory. If Processor Module is replaced in the field, the two groups of configuration codes must be entered through the keyboard and display module. The two groups of configuration codes (groups 7 and 8) that apply to the 30GB or 30GT unit being serviced can be found on a label inside the control box cover. See Table 11 for keystroke information to enter configuration codes 7 and 8.

SCHEDULE FUNCTION — This function provides a means to automatically switch chiller from an Occupied mode to Unoccupied mode. When using Schedule function, chilled water pump relay must be used to switch chilled water pump on and off. Connections for chilled water pump relay are: 30GB Models, Terminals 1 and 2 on TB12 - 30GT Models, Terminals 3 and 4 on TB5. The chilled water pump relay starts chilled water pump but compressors do not run until remote chilled water pump interlock contacts are closed and leaving chilled water temperature is above set point. If a remote chilled water pump interlock is not used, the first compressor starts (upon a call for cooling) approximately one minute after chilled water pump is turned on.

The Schedule function can be programmed for inactive, single set point, or dual set point operation.

When schedule is configured for inactive, chilled water pump relay remains energized continuously but is not used since chiller is usually controlled by remote chilled water pump interlock contacts.

When unit is configured for single set point operation, chilled water pump relay is energized whenever chiller is in Occupied mode regardless of whether chiller is running. When chiller is in Unoccupied mode, chilled water pump relay is not energized.

When unit is configured for dual set point, chilled water pump relay is energized continuously, in both Occupied and Unoccupied modes. Occupied mode places Occupied chilled water set point into effect; Unoccupied mode places Unoccupied chilled water set point into effect.

The schedule consists of from one to 8 Occupied time periods, set by the operator. 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.

The time schedule can be overridden to keep unit in Occupied mode for one, 2, 3 or 4 hours on a one-time basis. See Example 9.

All subfunctions of Schedule function are password protected except the override subfunction, [1] [SCHD]. Password entry into subfunctions [2] [SCHD] through [1] [1] [SCHD], is done through Service function. See page 31, logging on/ logging off.

Figure 6 shows a schedule for an office building with the chiller operating on a single set point schedule. The schedule is based on building occupancy with a 3-hour off-peak cool-down period from midnight to 3 a.m. following the weekend shutdown. To learn how this sample schedule would be programmed, see Example 9.

NOTE: This schedule was designed to illustrate the programming of the schedule function and is not intended as a recommended schedule for chiller operation.

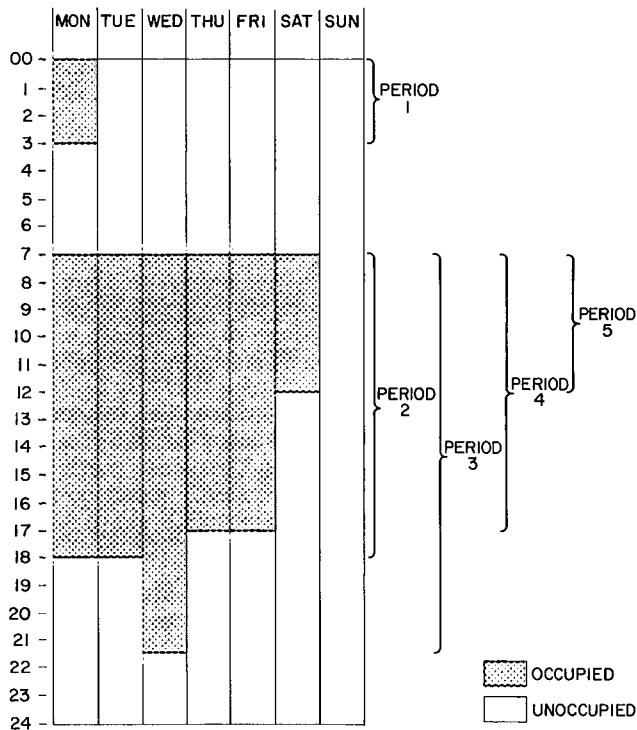


Fig. 6 – Sample Time Schedule

Example 9 – Using the Schedule Function

KEYBOARD ENTRY	DISPLAY	COMMENT
[1] [SCHD]	OVRD 0	No schedule override in effect
[3] [ENTR]	OVRD 3	3 Hours override in effect
[.] [0] [ENTR]	OVRD 0	Override cancelled
[2] [SCHD]	CLOCK 0	Schedule function is inactive
[1] [ENTR]	CLOCK 1	Schedule function is enabled through local unit clock
[6] [5] [ENTR]	CLOCK 65	Schedule function is enabled through CCN clock 65
PROGRAMMING PERIOD 1:		
[3] [SCHD]	PERIOD 1	Define schedule period 1 Start of Occupied time
[↓]	OCC 00 00	For this example, first period should start here (at midnight) so no entry is needed
[↓]	UNO 00 00	Start of Unoccupied time (end of period) For this example, period 1 should end at 3:00 am
[3] [.] [0] [0] [ENTR]	UNO 3 00	Period 1 ends at 3:00 am
[↓]	MON NO	Monday is now flagged for period 1 To put period 1 into effect on Monday, Monday must be flagged yes
[1] [ENTR]	MON YES	Monday is now flagged for period 1 to be in effect
[↓]	TUE YES	For this example, period 1 is to be in effect on Monday only. All other days must be checked to be sure that they are flagged no. If any day is flagged yes, change to no
[.] [ENTR]	TUE NO	Tuesday is now flagged no for period 1
PROGRAMMING PERIOD 2:		
[4] [SCHD]	PERIOD 2	Define schedule period 2
[↓]	OCC 00 00	Start of Occupied time
[7] [.] [0] [0] [ENTR]	OCC 7 00	Occupied time will start at 7:00 a m
[↓]	UNO 00 00	Start of Unoccupied time (end of period) for this example, period 2 should end at 18:00 (6:00 pm)
[1] [8] [.] [0] [0] [ENTR]	UNO 18 00	Period 2 ends at 18:00 (6:00 pm)
[↓]	MON NO	Monday is now flagged no for period 2 To put period 2 into effect on Monday, Monday must be flagged yes
[1] [ENTR]	MON YES	Monday is now flagged for period 2 to be in effect
[↓]	TUE NO	Tuesday is now flagged no for period 2. To put period 2 into effect on Tuesday, Tuesday must be flagged yes
[1] [ENTR]	TUE YES	Tuesday is now flagged for period 2 to be in effect
[↓]	WED YES	For this example, period 2 is to be in effect only on Monday and Tuesday All other days must be checked to be sure that they are flagged no. If a day is flagged yes, change to no
[.] [ENTR]	WED NO	Wednesday is now flagged no for period 2

Example 9 continued next page.

Example 9 — Using the Schedule Function (cont)

KEYBOARD ENTRY	DISPLAY	COMMENT
PROGRAMMING PERIOD 3:		
[5] [SCHD]	PERIOD 3	Define Schedule Period 3
[↓]	OCC 00 00	Start of Occupied Time
[7] [.] [0] [0] [ENTR]	OCC 7 00	Occupied time will start at 7:00 am
[↓]	UNO 00 00	Start of Unoccupied time (end of period 3) for this example, period 3 should end at 21:30 (9:30 pm)
[2] [1] [.] [3] [0] [ENTR]	UNO 21 30	Period 3 ends at 21:30 (9:30 pm)
[↓]	MON NO	Check to be sure that Monday and Tuesday are flagged no for period 3
[↓]	TUE NO	
[↓]	WED NO	Wednesday is flagged no, change to yes
[1] [ENTR]	WED YES	Wednesday is now flagged yes for period 3
[↓]	THUR NO	Check to be sure that all other days are flagged no
[↓]	FRI NO	
[↓]	SAT NO	
[↓]	SUN NO	

Period 4 and 5 can be programmed in the same manner, flagging Thursday and Friday yes for period 4 and Saturday yes for period 5. For this example, periods 6, 7 and 8 are not used: they should be programmed OCC 00.00, UNO 00.00.

NOTES: When a day is flagged yes for 2 overlapping periods, Occupied time will take precedence over Unoccupied time. Occupied times can overlap in the schedule with no consequence.

To extend an Occupied mode beyond its normal termination for a one-time schedule override, program as shown below:

[1] [SCHD]	OVRD 0	Override is set for 0, enter the number of hours of override desired
[3] [ENTR]	OVRD 3	Unit will now remain in Occupied mode for an additional 3 hours

Holiday Schedule — Keying [1] [1] [SCHD] allows the scheduling of up to 30 holiday periods. All holidays are entered with numerical values. First, the month (01 to 12), then the day (01 to 31), then the duration of the holiday period in days.

Examples: July 24 is 07.04.01.

Dec 25 - 26 is 12.25.02

If any of the 30 holiday periods are not used, the display shows NEW.

The following example explains how the holiday schedule function works:

ENTER	DISPLAY
[11] [SCHD]	HOLIDAY
[↓]	JAN01 02 (Includes JAN 1st and 2nd)
[↓]	APR17 01 (Includes APR 17th)
[↓]	MAY21 01 (Includes MAY 21st)
[↓]	JUL03 01 (Includes JUL 3rd)
[7] [.] [0] [4] [.] [0] [1] [ENTR]	JUL04 01 (Includes JUL 4th)
[↓]	SEP07 01 (Includes SEP 7th)
[↓]	NOV26 02 (Includes NOV 26th and 27th)
[↓]	DEC24 02 (Includes DEC 24th and 25th)
[↓]	DEC30 02 (Includes DEC 30th and 31st)
[↓]	NEW
[5] [.] [2] [5] [.] [0] [1] [ENTR]	MAY25 01 (Includes MAY 25th)
[↓]	NEW
[↓]	NEW
[↓]	NEW
[↓]	NEW
[↓]	NEW (30TH HOLIDAY)

NEW indicates a holiday that has not been assigned yet

TROUBLESHOOTING

The Flotronic™ II control has many features to aid the technicians in troubleshooting a Flotronic II Chiller. By using keyboard and display module and Status function, actual operating conditions of the chiller are displayed while unit is running. Test function allows proper operation of compressors, compressor unloaders, fans, EXV's and other components to be checked while chiller is stopped. Service function displays how configurable items are configured. If an operating fault is detected, an alarm is generated and an alarm code(s) is displayed under the subfunction **2** **STAT**, along with an explanation of the fault. Up to 5 current alarm codes are stored. For checking specific items, see Keyboard Directory.

Checking Display Codes — To determine how machine has been programmed to operate, check diagnostic information, **2** **STAT** and operating mode displays **3** **STAT**. If no display appears, follow procedures in Troubleshooting section, Control Modules. If display is working, continue as follows:

1. Note all alarm codes displayed, **2** **STAT**.
2. Note all operating mode codes displayed, **3** **STAT**.
3. Note leaving chilled water temperature set point in effect and current leaving water temperature, **5** **STAT**.

If machine is running, compare the "in effect" leaving water temperature set point with current water temperature. Remember, if reset is in effect, the values may be different because machine is operating to the modified chilled water set point. If current temperature is equal to set point, but set point is not the one desired, remember that if dual set point has been selected in the Schedule function, there are 2 set points to which the machine can be operating. Check the programming of Schedule function to see if Occupied or Unoccupied set point should be in effect.

Unit Shutoff — To shut unit off, move LOCAL/STOP/CCN Switch to STOP position. Any refrigeration circuit operating at this time continues to complete the pumpout cycle. Lag compressors stop immediately, lead compressors run to complete pumpout.

Complete Unit Stoppage

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

1. Cooling load satisfied
2. Remote ON/OFF contacts open
3. Programmed schedule
4. Emergency stop command from CCN
5. General power failure
6. Blown fuse in control power feed disconnect
7. Open control circuit fuse
8. LOCAL/STOP/CCN switch moved to STOP
9. Freeze protection trip
10. Low Flow protection trip
11. Open contacts in chilled water flow switch (optional)
12. 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 STOP. Unit cannot start if these contacts are open. If they open while unit is running, unit pumps down and stops.

13. Cooler entering or leaving fluid thermistor failure
14. Low transducer supply voltage (GT)
15. Loss of communications between processor module and other control modules
16. Low refrigerant pressure (GT)

Single Circuit Stoppage

Single circuit stoppage can be caused by the following:

1. Open contacts in lead compressor discharge gas thermostat
2. Open contacts in loss of charge switch (GB)
3. Low oil pressure in lead compressor
4. Open contacts in lead compressor high-pressure switch
5. Low refrigerant pressure (GT)
6. Thermistor failure
7. Transducer failure (GT)
8. Ground fault in lead compressor (GB)
9. Ground fault in any compressor in that circuit (GT)
10. High suction superheat
11. Low suction superheat
12. Loss of charge switch open (GB)
13. Lead compressor circuit breaker trip. Stoppage of one circuit by a safety device action does not affect other circuit. When a safety device trips on a lead compressor, circuit is shut down immediately and EXV closes.

Lag Compressor Stoppage

Lag compressor stoppage can be caused by the following:

1. Open contacts in discharge gas thermostat
2. Open contacts in high-pressure switch
3. Compressor ground fault (GB)
4. Compressor circuit breaker trip
5. Not required to run to meet cooling load requirement

⚠ CAUTION

If 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 cause for stoppage has been corrected, restart is either automatic or manual, depending on fault. Manual reset requires that LOCAL/STOP/CCN switch be moved to STOP, then back to original operating position. Some typical fault conditions are described below. For a complete list of fault conditions, codes, and reset type, see Table 13.

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

Typical Stoppage Faults and Reset Types

Chilled Water, Low Flow	Manual reset
Chilled Water, Low Temperature	Auto reset first time, manual if repeat
Chilled Water Pump Interlock	Manual reset
Control Circuit Fuse Blown	Unit restarts automatically when power is restored
High Pressure Switch Open	Manual reset
Low Refrigerant Pressure	Auto reset first time, then manual if within same day
Low Oil Pressure	Manual reset
Discharge Gas Thermostat Open	Manual reset

Alarm Codes — Following is a detailed description of each alarm code error and possible cause. Manual reset of an alarm is accomplished by moving LOCAL/STOP/CCN

Switch to STOP, then back to LOCAL or CCN. See Table 13 for listing of each alarm code.

Code 0 No alarms exist

Codes 1 - 8 Compressor failure

If DSIO relay module relay or control relay feedback switch opens during operation of a compressor, microprocessor detects this and stops compressor, energizes alarm light, and displays a code of 1 to 8 depending on the compressor. Compressor locks off; to reset, use manual reset method.

If lead compressor in a circuit shuts down, the other compressors in the circuit stop and lock off. Only the alarm mode for lead compressor is displayed.

The microprocessor is also programmed to indicate compressor failure if feedback terminal on DSIO J3 terminal strip receives voltage when compressor is not supposed to be on.

Following are possible causes of failure:

High-Pressure Switch Open — High-pressure switch for each compressor is wired in series with 24-v power that energizes compressor control relay. If high-pressure switch opens during operation compressor stops. This is detected by microprocessor through the feedback terminals.

Discharge Gas Thermostat — Discharge gas thermostat switch in each compressor is also wired in series with 24-v power that energizes control relay (CR). If switch opens during operation of compressor, the compressor stops and failure is detected through feedback terminals.

DSIO Module Failure — If a DSIO relay module relay fails open or closed, microprocessor detects this, locks compressor off and indicates an error.

Wiring Errors — If a wiring error exists causing CR or feedback switch not to function properly, microprocessor indicates an error.

Processor (PSIO) Failure — If hardware that monitors feedback switch fails, or processor fails to energize relay module relay to ON, an error may be indicated.

Ground Fault Module (CGFA or CGFB) Open — Module contacts are in lead compressor circuits, but ground fault could be in any compressor in affected circuit.

Loss Of Charge Switch — On 30GB units a loss of charge switch is used to detect low refrigerant pressure. Contacts of this switch are in each lead compressor circuit.

NOTE: The control does not detect circuit breaker failures. If a circuit breaker trips on lead compressor in a circuit, a low oil pressure failure is indicated. On the other compressors, no failure is indicated.

Checkout Procedure (Codes 1 - 8) — Shut off main power to unit. Turn on control power, then step through subfunction 2 TEST to proper compressor number (i.e. failure code 5 is compressor B1). Next, energize the step. If step works correctly, then failure code is caused by:

- HPS open
- DGT open
- Misplaced feedback wire from J4 and J5 terminals
- Ground wire and 24-v feeds reversed on one or more points on J3

Compressor A1 Alarm Circuit — Processor closes contacts between J4 terminals 2 and 3 to start compressor. See Fig. 7. Safeties shown to left of J4 must be closed in order for power to reach compressor control relay, and the feedback input terminals on J3.

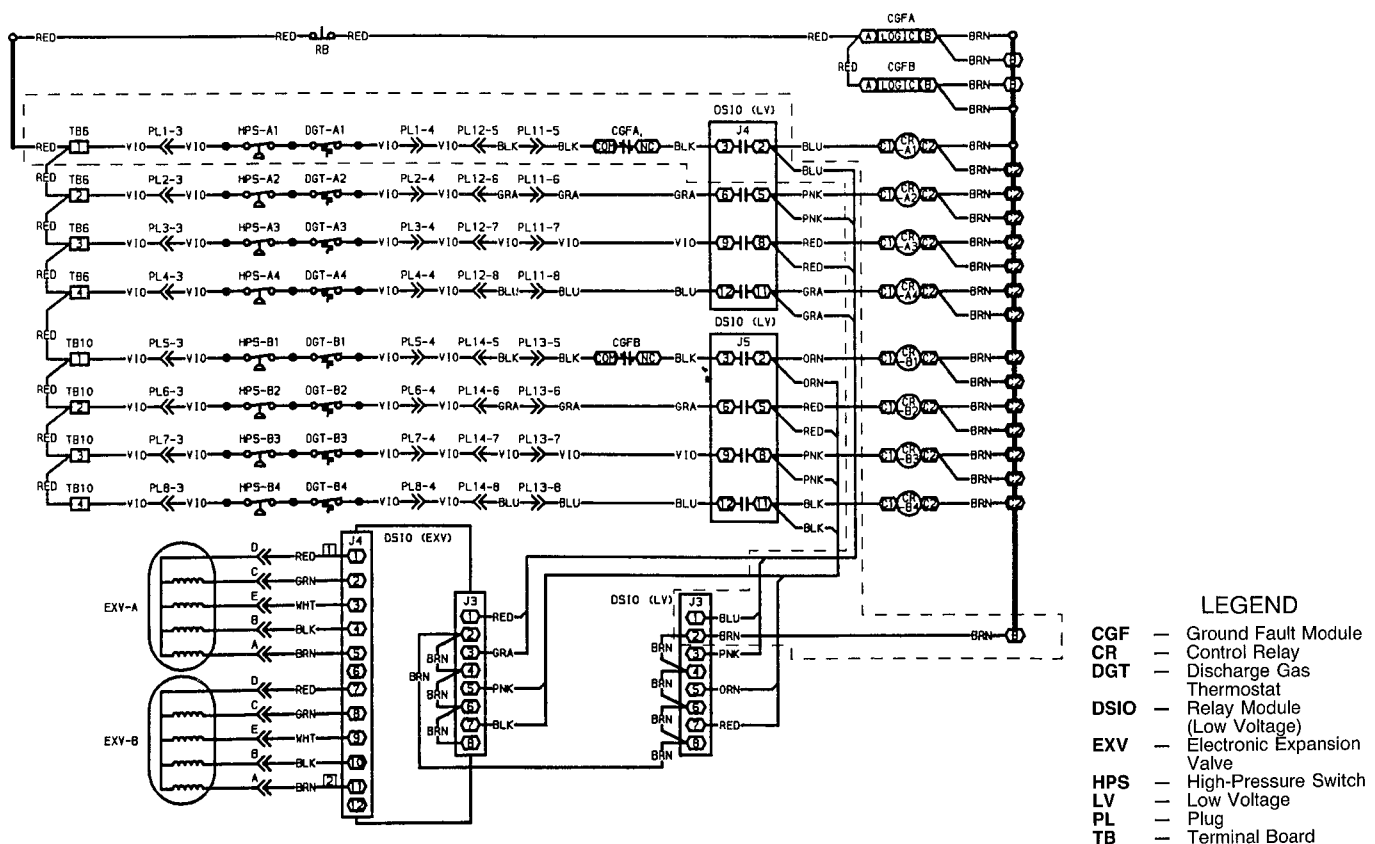


Fig. 7 — 24-V Safety Circuit Wiring

Failure of power to terminal 1 on J3, when contacts J5 2 and 3 should be closed, causes a code 1 alarm.

Terminal 2 on J3 is the other leg of the compressor A1 feedback channel. It is connected to the 24-v ground.

Code 9 Leaving water thermistor failure

Code 10 Entering water thermistor failure

If temperature measured by these thermistors is outside range of -40 to 240 F (-40 to 116 C), unit shuts down after going through a normal pumpout. Reset is automatic if temperature returns within range, and unit start-up follows normal sequence. Cause of fault is usually a bad thermistor, wiring error or loose connection.

Code 15 Circuit A Condensing Temperature Thermistor Failure (30GB)

Code 16 Circuit B Condensing Temperature Thermistor Failure (30GB)

If temperature measured by these thermistors is outside range of -40 to 240 F (-40 to 116 C), affected circuit shuts down after going through a normal pumpout. Other circuit continues to run. Reset is automatic if temperature returns within range, and circuit start-up follows normal sequence. Cause of this fault is usually a bad thermistor, wiring error or loose connection.

Code 17 Circuit A Cooler Refrigerant Temperature Failure (30GB)

Code 18 Circuit B Cooler Refrigerant Temperature Failure (30GB)

If temperature measured by these thermistors is outside range of -40 to 240 F (-40 to 116 C), or if measured refrigerant temperature is greater than cooler leaving fluid temperature when chiller is running, affected circuit shuts down after going through a normal pumpout. Other circuit continues to run. Reset is automatic if temperature returns within range, and circuit start-up follows normal sequence. Cause of this fault is usually a bad thermistor, wiring error or loose connection.

Code 19 Compressor A1 suction thermistor failure

Code 20 Compressor B1 suction thermistor failure

If temperature measured by these thermistors is outside the range of -40 to 240 F (-40 to 116 C), affected circuit shuts down after going through a normal pumpout. Other circuit continues to run. Reset is automatic if temperature returns within range, and circuit start-up follows normal sequence. Cause of this fault is usually a bad thermistor, wiring error or loose connection.

Code 21 Reset thermistor failure applies only to installations having external temperature reset.

If temperature measured by this thermistor is outside range of -40 to 240 F (-40 to 116 C), reset function is disabled and unit controls to normal set point. If temperature returns within range, reset function is automatically enabled. Cause of this fault is usually a bad thermistor, wiring error or loose connection.

NOTE: Codes 22 through 28 apply to 30GT only.

Code 22 Compressor A1 discharge pressure transducer failure

Code 23 Compressor B1 discharge pressure transducer failure

Code 24 Compressor A1 suction pressure transducer failure

Code 25 Compressor B1 suction pressure transducer failure

Code 26 Compressor A1 oil pressure transducer failure

Code 27 Compressor B1 oil pressure transducer failure

If output voltage of any of these transducers is greater than 5 volts, affected circuit shuts down without going through pumpout process. Other circuit continues to run. Reset is automatic if output voltage returns within range, and circuit start-up follows normal sequence. Cause of fault is usually a bad transducer or a wiring error.

Code 28 Low transducer supply voltage

If transducer supply voltage is less than 4.5 volts or greater than 5.5 volts, unit shuts down without going through pumpout process. Reset is automatic if supply voltage returns within range, and circuit start-up follows normal sequence. Cause of fault is usually a faulty transformer, or primary voltage is out of range.

Code 29 Chilled water pump interlock switch open (applies only if unit is configured for use with a chilled water pump interlock). Code can occur under any of these conditions:

1. Interlock switch fails to close within one minute after chilled water pump starts
2. Interlock switch opens during unit operation
3. Interlock voltage is detected, but unit is not configured for interlock
4. Interlock voltage is outside its valid range

If any of these conditions occur, all compressors are disabled and, if running, shutdown occurs without pumpout. Chilled water pump also shuts down. Reset is manual, with LOCAL/STOP/CCN Switch. Most probable cause of this fault is shutdown or failure of chilled water pump to start. Other possibilities are improper configuration or wiring errors

Code 30 Reset input failure (4 to 20 mA)

Code 31 Demand limit input failure (4 to 20 mA)

These codes apply only if unit is configured for these functions. If 4-20 mA signal is less than 2 or more than 22 mA, reset or Demand Limit function is disabled and unit functions normally. If mA signal returns within range, function is automatically enabled.

Code 32 Loss of communication with compressor relay module (DISO-LV)

Code 33 Loss of communication with EXV relay module (DSIO-EXV)

If communication is lost with either of these modules, unit shuts down without going through pumpout process. Reset is automatic when communication is restored and start-up follows normal sequence. Probable cause of fault is a loose plug, wiring error, or bad module.

Code 34 Loss of communication with options board

This applies only if one or more of the following options are used:

- External temperature reset
- 4-20 mA temperature reset
- External switch controlled dual set point
- Switch controlled demand limit
- 4-20 mA demand limit
- Compressor unloaders

If communication is lost with options board, unit shuts down after going through normal pumpout. Reset is automatic when communication is restored, and start-up follows normal sequence. Probable cause of fault is a loose plug, wiring error, or defective options board.

Code 36 Low refrigerant pressure, Circuit A (30GT)
Code 37 Low refrigerant pressure, Circuit B (30GT)

If suction pressure transducer senses a pressure below set point for more than 5 minutes at start-up or more than 2 minutes during normal operation, affected circuit shuts down without going through the pumpout process. Reset is automatic when pressure reaches 10 psig above set point, if there have been no previous occurrences of this fault on the same day. If this is a repeat occurrence on same day, then reset is manual, with LOCAL/STOP/CCN Switch. Factory configured set point is 27 psig for standard chillers and 12 psig for brine chillers.

Possible causes of fault are low refrigerant charge, faulty EXV, plugged filter drier, or faulty transducer.

Code 38 Failure to pump out, Circuit A (30GT)
Code 39 Failure to pump out, Circuit B (30GT)

The pumpout process is terminated when saturated suction temperature is 20 degrees F (11 degrees C) below temperature at beginning of pumpout, or 10 degrees F (5.5 degrees C) below leaving water temperature. If neither is met within 3 minutes, circuit shuts down without pumpout. Reset is manual with LOCAL/STOP/CCN Switch, and start-up follows normal sequence.

Code 40 Low oil pressure, Circuit A (30GT)
Code 41 Low oil pressure, Circuit B (30GT)

If oil pressure differential is less than set point for more than 2 minutes at start-up, or more than 1 minute during normal operation, affected circuit shuts down without going through pumpout process. Reset is manual with LOCAL/STOP/CCN Switch, and start-up follows normal sequence. Factory configured differential oil pressure is 6 psig.

Possible causes of fault are faulty compressor, EXV, crankcase heater, or transducer; or refrigerant overcharge, or insufficient oil charge.

Code 42 Cooler freeze protection

If cooler entering or leaving water temperature is below 34 F (1.1 C) for water or more than 8 degrees F (4.4 degrees C) below set point for brine, unit shuts down without pumpout. Chilled water pump continues to run if controlled by chiller controls. Reset is automatic when leaving water temperature reaches 6 degrees F (3 degrees C) above set point, providing there has been no prior occurrence of this fault the same day. If fault has occurred previously the same day, reset is manual with LOCAL/STOP/CCN Switch.

Possible causes of fault are low water flow or faulty thermistor.

Code 43 Low water flow

If any compressors are operating and entering water temperature is 3 degrees F (1.7 degrees C) or more below leaving water temperature for more than one minute, unit shuts down without pumpout. Chilled water pump also shuts down. Reset is manual with LOCAL/STOP/CCN Switch, and start-up follows normal sequence.

This is a suitable method for sensing low water flow because entering water thermistor is in the cooler shell and responds quicker to compressor operation than the leaving water thermistor which is in the leaving water nozzle. Pos-

sible causes of fault are faulty chilled water pump, control or thermistor.

Code 44 Low cooler suction temperature, Circuit A
Code 45 Low cooler suction temperature, Circuit B

If saturated suction temperature is less than 32 F (0°C) and is 20 degrees F (11 degrees C) or more below leaving water temperature, mode 14 is displayed, unit continues to run, but additional compressors are not allowed to start. If condition persists for more than 10 minutes, fault code is displayed, and unit shuts down without pumpout. Reset is manual with LOCAL/STOP/CCN Switch, and start-up follows normal sequence.

Possible causes of fault are low refrigerant charge, plugged filter drier, faulty EXV or thermistor.

Code 46 High suction superheat, Circuit A
Code 47 High suction superheat, Circuit B

If EXV is full open, suction superheat is greater than 75 degrees F (42 degrees C) and saturated evaporator temperature is less than MOP (maximum operating pressure) for more than 5 minutes, unit shuts down after normal pumpout process. Reset is manual with LOCAL/STOP/CCN Switch, and start-up follows normal sequence.

Possible causes of fault are low refrigerant charge, plugged filter drier, faulty EXV or faulty thermistor.

Code 48 Low suction superheat, Circuit A
Code 49 Low suction superheat, Circuit B

If EXV is at minimum position, suction superheat is more than 10 degrees F (5.5 degrees C) below set point, and saturated evaporator temperature is greater than MOP (maximum operating pressure) for more than 5 minutes, affected circuit shuts down after going through pumpout process. Reset is manual with LOCAL/STOP/CCN Switch, and start-up follows normal sequence.

Possible causes of fault are faulty EXV or thermistor.

Code 50 Illegal configuration

This fault indicates a configuration error. Unit is not allowed to start. Check all configuration data and set points and correct any errors.

Code 51 Initial configuration required

This fault indicates factory configuration has not been done, and unit is not allowed to start. Refer to unit wiring labels for factory configuration codes. There are 8 groups of 8-digit numbers that must be entered. The first 6 groups must be entered under

3	SRVC
---	------

 subfunction. Groups 7 and 8 must be entered under

5	SRVC
---	------

 subfunction.

Simply enter each group, then press the

ENTR

 key. Use the down arrow

↓

 after each group to bring up the next empty screen. Unit should start after factory and field configurations are correctly entered.

The usual cause of this fault is replacement of the processor module. Refer to instructions accompanying the replacement module.

Code 52 Emergency stop by CCN command. Unit goes through normal shutdown when this command is received, and goes through normal start-up when command is cancelled.

Table 13 – Alarm Codes

DISPLAY	DESCRIPTION	ACTION TAKEN BY CONTROL	CKT PUMPDOWN	RESET METHOD	PROBABLE CAUSE
0	No Alarms Exist	—	—	—	—
1	Compressor A1 Failure	Circuit A shut down	No	Manual	High pressure switch trip, or discharge gas thermostat trip, or wiring error
2, 3, 4	Compressor A2, A3 or A4 Failure	Compressor shut down	No	Manual	Codes 1 and 5 can be ground fault At any compressor in that circuit codes 1 and 5 on 30GB units can be open loss of charge switch
5	Compressor B1 Failure	Circuit B shut down	No	Manual	
6, 7, 8	Compressor B2, B3 or B4 Failure	Compressor shut down	Yes	Manual	
9	Leaving Water Thermistor Failure	Unit shut down	Yes	Auto	Thermistor failure or wiring error
10	Entering Water Thermistor Failure	Unit shut down	Yes	Auto	
15	Condenser Thermistor Failure Circuit A	Circuit A shut down	Yes	Auto	
16	Condenser Thermistor Failure Circuit B	Circuit B shut down	Yes	Auto	
17	Cooler Thermistor Failure Circuit B	Circuit B shut down	Yes	Auto	
18	Cooler Thermistor Failure Circuit A	Circuit B shut down	Yes	Auto	
19	Compressor A1 Thermistor Failure	Circuit A shut down	Yes	Auto	
20	Compressor B1 Thermistor Failure	Circuit B shut down	Yes	Auto	
21	Reset Thermistor Failure	Normal set point used	No	Auto.	
22	Discharge Pressure Transducer Failure Circuit A	Circuit A shut down	Yes	Auto	Transducer failure or wiring error (30GT ONLY)
23	Discharge Pressure Transducer Failure Circuit B	Circuit B shut down	Yes	Auto	
24	Suction Pressure Transducer Failure Circuit A	Circuit A shut down	No	Auto	
25	Suction Pressure Transducer Failure Circuit B	Circuit B shut down	No	Auto	
26	Oil Pressure Transducer Failure Circuit A	Circuit A shut down	No	Auto	
27	Oil Pressure Transducer Failure Circuit B	Circuit B shut down	No	Auto	
28	Transducer supply voltage low	Unit shut down	No	Auto	Unit voltage low or transformer 5 faulty.
29	Interlock switch open	Unit shut down	No	Manual	Chilled water pump inoperative
30	4-20 mA Reset Input Failure	Normal set point used	No	Auto	Wiring error or faulty module or improper address code
31	4-20 mA Demand Limit Failure	Demand limit ignored	No	Auto	
32	Loss of communication with DSIO-LV	Unit shut down	No	Auto	
33	Loss of communication with DSIO-EXV	Unit shut down	No	Auto	
34	Loss of communication with Options Board	Unit shut down	Yes	Auto	
35	Not used	—	—	—	—
36	Low pressure Circuit A, faulty EXV, or plugged filter	Circuit A shut down	No	*	Low refrigerant charge Plugged filter drier
37	Low Pressure Circuit B	Circuit B shut down	No	*	Low refrigerant charge Plugged filter drier
38	Failure to pump down Circuit A	Circuit A shut down	No	Manual	Faulty EXV or transducer
39	Failure to pump down Circuit B	Circuit B shut down	No	Manual	Faulty EXV or transducer
40	Low oil pressure Circuit A	Circuit A shut down	No	Manual	Low oil level, faulty EXV, crankcase heater or Pressure Transducer
41	Low oil pressure Circuit B	Circuit B shut down	No	Manual	Low oil level, faulty EXV, crankcase heater or Pressure Transducer
42	Cooler Freeze Protection	Unit shut down	No	*	Low water flow or faulty thermistor
43	Low cooler water flow	Unit shut down	No	Manual	Chilled water pump failure or faulty thermistor
44	Low suction temperature Circuit A	Circuit A shut down after 10 min	No	Manual	Faulty EXV or thermistor.
45	Low suction temperature Circuit B	Circuit B shut down after 10 min	No	Manual	Faulty EXV or thermistor
46	High suction superheat Circuit A	Circuit A shut down	Yes	Manual	Low charge, faulty EXV or thermistor, or plugged filter drier.
47	High suction superheat Circuit B	Circuit B shut down	Yes	Manual	Low charge, faulty EXV or thermistor, or plugged filter drier
48	Low suction superheat Circuit A	Circuit A shut down	Yes	Manual	Faulty EXV or thermistor
49	Low suction superheat Circuit B	Circuit B shut down	Yes	Manual	Faulty EXV or thermistor
50	Illegal configuration	Unit cannot start	—	Manual	Configuration error
51	Initial configuration required	Unit cannot start	—	Manual	Configuration omitted
52	Emergency stop by CCN command	Unit shut down	Yes	CCN	Network command.

*Reset automatic first time, manual if repeated same day.

Electronic Expansion Valve

EXV OPERATION — These valves control the flow of liquid refrigerant into the cooler. They are operated by processor to maintain a specified superheat at lead compressor entering gas thermistor (located between compressor motor and cylinders). There is one EXV per circuit. See Fig. 8.

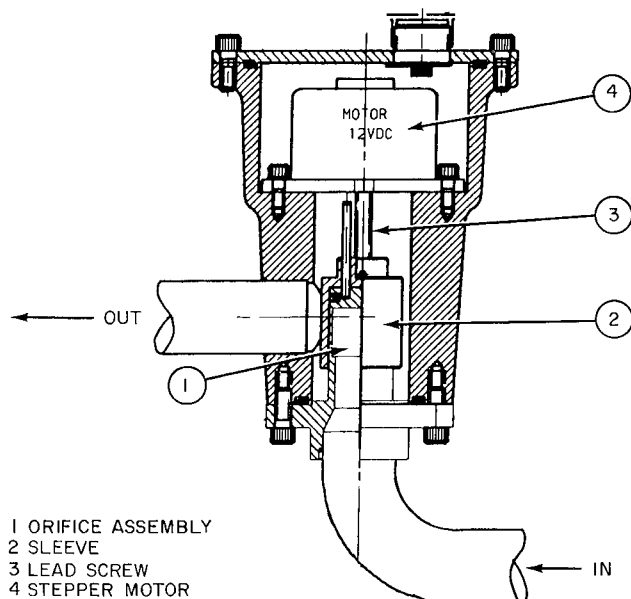


Fig. 8 — Electronic Expansion Valve

High-pressure liquid refrigerant enters valve through bottom. A series of calibrated slots are located in side of orifice assembly. As refrigerant passes through orifice, pressure drops and refrigerant changes to a 2-phase condition (liquid and vapor). To control refrigerant flow for different operating conditions, sleeve moves up and down over orifice, thereby changing orifice size. Sleeve is moved by a linear stepper motor. Stepper motor moves in increments and is controlled directly by processor module. As stepper motor rotates, motion is transferred into linear movement by lead screw. Through stepper motor and lead screws, 760 discrete steps of motion are obtained. The large number of steps and long stroke result in very accurate control of refrigerant flow.

The **10 STAT** subfunction shows EXV valve position as a percent of full open. Position should change constantly while unit operates. If a valve stops moving for any reason (mechanical or electrical) other than a processor or thermistor failure, the processor continues to attempt to open or close the valve to correct the superheat. Once the calculated valve position reaches 145 (fully closed) or 760 (fully open) it remains there. If EXV position reading remains at 145 or 760, and the thermistors and pressure transducers are reading correctly, the EXV is not moving. Follow EXV checkout procedure to determine cause.

The EXV is also used to limit cooler suction temperature to 55 F (13 C). This makes it possible for chiller to start at higher cooler water temperatures without overloading compressor. This is commonly referred to as MOP (maximum operating pressure), and serves as a load limiting device to prevent compressor motor overloading. This MOP or load limiting feature enables the 30G chillers to operate with up to 95 F (35 C) entering water temperatures during start-up and subsequent pull-down.

CHECKOUT PROCEDURE — Follow steps below to diagnose and correct EXV problems.

Step 1 — Check EXV Driver Outputs — Check EXV output signals at appropriate terminals on EXV driver module (see Fig. 9) as follows:

Connect positive test lead to terminal 1 on EXV driver. Set meter for approximately 20 vdc. Enter outputs subfunction of test function by pressing **1 TEST**, then advance to EXVA Test by pressing **8** times. Press **1 0 0 ENTR**. The driver should drive the Circuit A EXV fully open. During next several seconds connect negative test lead to pins 2, 3, 4 and 5 in succession. Voltage should rise and fall at each pin. If it remains constant at a voltage or at zero volts, remove connector to valve and recheck.

Press **ENTR** to close Circuit A EXV. If a problem still exists, replace EXV driver module. If voltage reading is correct, expansion valve should be checked. Next, test EXVB. Connect positive test lead to pin 7 and the negative test lead to pin 8, 9, 10, 11 in succession during EXVB Test.

Step 2 — Check EXV Wiring — Check wiring to electronic expansion valves from terminal strip on EXV driver. See Fig. 9.

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

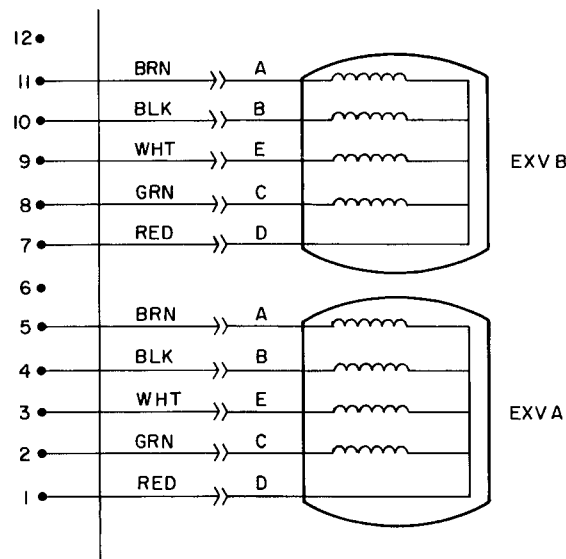


Fig. 9 — EXV Cable Connections to EXV Driver Module, DSIO (EXV)

Step 3 — Check Resistance of EXV Motor Windings — Remove plug at J4 terminal strip and check resistance between common lead (red wire, terminal D) and remaining leads, A, B, C and E (see Fig. 9). Resistance should be 25 ohms $\pm$ 2 ohms.

Control of valve is by microprocessor. In 30GB040-200, two thermistor temperature sensors are used to determine superheat. One thermistor is located in cooler and the other is located in lead compressor suction manifold after the motor. The difference between the two temperatures is a measurement of the superheat. In 30GT225-280, a thermistor and a pressure transducer located in lead compressor are

used to determine superheat. The thermistor measures temperature of the superheated gas entering the compressor cylinders. The pressure transducer measures refrigerant pressure in the suction manifold. The microprocessor converts pressure reading to a saturation temperature. The difference between temperature of superheated gas and saturation temperature is the superheat.

Because the EXV's are controlled by processor module, it is possible to track valve position. During initial start-up, EXV is fully closed. After start-up, valve position is tracked by processor by constantly observing amount of valve movement.

The processor keeps track of EXV position by counting the number of open and closed steps it has sent to each valve. It has no direct physical feedback of valve position. Whenever unit is switched from STOP to RUN, both valves are initialized, allowing the processor to send enough closing pulses to the valve to move it from fully open to fully closed, then reset the position counter to zero.

The EXV Test can be used to drive EXV to any desired position. When EXV opens, the metering slots are not uncovered until step 145. This is fully closed position when circuit is operating. The fully open position is 760 steps.

Step 4 — Check Thermistors and Pressure Transducers that Control EXV — Check thermistors and pressure transducers that control processor output voltage pulses to EXV's. See Fig. 10 for locations.

30GB's

Circuit A — Thermistors T5, T7

Circuit B — Thermistors T6, T8

30GT's

Circuit A — Thermistor T7, Pressure Transducer SPTA

Circuit B — Thermistor T8, Pressure Transducer SPTB

1. Use temperature subfunction of the Status function to determine if thermistors are reading correctly.
2. Check thermistor calibration at known temperature by measuring actual resistance and comparing value measured with values listed in Tables 14a and 14b.
3. Make sure thermistor leads are connected to proper pin terminals at J7 terminal strip on processor module and that thermistor probes are located in proper position in refrigerant circuit. See Fig. 11, 12, 13.
4. Use the pressure subfunction of the Status function to determine if pressure transducers are reading correctly. Connect a calibrated gage to lead compressor suction or discharge pressure connection to check transducer reading.
5. Make sure transducer leads are properly connected in junction box and at processor board. Check transformer 5 output. Check voltage transducer 5 vdc $\pm$.2 v.

When above checks have been completed, check actual operation of EXV by using procedures outlined in Step 5.

Step 5 — Checking Operation of EXV

1. Close liquid line service valve of circuit to be checked, and run through the Test step (subfunction 2 of Test function) for lead compressor in that circuit to pump down low side of system. Repeat test step 3 times to ensure all refrigerant has been pumped from low side.

NOTE: Be sure to allow compressors to run for the full pumpout period.

2. Turn off compressor circuit breaker(s). Close compressor discharge service valves and vent any remaining refrigerant from low side of system.
3. Remove screws holding top cover of EXV. Carefully remove top cover. If EXV plug was disconnected during this process, reconnect it after cover is removed.

CAUTION

When removing top cover, be careful to avoid damaging motor leads.

4. Enter appropriate EXV Test step for EXVA or EXVB in the outputs subfunction of the Test function .

Press to initiate test. With cover lifted off EXV valve body, observe operation of valve motor and lead screw. The motor should turn counterclockwise, and the lead screw should move up out of motor hub until valve is fully open. Lead screw movement should be smooth and uniform from fully closed to fully open position. Check open to closed operation by pressing .

If valve is properly connected to processor and receiving correct signals, yet does not operate as described above, valve should be replaced.

Operation of EXV valve is also checked without removing top cover. This method depends on operator's skill in determining whether or not valve is moving. To use this method, initiate EXV Test and open valve. Immediately grasp EXV valve body. As valve drives open, a soft, smooth pulse is felt for approximately 26 seconds as valve travels from fully closed to fully open. When valve reaches end of its opening stroke, a hard pulse is felt momentarily. Drive valve closed and a soft, smooth pulse is felt for the 26 seconds necessary for valve to travel from fully open to fully closed. When valve reaches end of its stroke, a hard pulse is again felt as valve overdrives by 50 steps. Valve should be driven through at least 2 complete cycles to be sure it is operating properly. If a hard pulse is felt for the 26 second duration, valve is not moving and should be replaced.

The EXV test can be repeated as required by entering any percentage from 0 () to 100 to initiate movement.

If operating problems persist after reassembly, they may be due to out-of-calibration thermistor(s), or intermittent connections between 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 liquid line. Check for plugged filter drier(s), or restricted metering slots in the EXV. 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: 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.

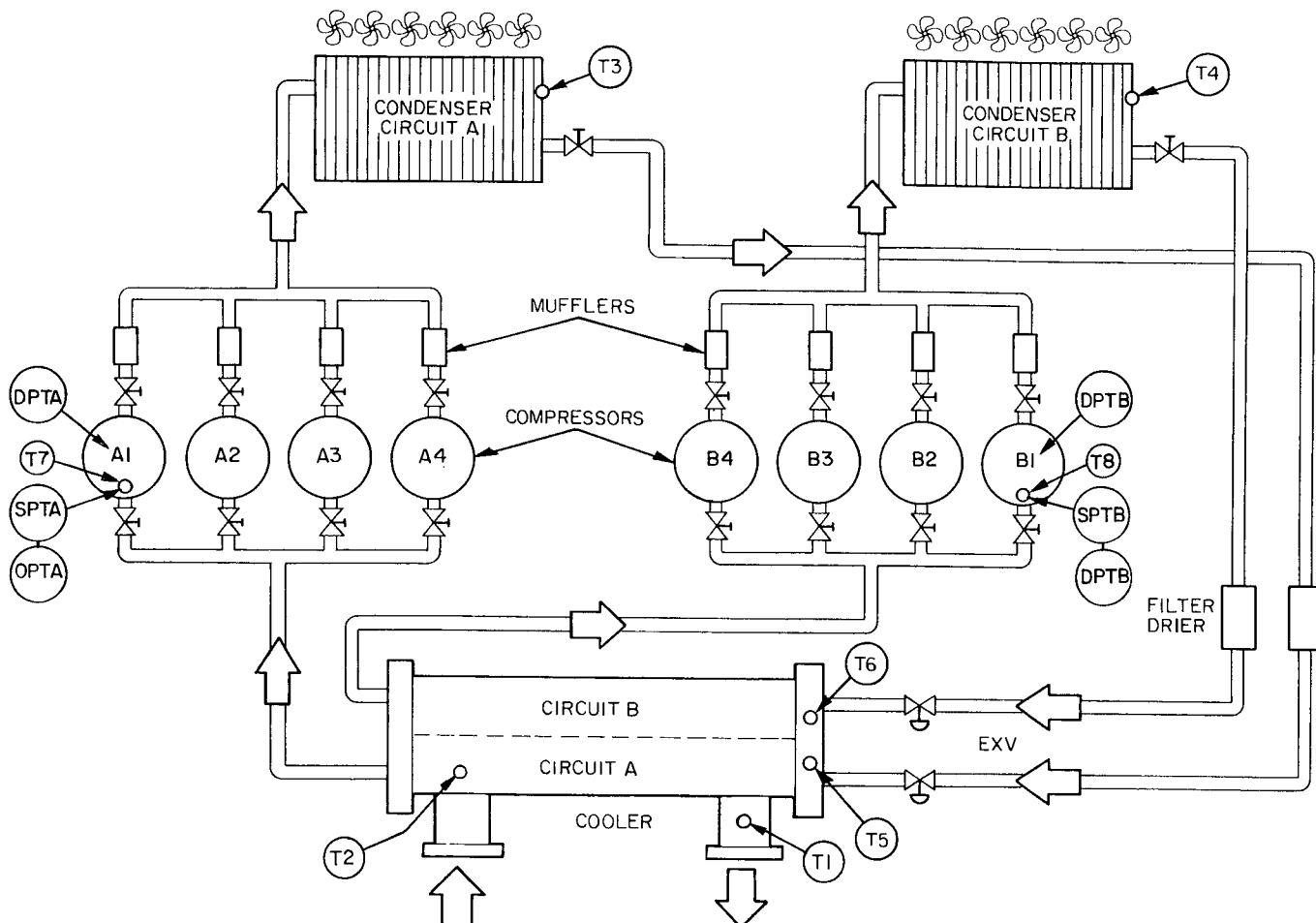


Fig. 10 — Thermistor and Pressure Transducer Locations

Thermistors — All thermistors are identical in their temperature vs. resistance performance. Resistance at various temperatures are listed in Tables 14a and 14b.

LOCATION — General location of thermistor sensors are shown in Fig. 10.

Cooler Leaving Water Thermistor (T1) — located in leaving water nozzle. The probe is immersed directly in the water. All thermistor connections are made through a 1/4-in. coupling. See Fig. 14. Actual location is shown in Fig. 11 and 13.

Cooler Entering Water Thermistor (T2) — located in cooler shell in first baffle space near tube bundle. Actual location is shown in Fig. 11 and 13.

Cooler Saturated Suction Temperature Thermistors (T5 and T6) (30GB only) — located next to refrigerant inlet in cooler head. Thermistors are immersed directly into refrigerant. Typical location is shown in Fig. 11 and 13.

Compressor Suction Gas Temperature Thermistors (T7 and T8) — located in lead compressor in each circuit in suction passage between motor and cylinders, above oil pump. See Fig. 11.

THERMISTOR REPLACEMENT (T1, T2, T5, T6, T7, T8)
(Compressor and Cooler)

Proceed as follows (see Fig. 14):

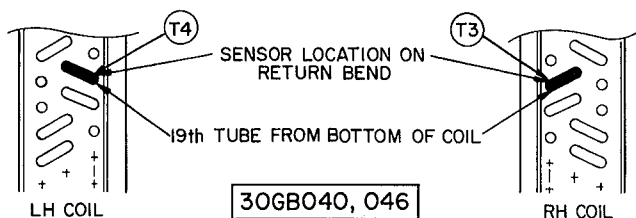
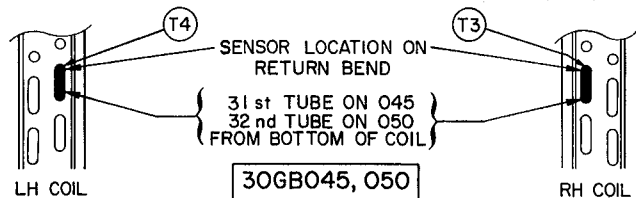
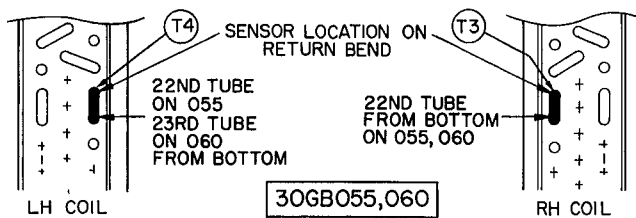
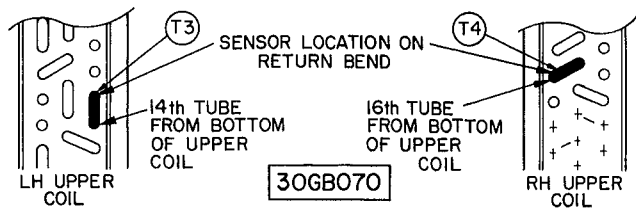
1. Remove and discard original thermistor and coupling.

IMPORTANT: Do not disassemble new coupling. Install as received.

2. Apply pipe sealant to 1/4-in. NPT threads on replacement coupling and install in place of original. Do not use packing nut to tighten coupling. This damages ferrules (see Fig. 14).
3. Insert new thermistor in coupling body to its full depth. If thermistor bottoms out before full depth is reached, pull thermistor back out 1/8 in. before tightening packing nut. Hand tighten packing nut to position ferrules, then finish tightening 1 1/4 turns with a suitable tool. Ferrules are now attached to thermistor which can be withdrawn from coupling for unit servicing.

⚠ CAUTION

Thermistors are installed directly in refrigerant or water circuit. Relieve all refrigerant pressure or drain water before removing.



Compressor End — Headers Removed
CONDENSER COILS

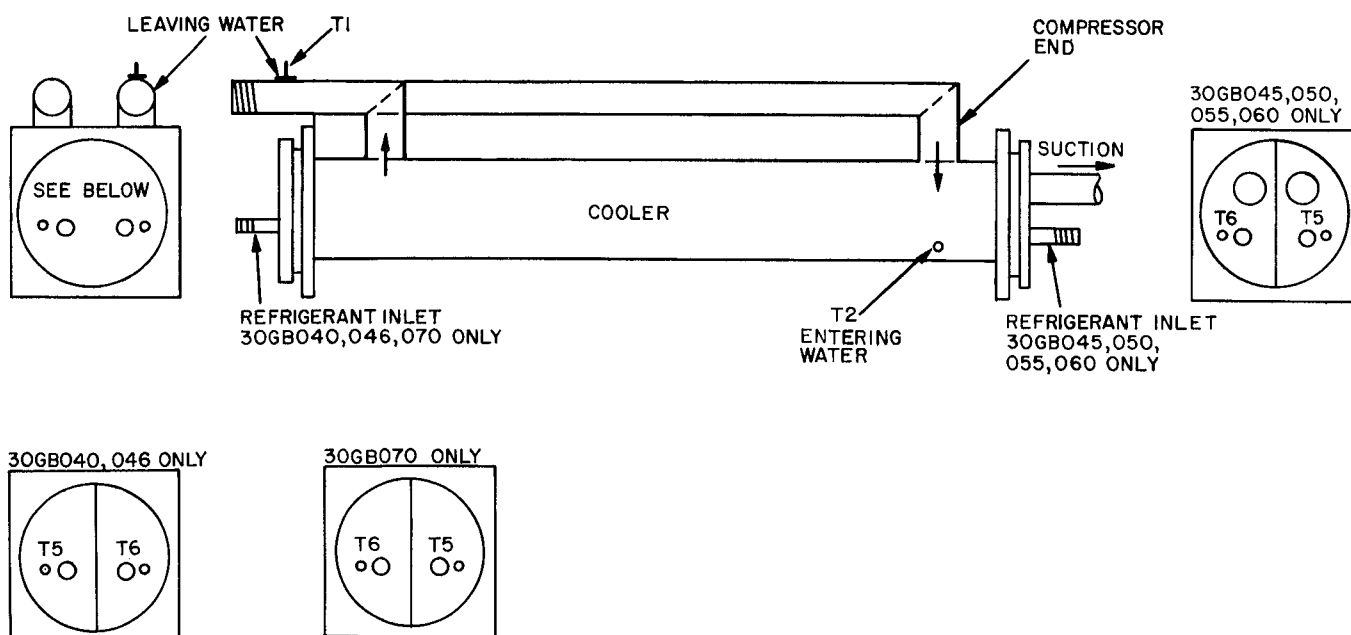
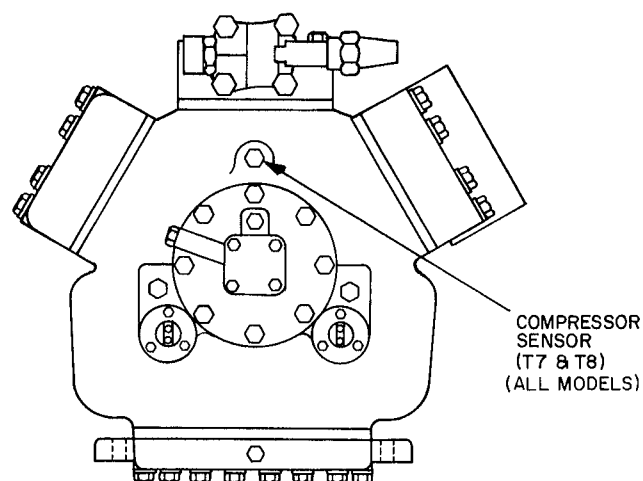


Fig. 11 — Thermistor Locations; 30GB040-070

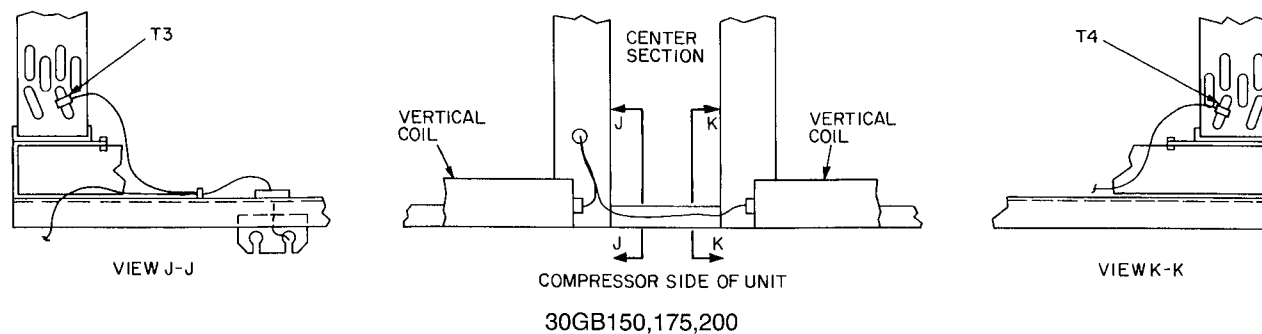
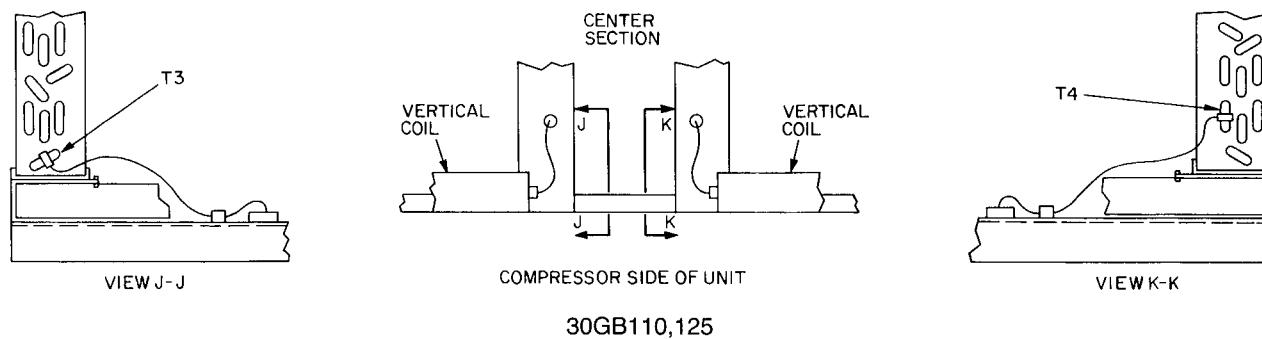
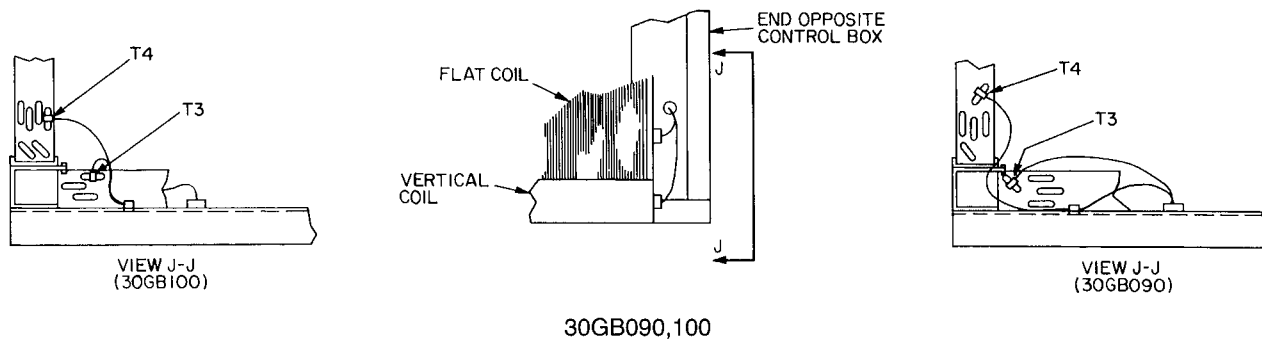
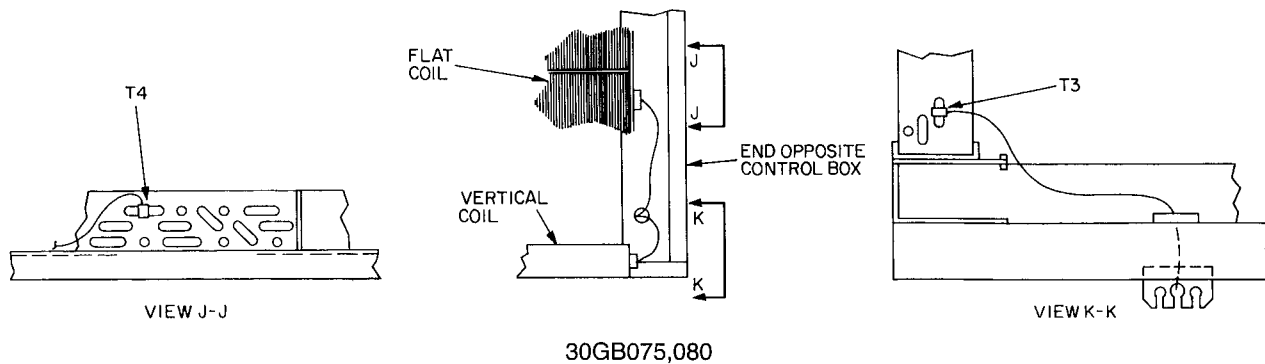


Fig. 12 – Condenser Thermistor Locations

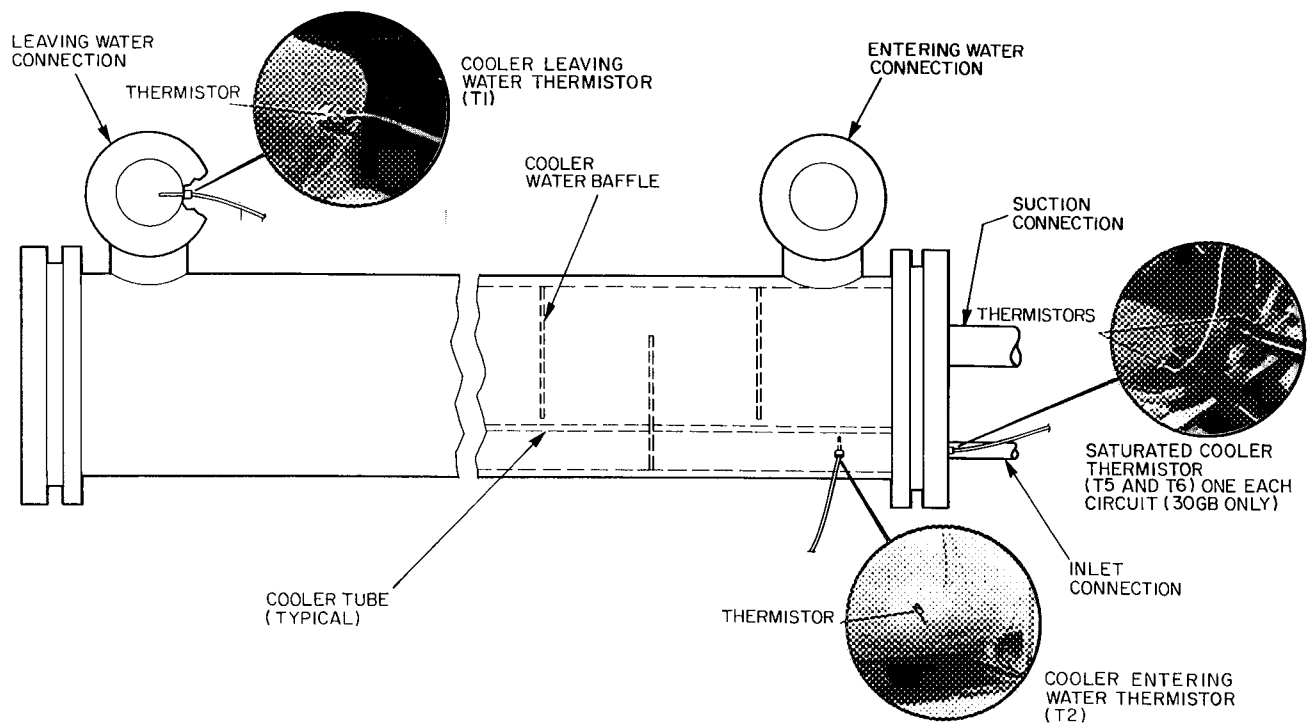


Fig. 13 – Cooler Thermistor Locations; 30GB075-200, 30GT225-280

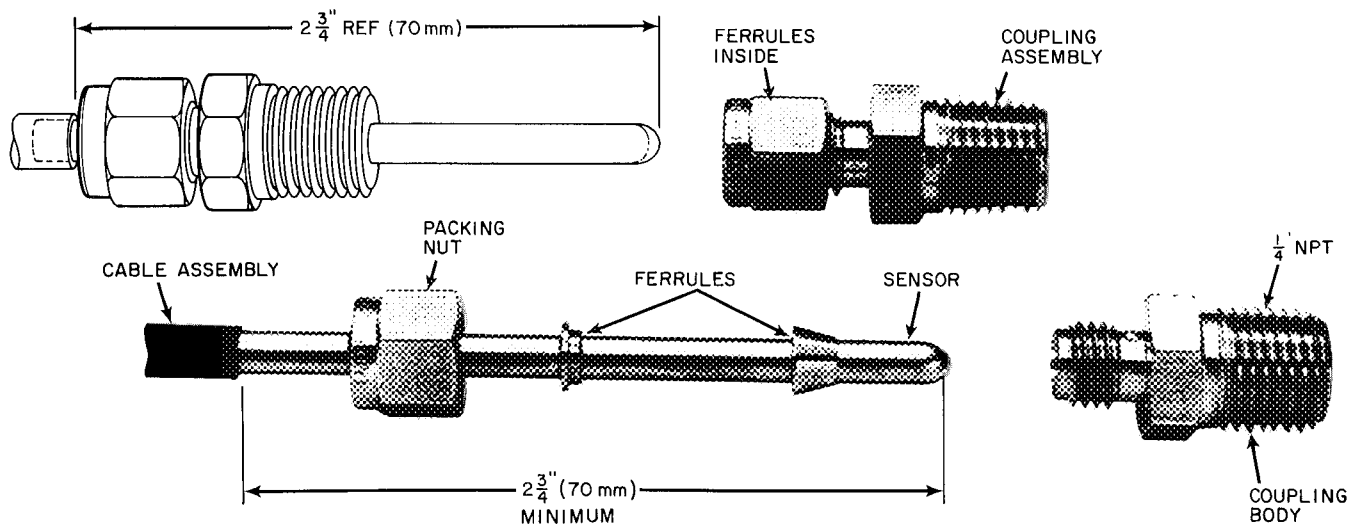


Fig. 14 – Thermistor (Compressor and Cooler)

Table 14a – Thermistor Temperature (F) vs Resistance/Voltage Drop (English)

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

Table 14b – Thermistor (°C) vs Resistance/Voltage Drop (SI)

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
-40	4.896	168 230
-39	4.889	157 440
-38	4.882	147 410
-37	4 874	138 090
-36	4 866	129 410
-35	4.857	121 330
-34	4.848	113 810
-33	4.838	106 880
-32	4.828	100 260
-31	4.817	94 165
-30	4.806	88 480
-29	4 794	83 170
-28	4 782	78 125
-27	4.769	73 580
-26	4.755	69 250
-25	4.740	65 205
-24	4 725	61 420
-23	4 710	57 875
-22	4 693	54 555
-21	4.676	51 450
-20	4 657	48 536
-19	4.639	45 807
-18	4.619	43 247
-17	4 598	40 845
-16	4 577	38 592
-15	4.554	38 476
-14	4 531	34 489
-13	4.507	32 621
-12	4.482	30 866
-11	4.456	29 216
-10	4.428	27 633
-9	4.400	26 202
-8	4.371	24 827
-7	4.341	23 532
-6	4 310	22 313
-5	4.278	21 163
-4	4.245	20 079
-3	4.211	19 058
-2	4.176	18 094
-1	4.140	17 184
0	4.103	16 325
1	4.065	15 515
2	4.026	14 749
3	3 986	14 026
4	3.945	13 342
5	3 903	12 696
6	3 860	12 085
7	3.816	11 506
8	3.771	10 959
9	3.726	10 441
10	3.680	9 949
11	3.633	9 485
12	3 585	9 044
13	3.537	8 627
14	3 487	8 231
15	3.438	7 855
16	3.387	7 499
17	3.337	7 161
18	3.285	6 840
19	3.234	6 536
20	3.181	6 246
21	3.129	5 971
22	3.076	5 710
23	3.023	5 461
24	2.970	5 225
25	2.917	5 000
26	2.864	4 786
27	2 810	4 583
28	2.757	4 389
29	2.704	4 204
30	2.651	4 028
31	2.598	3 861
32	2.545	3 701
33	2.493	3 549
34	2.441	3 404
35	2 389	3 266
36	2 337	3 134
37	2 286	3 008
38	2.236	2 888
39	2.186	2 773
40	2 137	2 663
41	2 087	2 559
42	2 039	2 459
43	1.991	2 363

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
44	1 944	2 272
45	1 898	2 184
46	1 852	2 101
47	1 807	2 021
48	1 763	1 944
49	1.719	1 871
50	1 677	1 801
51	1.635	1 734
52	1 594	1 670
53	1.553	1 609
54	1 513	1 550
55	1 474	1 493
56	1.436	1 439
57	1.399	1 387
58	1.363	1 337
59	1.327	1 290
60	1.291	1 244
61	1.258	1 200
62	1.225	1 158
63	1.192	1 118
64	1.160	1 079
65	1.129	1 041
66	1.099	1 006
67	1.069	971
68	1 040	938
69	1.012	906
70	0.984	876
71	0.949	836
72	0.920	805
73	0.892	775
74	0.865	747
75	0.838	719
76	0.813	693
77	0.789	669
78	0.765	645
79	0.743	623
80	0.722	602
81	0.702	583
82	0.683	564
83	0.665	547
84	0.648	531
85	0.632	516
86	0.617	502
87	0.603	489
88	0.590	477
89	0.577	466
90	0.566	456
91	0.555	446
92	0.545	436
93	0.535	427
94	0.525	419
95	0.515	410
96	0.506	402
97	0.496	393
98	0.486	385
99	0.476	376
100	0.466	367
101	0.454	357
102	0.442	346
103	0.429	335
104	0.416	324
105	0 401	312
106	0.386	299
107	0 370	285

Pressure Transducers (30GT) — Two types of pressure transducers are used on 30GT chillers, a low pressure transducer and a high pressure transducer. The low pressure transducer is identified by a white dot on the body of the transducer, and the high pressure transducer by a red dot. See Fig. 15.

Three pressure transducers are mounted on each lead compressor, two low pressure transducers to monitor compressor suction pressure and oil pressure, and a high pressure transducer to monitor compressor discharge pressure (see Fig. 16 for exact locations on compressor). Each transducer is supplied with 5 vdc power from a rectifier which changes 24 vac to 5 vdc.

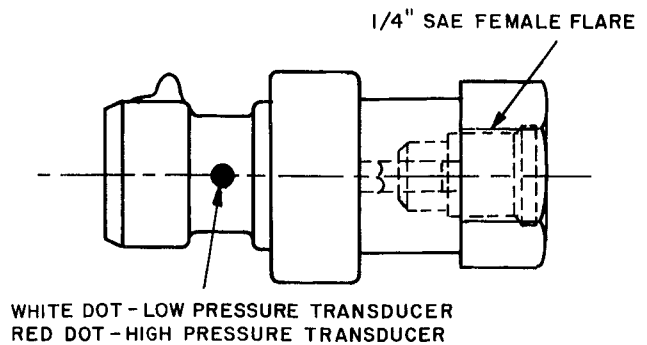


Fig. 15 — Pressure Transducer

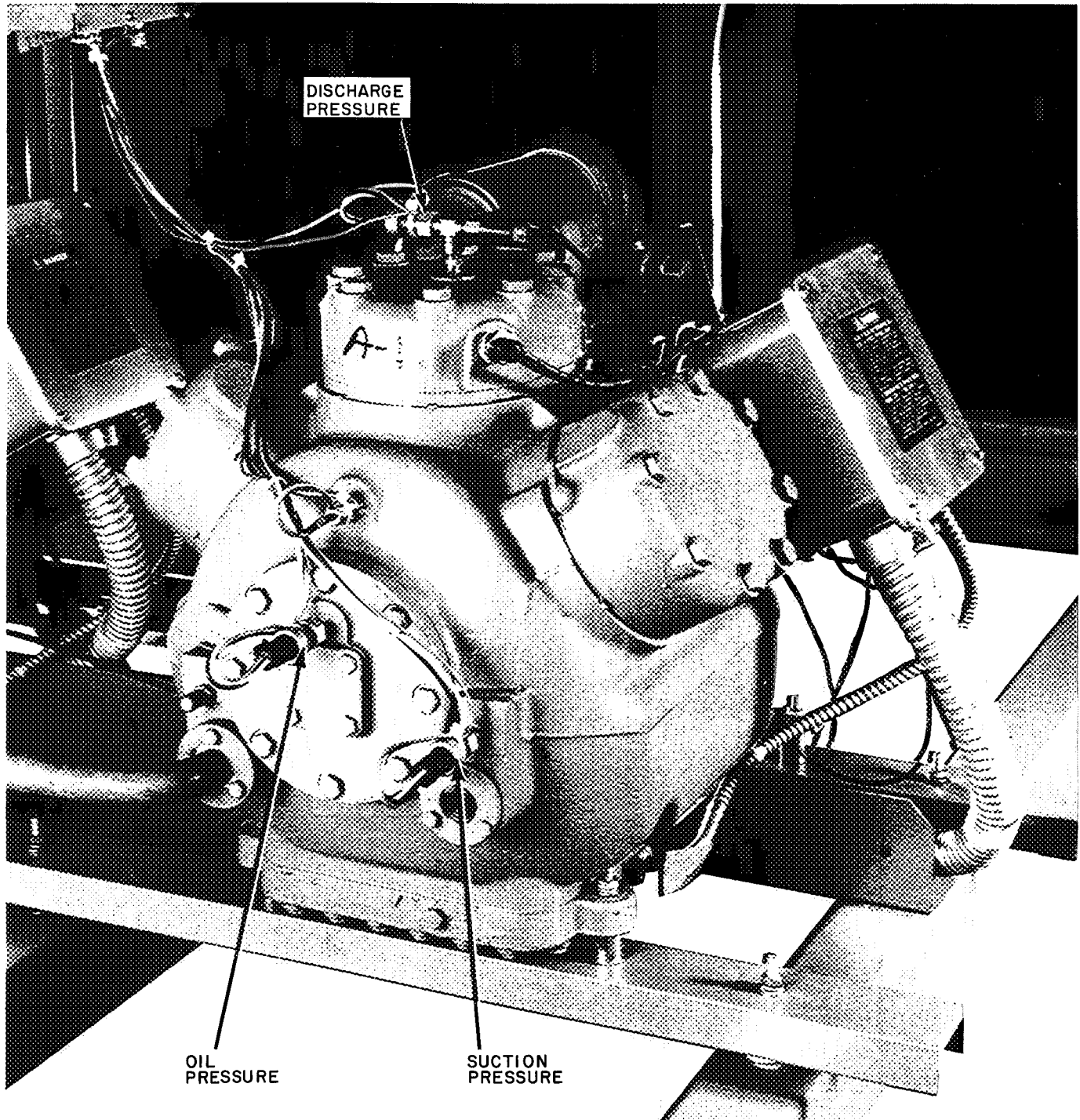


Fig. 16 — Lead Compressor Transducer Locations (3)

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

TRANSDUCER REPLACEMENT

⚠ CAUTION

Transducers are installed directly in the refrigerant circuit. Relieve all refrigerant pressure before removing.

After relieving refrigerant pressure, disconnect transducer wiring at transducer by pulling up on locking tab while pulling weathertight connection plug from end of transducer. **Do not pull on transducer wires.** Unscrew transducer from $\frac{1}{4}$ -in. male flare fitting. When installing new pressure transducer, do not use thread sealer. Thread sealer can plug transducer and render it inoperative. Insert weathertight wiring plug into end of transducer until locking tab snaps in place. Check for refrigerant leaks.

Control Modules

⚠ CAUTION

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

PROCESSOR MODULE (PSIO), OPTIONS MODULE (SIO), LOW-VOLTAGE RELAY MODULE (DSIO), AND EXV DRIVER MODULE (DSIO) — The PSIO, DSIO and SIO 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 PSIO.

RED LED — Blinking continuously at a 3 to 5-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, or for bad module.

GREEN LED — On a PSIO and SIO, 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. See Fig. 17. Proper addresses are:

PSIO (Processor Module) — 01 (different when CCN connected)

DSIO (Relay Module) — 19

DSIO (EXV Driver Module) — 31

SIO (Options Module) — 59

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

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

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

The machine operator communicates with microprocessor through keyboard 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.

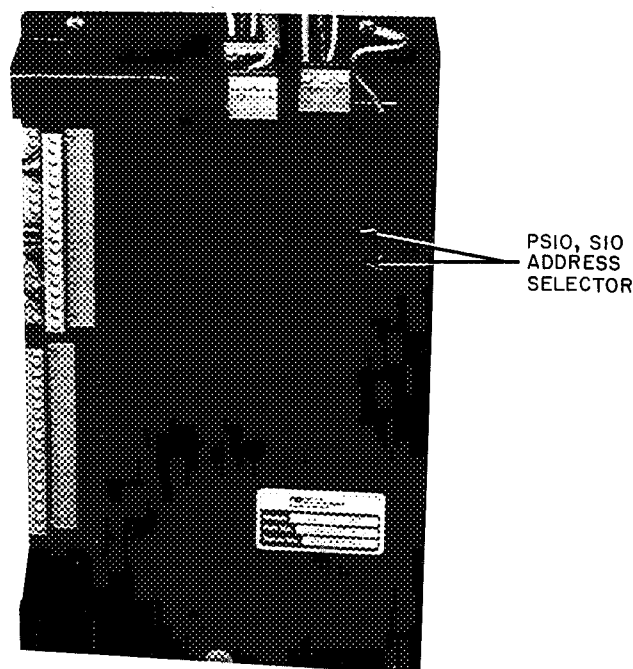
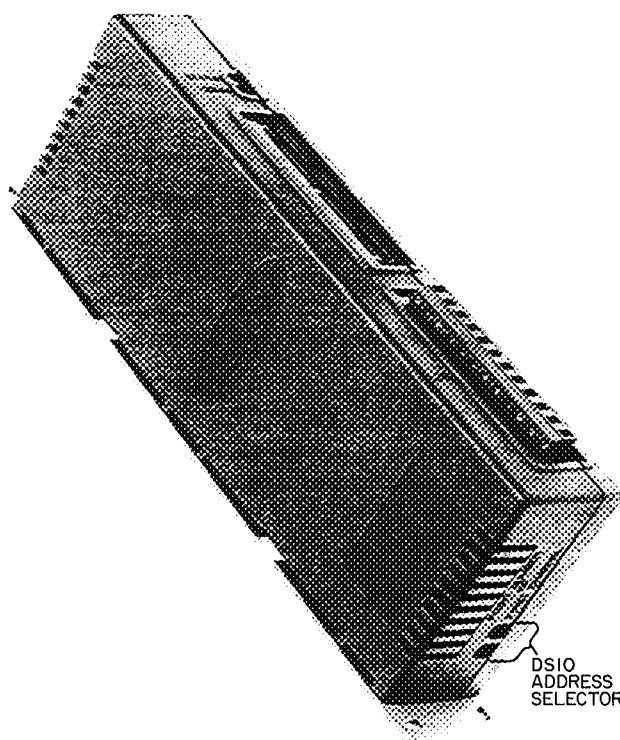


Fig. 17 — Module Address Selector Switch Locations

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

In Flotronic™ II Chillers, processor module, low-voltage relay module, and keyboard and display module are all powered from a common 21-vac power source which connects to terminals 1 and 2 of power input strip on each module. A

separate source of 21-vac power is used to power options module through terminals 1 and 2 on power input strip. A separate source of 12.5 vac power is used to power EXV driver module through terminals 1 and 2 on power input strip.

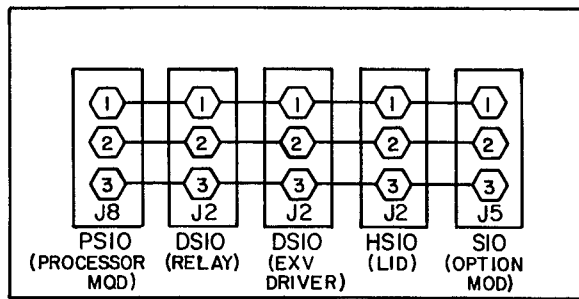


Fig. 18 — Sensor Bus Wiring (Communications)

PROCESSOR MODULE (PSIO) (Fig. 19)

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 individual unit wiring for terminal numbers.

Outputs — Output is 24 vdc. There are 3 terminals, only 2 of which are used, depending on application. Refer to unit wiring diagram.

NOTE: Address switches (see Fig. 18) must be set at 01.

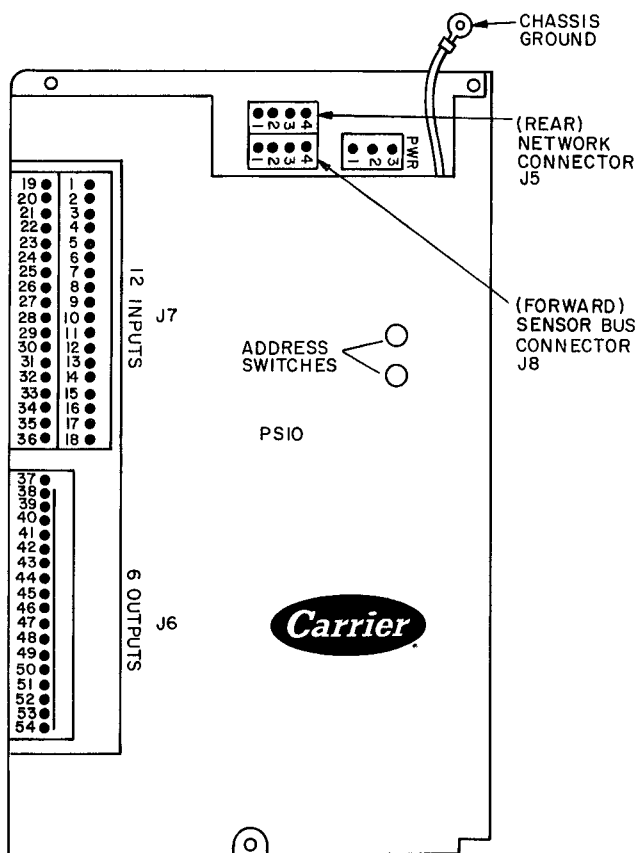


Fig. 19 — Processor Module (PSIO)

LOW VOLTAGE RELAY MODULE (DSIO) (Fig. 20)

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

Outputs — Terminal strips J4 and J5 are internal relays whose coils are powered-up and powered-off by a signal from microprocessor. The relays switch the circuit to which they are connected. No power is supplied to these connections by DSIO module.

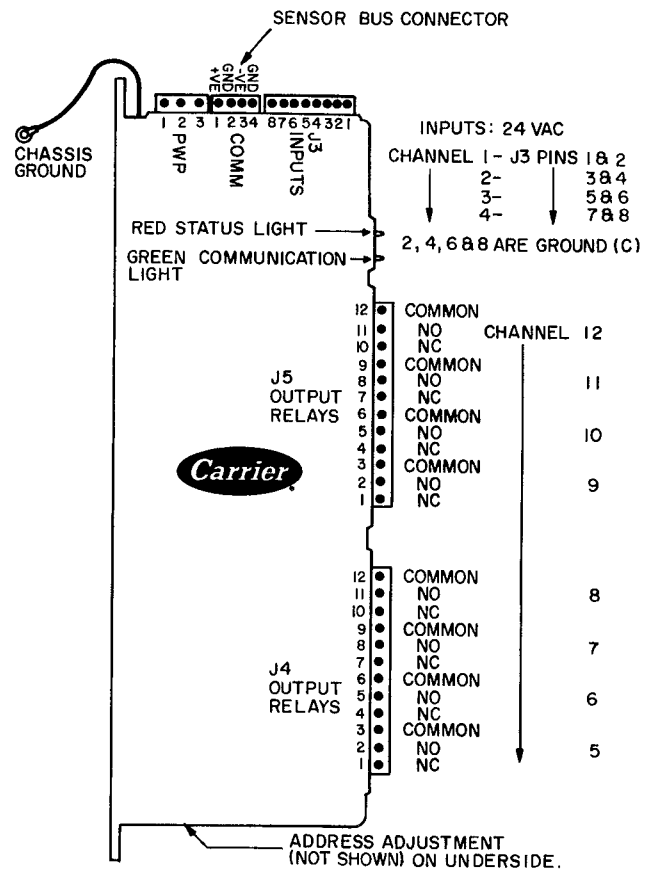


Fig. 20 — Low Voltage Relay Module (DSIO)

OPTIONS MODULE (SIO) (Fig. 21) — Options module allows the following features to be utilized:

1. Temperature Reset by outdoor air or space temperature. A remote thermistor (Part No. 30GB660002) is also required.

NOTE: This accessory is *not* required for return water temperature reset.

2. Temperature Reset by remote 4-20 mA signal.
3. Demand Limit by remote 2-stage switch.
4. Demand Limit by remote 4-20 mA signal
5. Dual Set Point by remote switch.
6. Accessory Compressor Unloaders

Convenient terminal block connections are provided within chiller control box when using these features. See Field Wiring section of this guide, Fig. 22-32.

The options module is standard on 30GB040-200 chillers. On 30GT225-280 chillers it is an accessory and must be field installed (Part No. 30GT910076). For installation, refer to instructions supplied with the accessory package.

Remember to reconfigure the chiller for each feature selected (see Adjustable Field Configurations, page 32). For temperature reset, demand limit and dual set point, desired set points must be entered through keyboard and display module (see Set Point Function section of this guide).

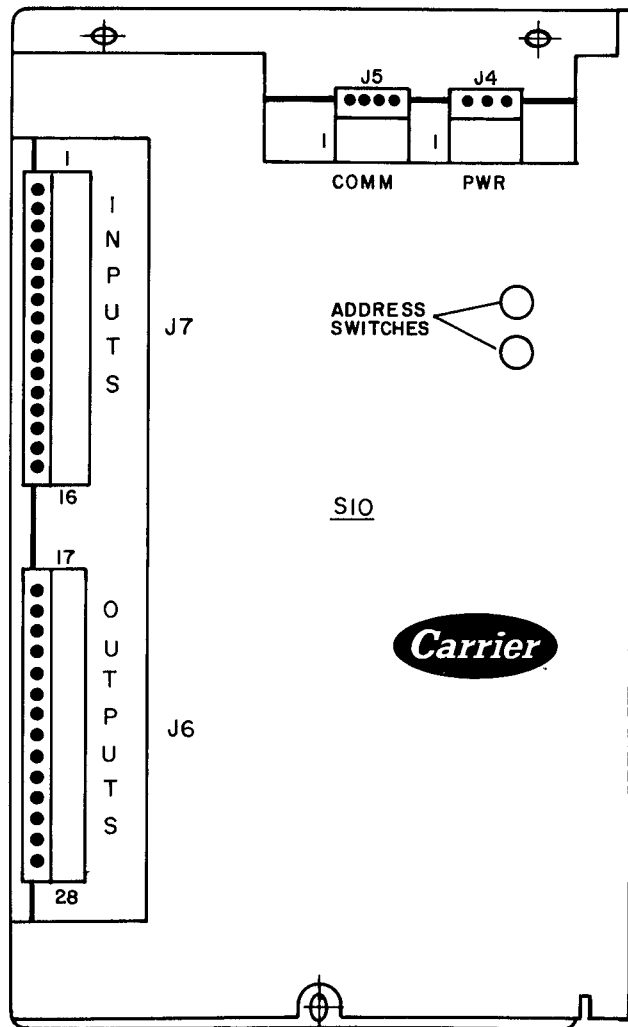


Fig. 21 — Options Module (SIO)

TROUBLESHOOTING

SYMPTOMS	CAUSE	REMEDY
COMPRESSOR DOES NOT RUN	Power line open Control fuse open Safety thermostat tripped (DGT) or High Pressure Switch (HPS) tripped Tripped power breaker Loose terminal connection Improperly wired controls Low line voltage Compressor motor defective Seized compressor	Reset circuit breaker. Check control circuit for ground or short Replace fuse. Move RUN/STOP/CCN switch to STOP then back to RUN or CCN. Check the controls. Find cause of trip and reset breaker. 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.
COMPRESSOR CYCLES OFF ON LOW PRESSURE	Loss of charge Bad transducer Low refrigerant charge	Repair leak, recharge. Replace transducer. Add refrigerant.
COMPRESSOR SHUTS DOWN ON HIGH PRESSURE CONTROL	High-pressure control erratic in action Compressor discharge valve partially closed Condenser fan(s) not operating	Replace control. Open valve or replace if defective. Check wiring. Repair or replace motor(s) if defective.
UNIT OPERATES LONG OR CONTINUOUSLY	Low refrigerant charge Control contacts fused Partially plugged or plugged expansion valve or filter drier Defective insulation Service load Inefficient compressor	Add refrigerant. Replace control. Clean or replace. Replace or repair. Keep doors and windows closed. Check 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. Check valve plates for valve noise. Replace compressor (worn bearings). Check for loose compressor hold-down bolts.
COMPRESSOR LOSES OIL	Leak in system Mechanical damage (blown piston or broken discharge valve) Oil trapped in line Crankcase heaters not energized during shutdown	Repair leak. Repair damage or replace compressor. Check piping for oil traps. Replace heaters, check wiring and crankcase heater relay contacts.
FROSTED SUCTION LINE	Expansion valve admitting excess refrigerant	Check cooler and compressor thermistors. Test EXV.
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 DOES NOT UNLOAD	Burned out coil Defective capacity control valve Miswired solenoid Weak, broken or wrong valve body spring	Replace coil. Replace valve. Rewire correctly. Replace spring
COMPRESSOR DOES NOT LOAD	Miswired solenoid Defective capacity control valve Plugged strainer (high side) Stuck or damaged unloader piston or piston ring(s)	Rewire corrected. Replace valve. Clean or replace strainer. Clean or replace the necessary parts.

ACCESSORY UNLOADER INSTALLATION

Units 30GB090-200 do not provide unloaders as a standard offering. Units 30GB040-080 provide one unloader. It is possible to add one additional unloader to 30GB040-080, and one or 2 unloaders to 30GB090-150. One or 2 unloaders can also be added to 30GT225-280. Unloaders cannot be used on 30GB175, 200

If unloaders are desired, an accessory unloader package is used. Package includes a suction cutoff unloader head package. In addition for 30GB units, a 24-v unloader coil should be ordered. The 115-v coil in unloader package can be used with 30GT units. Consult current Carrier price pages for appropriate part numbers.

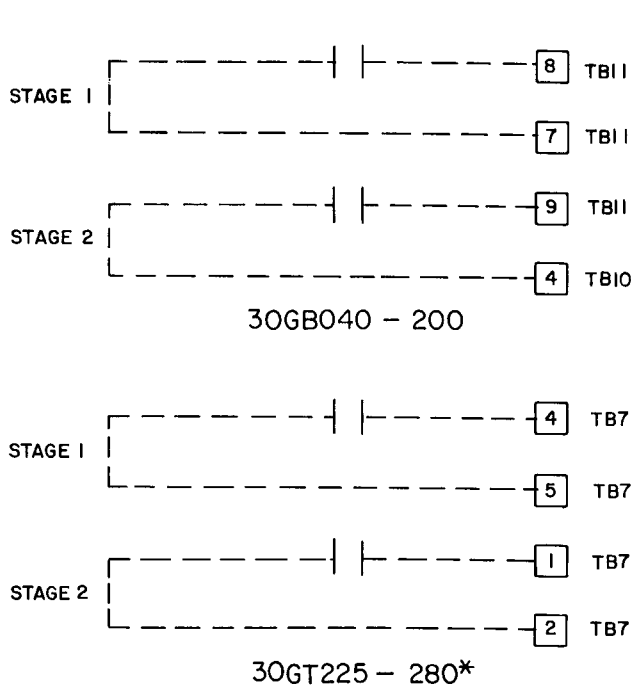
In order to apply accessory unloaders to 30GT chillers, accessory options module package (Part No. 30GT910076) must be used. All additional components and wiring required are included in this accessory package along with detailed instructions.

The first unloader must always be connected to lead compressor in circuit A and second unloader must be connected to lead compressor in circuit B. Use the following procedure to install unloaders:

1. Using Test function, pump refrigerant charge for circuit affected into condenser.

2. Valve off all compressors in circuit and relieve pressure in circuit. Install unloader head using standard 06E compressor service procedures. Only suction cutoff unloaders can be used with Flotronic™ II control.
3. Evacuate compressor and bleed refrigerant into compressor. Check for leaks.
4. To simplify installation, unit has been prewired at factory. Two wires have been run to lead compressor junction box. For 30GB chillers, circuit A, connect unloader coil to pink wires in junction box of lead compressor. For 30GT chillers, circuit A, connect unloader coil to gray wires in junction box of lead compressors. In circuit B, 30GB and 30GT chillers, connect second unloader (if used) to gray wires in junction box of lead compressor.
5. Reconfigure chiller for correct number of unloaders in circuit A and circuit B. See the Adjustable Field Configurations section in this guide.
6. Before starting unit, check operation of unit and unloaders, using the Test function.
- 7 Start unit and confirm chiller operates properly.

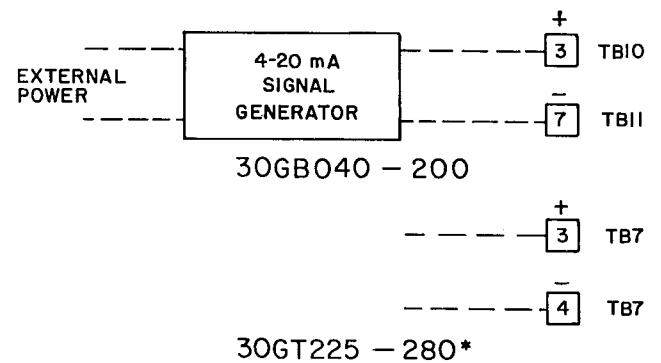
FIELD WIRING



*Require accessory options module package.

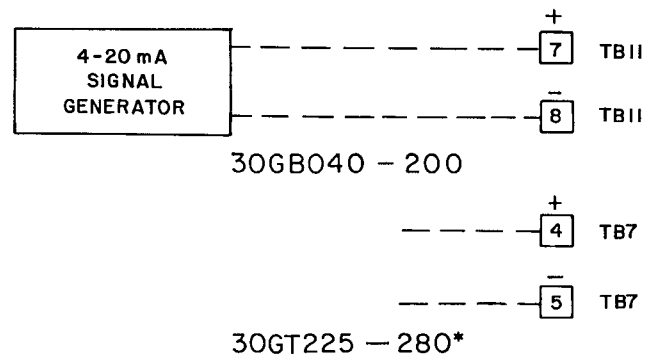
NOTE: Contacts must be rated for dry circuit application, capable of reliably switching a 5vdc, 1 mA to 20 mA load.

Fig. 22 - Demand Limit - Two External Switch Inputs



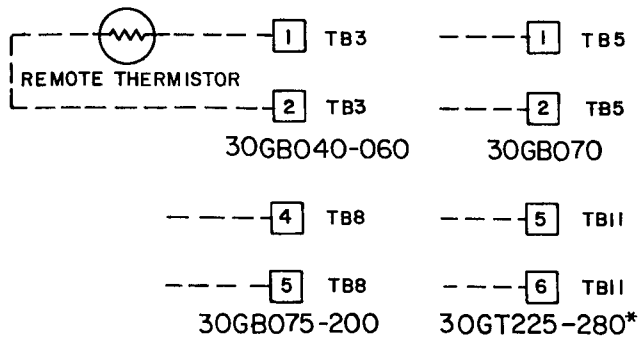
*Require accessory options module package.

Fig. 23 - Demand Limit - 4-20 mA Signal (Externally Powered)



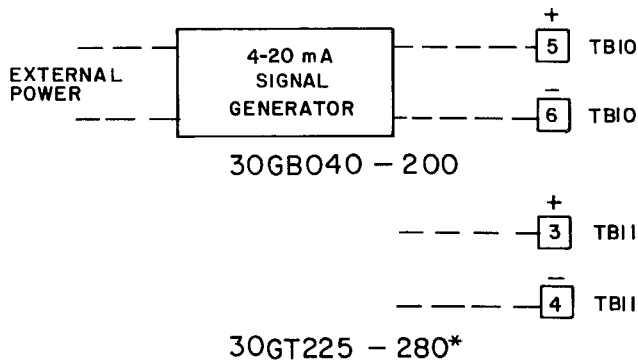
*Require accessory options module package.

Fig. 24 - Demand Limit - 4-20 mA Signal (Internally Powered)



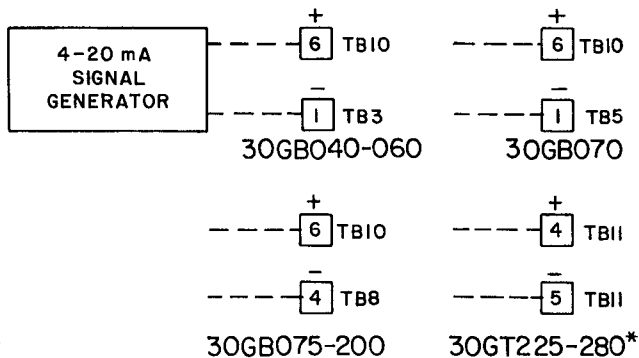
*Require accessory options module package.

Fig. 25 – Remote Reset from Space or Outside Air Temperature



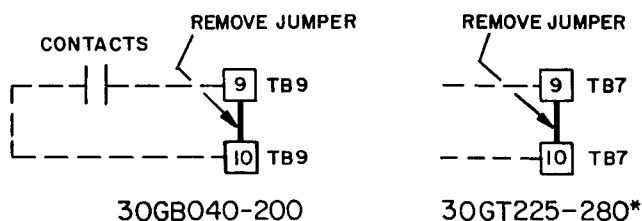
*Require accessory options module package.

Fig. 26 – Remote Reset from 4-20 mA Signal (Externally Powered)



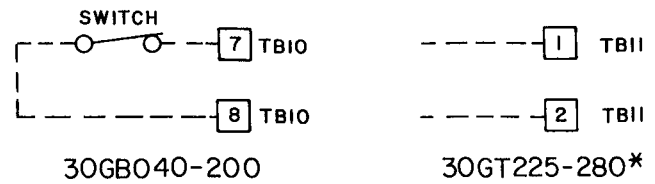
*Require accessory options module package.

Fig. 27 – Remote Reset from 4-20 mA Signal (Internally Powered)



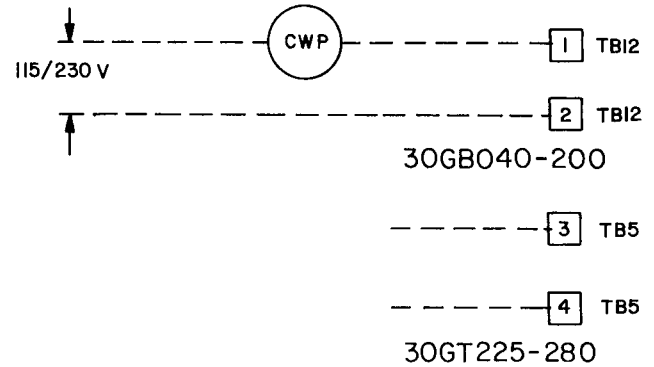
NOTE: Contacts must be rated for dry circuit application, capable of reliably switching a 5 vdc, 1 mA to 20 mA load.

Fig. 28 – Remote On/Off



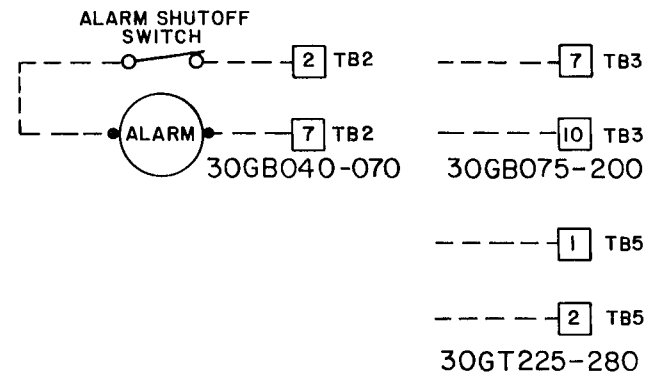
*Require accessory options module package.

Fig. 29 – Remote Dual Set Point Control



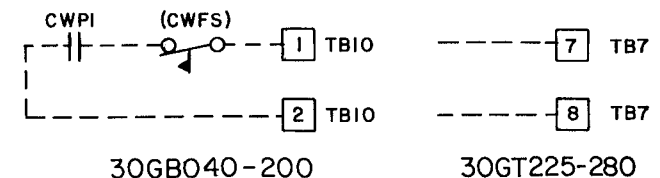
NOTE: The maximum load allowed for the chilled water pump circuit is 125 va sealed, 1250 va inrush at 115 or 230 volts

Fig. 30 – Chilled Water Pump



NOTE: The maximum load allowed for the alarm circuit is 125 va sealed, 1250 va inrush at 115 or 230 volts

Fig. 31 – Remote Alarm



CWPI – Chilled Water Pump Interlock
CWFS – Chilled Water Flow Switch (not required – low flow protection is provided by Flotronic™ II controls)

NOTE: Contacts must be rated for dry circuit application, capable of reliably switching a 5 vdc, 1 mA to 20 mA load.

Fig. 32 – Interlocks

REPLACING DEFECTIVE PROCESSOR MODULE

The replacement part number is printed on a small label on front of the PSIO module. The model and serial numbers are printed on the unit nameplate located on an exterior corner post. The proper software and unit configuration data is factory installed by Carrier in the replacement module. Therefore, when ordering a replacement processor module (PSIO), specify complete replacement part number, *full* unit model number, and serial number. If these numbers are not provided, the replacement module order is configured instead as a generic Flotronic™ II replacement module. This requires reconfiguration of the order by the installer.

⚠ CAUTION

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

Installation

1. Verify the existing PSIO module is defective, by using the procedure described in Troubleshooting section, Control Modules.
2. Refer to Start-Up Checklist for Flotronic™ II Chiller Systems (completed at time of original start-up) found in job folder. This information is needed later in this procedure. If checklist does not exist, fill out the and configuration code sections on a new checklist. Tailor the various options and configurations as needed for this particular installation.
3. Check that all power to unit is off. Carefully disconnect all wires from defective module by unplugging the six connectors. It is not necessary to remove any of the individual wires from the connectors. Remove the green ground wire.
4. Remove defective PSIO by removing its mounting screws with a Phillips screwdriver, and removing the module from the control box. Save the screws for later use.
5. Use a small screwdriver to set address switches S1 and S2 on the new PSIO module to exactly match the settings on the defective module.
6. Package the defective module in the carton of the new module for return to Carrier.
7. Mount the new module in the unit control box using a Phillips screwdriver and the screws saved in step 4 above.
8. Reinstall all 6 wire connectors and the green ground wire.
9. Carefully check all wiring connections before restoring power.
10. Verify the LOCAL/STOP/CCN switch is in STOP position.
11. Restore control power. Verify the red and green lights on top of PSIO and front of each DSIO module respond as described in Troubleshooting section, Control Modules. The keyboard and display module (HSIO or LID) should also begin its rotating display.
12. Using the keyboard and display module in , verify the software version number matches the ER number shown on the PSIO label.
13. In , verify that the 6 Factory Configuration Codes (CODE 1 through CODE 6) exactly match the codes listed for this unit model on the component arrangement label on the control box door. If they are different or are all zeros, reenter the 6 codes. If any changes are required, the PSIO display becomes blank and reconfigures itself after pressing the key while displaying CODE 6. The display returns in approximately 15 seconds.
14. In , verify each item is configured as needed for this particular installation. Table 8 shows the factory configuration code default settings. Table 8 also shows the service replacement code default settings which are used if no model number was specified when ordering the replacement PSIO module. It is strongly suggested that the Start-Up Checklist for Flotronic™ II Chiller Systems (completed at time of original start-up) be used at this time to verify and/or reprogram the various options and configurations required for this job.
15. After completing the configuration steps outlined above, restore main power and perform a unit test as described in and section of this book.
16. Complete this procedure and restore chiller to normal operation by returning the LOCAL/STOP/CCN switch to desired position.

