Carrier
HEATING & COOLING

REPLACED BY 30G-1T

DATE 6/94

040-420
250,280
Chillers
0/60 Hz

Contro ing

with M

CONTENTS

SAFETY CONSIDERATIONS

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

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

⚠ WARNING

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

⚠ WARNING

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

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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GENERAL

IMPORTANT: This publication contains controls, operation and troubleshooting data for 30GN040-420 and 30GT225, 250, and 280 Flotronic™ II chillers,

Circuits are identified as circuits A and B, and compressors are identified as A1, A2, etc. in circuit A, and B1, B2, etc. in circuit B.

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

The 30G Series standard Flotronic II chillers feature microprocessor-based electronic controls and an electronic expansion valve (EXV) in each refrigeration circuit.

NOTE: The 30GN040 and 045 chillers with a factory-installed brine option have thermal expansion valves (TXV) instead of the EXV.

Unit sizes 240,270, and 300-420 are modular units which are shipped as separate sections (modules A and B). Installation instructions specific to these units are shipped inside the individual modules. See Table 1 for a listing of unit sizes and modular combinations. For modules 240B and 270B, follow all general instructions as noted for unit sizes 080-110. For all remaining modules, follow instructions for unit sizes 130-210.

Table 1 — Unit Sizes and Modular Combinations

UNIT MODEL	NOMINAL TONS	SECTION A UNIT	SECTION B UNIT
30G N040	40		—
30G NO45	45	—	
30GN050	50	—	—
30GN060	60		—
30GN070	70	—	
30GN080	80	—	—
30GN090	90	—	—
30GN100	100	—	—
30GN110	110	—	—
30GN130	125	—	—
30GN150	145	—	—
30GN170	160	—	—
30GN190	180	—	—
30GN210	200	—	—
30GT225	225	—	
30GN240	225	30GN130	30GN100
30GT250	250	—	—
30GN270	260	30GN170	30GN100
30GT280	280	—	—
30GN300	285	30GN130	30GNf 70
30GN330	325	30GN170	30GN170
30GN360	350	30GN190	30GNf 90/30GN170*
30GN390	380	30GN210	30GN190
30GN420	400	30GN210	30GN210

*60 Hz units/50 Hz units.

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 EXVs, an EXV driver module (DSIO-EXV), a 6-pack relay board, a keypad and display module (also called HSIO or LID), thermistors, and transducers to provide inputs to the microprocessor. An options module (SIO) is used to provide additional functions. This module is standard on 30GN modules and is a field-installed accessory on the 30GT Flotronic II units. See Fig. 1.

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 thermistors and communicates with the relay modules 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 relay module, the EXV driver module, and the keypad and display module through a 3-wire communications bus. When used, the options module is also connected to the communications bus.

For the Flotronic II chillers, the processor monitors system pressure by means of 6 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 coil pressure signal is ignored for 2 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 all compressors and transmits this information to the processor.

Electronic Expansion Valve Module — This module receives signals from the processor and operates the electronic expansion valves.

Options Module — This module allows the use of Flotronic II features such as dual set point, remote reset, demand limit, hot gas bypass, 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 040-210 and modular 240-420 units. It is a field-installed accessory for 225, 250 and 280 units.

Keypad and Display Module (also called HSIO or LID) — This device consists of a keypad with 6 function keys, 5 operative keys, 12 numeric keys, and an alphanumeric g-character LCD. Key usage is explained in Accessing Functions and Subfunctions section on page 28.

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

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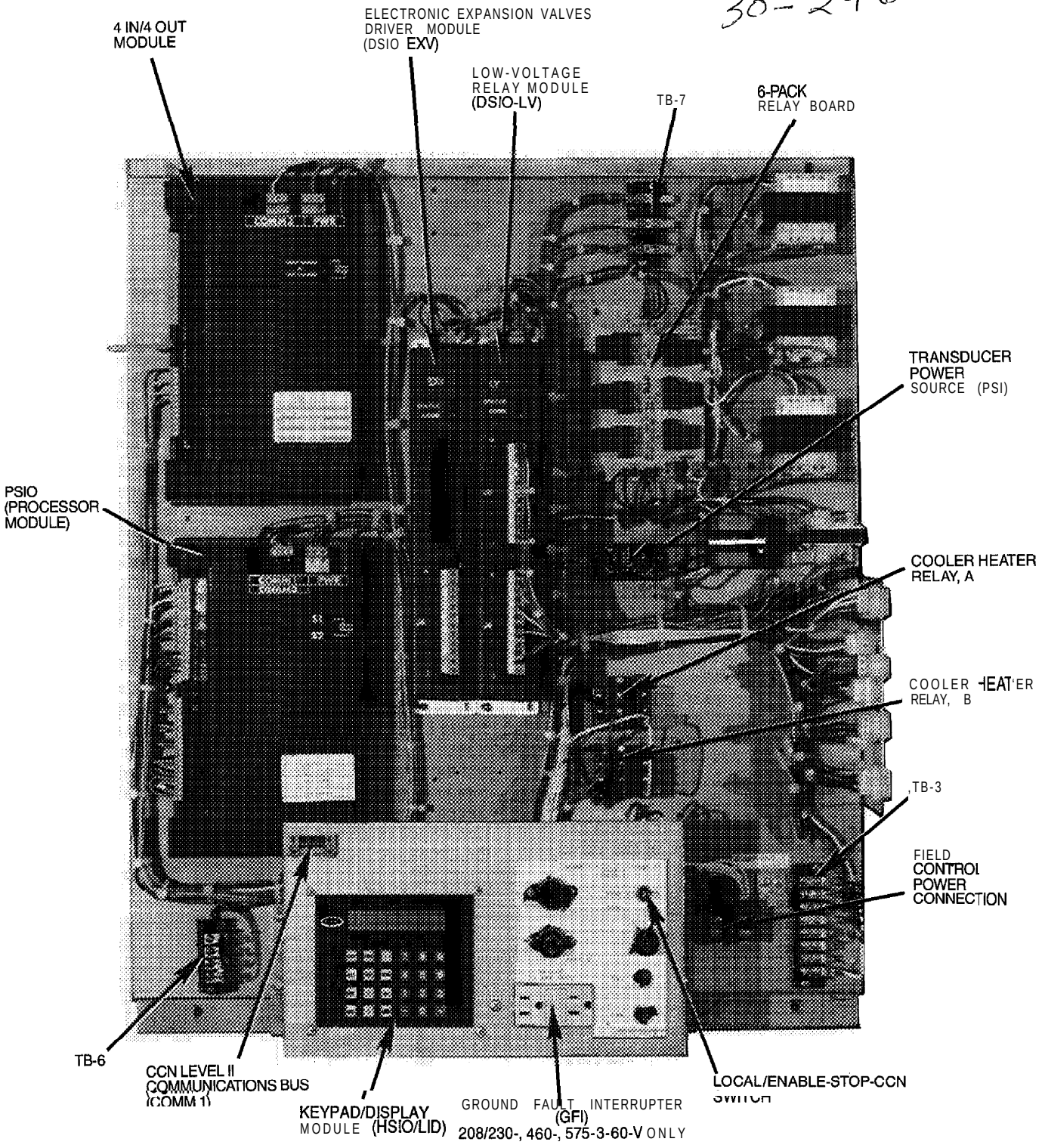


LEGEND

CCN — Carrier Comfort Network
TB — Terminal Block

Fig. 1 — 30GN Control Panel (040-110, 240B, 270B Unit Shown)

In the **LOCAL/ENABLE** position, the chiller is under local control and responds to the scheduling configuration and set point data input at its own local interface device (keypad 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 keypad 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 from the CCN network, except that an emergency stop command shuts down the chiller immediately and causes " "ALARM 52" to be displayed.

Table 2 — LOCAL/ENABLE-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/ENABLE	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

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

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 F (16 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 units use 6 standard pressure transducers and 4 standard thermistors to monitor system pressures and temperatures at various points within the chiller. Sensors are listed in Table 3.

Table 3 — Thermistor and Transducer Locations

THERMISTORS	
Sensor	**Location**
T1	Cooler Leaving Water Temp
T2	Cooler Entering Water Temp
T7	Compressor Suction Gas Temp Circuit A
T8	Compressor Suction Gas Temp Circuit B
T10	Remote Temperature Sensor (Accessory)
PRESSURE TRANSDUCERS	
Sensor	**Location**
DPT-A	Compressor Al Discharge Pressure
SPT-A	Compressor Al Suction-Pressure
OPT-A	Compressor Al Oil Pressure
DPT-B	Compressor Bl Discharge Pressure
SPT-B	Compressor B1 Suction Pressure
OPT-B	Compressor B1 Oil Pressure

Compressor Protection Control Module (CPCS) — Each compressor on models 30GN070 (50 Hz), 080-100, and 240B, 270B, has its own CPCS as standard equipment. All 30GN040-060 and 070 (60 Hz) units feature the CPCS as an accessory, and CR (control relay) as standard equipment. See Fig. 2. The 30GN130-2 10 and associated modular units and the 30GT225, 250, and 280 Flotronic II units have a CR as standard equipment. The CPCS or CR is used to control and protect the compressors and crankcase heaters. The CPCS provides the following functions:

- compressor contactor control
- crankcase heater control
- compressor ground current protection
- status communication to processor board
- high-pressure protection

The CR provides all of the same functions as the CPCS with the exception of compressor ground current protection. Ground current protection is accomplished by using a CGF (compressor ground fault) board in conjunction with the CR. The CGF provides the same ground fault function as the CPCS for units where the CPCS is not utilized.

One large relay is located on the CPCS board. This relay (or CR) controls the crankcase heater and compressor contactor. The CPCS also provides a set of signal contacts that the microprocessor monitors to determine the operating status of the compressor. If the processor board determines that the compressor is not operating properly through the signal contacts, it will lock the compressor off by deenergizing the proper 24-v control relay on the relay board. The CPCS board contains logic that can detect if the current-to-ground of any compressor winding exceeds 2.5 amps. If this condition occurs, the CPCS module shuts down the compressor.

A high-pressure switch with a trip pressure of 426 ± 7 psig (2936 ± 48 kPa), is wired in series with the CPCS. If this switch opens during operation, the compressor stops and the failure is detected by the processor when the signal contacts open. The compressor is locked off. If the lead compressor in either circuit is shut down by the high pressure switch or ground current protector, all compressors in the circuit are locked off.

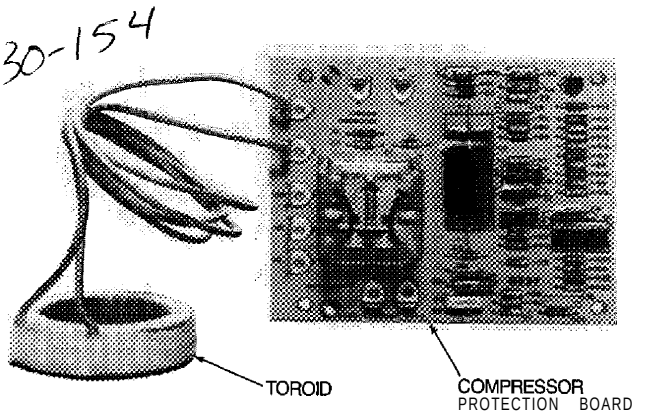


Fig. 2 — Compressor Protection Control Module

OPERATION DATA

Capacity Control – The control system cycles compressor to give capacity control steps as shown in Tables 4A-4D. 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 outdoor air temperature reset features. It can also be reset from an external 4-20 mA signal with a loop isolator, or from a network signal.

The operating sequences shown are some of many possible loading sequences for the control of the leaving water temperature. If a circuit has more unloaders than another, that circuit will always be the lead circuit.

Table 4A – Capacity Control Steps, 040-070

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
040 (60 Hz) A1†	1	25	A1*	–	–
	2	50	A1	–	–
	3	75	A1*, B1	–	–
	4	100	A1 ,B1	–	–
040 (60 Hz) A1†,B1**	1	25	A1*	25	B1*
	2	50	A1	50	B1
	3	75	A1*,B1	75	A1,B1*
	4	100	A1 ,B1	100	A1,B1
040 (60 Hz) 045 (60 Hz) A1†	1	24	A1"	–	–
	2	47	A1		–
	3	76	A1*,B1	–	–
	4	100	A1 ,B1	–	–
040 (50 Hz) 045 (60 Hz) A1†,B1**	1	24	A1*	37	B1*
	2	47	A1	53	
	3	61	A1*,B1*	61	A1 ,*
	4	76	A1 *,B1	84	A1 ,B1*
	5	100	A1 ,B1	100	A1 ,B1
040 (50 Hz) 045 (60 Hz) A1†,B1**	1	–	–	21	B1††
	2	–	–	37	B1*
	3	–	–	53	B1
	4	–	–	68	A1,B1††
	5	–	–	84	A1,B1*
	6	–	–	100	A1,B1
045 (50 Hz) 050 (60 Hz) A1†	1	31	A1*	–	–
	2	44	A1	–	–
	3	87	A1 *,B1	–	–
	4	100	A1 ,B1	–	–
045 (50 Hz) 050 (60 Hz) A1†,B1**	1	31	A1*	38	B1*
	2	44	A1	56	B1
	3	69	A1*,B1*	69	A1*,B1*
	4	87	A1 *,B1	82	A1,B1*
	5	100	A1 ,B1	100	A1 ,B1
045 (50 Hz) 050 (60 Hz) A1†**	1	18	A1††	–	–
	2	31	A1*	–	–
	3	73	A1††,B1	–	–
	4	87	A1*,B1	–	–
	5	100	A1 ,B1	–	
045 (50 Hz) 050 (60 Hz) A1†**,B1**	1	18	A1††	–	–
	2	31	A1*	–	–
	3	44	A1	–	–
	4	56	A1††,B1*	–	–
	5	73	A1 ††,B1	–	–
	6	87	A1 *,B1	–	–
	7	100	A1 ,B1	–	–
045 (50 Hz) 050 (60 Hz) A1†,B1**	1	–	–	20	B1††
	2	–	–	38	B1*
	3		–	56	B1
	4	–	–	51	A1*,B1††
	5	–	–	64	A1,B1††
	6	–	–	82	A1,B1*
	7	–	–	100	A1 ,B1

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory.
††Two unloaders, both unloaded.

Table 4A — Capacity Control Steps, 040-070 (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
045 (50 Hz) 050 (60 Hz) A1†**,B1**	1	18	A1††	20	B1††
	2	31	A1*	38	B1*
	3	44	A1	56	B1
	4	56	A1††,B1*	64	A1,B1††
	5	73	A1††,B1	82	A1,B1*
	6	87	A1*,B1	100	A1,B1
	7	100	A1.B1	—	—
050 (50 Hz) 060 (60 Hz) A1†	1	28	A1*	—	—
	2	42	A1	—	—
	3	87	A1*,B1	—	—
	4	100	Al ,B1	—	—
050 (50 Hz) 060 (60 Hz) A1†,B1**	1	28	A1*	38	Bl*
	2	42		58	B1
	3	67	A1 %.*	67	A1*,B1*
	4	87	A1*,B1	80	Al ,B1*
	5	100	Al ,B1	100	Al ,B1
050 (50 Hz) 060 (60 Hz) A1†**	1	15	A1††	—	—
	2	28	A1*	—	—
	3	73	A1††,B1	—	—
	4	87	A1*,B1	—	—
	5	100	Al ,B1	—	—
050 (50 Hz) 060 (60 Hz) A1†**,B1**	1	15	A1††	—	—
	2	28	A1*	—	—
	3	42	A1	—	—
	4	53	A1,B1*	—	—
	5	73	A1††,B1	—	—
	6	87	A1*,B1	—	—
	7	100	A1.B1	—	—
050 (50 Hz) 060 (60 Hz) A1†,B1**	1	—	—	18	B1††
	2	—		38	B1*
	3			58	B1
	4	—	—	60	A1,B1††
	5	—	—	80	A1,B1*
	6	—	—	100	A1.B1
050 (50 Hz) 060 (60 Hz) A1†**,B1**	1	15	A1††	18	B1††
	2	28	A1*	38	B1*
	3	42	A1	58	B1
	4	53	A1††,B1*	60	A1,B1††
	5	73	A1††,B1	80	A1,B1*
	6	87	A1*,B1	100	A1,B1
	7	100	Al ,B1	—	
060 (50 Hz) 070 (60 Hz) A1†	1	33	Al*	—	—
	2	50	A1	—	—
	3	83	A1*,B1	—	—
	4	100	Al ,B1		—
060 (50 Hz) 070 (60 Hz) A1†,B1**	1	33	A1*	33	B1*
	2	50	A1	50	B1
	3	67	A1*,B1*	66	A1*,B1*
	4	83	Al *,B1	83	Al ,B1*
	5	100	Al ,B1	100	A1,B1
060 (50 Hz) 070 (60 Hz) A1†**	1	16	A1††	—	
	2	33	A1*	—	
	3	66	A1††,B1		—
	4	83	A1*	—	—
	5	100	Al ,B1	—	—
060 (50 Hz) 070 (60 Hz) A1†**,B1**	1	16	A1††		—
	2	33	A1*	—	—
	3	50	A1	—	
	4	66	A1††,B1	—	—
	5	83	A1*,B1	—	—
	6	100	A1,B1	—	—
060 (50 Hz) 070 (60 Hz) A1†,B1**	1	—	—	16	B1††
	2	—	—	33	B1*
	3	—	—	50	B1
	4	—	—	66	A1,B1††
	5	—	—	83	A1,B1*
	6	—	—	100	A1.B1

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory.
††Two unloaders, both unloaded.

Table 4A — Capacity Control Steps, 040-070 (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
060 (50 Hz) 070 (60 Hz) A1†**,B1**	1	16	A1††	16	B1††
	2	33	A1*	33	B1*
	3	50	A1	50	B1
	4	66	A1††,B1	66	A1,B1††
	5	83	A1*,B1	83	A1,B1*
	6	100	A1,B1	100	A1,B1
070 (50 Hz) A1†	1	19	A1*	—	—
	2	27	A1	—	—
	3	65	A1*,B1	—	—
	4	73	A1,B1	—	—
	5	92	A1,A2,B1	—	—
	6	100	A1,A2,B1	—	—
070 (50 Hz) A1†,B1†	1	19	A1*	31	B1*
	2	27	A1	47	B1
	3	49	A1*,B1	49	A1*,B1*
	4	65	A1*,B1	57	A1,B1*
	5	73	A1,B1	73	A1,B1
	6	76	A1*,A2,B1*	76	A1*,A2,B1*
	7	92	A1*,A2,B1	84	A1,A2,B1*
	8	100	A1,A2,B1	100	A1,A2,B1
070 (50 Hz) A1†**	1	11	A1††	—	—
	2	19	A1*	—	—
	3	57	A1††,B1	—	—
	4	65	A1*,B1	—	—
	5	73	A1,B1	—	—
	6	84	A1††,A2,B1	—	
	7	92	A1*,A2,B1	—	—
	8	100	A1,A2,B1	—	—
070 (50 Hz) A1†**,B1**	1	11	A1††	—	—
	2	19	A1*	—	—
	3	27	A1	—	—
	4	41	A1††,B1*	—	—
	5	57	A1††,B1	—	—
	6	65	A1*,B1	—	—
	7	73	A1,B1	—	—
	8	84	A1††,A2,B1	—	—
	9	92	A1*,A2,B1	—	—
	10	100	A1,A2,B1	—	—
070 (50 Hz) A1†,B1**	1	—	—	15	B1††
	2	—	—	31	B1*
	3	—	—	47	B1
	4	—	—	57	A1*,B1
	5	—	—	73	A1,B1
	6	—	—	84	A1,A2,B1*
	7	—	—	100	A1,A2,B1
070 (50 Hz) A1†**,B1**	1	11	A1††	15	B1††
	2	19	A1*	31	B1*
	3	27	A1	47	B1
	4	41	A1††,B1*	54	A1*,B1*
	5	57	A1††,B1	73	A1,B1
	6	65	A1*,B1	84	A1,A2,B1*
	7	73	A1,B1	100	A1,A2,B1
	8	84	A1††,A2,B1	—	—
	9	92	A1*,A2,B1	—	—
	10	100	A1,A2,B1		

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory.
††Two unloaders, both unloaded.

Table 4B — Capacity Control Steps, 080-110 and Associated Modular Units

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
080 (60 Hz) A1†,B1†	1	22	A1*	30	B1*
	2	34	A1	44	B1
	3	52	A1*,B1*	52	A1*,B1*
	4	67	A1*,B1	63	A1,B1*
	5	78	A1,B1	78	A1,B1
	6	89	A1*,A2,B1	85	A1,A2,B1*
	7	100	A1,A2,B1	100	A1,A2,B1
080 (60 Hz) A1†**, B1†	1	11	A1††	—	—
	2	22	A1	—	—
	3	34	A1	—	—
	4	41	A1††,B1*	—	—
	5	55	A1††,B1	—	—
	6	67	A1*,B1	—	—
	7	78	A1,B1	—	—
	8	89	A1*,A2,B1	—	—
	9	100	A1,A2,B1	—	—
080 (60 Hz) A1†,B1†**	1	—	—	15	B1††
	2	—	—	30	B1*
	3	—	—	44	B1
	4		—	48	A1,B1††
	5	—	—	63	A1,B1*
	6	—	—	78	A1,B1
	7	—	—	85	A1,A2,B1*
	8	—	—	100	A1,A2,B1
080 (60 Hz) A1†**,B1†**	1	11	A1††	15	B1††
	2	22	A1*	30	B1*
	3	34	A1	44	B1
	4	41	A1††,B1*	48	A1,B1††
	5	55	A1††,B1	63	A1,B1*
	6	67	A1*,B1	78	A1,B1
	7	78	A1,B1	85	A1,A2,B1*
	8	89	A1*,A2,B1	100	A1,A2,B1
	9	100	A1,A2,B1	—	—
080 (50 Hz) A1†,B1†	1	17	A1*	25	B1*
	2	25	A1	38	B1
	3	42	A1*,B1*	42	A1*,B1*
	4	54	A1*,B1	50	A1,B1*
	5	62	A1,B1	62	A1,B1
	6	79	A1*,A2,B1*	79	A1*,A2,B1*
	7	92	A1*,A2,B1	88	A1,A2,B1*
	8	100	A1,A2,B1	100	A1,A2,B1
080 (50 Hz) A1†**,B1†	1	8	A1††	—	—
	2	17	A1*	—	—
	3	25	A1	—	—
	4	33	A1††,B1*	—	—
	5	46	A1††,B1	—	—
	6	54	A1*,B1	—	—
	7	62	A1,B1	—	—
	8	71	A1††,A2,B1	—	—
	9	84	A1*,A2,B1	—	—
	10	92	A1,A2,B1	—	—
	11	100		—	—
080 (50 Hz) A1†,B1†**	1	—	—	13	B1††
	2	—	—	25	B1*
	3	—	—	38	B1
	4	—	—	50	A1,B1*
	5	—	—	62	A1,B1
	6	—	—	67	A1*,A2,B1††
	7	—	—	75	A1,A2,B1††
	8	—	—	88	A1,A2,B1*
	9	—	—	100	A1,A2,B1
080 (50 Hz) A1†**,B1†**	1	8	A1††	13	B1††
	2	17	A1*	25	B1*
	3	25	A1	38	B1
	4	33	A1††,B1*	50	A1,B1*
	5	46	A1††,B1	62	A1,B1
	6	54	A1*,B1	67	A1*,A2,B1††
	7	62	A1,B1	75	A1,A2,B1††
	8	71	A1††,A2,B1*	88	A1,A2,B1*
	9	84	A1††,A2,B1	100	A1,A2,B1
	10	92	A1*,A2,B1	—	—
	11	100	A1,A2,B1	—	—

*Unloaded compressor.
†Compressor unloader, standard
**Compressor unloader, accessory
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing.

Table 4B — Capacity Control Steps, 080-110 and Associated Modular Units (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
080 (60 Hz) A1†,B1†	1	18	A1*	18	B1*
	2	27	A1	27	B1
	3	35	A1*,B1*	35	A1*,B1*
	4	44	A1*,B1	44	A1,B1*
	5	53	A1,B1	53	A1,B1
	6	56	A1*,A2,B1*	62	A1*,B1*,B2
	7	65	A1*,A2,B1	71	A1,B1*,B2
	8	74	A1,A2,B1	80	A1,B1,B2
	9	82	A1*,A2,B1*,B2	82	A1*,A2,B1*,B2
	10	91	A1*,A2,B1,B2	91	A1,A2,B1*,B2
	11	100	A1,A2,B1,B2	100	A1,A2,B1,B2
090 (60 Hz) A1†,B1†**	1	9	A1††	—	—
	2	18	A1*	—	—
	3	27	A1	—	—
	4	35	A1††,B1	—	—
	5	44	A1*,B1	—	—
	6	53	A1,B1	—	—
	7	56	A1††,A2,B1	—	—
	8	65	A1*,A2,B1	—	—
	9	74	A1,A2,B1	—	—
	10	82	A1††,A2,B1,B2	—	—
	11	91	A1*,A2,B1,B2	—	—
	12	100	A1,A2,B1,B2	—	—
090 (60 Hz) A1†,B1†**	1	—	—	9	B1††
	2	—	—	18	B1*
	3	—	—	27	B1
	4	—	—	35	A1,B1††
	5	—	—	44	A1,B1*
	6	—	—	53	A1,B1
	7	—	—	62	A1,B1††,B2
	8	—	—	71	A1,B1*,B2
	9			80	A1,B1,B2
	10	—	—	82	A1,A2,B1††,B2
	11	—	—	91	A1,A2,B1*,B2
	12	—	—	100	A1,A2,B1,B2
090 (60 Hz) A1†,B1†****	1	9	A1††	9	B1††
	2	18	A1*	18	BP'
	3	27	A1	27	B1
	4	35	A1††,B1	35	A1,B1††
	5	44	A1*,B1	44	A1,B1*
	6	53	A1,B1	53	A1,B1
	7	56	A1††,A2,B1	62	A1,B1††,B2
	8	65	A1*,A2,B1	71	A1,B1*,B2
	9	74	A1,A2,B1	80	A1,B1,B2
	10	82	A1††,A2,B1,B2	82	A1,A2,B1††,B2
	11	91	A1*,A2,B1,B2	91	A1,A2,B1*,B2
	12	100	A1,A2,B1,B2	100	A1,A2,B1,B2
090 (50 Hz) A1†,B1†		14	A1*	14	B1*
	2	21	A1	21	B1
	3	29	A1*,B1*	29	A1*,B1*
	4	36	A1*,B1	36	A1,B1*
	5	43	A1,B1	43	A1,B1
	6	61	A1*,A2,B1*	53	A1*,B1*,B2
	7	68	A1*,A2,B1	60	A1,B1*,B2
	8	75	A1,A2,B1	67	A1,B1,B2
	9	86	A1*,A2,B1*,B2	86	A1*,A2,B1*,B2
	10	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	11	100	A1,A2,B1,B2	100	A1,A2,B1,B2
090 (50 Hz) A1†,B1†**		7	A1††	—	
	2	14	A1*	—	—
	3	21	A1	—	—
	4	29	A1††,B1	—	—
	5	36	A1*,B1	—	—
	6	43	A1,B1	—	—
	7	54	A1††,A2,B1	—	—
	8	61	A1††,A2,B1	—	—
	9	68	A1*,A2,B1	—	—
	10	75	A1,A2,B1	—	—
	11	79	A1††,A2,B1*,B2	—	—
	12	86	A1††,A2,B1,B2	—	—
	13	93	A1*,A2,B1,B2	—	—
	14	100	A1,A2,B1,B2	—	—

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing.

Table 4B — Capacity Control Steps, 080-110 and Associated Modular Units (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
090 (50 Hz) A1†,B1†**	1	—	—	7	B1††
	2	—	—	14	B1*
	3	—	—	21	B1
	4	—	—	29	A1,B1††
	5	—	—	36	A1,B1*
	6	—	—	43	A1,B1
	7	—	—	46	A1*,B1††,B2
	8	—	—	53	A1,B1††,B2
	9	—	—	60	A1,B1*,B2
	10	—	—	67	A1,B1,B2
	11	—	—	79	A1*,A2,B1††,B1
	12	—	—	86	A1,A2,B1††,B1
	13	—	—	93	A1,A2,B1*,B2
	14		—	100	A1,2,B1 B2
090 (50 Hz) A1†**,B1†**	1	7	A1††	7	B1††
	2	14	A1*	14	B1*
	3	21	A1	21	B1
	4	29	A1††,B1	29	A1,B1††
	5	36	A1*,B1	36	A1,B1*
	6	43	A1,B1	43	A1,B1
	7	49	A1††,A2,B1 ††	46	A1*,B1††,B2
	8	54	A1††,A2,B1*	53	A1,B1††,B2
	9	61	A1††,A2,B1	60	A1,B1*,B2
	10	68	A1*,A2,B1	67	A1,B1,B2
	11	75	A1,A2,B1	72	A1††,A2,B1††,B2
	12	79	A1 ††,A2,B1*,B2	79	A1*,A2,B1††,B2
	13	86	A1 ††,A2,B1,B2	86	A1,A2,B1††,B2
	14	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	15	100	A1,A2,B1,B2	100	A1,A2,B1,B2
100, 2408, 270B (60 Hz) A1†,B1†	1	16	A1*	16	A1*
	2	23	A1	23	A1
	3	31	A1*,B1*	31	A1*,B1*
	4	39	A1*,B1	39	A1*,B1
	5	46	A1,B1	46	A1,B1
	6	58	A1*,A2,B1*	58	A1*,A2,B1*
	7	66	A1*,A2,B1	66	A1*,A2,B1
	8	73	A1,A2,B1	73	A1,A2,B1
	9	85	A1*,A2,B1*,B2	85	A1*,A2,B1*,B2
	10	92	A1*,A2,B1,B2	92	A1*,A2,B1,B2
	11	100	A1,A2,B1,B2	100	A1,A2,B1,B2
100, 240B, 270B (60 Hz) A1†**,B1†	1	8	A1††	—	—
	2	16	A1*	—	—
	3	23	A1	—	—
	4	31	A1††,B1	—	—
	5	39	A1*,B1	—	—
	6	46	A1,B1	—	—
	7	50	A1 ††,A2,B1*	—	—
	8	58	A1 ††,A2,B1	—	—
	9	66	A1*,A2,B1	—	—
	10	73	A1,A2,B1	—	—
	11	77	A1 ††,A2,B1*,B2	—	—
	12	85	A1 ††,A2,B1,B2	—	—
	13	92	A1*,A2,B1,B2	—	—
	14	100	A1,A2,B1,B2		—
100, 240B, 270B (60 Hz) A1†,B1†**	1	—	—	8	B1††
	2	—	—	16	B1*
	3	—	—	23	B1
	4	—	—	31	A1,B1††
	5	—	—	39	A1,B1*
	6	—	—	46	A1,B1
		—	—	50	A1*,B1††,B2
	8	—	—	58	A1,B1††,B2
	9	—	—	66	A1,B1*,B2
	10	—		73	A1,B1,B2
	11		—	77	A1*,A2,B1††,B2
	12	—	—	85	A1,A2,B1††,B2
	13		—	92	A1,A2,B1*,B2
	14		—	100	A1,A2,B1,B2

*Unloaded compressor
†Compressor unloader, standard.
**Compressor unloader, accessory.
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing

Table 40 — Capacity Control Steps, 080-I 10 and Associated Modular Units (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
100, 2406, 270B (60 Hz) A1†**,B1†**	1	8	A1††	8	B1††
	2	16	A1*	16	B1*
	3	23	A1	23	B1
	4	31	A1††,B1	31	A1,B1††
	5	39	A1*,B1	39	A1,B1*
	6	46	A1,B1	46	A1,B1
	7	50	A1††,A2,B1*	50	A1*,B1††,B2
	8	58	A1††,A2,B1	58	A1,B1††,B2
	9	66	A1*,A2,B1	66	A1,B1*,B2
	10	73	A1,A2,B1	73	A1,B1,B2
	11	77	A1††,A2,B1*,B2	77	A1*,A2,B1††,B2
	12	85	A1††,A2,B1,B2	85	A1,A2,B1††,B2
	13	92	A1*,A2,B1,B2	92	A1,A2,B1●,B2
	14	100	A1,A2,B1,B2	100	A1,A2,B1,B2
100, 240B, 2708 (50 Hz) A1†,B1†	1	13	A1*	13	B1*
	2	20		20	B1
	3	26	A1,B1*	26	A1*,B1*
	4	33	A1,B1	33	A1,B1*
	5	40	A1,B1	40	A1,B1
	6	57	A1*,A2,B1*	57	A1*,B1*,B2
	7	63	A1*,A2,B1	63	A1,B1*,B2
	8	70	A1,A2,B1	70	A1,B1,B2
	9	87	A1*,A2,B1*,B2	87	A1*,A2,B1*,B2
	10	93	A1*,A2,B1,B2	93	A1,A2,B1●,B2
	11	100	A1,A2,B1,B2	100	A1,A2,B1,B2
100, 240B, 2708 (50 Hz) A1†**,B1†	1	7	A1††	—	—
	2	13	A1*	—	—
	3	20	A1	—	—
	4	26	A1††,B1	—	—
	5	33	A1*,B1	—	—
	6	40	A1,B1	—	—
	7	50	A1††,A2,B1*	—	—
	8	57	A1††,A2,B1	—	—
	9	63	A1*,A2,B1	—	—
	10	70	A1,A2,B1	—	—
	11	80	A1††,A2,B1*,B2	—	—
	12	87	A1††,A2,B1,B2	—	—
	13	93	A1*,A2,B1,B2	—	—
	14	100	A1,A2,B1,B2	—	—
100, 2408, 270B (50 Hz) A1†,B1†**	1	—	—	7	B1††
	2	—	—	13	B1*
	3	—	—	20	B1
	4	—	—	26	A1,B1††
	5	—	—	33	A1,B1*
	6	—	—	40	A1,B1
	7	—	—	50	A1*,B1††,B2
	8	—	—	57	A1,B1††,B2
	9	—	—	63	A1,B1*,B2
	10	—	—	70	A1,B1,B2
	11	—	—	80	A1*,A2,B1††,B2
	12	—	—	87	A1,A2,B1††,B2
	13	—	—	93	A1,A2,B1*,B2
	14	—	—	100	A1,A2,B1,B2
100, 2408, 270B (50 Hz) A1†**,B1†**	1	7	A1††	7	B1††
	2	13	A1*	13	B1*
	3	20	A1	20	B1
	4	26	A1††,B1	26	A1,B1††
	5	33	A1*,B1	33	A1,B1*
	6	40	A1,B1	40	A1,B1
	7	43	A1††,A2,B1††	43	A1††,B1††,B2
	8	50	A1††,A2,B1*	50	A1*,B1††,B2
	9	57	A1†††,A2,B1	57	A1,B1†††,B2
	10	63	A1*,A2,B1	63	A1,B1*,B2
	11	70	A1,A2,B1	70	A1,B1,B2
	12	74	A1††,A2,B1†††,B2	74	A1††,A2,B1†††,B2
	13	80	A1††,A2,B1*,B2	80	A1*,A2,B1††,B2
	14	89	A1†††,A2,B1,B2	87	A1,A2,B1††,B2
	15	93	A1●,A2,B1,B2	93	A1,A2,B1*,B2
	16	100	A1,A2,B1,B2	100	A1,A2,B1,B2

*Unloaded compressor.
†Compressor unloader, standard
**Compressor unloader, accessory.
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing.

Table 4B – Capacity Control Steps, 080-110 and Associated Modular Units (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
110 (60 Hz) A1†,B1†	1	14	A1*	14	B1*
	2	21	A1	21	B1
	3	29	A1*,B1*	29	A1*,B1*
	4	36	A1*,B1	36	A1,B1*
	5	43	A1,B1	43	A1,B1
	6	61	A1,A2,B1*	53	A1*,B1*,B2
	7	68	A1*,A2,B1	60	A1,B1*,B2
	8	75	A1,A2,B1	67	A1,B1,B2
	9	86	A1*,A2,B1*,B2	86	A1*,A2,B1*,B2
	10	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	11	100	A1,A2,B1,B2	100	A1,A2,B1,B2
110 (60 Hz) A1†**,B1†	1	7	A1††	—	—
	2	14	A1*	—	—
	3	21	A1	—	—
	4	29	A1††,B1	—	—
	5	36	A1*,B1	—	—
	6	43	A1,B1	—	—
	7	54	A1††,A2,B1*	—	—
	8	61	A1††,A2,B1	—	—
	9	68	A1*,A2,B1	—	—
	10	75	A1,A2,B1	—	—
	11	79	A1††,A2,B1*,B2	—	—
	12	86	A1††,A2,B1,B2	—	—
	13	93	A1*,A2,B1,B2	—	—
	14	100	A1,A2,B1,B2		—
110 (60 Hz) A1†,B1†**	1	—	—	7	B1††
	2	—	—	14	B1*
	3	—	—	21	B1
	4	—	—	29	A1,B1††
	5	—	—	36	A1,B1*
	6		—	43	A1,B1
	7	—	—	46	A1*,B1††,B2
	8		—	53	A1,B1††,B2
	9	—	—	60	A1,B1*,B2
	10	—	—	67	A1,B1,B2
	11	—		79	A1*,A2,B1††,B2
	12	—	—	86	A1,A2,B1††,B2
	13	—	—	93	A1,A2,B1*,B2
	14	—	—	100	A1,A2,B1,B2
110 (60 Hz) A1†**,B1†**	1	7	A1††	7	B1††
	2	14	A1*	14	B1*
	3	21	A1	21	B1
	4	29	A1††,B1	29	A1,B1††
	5	36	A1*,B1	36	A1,B1*
	6	43	A1,B1	43	A1,B1
	7	47	A1††,A2,B1††	46	A1*,B1††,B2
	8	54	A1††,A2,B1*	53	A1,B1††,B2
	9	61	A1††,A2,B1	60	A1,B1*,B2
	10	68	A1*,A2,B1	67	A1,B1,B2
	11	75	A1,A2,B1	72	A1††,A2,B1††,B2
	12	79	A1††,A2,B1*,B2	79	A1*,A2,B1††,B2
	13	86	A1††,A2,B1,B2	86	A1,A2,B1††,B2
	14	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	15	100	A1,A2,B1,B2	100	A1,A2,B1,B2
110 (50 Hz) A1†,B1†	1	17	A1*	17	B1*
	2	25		25	B1
	3	33	A1*,B1*	33	A1*,B1*
	4	42	A1*,B1	42	A1,B1*
	5	50	A1,B1	50	A1,B1
	6	58	A1*,A2,B1*	58	A1,B1*,B2
	7	67	A1,A2,B1	67	A1,B1*,B2
	8	75	A1,A2,B1	75	A1,B1,B2
	9	83	A1*,A2,B1*,B2	83	A1*,A2,B1*,B2
	10	92	A1*,A2,B1,B2	92	A1,A2,B1*,B2
	11	100	A1,A2,B1,B2	100	A1,A2,B1,B2

*Unloaded compressor.
†Compressor unloader, standard
**Compressor unloader, accessory.
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing

Table 4B — Capacity Control Steps, 080-110 and Associated Modular Units (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
110 (50 Hz) A1†**,B1†		8	A1††	—	
	2	17	A1*	—	—
	3	25	A1	—	—
	4	33	A1††,B1	—	—
	5	42	A1*,B1	—	—
	6	50	A1 ,B1	—	—
	7	58	A1††,A2,B1	—	—
	8	67	A1*,A2,B1	—	—
	9	75	A1,A2,B1	—	—
	10	83	A1 ††,A2,B1,B2	—	—
	11	92	A1 *,A2,B1,B2	—	—
	12	100	A1 ,A2,B1,B2	—	—
110 (50 Hz) A1†,B1†**		—	—	8	B1††
	2	—		17	B1*
	3	—	—	25	B1
	4	—	—	33	A1,B1††
	5	—	—	42	A1,B1*
	6	—	—	50	A1,B1
	7		—	58	A1,B1††,B2
	8	—	—	67	A1,B1*,B2
	9	—	—	75	A1,B1,B2
	10	—	—	83	A1 ,A2,B1††,B2
	11	—	—	92	A1 ,A2,B1*,B2
	12	—	—	100	A1 ,A2,B1,B2
110 (50 Hz) A1†**,B1†**	1	a	A1††	a	B1††
	2	17	A1*	17	B1*
	3	25		25	B1
	4	33	A1 ,B1	33	A1,B1††
	5	42	A1 *,B1	42	A1,B1*
	6	50	A1 ,B1	50	A1,B1
	7	58	A1††,A2,B1	58	A1 ,B1††,B2
	8	67	A1*,A2,B1	67	A1 ,B1*,B2
	9	75	A1,A2,B1	75	A1 ,B1,B2
	10	83	A1 ††,A2,B1,B2	83	A1 ,A2,B1††,B2
	11	92	A1 *,A2,B1,B2	92	A1 ,A2,B1*,B2
	12	100	A1 ,A2,B1,B2	100	A1 ,A2,B1,B2

*Unloaded compressor.
†Compressor unloader, standard.
Compressor unloader, **accessory
††Two unloaders, both unloaded.

NOTE: These capacity control steps **may** vary due to lag compressor sequencing

Table 4C — Capacity Control Steps, 130-210 and Associated Modular Units

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
130, 240A, 300A (60 Hz) A1†,B1†		14	A1*	14	B1*
	2	21	A1	21	B1
	3	28	A1*,B1*	28	A1*,B1*
	4	35	A1*,B1	35	A1,B1*
	5	42	A1,B1	42	A1,B1
	6	58	A1*,A2,B1*	58	A1,B1,B2
	7	64	A1*,A2,B1	64	A1,B1*,B2
	8	71	A1,A2,B1	71	A1,B1,B2
	9	87	A1*,A2,B1*,B2	87	A1*,A2,B1*,B2
	10	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	11	100	A1,A2,B1,B2	100	A1,A2,B1,B2
130, 240A, 300A (60 Hz) A1†**,B1†		8	A1††	—	—
	2	14	A1*	—	—
	3	21	A1	—	—
	4	22	A1††,B1*	—	—
	5	28	A1††,B1	—	—
	6	35	A1*,B1	—	—
	7	42	A1,B1	—	—
	8	51	A1††,A2,B1*	—	—
	9	58	A1††,A2,B1	—	—
	10	64	A1*,A2,B1	—	—
	11	71	A1,A2,B1	—	—
	12	80	A1††,A2,B1*,B2	—	—
	13	87	A1††,A2,B1,B2	—	—
	14	93	A1*,A2,B1,B2		
	15	100	A1,A2,B1,B2	—	—
130, 240A, 300A (60 Hz) A1†,B1†**	1	—	—	8	B1††
	2	—	—	14	B1*
	3	—	—	21	B1
	4	—	—	22	A1*,B1††
	5	—	—	28	A1,B1††
	6	—	—	35	A1,B1*
	7	—	—	42	A1,B1
	8	—	—	51	A1*,B1††,B2
	9	—	—	58	A1,B1††,B2
	10		—	64	A1,B1*,B2
	11	—	—	71	A1,B1,B2
	12	—	—	80	A1*,A2,B1††,B2
	13	—	—	87	A1,A2,B1††,B2
	14	—	—	93	A1,A2,B1*,B2
	15	—	—	100	A1,A2,B1,B2
130, 240A, 300A (60 Hz) A1†**,B1†**	1	8	A1††	8	B1††
	2	14	A1*	14	B1*
	3	21	A1	21	B1
	4	22	A1††,B1*	22	A1*,B1††
	5	28	A1††,B1	28	A1,B1††
	6	35	A1*,B1	35	A1,B1*
	7	42	A1,B1	42	A1,B1
	8	44	A1††,A2,B1††	44	A1††,B1††,B2
	9	51	A1††,A2,B1*	51	A1*,B1††,B2
	10	58	A1††,A2,B1	58	A1,B1††,B2
	11	64	A1*,A2,B1	64	A1,B1*,B2
	12	71	A1,A2,B1	71	A1,B1,B2
	13	73	A1††,A2,B1††,B2	73	A1††,A2,B1††,B2
	14	80	A1††,A2,B1*,B2	80	A1●,A2,B1††,B2
	15	87	A1††,A2,B1,B2	87	A1,A2,B1††,B2
	16	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	17	100	A1,A2,B1,B2	100	A1,A2,B1,B2
130, 240A, 300A (50 Hz) A1†,B1†	1	10	A1*	16	B1*
	2	14	A1	25	B1
	3	26	A1*,B1*	26	A1*,B1*
	4	35	A1*,B1	31	A1,B1*
	5	39	A1,B1	39	A1,B1
	6	44	A1*,A2,B1.	51	A1*,B1*,B2
	7	53	A1*,A2,B1	56	A1,B1*,B2
	8	57	A1,A2,B1	64	A1,B1,B2
	9	69	A1*,A2,B1*,B2	69	A1*,A2,B1*,B2
	10	78	A1*,A2,B1,B2	74	A1,A2,B1*,B2
	11	82	A1,A2,B1,B2	82	A1,A2,B1,B2
	12	87	A1*,A2,A3,B1*,B2	87	A1*,A2,A3,B1*,B2
	13	96	A1*,A2,A3,B1,B2	91	A1,A2,A3,B1*,B2
	14	100	A1,A2,A3,B1,B2	100	A1,A2,A3,B1,B2

*Unloaded compressor
†Compressor unloader, standard.
**Compressor unloader, accessory
††Two unloaders, both unloaded

NOTE: These capacity control steps may vary due to lag compressor sequencing+

Table 4C — Capacity Control Steps, 130-210 and Associated Modular Units (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
130, 240A, 300A (50 Hz) A1†**,B1†	1	6	A1††	—	—
	2	10	A1*	—	—
	3	14	A1	—	—
	4	22	A1††,B1*	—	—
	5	31	A1 ††,B1	—	—
	6	35	[illegible]	—	—
	7	39	A1 ,B1	—	—
	8	40	A1 ††,A2,B1*	—	—
	9	49	A1††,A2,B1	—	—
	10	53	A1*,A2,B1	—	—
	11	57	A1,A2,B1	—	—
	12	65	A1 ††,A2,B1*,B2	—	—
	13	74	A1††,A2,B1,B2	—	—
	14	78	A1 *,A2,B1,B2	—	—
	15	82	A1 ,A2,B1,B2	—	—
	16	83	A1 ††,A2,A3,B1*,B2	—	—
	17	91	A1 ††,A2,A3,B1,B2	—	—
	18	96	A1 *,A2,A3,B1,B2	—	—
	19	100	A1 ,A2,A3,B1,B2	—	—
130, 240A, 300A (50 Hz) A1†,B1†**	1	—	—	8	B1††
	2	—	—	16	B1*
	3		—	25	B1
	4	—	—	31	A1,B1*
	5	—	—	39	A1,B1
	6	—	—	43	A1 *,B1 ††,B2
	7	—	—	47	A1 ,B1 ††,B2
	8	—	—	56	A1 ,B1*,B2
	9	—	—	64	A1 ,B1,B2
	10	—	—	65	A1 ,A2,B1††,B2
	11	—	—	74	A1 ,A2,B1*,B2
	12	—	—	82	A1 ,A2,B1,B2
	13	—	—	83	A1 ,A2,A3,B1††,B2,B3
	14	—	—	91	A1 ,A2,A3,B1*,B2,B3
	15	—	—	100	A1 ,A2,A3,B1,B2,B3
130, 240A, 300A (50 Hz) A1†**,B1†**	1	6	A1††	8	B1††
	2	10	A1*	16	B1*
	3	14	A1	25	B1
	4	22	A1††,B1*	31	A1,B1*
	5	31	A1††,B1	39	A1,B1
	6	35	A1*,B1	43	A1 ,B1††,B2
	7	39	A1 ,B1	47	A1 ,B1††,B2
	8	40	A1 ††,A2,B1*	56	A1,B1*,B2
	9	49	A1††,A2,B1	64	A1 ,B1,B2
	10	53	A1*,A2,B1	65	A1 ,A2,B1††,B2
	11	57	A1,A2,B1	74	A1 ,A2,B1*,B2
	12	65	A1††,A2,B1*,B2	82	A1 ,A2,B1,B2
	13	74	A1 ††,A2,B1,B2	83	A1 ,A2,A3,B1††,B2
	14	78	A1 *,A2,B1,B2	91	A1,A2,A3,B1 ,B2
	15	82	A1 ,A2,B1,B2	100	A1 ,A2,A3,B1,B2
	16	83	A1 ††,A2,A3,B1*,B2	—	—
	17	91	A1††,A2,A3,B1,B2	—	—
	18	96	A1*,A2,A3,B1,B2	—	—
	19	100	A1 ,A2,A3,B1,B2	—	—
150 (60 Hz) A1*,B1*	1	11	A1	18	B1*
	2	15	A1	27	B1
	3	29	A1 *,B1*	29	A1*,B1*
	4	38	A1 *,B1	33	A1 ,B1*
	5	42	A1 ,B1	42	A1 ,B1
	6	44	A1*,A2,B1*	55	A1 *,B1*,B2
	7	53	A1 ,A2,B1	60	A1 ,B1*,B2
	8	58	A1 ,A2,B1	69	A1 ,B1,B2
	9	71	A1*,A2,B1 ,B2	71	A1 ,A2,B1 ,B2
	10	80	A1 *,A2,B1,B2	75	A1 ,A2,B1*,B2
	11	85	A1 ,A2,B1,B2	85	A1 ,A2,B1,B2
	12	86	A1*,A2,A3,B1*,B2	86	A1 ,A2,A3,B1 *,B2
	13	95	A1 *,A2,A3,B1,B2	91	A1 ,A2,A3,B1*,B2
	14	100	A1 ,A2,A3,B1,B2	100	A1 ,A2,A3,B1,B2

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing.

Table 4C — Capacity Control Steps, 130-210 and Associated Modular Units (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
150 (60 Hz) A1†**,B1†	1	6	A1††		
	2	11	A1*		
	3	15	A1		
	4	24	A1††,B1*		
	5	33	A1††,B1		
	6	38	A1*,B1		
	7	42	A1,B1		
	8	49	A1††,A2,B		
	9	53	A1*,A2,B1		
	10	58	A1,A2,B1		
	11	66	A1††,A2,B1*,B2		
	12	75	A1††,A2,B1,B2		
	13	80	A1*,A2,B1,B2		
	14	85	A1,A2,B1,B2		
	15	91	A1††,A2,A3,B1,B2		
	16	95	A1*,A2,A3,B1,B2		
	17	100	A1,A2,A3,B1,B2		
150 (60 Hz) A1†,B1†**	1			9	B1††
	2			18	B1*
	3			27	B1
	4			33	A1,B1*
	5			42	A1,B1
	6			46	A1*,B1††,B2
	7			51	A1,B1††,B2
	8			60	A1,B1*,B2
	9			69	A1,B1,B2
	10			75	A1,A2,B1*,B2
	11			85	A1,A2,B1,B2
	12			91	A1,A2,A3,B1*,B2
	13			100	A1,A2,A3,B1,B2
150 (60 Hz) A1†**,B1†**	1	6	A1††	9	B1††
	2	11	A1*	18	B1*
	3	15	A1	27	B1
	4	24	A1††,B1*	33	A1,B1*
	5	33	A1††,B1	42	A1,kB1
	6	38	A1*,B1	46	A1*,B1††,B2
	7	42	A1,B1	51	A1,B1††,B2
	8	49	A1††,A2,B1	60	A1,B1*,B2
	9	53	A1*,A2,B1	69	A1,B1,B2
	10	58	A1,A2,B1	75	A1,A2,B1*,B2
	11	66	A1††,A2,B1*,B2	86	A1,A2,B1,B2
	12	75	A1††,A2,B1,B2	91	A1,A2,A3,B1*,B2
	13	80	A1*,A2,B1,B2	100	A1,A2,A3,B1,B2
	14	85	A1,A2,B1,B2	—	
	15	91	A1††,A2,A3,B1,B2	—	
	16	95	A1*,A2,A3,B1,B2	—	
	17	100	A1,A2,A3,B1,B2	—	
150 (50 Hz) A1†,B1†	1	13	A1*	13	B1*
	2	20		20	B1
	3	26	A1,*	26	A1*,B1*
	4	33	A1*,B1	33	A1,B1*
	5	40	A1,B1	40	A1,B1
	6	46	A1*,A2,B1*	46	A1*,B1*,B2
	7	53	A1*,A2,B1	53	A1,B1*,B2
	8	60	A1,A2,B1	60	A1,B1,B2
	9	66	A1*,A2,B1*,B2	66	A1*,A2,B1*,B2
	10	73	A1*,A2,B1,B2	73	A1,A2,B1*,B2
	11	80	A1,A2,B1,B2	80	A1,A2,B1,B2
	12	86	A1*,A2,A3,B1*,B2	86	A1*,A2,A3,B1*,B2
	13	93	A1*,A2,A3,B1,B2	93	A1,A2,A3,B1*,B2
	14	100	A1,A2,A3,B1,B2	100	A1,A2,A3,B1,B2
150 (50 Hz) A1†**,B1†	1	6	A1††		
	2	13	A1*		
	3	20	A1		
	4	26	A1††B1		
	5	33	A1*,&		
	6	40	A1,B1		
	7	46	A1††,A2,B1		
	8	53	A1*,A2,B1		
	9	60	A1,A2,B1		
	10	66	A1††,A2,B1,B2		
	11	73	A1*,A2,B1,B2		
	12	80	A1,A2,B1,B2		
	13	86	A1††,A2,A3,B1,B2		
	14	93	A1*,A2,A3,B1,B2		
	15	100	A1,A2,A3,B1,B2		

*Unloaded compressor.
†Compressor unloader, standard
**Compressor unloader, accessory.
††Two unloaders, both unloaded

NOTE: These capacity control steps may vary due to lag compressor sequencing

Table 4C — Capacity Control Steps, 130-210 and Associated Modular Units (cont)

UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
150 (50 Hz) A1†,B1†**	1	—	—	6	B1††
	2	—	—	13	B1*
	3	—	—	20	B1
	4	—	—	26	A1,B1††
	5	—	—	33	A1,B1*
	6	—	—	40	A1,B1
	7	—	—	46	A1,B1††,B2
	8	—	—	53	A1,B1*,B2
	9	—	—	60	A1,B1,B2
	10	—	—	66	A1,A2,B1††,B2
	11	—	—	73	A1,A2,B1*,B2
	12	—	—	80	A1,A2,B1,B2
	13	—	—	86	A1,A2,A3,B1††,B2
	14	—	—	93	A1,A2,A3,B1*,B2
	15	—	—	100	A1,A2,A3,B1,B2
150 (50 Hz) A1†**,B1†**	1	6	A1††	6	B1††
	2	13	A1*	13	B1*
	3	20	A1	20	B1
	4	26	A1††,B1	26	A1,B1††
	5	33	A1*,B1	33	A1,B1*
	6	40	A1,B1	40	A1,B1
	7	46	A1††,A2,B1	46	A1,B1††,B2
	8	53	A1*,A2,B1	53	A1,B1*,B2
	9	60	A1,A2,B1	60	A1,B1,B2
	10	66	A1††,A2,B1,B2	66	A1,A2,B1††,B2
	11	73	A1*,A2,B1,B2	73	A1,A2,B1*,B2
	12	80	A1,A2,B1,B2	80	A1,A2,B1,B2
	13	86	A1††,A2,A3,B1,B2	86	A1,A2,A3,B1††,B2
	14	93	A1*,A2,A3,B1,B2	93	A1,A2,A3,B1*,B2
	15	100	A1,A2,A3,B1,B2	100	A1,A2,A3,B1,B2
170, 270A, 300B, 330A/B (60 Hz) A1†,B1†	1	11	A1*	11	B1*
	2	17		17	B1
	3	23	A1††,A2	23	A1*,B1*
	4	28	A1*,B1	28	A1,B1*
	5	33	A1,B1	33	A1,B1
	6	39	A1*,A2,B1*	39	A1*,B1*,B2
	7	45	A1*,A2,B1	45	A1,B1*,B2
	8	50	A1,A2,B1	50	A1,B1,B2
	9	56	A1*,A2,B1*,B2	56	A1*,A2,B1●,B2
	10	61	A1*,A2,B1,B2	61	A1,A2,B1*,B2
	11	67	A1,A2,B1,B2	67	A1,A2,B1,B2
	12	73	A1*,A2,A3,B1*,B2	73	A1*,A2,B1*,B2,B3
	13	78	A1*,A2,A3,B1,B2	78	A1,A2,B1*,B2,B3
	14	83	A1,A2,A3,B1,B2	83	A1,A2,B1,B2,B3
	15	89	A1*,A2,A3,B1*,B2,B3	89	A1*,A2,A3,B1*,B2,B3
	16	95	A1*,A2,A3,B1,B2,B3	95	A1,A2,A3,B1*,B2,B3
	17	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
170, 270A, 3008, 330A/B (60 Hz) A1†**,B1†	1	6	A1††	—	—
	2	11	A1*	—	—
	3	17	A1	—	—
	4	17	A1††,B1*	—	—
	5	23	A1††,B1	—	—
	6	28	A1*,B1	—	—
	7	33	A1,B1	—	—
	8	34	A1††,A2,B1*	—	—
	9	39	A1††,A2,B1	—	—
	10	45	A1*,A2,B1	—	—
	11	50	A1,A2,B1	—	—
	12	51	A1††,A2,B1*,B2	—	—
	13	56	A1††,A2,B1,B2	—	—
	14	61	A1*,A2,B1,B2	—	—
	15	67	A1,A2,B1,B2	—	—
	16	67	A1††,A2,A3,B1*,B2	—	—
	17	73	A1††,A2,A3,B1,B2	—	—
	18	78	A1*,A2,A3,B1,B2	—	—
	19	83	A1,A2,A3,B1,B2	—	—
	20	84	A1††,A2,A3,B1*,B2,B3	—	—
	21	89	A1††,A2,A3,B1,B2,B3	—	—
	22	95	A1*,A2,A3,B1,B2,B3	—	—
	23	100	A1,A2,A3,B1,B2,B3	—	—

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory
††Two unloaders, both unloaded.

NOTE: These capacity control **steps** may vary due to lag compressor sequencing.

Table 4C — Capacity Control Steps, 130-210 and Associated Modular Units (cont)

UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
170, 270A,300B, 330A/B (60 Hz) A1†,B1†**	1	—		6	B1††
	2	—	—	11	B1*
	3	—	—	17	B1
	4	—	—	17	A1*,B1††
	5	—	—	23	A1,B1††
	6	—	—	28	A1,B1*
	7	—	—	33	A1,B1
	8	—	—	34	A1*,B1††,B2
	9	—	—	39	A1,B1††,B2
	10	—	—	45	A1,B1*,B2
	11	—	—	50	A1,B1,B2
	12	—	—	51	A1*,A2,B1††,B2
	13	—	—	56	A1,A2,B1††,B2
	14	—	—	61	A1,A2,B1*,B2
	15	—	—	67	A1,A2,B1,B2
	16	—	—	67	A1*,A2,B1††,B2,B3
	17	—	—	73	A1,A2,B1††,B2,B3
	18	—	—	78	A1,A2,B1*,B2,B3
	19	—	—	83	A1,A2,B1,B2,B3
	20	—	—	84	A1*,A2,A3,B1††,B2,B3
	21	—	—	89	A1,A2,A3,B1††,B2,B3
	22	—	—	95	A1,A2,A3,B1*,B2,B3
	23	—	—	100	A1,A2,A3,B1,B2,B3
170, 270A, 300B, 330A/B (60 Hz) A1†**,B1†**	1	6	A1††	6	B1††
	2	11	A1*	11	B1*
	3	17	A1	17	B1
	4	17	A1††,B1*	17	A1*,B1††
	5	23	A1††,B1	23	A1,B1††
	6	28	A1*,B1	28	A1,B1*
	7	33	A1,B1	33	A1,B1
	8	34	A1††,A2,B1*	34	A1*,B1††,B2
	9	39	A1††,A2,B1	39	A1,B1††,B2
	10	45	A1*,A2,B1	45	A1,B1*,B2
	11	50	A1,A2,B1	50	A1,B1,B2
	12	51	A1††,A2,B1*,B2	51	A1*,A2,B1††,B2
	13	56	A1††,A2,B1,B2	56	A1,A2,B1††,B2
	14	61	A1*,A2,B1,B2	61	A1,A2,B1*,B2
	15	67	A1,A2,B1,B2	67	A1,A2,B1,B2
	16	67	A1††,A2,A3,B1*,B2	67	A1*,A2,B1††,B2,B3
	17	73	A1††,A2,A3,B1,B2	73	A1,A2,B1††,B2,B3
	18	78	A1*,A2,A3,B1,B2	78	A1,A2,B1*,B2,B3
	19	83	A1,A2,A3,B1,B2	83	A1,A2,B1,B2,B3
	20	84	A1††,A2,A3,B1*,B2,B3	84	A1*,A2,A3,B1††,B2,B3
	21	89	A1††,A2,A3,B1,B2,B3	89	A1,A2,A3,B1††,B2,B3
	22	95	A1*,A2,A3,B1,B2,B3	95	A1,A2,A3,B1*,B2,B3
	23	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
170, 270A, 300B, 330A/B,360B (50 Hz) A1†,B1†	1	9	A1*	9	B1*
	2	14	A1	14	B1
	3	19	A1*,B1*	19	A1*,B1*
	4	23	A1*,B1	23	A1,B1*
	5	28	A1,B1	28	A1,B1
	6	33	A1*,A2,B1*	38	A1*,B1*,B2
	7	37	A1*,A2,B1	43	A1,B1*,B2
	8	42	A1,A2,B1	47	A1,B1,B2
	9	52	A1*,A2,B1*,B2	52	A1*,A2,B1*,B2
	10	57	A1*,A2,B1,B2	57	A1,A2,B1*,B2
	11	61	A1,A2,B1,B2	61	A1,A2,B1,B2
	12	72	A1*,A2,A3,B1*,B2	72	A1*,A2,B1*,B2,B3
	13	76	A1*,A2,A3,B1,B2	76	A1,A2,B1*,B2,B3
	14	81	A1,A2,A3,B1,B2	81	A1,A2,B1,B2,B3
	15	91	A1*,A2,A3,B1*,B2,B3	91	A1*,A2,A3,B1*,B2,B3
	16	96	A1*,A2,A3,B1,B2,B3	96	A1,A2,A3,B1*,B2,B3
	17	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory.
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing

Table 4C — Capacity Control Steps, 130210 and Associated Modular Units (cont)

UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
170, 270A, 300B, 330A/B, 360B (50 Hz) A1†**,B1†	1	5	A1††	—	—
	2	9	A1*	—	—
	3	14	A1		—
	4	14	A1††,B1*	—	—
	5	19	A1††,B1	—	—
	6	23	A1*,B1	—	—
	7	28	A1 ,B1	—	—
	8	28	A1 ††,A2,B1*	—	—
	9	33	A1††,A2,B1	—	—
	10	37	A1*,A2,B1	—	—
	11	42	A1 ,A2,B1	—	—
	12	48	A1 ††,A2,B1*,B2	—	—
	13	52	A1 ††,A2,B1,B2	—	—
	14	57	A1 *,A2,B1,B2	—	—
	15	61	A1 ,A2,B1,B2	—	—
	16	67	A1 ††,A2,A3,B1*,B2	—	—
	17	72	A1††,A2,A3,B1,B2	—	—
	18	76	A1 *,A2,A3,B1,B2	—	—
	19	81	A1 ,A2,A3,B1,B2	—	—
	20	87	A1 ††,A2,A3,B1*,B2,B3	—	—
	21	91	A1††,A2,A3,B1,B2,B3	—	—
	22	96	A1*,A2,A3,B1,B2,B3	—	—
	23	100	A1 ,A2,A3,B1,B2,B3	—	—
170, 270A, 3008, 330A/B, 360B (50 Hz) A1†,B1†**	1	—	—	5	B1††
	2	—	—	9	B1*
	3	—	—	14	B1
	4	—	—	14	A1*,B1††
	5			19	A1,B1††
	6		—	23	A1,B1*
	7	—	—	28	A1,B1
	8	—	—	34	A1 *,B1††,B2
	9	—	—	38	A1 ,B1 ††,B2
	10	—	—	43	A1 ,B1 *,B2
	11	—	—	47	A1,B1,B2
	12	—	—	48	A1*,A2,B1††,B2
	13	—	—	52	A1 ,A2,B1††,B2
	14		—	57	A1,A2,B1*,B2
	15	—	—	61	A1 ,A2,B1,B2
	16	—	—	67	A1 *,A2,B1††,B2,B3
	17	—	—	72	A1 ,A2,B1††,B2,B3
	18	—	—	76	A1 ,A2,B1*,B2,B3
	19	—	—	81	A1 ,A2,B1,B2,B3
	20	—	—	87	A1 *,A2,A3,B1††,B2,B3
	21	—	—	91	A1 ,A2,A3,B1††,B2,B3
	22	—	—	96	A1,A2,A3,B1*,B2,B3
	23	—	—	100	A1 ,A2,A3,B1,B2,B3
170, 270A, 3008, 330A/B, 360B (50 Hz) A1†**,B1†**	1	5	A1††	5	B1††
	2	9	A1*	9	B1*
	3	14	A1	14	B1
	4	14	A1††,B1*	14	A1*,B1††
	5	19	A1 ††,B1	19	A1,B1††
	6	23	A1 ,B1	23	A1,B1*
	7	28	A1 ,B1	28	A1 ,B1
	8	28	A1 ††,A2,B1*	29	A1††,B1††,B2
	9	33	A1††,A2,B1	34	A1 *,B1††,B2
	10	37	A1*,A2,B1	38	A1,B1††,B2
	11	42	A1,A2,B1	43	A1,B1*,B2
	12	43	A1††,A2,B1††,B2	47	A1,B1,B2
	13	48	A1 ††,A2,B1*,B2	48	A1 *,A2,B1††,B2
	14	52	A1††,A2,B1,B2	52	A1 ,A2,B1††,B2
	15	57	A1 *,A2,B1,B2	57	A1 ,A2,B1*,B2
	16	61	A1 ,A2,B1,B2	61	A1 ,A2,B1,B2
	17	63	A1 ††,A2,A3,B1††,B2	63	A1 ††,A2,B1††,B2,B3
	18	67	A1 ††,A2,A3,B1*,B2	67	A1 *,A2,B1††,B2,B3
	19	72	A1 ††,A2,A3,B1,B2	72	A1 ,A2,B1††,B2,B3
	20	76	A1 *,A2,A3,B1,B2	76	A1 ,A2,B1*,B2,B3
	21	81	A1 ,A2,A3,B1,B2	81	A1 ,A2,B1,B2,B3
	22	82	A1††,A2,A3,B1††,B2,B3	82	A1 ††,A2,A3,B1††,B2,B3
	23	87	A1††,A2,A3,B1*,B2,B3	87	A1*,A2,A3,B1††,B2,B3
	24	91	A1 ††,A2,A3,B1,B2,B3	91	A1 ,A2,A3,B1††,B2,B3
	25	96	A1 *,A2,A3,B1,B2,B3	96	A1 ,A2,A3,B1*,B2,B3
	26	100	A1 ,A2,A3,B1,B2,B3	100	A1 ,A2,A3,B1,B3,B3

*Unloaded compressor.
†Compressor unloader, standard
**Compressor unloader, accessory
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing.

Table 4C — Capacity Control Steps, 130-210 and Associated Modular Units (cont)

UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
190, 360A/B, 390B (60 Hz) A1,B1		13	A1	13	B1
	2	25	A1,B1	25	A1,B1
	3	41	A1,A2,B1	41	A1,B1,B2
	4	56	A1,A2,B1,B2	56	A1,A2,B1,B2
	5	78	A1,A2,A3,B1,B2	78	A1,A2,B1,B2,B3
	6	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
190, 360A/B, 390B (60 Hz) A1**,B1	1	9	A1*	—	—
	2	13	A1	—	—
	3	21	A1*,B1	—	—
	4	25	A1,B1	—	—
	5	37	A1*,A2,B1	—	—
	6	41	A1,A2,B1	—	—
	7	53	A1*,A2,B1,B2	—	—
	8	56	A1,A2,B1,B2	—	—
	9	74	A1*,A2,A3,B1,B2	—	—
	10	78	A1,A2,A3,B1,B2	—	—
	11	96	A1*,A2,A3,B1,B2,B3	—	—
	12	100	A1,A2,A3,B1,B2,B3	—	—
190, 360A/B, 390B (60 Hz) A1,B1**	1	—	—	9	B1*
	2	—	—	13	B1
	3	—	—	21	A1,B1*
	4	—	—	25	A1,B1
	5	—	—	37	A1,B1*,B2
	6	—	—	41	A1,B1,B2
	7	—	—	53	A1,A2,B1*,B2
	8	—	—	56	A1,A2,B1,B2
	9	—	—	74	A1,A2,B1*,B2,B3
	10	—	—	78	A1,A2,B1,B2,B3
	11	—	—	96	A1,A2,A3,B1*,B2,B3
	12	—	—	100	A1,A2,A3,B1,B2,B3
190, 360A/B, 390B (60 Hz) A1**,B1**		9	A1*	9	B1*
	2	13	A1	13	B1
	3	18	A1*,B1*	18	A1*,B1
	4	21	A1*,B1	21	A1,B1*
	5	25	A1,B1	25	A1,B1
	6	33	A1*,A2,B1*	33	A1*,B1*,B2
	7	37	A1*,A2,B1	37	A1,B1*,B2
	8	41	A1,A2,B1	41	A1,B1,B2
	9	49	A1*,A2,B1*,B2	49	A1*,A2,B1*,B2
	10	53	A1*,A2,B1,B2	53	A1,A2,B1*,B2
	11	56	A1,A2,B1,B2	56	A1,A2,B1,B2
	12	71	A1●,A2,A3,B1*,B2	71	A1*,A2,B1●,B2,B3
	13	74	A1*,A2,A3,B1,B2	74	A1,A2,B1*,B2,B3
	14	78	A1,A2,A3,B1,B2	78	A1,A2,B1,B2,B3
	15	93	A1●,A2,A3,B1*,B2,B3	93	A1*,A2,A3,B1*,B2,B3
	16	96	A1*,A2,A3,B1,B2,B3	96	A1,A2,A3,B1●,B2,B3
	17	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
190, 360A, 390B (50 Hz) A1,B1		17	A1	17	B1
	2	33	A1,B1	33	A1,B1
	3	50	A1,A2,B1	50	A1,B1,B2
	4	67	A1,A2,B1,B2	67	A1,A2,B1,B2
	5	83	A1,A2,A3,B1,B2	83	A1,A2,B1,B2,B3
	6	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
190, 360A, 390B (50 Hz) A1**,B1		11	A1*	—	—
	2	17	A1	—	—
	3	28	A1*,B1	—	—
	4	33	A1,B1	—	—
	5	44	A1*,A2,B1	—	—
	6	50	A1,A2,B1	—	—
	7	61	A1*,A2,B1,B2	—	—
	8	67	A1,A2,B1,B2	—	—
	9	78	A1●,A2,A3,B1,B2	—	—
	10	83	A1,A2,A3,B1,B2	—	—
	11	94	A1*,A2,A3,B1,B2,B3	—	—
	12	100	A1,A2,A3,B1,B2,B3	—	—

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory.
††Two unloaders, both unloaded

NOTE: These capacity control steps may vary due to lag compressor sequencing

Table 4C — Capacity Control Steps, 130-210 and Associated Modular Units (cont)

UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
190, 360A, 390B (50 Hz) A1,B1**	1	—	—	11	B1*
	2	—	—	17	B1
	3	—	—	28	A1,B1*
	4	—	—	33	A1,B1
	5	—	—	44	A1,B1*,B2
	6	—	—	50	A1,B1,B2
	7	—	—	61	A1,A2,B1*,B2
	8	—	—	67	A1,A2,B1,B2
	9	—	—	78	A1,A2,B1*,B2,B3
	10	—	—	83	A1,A2,B1,B2,B3
	11	—	—	94	A1,A2,A3,B1●,B2,B3
	12	—	—	100	A1,A2,A3,B1,B2,B3
190, 360A, 390B (50 Hz) A1**,B1**	1	11	A1*	11	B1*
	2	17	A1	17	B1
	3	22	A1*,B1	22	A1*,B1*
	4	28	A1*,B1	28	A1,B1*
	5	33	A1,B1	33	A1,B1
	6	39	A1*,A2,B1*	39	A1●,B1*,B2
	7	44	A1*,A2,B1	44	A1,B1*,B2
	8	50	A1,A2,B1	50	A1,B1,B2
	9	55	A1*,A2,B1*,B2	55	A1*,A2,B1*,B2
	10	61	A1*,A2,B1,B2	61	A1,A2,B1*,B2
	11	67	A1,A2,B1,B2	67	A1,A2,B1,B2
	12	72	A1*,A2,A3,B1*,B2	72	A1*,A2,B1*,B2,B3
	13	78	A1*,A2,A3,B1,B2	78	A1,A2,B1*,B2,B3
	14	83	A1,A2,A3,B1,B2	83	A1,A2,B1,B2,B3
	15	89	A1*,A2,A3,B1*,B2,B3	89	A1*,A2,A3,B1*,B2,B3
	16	94	A1*,A2,A3,B1,B2,B3	94	A1,A2,A3,B1*,B2,B3
	17	100	At,A2,A3,Bt,B2,B3	100	A1,A2,A3,B1,B2,B3
210, 390A, 420A/B (60 Hz) A1,B1	1	11	A1	14	B1
	2	25	A1,B1	25	A1,B1
	3	36	A1,A2,B1	44	A1,B1,B2
	4	56	A1,A2,B1,B2	56	A1,A2,B1,B2
	5	67	A1,A2,A3,B1,B2	75	A1,A2,B1,B2,B3
	6	86	A1,A2,A3,B1,B2,B3	86	A1,A2,A3,B1,B2,B3
	7	100	A1,A2,A3,A4,B1,B2,B3	100	A1,A2,A3,A4,B1,B2,B3
210, 390A, 420A/B (60 Hz) A1**,B1	1	8	A1*	—	—
	2	11	A1	—	—
	3	22	A1*,B1	—	—
	4	25	A1,B1	—	—
	5	33	A1●,A2,B1	—	—
	6	36	A1,A2,B1	—	—
	7	52	A1●,A2,B1,B2	—	—
	8	56	A1,A2,B1,B2	—	—
	9	63	A1●,A2,A3,B1,B2	—	—
	10	67	At,A2,A3,B1,B2	—	—
	11	83	A1●,A2,A3,61,B2,B3	—	—
	12	86	A1,A2,A3,B1,B2,B3	—	—
	13	97	A1●,A2,A3,A4,Bi,B2,B3	—	—
	14	100	A1,A2,A3,A4,B1,B2,B3	—	—
210, 390A, 420A/B (60 Hz) A1,B1**	1	—	—	9	B1*
	2	—	—	14	B1
	3	—	—	21	A1,B1*
	4	—	—	25	A1,B1
	5	—	—	40	A1,B1*,B2
	6	—	—	44	A1,B1,B2
	7	—	—	51	At,A2,B1●,B2
	8	—	—	56	A1,A2,B1,B2
	9	—	—	71	A1,A2,B1●,B2,B3
	10	—	—	75	A1,A2,B1,B2,B3
	11	—	—	82	A1,A2,A3,B1*,B2,B3
	12	—	—	86	A1,A2,A3,B1,B2,B3
	13	—	—	96	A1,A2,A3,A4,B1*,B2,B3
	14	—	—	100	A1,A2,A3,A4,B1,B2,B3

*Unloaded compressor.
j-Compressor unloader, standard.
**Compressor unloader, accessory.
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing.

Table 4C — Capacity Control Steps, 130-210 and Associated Modular Units (cont)

UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
210, 390A, 420A/B (60 Hz) A1**,B1**	1	8	A1*	9	B1*
	2	11	A1	14	B1
	3	17	A1*,B1*	17	A1*,B1*
	4	22	A1*,B1	21	A1,B1*
	5	25	A1,B1	25	A1,B1
	6	28	A1*,A2,B1*	37	A1*,B1*,B2
	7	33	A1*,A2,B1	40	A1,B1*,B2
	8	36	A1,A2,B1	44	A1,B1,B2
	9	48	A1*,A2,B1*,B2	48	A1*,A2,B1*,B2
	10	52	A1●,A2,B1,B2	51	A1,A2,B1*,B2
	11	56	A1,A2,B1,B2	56	A1,A2,B1,B2
	12	59	A1*,A2,A3,B1*,B2	67	A1*,A2,B1*,B2,B3
	13	63	A1*,A2,A3,B1,B2	71	A1,A2,B1*,B2,B3
	14	67	A1,A2,A3,B1,B2	75	A1,A2,B1,B2,B3
	15	78	A1*,A2,A3,B1*,B2,B3	78	A1*,A2,A3,B1*,B2,B3
	16	83	A1*,A2,A3,B1,B2,B3	82	A1,A2,A3,B1*,B2,B3
	17	86	A1,A2,A3,B1,B2,B3	86	A1,A2,A3,B1,B2,B3
	18	92	A1*,A2,A3,A4,B1*,B2,B3	92	A1*,A2,A3,A4,B1*,B2,B3
	19	97	A1*,A2,A3,A4,B1,B2,B3	96	A1,A2,A3,A4,B1*,B2,B3
	20	100	A1,A2,A3,A4,B1,B2,B3	100	A1,A2,A3,A4,B1,B2,B3
210, 390A, 420A/B (50 Hz) A1,B1	1	9	A1	16	B1
	2	26	A1,B1	26	A1,B1
	3	35	A1,A2,B1	42	A1,B1,B2
	4	51	A1,A2,B1,B2	51	A1,A2,B1,B2
	5	67	A1,A2,A3,B1,B2	67	A1,A2,B1,B2,B3
	6	84	A1,A2,A3,B1,B2,B3	84	A1,A2,A3,B1,B2,B3
	7	100	A1,A2,A3,A4,B1,B2,B3	100	A1,A2,A3,A4,B1,B2,B3
210, 390A, 420A/B (50 Hz) A1**,B1	1	6	A1"	—	—
	2	9	A1	—	—
	3	23	A1*,B1	—	—
	4	26	A1,B1	—	—
	5	32	A1*,A2,B1		—
	6	35	A1,A2,B1	—	—
	7	48	A1*,A2,B1,B2	—	—
	8	51	A1,A2,B1,B2	—	—
	9	65	A1*,A2,A3,B1,B2	—	—
	10	67	A1,A2,A3,B1,B2	—	—
	11	81	A1*,A2,A3,B1,B2,B3	—	—
	12	84	A1,A2,A3,B1,B2,B3	—	—
	13	97	A1*,A2,A3,A4,B1,B2,B3	—	—
	14	100	A1,A2,A3,A4,B1,B2,B3	—	—
210, 390A, 420A/B (50 Hz) A1,B1**	1	—	—	11	B1*
	2	—	—	16	B1
	3	—	—	20	A1,B1*
	4	—	—	26	A1,B1
	5	—	—	36	A1,B1*,B2
	6	—	—	42	A1,B1,B2
	7	—	—	46	A1,A2,B1*,B2
	8	—	—	51	A1,A2,B1,B2
	9	—	—	62	A1,A2,B1*,B2,B3
	10	—	—	67	A1,A2,B1,B2,B3
	11	—	—	78	A1,A2,A3,B1*,B2,B3
	12	—	—	84	A1,A2,A3,B1,B2,B3
	13	—	—	94	A1,A2,A3,A4,B1*,B2,B3
	14	—	—	100	A1,A2,A3,A4,B1,B2,B3
210, 390A, 420A/B (50 Hz) A1**,B1**	1	7	A1*	11	B1*
	2	9	A1	16	B1
	3	17	A1*,B1*	17	A1*,B1*
	4	23	A1*,B1	20	A1,B1*
	5	26	A1,B1	26	A1,B1
	6	27	A1*,A2,B1*	34	A1*,B1*,B2
	7	32	A1*,A2,B1	36	A1,B1*,B2
	8	35	A1,A2,B1	42	A1,B1,B2
	9	43	A1●,A2,B1*,B2	43	A1●,A2,B1*,B2
	10	48	A1*,A2,B1,B2	46	A1,A2,B1*,B2
	11	51	A1,A2,B1,B2	51	A1,A2,B1,B2
	12	59	A1*,A2,A3,B1*,B2	59	A1*,A2,B1*,B2,B3
	13	65	A1*,A2,A3,B1,B2	62	A1,A2,B1*,B2,B3
	14	67	A1,A2,A3,B1,B2	67	A1,A2,B1,B2,B3
	15	75	A1*,A2,A3,B1*,B2,B3	75	A1*,A2,A3,B1*,B2,B3
	16	81	A1*,A2,A3,B1,B2,B3	78	A1,A2,A3,B1*,B2,B3
	17	84	A1,A2,A3,B1,B2,B3	84	A1,A2,A3,B1,B2,B3
	18	92	A1*,A2,A3,A4,B1*,B2,B3	92	A1*,A2,A3,A4,B1*,B2,B3
	19	97	A1*,A2,A3,A4,B1,B2,B3	94	A1,A2,A3,A4,B1*,B2,B3
	20	100	A1,A2,A3,A4,B1,B2,B3	100	A1,A2,A3,A4,B1,B2,B3

*Unloaded compressor
†Compressor unloader, standard
**Compressor unloader, accessory
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing.

Table 4D — Capacity Control Steps, 225, 250,280

UNIT 30GT	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
225 (60 Hz)	1	12	A1	12	B1
	2	23	A1,B1	23	A1,B1
	3	35	A1,A2,B1	35	A1,B1,B2
	4	46	A1,A2,B1,B2	46	A1,A2,B1,B2
	5	58	A1,A2,A3,B1,B2	58	A1,A2,B1,B2,B3
	6	69	A1,A2,A3,B1,B2,B3	69	A1,A2,A3,B1,B2,B3
	7	85	A1,A2,A3,A4,B1,B2,B3	85	A1,A2,A3,B1,B2,B3,B4
	8	100	A1,A2,A3,A4,B1,B2,B3,B4	100	A1,A2,A3,A4,B1,B2,B3,B4
225 (60 Hz) A1**	1	8	A1*	—	—
	2	12	A1	—	—
	3	19	A1*,B1	—	—
	4	23	A1,B1	—	—
	5	31	A1*,A2,B1	—	—
	6	35	A1,A2,B1	—	—
	7	42	A1*,A2,B1,B2	—	—
	8	46	A1,A2,B1,B2	—	—
	9	54	A1●,A2,A3,B1,B2	—	—
	10	58	A1,A2,A3,B1,B2	—	—
	11	66	A1*,A2,A3,B1,B2,B3	—	—
	12	69	A1,A2,A3,B1,B2,B3	—	—
	13	81	A1*,A2,A3,A4,B1,B2,B3	—	—
	14	85	A1,A2,A3,A4,B1,B2,B3	—	—
	15	96	A1*,A2,A3,A4,B1,B2,B3,B4	—	—
	16	100	A1,A2,A3,A4,B1,B4,B3,A4	—	—
225 (60 Hz) A1**,B1**	1	8	A1*	8	B1*
	2	12	A1	12	B1
	3	15	A1*,B1*	15	A1*,B1*
	4	19	A1,B1*	19	A1*,B1
	5	23	A1,B1	23	A1,B1
	6	27	A1*,A2,B1*	27	A1*,B1*,B2
	7	31	A1*,A2,B1	31	A1,B1*,B2
	8	35	A1,A2,B1	35	A1,B1,B2
	9	39	A1*,A2,B1*,B2	39	A1*,A2,B1*,B2
	10	42	A1,A2,B1*,B2	42	A1*,A2,B1,B2
	11	46	A1,A2,B1,B2	46	A1,A2,B1,B2
	12	50	A1*,A2,A3,B1*,B2	50	A1*,A2,B1*,B2,B3
	13	54	A1*,A2,A3,B1,B2	54	A1,A2,B1*,B2,B3
	14	58	A1,A2,A3,B1,B2	58	A1,A2,B1,B2,B3
	15	62	A1●,A2,A3,B1●,B2,B3	62	A1●,A2,A3,B1*,B2,B3
	16	66	A1,A2,A3,B1*,B2,B3	66	A1*,A2,A3,B1,B2,B3
	17	69	A1,A2,A3,B1,B2,B3	69	A1,A2,A3,B1,B2,B3
	18	77	A1*,A2,A3,A4,B1*,B2,B3	77	A1*,A2,A3,B1*,B2,B3,B4
	19	81	A1*,A2,A3,A4,B1,B2,B3	81	A1,A2,A3,B1*,B2,B3,B4
	20	85	A1,A2,A3,A4,B1,B2,B3	85	A1,A2,A3,B1,B2,B3,B4
	21	92	A1*,A2,A3,A4,B1*,B2,B3,B4	92	A1*,A2,A3,A4,B1*,B2,B3,B4
	22	96	A1,A2,A3,A4,B1*,B2,B3,B4	96	A1*,A2,A3,A4,B1,B2,B3,B4
	23	100	A1,A2,A3,A4,B1,B2,B3,B4	100	At,A2,A3,A4,B1,A2,B3,B4
225 (50 Hz)	1	10	A1	13	B1
	2	23	A1,B1	23	A1,B1
	3	36	A1,A2,B1	36	A1,B1,B2
	4	48	A1,A2,B1,B2	48	A1,A2,B1,B2
	5	61	A1,A2,A3,B1,B2	61	A1,A2,B1,B2,B3
	6	74	A1,A2,A3,B1,B2,B3	74	A1,A2,A3,B1,B2,B3
	7	87	A1,A2,A3,A4,B1,B2,B3	87	A1,A2,A3,B1,B2,B3,B4
	8	100	A1,A2,A3,A4,B1,B2,B3,B4	100	A1,A2,A3,A4,B1,B2,B3,B4
225 (50 Hz) A1**	1	7	A1*	—	—
	2	10	A1	—	—
	3	19	A1*,B1	—	—
	4	23	A1,B1	—	—
	5	32	A1*,A2,B1	—	—
	6	36	A1,A2,B1	—	—
	7	45	At*,A2,B1,B2	—	—
	8	48	A1,A2,B1,B2	—	—
	9	58	A1*,A2,A3,B1,B2	—	—
	10	61	A1,A2,A3,B1,B2	—	—
	11	71	A1*,A2,A3,B1,B2,B3	—	—
	12	74	A1,A2,A3,B1,B2,B3	—	—
	13	84	A1*,A2,A3,A4,B1,B2,B3	—	—
	14	87	A1,A2,A3,A4,B1,B2,B3	—	—
	15	97	A1*,A2,A3,A4,B1,B2,B3,B4	—	—
	16	100	A1,A2,A3,A4,B1,B2,B3,B4	—	—

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to **lag** compressor sequencing

Table 4D — Capacity Control Steps, 225, 250,280 (cont)

UNIT 30GT	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
225 (50 Hz) A1**,B1**	1	7	A1*	9	B1*
	2	10	A1	13	B1
	3	15	A1*,B1*	15	A1*,B1*
	4	18	A1,B1*	18	A1,B1*
	5	23	A1,B1	23	A1,B1
	6	28	A1*,A2,B1*	28	A1*,A2,B1*
	7	32	A1*,A2,B1	32	A1*,A2,B1
	8	36	A1,A2,B1	36	A1,A2,B1
	9	41	A1*,A2,B1*,B2	41	A1*,A2,B1*,B2
	10	44	A1,A2,B1*,B2	44	A1,A2,B1*,B2
	11	48	A1,A2,B1,B2	48	A1,A2,B1,B2
	12	54	A1*,A2,A3,B1*,B2	54	A1*,A2,A3,B1*,B2
	13	58	A1*,A2,A3,B1,B2	58	A1*,A2,A3,B1,B2
	14	61	A1,A2,A3,B1,B2	61	A1,A2,A3,B1,B2
	15	67	A1*,A2,A3,B1*,B2,B3	67	A1*,A2,A3,B1*,B2,B3
	16	71	A1*,A2,A3,B1,B2,B3	71	A1*,A2,A3,B1,B2,B3
	17	74	A1,A2,A3,B1,B2,B3	74	A1,A2,A3,B1,B2,B3
	18	80	A1*,A2,A3,A4,B1*,B2,B3	80	A1*,A2,A3,A4,B1*,B2,B3
	19	84	A1*,A2,A3,A4,B1,B2,B3	84	A1*,A2,A3,A4,B1,B2,B3
	20	87	A1,A2,A3,A4,B1,B2,B3	87	A1,A2,A3,A4,B1,B2,B3
	21	92	A1*,A2,A3,A4,B1*,B2,B3,B4	92	A1*,A2,A3,A4,B1*,B3,B3,B4
	22	97	A1*,A2,A3,A4,B1,B2,B3,B4	97	A1*,A2,A3,A4,B1,B2,B3,B4
	23	100	A1,A2,A3,A4,B1,B2,B3,B4	100	A1,A2,A3,A4,B1,B2,B3,B4
250 (60 Hz)	1	11	A1	11	B1
	2	22	A1,B1	22	A1,B1
	3	32	A1,A2,B1	32	A1,B1,B2
	4	43	A1,A2,B1,B2	43	A1,A2,B1,B2
	5	57	A1,A2,A3,B1,B2	57	A1,A2,B1,B2,B3
	6	72	A1,A2,A3,B1,B2,B3	72	A1,A2,A3,B1,B2,B3
	7	86	A1,A2,A3,A4,B1,B2,B3	86	A1,A2,A3,B1,B2,B3,B4
	8	100	A1,A2,A3,A4,B1,B2,B3,B4	100	A1,A2,A3,A4,B1,B2,B3,B4
250 (60 Hz) A1**	1	7	A1*	—	—
	2	11	A1	—	—
	3	18	A1*,B1	—	—
	4	22	A1,B1	—	—
	5	29	A1*,A2,B1	—	—
	6	32	A1,A2,B1	—	—
	7	40	A1*,A2,B1,B2	—	—
	8	43	A1,A2,B1,B2	—	—
	9	54	A1*,A2,A3,B1,B2	—	—
	10	57	A1,A2,A3,B1,B2	—	—
	11	68	A1*,A2,A3,B1,B2,B3	—	—
	12	72	A1,A2,A3,B1,B2,B3	—	—
	13	82	A1*,A2,A3,A4,B1,B2,B3	—	—
	14	86	A1,A2,A3,A4,B1,B2,B3	—	—
	15	96	A1*,A2,A3,A4,B1,B2,B3,B4	—	—
	16	100	A1,A2,A3,A4,B1,B2,B3,B4	—	—
250 (60 Hz) A1**,B1**	1	7	A1*	7	B1*
	2	11	A1	11	B1
	3	14	A1*,B1*	14	A1*,B1*
	4	18	A1,B1	18	A1*,B1
	5	22	A1,B1	22	A1,B1
	6	25	A1*,A2,B1*	25	A1*,B1*,B2
	7	29	A1*,A2,B1	29	A1,B1*,B2
	8	32	A1,A2,B1	32	A1,B1,B2
	9	36	A1,A2,B1*,B2	36	A1,A2,B1*,B2
	10	40	A1,A2,B1*,B2	40	A1*,A2,B1,B2
	11	43	A1,A2,B1,B2	43	A1,A2,B1,B2
	12	50	A1*,A2,A3,B1*,B2	50	A1*,A2,B1*,B2,B3
	13	54	A1*,A2,A3,B1,B2	54	A1,A2,B1*,B2,B3
	14	57	A1,A2,A3,B1,B2	57	A1,A2,B1,B2,B3
	15	64	A1*,A2,A3,B1*,B2,B3	64	A1*,A2,A3,B1*,B2,B3
	16	68	A1,A2,A3,B1*,B2,B3	68	A1*,A2,A3,B1,B2,B3
	17	72	A1,A2,A3,B1,B2,B3	72	A1,A2,A3,B1,B2,B3
	18	79	A1*,A2,A3,A4,B1*,B2,B3	79	A1*,A2,A3,B1*,B2,B3,B4
	19	82	A1*,A2,A3,A4,B1,B2,B3	82	A1,A2,A3,B1*,B2,B3,B4
	20	86	A1,A2,A3,A4,B1,B2,B3	86	A1,A2,A3,B1,B2,B3,B4
	21	93	A1*,A2,A3,A4,B1*,B2,B3,B4	93	A1*,A2,A3,A4,B1*,B2,B3,B4
	22	96	A1,A2,A3,A4,B1*,B2,B3,B4	96	A1*,A2,A3,A4,B1,B2,B3,B4
	23	100	A1,A2,A3,A4,B1,B2,B3,B4	100	A1,A2,A3,A4,B1,B2,B3,B4

*Unloaded compressor.
†Compressor unloader, standard
**Compressor unloader, accessory
††Two unloaders, both unloaded.

NOTE: These capacity control steps may vary due to lag compressor sequencing.

Table 4D — Capacity Control Steps, 225, 250, 280 (cont)

UNIT 30GT	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
250 (50 Hz) 280 (60 Hz)	1	13	A1	13	B1
	2	25	A1,B1	25	A1,B1
	3	38	A1,A2,B1	38	A1,B1,B2
	4	50	A1,A2,B1,B2	50	A1,A2,B1,B2
	5	63	A1,A2,A3,B1,B2	63	A1,A2,B1,B2,B3
	6	75	A1,A2,A3,B1,B2,B3	75	A1,A2,A3,B1,B2,B3
	7	88	A1,A2,A3,A4,B1,B2,B3	88	A1,A2,A3,A4,B1,B2,B3
	8	100	A1,A2,A3,A4,B1,B2,B3,B4	100	A1,A2,A3,A4,B1,B2,B3,B4
250 (50 Hz), 280 A1**	1	8	A1"	—	
	2	13	A1	—	—
	3	21	A1*,B1	—	—
	4	25	A1,B1	—	—
	5	33	A1 ●,A2,B1	—	
	6	38	A1,A2,B1	—	—
	7	46	A1*,A2,B1,B2	—	—
	8	50	A1,A2,B1,B2	—	—
	9	58	A1*,A2,A3,B1,B2	—	—
	10	63	A1,A2,A3,B1,B2	—	—
	11	71	A1*,A2,A3,B1,B2,B3	—	—
	12	75	A1,A2,A3,B1,B2,B3	—	—
	13	83	A1 ●,A2,A3,A4,B1,B2,B3	—	
	14	88	A1,A2,A3,A4,B1,B2,B3	—	—
	15	96	A1*,A2,A3,A4,B1,B2,B3,B4	—	—
	16	100	A1,A2,A3,A4,B1,B2,B3,B4	—	—
250 (50 Hz), 280 A1**,B1**	1	8	A1*	8	B1*
	2	13	A1	13	B1
	3	17	A1*,B1*	17	A1*,B1*
	4	21	A1,B1*	21	A1*,B1
	5	25	A1,B1	25	A1,B1
	6	29	A1*,A2,B1*	29	A1 ●,B1*,B2
	7	33	A1*,A2,B1	33	A1,B1*,B2
	8	38	A1,A2,B1	38	A1,B1,B2
	9	42	A1*,A2,B1*,B2	42	A1*,A2,B1*,B2
	10	46	A1,A2,B1*,B2	46	A1 ●,A2,B1,B2
	11	50	A1,A2,B1,B2	50	A1,A2,B1,B2
	12	54	A1*,A2,A3,B1*,B2	54	A1*,A2,B1*,B2,B3
	13	58	A1 ●,A2,A3,B1,B2	58	A1,A2,B1*,B2,B3
	14	63	A1,A2,A3,B1,B2	63	A1,A2,B1,B2,B3
	15	67	A1*,A2,A3,B1*,B2,B3	67	A1*,A2,A3,B1*,B2,B3
	16	71	A1,A2,A3,B1*,B2,B3	71	A1*,A2,A3,B1,B2,B3
	17	75	A1,A2,A3,B1,B2,B3	75	A1,A2,A3,B1,B2,B3
	18	79	A1*,A2,A3,A4,B1*,B2,B3	79	A1*,A2,A3,B1*,B2,B3,B4
	19	83	A1*,A2,A3,A4,B1,B2,B3	83	A1,A2,A3,B1*,B2,B3,B4
	20	88	A1,A2,A3,A4,B1,B2,B3	88	A1,A2,A3,B1,B2,B3,B4
	21	92	A1*,A2,A3,A4,B1*,B2,B3,B4	92	A1*,A2,A3,A4,B1*,B2,B3,B4
	22	96	A1,A2,A3,A4,B1*,B2,B3,B4	96	A1*,A2,A3,A4,B1,B2,B3,B4
	23	100	A1,A2,A3,A4,B1,B2,B3,B4	100	A1,A2,A3,A4,B1,B2,B3,B4

*Unloaded compressor.
-/-Compressor unloader, standard.
●Compressor unloader, accessory
††Two unloaders, both unloaded

NOTE: These capacity control steps may vary due to lag compressor sequencing

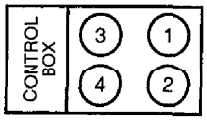
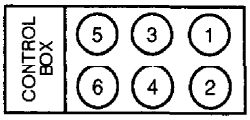
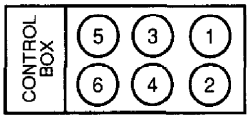
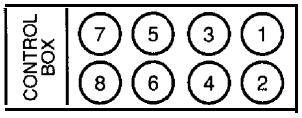
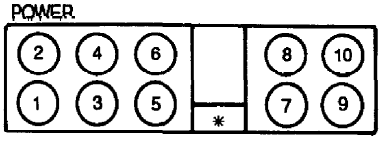
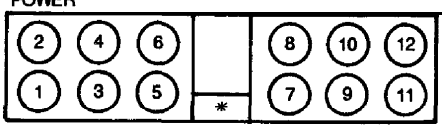
Head Pressure Control — The microprocessor controls the condenser fans in order to maintain the lowest condensing temperature possible, thus the highest unit efficiency. Instead of using the conventional head pressure control methods, the fans are controlled by the position of the EXV and suction superheat.

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

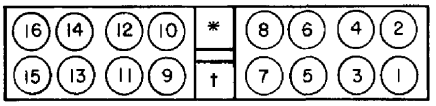
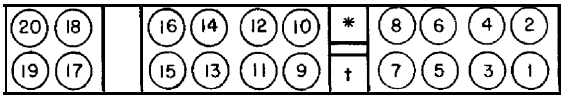
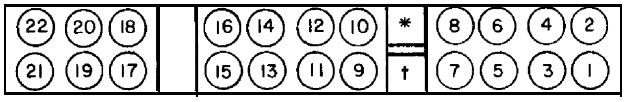
During start-up, all the condenser fans are started when the condensing temperature reaches 95 F (35 C) to prevent excessive discharge pressure during pulldown. See Table 5 for condenser fan sequence of operation.

Table 5 — Condenser Fan Sequence

FAN ARRANGEMENT	FAN NUMBER(S)	FAN CONTACTOR (FC)	CONTROLLED BY
30GN040-050  A30-1346	1	FC-Al	Compressor Al
	2	FC-B1	Compressor B1
	3	FC-A2	First Stage Microprocessor
	4	FC-B2	Second Stage Microprocessor
30GN060,070  -1347	1	FC-Al	Compressor Al
	2	FC-B1	Compressor B1
	3, 4	FC-A2	First Stage Microprocessor
	5, 6	FC-B2	Second Stage Microprocessor
30GN080,090  -1348	1	FC-Al	Compressor Al
	2	FC-B1	Compressor B1
	3	FC-A2	First Stage Microprocessor
	4	FC-B2	
	3, 4, 5, 6	FC-A2, FC-B2, FC-A3, FC-B3	Second Stage Microprocessor
30GN100,110 (and associated modular units)  -1349	1	FC-Al	Compressor Al
	2	FC-81	Compressor B1
	3	FC-A2	First Stage Microprocessor
	4	FC-B2	
	5, 7, 6, 8	FC-AS, FC-B3	Second Stage Compressor
	3, 4, 5, 6, 7, 8	FC-A2, FC-A3, FC-B2, FC-B3	Third Stage Microprocessor
30GN130-170 (and associated modular units)  -1350	5, 7	FC-Al	Compressor Al
	6, 8	FC-Bl	Compressor B1
	3, 9	FC-A2	First Stage Microprocessor
	4, 10	FC-B2	
	1, 3, 9	FC-A2, FC-A3	Second Stage Microprocessor
	2, 4, 10	FC-B2, FC-B3	
30GN190,210 (and associated modular units) -1351 	5, 7	FC-Al	Compressor Al
	6. 8	FC-B1	Compressor B1
	3, 9	FC-A2	Frist Stage Microprocessor
	4, 10	FC-B2	
	1, 3, 9, 11	FC-A2, FC-A3	Second Stage Microprocessor
	2, 4, 10, 12	FC-B2, FC-B3	

*Control box.

Table 5 — Condenser Fan Sequence (cont)

FAN ARRANGEMENT	FAN NUMBER(S)	FAN CONTACTOR (FC)	CONTROLLED BY
30GT225 A30-771 	7, 8	FC-1	Compressor A1
	9, 10	FC-4	Compressor B1
	5, 6	FC-2	First Stage Microprocessor
	11, 12	FC-5	
	1, 2, 3, 4	FC-3	Second Stage Microprocessor
	13, 14, 15, 16	FC-6	
	1, 2, 3, 4, 5, 6	FC-2, FC-3	Third Stage Microprocessor
	11, 12, 13, 14, 15, 16	FC-5, FC-6	
30GT250 (60 Hz) -772 	7, 8, 10	FC-1	Compressor A1
	9, 17, 18	FC-4	Compressor B1
	5, 6	FC-2	First Stage Microprocessor
	11, 12, 19	FC-5	
	1, 2, 3, 4, 13, 14, 15, 16, 20	FC-3, FC-6, FC-7	Second Stage Microprocessor
	1, 2, 3, 4, 5, 6, 11, 12, 13, 14, 15, 16, 19, 20	FC-2, FC-3, FC-5, FC-6, FC-7	Third Stage Microprocessor
30GT250 (50 Hz) AND **30GT280** -773 	7, 8, 10	FC-1	Compressor A1
	9, 17, 18	FC-4	Compressor B1
	5, 6	FC-2	First Stage Microprocessor
	11, 12, 19, 20	FC-5	
	1, 2, 3, 4, 13, 14, 15, 16, 21, 22	FC-3, FC-6, FC-7	Second Stage Microprocessor
	1, 2, 3, 4, 5, 6, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22	FC-2, FC-3, FC-4, FC-5, FC-6, FC-7	Third Stage Microprocessor

*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 pumpout cycle starts immediately upon starting the lead compressor and continues until the saturated suction temperature is 10” F (5.5” C) below the saturated suction temperature at start-up, is 10° F (5.5” C) below the cooler leaving fluid temperature, or reaches a saturated suction temperature of -15 F (-26 C). No pumpout is necessary if the saturated suction temperature is below -15 F (-26 C). 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 shutdown, the pumpout cycle continues until the saturated suction temperature for that circuit is 10” F (5.5” C) below the saturated suction temperature when pumpout is initiated, or saturated suction temperature reaches -15 F (-26 C). At that point, the compressor shuts down and the EXV continues to move until fully closed.

Keypad 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 keypad with 6 function keys, 5 operative keys, 12 numeric keys (0 to 9, •, and -), and an alphanumeric g-character LCD (liquid crystal display). See Fig. 3. See Table 6 for key usage.

> IMPORTANT: When entering multiple character inputs beginning with a zero, a decimal point must be entered in place of the first zero. When entering an input of zero, only the decimal point need be entered.

ACCESSING FUNCTIONS AND SUBFUNCTIONS — See Tables 6 - 8. Table 7 shows the 6 functions (identified by name) and the subfunctions (identified by number).

A30-645

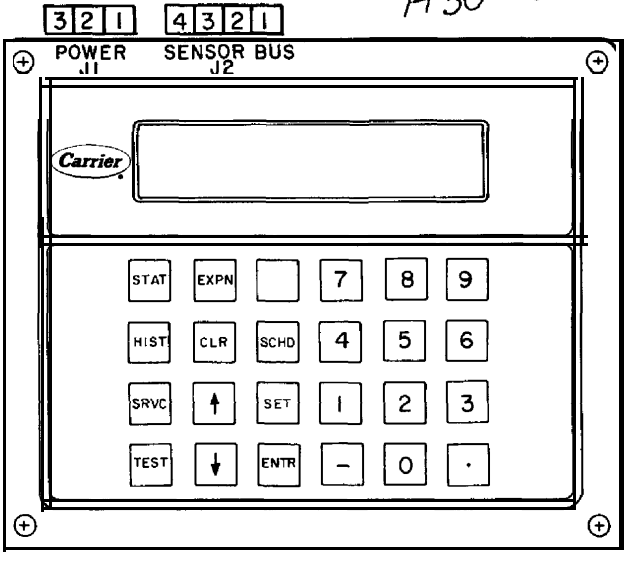


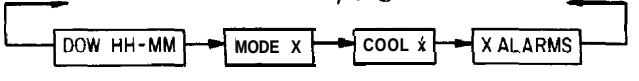
Fig. 3 — Keypad and Display Module

SUMMARY DISPLAY — When keypad 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 keypad displays the current time (24-hour format), current operating modes, cooling capacity stages, and total number of alarms.

A30-1352



DOW — Day of Week
HH — Hour(s)
MM — Minute(s)

The default display is displayed every 2 seconds if there has been no manual input from the keypad for 10 minutes. To return to automatic display, enter [alt] [STAT] any time.

Table 6 — Keypad and Display Module Usage

FUNCTION KEYS	USE
STAT	STATUS — For displaying diagnostic codes and current operating information about the machine.
HIST	HISTORY — For displaying run time, cycles and previous alarms.
SRVC	SERVICE — For entering specific unit configuration information.
	TEST — For checking inputs and outputs for proper operation.
SCHD	SCHEDULE — For entering occupied/unoccupied schedules for unit operation
SET	SET POINT — For entering operating set points and day/time information.
OPERATIVE KEYS	**USE**
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

KEYPAD OPERATING INSTRUCTIONS (Refer to Table 9.)

1. White keys on left side of keypad are shown and operated in these instructions according to the following example: keypad entry means press the ❑ , then the white key marked [SRVC] .
2. The standard display uses abbreviations. Expanded information scrolls through the display whenever ❑ 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 ❑ or [↓] arrow. For example, a [6] [STAT] enters the Temperature Information subfunction.
4. At any time, another subfunction may be entered by 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 section on page 39.
6. Depending on system configuration, all displays may not be shown. All displays are shown unless marked with the following symbol.

   *Must be configured.

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

Table 7 — Functions and Subfunctions

SUBFUNCTION NO.	FUNCTIONS					
	Status [STAT]	Test [TEST]	Schedule [SCHD]	Service [SRVC]	History [HIST]	Set Point [SET]
1	Automatic Display	outputs	Override	Log On and Log Off	Run Time	Set Points (Chiller Fluid)
2	Alarm Display	Compressors and Unloaders	Clock Set	Version (Software)	Starts	Reset Set Points
3	Mode (Operating) Display	—	Period 1	Factory Configuration	Alarm History	Demand Limit Set Points
4	Capacity Stages	—	Period 2	Field Configuration	—	Date and Time
5	Set Points (Current Operating)	—	Period 3	Service Configuration	—	—
6	Temperatures	—	Period 4	—	—	—
7	Pressures	—	Period 5	—	—	—
8	Analog	—	Period 6	—	—	—
9	Inputs	—	Period 7	—	—	—
10	outputs		Period 8	—	—	—
11	—	—	HOLIDAYS	—	—	—

Table 8 — Accessing Functions and Subfunctions

OPERATION	KEYPAD ENTRY	DISPLAY RESPONSE	DESCRIPTION
To access a function, press subfunction no and function name key. Display shows subfunction group.	2 [SET]	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 Maximum Reset xx
	[↓]	CREF2xx	Cooling Maximum Reference xx
	[↓]	CRST1xx	Cooling Minimum Reference xx
	[↓]	CREF1xx	Cooling Minimum Reference xx
When the last element in a subfunction has been displayed, the first element is repeated.	[↓]	RESET	Reset Set
	[↓]	CRST2xx	Cooling Maximum Reset xx
To move to next subfunction it is not necessary to use subfunction number Press function name key to advance display through all subfunctions within a function and then back to the first	[SET]	DEMAND	Demand Set Points
	[SET]	TIME	Current Time and Day of Week
	[SET]	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 specif ic subfunction by'using the subfunction number and the function name kev.	[STAT]	X ALARMS	Rotating Display
	4 [STAT]	STAGE	Capacity Stages

Table 9 — Keypad Directory

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
STATUS			
1 AUTOMATIC DISPLAY	1 STAT	Refer to Automatic Display Operation on page 28	
2 ALARMS	2 STAT	X ALARMS	Number of Tripped Alarms
	↓	ALARM X	Displays Tripped Alarms
	↓	ALARM X	
	↓	ALARM X	
	↓	ALARM X	
	↓	ALARM X	
3 MODES	3 STAT	X MODES	Number of Modes in Effect
	↓	MODE X	Displays Mode in Effect
	↓	MODE X	
	↓	MODE X	
	↓	MODE X	
4 STAGE	4 STAT	STAGE	Capacity Staging Information
	↓	STAGE X	Number of Requested Stages
	↓	CAPT X	Percent of Total Capacity
	↓	CAPA X	Percent Circuit A Capacity
	↓	CAP0 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**	5 STAT	SET POINT	Fluid Set Point Information
	↓	SP x	Set Point
	↓	MSP X	Modified Set Point = Set Point + Reset
	↓	TWX	Cooler Leaving Fluid Temperature
6 TEMPERATURE	6 STAT	TEMPS	Temperature Information
	↓	EWTX	Cooler Entering Fluid Temperature
	↓	LWT X	Cooler Leaving Fluid Temperature
	↓	SCTA X	Circuit A Saturated Condenser Temperature
	↓	SSTA X	Circuit A Saturated Suction Temperature
	↓	CTA X	Compressor Al Suction Temperature
	↓	SHA X	Circuit A Suction Superheat

LEGEND

CCN — Carrier Comfort Network
EXV — Electronic Expansion Valve
MOP — Maximum Operating Pressure

*Must be configured
†If applicable

Table 9 — Keypad Directory (cont)

STATUS (cont)			
SUBFUNCTION	**KEYPADENTRY**	**DISPLAY**	**COMMENT**
6 TEMPERATURE (cont)	cl ↓	SCTB X	Circuit B Saturated Condenser Temperature
	↓	SSTB X	Circuit B Saturated Suction Temperature
	↓	CTB X	Compressor B1 Suction Temperature
	↓	SHB X	Circuit B Suction Superheat
	↓	RST X*	Reset Temperature
7 **PRESSURE**	7 STAT	PRESSURE	Refrigerant System Pressure (psig)
	↓	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	8 STAT	ANALOG	Status of Analog Inputs
	↓	REF X	Transducer Supply Voltage
	↓	LMT X*	Demand 4-20 mA Signal
	↓	RST X*	Reset 4-20 mA Signal
9 INPUTS	9 STAT	INPUT	Status of Switch Inputs
	↓	SPW x*	Dual Set Point Switch
	↓	DL1 X*	Demand Limit Switch 1
	↓	DL2 X*	Demand Limit Switch 2

Table 9 — Keypad Directory (cont)

STATUS (cont)

SUBFUNCTION	KEYPAD 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/ENABLE-STOP-CCN switch must be in STOP position To operate a test, scroll to desired test Then, press ENTR to start test. Press ↓ to stop test.

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
1 OUTPUTS	1 TEST	OUTPUTS	Test Outputs
	↓	8 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

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	KEYPAD ENTRY	DISPLAY	COMMENT
2 COMPRESSORS AND UNLOADERS	2 TEST	COMP	Compressor and Unloader Test
	↓	CPA1 X	Test Compressor Al
	↓	CPA2 X*	Test Compressor A2†
	↓	CPA3 X*	Test Compressor A3†
	↓	CPA4 X*	Test Compressor A4†
	↓	CPB1 X	Test Compressor B1
	↓	CPB2 x*	Test Compressor B2†
	↓	CPB3 X*	Test Compressor B3†
	↓	CPB4 X*	Test Compressor B4†
	↓	ULA1 X	Energize Unloader Al †
	↓	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 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 1	KEYPAD ENTRY	DISPLAY	COMMENT
1 OVERRIDE	1 SCHD	OVRD X	Number of Override Hrs (0 - 4 Hrs)
For 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)

LEGEND

CCN — Carrier Comfort Network
EXV — Electronic Expansion Valve
MOP — Maximum Operating Pressure

*Must be configured
†If applicable.

Table 9 — Keypad Directory

SCHEDULE (cont)

SUBFUNCTION	KEYPAD 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: [•] [ENTR]			
4 PERIOD 2	[4] [SCHD]	PERIOD 2	Period 2 Time Schedule
5 PERIOD 3 . . . 9 PERIOD 7	[5] [SCHD] ... [9] [SCHD]	PERIOD 3 ... PERIOD 7	Period 3 ... Period 7 Time Schedule
10 PERIOD 8	[10] [SCHD]	PERIOD 8	Period 8 Time Schedule
11 HOLIDAYS	[11] [SCHD]	HOLIDAYS	Define Calendar Holidays
	[↓]	DAT MM.DD	Holiday Date 1
New = Unassigned Holiday Date	[↓]		
	[↓]		
	[↓]	DAT MM.DD NN	Holiday Date 30

For 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 on page 45.

SERVICE

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

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
1 LOG ON AND LOG OFF	[1] [SRVC]	LOG ON	Enter Password/Disable Password Protection
	[Logged On] [1] [ENTR]	(LOGGEDON	
At this time, configurations may be modified. When finished viewing and/or modifying configurations, log out as follows:			
	[↓]	LOG OFF	Disable Password Protection
	[ENTR]	EXIT LOG	Logged Off/Enable Password Protection
2 VERSION	[2] [SRVC]	VERSION	Software Information
	[↓]	XXXXXXXX	Version No. of Software (CESRXX)
	[↓]	X	Language Options

See legend on page 30

Table 9 — Keypad 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	KEYPAD ENTRY	DISPLAY	COMMENT
3 FACTORY CONFIGURATION	[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
	[↓]	xxxxxxxx	Configuration Code 6
4 FIELD CONFIGURATION	[4] [SRVC]	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 Unloaders
	[↓]	HGB X	Hot Gas Bypass Select
	[↓]	SEQT X	Loading Sequence Select
	[↓]	SEQF X	Lead/Lag Sequence Select
	[↓]	OPS x	Oil Pressure Switch Select
	[↓]	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 CONFIGURATION	[5] [SRVC]	SRV CFG	Service Configurations
	[↓]	xxxxxxxx	Configuration Code 7
	[↓]	xxxxxxxx	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

Table 9 — Keypad Directory (cont)

HISTORY

SUBFUNCTION	KEYPAD ENTRY	DISPLAY	COMMENT
1 RUN TIME	1 HIST	RUN TIME	Run Time Information
	↓	HR X	Total Hrs Unit Has a Comp Operating
	↓	HRA X	Circuit A Run Time
	C ↓ I	HRB X	Circuit B Run Time
2 STARTS	2 HIST	STARTS	Starts Information
	C ↓ I	CY x	Cycles from Stage 0 to Stage 1
	C ↓ I	CYA X	Circuit A Starts
	C ↓ I	CYB X	Circuit 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 ENTR
LOCAL/ENABLE-STOP-CCN switch must be in LOCAL or STOP position,

SUBFUNCTION	KEYPAD 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 Minimum 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 Maximum Demand Limit
	↓	RMAX X*	Max Demand Limit Occurs at X mA
	↓	DMIN X*	4-20 mA Minimum Demand Limit
	↓	RMIN X*	Minimum 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, and switch inputs. These subfunctions are defined on pages 37 and 38.

(Rotating Display)

(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 10 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 ❑ after a code has been displayed. The meaning of the code scrolls across the screen. See Example 1

Example 1 — Reading Alarm Codes

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
	TUE 12:45 MODE 13 0 STAGES 2 ALARMS	Keypad 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/ENABLE 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 10.

Table 10 — Operationat 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/ENABLE-STOP-CCN switch is in OFF position, or LOCAL/ENABLE-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/ENABLE-STOP-CCN switch is in CCN position.
CLOCK OFF	Unit is off due to internal clock schedule. LOCAL/ENABLE-STOP-CCN switch is in LOCAL position.
LOCAL ON	Unit is on. LOCAL/ENABLE-STOP-CCN switch is in LOCAL position If external ON/OFF switch is used, it will be in ON hosition.
CCN ON	Unit is on due to CCN command LOCAL/ENABLE-STOP-CCN switch is in CCN position.
CLOCK ON	Unit is on due to internal clock schedule or occupied override function. LOCAL/ENABLE-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, outdoor-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 loadshed command Due to this limitation, unit may not be able to produce the desired leaving water temperature.
MODE II	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 in Table 9 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, circuit capacity is not allowed to increase if cooler saturated suction temperature is 20° F (11° C) for water or 30" F (16" C) for brine or more below leaving fluid temperature, and saturated suction temperature is less than 32 F (0° C). If these conditions persist beyond 10 minutes, circuit is shut down and fault code 44 or 45 is displayed.

CCN — CarrierComfort Network

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

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
	TUE 15:45 LOCAL ON COOL 1 0 ALARMS	Keypad 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 chiller on/off switch
↓	MODE 8	Temperature reset is in effect

4 STAT (Stage) — This subfunction displays the capacity stage number. See Tables 4A-4D for compressor loading sequence. To enter the STAGE subfunction, press 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. For example: In a given circuit, if compressors 1 and 3 are running, and 2 and 4 are not running, 0301 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 .O to slightly more than + 1 .O. When load/unload factor reaches + 1.0, a compressor is added. When the load/unload factor reaches -1 .O, 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 Table 9 for the order of readouts.

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

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 prior to using the test function.

9 STAT (Inputs) — This subfunction displays status (ON/OFF) of input switch where applicable. Status of dual set point switch, and demand limit switches 1 and 2 can be displayed. This is useful for problem diagnosis prior to using the test function.

10 STAT (Outputs) — 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/ENABLE-STOP-CCN switch must be in STOP position.

To reach a particular test, enter its subfunction number, then scroll to desired test by pressing the ↓ key. Press ENTR to start a test. Press ❑ or ❑ or ENTR to terminate or exit a test. 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 pressing appropriate keys. However, a component that is operating when another function is accessed remains operating. You must re-enter test function and press the ↓ key to shut down the component. Components with a timed operating limit time **out** normally even if another function is accessed.

Keypad 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 EXVs. To drive EXV fully open, enter 1 0 0 (100% open). To drive EXV fully closed, enter . (0% open).

Keypad 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 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 Table 9). If keypad is not used for 10 minutes, unit automatically leaves test function and resumes rotating display. See Example 3.

Example 3 — Using Test Function

KEYPAD 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 CPA1 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 5 alarms along with a description of each alarm.

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

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 F (0.11 to 1.1 C)/min.

Reset Set Points

Maximum Reset Range:
0° to 20" F (0" to 11" C)

Maximum Reset Reference Range:
Return Fluid Reset 0° to 20" F (0" to 11" C)
External Temperature Reset 20 to 125 F (-6.6 to 51.6 C)
External Signal Reset 4 to 20 mA

Minimum Reset Reference Range:
Return Fluid Reset 0° to 20" F (0" to 11" C)
External Temperature Reset 20 to 125 F (-6.6 to 51.6 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:

Displays chiller water and cooling ramp set points.

a. The first value shown is the occupied chilled water set point.

b. The next value displayed depends on how the schedule function has been programmed. (See pages 45-47.) 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 pressed, the display shows the modified chilled water set point.

c. The final value displayed when the ❑ is pressed 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 F (.11" to 1.1" C)/minute. This value is not displayed unless the function is enabled (see Adjustable Field Configurations on page 45).

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 Table 9 for the sequence of display of set points in each subfunction.

Example 4 — Reading and Changing Chilled Water Set Point

KEYPAD 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 420	Press the 4 2 ENTR 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	Press the 5 0 ENTR 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 F (5.5 C) at full load to a theoretical 0° F (0" C) at no load. See Fig. 4.

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. 4. This is a simple linear function that requires 4 pieces of input data for the set function:

1. **Maximum Reset Amount (CRST2)** — allowable range 0” to 20” F (0” to 11” C). This is maximum amount leaving chilled water set point is to be increased.
2. **Maximum Reset Reference (CREF2)** — allowable range 0” to 20” F (0” to 11” C). This is the cooler temperature drop at which reset reaches its maximum value.
3. **Minimum Reset Amount (CRST1)** — allowable range 0° to 20° F (0” to 11° C). This is minimum amount leaving chilled water set point is to be increased when reset is initiated.
4. **Minimum Reset Reference (CREFl)** — allowable range 0” to 20” F (0” to 11” 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 3 choices for type of reset: Return Fluid Reset, External Temperature Reset, or 4-20 mA External Signal (with a loop isolator) Reset.

If dual set point control is enabled (see Field Wiring section on page 7 1), the amount of reset is applied to whichever set point is in effect at the time.

Example 5 demonstrates how to activate reset. Example 6 demonstrates how to change the type of reset. Assume that reset is to be based on return water temperature, the desired reset range is to be 2” to 10” F (1” to 5.5” C) and full load is a 10” F (5.5” C) drop across the cooler. See Fig. 4.

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” F (-6.6” to 5 1.6” C), or 4 to 20 mA depending on which method was selected at the field configuration step.

Example 5 — Using Return Water Temperature Reset

KEYPAD 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° F
1 0 ENTR	CRST2 10 0	Cooling maximum reset is 10 F
↓	CREF2 0.0	Cooling maximum reset reference is 0” F
1 ENTR	CREF2 1.0	Cooling maximum reset reference is 1 F
↓	CRST1 0 0	Cooling minimum reset is 0° F
2 ENTR	CRST1 2.0	Cooling minimum reset is 2 F
↓	CREFI 0.0	Cooling minimum reset reference is 0” F
8 ENTR	CREF1 8 0	Cooling minimum reset reference is 8 F

A30-1353

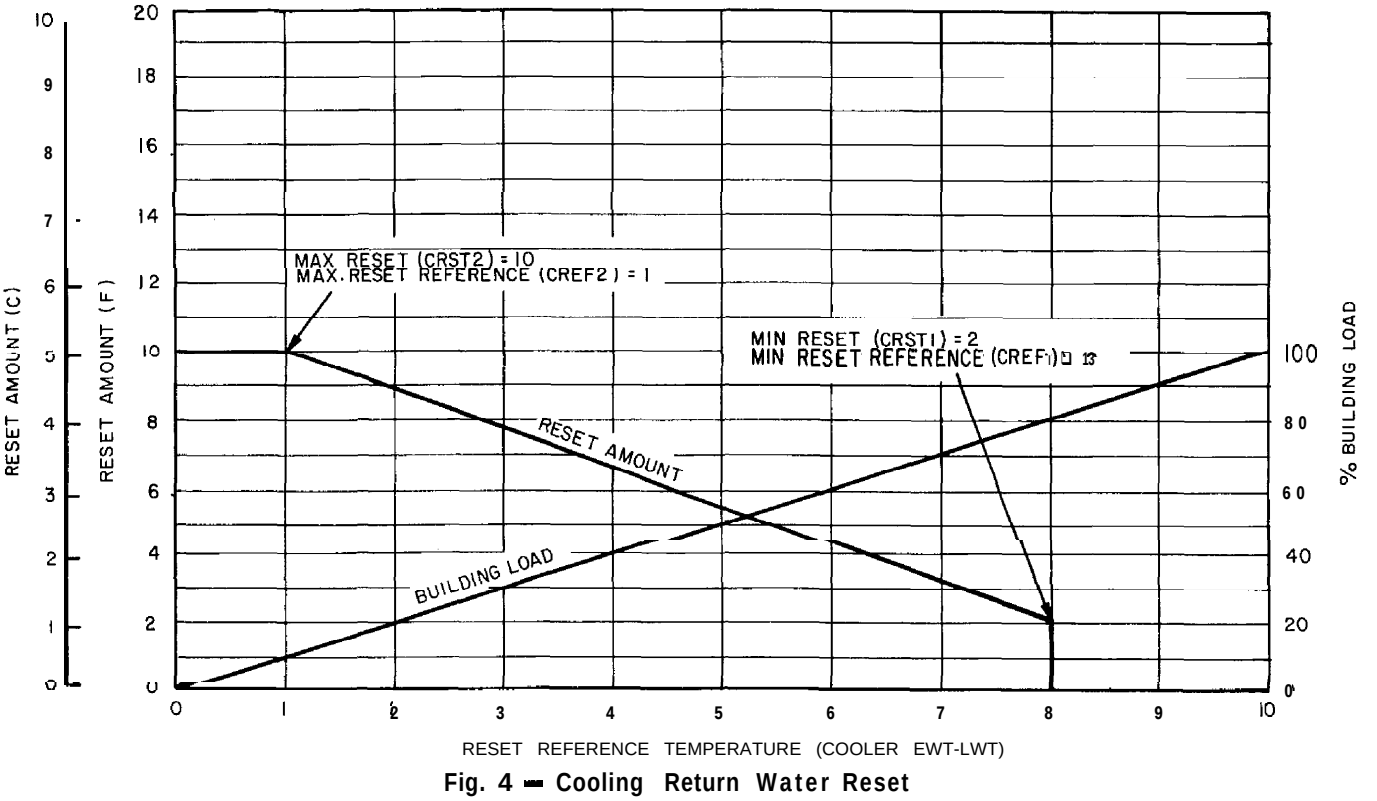


Fig. 4 — Cooling Return Water Reset

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 outdoor air and wired to terminals as follows (also see Field Wiring section on page 71):

4 in/4 out Module — J7-15 and J7-16.

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

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 on page 71 and Fig. 6.

At the field configuration step, select 4-20 mA reset by entering ❑ when CRTYP 0 appears. Then enter set points as described previously in Example 5. See Fig. 7.

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 keypad 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 on page 71 and Fig. 6.)

Example 6 — Changing Reset Type

To change type of reset, first log on as shown in Table 11. Also refer to Set Point Function section, page 39, for information on entering reset set points using reset feature.

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SHVC	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 outdoor-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

A30-1354

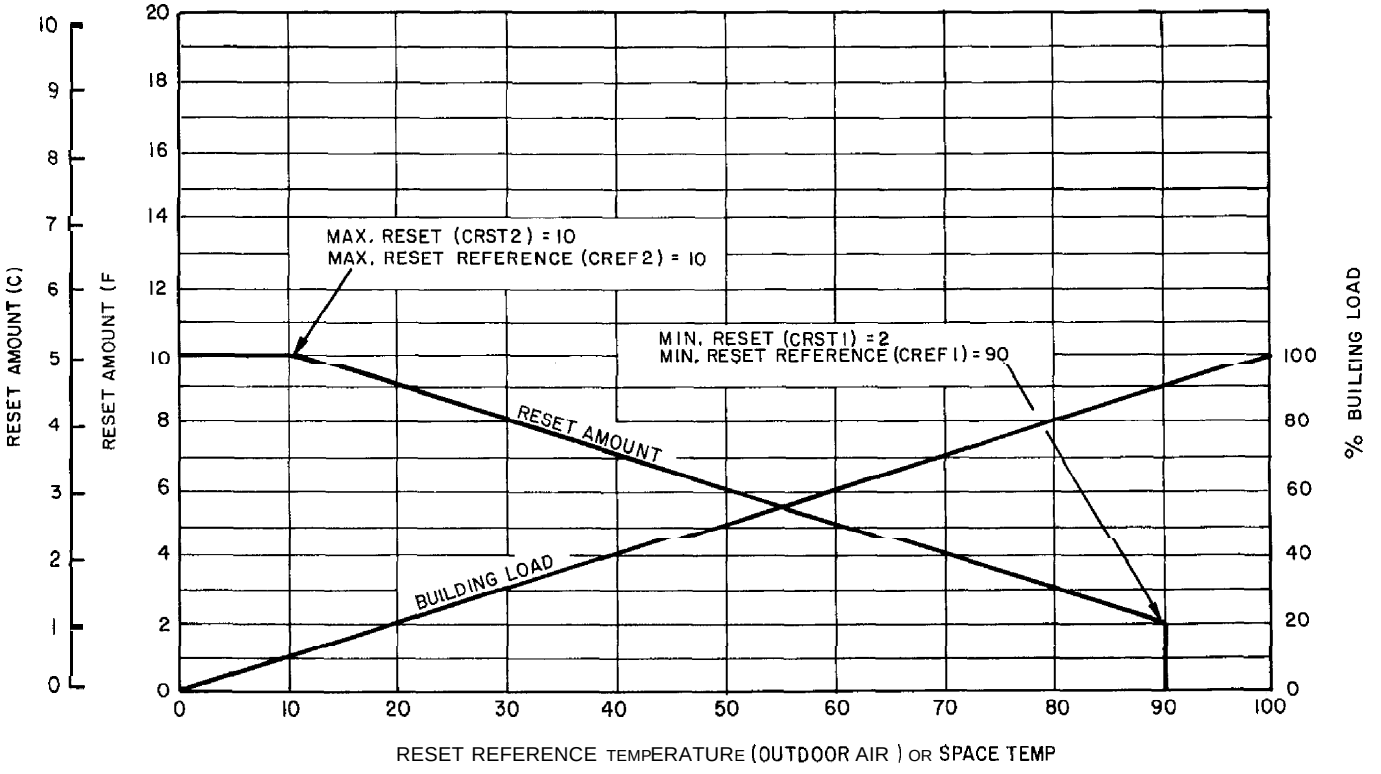


Fig. 5 — Cooling External Temperature Reset

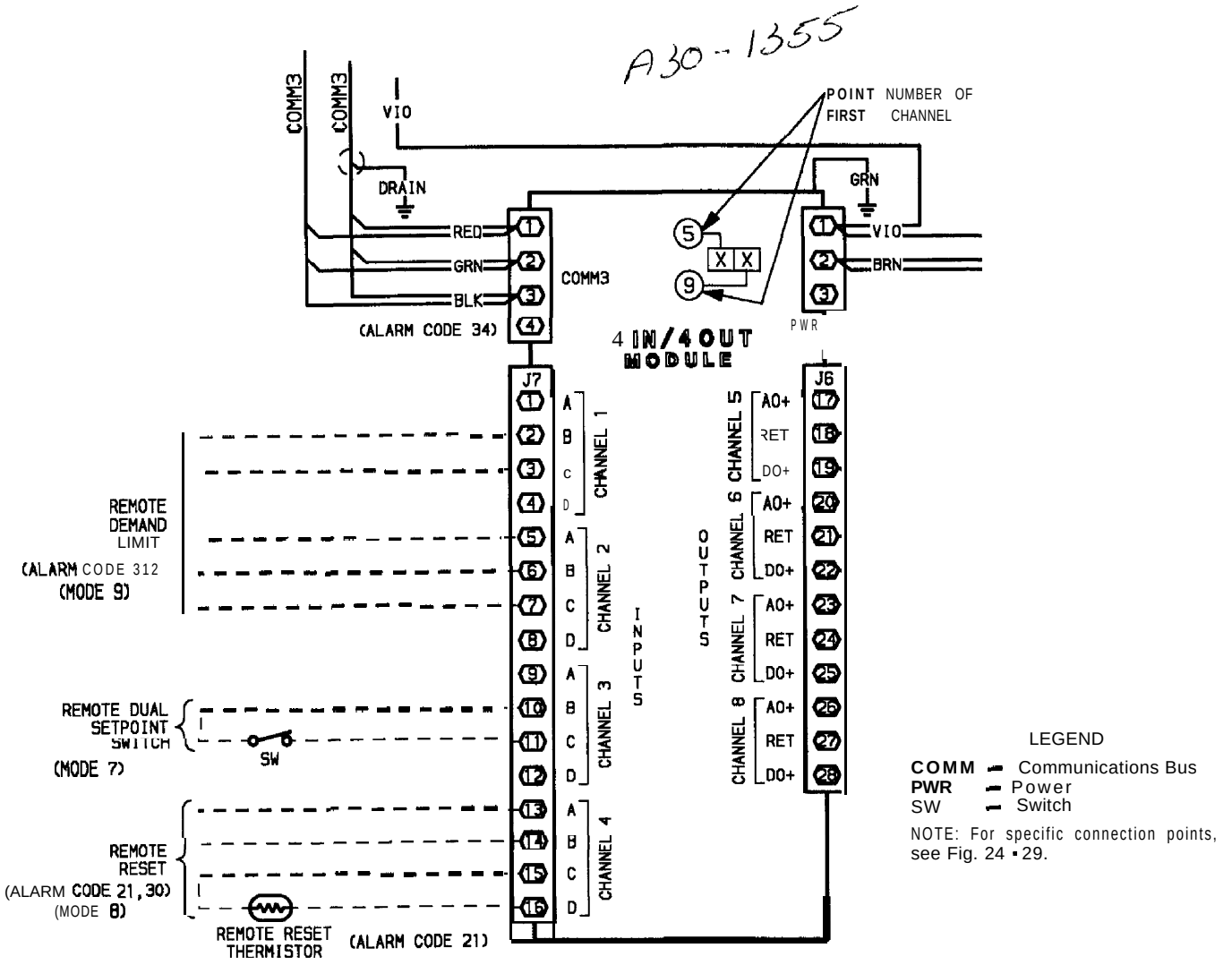


Fig 6 — 4 IN/4 OUT Options Module Wiring for Reset, Demand Limit, and Dual Set Point

Table 11 — Service Functions

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

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

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

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

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

-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 shown below:

Externally powered (loop isolator required)
Positive lead to J7-5 - 4 In/4 Out Module
Negative lead to J7-6 - 4 In/4 Out Module

Internally powered
Positive lead to J7-6 - 4 In/4 Out Module
Negative lead to J7-7 - 4 In/4 Out Module

See Field Wiring section on page 71 and Fig. 6.

At field configuration step, select 4-20 mA loadshed by entering ❑ when the LSTYP 0 display appears. See Example 7B. Then enter set points as follows. In this example, set points are coordinates of the demand limit curve shown in Fig. 8.

A30-1356

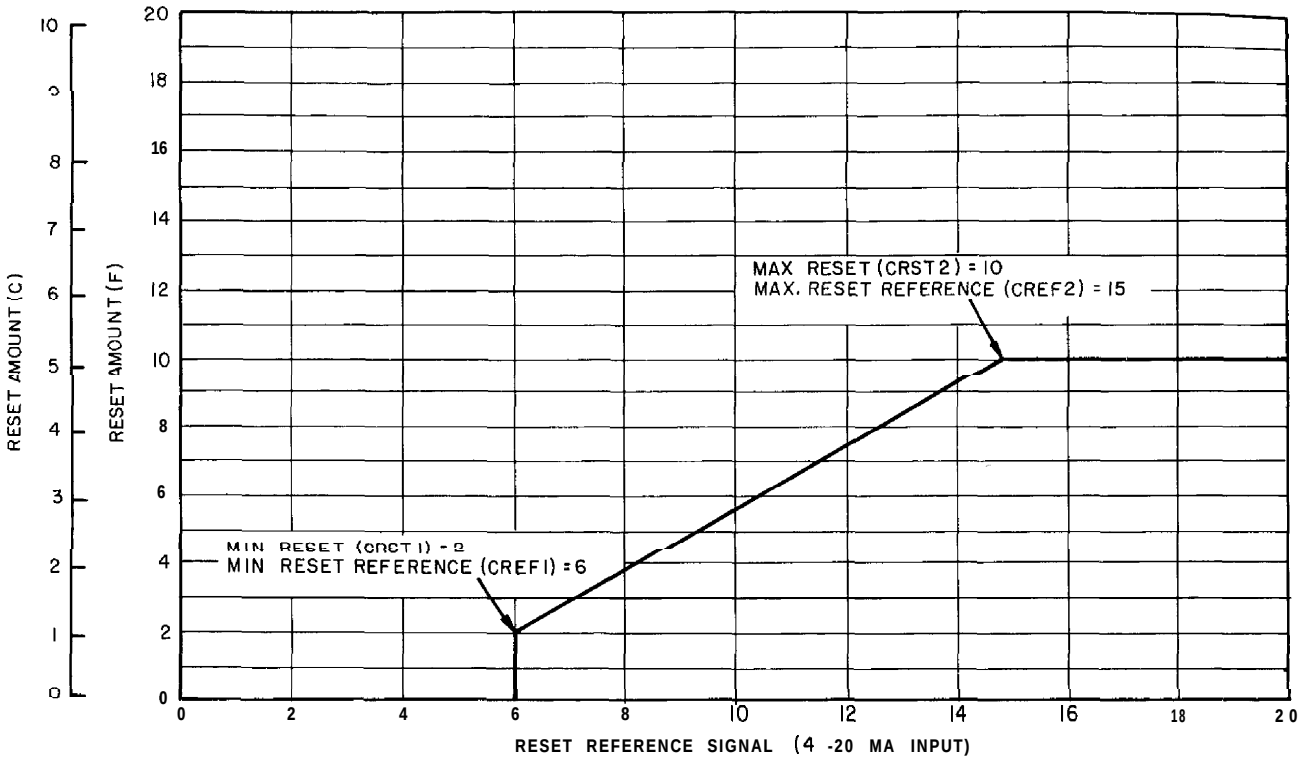


Fig. 7 – 4-20 mA Cooling Temperature Reset

Example 7A – Using Demand Limit (First Log On as Shown in Table 11)

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	FLD CFG	Field configuration sub-function 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 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:

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	FLD CFG	Field configuration sub-function of servicefunction
↓	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 Carrier comfort Network (CCN) load limiting
Select 4 for CCN demand limiting.

Example 7B – Using Demand Limit (4-20 mA) (First Log On As Shown in Table 11)

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
4 SRVC	FLD CFG	Field configuration subfunction of service function
↓	ERTYP 0	Scroll past other elements in the subfunction
↓ ENTR	LSTYP 0	Loadshed is not enabled
	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

A30-747

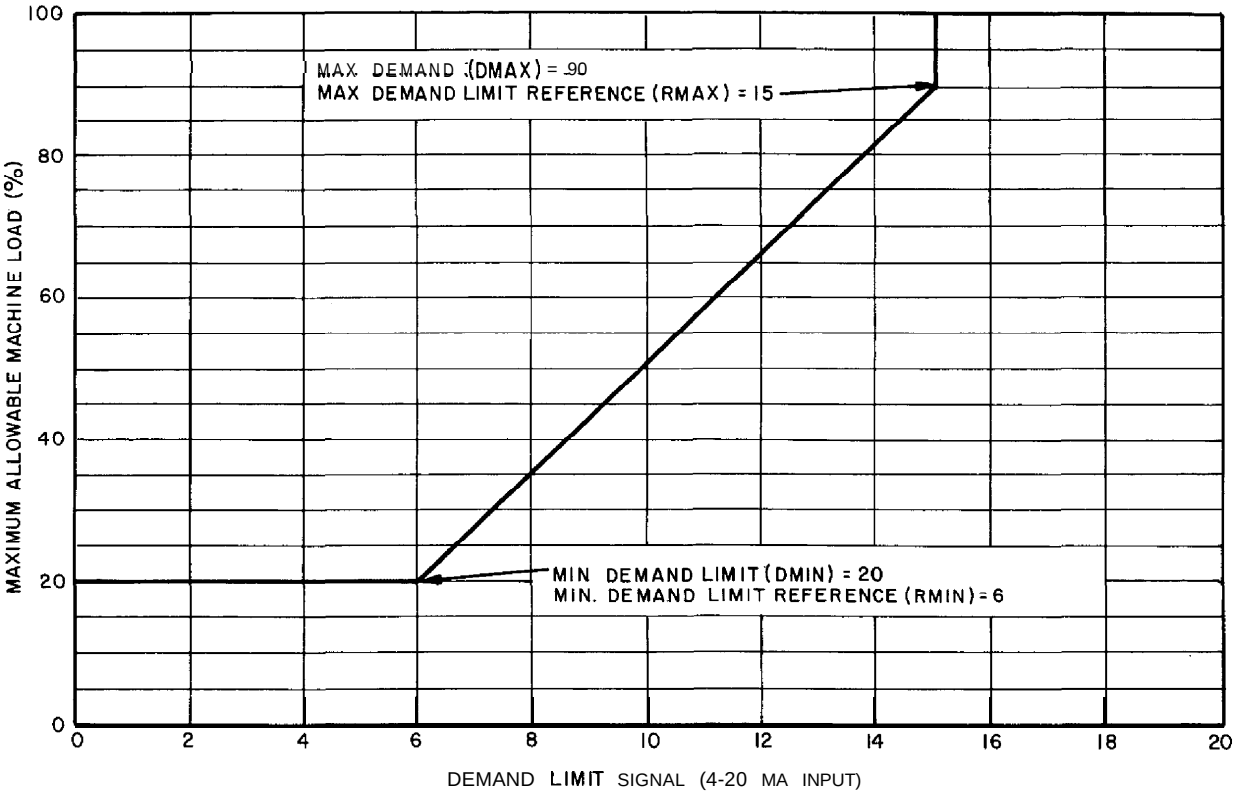


Fig. 8 — 4-20 mA Demand Limiting

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

KEYPAD ENTRY	DISPLAY RESPONSE	COMMENTS
[4] [SET]	TIME	Time display subfunction of set point function
[↓]	MON 1600	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

SERVICE FUNCTION — This function allows the technician to view and input configuration data. Factory configuration data, field configuration data and service configuration data may be viewed or entered through the keypad and display module. See Table 9 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. Pressing [1] [1] [1] [1] [ENTR] allows the technician to view, change or enter configuration codes. To log off, perform the following keystrokes: [1] [SRVC] [↓] [ENTR]. The service function is once again password protected.

Software Information — [2] [SRVC] [↓] displays the version number of the software that resides in the processor module. Press [↓] a second time to display the language options that are available in the field configuration group.

The [1] [SRVC] and [2] [SRVC] functions are summarized in Table 11.

Factory Configuration Codes — [3] [SRVC] allows entry into the factory configuration subfunction. Under this subfunction, there are 6 groups of configuration codes that are downloaded at the factory. Each group is made up of 8 digits. If processor module is replaced in the field, these 6 groups of configuration codes must be entered through the keypad and display module. Factory configuration codes (groups 1 through 6) that apply to the particular Flotronic™ II chiller being serviced are found on a label diagram located inside the control box cover. See Table 12 for a summary of factory configuration subfunction keystrokes.

Table 12 — Factory Configuration Keystrokes

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

SUB-FUNCTION	KEYPAD 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
	↓	xxxxxxxx	Configuration Code 6
5 SERVICE CFG	5 SRVC	SRV CFG	SERVICE CONFIGURATION CODES
	↓	xxxxxxxx	Configuration Code 7
	↓	xxxxxxxx	Configuration Code 8

Adjustable Field Configurations — After logging on, press 4 SRVC to enter 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 the needs of most applications. Each item should be checked to determine which configuration alternative best meets the needs of a particular application. See Table 13 for factory loaded configuration codes and alternative configurations.

If processor module is replaced, the replacement module is preloaded with factory default configuration codes. Each configuration code must be checked and, if necessary, reconfigured to meet needs of the application. See Table 13 for pre-loaded service replacement configuration codes.

Service Configuration Codes — Press 5 SRVC to enter the service configuration subfunction. The first 2 items under this subfunction are 2 groups (8 digits each) of configuration codes that are downloaded at the factory. If processor module is replaced in the field, the 2 groups of configuration codes must be entered through the keypad and display module. The 2 groups of configuration codes (groups 7 and 8) that apply to the unit being serviced can be found on a label diagram inside the control box cover. See Table 12 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 an 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: TB3-3 and TB3-4 (040-210 and associated modular units) or TB5-3 and TB5-4 (225, 250, and 280 units). The chilled water pump relay starts chilled water pump but compressors do not run until remote chilled water pump interlock contacts are between TB6-1 and TB6-2 on 30GN040-210 and associated modular units, or between TB5-1 and TB5-2 on 30GT225, 250, and 280 Flotronic™ units 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.

Table 13 — Adjustable Field Configurations

FIELD CONFIGURATION ITEM AND CODES	FACTORY CONFIGURATION CODE	SERVICE REPLACEMENT CODE
CCN element address (Entered by CCN Technician)	001	001
CCN Bus 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 f-9 to 21 C] Set Point)	= Standard Models = Brine Models	1
Display Unit Select 0 = English 1 = Metric SI	0	0
Display Language Select 1 = English		1
No. Circuit A Unloaders 0 = No Unloaders 1 = One Unloader 2 = Two Unloaders	= 30GN190-210*; 30GT225,250,280 = 30GN040-170*	0
No. Circuit B Unloaders 0 = No Unloaders 1 = One Unloader 2 = Two Unloaders	= 30GN040-070, 190-210*; 30GT225,250,280 = 30GN080-170*	0
Hot Gas Bypass Select 0 = No Valve	0	0
Loading Sequence Select 1 = Equal Circuit Loading 2 = Staged Circuit Loading		1
Lead/Lag Sequence Select 1 = Automatic		1
Oil Pressure Switch Select 0 = Not Used 1 = Air Cooled	0	0
Head Pressure Control Type 0 = Not Used 1 = Air Cooled		0
Head Pressure Control Method 1 = EXV Controlled 2 = Set Point Control for Both Circuits 3 = Set Point Control for Circuit A; EXV Control for Circuit B 4 = Set Point Control for Circuit B; EXV Control for Circuit A		1
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 Input 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		0
Cooler Pump Interlock Select 0 = No Interlock 1 = With Interlock		0
Cooler Pump Control Select 0 = Not Controlled 1 = ON/OFF Controlled		0

LEGEND
CCN — Carrier Comfort Network
EXV — Electronic Expansion Valve
*And associated modular units

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.

NOTE: This is true only if the occupied period starts at 00:00 (midnight). If the occupied period starts at a time other than midnight, then the occupied period must end at 00:00 hours (midnight) and new occupied period must be programmed to start at 00:00 in order for the chiller to stay in the occupied mode past midnight.

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 44, logging on/logging off.

Figure 9 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.

Example 9 — Using the Schedule Function

KEYPAD ENTRY	DISPLAY	COMMENT
[1] [SCHD]	OVRD 0	No schedule override in effect
[3] [ENTR]	OVRD 3	3 hours override in effect
[.] [0] [ENTR]	OVRO 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 throuah 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 stat-t 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 a m.
[3] [.] [0] [0] [ENTR]	UNO 3.00	Period 1 ends at 3:00 a m
[↓]	MON NO	Monday is now flagged no 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 p m)
[1] [8] [.] [0] [0] [ENTR]	UNO 18 00	Period 2 ends at 18:OO (6:00 p m)
[↓]	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	Tuesay 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

CCN — Carrier Comfort Network

Example 9 continued next page.

Example 9 — Using the Schedule Function (cont)

KEYPAD 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 a m
↓	UNO 00 00	Start of unoccupied time (end of period 3). For this example, period 3 should end at 21:30 (9:30 p m)
2 1 . 3 0 ENTR	UNO 21 30	Period 3 ends at 21:30 (9:30 p m)
↓	MON NO	Check to be sure that Monday and Tuesday are flagged 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.

NOTE: 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 — Press 1 1 SCHD to schedule 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.

See Example 10.

Example 10 — Holiday Schedule Function

ENTER	DISPLAY
11 SCHD	HOLIDAY
↓	JAN01 02 (Includes Jan 1st and 2nd)
↓	APR17 01 (Includes April 17th)
↓	MAY21 01 (Includes May 21 st)
↓	JUL03 01 (Includes July 3rd)
7 . 0 4 . 0 1 ENTR	JULO4 01 (Includes July 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.

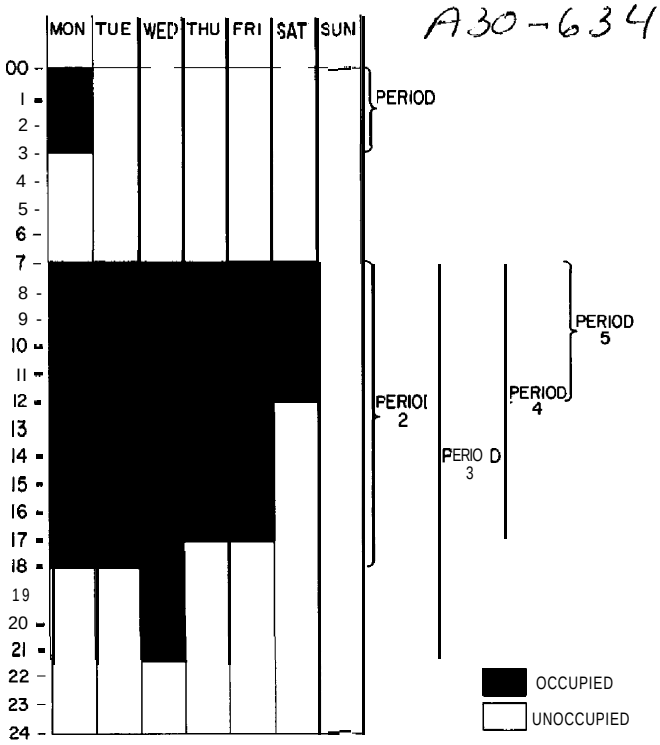


Fig. 9 — Sample Time Schedule

TROUBLESHOOTING

The Flotronic™ II control has many features to aid the technicians in troubleshooting a Flotronic II Chiller. By using keypad 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, EXVs 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 Table 9.

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 Control Modules section on page 64. 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/ENABLE-STOP-CCN Switch to STOP position. Any refrigeration circuit operating at this time continues to complete the pumpout cycle. Lag compressors stop immediately, and 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/ENABLE-STOP-CCN switch moved to STOP position
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 position. 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
15. Loss of communications between processor module and other control modules
16. Low refrigerant pressure

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

1. Low oil pressure in lead compressor
2. Open contacts in lead compressor high-pressure switch
3. Low refrigerant pressure
4. Thermistor failure
5. Transducer failure
6. Ground fault in lead compressor indicator (indicator is field-supplied on 040-060, 070 [60 Hz], 080- 110, and associated modular units)
7. High suction superheat
8. Low suction superheat
9. 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.
10. Ground fault for any circuit compressor (130-210, 225, 250, 280, and associated modular units).

Lag Compressor Stoppage — Lag compressor stoppage can be caused by the following:

1. Open contacts in high-pressure switch
2. Compressor ground fault (indicator is field-supplied on 040-060, 070 [60 Hz], 080- 110, and associated modular units)
3. Compressor circuit breaker trip
4. 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/ENABLE-STOP-CCN switch be moved to STOP position, 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 14.

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/ENABLE-STOP-CCN Switch to STOP position, then back to LOCAL or CCN position. See Table 14 for listing of each alarm code.

Code 0 No alarms exist

Codes 1 - 8 Compressor failure

If DSIO-LV or -EXV relay module control relay feedback switch or signal is sensed as open during operation of a compressor, microprocessor detects this and stops compressor, energizes alarm light, and displays a code of 1, 2, 3, 4, 5, 6, 7, or 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-LV or -EXV J3 terminal strip receives voltage when compressor is not supposed to be on.

Table 14 – 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, discharge gas thermostat trip, or wiring error
2, 3, 4	Compressor A2, A3, A4 failure	Compressor shut down	Yes	Manual	CPCS Ground Fault Protection
5	Compressor B1 failure	Circuit B shut down	No	Manual	
6, 7, 8	Compressor B2, B3, B4 failure	Compressor shut down	Yes	Manual	
9	Leaving water thermistor failure	Unit shut down	Yes	Auto	
10	Entering water thermistor failure	Unit shut down	Yes	Auto	
19	Compressor A1 sensor failure	Circuit A shut down	Yes	Auto	Thermistor or transducer failure or wiring error.
20	Compressor B1 sensor 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.	
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.	Transducer failure or wiring error
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 PSI faulty
29	Interlock switch oaen	Unit shut down	No	Manual	Chilled water pump inoperative
30	4-20 mA reset input failure	Normal set point used	No	Auto	
31	4-20 mA demand limit failure	Demand limit ignored	No	Auto	
32	Loss of communication with DSIO-LV	Unit shut down	No	Auto.	Wiring error or faulty module or improper address code
33	Loss of communication with DSIO-EXV	Unit shut down	No	Auto	
34	Loss of communication with 4 In/4 Out module	Unit shut down	Yes	Auto	
35	Not used	–	–	–	–
36	Low refrigerant pressure circuit A	Circuit A shut down	No	*	Low refrigerant charge, plugged filter drier, faulty EXV
37	Low refrigerant pressure circuit B	Circuit B shut down	No	*	Low refrigerant charge, plugged filter drier, faulty EXV
38	Failure to pump out circuit A	Circuit A shut down	No	Manual	Faulty EXV, transducer, or thermistor
39	Failure to pump out circuit B	Circuit B shut down	No	Manual	Faultv EXV, transducer, or thermistor.
40	Low oil pressure circuit A	Circuit A shut down	No	Manual	Low oil level, circuit breaker trip, faulty EXV, crankcase heater, or Pressure Transducer
41	Low oil pressure circuit B	Circuit B shut down	No	Manual	Low oil level, circuit breaker trip, fautty 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 minutes	No	Manual	Faulty EXV or thermistor
45	Low suction temperature circuit B	Circuit B shut down afler 10 minutes	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	Faultv 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.

LEGEND

CPCS – Compressor Protection Control Module
PS – Power Supply

*Reset automatic first time, manual if repeated same day

Possible causes of failure:

1. 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.
2. DSIO-LV or DSIO-EXV Module Failure — If a DSIO-LV relay module relay fails open or closed, microprocessor detects this, locks compressor off and indicates an error.
3. Wiring Errors — If a wiring error exists causing CPCS, CR, or feedback switch not to function properly, microprocessor indicates an error.
4. 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.

   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.
5. Ground Fault Module on 130-2 10, 225, 250, 280, and associated modular units (CGFA or CGFB) Open — Module contacts are in lead compressor circuits, but ground fault could be in any compressor in affected circuit.

   Ground fault of any 040-l 10 and associated modular unit compressor (field-supplied accessory on 040-060 and 070, 60 Hz units; standard on 070, 50 Hz and 80-l 10 and associated modular units) will cause a trip.
6. Checkout Procedure — 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 (high-pressure switch) open
   - Misplaced feedback wire from J4 and J5 terminals
   - Ground wire and 24-v feeds reversed on one or more points on J3

Compressor Alarm Circuit — For compressor Al alarm circuit, processor closes contacts between J4 terminals 2 and 3 to start compressor. See Fig. 10A - 10D. 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.

Failure of power to terminal 1 on J3, when contacts between 2 and 3 on J4 should be closed, causes a code 1 alarm.

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

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

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 to the acceptable range, and unit start-up follows normal sequence. Cause of fault is usually a bad thermistor, wiring error, or loose connection.

Code 19 Compressor Al suction sensor failure
Code 20 Compressor B1 suction sensor failure

On units with thermistors, 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 to the acceptable range, and circuit start-up follows normal sequence. Cause of this fault is usually a bad thermistor, wiring error or loose connection.

On units with transducers, if the saturated suction temperature is greater than the leaving water temperature plus 10" F (5.5 C) for more than 5 minutes, the affected circuit shuts down (after going through normal pumpout). The reset is automatic if the saturated suction temperature returns to the acceptable range and start-up follows the normal sequence. Cause of this fault is usually a bad transducer, a wiring error, or a 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 to the acceptable range, reset function is automatically enabled. Cause of this fault is usually a bad thermistor, wiring error or loose connection.

Code 22 Compressor A 1 discharge pressure transducer failure
Code 23 Compressor B 1 discharge pressure transducer failure
Code 24 Compressor A 1 suction pressure transducer failure
Code 25 Compressor B 1 suction pressure transducer failure
Code 26 Compressor Al oil pressure transducer failure
Code 27 Compressor Bl oil pressure transducer failure

If output voltage of any of these transducers is greater than 5 v, affected circuit shuts down without going through pumpout process. Other circuit continues to run. Reset is automatic if output voltage returns to the acceptable 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 v or greater than 5.5 v, unit shuts down without going through pumpout process. Reset is automatic if supply voltage returns to the acceptable range, and circuit start-up follows normal sequence. Cause of fault is usually a faulty transformer, or primary voltage is out of range.

The voltage supplied to the processor is polarized. When checking for proper voltage supply, be sure to consider this polarity. If voltage appears to be within acceptable tolerance, check to be sure the transformer supplying PS1 is not grounded. *Grounding the supply transformer can result in serious damage to the control system.*

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/ENABLE-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 4 or more than 20 mA, reset or demand limit function is disabled and unit functions normally. If mA signal returns to the acceptable 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 pumpout. This alarm resets **auto-**matically when communication is restored. The unit starts up normally after alarm condition is reset. Probable cause of condition is a faulty or improperly connected plug, wiring error, or faulty module.

Loss of communication can be attributed to a grounded transformer with a secondary voltage of 21 vac supplying the PSIO, DSIO-LV, or 4 IN/4 OUT modules; the 12.5-vac transformer supplying the DSIO-EXV module; or the 24-vac transformer supplying PS 1 for the transformers. These *transformers should not be grounded, or serious damage to controls can result.* Check *to* be sure the transformers are not grounded.

NOTE: If a blank PSIO module is downloaded without being connected to the modules DSIO, this alarm is energized.

Code 34 Loss of communication with 4 In/4 Out module

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
- hot gas bypass

If communication is lost with 4 IN/4 OUT module, the unit shuts off automatically, after finishing pumpout. Reset of alarm is automatic when communication is restored. Start-up after alarm is remedied follows a normal sequence. Probable cause of condition is a faulty or improperly connected plug, wiring error, or faulty module.

Loss of communication can be attributed to a grounded transformer with a secondary voltage of 21 vac supplying the PSIO, DSIO-LV, or 4 IN/4 OUT; the 12.5-vac transformer supplying the DSIO-EXV module, or the 24-vac transformer supplying PS 1 for the transformers. *These transformers should not be grounded, or serious damage to controls can* result. Check to be sure the transformers are not grounded.

Code 36 Low refrigerant pressure, Circuit A
Code 37 Low refrigerant pressure, Circuit B

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/ENABLE-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
Code 39 Failure to pump out, Circuit B

The pumpout process is terminated when saturated suction temperature is 10" F (5.5" C) below temperature at beginning of pumpout, or 10° F (5.5" C) below leaving water temperature or reaches a saturated suction temperature of -15 F (-26 C). If appropriate saturated suction temperature is not met within 3 minutes (on 2 consecutive tries}, circuit shuts down without pumpout. Reset is manual with LOCAL/ENABLE-STOP-CCN Switch, and start-up follows normal sequence.

Possible causes for this alarm are a bad thermistor or transducer or a faulty EXV.

Code 40 Low oil pressure, Circuit A
Code 41 Low oil pressure, Circuit B

If oil pressure differential is less than set point for more than 2 minutes at start-up, or more than one minute during normal operation, affected circuit shuts down without going through pumpout process, Reset is manual with LOCAL/ENABLE-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, refrigerant overcharge, insufficient oil charge, or tripped circuit breaker.

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" F (4.4" 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° F (3" 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/ENABLE-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" F (1.7" 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/ENABLE-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 more quickly to compressor operation than the leaving water thermistor in the leaving water nozzle, Possible 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" F (11" C) for water or 30" F (16° C) for brine or more below leaving fluid 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/ENABLE-STOP-CCN switch, and start-up follows normal sequence.

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

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

If EXV is fully open, suction superheat is greater than 75 F (42 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/ENABLE-STOP-CCN switch, and start-up follows normal sequence.

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

Code 48 Low suction superheat, Circuit A

Code 49 Low suction superheat, Circuit B

If EXV is at minimum position, suction superheat is less than 10° F (5.5" C) or 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/ENABLE-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 label diagrams for factory configuration codes, There are 8 groups of S-digit numbers that must be entered. The first 6 groups must be entered under S31 Software function. Groups 7 and 8 must be entered under S50 Service function.

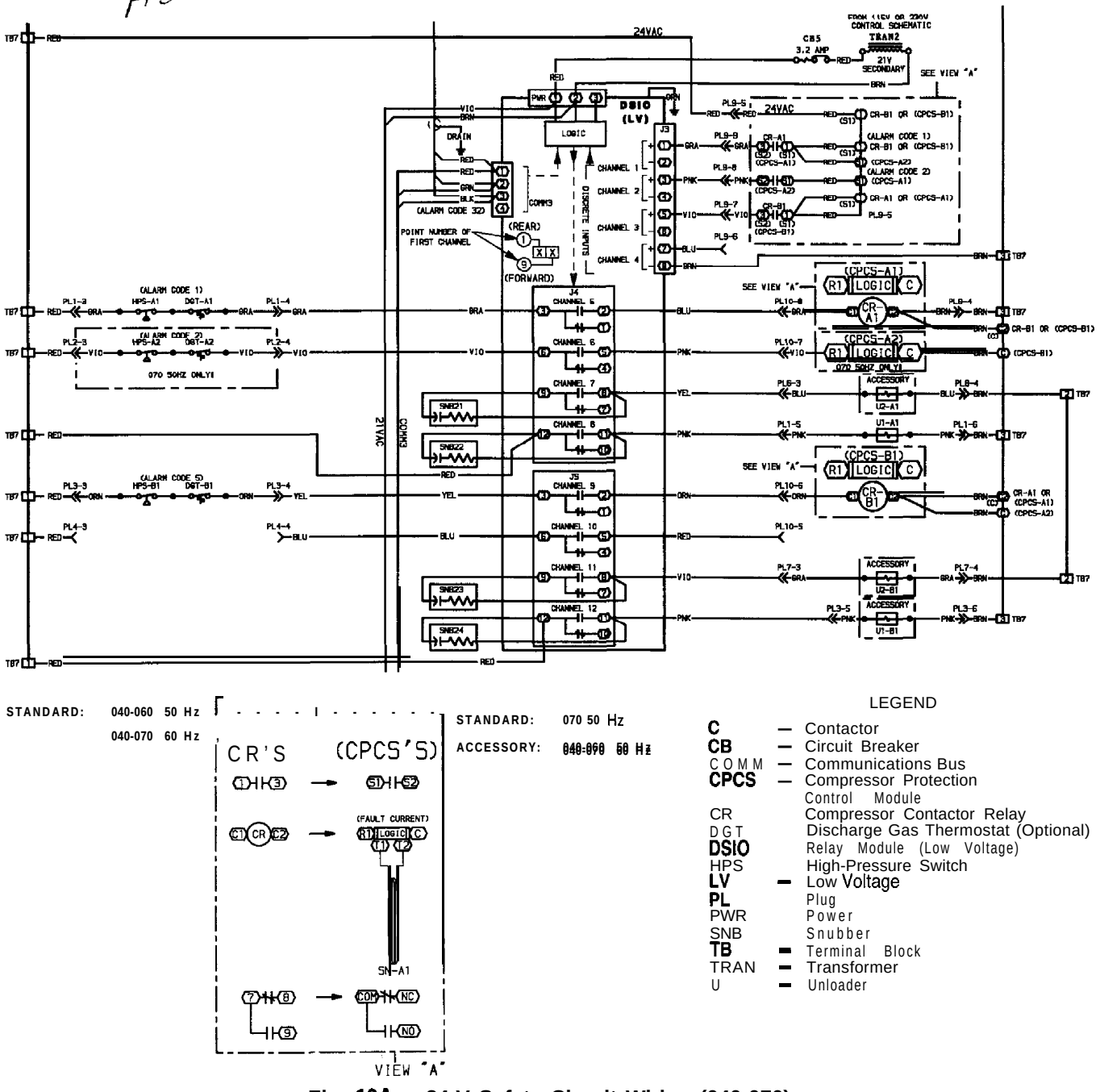
Enter each group, then press the ENTER key. Use the down arrow ↓ after each group to bring up the next empty screen. Unit should start after factory and field configurations are correctly entered.

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.

A30-1357

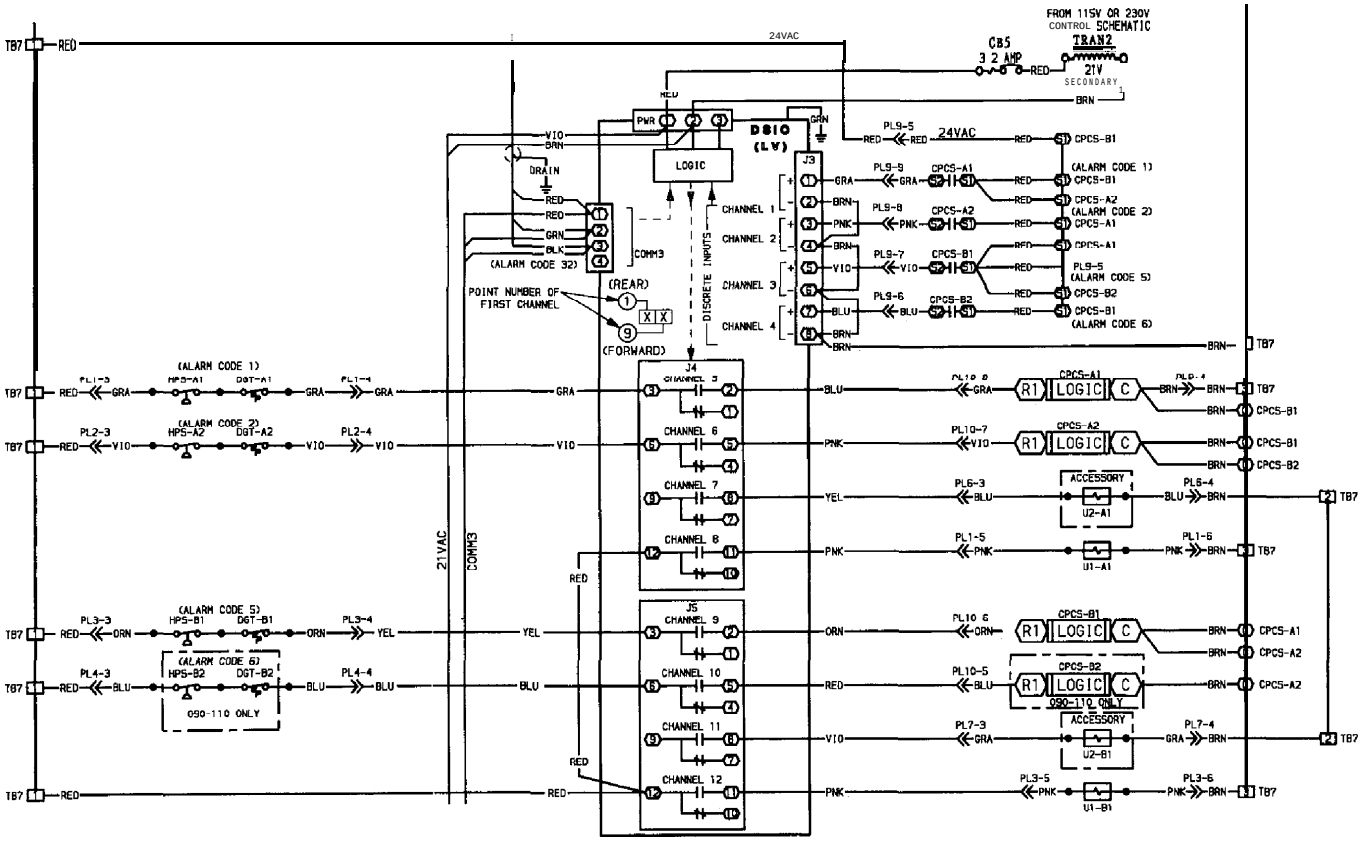


LEGEND

C	—	Contactor
CB	—	Circuit Breaker
COMM	—	Communications Bus
CPCS	—	Compressor Protection Control Module
CR		Compressor Contactor Relay
DGT		Discharge Gas Thermostat (Optional)
DSIO		Relay Module (Low Voltage)
HPS		High-Pressure Switch
LV	—	Low Voltage
PL		Plug
PWR		Power
SNB		Snubber
TB	—	Terminal Block
TRAN	—	Transformer
U	—	Unloader

Fig. 10A — 24-V Safety Circuit Wiring (040-070)

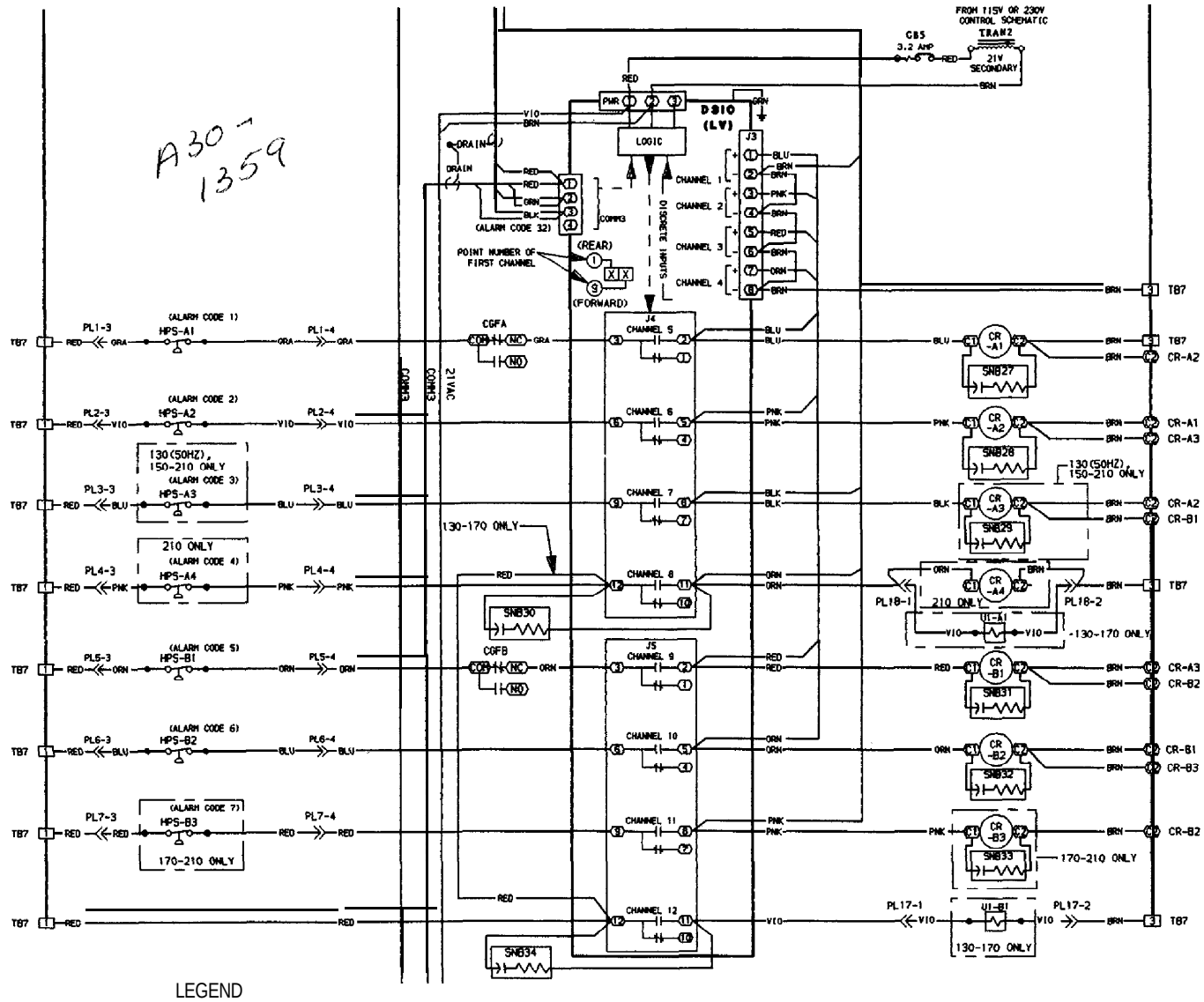
A30-1358



LEGEND

C	— Contactor
COMM	— Communications Bus
CPCS	— Compressor Protection Control Module
DGT	— Discharge Gas Thermostat (Optional)
DSIO	— Relay Module (Low Voltage)
HPS	— I-tigh-Pressure Switch
LV	— Low Voltage
PL	— Plug
PWR	— Power
TB	— Terminal Block
TRAN	— Transformer
U	— Unloader

Fig. 10B — 24-V Safety Circuit Wiring (080-110 and Associated Modular Units)

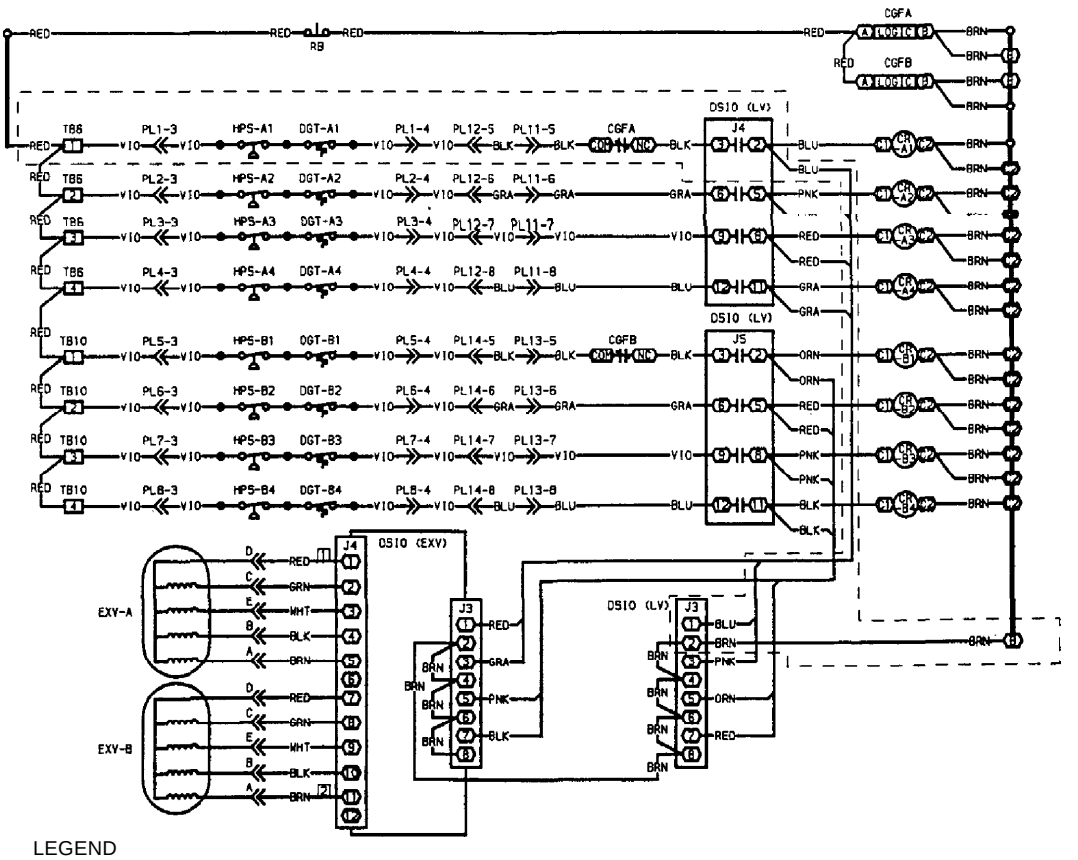


LEGEND

CGF	—	Ground Fault Module
COMM	—	Communications Bus
CR	—	Compressor Contactor Relay
DSIO	—	Relay Module (Low Voltage)
HPS	—	High-Pressure Switch
LV	—	Low Voltage
PL	—	Plug
SNB	—	Snubber
TB	—	Terminal Block
TRAN	—	Transformer
U	—	Unloader

Fig. 10C – 24-V Safety Circuit Wiring (130-210 and Associated Modular Units)

A30-748



LEGEND

C	—	Contactor
C G F	—	Ground Fault Module
COM	—	Common
CR	—	Control Relay
D G T	—	Discharge Gas Thermostat (Optional)
DSIO	—	Relay Module (Low Voltage)
E X V	—	Electronic Expansion Valve
H P S	—	High-Pressure Switch
LV	—	Low Voltage
NC	—	Normally Closed
PL	—	Plug
RB	—	Reset Button
TB	—	Terminal Board

Fig. 10D — 24-V Safety Circuit Wiring (225, 250, and 280 Units)

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. 11.

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 60 (fully closed) for 040-210 and associated modular units, 145 (fully closed) for 225, 250, and 280 units, or 760 (fully open) it remains there. If EXV position reading remains at 60, 145 or 760, and the thermistors and pressure transducers are reading correctly, the EXV is not moving. Follow EXV checkout procedure below to determine cause.

The EXV is also used to limit cooler suction temperature to 50 F (10 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 Flotronic™ II chillers to operate with up to 95 F (35 C) entering water temperatures during start-up and subsequent pull-down.

30-332

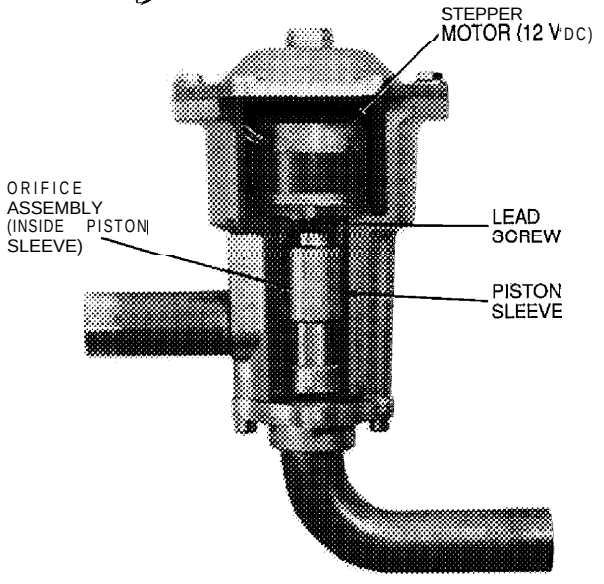


Fig. 11 — Electronic Expansion Valve (EXV)

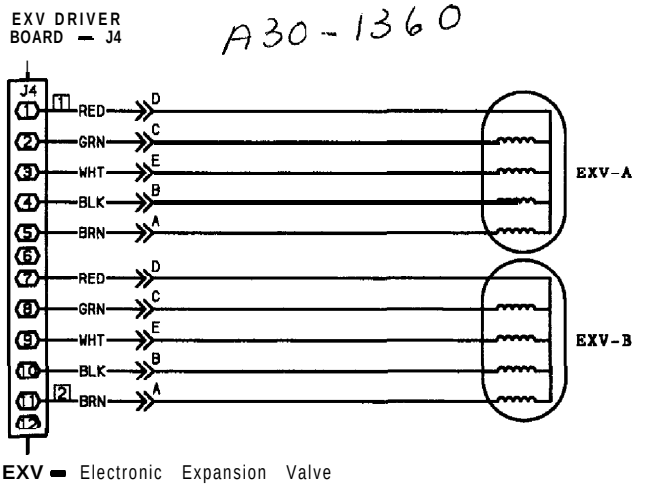
CHECKOUT PROCEDURE — Follow steps below to diagnose and correct EXV problems.

1. Check EXV driver outputs. Check EXV output signals at appropriate terminals on EXV driver module (see Fig. 12) 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 v, 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.

2. Check EXV wiring, Check wiring to electronic expansion valves from terminal strip on EXV driver. See Fig. 12.
   a. Check color coding and wire connections. Make sure they are connected to correct terminals at driver and EXV plug connections.
   b. Check for continuity and tight connection at all pin terminals.
   c. Check plug connections at driver and at EXVs to be sure EXV cables are not crossed.



EXV — Electronic Expansion Valve

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

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. 12). Resistance should be 25 ohms ± 2 ohms.

   Control of valve is by microprocessor. 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 EXVs are controlled by the 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 position, 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.

4. The EXV test can be used to drive EXV to any desired position. When EXV opens, the metering slots begin to provide enough refrigerant for operation at these steps: step 60 for sizes 040-210 and associated modular units, or 145 for sizes 225, 250, and 280. This is fully closed position when circuit is operating. The fully open position is 760 steps.

5. Check thermistors and pressure transducers that control EXV. Check thermistors and pressure transducers that control processor output voltage pulses to EXVs. See Fig, 13 for locations.

   Circuit A — Thermistor T7, Suction Pressure Transducer SPTA
   Circuit B Thermistor T8, Suction Pressure Transducer SPTB

   a. Use temperature subfunction of the status function (6 STAT) to determine if thermistors are reading correctly.

   b. Check thermistor calibration at known temperature by measuring actual resistance and comparing value measured with values listed in Tables 15 and 16.

   c. 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. 14 and 15.

   d. Use the pressure subfunction of the Status function (7 STAT) to determine if pressure transducers are reading correctly. Connect a calibrated gage to lead compressor suction or discharge pressure connection to check transducer reading.

   e. Make sure transducer leads are properly connected in junction box and at processor board. Check transformer 5 output. Check voltage transducer 5 vdc ± .2 v.

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

6. Check operation of EXV.

   a. Close liaujd line service valve of circuit to be checked, and run through the test step (2 TEST) 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.

   b. Turn off compressor circuit breaker(s). Close compressor discharge service valves and remove any remaining refrigerant from low side of system.

   c. 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.

   d. Enter appropriate EXV test step for EXVA or EXVB in the outputs subfunction of the test function (1 TEST). Press 1 0 0 ENTR 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. Press . ENTR to check open to closed operation.

   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 can also be 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.

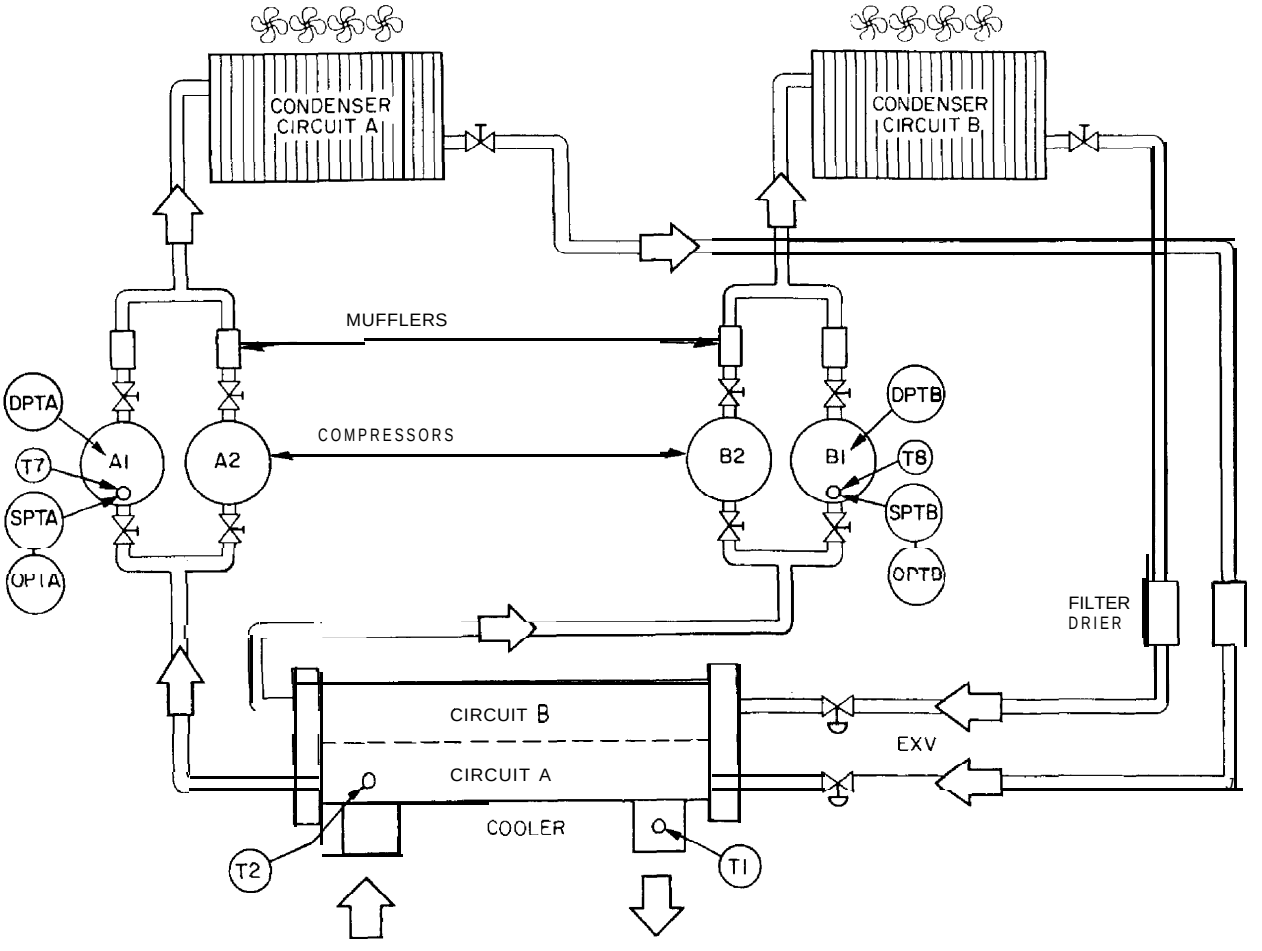
   The EXV test can be repeated as required by entering any percentage from 0 (.) to 100 to initiate movement.

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.

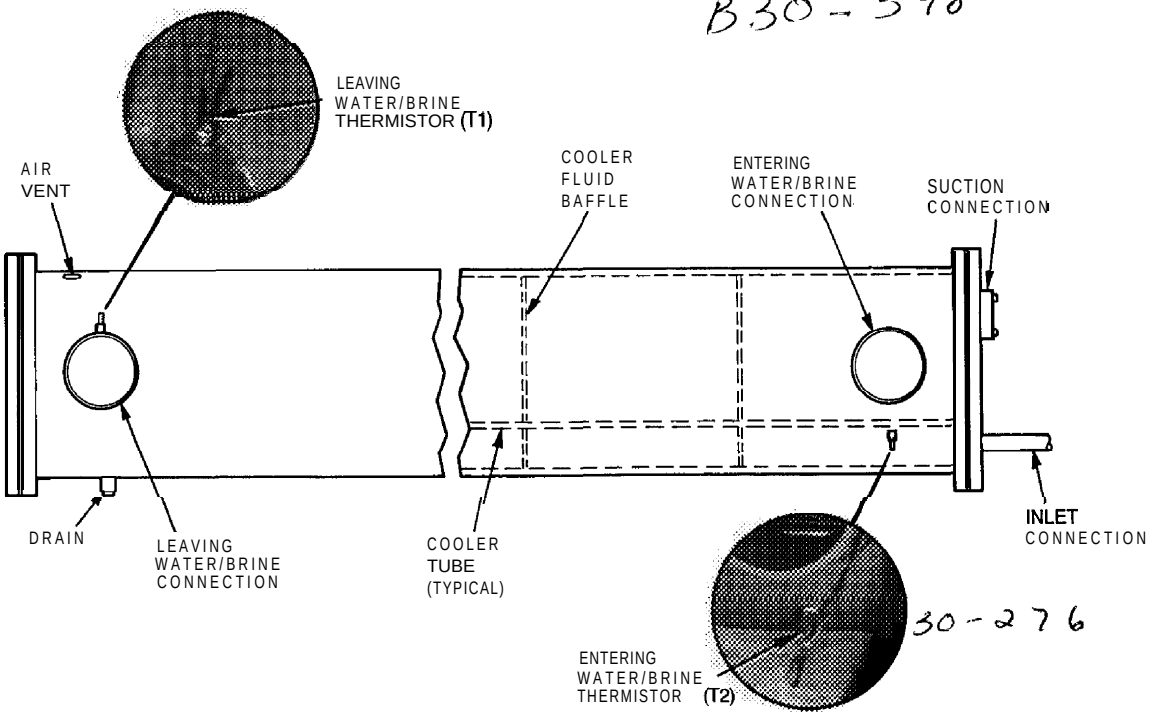
A30-1361



LEGEND

DPT — Discharge Pressure Transducer
OPT — Oil Pressure Transducer
SPT — Suction Pressure Transducer
T — Thermistor Number

Fig. 13 — Thermistor and Pressure Transducer Locations



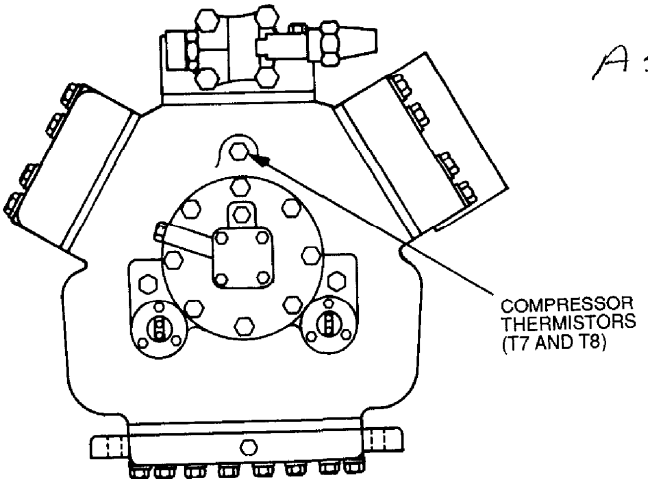
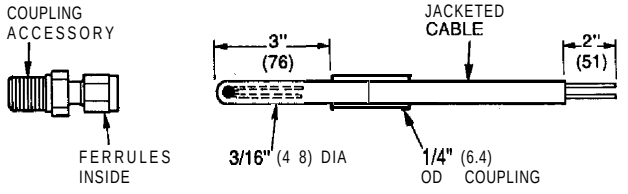
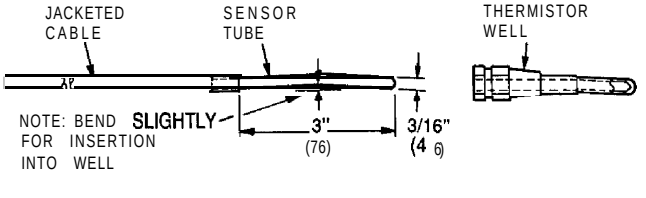


Fig. 14 — Thermistor Locations (Circuits A and B, Lead Compressor Only)



WATER-SIDE TEMPERATURE SENSOR (TI, T2, — ALL UNITS), (T7, T8 — 225, 250, 280)



REFRIGERANT TEMPERATURE SENSOR (T7, T8 — 040-210 AND ASSOCIATED MODULAR UNITS)

Fig. 15 — Thermistors

Thermistors — All thermistors are identical in their temperature vs. resistance performance. Resistance at various temperatures are listed in Tables 15 and 16.

LOCATION — General location of thermistor sensors are shown in Fig. 13.

Cooler Leaving Water Thermistor (T1) — T1 is located in leaving water nozzle. The probe is immersed directly in the water. All thermistor connections are made through a ¼-in. coupling. See Fig. 15. Actual location is shown in Fig. 13 and 14.

Cooler Entering Water Thermistor (T2) — T2 is located in cooler shell in first baffle space near tube bundle. Thermistor connection is made through a ¼-in. coupling. See Fig. 15. Actual location is shown in Fig. 13 and 14.

Compressor Suction Gas Temperature Thermistors (T7 and T8) T7 and T8 are located in lead compressor in each circuit in suction passage between motor and cylinders, above oil pump. They are well-type thermistors on 040-210 and associated modular units, or ferrule-type on 225, 250, 280 units. See Fig. 13 and 14.

THERMISTOR REPLACEMENT (Tl , T2, T7, T8) (Compressor and Cooler)

⚠ CAUTION

Thermistors are installed directly in fluid or refrigerant circuit. Relieve all refrigerant pressure using standard refrigerant practices or drain fluid before removing.

Proceed as follows (see Fig. 15):

To replace sensors T1, T2, T7 (225,250,280), and T8 (225,250,280)

1. Remove and discard original thermistor and coupling.

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

2. Apply pipe sealant to ¼-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. 15).
3. Insert new thermistor in coupling body to its full depth. If thermistor bottoms out before full depth is reached, pull thermistor back out ⅛ in, before tightening packing nut. Hand tighten packing nut to position ferrules, then finish tightening 1¼ turns with a suitable tool. Ferrules are now attached to thermistor which can be withdrawn from coupling for unit servicing.

To replace thermistors T7 and T8 (040-210 and associated modular units):

Add a small amount of thermal conductive grease to thermistor well. Thermistors are friction-fit thermistors, which must be slipped into receiver located in the compressor pump end.

Pressure Transducers — Two types of pressure transducers are used on 30G Flotronic™ II 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. 16.

Three pressure transducers are mounted on each lead compressor: 2 low-pressure transducers to monitor compressor suction pressure and oil pressure, and a high-pressure transducer to monitor compressor discharge pressure (see Fig. 17 for exact locations on compressor). Each transducer is supplied with 5 vdc power from a rectifier which changes 24 vac to 5 vdc.

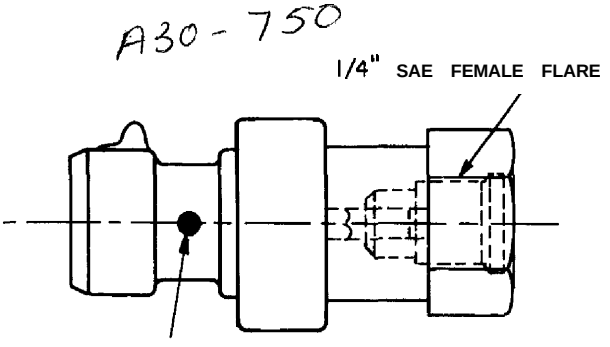
TROUBLESHOOTING — If transducer is suspected of being faulty, first check supply voltage to transducer. Supply voltage should be 5 vdc ± .2 v. If supply voltage is correct, compare pressure reading displayed on keypad and display module against pressure shown on a calibrated pressure gage. If the 2 pressure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

TRANSDUCER REPLACEMENT

⚠ CAUTION

Transducers are installed directly in the refrigerant circuit. Relieve all refrigerant pressure using standard refrigeration practices before removing.

1. Relieve refrigerant pressure using standard refrigeration practices.
2. Disconnect transducer wiring at transducer by pulling up on locking tab while pulling weather-tight connection pfug from end of transducer. **Do not pull on transducer wires.**
3. Unscrew transducer from ¼-in. male flare fitting. When installing new pressure transducer, do not use thread sealer. Thread sealer can plug transducer and render it inoperative.
4. Insert weathertight wiring plug into end of transducer until locking tab snaps in place.
5. Check for refrigerant leaks.



SAE — Society of Automotive Engineers

Fig. 16 — Pressure Transducer

Table 15 — Thermistor Temperature (°F) vs Resistance/Voltage Drop; Flotronic™ II

TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
−25.0	4 8 2 1	98010
-24.0	4818	94707
-23.0	4814	91522
-22.0	4806	88449
-21.0	4.800	85486
-20.0	4793	82627
−19.0	4786	79871
-18.0	4779	77212
-17.0	4772	74648
-16.0	4764	72175
- 15.0	4.757	69790
- 14.0	4749	67490
-13.0	4740	65272
-12.0	4734	63133
−11.0	4724	61070
- 10.0	4715	59081
-9.0	4705	57162
-8.0	4696	55311
-7.0	4.688	53526
-6.0	4676	51804
-5.0	4666	50143
-4.0	4657	48541
−3.0	4648	46996
−2.0	4.636	45505
-l:o	4.624	44066
0.0	4'613	42679
1.0	4602	41339
2.0	4592	40047
3.0	4579	38800
4.0	4.567	37596
5:o	4554	36435
6.0	4540	35313
7.0	4527	34231
8:0	4.514	33185
9.0	4.501	32176
10.0	4487	31202
11.0	4472	30260
12.0	4457	29351
13.0	4442	28473
14.0	4427	27624
15.0	4413	26804
16.0	4397	26011
17.0	4.381	25245
18.0	4366	24505
19.0	4348	23789
20.0	4.330	23096
21.0	4313	22427
22.0	4.295	21779
23.0	4278	21153
24.0	4258	20547
25.0	4241	19960
26.0	4223	19393
27.0	4202	18843
28.0	4184	18311
29.0	4.165	17796
30.0	4145	17297
31 .o	4125	16814
32.0	4103	16346
33.0	4082	15892
34.0	4.059	15453
35.0	4037	15027
36.0	4017	14614
37.0	3994	14214
38.0	3.968	13826
39.0	3.948	13449
40.0	3927	13084
41.0	3902	12730
42.0	3.878	12387
43.0	3854	12053
44.0	3828	11730
45.0	3805	11416
46.0	3781	11112
47.0	3757	10816
48.0	3729	10529
49.0	3705	10250
50.0	3.679	9979
51.0	3653	9717
52.0	3627	9461
53.0	3600	9213
54.0	3.575	8973
55.0	3547	8739
56.0	3520	8511
57.0	3493	8291
58.0	3464	8076
59.0	3437	7868
60.0	3409	7665
61.0	3382	7468
62.0	3.353	7277
63.0	3.323	7091
64.0	3295	6911
65.0	3.267	6735
66.0	3238	6564
67.0	3210	6399
68.0	3 181	6238
69.0	3152	6081
70.0	3123	5929
71	3 . 0 9 3	5781
72	3.064	5637
73	3034	5497
74	3005	5361
75	2977	5229
76	2.947	5101
77	2.917	4976
78	2884	4855
79	2857	4737
80	2.827	4622
81	2797	4511
82	2766	4403
83	2738	4298
84	2708	4196
85	2679	4096
86	2 650	4000
87	2622	3906
88	2593	3814
89	2563	3726
90	2533	3640
91	2505	3556
92	2.476	3474
93	2447	3395
94	2417	3318
95	2388	3243
96	2360	3170
97	2332	3099
98	2.305	3031
99	2277	2964
100	2 251	2898
101	2217	2835
102	2189	2773
103	2.162	2713
104	2136	2655
105	2107	2597
106	2080	2542
107	2053	2488
108	2028	2436
109	2 001	2385
110	1 973	2335
111	1.946	2286
112	1 919	2239
113	1897	2192
114	1870	2147
115	1.846	2103
116	1.822	2060
117	1792	2018
118	1 771	1977
119	1.748	1937
120	1724	1898
121	1.702	1860
122	1676'	1822
123	1653	1786
124	1 630	1750
125	1 607	1715
126	1 585	1680
127	1562	1647
128	1538	1614
129	1 517	1582
130	1496	1550
131	1474	1519
132	1453	1489
133	1.431	1 459
134	1 408	1430
135	1389	1401
136	1369	1373
137	1348	1345
138	1 327	1318
139	1308	1291
140	1291	1265
141	1 289	1240
142	1 269	1214
143	1 250	1190
144	1230	1165
145	1 211	1141
146	1192	1118
147	1 173	1095
146	1 155	1072
149	1 136	1050
150	1 118	1029
151	1 100	1007
152	1.082	986
153	1 064	965
154	1 047	945
155	1 029	925
156	1.012	906
157	0 995	887
158	0978	868
159	0 962	850
160	0945	832
161	0 929	815
162	0914	798
163	0 898	782
164	0883	765
165	0868	750
166	0853	734
167	0 . 8 3 8	719
168	0824	705
169	0.810	690
170	0.797	677
171	0.783	663
172	0770	650
173	0758	638
174	0745	626
175	0734	614
176	0722	602
177	0.710	591
178	0.700	581
179	0.689	570
180	0678	561
181	0668	551
182	0659	542
183	0 649	533
184	0640	524
185	0632	516
186	0.623	508
187	0.615	501
188	0607	494
189	0600	487
190	0592	480
191	0.585	473
192	0579	467
193	0572	461
194	0566	456
195	0560	450
196	0554	445
197	0548	439
198	0542	434
199	0 537	429
200	0 531	424
201	0526	419
202	0.520	415
203	0515	410
204	0.510	405
205	0.505	401
206	0 499	398
207	0 494	391
208	0488	386
209	0.483	382
210	0 477	377
211	0471	372
212	0465	367
213	0 459	361
214	0.453	356
215	0.446	350
216	0439	344
217	0432	338
218	0.425	332
219	0417	325
220	0 409	318
221	0401	311
222	0393	304
223	0384	297
224	0375	289
225	0366	282

Table 16 – Thermistor Temperature (°C) vs Resistance/Voltage Drop; Flotronic'™ II

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
-40	4.896	168230
-39	4 889	157440
-38	4 882	147410
-37	4.874	138090
-36	4.866	129 410
-35	4 857	121 330
-34	4 848	113810
-33	4 838	106 880
-32	4.828	100 260
-31	4.817	94165
-30	4.806	88 480
-29	4 794	83 170
-28	4.782	78125
-27	4.769	73 580
-26	4.755	69 250
-25	4.740	65 205
-24	4 725	61 420
-23	4710	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	4482	30 866
-11	4.456	29 216
-10	4.428	27 633
-9	4400	26 202
-8	4371	24 827
-7	4341	23 532
-6	4310	22313
-5	4.278	21 163
-4	4.245	20 079
-3	4.211	19 058
-2	4.176	18 094
-1	4.140	17184
0	4.103	16 325
1	4.065	15515
2	4026	14749
3	3.986	14026
4	3.945	13 342
5	3.903	12 696
6	3860	12085
	3816	11 506
3	3.771	10 959
9	3726	10441
10	3 680	9 949
11	3.633	9485
12	3.585	9 044
13	3.537	8 627
14	3.487	8 231
15	3438	7 855
16	3387	7 499
17	3.337	7 161
18	3285	6 840
19	3234	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	4389
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	2337	3134
37	2.286	3 008
38	2236	2 888
39	2.186	2 773
40	2.137	2 663
41	2087	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	1898	2184
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	1635	1 734
52	1594	1670
53	1553	1609
54	1513	1 550
55	1474	1 493
56	1436	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	1006
67	1 069	971
68	1040	938
69	1012	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	0813	693
77	0 789	669
78	0765	645
79	0743	623
80	0722	602
81	0702	583
82	0.683	564
83	0665	547
84	0648	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	0555	446
92	0545	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	0466	367
101	0454	357
102	0.442	346
103	0 429	335
104	0.416	324
105	0401	312
106	0386	299
107	0370	285

30-261

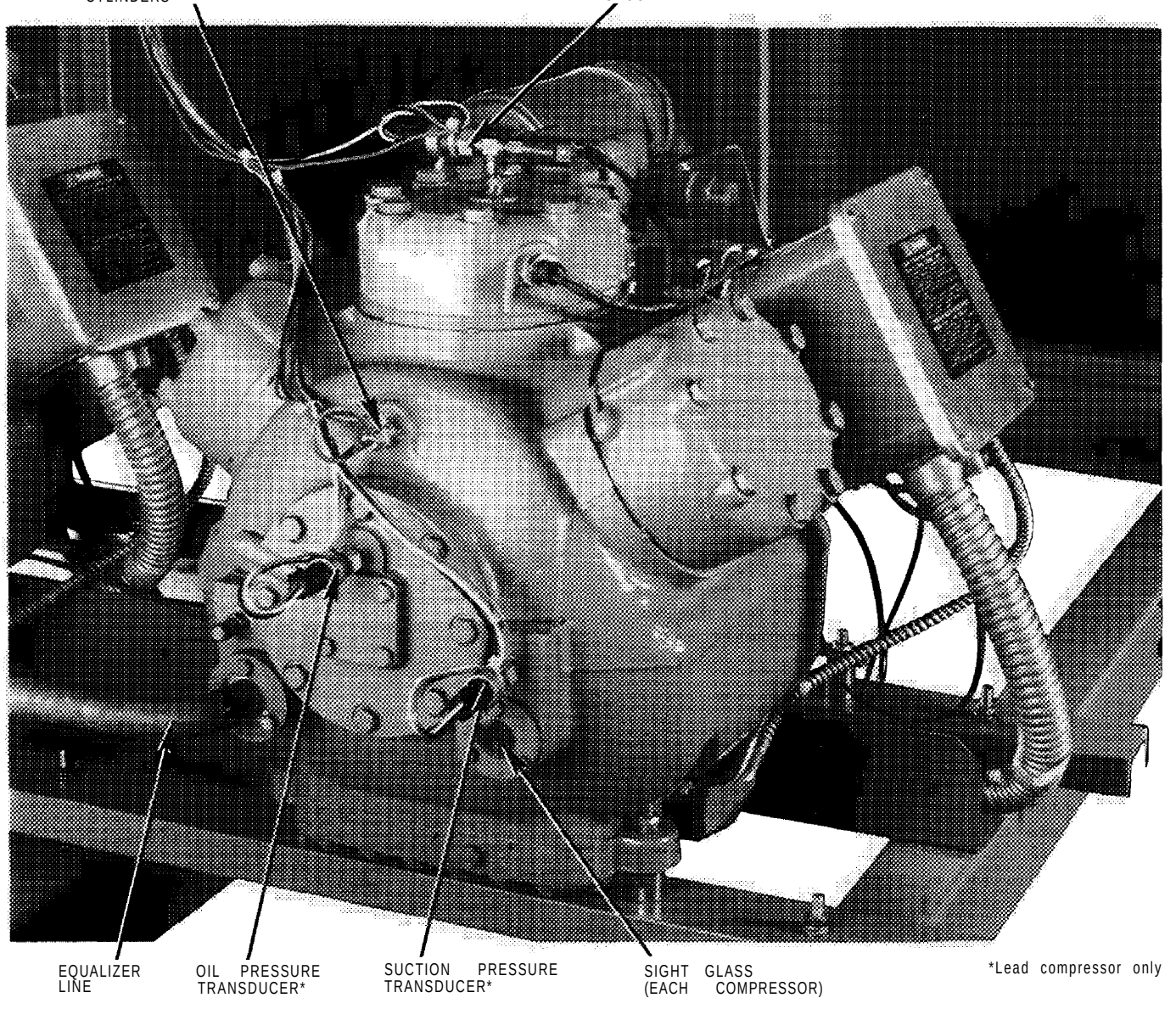


Fig. 17 — Lead Compressor Transducer and Thermistor Locations

Control Modules

⚠ CAUTION

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

PROCESSOR MODULE (PSIO), 4 IN/4 OUT 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 and SIO.

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. On the PSIO module, if the light is blinking at a rate of twice per second, the module should be replaced.

GREEN LED — On a PSIO and an 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. 18. Proper addresses are:

PSIO (Processor Module) — 01 (different when CCN connected)
DSIO (Relay Module) — 19
DSIO (EXV Driver Module) — 31
SIO (4 In/4 Out 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 mode for proper seating. If a good connection is assured and condition persists, replace DSIO or SIO module.

All system operating intelligence rests in PSIO 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 keypad and display module. Communication between PSIO and other modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module.

On sensor bus terminal strips, terminal 1 of PSIO module is connected to terminal 1 of each of the other modules. Terminals 2 and 3 are connected in the same manner. See Fig, 19, 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 keypad 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.

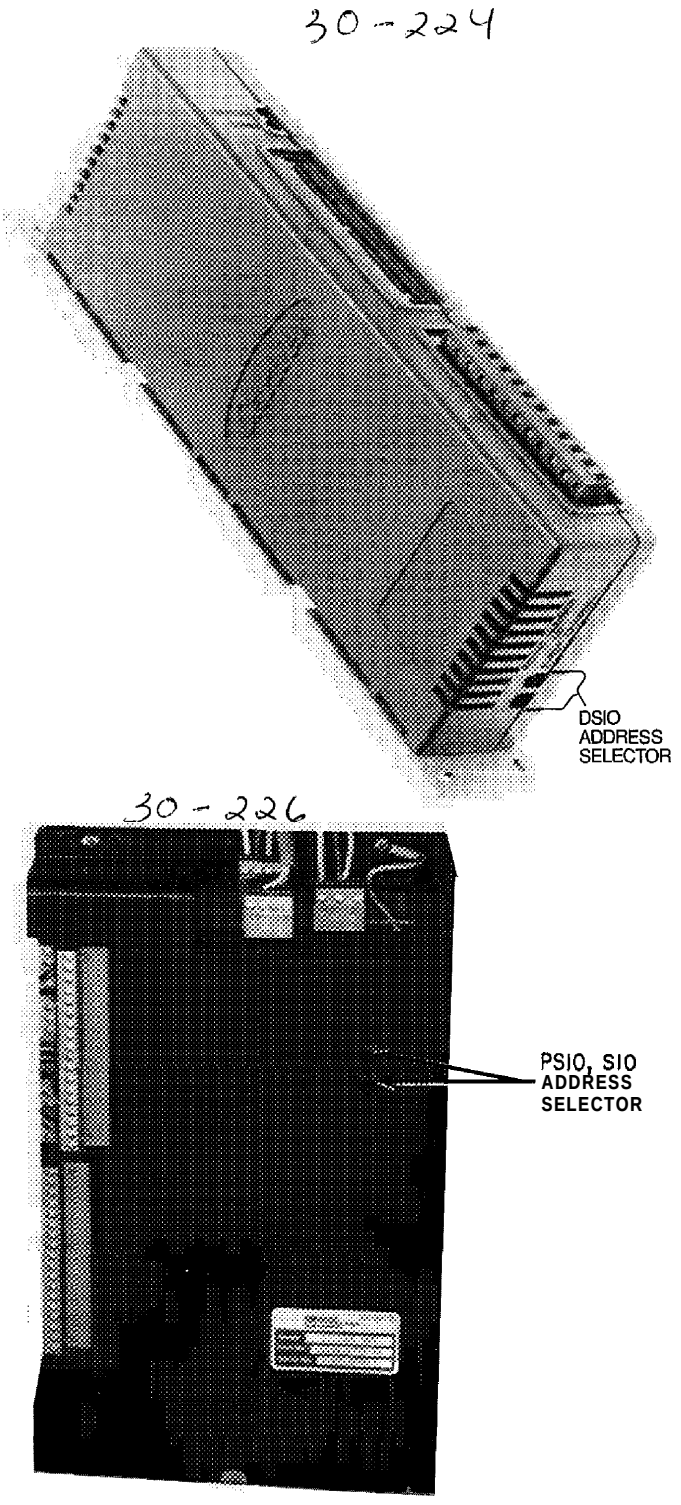


Fig. 18 — Module Address Selector Switch Locations

A30-1362

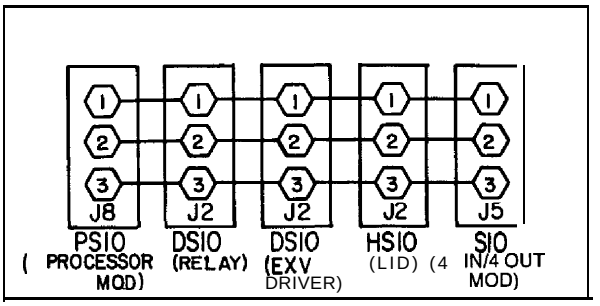


Fig. 19 — Sensor Bus Wiring (Communications)

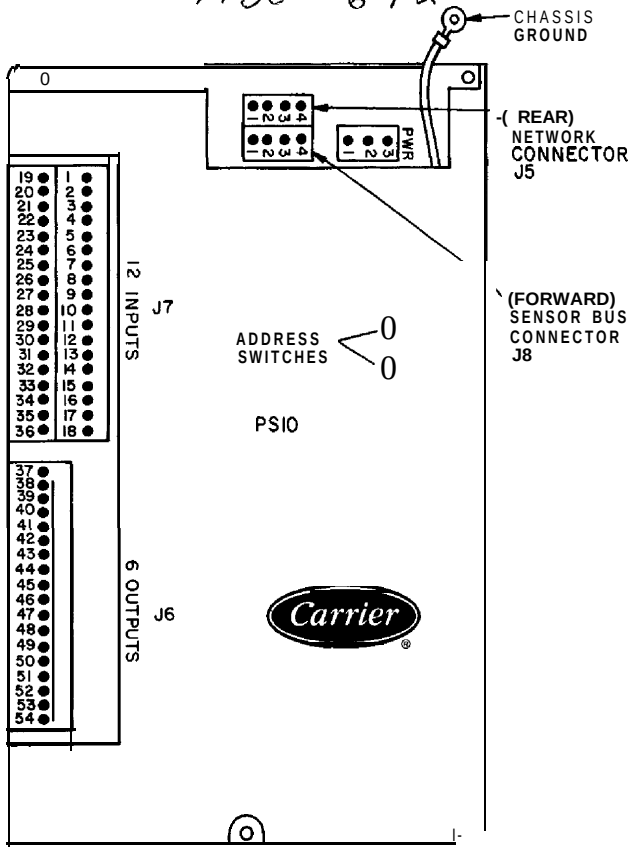
PROCESSOR MODULE (PSIO) (Fig. 20)

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. 20) must be set at 01 (different when CCN connected).

A30-642



PWR — Power

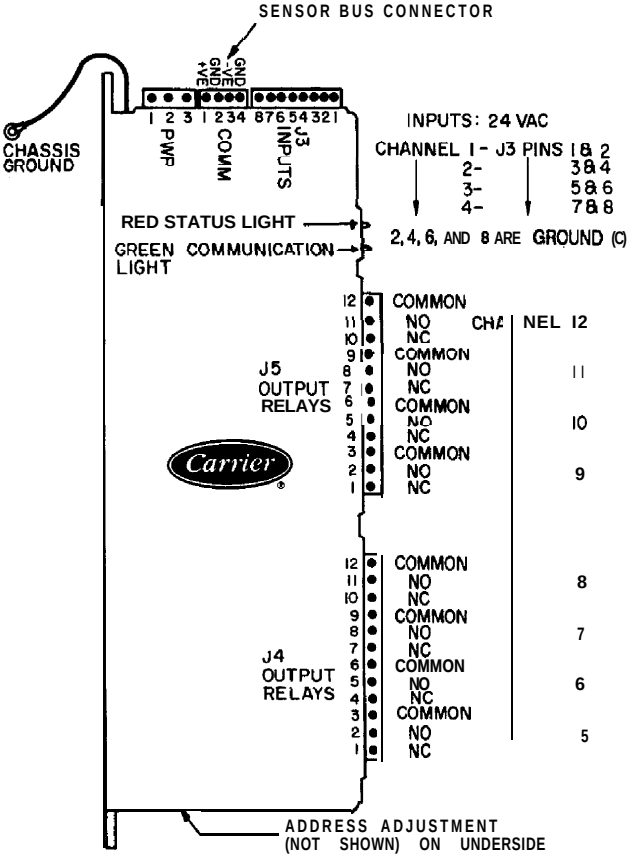
Fig. 20 — Processor Module (PSIO)

LOW VOLTAGE RELAY MODULE (DSIO) (Fig. 21)

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

A30-643



LEGEND

COMM — Communications Bus
NC — Normally Closed
NO — Normally Open
PWR — Power

Fig. 21 — Low-Voltage Relay Module (DSIO)

A30-752

4 IN/4 OUT MODULE (SIO) (Fig. 22) — 4 In/4 Out 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.

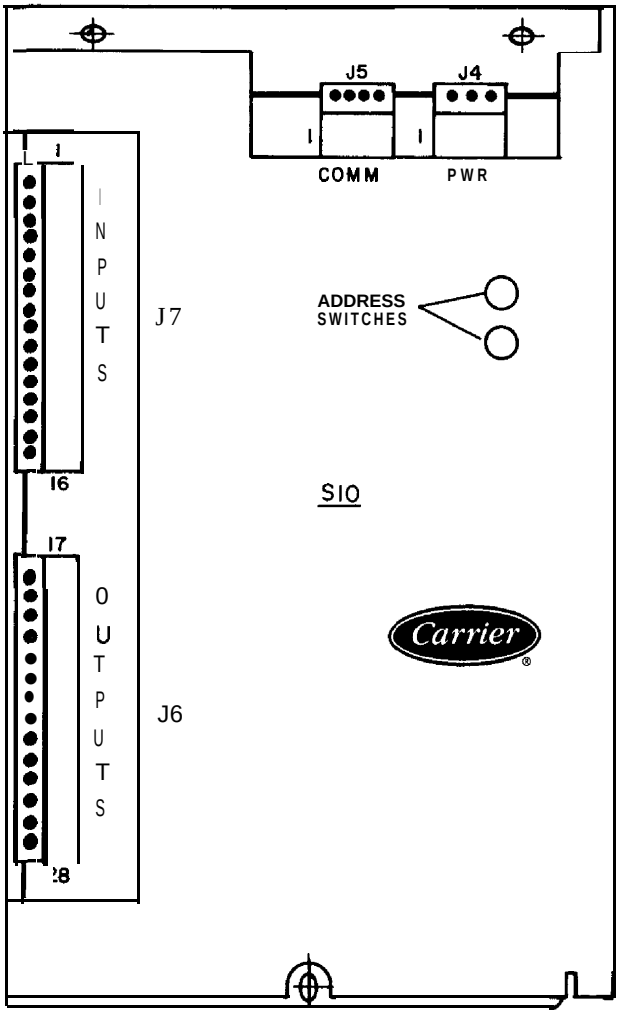
   NOTE: This accessory is *not* required for return water temperature reset.

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.

The options module is standard on 30GN040-210 and associated modular chillers and is available as a field-installed accessory on 30GT225, 250, and 280 Flotronic ™ II chillers.

Remember to reconfigure the chiller for each feature selected (see Table 13). For temperature reset, demand limit, and dual set point, desired set points must be entered through keypad and display module (see Set Point Function section on page 39).

See Table 17 for overall troubleshooting information.



LEGEND

COMM – Communications Bus
PWR – Power

Fig. 22 – 4 In/4 Out Module (SIO)

Table 17 — Troubleshooting

SYMPTOMS	CAUSE	REMEDY
COMPRESSOR DOES NOT RUN	Power line open	Reset circuit breaker
	Control fuse open	Check control circuit for ground or short. Replace fuse
	High Pressure Switch (HPS) tripped	Move LOCAL/ENABLE-STOP-CCN switch to STOP position then back to RUN or CCN position.
	Tripped power breaker	Check the controls. Find cause of trip and reset breaker
	Loose terminal connection	Check connections
	Improperly wired controls	Check wiring and rewire.
	Low line voltage	Check line voltage. Determine location of voltage drop and remedy deficiency
	Compressor motor defective	Check motor winding for open or shot-t. Replace compressor if necessary.
	Seized compressor	Replace compressor.
COMPRESSOR CYCLES OFF ON LOW PRESSURE	Loss of charge	Repair leak and recharge
	Bad transducer	Replace transducer.
	Low refrigerant charge	Add refrigerant.
COMPRESSOR SHUTS DOWN ON HIGH PRESSURE CONTROL	High-pressure control erratic in action	Replace control
	Compressor discharge valve partially closed	Open valve or replace if defective.
	Condenser fan(s) not operating	Check wiring. Repair or replace motor(s) if defective.
	Condenser coil plugged or dirtv	Clean coil.
UNIT OPERATES LONG OR CONTINUOUSLY	Low refrigerant charge	Add refrigerant,
	Control contacts fused	Replace control
	Partially plugged or plugged expansion valve or filter driver	Clean or replace
	Defective insulation	Replace or repair.
	Service load	Keep doors and windows closed.
	Inefficient compressor	Check valves. Replace if necessary.
SYSTEM NOISES	Piping vibration	Support piping as required
	Expansion valve hissing	Add refrigerant.
		Check for plugged liquid line filter drier.
	Compressor noisy	Check valve plates for valve noise.
		Replace compressor (worn bearings).
		Check for loose compressor holddown bolts.
COMPRESSOR LOSES OIL	Leak in system	Repair leak.
	Mechanical damage (blown piston or broken discharge valve)	Repair damage or replace compressor.
	Crankcase heaters not energized durina shutdown	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	Shortaae of refriaerant 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	Replace coil
	Defective capacity control valve	Replace valve
	Miswired solenoid	Rewire correctly.
	Weak, broken, or ***wrong*** valve body spring	Replace spring
COMPRESSOR DOES NOT LOAD	Miswired solenoid	Rewire correctly
	Defective capacity control valve	Replace valve.
	Plugged strainer (high side)	Clean or replace strainer.
	Stuck or damaged unloader piston or piston ring(s)	Clean or replace the necessary parts.

ACCESSORY UNLOADER INSTALLATION

Some of the 30G Flotronic™ II units come standard with unloader(s), and many permit additional unloader(s) to be added if desired. See Table 18.

IMPORTANT: Accessory hot gas bypass cannot be installed with accessory unloaders on units with more than 4 compressors.

If accessory unloaders are desired, an accessory unloader package is used. Package includes a suction cutoff unloader head package. The 24-v coil in the package can be used for 040-l 10, 130 (60 Hz) and associated modular units. A 115 v or 230 v coil must be used for 130 (50 Hz), 150-210, 225, 250, 280, and associated modular units. Coil voltage depends on control circuit voltage, Consult current Carrier price pages for appropriate part numbers.

NOTE: The accessory package will include all necessary components and wiring with the following exceptions: The field must provide screws, and on the 130-2 10, 225, 250, 280, and associated modular units, the field must also supply a 20 vdc (part number HK356AB001) unloader relay and wire (90" C or equivalent).

Table 18 — Standard and Accessory Unloaders

UNIT	NO. OF STANDARD UNLOADER(s)	NO. OF ACCESSORY UNLOADERS PERMITTED	
		Circuit A	Circuit B
30GN040-070	1	1	1 or2
30GN080-170*	2	1	1
30GN190-210*	0	1	1
30GT225,250,280	0	1	1

*And associated modular units

Installation

1. Be sure all electrical disconnects are open and tagged before any work begins. Inspect the package contents for any damage during shipping. File a claim with the shipper if damage has occurred.
2. For ease of installation, factory-supplied wiring for the additional unloader is provided in the compressor harness.
3. Install the additional unloader cylinder head on the lead compressor, Al or B1, according to instructions provided by the compressor manufacturer in the accessory package.
4. Continue installation per either 040-l 10, 130 (60 Hz) units or 130 (50 Hz), 150-210, 225, 250, and 280 units section as appropriate.

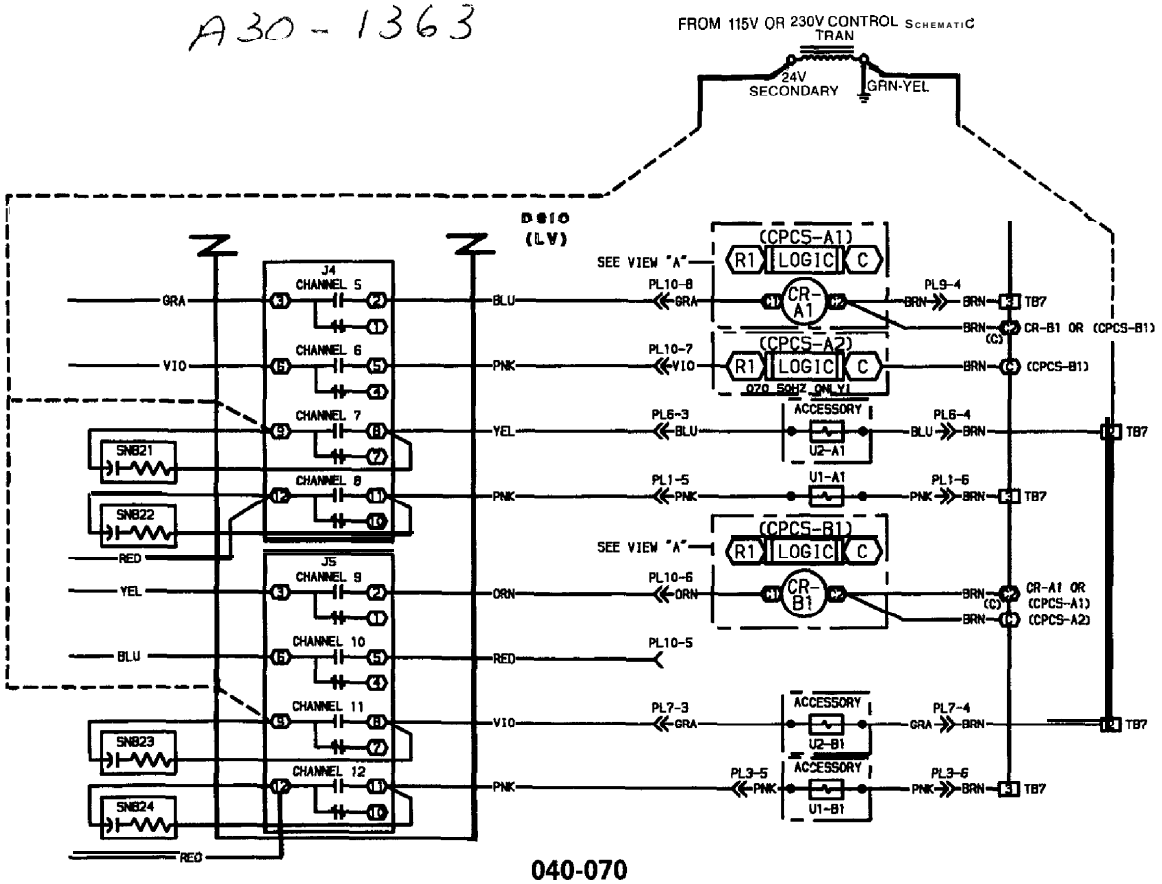
040-l 10, 130 (60 Hz) UNITS (and associated modular units)

1. Wire the solenoid before any field wiring begins. Wiring between components and control box must be enclosed in conduit. All local electrical codes and National Electrical Code (NEC) must be followed. Factory wires are provided in the compressor harness to connect the solenoid. These wires are in the compressor control box.
2. Wire the control side. Open the left side control box door and remove inner panel. Using the holes provided and field-supplied screws, install field-supplied transformer above the DSIO-LV on the control panel.

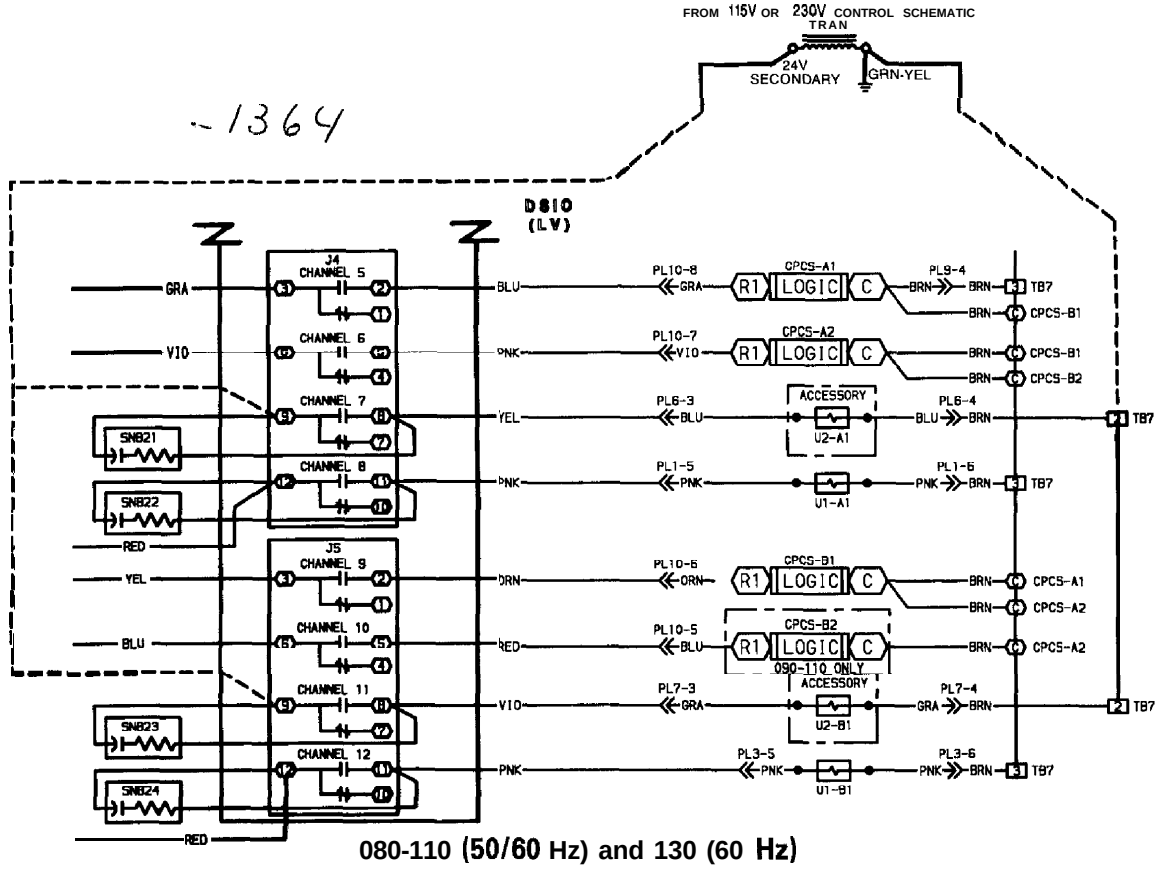
   Wire the primary side of the transformer in parallel with TRAN3. See Fig. 23. This supplies transformer with proper line voltage. Be sure to connect proper tap of the transformer to ensure supply of proper secondary voltage.

   Wire the secondary side of transformer to DSIO-LV - J5-9, and a jumper from DSIO-LV - J5-9 to DSIO-LV - J4-9. Wire the secondary common to TB7-2. Connect the transformer ground to ground hole supplied near the transformer. These connections provide DSIO with necessary power to energize the solenoid coils.
3. When all connections are made, check for proper wiring and tight connections. Replace and secure inner panel. Restore power to unit.
4. Configure the processor. With the addition of extra unloaders, the unit configuration has changed. To change the configuration of the processor, enter the service function using the keypad and display module. Before any changes can be made, the LOCAL/ENABLE-STOP-CCN switch must be in the STOP position, and the servicer must log on to the processor.
   a. Press [1] [SRVC]. Keypad LCD displays the word PASSWORD.
   b. Enter [1] [1] [1] [1] [ENTR]. Keypad LCD displays LOGGEDON.
   c. To change configuration, press [4] [SRVC]. Keypad LCD displays FLD CFG.
   d. If an additional unloader was added to compressor Al, press [↓] until NULA 1 appears in keypad display. Press [2] [ENTR] for the number of unloaders on circuit A. Keypad display now reads NULA 2.
   e. If an additional unloader was added to compressor B 1, press ❑ until NULB 1 appears in keypad display. Press [2] [ENTR] for the number of unloaders on circuit B. Keypad display now reads NULB 2.
   f. When configuration is complete, press [1] [ENTR]. Keypad display reads LOGGEDON. Press [↓] until keypad display reads LOG OFF. Press [ENTR]. Keypad display reads EXIT LOG.
5. Using test function, check unloaders. Press [2] [TEST]. Keypad display reads OUTPUTS. Press [↓] until display reads ULA 2 OFF. Press ❑. Relay energizes. Press [↓] and relay deenergizes. Press [↓] until display reads ULB2 OFF. Press [ENTR]. Relay energizes. Press ❑ and relay deenergizes.
6. When unloader check has been performed, return LOCAL/ENABLE-STOP-CCN to proper position. Close and secure control box door.

A30-1363



040-070



080-110 (50/60 Hz) and 130 (60 Hz)

LEGEND

C	Contactor	PL	Plug
CRCS	Compressor Protection Control System	SNB	Snubber
CR	Control Relay	TB	Terminal Block
DSIO	Relay Module	TRAN	Transformer
LV	Low Voltage	U	Unloader

Fig. 23 — Accessory Unloader Control Wiring

130 (50 Hz), 150-210, 225, 250, AND 280 UNITS (and associated modular units)

1. Install control wiring. The minimum wire size for installation is 16 AWG (American Wire Gage). Refer to Fig. 24 and 25 for proper wiring. Open the control box door. Locate unloader relays A and B (URA, URB) in place of the hot gas bypass relays as shown on the component arrangement diagram on the unit. Mount the relays with the field-supplied screws. Be careful not to damage the components and wiring in the area when mounting the relays.

2 Wire the control side. Wire the URA coil in series between J6-18 and J6- 19 of the 4 IN/4 OUT module with the wires provided. Wire the URB coil in series between J6-21 and J6-22 of the same module with the wires provided.

Locate the black wire in the control harness originating from TRAN5 labeled HGBPR-A-COM. Connect this wire to the URA terminal COM. Connect the wire labeled HGBPR-A-NO to URA-NO. Connect the wire from URA-NO to TB3-5. For an extra unloader on circuit B, connect the wire labeled HGBPR-B-COM to UR-B-COM, and the wire labeled HGBPR-B-NO to URB-NO. Connect the wire from URB-NO to TB3-6.

3. Wire in the solenoid valves.

NOTE: Wires external to the control box must be run in conduit .

Terminal blocks are provided for easy field wiring. Use one of the isolated 7/8-in. (22-mm) holes in the side of the compressor electrical box with a strain relief to run the wires to the solenoid coil. Connect URA between TB3-5 and TB3-8. Connect URB between TB3-6 and TB3-8. Check all of the electrical connections for proper location and tightness, and replace and secure the electrical box of the compressor,

4. Configure the microprocessor, Once the relays are mounted in the control box, the microprocessor must be configured for the unloader option. 'To do so:

a. Be sure the LOCAL/ENABLE-STOP-CCN switch is in the STOP position.

b. Log into the processor and enter the service function using the keypad and display module. Type [1] [SRVC] . The keypad LCD will display "PASSWORD." Enter [1] [1] [1] [1] [ENTR], and the keypad LCD will display "LOGGEDON. ;"

c. To change the configuration, type [4] [SRVC], and the keypad LCD will display "FLD CFG." Press [↓] until either ''NULA 0" or "NULA 1'' is displayed (depending on the number of unloaders provided as standard), Then press [1] [ENTR] (for 1 unloader on Al) or [2] [ENTR] (for 2 unloaders on compressor Al). The display will now read either "NULA 1" or ''NULA 2, '' as appropriate, Press [↓] to get to the NULB display, and change this setting in the same manner as with circuit A.

d. Once the configuration is complete, press [1] [SRVC], and the keypad LCD will display "LOGGEDON," Press [↓] until the keypad LCD display reads "LOG OFF." Press [ENTR] and the keypad LCD will display "EXIT LOG."

5 Once the unloader heads are installed, the unit is checked for leaks, and the system is prepared for operation per the instructions for the compressor unloader head installation, check the output of the relays using the test function as follows:

a. Press [2] [TEST], and the display will read ''COMP.''

b. Press the [❑] to scroll down until the display reads "CPA1 OFF."

c. Press [ENTR], and the compressor should start.

d. Press [↓], and the compressor should stop.

e. Press [↓] until the display reads ''ULA1 OFF."

f. Press [ENTR], and the solenoid should energize.

g. Press [❑] and the solenoid should deenergize.

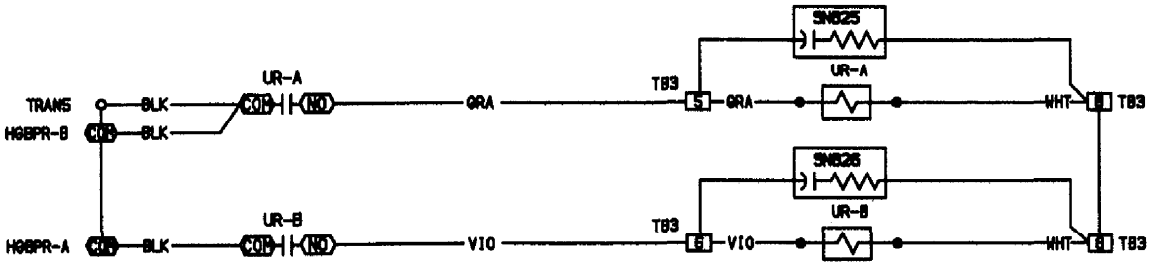
h. Use the [↓] and [ENTR] keys to check the remainder of the unloader coils.

6. Once the check has been performed, return the LOCAL/ENABLE-STOP-CCN switch to the proper position.

7. Close and secure the control box door.

8. Start the unit and confirm that the chiller operates properly.

A30-1365

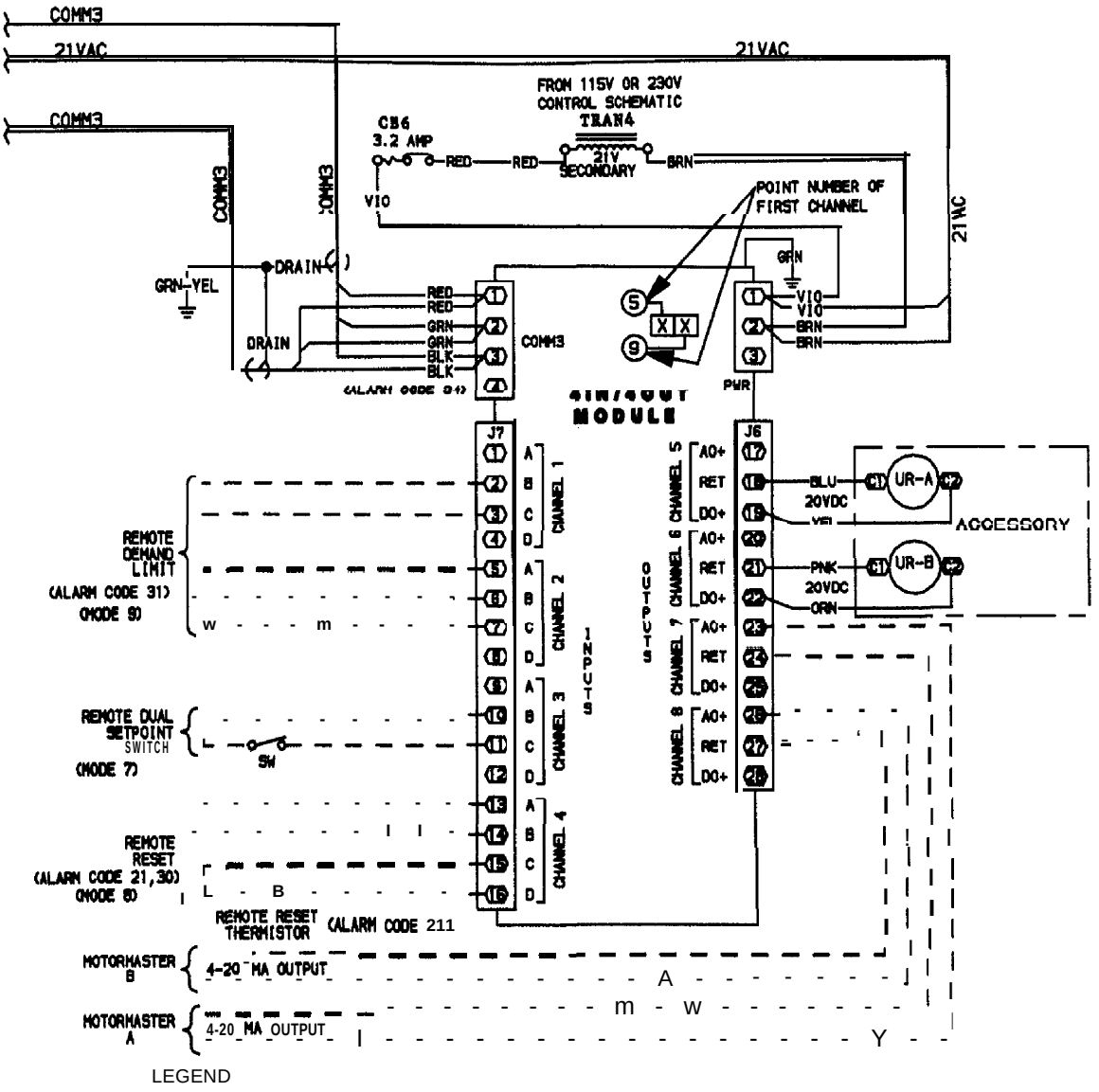


LEGEND

COM	– Communications Bus	TB	– Terminal Block
HGBPR	– Hot Gas Bypass Relay	TRAN	– Transformer
NO	– Normally Open	U	– Unloader
SNB	– Snubber	UR	– Unloader Relay

Fig. 24 - Flotronic'" II 115/230-V Unloader Wiring, 130 (50 Hz), 150-210, 225, 250, 280

A30-1366



LEGEND

C	— Contactor	**SW**	— Switch
CB	— Circuit Breaker	**TRAN**	— Transformer
COMM	— Communications Bus	**UR**	— Unloader Relay

Fig. 25 — Accessory Unloader Control Wiring, 130 (50 Hz), 150-210, 225, 250, 280

FIELD WIRING

Refer to Fig, 26 - 36 for field wiring. -1368

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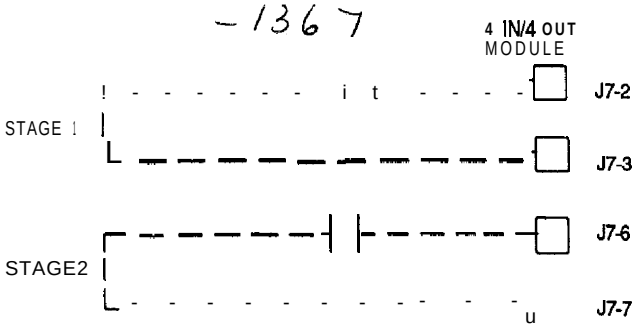
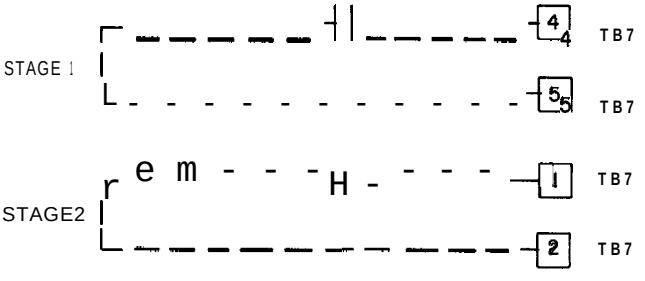


NOTE: Contacts must be rated for dry circuit application, capable of reliably switching a 5 vdc, 1mA to 20 mA load

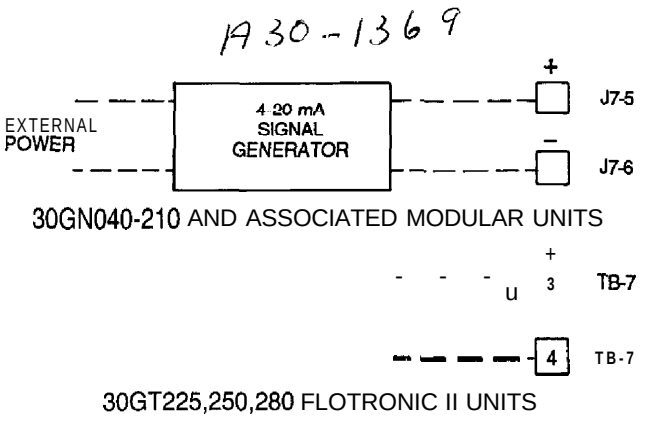
Fig. 26A — Demand Limit — Two External Switch Inputs, 30GN040-210 and Associated Modular Units



TB — Terminal Block

NOTES:
1 Requires accessory options module package.
2 Contacts must be rated for dry circuit application, capable of reliably switching a 5 vdc, 1 mA to 20 mA load

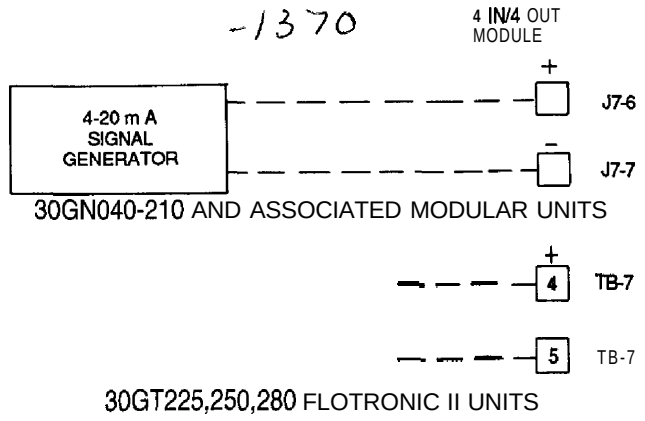
Fig. 26B — Demand Limit — Two External Switch Inputs, 30GT225, 250, 280 Units



TB — Terminal Block

NOTE: The 30GT225,250,280 Flotronic™ II units require the accessory options module package for this feature

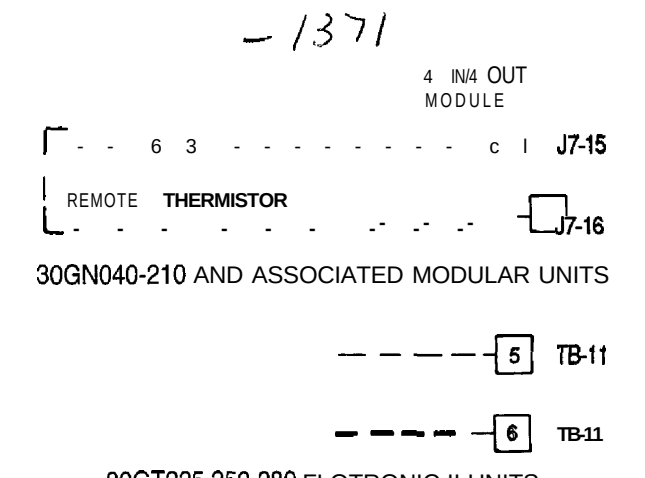
Fig. 27 — Demand Limit — 4-20 mA Signal (Externally Powered)



TB — Terminal Block

NOTE: The 30GT225,250,280 Flotronic II units require the accessory options module package for this feature.

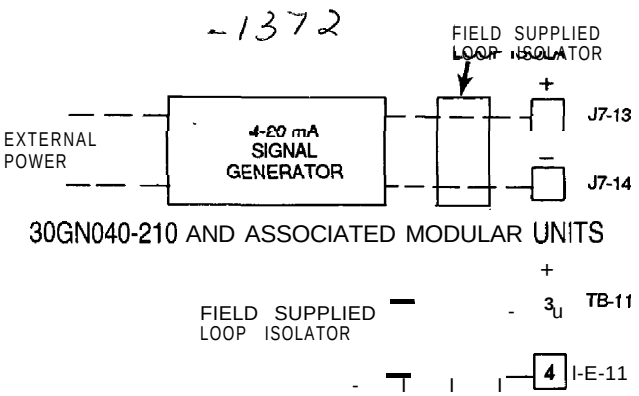
Fig. 28 — Demand Limit — 4-20 mA Signal (Internally Powered)



TB — Terminal Block

NOTE: The 30GT225,250,280 Flotronic II units require the accessory options module package for this feature.

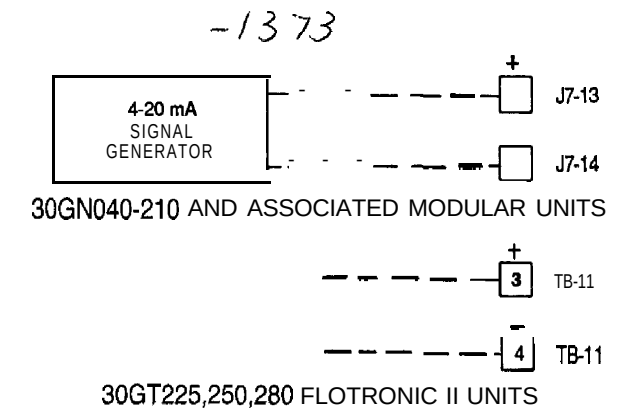
Fig. 29 — Remote Reset from Space or Outdoor-Air Temperature



TB — Terminal Block

NOTE: The 30GT225,250,280 Flotronic II units require the accessory options module package for this feature.

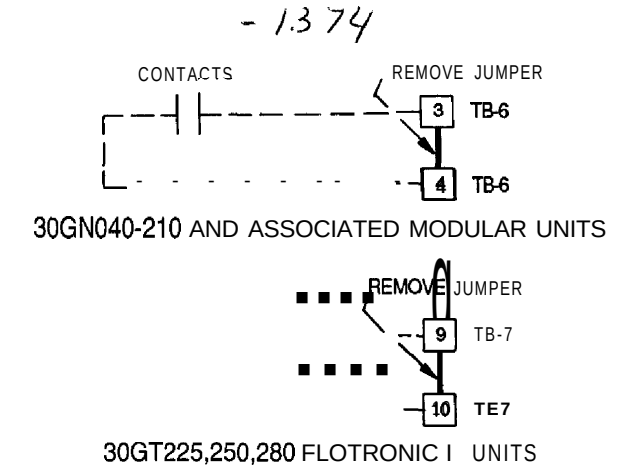
Fig. 30 — Remote Reset from 4-20 mA Signal (Externally Powered)



TB — Terminal Block

NOTE: The 30GT225,250,280 Flotronic II units require the accessory options module package for this feature

Fig. 31 — Remote Reset from 4-20 mA Signal (Internally Powered)

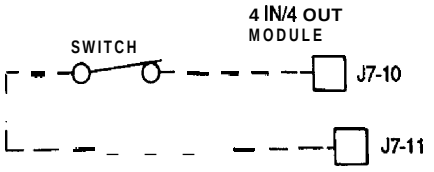


TB — Terminal Block

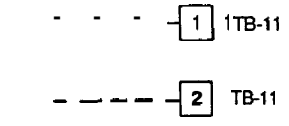
NOTES:
1 The 30GT225,250,280 Flotronic II units require the accessory options module for this feature.
2. Contacts must be rated for dry circuit application, capable of reliably switching a 5 vdc, 1 mA to 20 mA load

Fig. 32 — Remote On/Off

A30-1375



30GN040-210 AND ASSOCIATED MODULAR UNITS



30GT225,250,280 FLOTRONIC™ II **UNITS**

T B — Terminal Block

NOTE: The 30GT225,250,280 Flotronic II units require the accessory options module for this feature

Fig. 33 — Remote Dual Set Point Control

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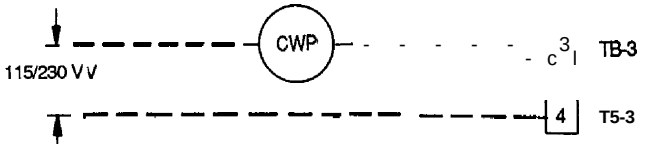
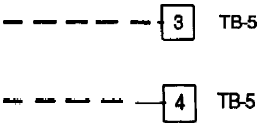


30GN040-210 AND ASSOCIATED MODULAR UNITS



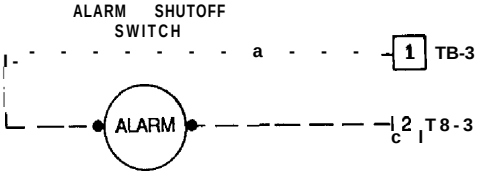
30GT225,250,280 FLOTRONIC II UNITS

CWP — Chilled Water Pump
T B — Terminal Block

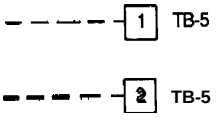
NOTE: The maximum load allowed for the chilled water pump circuit is 125 va sealed, 1250 va inrush at 115 or 230 v

Fig. 34 — Chilled Water Pump

-1377



30GN040-210 AND ASSOCIATED MODULAR UNITS



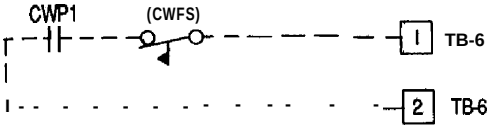
30GT225,250,280 FLOTRONIC II UNITS

TB — Terminal Block

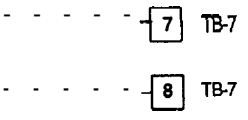
NOTE: The maximum load allowed for the alarm circuit is 125 va sealed, 1250 va inrush at 115 or 230 v

Fig. 35 — Remote Alarm

-1378



30GN040-210 AND ASSOCIATED MODULAR UNITS



30GT225,250,280 FLOTRONIC I I UN ITS

CWP1 — Chilled Water Pump Interlock
CWFS — Chilled Water Flow Switch (not required — low flow protection is provided by Flotronic II controls)
T B — Terminal Block

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

Fig. 36 — 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™ 11 replacement module. This requires reconfiguration of the module 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 the Control Modules section on page 64.
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 3 SRVC and 5 SRVC 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 6 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/ENABLE-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 Control Modules section on page 64. The keypad and display module (HSIO or LID) should also begin its rotating display.
12. Using the keypad and display module, press 2 SRVC, to verify that the software version number matches the ER (engineering requirement) number shown on the PSIO label.
13. Press 3 SRVC to 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 diagram 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 ENTR key while displaying CODE 6. The display returns in approximately 15 seconds.

    NOTE: Codes with leading zeros in the configuration will be displayed starting with the first number greater than zero.
14. Press 4 SRVC to verify each item is configured as needed for this particular installation. Table 9 shows the factory configuration code default settings. Table 9 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 1 TEST and 2 TEST sections on page 38.
16. Complete this procedure and restore chiller to normal operation by returning the LOCAL/ENABLE-STOP-CCN switch to desired position.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

Book 2 Tab 5c | PC 903 | Catalog No 563-015 | Printed in U S A | Form 30GN-2T | Pg 76 | I-94 | Replaces: 30GB,GT-1T, 30GN-1T