30GTN,GTR040-420
30GUN,GUR040-420
Air-Cooled Reciprocating Liquid Chillers with *Comfort*Link™ Controls
50/60 Hz

Controls Start-Up, Operation, Service, and Troubleshooting

SAFETY CONSIDERATIONS

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

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

To prevent potential damage to heat exchanger tubes always run fluid through heat exchangers when adding or removing refrigerant charge. Use appropriate brine solutions in cooler fluid loops to prevent the freezing of heat exchangers when the equipment is exposed to temperatures below 32 F (0° C).

DO NOT VENT refrigerant relief valves within a building. Outlet from relief valves must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigeration and Air Conditioning Engineers) 15 (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation. Provide adequate ventilation in enclosed or low overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness or death. Misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

⚠ WARNING

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

CONTENTS

Book 2 | Tab 5c   PC 903   Catalog No. 563-025   Printed in U.S.A.   Form 30GTN-3T   Pg 1   3-00   Replaces: 30GTN-2T

CONTENTS (cont)

GENERAL

The model 30GTN,R chillers are air-cooled chillers utilizing refrigerant R-22. The model 30GUN,R chillers are air-cooled chillers utilizing refrigerant R-134a.

Unit sizes 230-420 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 Tables 1A and 1B for a listing of unit sizes and modular combinations. For modules 230B-315B, follow all general instructions as noted for unit sizes 080-110. For all remaining modules, follow instructions for unit sizes 130-210.

INTRODUCTION

This publication contains Start-Up, Service, Controls, Operation, and Troubleshooting information for the 30GTN,R040-420 and 30GUN,R040-420 liquid chillers with ComfortLink controls.

The 30GTN,R and 30GUN,R040-420 chillers are equipped with electronic expansion valves (EXVs) or, on size 040-110 FIOP (factory-installed option) units, conventional thermostatic expansion valves (TXVs). The size 040-110 FIOP chillers are also equipped with liquid line solenoid valves (LLSV).

NOTE: TXVs are not available on modular units.

Differences in operations and controls between standard and 040-110 FIOP units are noted in appropriate sections in this publication. Refer to the Installation Instructions and the Wiring Diagrams for the appropriate unit for further details.

Table 1A — Unit Sizes and Modular Combinations (30GTN,R)

UNIT 30GTN,R	NOMINAL TONS	SECTION A UNIT 30GTN,R	SECTION B UNIT 30GTN,R
040	40	—	—
045	45	—	—
050	50	—	—
060	60	—	—
070	70	—	—
080	80	—	—
090	90	—	—
100	100	—	—
110	110	—	—
130	125	—	—
150	145	—	—
170	160	—	—
190	180	—	—
210	200	—	—
230	220	150	080
245	230	150	090
255	240	150	100
270	260	170	100
290	280	190	110
315	300	210	110
330	325	170	170
360	350	190	190/170*
390	380	210	190
420	400	210	210

*60 Hz units/50 Hz units.

Table 1B — Unit Sizes and Modular Combinations (30GUN,R)

UNIT 30GUN,R	NOMINAL TONS	SECTION A UNIT 30GUN,R	SECTION B UNIT 30GUN,R
040	26	—	—
045	28	—	—
050	34	—	—
060	42	—	—
070	48	—	—
080	55	—	—
090	59	—	—
100	66	—	—
110	72	—	—
130	84	—	—
150	99	—	—
170	110	—	—
190	122	—	—
210	134	—	—
230	154	150	080
245	158	150	090
255	165	150	100
270	176	170	100
290	193	190	110
315	206	210	110
330	219	170	170
360	243	190	190/170*
390	256	210	190
420	268	210	210

*60 Hz units/50 Hz units.

MAJOR SYSTEM COMPONENTS

General — The 30GTN,R and 30GUN,R air-cooled reciprocating chillers contain the *Comfort*Link™ electronic control system that controls and monitors all operations of the chiller.

The control system is composed of several components as listed in the sections below. See Fig. 1 for typical control box drawing. See Fig. 2-4 for control schematics.

Main Base Board (MBB) — See Fig. 5. The MBB is the heart of the *Comfort*Link control system. It contains the major portion of operating software and controls the operation of the machine. The MBB continuously monitors input/output channel information received from its inputs and from all other modules. The MBB receives inputs from thermistors T1-T6, T9, and T10. See Table 2. The MBB also receives the feedback inputs from compressors A1, A2, B1 and B2, and other status switches. See Table 3. The MBB also controls several outputs. Relay outputs controlled by the MBB are shown in Table 4. Information is transmitted between modules via a 3-wire communication bus or LEN (Local Equipment Network). The CCN (Carrier Comfort Network) bus is also supported. Connections to both LEN and CCN buses are made at TB3. See Fig. 5.

Expansion Valve (EXV) Board — The electronic expansion valve (EXV) board receives inputs from thermistors T7 and T8. See Table 2. The EXV board communicates with the MBB and directly controls the expansion valves to maintain the correct compressor superheat.

Compressor Expansion Board (CXB) — The CXB is included as standard on sizes 150-210 (60 Hz) and 130 (50 Hz) and associated modular units. The compressor expansion board (CXB) receives the feedback inputs from compressors A3, B3 and A4. See Table 3. The CXB board communicates the status to the MBB and controls the outputs for these compressors. An additional CXB is required for unit sizes 040-110, 130 (60 Hz), 230B-315B with additional unloaders.

Scrolling Marquee Display — This device is the keypad interface used for accessing chiller information, reading sensor values, and testing the chiller. The marquee display is a 4-key, 4-character, 16-segment LED (light-emitting diode) display. Eleven mode LEDs are located on the display as well as an Alarm Status LED. See Marquee Display Usage section on page 29 for further details.

Energy Management Module (EMM) — The EMM module is available as a factory-installed option or as a field-installed accessory. The EMM module receives 4 to 20 mA inputs for the temperature reset, cooling set point reset and demand limit functions. The EMM module also receives the switch inputs for the field-installed 2-stage demand limit and ice done functions. The EMM module communicates the status of all inputs with the MBB, and the MBB adjusts the control point, capacity limit, and other functions according to the inputs received.

Enable/Off/Remote Contact Switch — The Enable/Off/Remote Contact switch is a 3-position switch used to control the chiller. When switched to the Enable position the chiller is under its own control. Move the switch to the Off position to shut the chiller down. Move the switch to the Remote Contact position and a field installed dry contact can be used to start the chiller. The contacts must be rated for dry circuit application capable of handling a 24 vac load. In the Enable and Remote Contact (dry contacts closed) positions, the chiller is allowed to operate and respond to the scheduling configuration, CCN configuration and set point data. See Fig. 6.

Emergency On/Off Switch — The Emergency On/Off switch should only be used when it is required to shut the chiller off immediately. Power to the MBB, EMM, CXB, and marquee display is interrupted when this switch is off and all outputs from these modules will be turned off. The EXV board is powered separately, but expansion valves will be closed as a result of the loss of communication with the MBB. There is no pumpout cycle when this switch is used. See Fig. 6.

Reset Button — A reset button is located on the fuse/circuit breaker panel for unit sizes 130-210 and associated modules. The reset button must be pressed to reset either Circuit Ground Fault board in the event of a trip.

Board Addresses — The Main Base Board (MBB) has a 3-position Instance jumper that must be set to ‘1.’ All other boards have 4-position DIP switches. All switches are set to ‘On’ for all boards.

Control Module Communication

RED LED — Proper operation of the control boards can be visually checked by looking at the red status LEDs (light-emitting diodes). When operating correctly, the red status LEDs should be blinking in unison at a rate of once every 2 seconds. If the red LEDs are not blinking in unison, verify that correct power is being supplied to all modules. Be sure that the Main Base Board (MBB) is supplied with the current software. If necessary, reload current software. If the problem still persists, replace the MBB. A red LED that is lit continuously or blinking at a rate of once per second or faster indicates that the board should be replaced.

GREEN LED — The MBB has one green LED. The Local Equipment Network (LEN) LED should always be blinking whenever power is on. All other boards have a LEN LED which should be blinking whenever power is on. Check LEN connections for potential communication errors at the board J3 and/or J4 connectors. Communication between modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module. The J4 connector on the MBB provides both power and communication directly to the marquee display only.

YELLOW LED — The MBB has one yellow LED. The Carrier Comfort Network (CCN) LED will blink during times of network communication.

Carrier Comfort Network (CCN) Interface —

The 30GTN,R chiller units can be connected to the CCN if desired. The communication bus wiring is a shielded, 3-conductor cable with drain wire and is supplied and installed in the field. The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system elements on either side of it. This is also required for the negative and signal ground pins of each system element. Wiring connections for CCN should be made at TB3. Consult the CCN Contractor's Manual for further information.

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

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

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

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground), and black (–) conductors. (Substitute appropriate colors for different colored cables.)
3. Connect the red wire to (+) terminal on TB3 of the plug, the white wire to COM terminal, and the black wire to the (–) terminal.
4. The RJ14 CCN connector on TB3 can also be used, but is only intended for temporary connection (for example, a laptop computer running Service Tool).

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

Table 2 — Thermistor Designations

THERMISTOR NO.	PIN CONNECTION POINT	THERMISTOR INPUT
T1	J8-13,14 (MBB)	Cooler Leaving Fluid
T2	J8-11,12 (MBB)	Cooler Entering Fluid
T3	J8-21,22 (MBB)	Saturated Condensing Temperature, Ckt A
T4	J8-15,16 (MBB)	Saturated Condensing Temperature, Ckt B
T5	J8-24,25 (MBB)	Cooler Suction Temperature, Ckt A (EXV Only)
T6	J8-18,19 (MBB)	Cooler Suction Temperature, Ckt B (EXV Only)
T7	J5-11,12 (EXV)	Compressor Suction Gas Temperature, Ckt A (EXV Only)
T8	J5-9,10 (EXV)	Compressor Suction Gas Temperature, Ckt B (EXV Only)
T9	J8-7,8 (MBB)	Outdoor-Air Temperature Sensor or Dual Chiller LWT Sensors (Accessory)
T10	J8-5,6 (MBB)	Remote Space Temperature Sensor (Accessory)

LEGEND

EXV — Electronic Expansion Valve
MBB — Main Base Board

Table 3 — Status Switches

STATUS SWITCH	PIN CONNECTION POINT	040-060 (50 Hz) 040-070 (60 Hz)	070 (50 Hz) 080, 230B	090-110, 245B-315B	130 (60 Hz)	130 (50 Hz) 150, 230A-255A	170,190, 270A,290A, 330A/B, 360A/B, 390B	210, 315A, 390A, 420A/B
Oil Pressure, Ckt B	J7-1, 2 (MBB)	Not Used*	OPSB	OPSB	OPSB	OPSB	OPSB	OPSB
Oil Pressure, Ckt A	J7-3, 4 (MBB)	Not Used*	OPSA	OPSA	OPSA	OPSA	OPSA	OPSA
Remote On/Off	TB5-13, 14	Field-Installed Relay Closure						
Compressor Fault Signal, B3	J5-8, 12 (CXB)	Not Used	Not Used	Not Used	Not Used	Not Used	CR-B3	CR-B3
Compressor Fault Signal, B2	J9-2, 12 (MBB)	Not Used	Not Used	CPCS-B2	CR-B2	CR-B2	CR-B2	CR-B2
Compressor Fault Signal, B1	J9-8, 12 (MBB)	CR/CPCS-B1†	CPCS-B1	CPCS-B1	CR-B1	CR-B1	CR-B1	CR-B1
Compressor Fault Signal, A4	J5-5, 12 (CXB)	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	CR-A4
Compressor Fault Signal, A3	J5-11, 12 (CXB)	Not Used	Not Used	Not Used	Not Used	CR-A3	CR-A3	CR-A3
Compressor Fault Signal, A2	J9-5, 12 (MBB)	Not Used	CPCS-A2	CPCS-A2	CR-A2	CR-A2	CR-A2	CR-A2
Compressor Fault Signal, A1	J9-11, 12 (MBB)	CR/CPCS-A1†	CPCS-A1	CPCS-A1	CR-A1	CR-A1	CR-A1	CR-A1

LEGEND

CPCS — Compressor Protection Control System
CR — Control Relay
CXB — Compressor Expansion Board
MBB — Main Base Board
OPS — Oil Pressure Switch, Circuit A or B

*The OPS can also be added as an accessory.
†The CPCS can be added as an accessory.

Table 4 — Output Relay

RELAY NO.	DESCRIPTION
K1(MBB)	Energize Compressor A1 and OFM1 (040-110*) Energize Liquid Line Solenoid Valve for Ckt A (if used) (040-110*) Energize Compressor A1, OFM5, and OFM7 (130-210*)
K2 (MBB)	Energize Compressor B1 and OFM2 (040-110*) Energize Liquid Line Solenoid Valve for Ckt B (if used) (040-110*) Energize Compressor B1, OFM6, and OFM8 (130-210*)
K3 (MBB)	Energize Unloader A1 (040-170*) No Action (190-210*)
K4 (MBB)	Energize Unloader B1 (040-070†, 080-170*) No Action (190,210*)
K5 (MBB)	No Action (040-060, 50 Hz; 040-070, 60 Hz) Energize Compressor A2 (070, 50 Hz; 080-210*)
K6 (MBB)	No Action (040-080*) Energize Compressor B2 (090-210*)
K7 (MBB)	Alarm
K8 (MBB)	Cooler Pump
K9 (MBB)	Energize First Stage of Condenser Fans: 040-050 —OFM3 060-110* — OFM3, OFM4 130 (60 Hz) — OFM1,OFM2 Energize First Stage of Ckt A Condenser Fans: 130 (50 Hz), 150,170* — OFM1 190,210* —OFM1,OFM11
K10 (MBB)	Energize Second Stage of Condenser Fans: 040-050 — OFM4 060-090* — OFM5, OFM6 100,110* — OFM5,OFM6,OFM7,OFM8 130 (60 Hz) — OFM3,OFM4,OFM9,OFM10 Energize First Stage of Ckt B Condenser Fans: 130 (50 Hz), 150,170* — OFM2 190,210* — OFM2,OFM12
K11 (MBB)	Hot Gas Bypass
K1 (CXB)	No Action (040-110*; 130, 60 Hz) Energize Compressor A3 (130, 50 Hz; 150-210*)
K2 (CXB)	No Action (040-150*) Energize Compressor B3 (170-210*)
K3 (CXB)	Energize Compressor A4 (210*) Energize Accessory Unloader A2 (080-110*)
K4 (CXB)	Energize Accessory Unloader B2 (080-110*)
K5 (CXB)	Energize Second Stage of Ckt A Condenser Fans: 130 (50 Hz), 150-210* — OFM3,OFM9
K6 (CXB)	Energize Second Stage of Ckt B Condenser Fans: 130 (50 Hz), 150-210* — OFM4,OFM10

LEGEND

OFM — Outdoor-Fan Motor

*And associated modular units.
†Field-installed accessory unloader.

LEGEND FOR FIG. 1-4

C — Compressor Contactor
CB — Circuit Breaker
CCN — Carrier Comfort Network
CGF — Compressor Ground Fault
CHT — Cooler Heater Thermostat
CKT — Circuit
CLHR — Cooler Heater Relay
CPCS — Compressor Protection and Control System
CWFS — Chilled Water Flow Switch
CWPI — Chilled Water Pump Interlock
CR — Control Relay
CXB — Compressor Expansion Board
EQUIP GND — Equipment Ground
FB — Fuse Block
FC — Fan Contactor
FCB — Fan Circuit Breaker
FIOP — Factory-Installed Option Package
EMM — Energy Management Module
EXV — Electronic Expansion Valve
FCB — Fan Circuit Breaker
HPS — High-Pressure Switch
LCS — Loss-of-Charge Switch
LEN — Local Equipment Network
MBB — Main Base Board
NEC — National Electrical Code
OAT — Outdoor-Air Temperature
OPS — Oil Pressure Switch
PL — Plug
PW — Part Wind
SN — Sensor (Toroid)
SPT — Space Temperature
TRAN — Transformer
SW — Switch
TB — Terminal Block
TDR — Time Delay Relay
TXV — Thermostatic Expansion Valve
UL — Unloader
XL — Across-the-Line

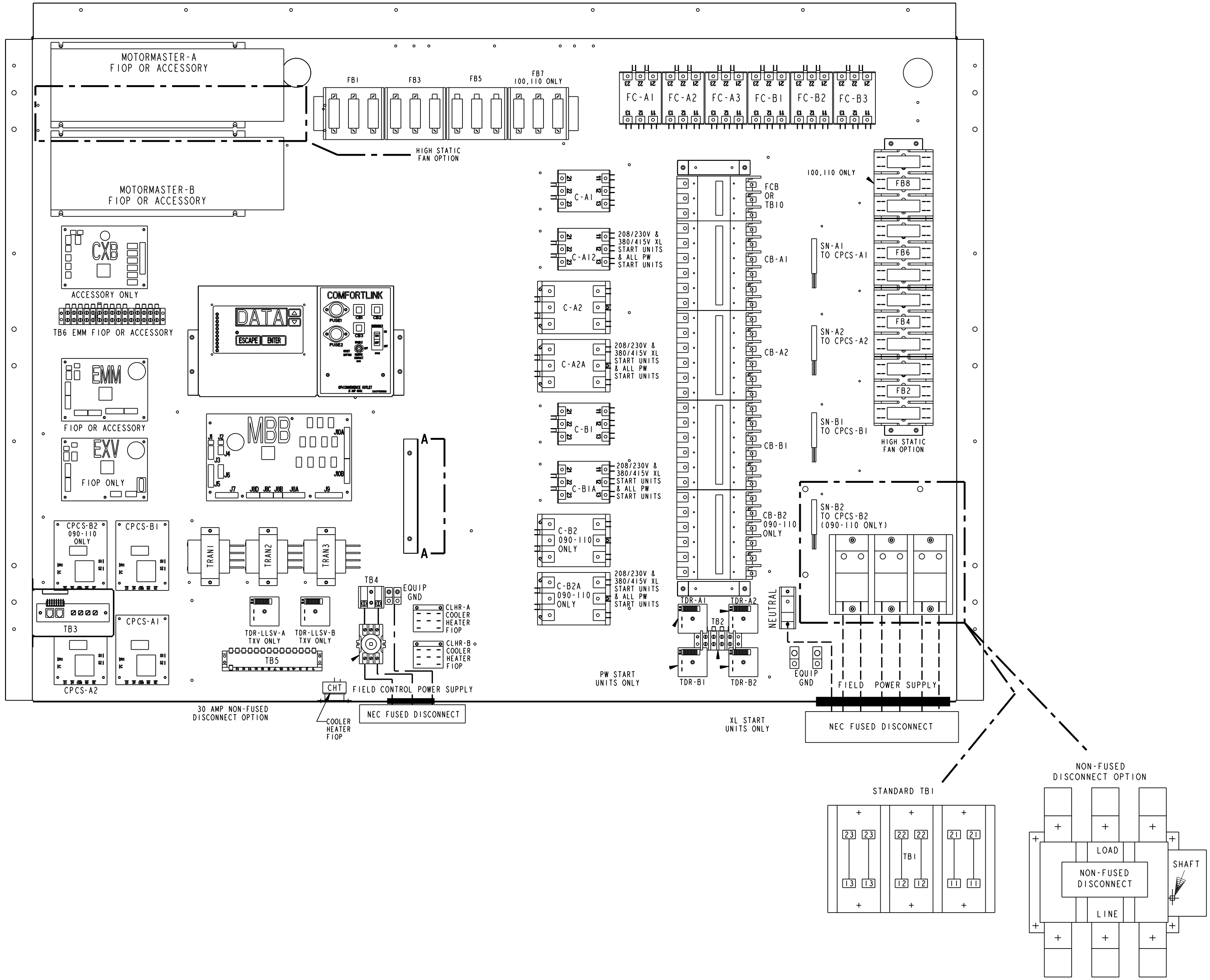


Fig. 1 — Typical Control Box (080-110 and Associated Modular Units Shown)

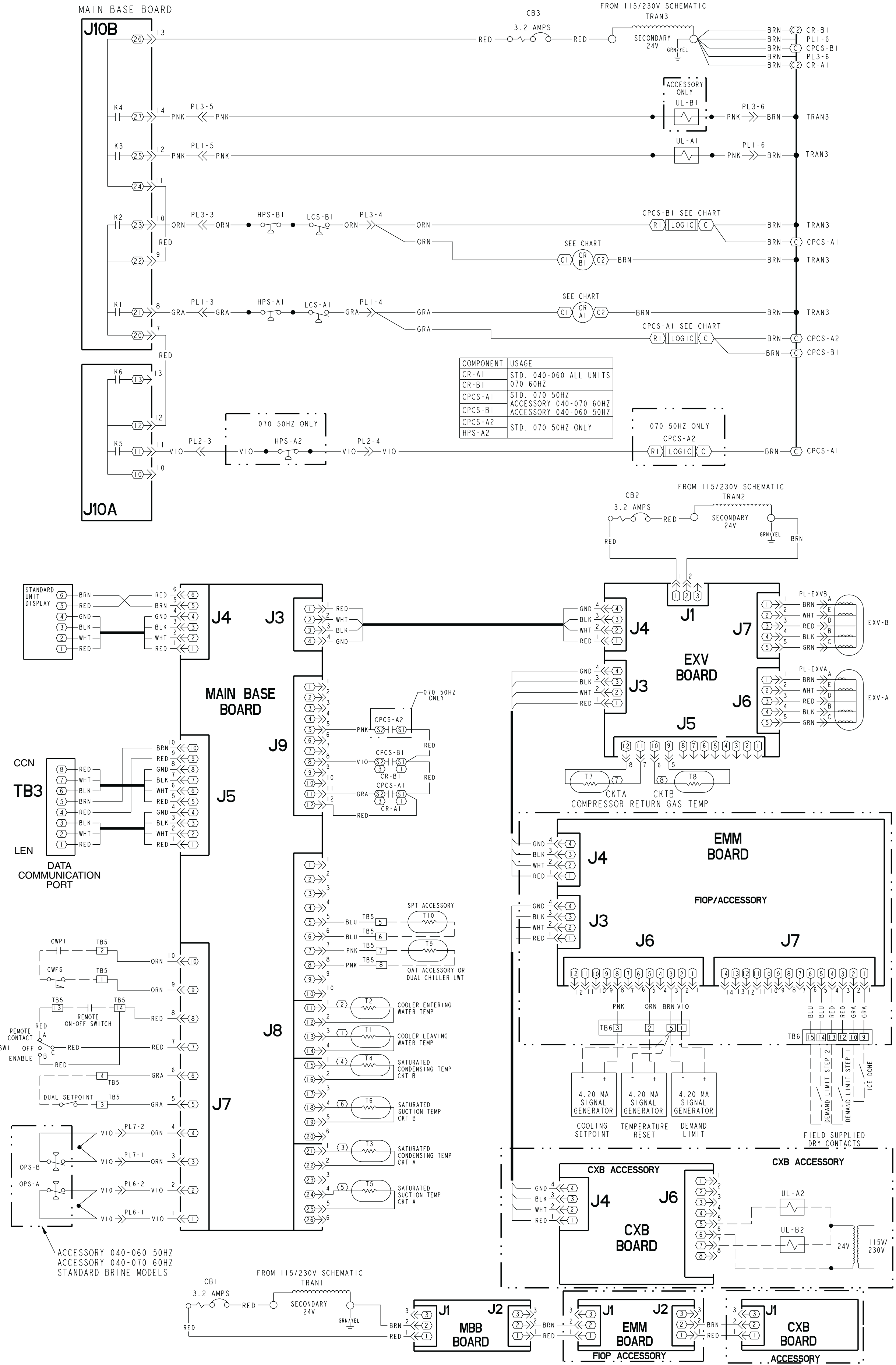


Fig. 2 — 24 V Control Schematic, Unit Sizes 040-070

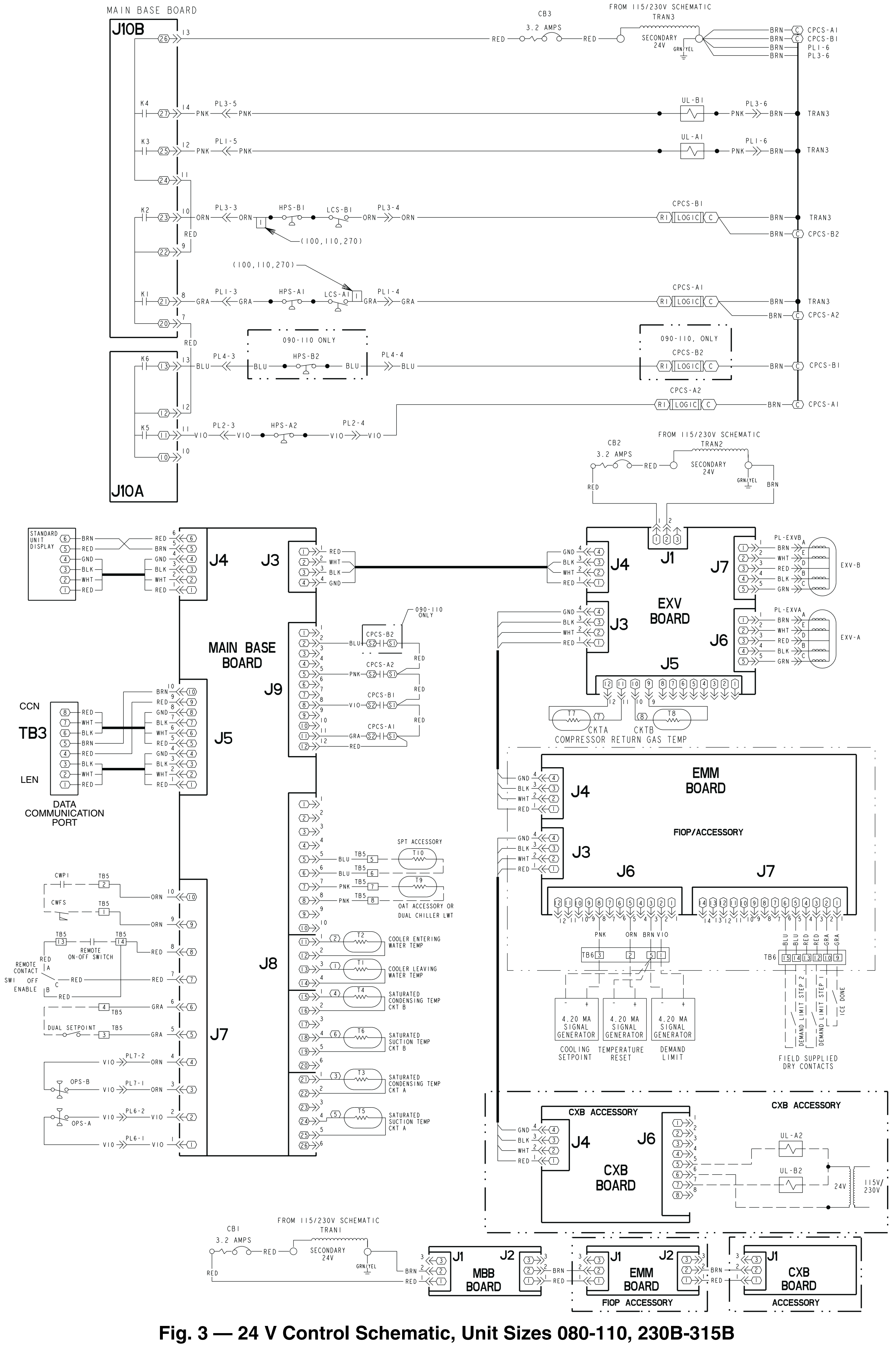


Fig. 3 — 24 V Control Schematic, Unit Sizes 080-110, 230B-315B

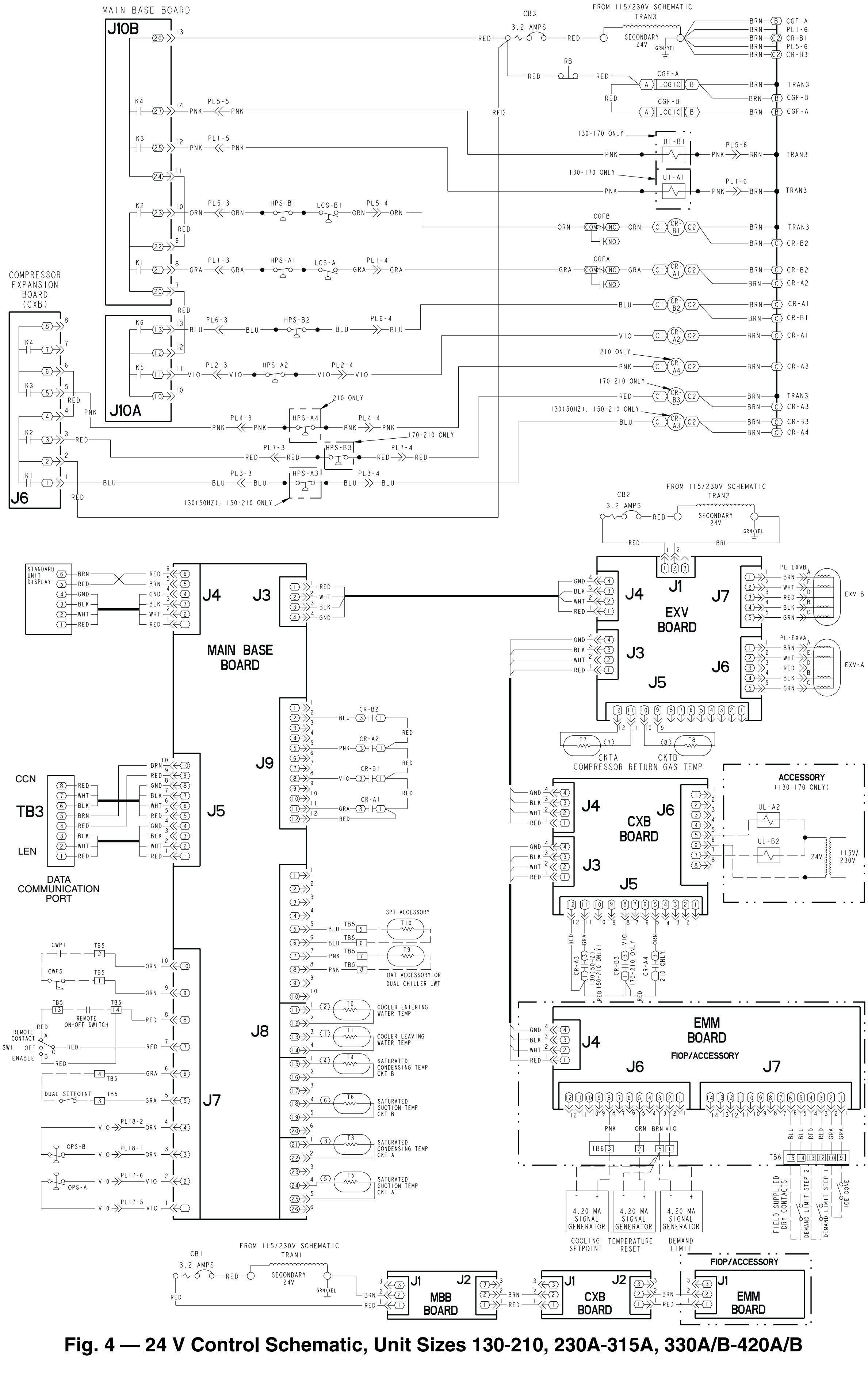


Fig. 4 — 24 V Control Schematic, Unit Sizes 130-210, 230A-315A, 330A/B-420A/B

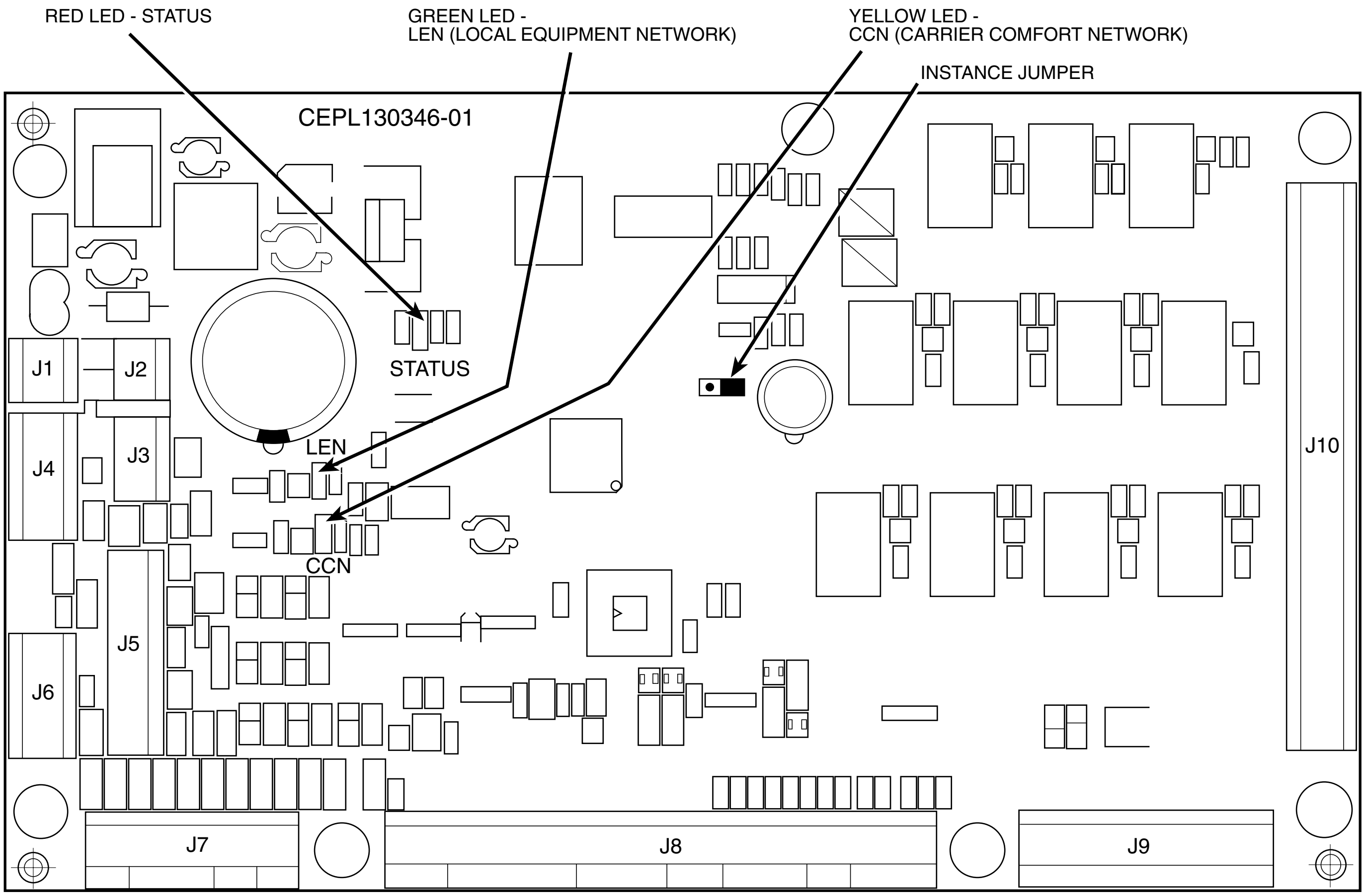


Fig. 5 — Main Base Board

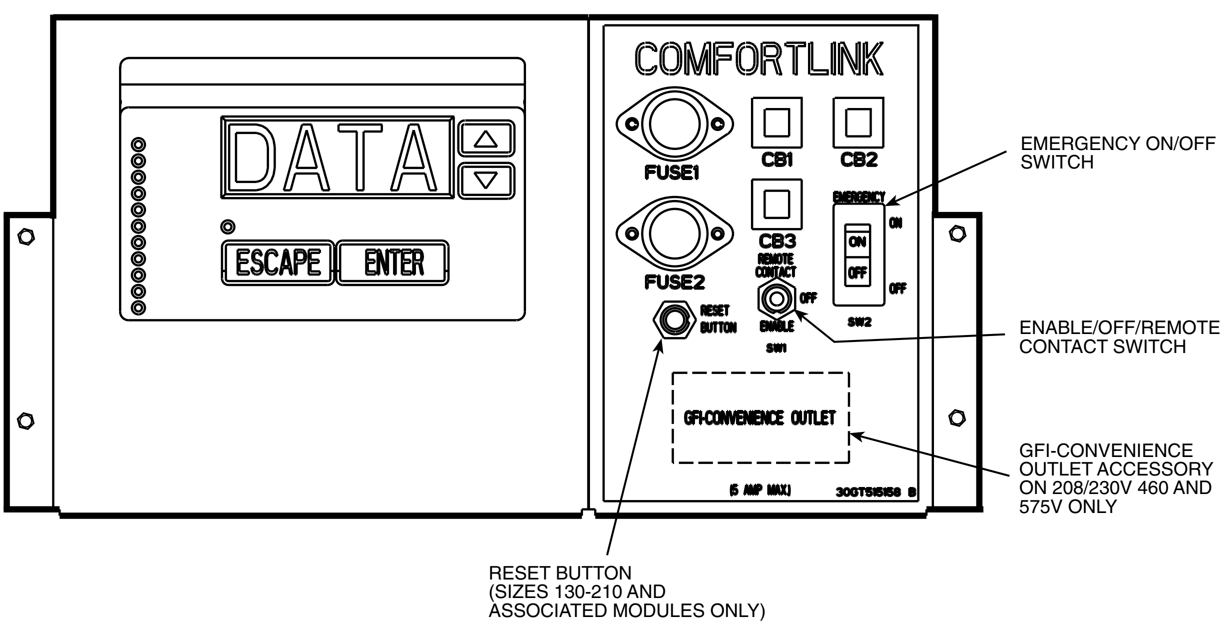


Fig. 6 — Enable/Off/Remote Contact Switch, Emergency On/Off Switch, and Reset Button Locations

OPERATING DATA

Sensors — The electronic control uses 4 to 10 thermistors to sense temperatures for controlling chiller operation. See Table 2. These sensors are outlined below. See Fig. 7-10 for thermistor locations. Thermistors T1-T9 are 5 kΩ at 77 F (25 C). Thermistors T1, T2, T3-T6 and T7-T9 have different temperature versus resistance and voltage drop performance. Thermistor T10 is 10 kΩ at 77 F (25 C) and has a different temperature vs resistance and voltage drop performance. See Thermistors section on page 59 for temperature-resistance-voltage drop characteristics.

T1 — COOLER LEAVING FLUID SENSOR — This thermistor is located in the leaving fluid nozzle. The thermistor probe is inserted into a friction-fit well.

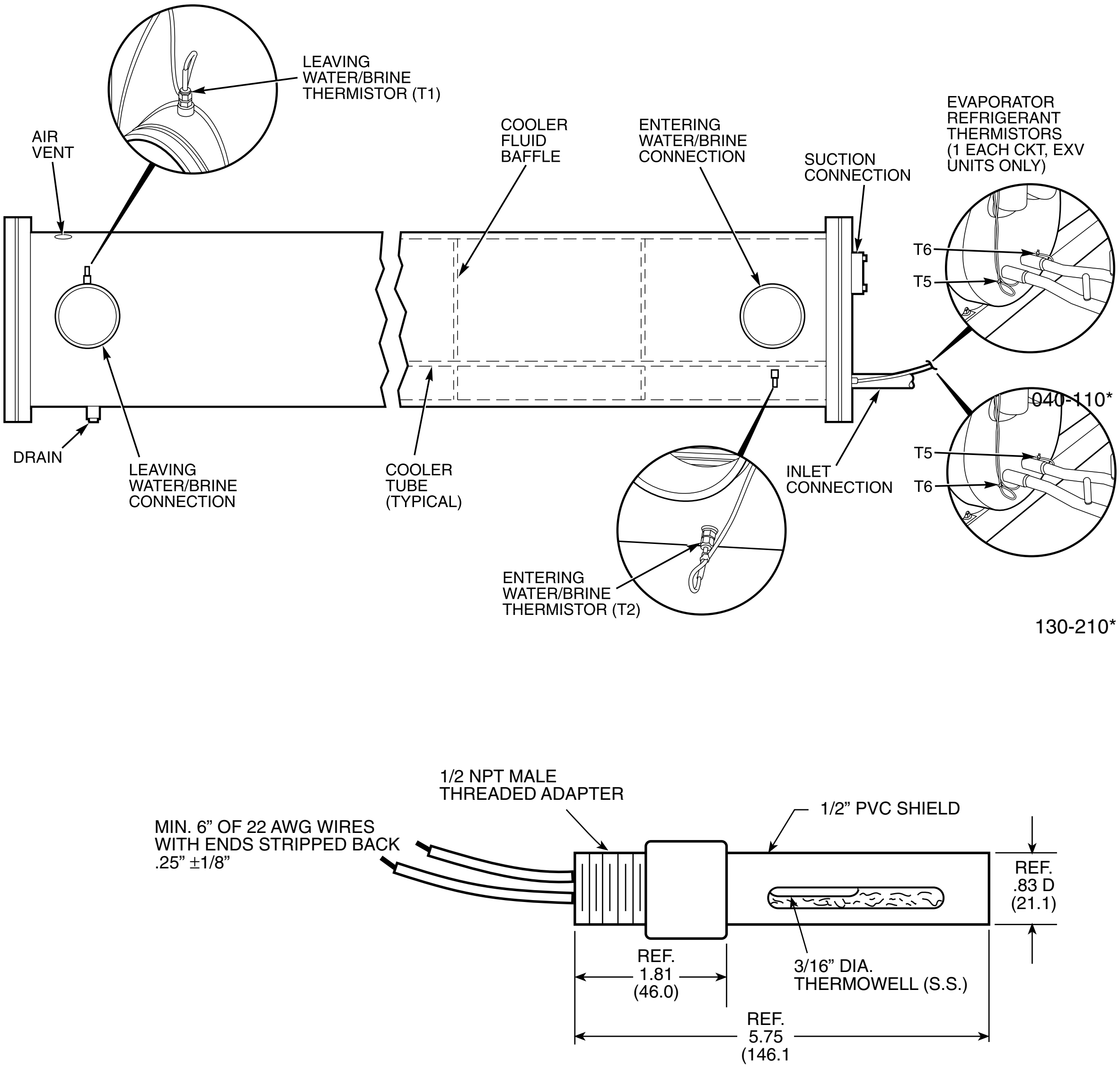
T2 — COOLER ENTERING FLUID SENSOR — This thermistor is located in the cooler shell in the first baffle space in close proximity to the cooler tube bundle.

T3, T4 — SATURATED CONDENSING TEMPERATURE SENSORS — These 2 thermistors are clamped to the outside of a return bend of the condenser coils.

T5, T6 — COOLER SUCTION TEMPERATURE SENSORS — These thermistors are located next to the refrigerant inlet in the cooler head, and are inserted into a friction-fit well. The sensor well is located directly in the refrigerant path. These thermistors are not used on units with TXVs.

T7, T8 — COMPRESSOR SUCTION GAS TEMPERATURE SENSORS — These thermistors are located in the lead compressor in each circuit in a suction passage after the refrigerant has passed over the motor and is about to enter the cylinders. These thermistors are inserted into friction-fit wells. The sensor wells are located directly in the refrigerant path. These thermistors are not used on units with TXVs.

T9 — OUTDOOR-AIR TEMPERATURE SENSOR — Sensor T9 is an accessory sensor that is remotely mounted and used for outdoor-air temperature reset.

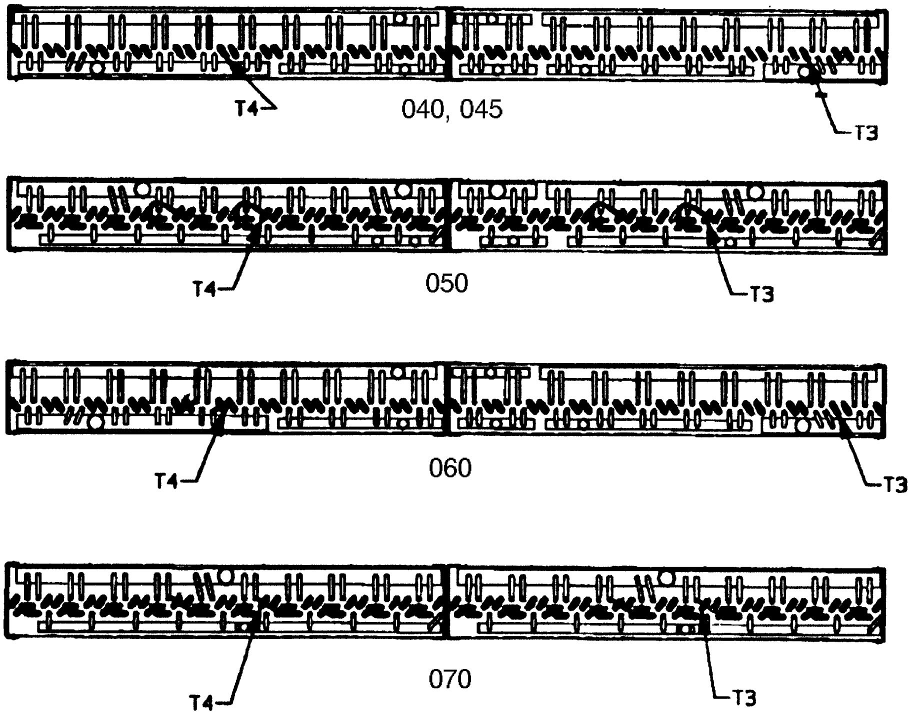


LEGEND

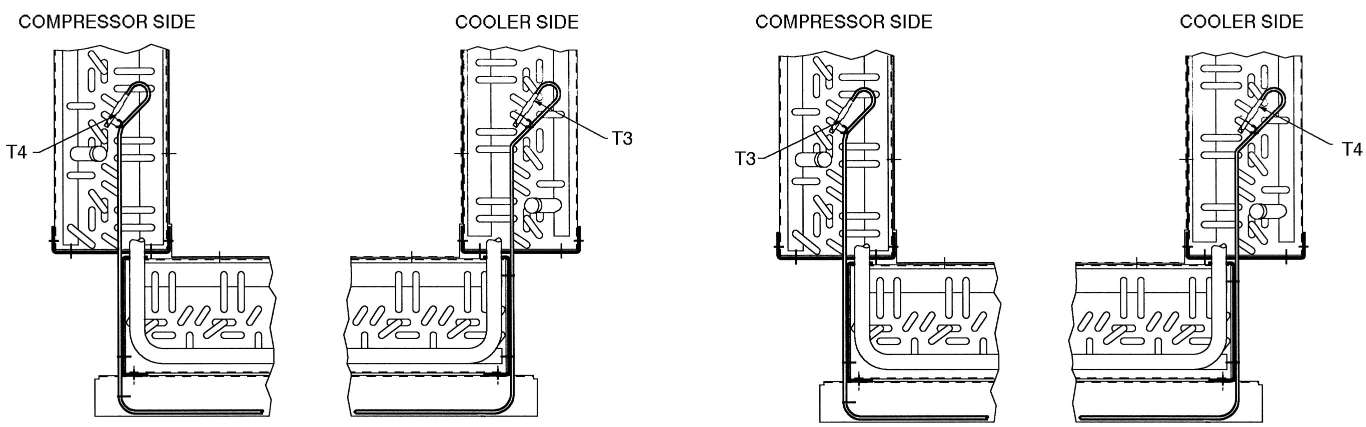
AWG — American Wire Gage
EXV — Electronic Wire Gage

*And associated modular units.

Fig. 7 — Cooler Thermistor Locations and Accessory Outdoor-Air Temperature Sensor Detail



040-070

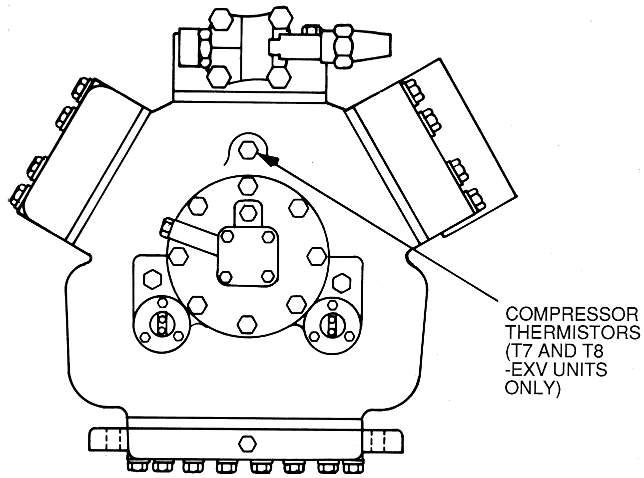


080-110 AND ASSOCIATED MODULAR UNITS*

130-210 AND ASSOCIATED MODULAR UNITS*

*When thermistor is viewed from perspective where the compressor is on the left and the cooler is on the right.

Fig. 8 — Thermistor T3 and T4 Locations



LEGEND
EXV — Electronic Expansion Valve

Fig. 9 — Compressor Thermistor Locations (T7 and T8)

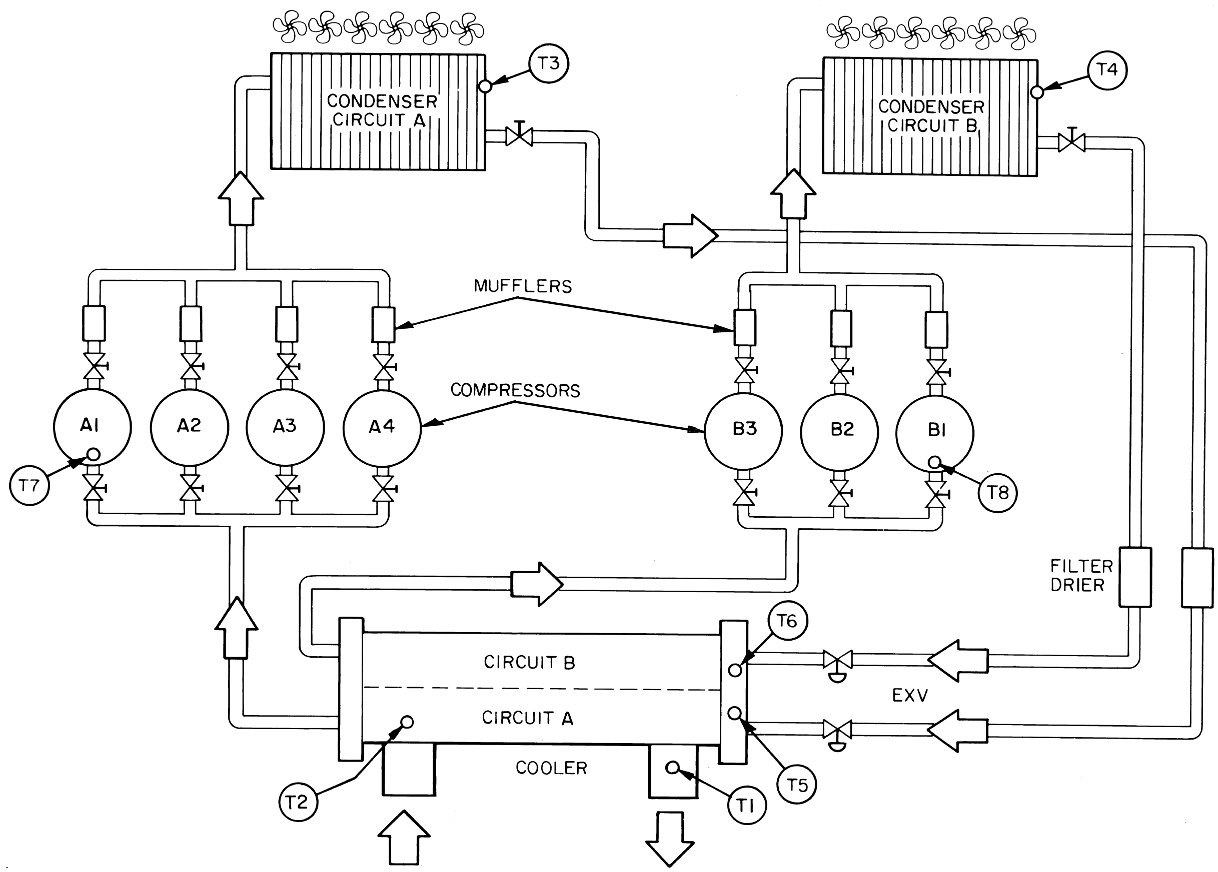


Fig. 10 — Typical Thermistor Location (30GTN,R and 30GUN,R 210, 315A, 390A, 420A/B Shown)

T10 — REMOTE SPACE TEMPERATURE SENSOR — Sensor T10 (part no. HH51BX006) is an accessory sensor that is remotely mounted in the controlled space and used for space temperature reset. The sensor should be installed as a wall-mounted thermostat would be (in the conditioned space where it will not be subjected to either a cooling or heating source or direct exposure to sunlight, and 4 to 5 ft above the floor). The push button override button is not supported by the ComfortLink™ Controls.

Space temperature sensor wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (SEN) and a RJ11 female connector. The RJ11 connector is used to tap into the Carrier Comfort Network (CCN) at the sensor.

To connect the space temperature sensor (Fig. 11):

1. Using a 20 AWG (American Wire Gage) twisted pair conductor cable rated for the application, connect 1 wire of the twisted pair to one SEN terminal and connect the other wire to the other SEN terminal located under the cover of the space temperature sensor.
2. Connect the other ends of the wires to terminals 5 and 6 on TB5 located in the unit control box.

Units on the CCN can be monitored from the space at the sensor through the RJ11 connector, if desired. To wire the RJ11 connector into the CCN (Fig. 12):

> IMPORTANT: The cable selected for the RJ11 connector wiring MUST be identical to the CCN communication bus wire used for the entire network. Refer to table below for acceptable wiring.

MANUFACTURER	PART NO.	
	Regular Wiring	Plenum Wiring
Alpha	1895	—
American	A21451	A48301
Belden	8205	884421
Columbia	D6451	—
Manhattan	M13402	M64430
Quabik	6130	—

1. Cut the CCN wire and strip ends of the red (+), white (ground), and black (–) conductors. (If another wire color scheme is used, strip ends of appropriate wires.)
2. Insert and secure the red (+) wire to terminal 5 of the space temperature sensor terminal block.
3. Insert and secure the white (ground) wire to terminal 4 of the space temperature sensor.
4. Insert and secure the black (–) wire to terminal 2 of the space temperature sensor.
5. Connect the other end of the communication bus cable to the remainder of the CCN communication bus.

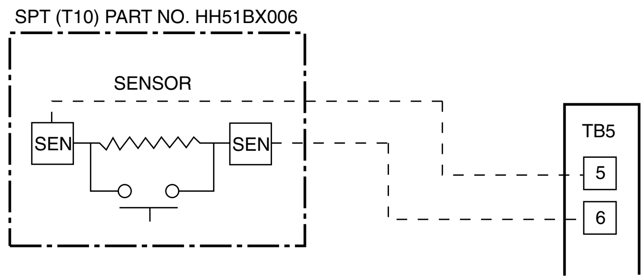


Fig. 11 — Typical Space Temperature Sensor Wiring

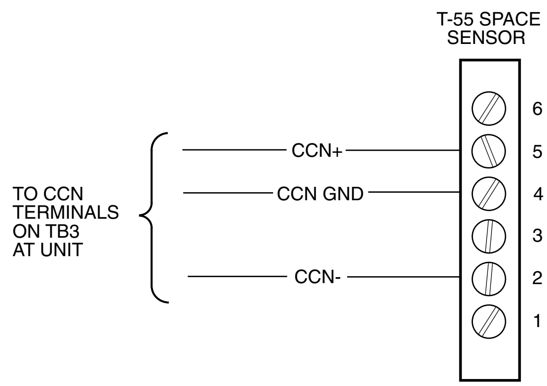


Fig. 12 — CCN Communications Bus Wiring to Optional Space Sensor RJ11 Connector

Thermostatic Expansion Valves (TXV) — Model 30GTN,R and 30GUN,R 040-110 units are available from the factory with conventional TXVs with liquid line solenoids. The liquid line solenoid valves are not intended to be a mechanical shut-off. When service is required, use the liquid line service valve to pump down the system.

NOTE: This option is not available for modular units.

The TXV is set at the factory to maintain approximately 8 to 12° F (4.4 to 6.7° C) suction superheat leaving the cooler by metering the proper amount of refrigerant into the cooler. All TXVs are adjustable, *but should not be adjusted unless absolutely necessary.* When TXV is used, thermistors T5, T6, T7, and T8 are not required.

The TXV is designed to limit the cooler saturated suction temperature to 55 F (12.8 C). This makes it possible for unit to start at high cooler fluid temperatures without overloading the compressor.

Compressor Protection Control System (CPCS [CPCS — Standard on Sizes 080-110 and Optional on Sizes 040-070]) or Control Relay (CR) — 30GTN,R and 30GUN,R 040-110 — Each compressor has its own CPCS module or CR. See Fig. 13 for CPCS module. The CPCS or CR is used to control and protect the compressors and crankcase heaters. The CPCS and CR provide the following functions:

- compressor contactor control/crankcase heater
- crankcase heater control
- compressor ground current protection (CPCS only)
- status communication to processor board
- high-pressure protection

One large relay is located on the CPCS board. This relay controls the crankcase heater and compressor contactor, and 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 shuts down the compressor.

A high-pressure switch is wired in series between the MBB and the CR or CPCS. On compressor A1 and B1 a loss-of-charge switch is also wired in series with the high-pressure switch. If the high-pressure switch opens during operation of a compressor, the compressor will be stopped, the failure will be detected through the signal contacts, and the compressor will be locked off. If the lead compressor in either circuit is shut down by the high-pressure switch, loss-of-charge switch, ground current protector, or oil safety switch, all compressors in that circuit are shut down.

NOTE: The CR operates the same as the CPCS, except the ground current circuit protection is not provided.

Compressor Ground Current Protection Board (CGF) and Control Relay (CR) — The 30GTN,R and 30GUN,R 130-210, and associated modular units (see Table 1) contain one compressor ground current protection board (CGF) (see Fig. 14) for each refrigeration circuit. The CGF contains logic that can detect if the current-to-ground of any compressor winding exceeds 2.5 amps. If this occurs, the lead compressor in that circuit is shut down along with other compressors in that circuit.

A high-pressure switch is wired in series between the MBB and the CR. On compressor A1 and B1 a loss-of-charge switch is also wired in series with the high-pressure switch. The lead compressor in each circuit also has the CGF contacts described above. If any of these switches open during operation of a compressor, the CR relay is deenergized, stopping the compressor and signaling the processor at the MBB-J9 inputs to lock out the compressor. If the lead compressor in either circuit is shut down by high-pressure switch, compressor ground fault, oil pressure switch, or the loss-of-charge switch, all compressors in that circuit are also shut down.

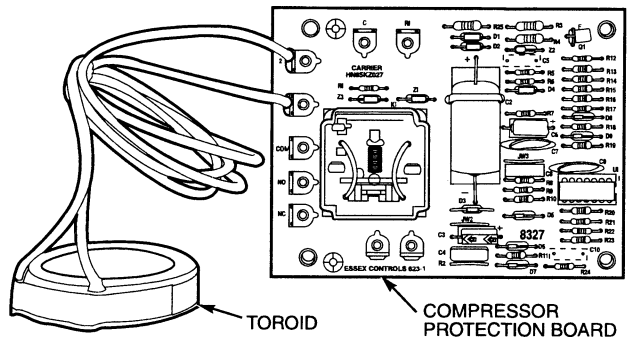


Fig. 13 — Compressor Protection Control System Module — Sizes 040-110

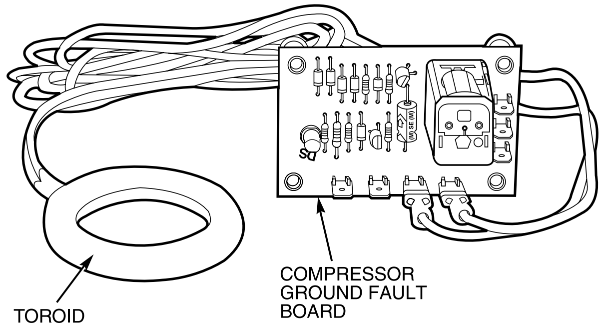


Fig. 14 — Compressor Ground Fault Module — Sizes 130-210

Electronic Expansion Valve (EXV) (See Fig. 15) — Standard units are equipped with a bottom seal EXV. This device eliminates the use of the liquid line solenoid pumpdown at unit shutdown. An O-ring has been added to bottom of orifice assembly to complete a seal in the valve on shutdown. This is not a mechanical shut-off. When service is required, use the liquid line service valve to pump down the system.

High pressure refrigerant enters bottom of valve where it passes through a group of machined slots in side of orifice assembly. As refrigerant passes through the orifice, it drops in pressure. To control flow of refrigerant, the sleeve slides up and down along orifice assembly, modulating the size of orifice. The sleeve is moved by a linear stepper motor that moves in increments controlled directly by the processor. As stepper motor rotates, the motion is translated into linear movement of lead screw. There are 1500 discrete steps with this combination. The valve orifice begins to be exposed at 320 steps. Since there is not a tight seal with the orifice and the sleeve, the minimum position for operation is 120 steps.

Two thermistors are used to determine suction superheat. One thermistor is located in the cooler and the other is located in the cylinder end of the compressor after refrigerant has passed over the motor. The difference between the 2 thermistors is the suction superheat. These machines are set up to provide approximately 5 to 7 F (2.8 to 3.9 C) superheat leaving the cooler. Motor cooling accounts for approximately 22 F (12.2 C) on 30GTN,R units and 16 F (8.9 C) on 30GUN,R units, resulting in a superheat entering compressor cylinders of approximately 29 F (16.1 C) for 30GTN,R units and 23 F (12.8 C) for 30GUN,R units.

Because the valves are controlled by the EXV module, it is possible to track the position of the valve. Valve position can be used to control head pressure and system refrigerant charge.

During initial start-up, the EXV module will drive each valve fully closed. After initialization period, valve position is controlled by the EXV module and the MBB.

The EXV is used to limit the maximum cooler saturated suction temperature to 55 F (12.8 C). This makes it possible for the chiller to start at high cooler fluid temperatures without overloading the compressor.

Energy Management Module (Fig. 16) — This factory-installed option or field-installed accessory is used for the following types of temperature reset, demand limit, and/or ice features:

- 4 to 20 mA leaving fluid temperature reset (requires field-supplied 4 to 20 mA generator)
- 4 to 20 mA cooling set point reset (requires field-supplied 4 to 20 mA generator)
- Discrete inputs for 2-step demand limit (requires field-supplied dry contacts capable of handling a 5 vdc, 1 to 20 mA load)
- 4 to 20 mA demand limit (requires field-supplied 4 to 20 mA generator)
- Discrete input for Ice Done switch (requires field-supplied dry contacts capable of handling a 5 vdc, 1 to 20 mA load)

See Demand Limit and Temperature Reset sections on pages 46 and 43 for further details.

Capacity Control — The control system cycles compressors, unloaders, and hot gas bypass solenoids to maintain the user-configured leaving chilled fluid temperature set point. Entering fluid temperature is used by the Main Base Board (MBB) to determine the temperature drop across the cooler and is used in determining the optimum time to add or subtract capacity stages. The chilled fluid temperature set point can be automatically reset by the return temperature reset or space and outdoor-air temperature reset features. It can also be reset from

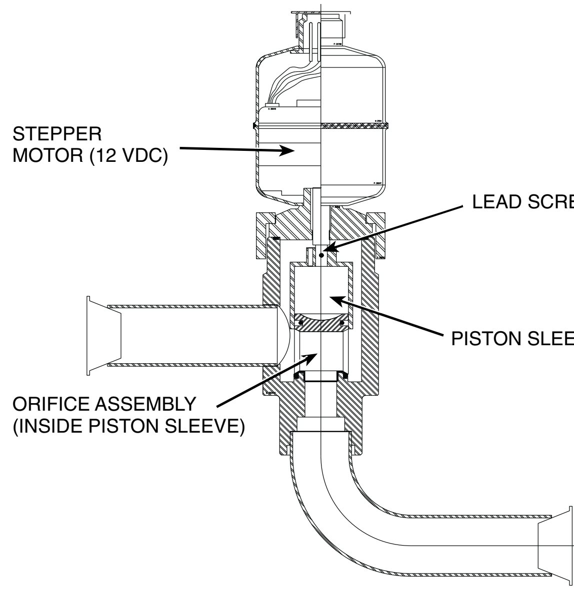


Fig. 15 — Electronic Expansion Valve (EXV)

an external 4 to 20 mA signal (requires Energy Management Module FIOP/accessory).

With the automatic lead-lag feature in the unit, the control determines which circuit will start first, A or B. At the first call for cooling, the lead compressor crankcase heater will be deenergized, a condenser fan will start, and the compressor will start unloaded.

NOTE: The automatic lead-lag feature is only operative when an even number of unloaders is present. The 040-070 units require an accessory unloader to be installed on the B1 compressor for the lead-lag feature to be in effect.

If the circuit has been off for 15 minutes, and the unit is a TXV unit, liquid line solenoid will remain closed during start-up of each circuit for 15 seconds while the cooler and suction lines are purged of any liquid refrigerant. For units with EXVs, the lead compressor will be signaled to start. The EXV will remain at minimum position for 10 seconds before it is allowed to modulate.

After the purge period, the EXV will begin to meter the refrigerant, or the liquid line solenoid will open allowing the TXV to meter the refrigerant to the cooler. If the off-time is less than 15 minutes, the EXV will be opened as soon as the compressor starts.

The EXVs will open gradually to provide a controlled start-up to prevent liquid flood-back to the compressor. During start-up, the oil pressure switch is bypassed for 2 minutes to allow for the transient changes during start-up. As additional stages of compression are required, the processor control will add them. See Tables 5A and 5B.

If a circuit is to be stopped, the control will first start to close the EXV or close the liquid line solenoid valve.

For units with TXVs, the lag compressor(s) will be shut down and the lead compressor will continue to operate for 10 seconds to purge the cooler of any refrigerant.

For units with EXVs, the lag compressor(s) will be shut down and the lead compressor will continue to run. After the lag compressor(s) has shut down, the EXV is signaled to close. The lead compressor will remain on for 10 seconds after the EXV is closed.

During both algorithms (TXV and EXV), all diagnostic conditions will be honored. If a safety trip or alarm condition is detected before pumpdown is complete, the circuit will be shut down.

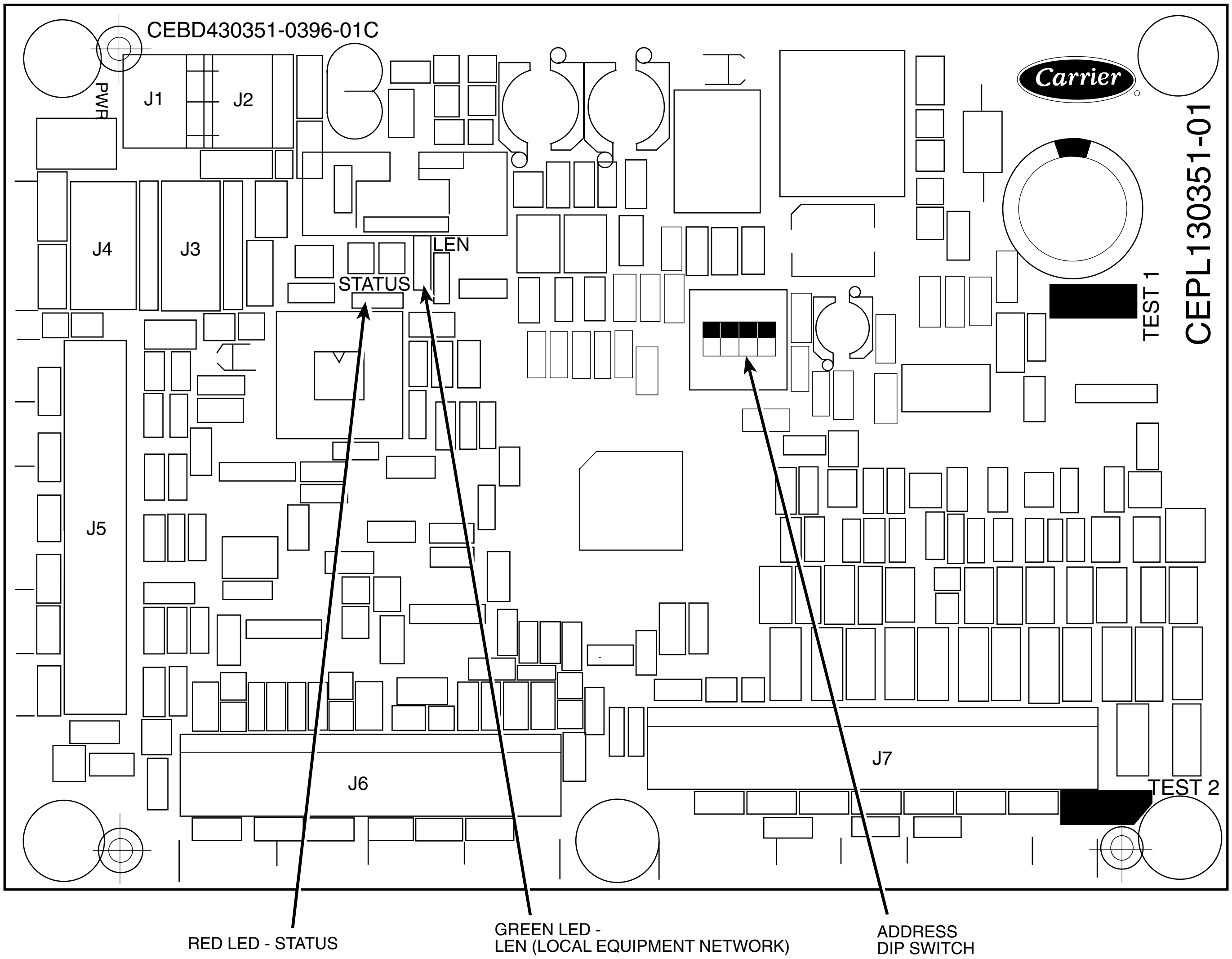


Fig. 16 — Energy Management Module

The capacity control algorithm runs every 30 seconds. The algorithm attempts to maintain the leaving chilled water temperature at the control point. Each time it runs, the control reads the entering and leaving fluid temperatures. The control determines the rate at which conditions are changing and calculates 2 variables based on these conditions. Next, a capacity ratio is calculated using the 2 variables to determine whether or not to make any changes to the current stages of capacity. This ratio value ranges from –100 to + 100%. If the next stage of capacity is a compressor, the control starts (stops) a compressor when the ratio reaches +100% (–100%). If the next stage of capacity is an unloader, the control deenergizes (energizes) an unloader when the ratio reaches +60% (–60%). Unloaders are allowed to cycle faster than compressors, to minimize the number of starts and stops on each compressor. A delay of 90 seconds occurs after each capacity step change.

Table 5A — Part Load Data Percent Displacement, Standard Units

UNIT 30GTN,R 30GUN,R	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
040 (60 Hz)	1	25	A1*	—	—
	2	50	A1	—	—
	3	75	A1*, B1	—	—
	4	100	A1,B1	—	—
040 (50 Hz) 045 (60 Hz)	1	24	A1*	—	—
	2	47	A1	—	—
	3	76	A1*,B1	—	—
	4	100	A1,B1	—	—
045 (50 Hz) 050 (60 Hz)	1	31	A1*	—	—
	2	44	A1	—	—
	3	87	A1*,B1	—	—
	4	100	A1,B1	—	—
050 (50 Hz) 060 (60 Hz)	1	28	A1*	—	—
	2	42	A1	—	—
	3	87	A1*,B1	—	—
	4	100	A1,B1	—	—
060 (50 Hz) 070 (60 Hz)	1	33	A1*	—	—
	2	50	A1	—	—
	3	83	A1*,B1	—	—
	4	100	A1,B1	—	—
070 (50 Hz)	1	19	A1*	—	—
	2	27	A1	—	—
	3	65	A1*,B1	—	—
	4	73	A1,B1	—	—
	5	92	A1*,A2,B1	—	—
	6	100	A1,A2,B1	—	—
080, 230B (60 Hz)	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, 230B (50 Hz)	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
090, 245B (60 Hz)	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, 245B (50 Hz)	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
100, 255B, 270B (60 Hz)	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

*Unloaded compressor.

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

Table 5A — Part Load Data Percent Displacement, Standard Units (cont)

UNIT 30GTN,R 30GUN,R	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
100, 255B 270B (50 Hz)	1	13	A1*	13	B1*
	2	20	A1	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
110, 290B, 315B (60 Hz)	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,B	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, 290B, 315B (50 Hz)	1	17	A1*	17	B1*
	2	25	A1	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
130 (60 Hz)	1	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	B1,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,G1,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 (50 Hz)	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	75	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
150, 230A, 245A, 255A (60 Hz)	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,A3,1*,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.

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

Table 5A — Part Load Data Percent Displacement, Standard Units (cont)

UNITT 30GTN,R 30GUN,R	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
150, 230A, 245A, 255A (50 Hz)	1	13	A1*	13	B1*
	2	20	A1	20	B1
	3	26	A1*,B1*	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
170, 270A, 330A/B (60 Hz)	1	11	A1*	11	B1*
	2	17	A1	17	B1
	3	23	A1*,B1*	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, 330A/B, 360B (50 Hz)	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
190, 290A, 360A/B, 390B (60 Hz)	1	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, 290A, 360A, 390B (50 Hz)	1	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
210, 315A, 390A, 420A/B (60 Hz)	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, 315A, 390A, 420A/B (50 Hz)	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

*Unloaded compressor.

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

Table 5B — Part Load Data Percent Displacement, With Accessory Unloaders

UNIT 30GTN,R 30GUN,R	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
040 (60 Hz)	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 (50 Hz) 045 (60 Hz)	1	24	A1*	21	B1†
	2	47	A1	37	B1*
	3	45	A1*,B1†	53	B1
	4	61	A1*,B1*	45	A1*,B1†
	5	84	A1,B1*	61	A1*,B1*
	6	100	A1,B1	84	A1,B1*
	7	—	—	100	A1,B1
045 (50 Hz) 050 (60 Hz)	1	18	A1†	20	B1†
	2	31	A1*	38	B1*
	3	44	A1	56	B1
	4	38	A1†,B1†	38	A1†,B1†
	5	51	A1*,B1†	51	A1*,B1†
	6	69	A1*,B1*	69	A1*,B1*
	7	82	A1,B1*	82	A1,B1*
	8	100	A1,B1	100	A1,B1
050 (50 Hz) 060 (60 Hz)	1	15	A1†	18	B1†
	2	28	A1*	38	B1*
	3	42	A1	58	B1
	4	33	A1†,B1†	33	A1†,B1†
	5	47	A1*,B1†	47	A1*,B1†
	6	67	A1*,B1*	67	A1*,B1*
	7	80	A1,B1*	80	A1,B1*
	8	100	A1,B1	100	A1,B1
060 (50 Hz) 070 (60 Hz)	1	16	A1†	16	B1†
	2	33	A1*	33	B1*
	3	50	A1	50	B1
	4	31	A1†,B1†	31	A1†,B1†
	5	49	A1*,B1†	49	A1*,B1†
	6	66	A1*,B1*	66	A1*,B1*
	7	83	A1,B1*	83	A1,B1*
	8	100	A1,B1	100	A1,B1
070 (50 Hz)	1	11	A1†	15	B1†
	2	19	A1*	31	B1*
	3	27	A1	47	B1
	4	25	A1†,B1†	25	A1†,B1†
	5	33	A1*,B1†	33	A1*,B1†
	6	49	A1*,B1*	49	A1*,B1*
	7	57	A1,B1*	57	A1,B1*
	8	73	A1,B1	73	A1,B1
	9	84	A1†,A2,B1	68	A1,A2,B1†
	10	92	A1*,A2,B1	84	A1,A2,B1*
	11	100	A1,A2,B1	100	A1,A2,B1
080, 230B (60 Hz)	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, 230B (50 Hz)	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	—	—
090, 245B (60 Hz)	1	9	A1†	9	B1†
	2	18	A1*	18	B1*
	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

*Unloaded compressor.
†Two unloaders, both unloaded.

NOTE: Some control steps will be skipped if they do not increase chiller capacity when staging up or decrease chiller capacity when staging down.

Table 5B — Part Load Data Percent Displacement, With Accessory Unloaders (cont)

UNIT 30GTN,R 30GUN,R	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
090, 245B (50 Hz)	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, 255B, 270B (60 Hz)	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, 255B, 270B (50 Hz)	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
110, 290B, 315B (60 Hz)	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, 290B, 315B (50 Hz)	1	8	A1†	8	B1†
	2	17	A1*	17	B1*
	3	25	A1	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.
†Two unloaders, both unloaded.

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

Table 5B — Part Load Data Percent Displacement, with Accessory Unloaders (cont)

UNIT 30GTN,R 30GUN,R	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
130 (60 Hz)	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 (50 Hz)	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, 230A, 245A, 255A (60 Hz)	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,B1
	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, 230A, 245A, 255A (50 Hz)	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

*Unloaded compressor.
Two unloaders, both unloaded.

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

Table 5B — Part Load Data Percent Displacement, With Accessory Unloaders (cont)

UNIT 30GTN,R 30GUN,R	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
170, 270A, 330A/B (60 Hz)	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, 330A/B, 360B (50 Hz)	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
190, 290A, 360A/B, 390B (60 Hz)	1	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

*Unloaded compressor.
†Two unloaders, both unloaded.

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

Table 5B — Part Load Data Percent Displacement, With Accessory Unloaders (cont)

UNIT 30GTN,R 30GUN,R	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
190, 290A, 360A, 390B (50 Hz)	1	11	A1*	11	B1*
	2	11	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	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
210, 315A, 390A, 420A/B (60 Hz)	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, 315A, 390A, 420A/B (50 Hz)	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.
†Two unloaders, both unloaded.

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

ADDING ADDITIONAL UNLOADERS — See Table 6 below for required hardware.

Follow accessory instructions for installation. Connect unloader coil leads to PINK wires in compressor A1/B1 junction box. Configuration items CA.UN and CB.UN in the OPT1 sub-mode of the configuration mode must be changed to match the new number of unloaders. Two unloaders cannot be used with hot gas bypass on a single circuit.

MINUTES LEFT FOR START — This value is displayed only in the network display tables (using Service Tool or ComfortWORKS® software) and represents the amount of time to elapse before the unit will start its initialization routine. This value can be zero without the machine running in many situations. This can include being unoccupied, ENABLE/OFF/REMOTE CONTACT switch in the OFF position, CCN not allowing unit to start, Demand Limit in effect, no call for cooling due to no load, and alarm or alert conditions present. If the machine should be running and none of the above are true, a minimum off time (DELY, see below) may be in effect. The machine should start normally once the time limit has expired.

MINUTES OFF TIME (DELY, Configuration Mode under OPT2) — This user configurable time period is used by the control to determine how long unit operation is delayed after power is applied/restored to the unit. Typically, this time period is configured when multiple machines are located on a single site. For example, this gives the user the ability to prevent all the units from restarting at once after a power failure. A value of zero for this variable does not mean that the unit should be running.

LOADING SEQUENCE — The 30GTN,R and 30GUN,R compressor efficiency is greatest at partial load. Therefore, the following sequence list applies to capacity control.

The next compressor will be started with unloaders energized on both lead compressors.

All valid capacity combinations using unloaders will be used as long as the total capacity is increasing.

LEAD/LAG DETERMINATION (LLCS, Configuration Mode under OPT2) — This is a configurable choice and is factory set to be automatic (for sizes 080-420) or Circuit A leading (for 040-070 sizes). For 040-070 sizes, the value can be changed to Automatic or Circuit B only if an accessory unloader is added to compressor B1. For 080-420 sizes, the value can be changed to Circuit A or Circuit B leading, as desired. Set at automatic, the control will sum the current number of logged circuit starts and one-quarter of the current operating hours for each circuit. The circuit with the lowest sum is started first. Changes to which circuit is the lead circuit and which is the lag are also made when total machine capacity is at 100% or when there is a change in the direction of capacity (increase or decrease) and each circuit's capacity is equal.

CAPACITY SEQUENCE DETERMINATION (LOAD, Configuration Mode under OPT2) — This is configurable as equal circuit loading or staged circuit loading with the default set at equal. The control determines the order in which the steps of capacity for each circuit are changed. This control choice does NOT have any impact on machines with only 2 compressors.

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

Deadband Multiplier — The user configurable Deadband Multiplier (Z.GN, Configuration Mode under SLCT) has a default value of 1.0. The range is from 1.0 to 4.0. When set to other than 1.0, this factor is applied to the capacity Load/Unload Factor. The larger this value is set, the longer the control will delay between adding or removing stages of capacity. Figure 17 shows how compressor starts can be reduced over time if the leaving water temperature is allowed to drift a larger amount above and below the set point. This value should be set in the range of 3.0 to 4.0 for systems with small loop volumes.

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

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

Ramp Loading (CRMP, Configuration Mode under SLCT) — Limits the rate of change of leaving fluid temperature. If the unit is in a Cooling mode and configured for Ramp Loading, the control makes 2 comparisons before deciding to change stages of capacity. The control calculates a temperature difference between the control point and leaving fluid temperature. If the difference is greater than 4° F (2.2° C) and the rate of change (°F or °C per minute) is more than the configured Cooling Ramp Loading value (CRMP), the control does not allow any changes to the current stage of capacity.

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

Table 6 — Required Hardware for Additional Unloaders

UNIT 30GTN,GTR,GUN,GUR	COMP.	FACTORY STANDARD	ADDITIONAL UNLOADERS	UNLOADER PACKAGE*	SOLENOID COIL	CXB ACCESSORY†
040 (60 Hz)	A1	1	0	N/A	N/A	Not Required
	B1	0	1	06EA-660---138	EF19ZE024	
040 (50 Hz) 045 (60 Hz)	A1	1	0	N/A	N/A	Not Required
	B1	0	1	06EA-660---138	EF19ZE024	
			2		Not Required	30GT-911---031
045 (50 Hz) 050-070	A1	1	1	06EA-660---138	EF19ZE024	Not Required
	B1	0	1			
			2		Not Required	30GT-911---031
080-110** 130 (60 Hz)	A1	1	1	06EA-660---138	Not Required	30GT-911---031
	B1	1	1			
130 (50 Hz) 150-210**	A1	1	1	06EA-660---138	EF19ZE024	Not Required
	B1	1	1			

LEGEND
CBX — Compressor Expansion Board

*Requires one per additional unloader.
†2 solenoid coils are included in the CXB Accessory.
**And associated modular units.

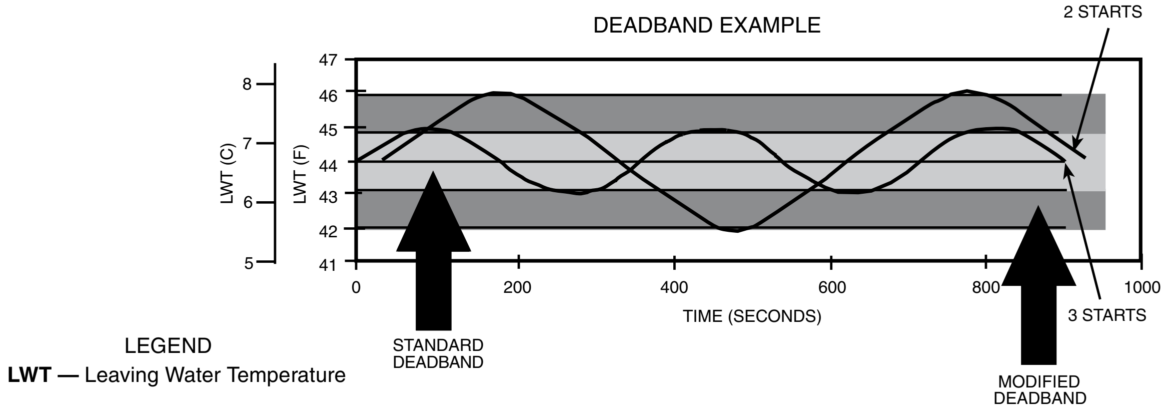


Fig. 17 — Deadband Multiplier

Low Cooler Suction Temperature — To avoid freezing the cooler, the control will compare the circuit Cooler Suction temperature (T5/T6) with a predetermined freeze point. If the cooler fluid selected is Water, the freeze point is 34 F (1.1 C). If the cooler fluid selected is Brine, the freeze point is 8° F (4.4 ° C) below the cooling set point (or lower of two cooling set points in dual set point configurations). If the cooler suction temperature is 24° to 29° F (13.3° to 16.1° C) below the cooler leaving water temperature and is also 2° F (1.1° C) less than the freeze point for 5 minutes, Mode 7 (Circuit A) or Mode 8 (Circuit B) is initiated and no additional capacity increase is allowed. The circuit will be allowed to run in this condition. If the cooler suction temperature is more than 30° F (16.7° C) below the cooler leaving water temperature and is also 2° F (1.1° C) below the freeze point for 10 minutes, the circuit will be stopped without going through pumpdown.

Cooler Freeze Protection — The control will try to prevent shutting the chiller down on a Cooler Freeze Protection alarm by removing stages of capacity. The control uses the same freeze point logic as described in the Low Cooler Suction Temperature section above. If the cooler leaving fluid temperature is less than the freeze point plus 2.0° F (1.1° C), the control will immediately remove one stage of capacity. This can be repeated once every 30 seconds.

MOP (Maximum Operating Pressure) Override — The control monitors saturated condensing and suction temperature for each circuit. Based on a maximum operating set point (saturated suction temperature), the control may lower the EXV position when system pressures approach the set parameters.

Head Pressure Control

*COMFORT*LINK™ UNITS (With EXV) — The Main Base Board (MBB) controls the condenser fans to maintain the lowest condensing temperature possible, and thus the highest unit efficiency. The fans are controlled by the saturated condensing temperature set from the factory. The fans can also be controlled by a combination of the saturated condensing temperature, EXV position and compressor superheat. Fan control is a configurable decision and is determined by the Head Pressure Control Method (HPCM) setting in the Configuration Mode under the OPT1 sub-mode. For EXV control (HPCM = 1), when the position of the EXV is fully open, T3 and T4 are less than 78 F (25.6 C), and superheat is greater than 40 F (22.2 C), fan stages will be removed. When the valve is less than 40% open, or T3 and T4 are greater than 113 F (45 C), fan stages will be added. At each change of the fan stage, the system will wait one minute to allow the head pressure to stabilize unless either T3 or T4 is greater than 125 F (51.6 C), in which case all MBB-controlled fans will start immediately. This method allows the unit to run at very low condensing temperatures at part load.

During the first 10 minutes after circuit start-up, MBB-controlled fans are not turned on until T3 and T4 are greater than the head pressure set point plus 10 F (5.6 C). If T3 and T4 are greater than 95 F (35 C) just prior to circuit start-up, all MBB-controlled fan stages are turned on to prevent excessive discharge pressure during pull-down. Fan sequences are shown in Fig. 17.

UNITS WITH TXV — The logic to cycle MBB-controlled fans is based on saturated condensing temperature only, as sensed by thermistors T3 and T4 (see Fig. 8 and 10). When either T3 or T4 exceeds the head pressure set point, the MBB will turn on an additional stage of fans. For the first 10 minutes of each circuit operation, the head pressure set point is raised by 10° F (5.6° C). It will turn off a fan stage when T3 and T4 are both below the head pressure set point by 35° F (19.4° C). At each change of a fan stage the control will wait for one minute for head pressure to stabilize unless T3 and T4 is greater than 125 F (51.6 C), in which case all MBB-controlled fans start immediately. If T3 and T4 are greater than 95 F (35.0 C) just prior to circuit start-up, all MBB-controlled fan stages are turned on to prevent excessive discharge pressure during pull-down. Fan sequences are shown in Fig. 18.

Motormaster® Option — For low-ambient operation, the lead fan(s) in each circuit can be equipped with the Motormaster III head pressure controller option or accessory. Wind baffles and brackets must be field-fabricated for all units using accessory Motormaster III controls to ensure proper cooling cycle operation at low-ambient temperatures. The fans controlled are those that are energized with the lead compressor in each circuit. All sizes use one controller per circuit. Refer to Fig. 18 for condenser fan staging information.

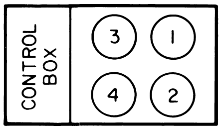
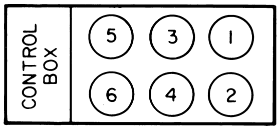
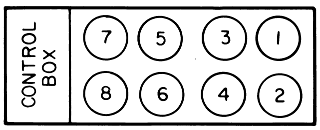
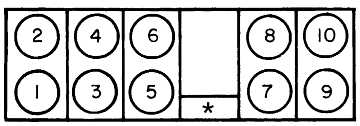
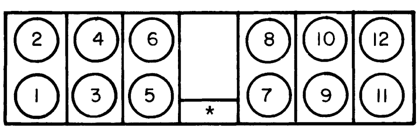
Pumpout

EXV UNITS — 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. If a circuit is starting within 15 minutes of the last shutdown, the pumpout cycle will be skipped.

The pumpout cycle starts immediately upon starting the lead compressor and keeps the EXV at minimum position for 10 seconds. The EXV is then opened an additional percentage and compressor superheat control begins. At this point, the EXV opens gradually to provide a controlled start-up to prevent liquid flood-back to the compressor.

At shutdown, the pumpout cycle continuously closes the EXV until all lag compressors are off and the EXV is at 0%. The lead compressor continues to run for an additional 10 seconds and is then shut off.

TXV UNITS — Pumpout is based on timed pumpout. On a command for start-up, the lead compressor starts. After 15 seconds, the liquid line solenoid opens. At shutdown, the liquid line solenoid closes when the lead compressor has stopped.

FAN ARRANGEMENT	FAN NO.	FAN RELAY	NORMAL CONTROL
30GTN,R040-050 **30GUN,R040-050** 	1	—	Compressor No. A1
	2	—	Compressor No. B1
	3	1	First Stage of Condenser Fans
	4	2	Second Stage of Condenser Fans
30GTN,R060-090, 230B, 245B **30GUN,R060-090, 230B, 245B** 	1	—	Compressor No. A1
	2	—	Compressor No. B1
	3, 4	1	First Stage of Condenser Fans
	5, 6	2	Second Stage of Condenser Fans
30GTN,R100,110, 255B-315B **30GUN,R100,110, 255B-315B** 	1	—	Compressor No. A1
	2	—	Compressor No. B1
	3, 4	1	First Stage of Condenser Fans
	5, 6, 7, 8	2	Second Stage of Condenser Fans
30GTN,R130 (60 Hz), **30GUN,R130 (60 Hz)** **POWER** 	5, 7	—	Compressor No. A1
	6, 8	—	Compressor No. B1
	1, 2	1	First Stage of Condenser Fans
	3, 4, 9, 10	2	Second Stage of Condenser Fans
30GTN,R130 (50 Hz), 150-210, **230A-315A, 330A/B-420A/B†** **30GUN,R130 (50 Hz), 150-210,** **230A-315A, 330A/B-420A/B†** **POWER** 	5, 7	—	Compressor No. A1
	6, 8	—	Compressor No. B1
	1, 11	1	First Stage of Condenser Fans, Circuit A
	3, 9	2	Second Stage of Condenser Fans, Circuit A
	2, 12	3	First Stage of Condenser Fans, Circuit B
	4, 10	4	Second Stage of Condenser Fans, Circuit B

*Control box.
†Fan numbers 11 and 12 do not apply to 30GTN,R and 30GUN,R 130-170 and associated modular units (see Table 1).

Fig. 18 — Condenser Fan Sequence

Marquee Display Usage (See Fig. 19 and Tables 7-25) — The Marquee display module provides the user interface to the *Comfort*Link™ control system. The display has up and down arrow keys, an ESCAPE key, and an ENTER key. These keys are used to navigate through the different levels of the display structure. See Table 7. Press the ESCAPE key until the display is blank to move through the top 11 mode levels indicated by LEDs on the left side of the display.

Pressing the ESCAPE and ENTER keys simultaneously will scroll a clear language text description across the display indicating the full meaning of each display acronym. Pressing the ESCAPE and ENTER keys when the display is blank (Mode LED level) will return the Marquee display to its default menu of rotating display items. In addition, the password will be disabled requiring that it be entered again before changes can be made to password protected items.

Clear language descriptions in English, Spanish, French, or Portuguese can be displayed when properly configuring the LANG variable in the Configuration mode, under DISP submode. See Table 16.

NOTE: When the LANG variable is changed to 1, 2, or 3, all appropriate display expansions will immediately change to the new language. No power-off or control reset is required when reconfiguring languages.

When a specific item is located, the display will flash showing the operator, the item, followed by the item value and then followed by the item units (if any). Press the ENTER key to stop the display at the item value. Items in the Configuration and Service Test modes are password protected. The display will flash PASS and WORD when required. Use the ENTER and arrow keys to enter the 4 digits of the password. The default password is 1111. The password can only be changed through CCN devices such as ComfortWORKS® and Service Tool.

Changing item values or testing outputs is accomplished in the same manner. Locate and display the desired item. Press ENTER to stop the display at the item value. Press the ENTER key again so that the item value flashes. Use the arrow keys to change the value or state of an item and press the ENTER key to accept it. Press the ESCAPE key and the item, value, or units display will resume. Repeat the process as required for other items.

See Tables 7-25 for further details.

Service Test (See Table 9) — *Both main power and control circuit power must be on.*

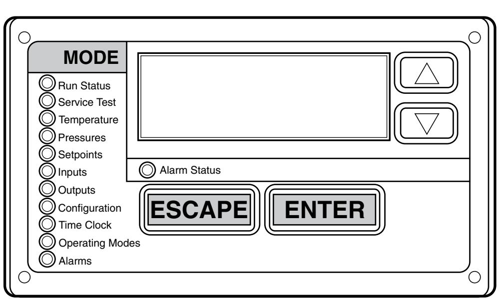


Fig. 19 — Scrolling Marquee Display

The Service Test function should be used to verify proper operation of compressors, unloaders, hot gas bypass (if installed), cooler pump and remote alarm relays, EXVs and condenser fans. To use the Service Test mode, the Enable/Off/Remote Contact switch must be in the OFF position. Use the display keys and Table 9 to enter the mode and display TEST. Press ENTER twice so that OFF flashes. Enter the password if required. Use either arrow key to change the TEST value to the On position and press ENTER. Switch the Enable/Off/Remote Contact switch to the Enable position (Version 2.3 and later). Press ESCAPE and the ▼ button to enter the OUTS or COMP sub-mode.

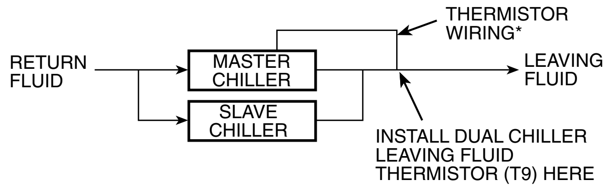
Test the condenser fan, cooler pump, and alarm relays by changing the item values from OFF to ON. These discrete outputs are turned off if there is no keypad activity for 10 minutes. Use arrow keys to select desired percentage when testing expansion valves. When testing compressors, the lead compressor must be started first. All compressor outputs can be turned on, but the control will limit the rate by staging one compressor per minute. Compressor unloaders and hot gas bypass relays/solenoids (if installed) can be tested with compressors on or off. The relays under the COMP sub-mode will stay on for 10 minutes if there is no keypad activity. Compressors will stay on until they are turned off by the operator. The Service Test mode will remain enabled for as long as there is one or more compressors running. All safeties are monitored during this test and will turn a compressor, circuit or the machine off if required. Any other mode or sub-mode can be accessed, viewed, or changed during the TEST mode. The MODE item (Run Status mode under sub-mode VIEW) will display “0” as long as the Service mode is enabled. The TEST sub-mode value must be changed back to OFF before the chiller can be switched to Enable or Remote contact for normal operation.

Configuring and Operating Dual Chiller Control (See Table 18) — The dual chiller routine is available for the control of two units supplying chilled fluid on a common loop. This control is designed for a parallel fluid flow arrangement only. One chiller must be configured as the master chiller, the other as the slave chiller. An additional leaving fluid temperature thermistor (Dual Chiller LWT) must be installed as shown in Fig. 20 and connected to the master chiller. See Field Wiring section for Dual Chiller LWT sensor wiring.

To configure the two chillers for operation, follow the example shown in Table 18. The master chiller will be configured with a slave chiller at address 6. Also in this example, the master chiller will be configured to use Lead/Lag Balance to even out the chiller runtimes weekly. The Lag Start Delay feature will be set to 10 minutes. The master and slave chillers cannot have the same CCN address (CCNA, Configuration mode under OPT2). Both chillers must have the control method variable (CTRL, Configuration mode under OPT2) set to ‘3.’ In addition, the chillers must both be connected together on the same CCN bus. Connections can be made to the CCN screw terminals on TB3 in both chillers. The master chiller will determine which chiller will be Lead and which will be Lag. The master chiller controls the slave chiller by forcing the slave chiller’s CCN START/STOP variable (CHIL_S_S), control point (CTPT) and demand limit (DEM_LIM).

The master chiller is now configured for dual chiller operation. To configure the slave chiller, only the LLEN and MSSL variables need to be set. Enable the Lead/Lag chiller enable variable (LLEN) as shown Table 18. Similarly, set the Master/Slave Select variable (MSSL) to SLVE. The variables LLBL, LLBD, an LLDY are not used by the slave chiller.

Refer to Field Wiring section on page 67 for wiring information.



*Depending on piping sizes, use either:
— HH79NZ014 sensor and 10HB50106801 well (3-in. sensor/well)
— HH79NZ029 sensor and 10HB50106802 well (4-in. sensor/well)

Fig. 20 — Dual Chiller Thermistor Location

Table 7 — Marquee Display Menu Structure

RUN STATUS	SERVICE TEST	TEMPERATURES	PRESSURES	SET POINTS	INPUTS	OUTPUTS	CONFIGURATION	TIME CLOCK	OPERATING MODES	ALARMS
Auto Display (VIEW)	Manual Mode On/Off (TEST)	Unit Temperatures (UNIT)	Ckt A Pressures (PRC.A)	Cooling (COOL)	Unit Discrete (GEN.I)	Unit Discrete (GEN.O)	Display (DISP)	Unit Time (TIME)	Modes (MODE)	Current (CRNT)
Machine Hours/Starts (RUN)	Ckt A/B Outputs (OUTS)	Ckt A Temperatures (CIR.A)	Ckt B Pressures (PRC.B)	Heating (HEAT)	Ckt A/B (CRCT)	Ckt A (CIR.A)	Machine (UNIT)	Unit Date (DATE)		Reset Alarms (RCRN)
Compressor Run Hours (HOUR)	Compressor Tests (COMP)	Ckt B Temperatures (CIR.B)		Head Pressure (HEAD)	Unit Analog (4-20)	Ckt B (CIR.B)	Options 1 (OPT1)	Schedule (SCHD)		Alarm History (HIST)
Compressor Starts (STRT)							Options 2 (OPT2)			Reset History (RHIS)
Software Version (VERS)							Temperature Reset (RSET)			
							Set Point Select (SLCT)			

LEGEND
Ckt — Circuit

Table 8 — Run Status Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	RANGE	ITEM EXPANSION	COMMENT
VIEW	ENTER	EWT	0 - 100 F (–18 - 38 C)	ENTERING FLUID TEMP	
	▼	LWT	0 - 100 F (–18 - 38 C)	LEAVING FLUID TEMP	
	▼	SETP	0 - 100 F (–18 - 38 C)	ACTIVE SETPOINT	
	▼	CTPT	0 - 100 F (–18 - 38 C)	CONTROL POINT	
	▼	STAT	0 - 7	CONTROL MODE	0 = Service Test 1 = Off Local 2 = Off CCN 3 = Off Time Clock 4 = Off Emergency 5 = On Local 6 = On CCN 7 = On Time Clock
	▼	OCC	NO-YES	OCCUPIED	
	▼	MODE	NO-YES	OVERRIDE MODE IN EFFECT	
	▼	CAP	0 - 100%	PERCENT TOTAL CAPACITY	
	▼	STGE	0 - 30	REQUESTED STAGE	
	▼	ALRM	0 - 25	CURRENT ALARMS & ALERTS	
	▼	TIME	00.00 - 23.59	TIME OF DAY	
	▼	MNTH	1 - 12	MONTH OF YEAR	1 = Jan., 2 = Feb
	▼	DATE	1 - 31	DAY OF MONTH	
	▼	YEAR	0 - 9999	YEAR OF CENTURY	
RUN	ENTER	HRS.U	0 - 999999	MACHINE OPERATING HOURS	
	▼	STR.U	0 - 999999	MACHINE STARTS	
HOUR	ENTER	HRS.A	0 - 999999	CIRCUIT A RUN HOURS	
	▼	HRS.B	0 - 999999	CIRCUIT B RUN HOURS	
	▼	HR.A1	0 - 999999	COMPRESSOR A1 RUN HOURS	
	▼	HR.A2	0 - 999999	COMPRESSOR A2 RUN HOURS	
	▼	HR.A3	0 - 999999	COMPRESSOR A3 RUN HOURS	
	▼	HR.A4	0 - 999999	COMPRESSOR A4 RUN HOURS	
	▼	HR.B1	0 - 999999	COMPRESSOR B1 RUN HOURS	
	▼	HR.B2	0 - 999999	COMPRESSOR B2 RUN HOURS	
	▼	HR.B3	0 - 999999	COMPRESSOR B3 RUN HOURS	
	▼	HR.B4	0 - 999999	COMPRESSOR B4 RUN HOURS	
STRT	ENTER	ST.A1	0 - 999999	COMPRESSOR A1 STARTS	
	▼	ST.A2	0 - 999999	COMPRESSOR A2 STARTS	
	▼	ST.A3	0 - 999999	COMPRESSOR A3 STARTS	
	▼	ST.A4	0 - 999999	COMPRESSOR A4 STARTS	
	▼	ST.B1	0 - 999999	COMPRESSOR B1 STARTS	
	▼	ST.B2	0 - 999999	COMPRESSOR B2 STARTS	
	▼	ST.B3	0 - 999999	COMPRESSOR B3 STARTS	
	▼	ST.B4	0 - 999999	COMPRESSOR B4 STARTS	
VERS	ENTER	MBB		CESR-131170-XX-XX	
	▼	EXV		CESR-131172-XX-XX	
	▼	CXB		CESR-131173-XX-XX	
	▼	EMM		CESR-131174-XX-XX	
	▼	MARQ		CESR-131171-XX-XX	
	▼	NAV		CESR-131227-XX-XX	

Table 9 — Service Test Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	RANGE	ITEM EXPANSION	COMMENT
TEST	ENTER	TEST	OFF-ON	SERVICE TEST MODE	Use to Enable/Disable Manual Mode
OUTS	ENTER	LLS.A	OPEN-CLSE	LIQ. LINE SOLENOID VALVE	TXV units only
	▼	EXV.A	0 - 100%	EXV % OPEN	
	▼	LLS.B	OPEN-CLSE	LIQ. LINE SOLENOID VALVE	TXV units only
	▼	EXV.B	0 - 100%	EXV % OPEN	
	▼	FAN1	OFF-ON	FAN 1 RELAY	Fan 3: (040-050) Fans 3, 4: (060-110, 230B-315B) Fans 1, 2: (130 [60 Hz]) Fans 1: (130 [50 Hz], 150, 170, 230A-270A, 330A/B, 360B [50 Hz]) Fans 1, 11: (190-210, 290A, 315A, 360A, 360B [60 Hz], 390A/B-420A/B)
	▼	FAN2	OFF-ON	FAN 2 RELAY	Fan 4: (040-050) Fans 5, 6: (060-090, 230B-245B) Fans 5, 6, 7, 8: (100, 110, 255B-315B) Fans 3, 4, 9, 10: (130 [60 Hz]) Fan 2: (130 [50 Hz], 150, 170, 230A-270A, 330A/B, 360B [50 Hz]) Fans 2, 12: (190-210, 290A, 315A, 360A, 360B [60 Hz], 390A/B-420A/B)
	▼	FAN3	OFF-ON	FAN 3 RELAY	Fans 3, 9: (130 [50 Hz], 150-210, 230A-315A, 330A/B-420A/B)
	▼	FAN4	OFF-ON	FAN 4 RELAY	Fans 4, 10: (130 [50 Hz], 150-210, 230A-315A, 330A/B-420A/B)
	▼	CLR.P	OFF-ON	COOLER PUMP RELAY	
	▼	CND.P	OFF-ON	CONDENSER PUMP RELAY	
	▼	RMT.A	OFF-ON	REMOTE ALARM RELAY	
COMP	ENTER	CC.A1	OFF-ON	COMPRESSOR A1 RELAY	
	▼	CC.A2	OFF-ON	COMPRESSOR A2 RELAY	
	▼	CC.A3	OFF-ON	COMPRESSOR A3 RELAY	
	▼	CC.A4	OFF-ON	COMPRESSOR A4 RELAY	
	▼	UL.A1	OFF-ON	UNLOADER A1 RELAY	
	▼	UL.A2	OFF-ON	UNLOADER A2 RELAY	
	▼	HGBP	OFF-ON	HOT GAS BYPASS RELAY	
	▼	CC.B1	OFF-ON	COMPRESSOR B1 RELAY	
	▼	CC.B2	OFF-ON	COMPRESSOR B2 RELAY	
	▼	CC.B3	OFF-ON	COMPRESSOR B3 RELAY	
	▼	CC.B4	OFF-ON	COMPRESSOR B4 RELAY	
	▼	UL.B1	OFF-ON	UNLOADER B1 RELAY	
	▼	UL.B2	OFF-ON	UNLOADER B2 RELAY	

LEGEND

EXV — Electronic Expansion Valve

Table 10 — Temperature Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	RANGE	ITEM EXPANSION	COMMENT
UNIT	ENTER	CEWT	–40 - 245 F (–40 - 118 C)	COOLER ENTERING FLUID	
	▼	CLWT	–40 - 245 F (–40 - 118 C)	COOLER LEAVING FLUID	
	▼	OAT	–40 - 245 F (–40 - 118 C)	OUTSIDE AIR TEMPERATURE	
	▼	SPT	–40 - 245 F (–40 - 118 C)	SPACE TEMPERATURE	
	▼	CNDE	–40 - 245 F (–40 - 118 C)	CONDENSER ENTERING FLUID	
	▼	CNDL	–40 - 245 F (–40 - 118 C)	CONDENSER LEAVING FLUID	
	▼	DLWT	–40 - 245 F (–40 - 118 C)	LEAD/LAG LEAVING FLUID	
CIR.A	ENTER	SCT.A	–40 - 245 F (–40 - 118 C)	SATURATED CONDENSING TMP	
	▼	SST.A	–40 - 245 F (–40 - 118 C)	SATURATED SUCTION TEMP	
	▼	SGT.A	–40 - 245 F (–40 - 118 C)	COMPRESSOR SUCTION GAS TEMP	
	▼	SUP.A	–40 - 245 Δ F (–40 - 118 Δ C)	SUCTION SUPERHEAT TEMP	
CIR.B	ENTER	SCT.B	–40 - 245 F (–40 - 118 C)	SATURATED CONDENSING TMP	
	▼	SST.B	–40 - 245 F (–40 - 118 C)	SATURATED SUCTION TEMP	
	▼	SGT.B	–40 - 245 F (–40 - 118 C)	COMPRESSOR SUCTION GAS TEMP	
	▼	SUP.B	–40 - 245 Δ F (–40 - 118 Δ C)	SUCTION SUPERHEAT TEMP	

Table 11 — Pressure Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	RANGE	ITEM EXPANSION	COMMENT
PRC.A	ENTER	DP.A	0-900 Psig	DISCHARGE PRESSURE	Pressure is converted from SCT.A.
	▼	SP.A	0-900 Psig	SUCTION PRESSURE	Pressure is converted from SST.A.
PRC.B	ENTER	DP.B	0-900 Psig	DISCHARGE PRESSURE	Pressure is converted from SCT.B.
	▼	SP.B	0-900 Psig	SUCTION PRESSURE	Pressure is converted from SST.B.

Table 12 — Set Point Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	RANGE	ITEM EXPANSION	COMMENT
COOL	ENTER	CSP.1	–20 - 70 F (–29 - 21 C)	COOLING SETPOINT 1	Default 44 F
	▼	CSP.2	–20 - 70 F (–29 - 21 C)	COOLING SETPOINT 2	Default 44 F
	▼	CSP.3	–20 - 32 F (–29 - 0° C)	ICE SETPOINT	Default 32 F
HEAT	▼	HSP.1	80 - 140 F (27 - 60 C)	HEATING SETPOINT 1	Not Supported
	▼	HSP.2	80 - 140 F (27 - 60 C)	HEATING SETPOINT 2	Not Supported
HEAD	ENTER	HD.P.A	80 - 140 F (27 - 60 C)	HEAD PRESSURE SETPOINT A	Default 113 F
	▼	HD.P.B	80 - 140 F (27 - 60 C)	HEAD PRESSURE SETPOINT B	Default 113 F

Table 13 — Reading and Changing Chilled Fluid Set Point

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	RANGE	ITEM EXPANSION	COMMENT
COOL	ENTER	CSP.1	44.0 °F	–20-70 F	COOLING SETPOINT 1	Default: 44 F 38-70 F Flud = 1 14-70 F Flud = 2 –20-70 F Flud = 3
	ENTER		44.0 °F	–20-70 F		Scrolling stops
	ENTER		44.0 °F	–20-70 F		Value flashes
	▲			–20-70 F		Select 46.0
	ENTER		46.0 °F	–20-70 F		Change accepted
	ENTER	CSP.1	46.0 °F	–20-70 F	COOLING SETPOINT 1	Item/Value/Units scrolls again

Table 14 — Inputs Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	RANGE	ITEM EXPANSION	COMMENT
GEN.I	ENTER	STST	STRT-STOP	START/STOP SWITCH	Enable/Off/Remote Contact Switch Input
	▼	FLOW	OFF-ON	COOLER FLOW SWITCH	
	▼	CND.F	OFF-ON	CONDENSER FLOW SWITCH	
	▼	DLS1	OFF-ON	DEMAND LIMIT SWITCH 1	
	▼	DLS2	OFF-ON	DEMAND LIMIT SWITCH 2	
	▼	ICED	OFF-ON	ICE DONE	
	▼	DUAL	OFF-ON	DUAL SETPOINT SWITCH	
CRCT	ENTER	FKA1	OFF-ON	COMPRESSOR A1 FEEDBACK	
	▼	FKA2	OFF-ON	COMPRESSOR A2 FEEDBACK	
	▼	FKA3	OFF-ON	COMPRESSOR A3 FEEDBACK	
	▼	FKA4	OFF-ON	COMPRESSOR A4 FEEDBACK	
	▼	OIL.A	OPEN-CLSE	OIL PRESSURE SWITCH A	
	▼	LPS.A	OPEN-CLSE	LOW PRESSURE SWITCH	Not applicable (040-420)
	▼	FKB1	OFF-ON	COMPRESSOR B1 FEEDBACK	
	▼	FKB2	OFF-ON	COMPRESSOR B2 FEEDBACK	
	▼	FKB3	OFF-ON	COMPRESSOR B3 FEEDBACK	
	▼	FKB4	OFF-ON	COMPRESSOR B4 FEEDBACK	
	▼	OIL.B	OPEN-CLSE	OIL PRESSURE SWITCH B	
	▼	LPS.B	OPEN-CLSE	LOW PRESSURE SWITCH	Not applicable (040-420)
4-20	ENTER	DMND	0 - 24 mA	4-20 mA DEMAND SIGNAL	
	▼	RSET	0 - 24 mA	4-20 mA RESET SIGNAL	
	▼	CSP	0 - 24 mA	4-20 mA COOLING SETPOINT	
	▼	HSP	0 - 24 mA	4-20 mA HEATING SETPOINT	

Table 15 — Outputs Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	RANGE	ITEM EXPANSION	COMMENT
GEN.O	ENTER	FAN1	OFF-ON	FAN 1 RELAY	
	▼	FAN2	OFF-ON	FAN 2 RELAY	
	▼	FAN3	OFF-ON	FAN 3 RELAY	
	▼	FAN4	OFF-ON	FAN 4 RELAY	
	▼	C.PMP	OFF-ON	COOLER PUMP RELAY	
	▼	H.GAS	OFF-ON	HOT GAS BYPASS RELAY	
	▼	CNDP	OFF-ON	CONDENSER PUMP RELAY	
CIR.A	ENTER	CC.A1	OFF-ON	COMPRESSOR A1 RELAY	
	▼	CC.A2	OFF-ON	COMPRESSOR A2 RELAY	
	▼	CC.A3	OFF-ON	COMPRESSOR A3 RELAY	
	▼	CC.A4	OFF-ON	COMPRESSOR A4 RELAY	
	▼	ULA1	OFF-ON	UNLOADER A1 RELAY	
	▼	ULA2	OFF-ON	UNLOADER A2 RELAY	TXV units only
	▼	LLS.A	OPEN-CLSE	LIQUID LINE SOLENOID VLV	EXV units only
	▼	EXV.A	0 - 100%	EXV % OPEN	
CIR.B	ENTER	CC.B1	OFF-ON	COMPRESSOR B1 RELAY	
	▼	CC.B2	OFF-ON	COMPRESSOR B2 RELAY	
	▼	CC.B3	OFF-ON	COMPRESSOR B3 RELAY	
	▼	CC.B4	OFF-ON	COMPRESSOR B4 RELAY	
	▼	ULB1	OFF-ON	UNLOADER B1 RELAY	
	▼	ULB2	OFF-ON	UNLOADER B2 RELAY	
	▼	LLS.B	OPEN-CLSE	LIQUID LINE SOLENOID VLV	TXV units only
	▼	EXV.B	0 - 100%	EXV % OPEN	EXV units only

LEGEND

EXV — Electronic Expansion Valve
TXV — Thermostatic Expansion Valve

Table 16 — Configuration Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	MARQUEE DISPLAY RANGE	NAVIGATOR DISPLAY RANGE	ITEM EXPANSION	COMMENT
DISP	ENTER	TEST	OFF-ON	OFF-ON	TEST DISPLAY LEDS	
	▼	METR	OFF-ON	OFF-ON	METRIC DISPLAY	Off = English On = Metric
	▼	LANG	0 - 3	ENGLISH ESPANOL FRANCAIS PORTUGUES	LANGUAGE SELECTION	Default: 0 0 = English 1 = Espanol 2 = Francais 3 = Portugues

LEGEND

CCN — Carrier Comfort Network
EMM — Energy Management Module
EXV — Electronic Expansion Valve
LCW — Leaving Chilled Water

Table 16 — Configuration Mode and Sub-Mode Directory (cont)

SUB-MODE	KEYPAD ENTRY	ITEM	MARQUEE DISPLAY RANGE	NAVIGATOR DISPLAY RANGE	ITEM EXPANSION	COMMENT
UNIT	ENTER	TYPE	1 - 5	AIR COOLED WATER COOLED SPLIT HEAT MACHINE HEAT RECLAIM	UNIT TYPE	Default: 1 1 = Air Cooled 2 = Water Cooled 3 = Split System 4 = Heat Machine 5 = Heat Reclaim
	▼	TONS	15 - 300	15 - 300	UNIT SIZE	
	▼	CAP.A	0 - 100%	0 - 100%	CIRCUIT A % CAPACITY	
	▼	CMP.A	1 - 4	1 - 4	NUMBER CIRC A COMPRESSOR	
	▼	CYL.A	4, 6	4, 6	COMPRESSOR A1 CYLINDERS	
	▼	CMP.B	1 - 4	1 - 4	NUMBER CIRC B COMPRESSOR	
	▼	CYL.B	4, 6	4, 6	COMPRESSOR B1 CYLINDERS	
	▼	EXV	NO-YES	NO-YES	EXV MODULE INSTALLED	
	▼	SH.SP	10 - 40 ∆ F (6 - 22 ∆ C)	10 - 40 ∆ F (6 - 22 ∆ C)	EXV SUPERHEAT SETPOINT	Default 29 = 30GTN,R 23 = 30GUN,R
	▼	SH.OF	–20 - 20 ∆ F (–11 - 11 ∆ C)	–20 - 20 ∆ F (–11 - 11 ∆ C)	EXV SUPERHEAT OFFSET	Default: 0
	▼	REFG	1, 2	1, 2	REFRIGERANT	1 = R-22 (30GTN,R) 2 = R-134a (30GUN,R)
	▼	FAN.S	1 - 4	2 STAGE IND 3 STAGE IND 2 STAGE COM 3 STAGE COM	FAN STAGING SELECT	1 = 2 Stage Independent 2 = 3 Stage Independent 3 = 2 Stage Common 4 = 3 Stage Common (Not supported for air cooled)
OPT1	ENTER	FLUD	1 - 3	1 - 3	COOLER FLUID	1 = Water 2 = Med. Brine 3 = Low Brine
	▼	HGB.S	NO-YES	NO-YES	HOT GAS BYPASS SELECT	
	▼	HPCM	1 - 4	EXV CONTROL SETPOINT CONTROL SET A EXV B EXV A SET B	HEAD PRESS. CONT. METHOD	Default:2 1 = EXV Control 2 = Set Point Control 3 = Set Point Circuit A, EXV Circuit B 4 = Set Point Circuit B, EXV Circuit A
	▼	HPCT	0 - 2	NO CONTROL AIR COOLED WATER COOLED	HEAD PRESS. CONTROL TYPE	Default: 1 0 = No Control 1 = Air Cooled 2 = Water Cooled
	▼	MMR.S	NO-YES	NO-YES	MOTORMASTER SELECT	
	▼	PRTS	NO-YES	NO-YES	PRESSURE TRANSDUCERS	Default: NO Not Supported
	▼	PMP.I	OFF-ON	OFF-ON	COOLER PUMP INTERLOCK	Default: ON
	▼	CPC	OFF-ON	OFF-ON	COOLER PUMP CONTROL	Default: OFF
	▼	CNP.I	OFF-ON	OFF-ON	CONDENSER PUMP INTERLOCK	Default: OFF Not Applicable
	▼	CNPC	0 - 2	NO CONTROL ON WITH MODE ON WITH COMP	CONDENSER PUMP CONTROL	Default: 0 0 = Not Controlled 1 = On with Occupied Mode 2 = On with Compressors
	▼	CWT.S	NO-YES	NO-YES	CONDENSER FLUID SENSORS	Default: NO Not Applicable
	▼	CA.UN	0 - 2	0 - 2	NO. CIRCUIT A UNLOADERS	
	▼	CB.UN	0 - 2	0 - 2	NO. CIRCUIT B UNLOADERS	
	▼	EMM	NO-YES	NO-YES	EMM MODULE INSTALLED	
OPT2	ENTER	CTRL	0 - 3	SWITCH 7 DAY OCC OCCUPANCY CCN	CONTROL METHOD	0 = Switch 1 = 7-Day Schedule 2 = Occupancy Schedule 3 = CCN
	▼	CCNA	1 - 239	1 - 239	CCN ADDRESS	Default: 1
	▼	CCNB	0 - 239	0 - 239	CCN BUS NUMBER	Default: 0

LEGEND

CCN — Carrier Comfort Network
EMM — Energy Management Module
EXV — Electronic Expansion Valve
LCW — Leaving Chilled Water

Table 16 — Configuration Mode and Sub-Mode Directory (cont)

SUB-MODE	KEYPAD ENTRY	ITEM	MARQUEE DISPLAY RANGE	NAVIGATOR DISPLAY RANGE	ITEM EXPANSION	COMMENT
OPT2 (cont)	▼	BAUD	1 - 5	2400 4800 9600 19,200 38,400	CCN BAUD RATE	Default: 3 1 = 2400 2 = 4800 3 = 9600 4 = 19,200 5 = 38,400
	▼	LOAD	1 - 2	EQUAL STAGED	LOADING SEQUENCE SELECT	Default: 1 1 = Equal 2 = Staged
	▼	LLCS	1 - 3	AUTOMATIC CIR A LEADS CIR B LEADS	LEAD/LAG CIRCUIT SELECT	Default: 1 (Size 080-420); 2 (Size 040-070) 1 = Automatic 2 = Circuit A Leads 3 = Circuit B Leads
	▼	LCWT	2 - 60 Δ F (–16 - 16 Δ C)	2 - 60 Δ F (–16 - 16 Δ C)	HIGH LCW ALERT LIMIT	Default: 60
	▼	DELY	0 - 15	0 - 15	MINUTES OFF TIME	Default: 0
	▼	ICE.M	ENBL-DSBL	ENBL-DSBL	ICE MODE ENABLE	Default: DSBL
RSET	ENTER	CRST	0 - 4	NO RESET 4-20 INPUT OUT AIR TEMP RETURN FLUID SPACE TEMP	COOLING RESET TYPE	0 = No report 2 = 4 to 20 mA input 3 = Return fluid 4 = Space temperature
	▼	CRT1	0° - 125 F (–18 - 52 C)	0° - 125 F (–18 - 52 C)	NO COOL RESET TEMP	Default: 125 F
	▼	CRT2	0° - 125 F (–18 - 52 C)	0° - 125 F (–18 - 52 C)	FULL COOL RESET TEMP	Default: 0° F
	▼	DGRC	–30 - 30 Δ F (–17 - 17 Δ C)	–30 - 30 Δ F (–17 - 17 Δ C)	DEGREES COOL RESET	Default: 0° F
	▼	HRST	0 - 4	0 - 4	HEATING RESET TYPE	Not Supported
	▼	HRT1	0° - 125 F (–18 - 52 C)	0° - 125 F (–18 - 52 C)	NO HEAT RESET TEMP	Not Supported
	▼	HRT2	0° - 125 F (–18 - 52 C)	0° - 125 F (–18 - 52 C)	FULL HEAT RESET TEMP	Not Supported
	▼	DGRH	–30 - 30 Δ F (–17 - 17 Δ C)	–30 - 30 Δ F (–17 - 17 Δ C)	DEGREES HEAT RESET	Not Supported
	▼	DMDC	0 - 3	0 - 3	DEMAND LIMIT SELECT	Default: 0
	▼	DM20	0 - 100%	0 - 100%	DEMAND LIMIT AT 20 mA	Default: 100%
	▼	SHNM	0 - 99	0 - 99	LOADSHED GROUP NUMBER	Default: 0
	▼	SHDL	0 - 60%	0 - 60%	LOADSHED DEMAND DELTA	Default: 0
	▼	SHTM	0 - 120	0 - 120	MAXIMUM LOADSHED TIME	Default: 60 minutes
	▼	DLS1	0 - 100%	0 - 100%	DEMAND LIMIT SWITCH 1	Default: 80%
	▼	DLS2	0 - 100%	0 - 100%	DEMAND LIMIT SWITCH 2	Default: 50%
	▼	LLEN	ENBL-DSBL	ENBL-DSBL	LEAD/LAG CHILLER ENABLE	Default: DSBL
	▼	MSSL	SLVE-MAST	SLVE-MAST	MASTER/SLAVE SELECT	Default: Master
	▼	SLVA	0 - 239	0 - 239	SLAVE ADDRESS	Default: 0
	▼	LLBL	ENBL-DSBL	ENBL-DSBL	LEAD/LAG BALANCE SELECT	Default: DSBL
	▼	LLBD	40 - 400HRS	40 - 400HRS	LEAD/LAG BALANCE DELTA	Default: 168 hours
	▼	LLDY	0 - 30 MIN	0 - 30 MIN	LAG START DELAY	Default: 5 minutes

Table 16 — Configuration Mode and Sub-Mode Directory (cont)

SUB-MODE	KEYPAD ENTRY	ITEM	MARQUEE DISPLAY RANGE	NAVIGATOR DISPLAY RANGE	ITEM EXPANSION	COMMENT
SLCT	ENTER	CLSP	0 - 5	DUAL SWITCH DUAL 7 DAY DUAL CCN OCC 4-20 INPUT EXTERNAL POT	COOLING SETPOINT SELECT	Default: 0 0 = Single 1 = Dual Switch 2 = Dual 7 Day 3 = Dual CCN Occupancy 4 = 4-20 Input 5 = Set Point Potentiometer
	▼	HTSP	0 - 4	0 - 4	HEATING SETPOINT SELECT	Not Supported
	▼	RL.S	ENBL-DSBL	ENBL-DSBL	RAMP LOAD SELECT	Default: DSBL
	▼	CRMP	0.2 - 2.0° F (0.1 - 1.1° C)	0.2 - 2.0° F (0.1 - 1.1° C)	COOLING RAMP LOADING	Default: 1.0
	▼	HRMP	0.2 - 2.0° F (0.1 - 1.1° C)	0.2 - 2.0° F (0.1 - 1.1° C)	HEATING RAMP LOADING	Not Supported
	▼	HCSW	COOL-HEAT	COOL-HEAT	HEAT COOL SELECT	Not Supported
	▼	Z.GN	1.0 - 4.0	1.0 - 4.0	DEADBAND MULTIPLIER	Default: 1.0

Table 17 — Example of Temperature Reset (Return Fluid) Configuration

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
RSET	ENTER	CRST	0	COOLING RESET TYPE	0 = No reset 1 = 4 to 20 mA input 2 = Outdoor Air Temp 3 = Return Fluid 4 = Space Temperature
	ENTER		0		Scrolling stops
	ENTER		0		Value flashes
	▲		3		Select 3
	ENTER		3		Change accepted
	ENTER	CRST	3		Item/Value/Units scrolls again
	▼	CRT1	125	NO COOL RESET TEMP	Range: 0° to 125 F
	ENTER		125		Scrolling stops
	ENTER		125		Value flashes
	▼		10		Select 10
	ENTER		10		Change accepted
	ESCAPE	CRT1	10		Item/Value/Units scrolls again
	▼	CRT2	0	FULL COOL RESET TEMP	Range: 0° to 125 F
	ENTER		0		Scrolling stops
	ENTER		0		Value flashes
	▲		2		Select 2
	ENTER		2		Change accepted
	ESCAPE	CRT2	2		Item/Value/Units scrolls again
	▼	DGRC	0	DEGREES COOL RESET	Range: –30 to 30 F
	ENTER		0		Scrolling stops
	ENTER		0		Value flashes
	▲		8		Select 8
	ENTER		8		Change accepted
	ESCAPE	DGRC	8		Item/Value/Units scrolls again

NOTE: The example above shows how to configure the chiller for temperature reset based on chiller return fluid. The chiller will be configured for no reset at a cooler ΔT (EWT-LWT) of 10 F (5.6 C) and a full reset of 8 F (4.4 C) at a cooler ΔT of 2 F (1.1 C).

Table 18A — Example of Configuring Dual Chiller Control (Master Chiller)

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
RSET	ENTER	CRST	0	COOLING RESET TYPE	
	▲	LLDY	5	LAG START DELAY	
	ENTER		5		Scrolling stops
	ENTER		5		Value flashes
	▲		10		Select 10
	ENTER		10		Change accepted
	ESCAPE	LLDY	10		
	▲	LLBD	168	LEAD/LAG BALANCE DELTA	No change needed. Default set for weekly changeover
	▲	LLBL	DSBL	LEAD/LAG BALANCE SELECT	
	ENTER		DSBL		Scrolling stops
	ENTER		DSBL		Value flashes
	▲		ENBL		Select Enable
	ENTER		ENBL		Change accepted
	ESCAPE	LLBL	ENBL		
	▲	SLVA	0	SLAVE ADDRESS	
	ENTER		0		Scrolling stops
	ENTER		0		Value flashes
	▲		6		Select 6
	ENTER		6		Change accepted
	ESCAPE	SLVA	6		
	▲	MSSL	MAST	MASTER/SLAVE SELECT	No change needed. Default set for Master

Table 18B — Example of Configuring Dual Chiller Control (Slave Chiller)

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
RSET	ENTER	CRST	0	COOLING RESET TYPE	
	▲	LLDY	5	LAG START DELAY	
	▲	LLBD	168	LEAD/LAG BALANCE DELTA	No change needed. Default set for weekly changeover
	▲	LLBL	DSBL	LEAD/LAG BALANCE SELECT	
	▲	SLVA	0	SLAVE ADDRESS	
	▲	MSSL	MAST	MASTER/SLAVE SELECT	Default set for Master
	ENTER	MAST			Scrolling stops
	ENTER	MAST			Value flashes
	▲	SLVE			Select SLVE
	ENTER	SLVE			Change accepted
	▲	MSSL			Item/Value/Units scrolls again
	▲	LLEN	DSBL	LEAD/LAG CHILLER ENABLE	
	ENTER		DSBL		Scrolling stops
	ENTER		DSBL		Value flashes
	▲		ENBL		Select enable
	ENTER	LLEN	ENBL		Change accepted
	ESCAPE	LLEN	ENBL	LEAD/LAG CHILLER ENABLE	Item/Value/Units scrolls again

Table 19 — Example of Compressor Lead/Lag Configuration

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
OPT2	ENTER	CTRL	0	CONTROL METHOD	
	▼	CCNA	1		
	▼	CCNB	0		
	▼	BAUD	3		
	▼	LOAD	1		
	▼	LLCS	1	LEAD/LAG CIRCUIT SELECT	DEFAULT: 1 (Size 080-420) 2 (Size 040-070); 1 = Automatic, 2 = Circuit A Leads, 3 = Circuit B Leads
	ENTER		1		Scrolling stops
	ENTER		1		Value flashes
	▲		3		Select 3 (See note below)
	ENTER		3		Change accepted
	ESCAPE	LLCS	3	LEAD/LAG CIRCUIT SELECT	Item/Value/Units scrolls again

NOTE: Options 1 and/or 3 not valid for sizes 040-070 without Circuit B accessory unloader installed.

Table 20 — Time Clock Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	ITEM RANGE	ITEM EXPANSION	COMMENT
TIME	ENTER	HH.MM	00.00 - 23.59	HOUR AND MINUTE	Military (00.00-23.59)
DATE	ENTER	MNTH	1 - 12	MONTH	1=Jan, 2=Feb, etc.
	▼	DOM	1 - 31	DATE OF MONTH	
	▼	DAY	1 - 7	DAY OF WEEK	1=Mon, 2=Tue, etc.
	▼	YEAR	0000 - 9999	YEAR OF CENTURY	
SCHD	ENTER	MON.O	00.00 - 23.59	MONDAY OCCUPIED TIME	Default: 00.00
	▼	MON.U	00.00 - 23.59	MONDAY UNOCCUPIED TIME	Default: 00.00
	▼	TUE.O	00.00 - 23.59	TUESDAY OCCUPIED TIME	Default: 00.00
	▼	TUE.U	00.00 - 23.59	TUESDAY UNOCCUPIED TIME	Default: 00.00
	▼	WED.O	00.00 - 23.59	WEDNESDAY OCCUPIED TIME	Default: 00.00
	▼	WED.U	00.00 - 23.59	WEDNESDAY UNOCC TIME	Default: 00.00
	▼	THU.O	00.00 - 23.59	THURSDAY OCCUPIED TIME	Default: 00.00
	▼	THU.U	00.00 - 23.59	THURSDAY UNOCCUPIED TIME	Default: 00.00
	▼	FRI.O	00.00 - 23.59	FRIDAY OCCUPIED TIME	Default: 00.00
	▼	FRI.U	00.00 - 23.59	FRIDAY UNOCCUPIED TIME	Default: 00.00
	▼	SAT.O	00.00 - 23.59	SATURDAY OCCUPIED TIME	Default: 00.00
	▼	SAT.U	00.00 - 23.59	SATURDAY UNOCCUPIED TIME	Default: 00.00
	▼	SUN.O	00.00 - 23.59	SUNDAY OCCUPIED TIME	Default: 00.00
	▼	SUN.U	00.00 - 23.59	SUNDAY UNOCCUPIED TIME	Default: 00.00

Table 21 — Setting an Occupied Time Schedule

SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
SCHD	ENTER	MON.O	00.00	MONDAY OCCUPIED TIME	TIME IN MILITARY FORMAT (HH.MM)
	ENTER		00.00		Scrolling stops
	ENTER		00.00		Hours flash
	▲		07.00		Select 7 AM
	ENTER		07.00		Change accepted, minutes flash
	▲		07.30		Select 30
	ENTER		07.30		Change accepted
	ESCAPE	MON.O	07.30	MONDAY OCCUPIED TIME	Item/Value/Units scrolls again

Table 22 — Operating Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	RANGE	ITEM EXPANSION	COMMENT
MODE	ENTER	MD01	OFF-ON	FSM CONTROLLING CHILLER	
	▼	MD02	OFF-ON	WSM CONTROLLING CHILLER	
	▼	MD03	OFF-ON	MASTER/SLAVE CONTROL	
	▼	MD04	OFF-ON	LOW SOURCE PROTECTION	Not Supported
	▼	MD05	OFF-ON	RAMP LOAD LIMITED	
	▼	MD06	OFF-ON	TIMED OVERRIDE IN EFFECT	
	▼	MD07	OFF-ON	LOW COOLER SUCTION TEMPA	
	▼	MD08	OFF-ON	LOW COOLER SUCTION TEMPB	
	▼	MD09	OFF-ON	SLOW CHANGE OVERRIDE	
	▼	MD10	OFF-ON	MINIMUM OFF TIME ACTIVE	
	▼	MD11	OFF-ON	LOW SUCTION SUPERHEAT A	
	▼	MD12	OFF-ON	LOW SUCTION SUPERHEAT B	
	▼	MD13	OFF-ON	DUAL SETPOINT	
	▼	MD14	OFF-ON	TEMPERATURE RESET	
	▼	MD15	OFF-ON	DEMAND LIMIT IN EFFECT	
	▼	MD16	OFF-ON	COOLER FREEZE PROTECTION	
	▼	MD17	OFF-ON	LO TMP COOL/HI TMP HEAT	
	▼	MD18	OFF-ON	HI TMP COOL/LO TMP HEAT	
	▼	MD19	OFF-ON	MAKING ICE	
	▼	MD20	OFF-ON	STORING ICE	
	▼	MD21	OFF-ON	HIGH SCT CIRCUIT A	
	▼	MD22	OFF-ON	HIGH SCT CIRCUIT B	

LEGEND

FSM — Flotronic™ System Manager
SCT — Saturated Condensing Temperature
WSM — Water System Manager

Table 23 — Operating Modes

MODE NO.	ITEM EXPANSION	DESCRIPTION
01	FSM CONTROLLING CHILLER	Flotronic™ System Manager (FSM) is controlling the chiller.
02	WSM CONTROLLING CHILLER	Water System Manager (WSM) is controlling the chiller.
03	MASTER/SLAVE CONTROL	Lead/Lag Chiller control is enabled.
04	LOW SOURCE PROTECTION	Not currently supported.
05	RAMP LOAD LIMITED	Ramp load (pulldown) limiting in effect. In this mode, the rate at which leaving fluid temperature is dropped is limited to a predetermined value to prevent compressor overloading. See CRMP set point in the Set Point Select (SLCT) section of the Configuration mode. The pulldown limit can be modified, if desired, to any rate from 0.2° F to 2° F (0.1° to 1° C)/minute.
06	TIMED OVERRIDE IN EFFECT	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 (Enable) or CCN control. Override expires after each use.
07	LOW COOLER SUCTION TEMP A	Circuit A capacity may be limited due to operation of this mode. Control will attempt to correct this situation for up to 10 minutes before shutting the circuit down. The control may decrease capacity when attempting to correct this problem. See Alarms and Alerts section for more information.
08	LOW COOLER SUCTION TEMP B	Circuit B capacity may be limited due to operation of this mode. Control will attempt to correct this situation for up to10 minutes before shutting the circuit down. The control may decrease capacity when attempting to correct this problem. See Alarms and Alerts section for more information.
09	SLOW CHANGE OVERRIDE	Slow change override is in effect. The leaving fluid temperature is close to and moving towards the control point.
10	MINIMUM OFF TIME ACTIVE	Chiller is being held off by Minutes Off Time (DELY) found under Options 2 (OPT2) section of Configuration mode.
11	LOW SUCTION SUPERHEAT A	Circuit A capacity may be limited due to operation of this mode. Control will attempt to correct this situation for up to 5 minutes before shutting the circuit down. See Alarms and Alerts section for more information.
12	LOW SUCTION SUPERHEAT B	Circuit B capacity may be limited due to operation of this mode. Control will attempt to correct this situation for up to 5 minutes before shutting the circuit down. See Alarms and Alerts section for more information.
13	DUAL SET POINT	Dual set point mode is in effect. Chiller controls to CSP.1 during occupied periods and CSP.2 during unoccupied periods. Both CSP.1 and CSP.2 are located under COOL in the Set Point mode.
14	TEMPERATURE RESET	Temperature reset is in effect. In this mode, chiller is using temperature reset to adjust leaving fluid set point upward and is currently controlling to the modified set point. The set point can be modified based on return fluid, outdoor-air-temperature, space temperature, or 4 to 20 mA signal.
15	DEMAND LIMIT IN EFFECT	Demand limit is in effect. This indicates that the capacity of the chiller is being limited by demand limit control option. Because of this limitation, the chiller may not be able to produce the desired leaving fluid temperature. Demand limit can be controlled by switch inputs or a 4 to 20 mA signal.
16	COOLER FREEZE PROTECTION	Cooler fluid temperatures are approaching the Freeze point (see Alarms and Alerts section for definition). The chiller will be shut down when either fluid temperature falls below the Freeze point.
17	LO TMP COOL/HI TMP HEAT	Chiller is in Cooling mode and the rate of change of the leaving fluid is negative and decreasing faster than -0.5° F per minute. Error between leaving fluid and control point exceeds fixed amount. Control will automatically unload the chiller if necessary.
18	HI TMP COOL/LO TMP HEAT	Chiller is in Cooling mode and the rate of change of the leaving fluid is positive and increasing. Error between leaving fluid and control point exceeds fixed amount. Control will automatically load the chiller if necessary to better match the increasing load.
19	MAKING ICE	Chiller is in an unoccupied mode and is using Ice Set Point 3 (CSP.3) to make ice. The ice done input to the Energy Management Module (EMM) is open.
20	STORING ICE	Chiller is in an unoccupied mode and is controlling to Cooling Set Point 2 (CSP.2). The ice done input to the Energy Management Module (EMM) is closed.
21	HIGH SCT CIRCUIT A	Chiller is in a cooling mode and the Saturated Condensing temperature read by sensor T3 is greater than 140 F (60 C). No additional stages of capacity will be added. Chiller may be unloaded if SCT continues to rise to avoid high-pressure switch trips by reducing condensing temperature.
22	HIGH SCT CIRCUIT B	Chiller is in a cooling mode and the Saturated Condensing temperature read by sensor T4 is greater than 140 F (60 C). No additional stages of capacity will be added. Chiller may be unloaded if SCT continues to rise to avoid high-pressure switch trips by reducing condensing temperature.

Table 24 — Alarms Mode and Sub-Mode Directory

SUB-MODE	KEYPAD ENTRY	ITEM	ITEM EXPANSION	COMMENT
CRNT	ENTER	AXXX or TXXX	CURRENTLY ACTIVE ALARMS	Alarms are shown as AXXX. Alerts are shown as TXXX.
RCRN	ENTER	YES/NO	RESET ALL CURRENT ALARMS	
HIST	ENTER	AXXX or TXXX	ALARM HISTORY	Alarms are shown as AXXX. Alerts are shown as TXXX.
RHIS	ENTER	YES/NO	RESET ALARM HISTORY	

Table 25 — Example of Reading and Clearing Alarms

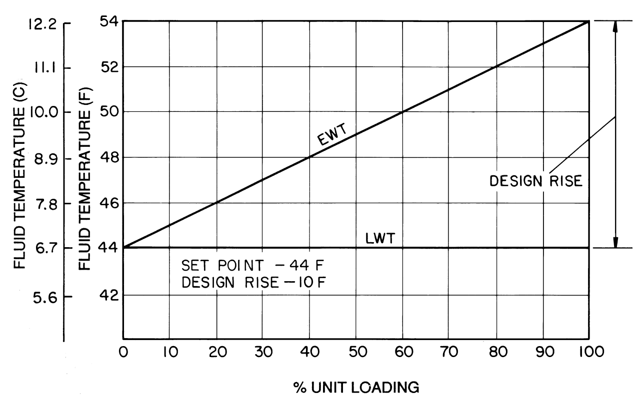
SUB-MODE	KEYPAD ENTRY	ITEM	ITEM EXPANSION	COMMENT
CRNT	ENTER	AXXX or TXXX	CURRENTLY ACTIVE ALARMS	ACTIVE ALARMS (AXXX) OR ALERTS (TXXX) DISPLAYED.
CRNT	ESCAPE			
RCRN	▼	NO		Use to clear active alarms/alerts
	ENTER	NO		NO Flashes
	▲	YES		Select YES
	ENTER	NO		Alarms/alerts clear, YES changes to NO

Temperature Reset — The control system is capable of handling leaving-fluid temperature reset based on return cooler fluid temperature. Because the change in temperature through the cooler is a measure of the building load, the return temperature reset is in effect an average building load reset method. The control system is also capable of temperature reset based on outdoor-air temperature (OAT), space temperature (SPT), or from an externally powered 4 to 20 mA signal. Accessory sensors must be used for OAT and SPT reset (HH79NZ073 for OAT and HH51BX006 for SPT). The Energy Management Module (EMM) must be used for temperature reset using a 4 to 20 mA signal.

To use the return reset, four variables must be configured. In the Configuration mode under the sub-mode RSET, items CRST, CRT1, CRT2, and DGRC must be set properly. See Table 26 on page 44 for correct configuration. See Fig. 2-4 for wiring details.

Under normal operation, the chiller will maintain a constant leaving fluid temperature approximately equal to the chilled fluid set point. As the cooler load varies, the entering cooler fluid will change in proportion to the load as shown in Fig. 21. Usually the chiller size and leaving-fluid temperature set point are selected based on a full-load condition. At part load, the fluid temperature set point may be colder than required. If the leaving fluid temperature was allowed to increase at part load, the efficiency of the machine would increase.

Return temperature reset allows for the leaving temperature set point to be reset upward as a function of the return fluid temperature or, in effect, the building load.



LEGEND

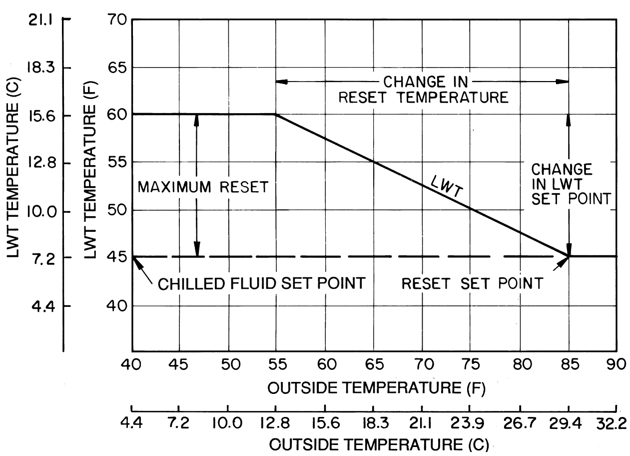
EWT — Entering Water (Fluid) Temperature
LWT — Leaving Water (Fluid) Temperature

Fig. 21 — Standard Chilled Fluid Temperature Control — No Reset

Table 26 — Configuring Temperature Reset

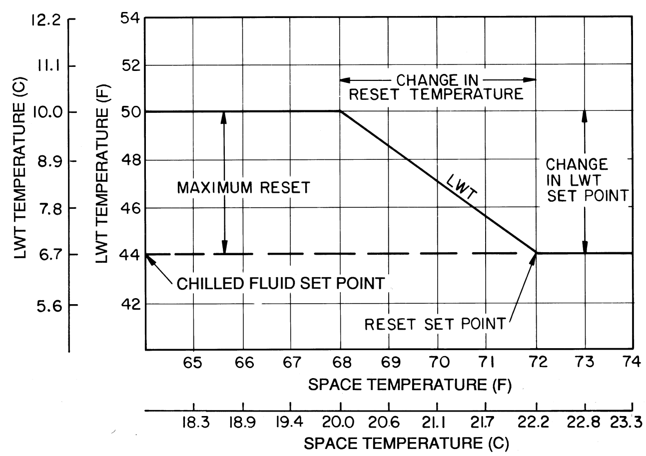
MODE	KEYPAD ENTRY	SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
CONFIGURATION	ENTER	DISP	ENTER	TEST	ON/OFF	TEST DISPLAY LEDS	
	▼	UNIT	ENTER	TYPE		UNIT TYPE	
	▼	OPT1	ENTER	FLUD		COOLER FLUID	
	▼	OPT2	ENTER	CTRL		CONTROL METHOD	
	▼	RSET	ENTER	CRST		COOLING RESET TYPE	0 = No Reset 1 = 4 to 20 mA Input (EMM required) (Connect to EMM J6-2,5) 2 = Outdoor-Air Temperature (Connect to TB5-7,8) 3 = Return Fluid 4 = Space Temperature (Connect to TB5-5,6)
			▼	CRT1	XXX.X F	NO COOL RESET TEMP	Default: 125 F (51.7 C) Range: 0° to125 F Set to 4.0 for CRST= 1
			▼	CRT2	XXX.X F	FULL COOL RESET TEMP	Default: 0° F (–17.8 C) Range: 0° to 125 F Set to 20.0 for CRST=1
			▼	DGRC	XX.X °F	DEGREES COOL RESET	Default: 0° F (0° C) Range: –30 to 30° F (–16.7 to 16.7° C)

The following are examples of outdoor air and space temperature resets:



LEGEND

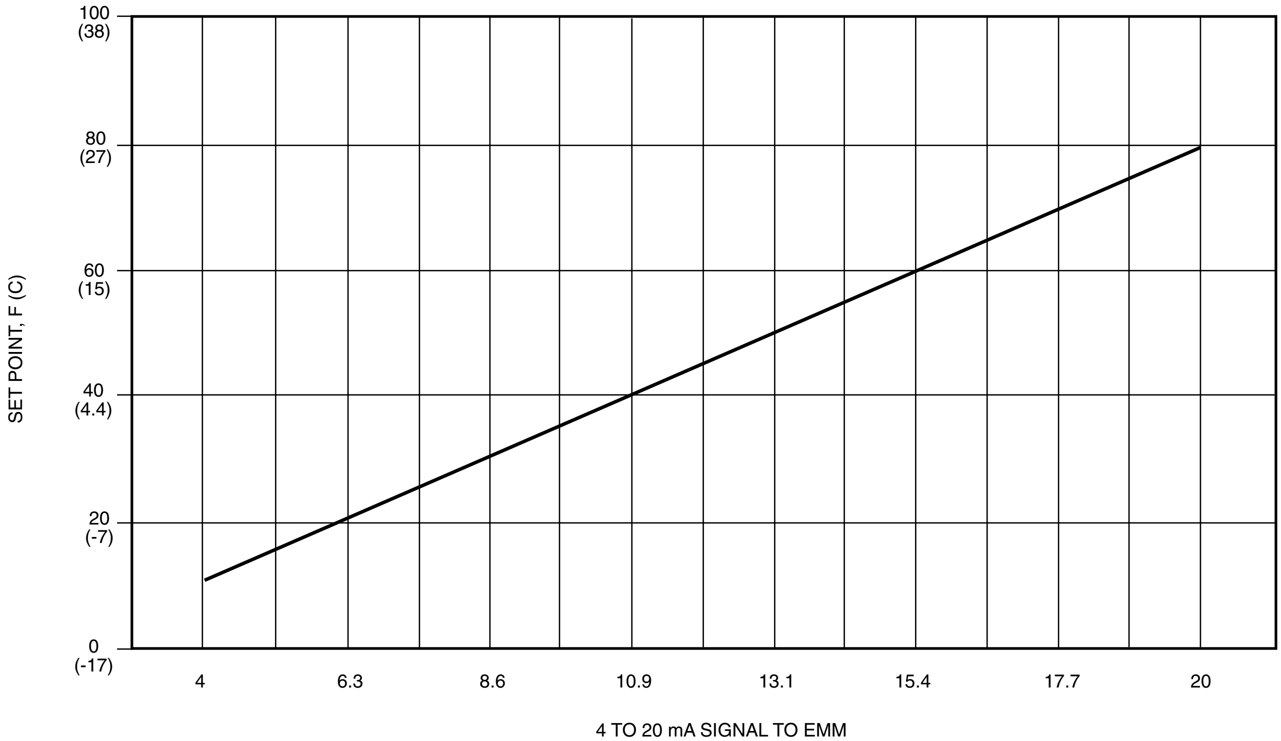
LWT — Leaving Water (Fluid) Temperature



LEGEND

LWT — Leaving Water (Fluid) Temperature

Cooling Set Point (4 to 20 mA) — A field supplied and generated, externally powered 4 to 20 mA signal can be used to provide the leaving fluid temperature set point. Connect the signal to TB6-3,5 (+,–). See Table 27 for instructions to enable the function. Figure 22 shows how the 4 to 20 mA signal is linearly calculated on an overall 10 F to 80 F range for fluid types (Configuration mode, sub-mode OPT1, item FLUD) 1 or 2.



EMM — Energy Management Module

Fig. 22 — Cooling Set Point (4 to 20 mA)

Table 27 — Menu Configuration of 4 to 20 mA Cooling Set Point Control

MODE (RED LED)	KEYPAD ENTRY	SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
CONFIGURATION	ENTER	DISP					
	▼	UNIT					
	▼	OPT1					
	▼	OPT2					
	▼	RSET					
	▼	SLCT	ENTER	CLSP	0	COOLING SETPOINT SELECT	
			ENTER		0		Scrolling Stops
			ENTER		0		Flashing ‘0’
			▲		4		Select ‘4’
			ENTER		4		Change Accepted

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

NOTE: The 2-stage switch control and 4 to 20 mA input signal types of demand limiting require the Energy Management Module (EMM).

To use Demand Limit, select the type of demand limiting to use. Then configure the Demand Limit set points based on the type selected.

DEMAND LIMIT (2-Stage Switch Controlled) — To configure Demand Limit for 2-stage switch control set the Demand Limit Select (DMDC) to 1. Then configure the 2 Demand Limit Switch points (DLS1 and DLS2) to the desired capacity limit. See Table 28. Capacity steps are controlled by 2 relay switch inputs field wired to TB6 as shown in Fig. 2-4.

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

To disable demand limit configure the DMDC to 0. See Table 28.

EXTERNALLY POWERED DEMAND LIMIT (4 to 20 mA Controlled) — To configure Demand Limit for 4 to 20 mA control set the Demand Limit Select (DMDC) to 2. Then configure the Demand Limit at 20 mA (DM20) to the maximum loadshed value desired. The control will reduce allowable capacity to this level for the 20 mA signal. See Table 28 and Fig. 23.

DEMAND LIMIT (CCN Loadshed Controlled) — To configure Demand Limit for CCN Loadshed control set the Demand Limit Select (DMDC) to 3. Then configure the Loadshed Group Number (SHNM), Loadshed Demand Delta (SHDL), and Maximum Loadshed Time (SHTM). See Table 28.

The Loadshed Group number is established by the CCN system designer. The MBB will respond to a Redline command from the Loadshed control. When the Redline command is received, the current stage of capacity is set to the maximum stages available. Should the loadshed control send a Loadshed command, the MBB will reduce the current stages by the value entered for Loadshed Demand delta. The Maximum Loadshed Time defines the maximum length of time that a loadshed condition is allowed to exist. The control will disable the Redline/Loadshed command if no Cancel command has been received within the configured maximum loadshed time limit.

Table 28 — Configuring Demand Limit

MODE	KEYPAD ENTRY	SUB-MODE	KEYPAD ENTRY	ITEM	DISPLAY	ITEM EXPANSION	COMMENT
CONFIGURATION	ENTER	DISP	ENTER	TEST	ON/OFF	Test Display LEDs	
	▼	UNIT	ENTER	TYPE	X	Unit Type	
	▼	OPT1	ENTER	FLUD	X	Cooler Fluid	
	▼	OPT2	ENTER	CTRL	X	Control Method	
	▼	RSET	ENTER	CRST	X	Cooling Reset Type	
			▼	CRT1	XXX.X °F	No Cool Reset Temperature	
			▼	CRT2	XXX.X °F	Full Cool Reset Temperature	
			▼	DGRC	XX.X ΔF	Degrees Cool Reset	
			▼	DMDC	X	Demand Limit Select	Default: 0 0 = None 1 = Switch 2 = 4 to 20 mA Input 3 = CCN Loadshed
			▼	DM20	XXX %	Demand Limit at 20 mA	Default: 100% Range: 0 to 100
			▼	SHNM	XXX	Loadshed Group Number	Default: 0 Range: 0 to 99
			▼	SHDL	XXX%	Loadshed Demand Delta	Default: 0% Range: 0 to 60%
			▼	SHTM	XXX MIN	Maximum Loadshed Time	Default: 60 min. Range: 0 to 120 min.
			▼	DLS1	XXX %	Demand Limit Switch 1	Default: 80% Range: 0 to 100%
			▼	DLS2	XXX%	Demand Limit Switch 2	Default: 50% Range: 0 to 100%

NOTE: Heating reset values skipped in this example.

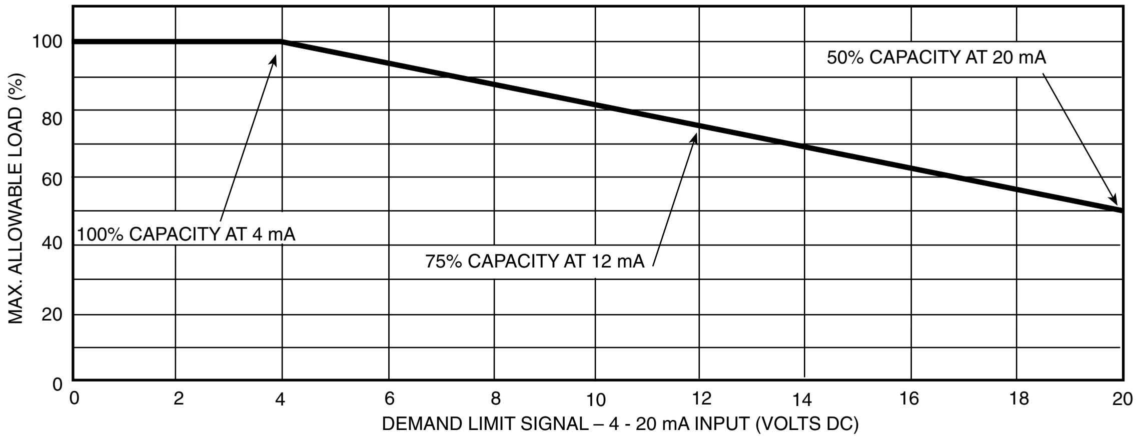


Fig. 23 — 4 to 20 mA Demand Limiting

TROUBLESHOOTING

Compressor Protection Control System (CPCS) Board — The compressor protection board controls the compressor and compressor crankcase heater.

The ground current protection is provided by the compressor board.

The large relay located on the board is used to provide a feedback signal to the Main Base Board.

The operation of the compressor board can be checked using the Service Test procedure. When the Service Test step is turned on, the compressor board is energized. All safeties are continuously monitored. The crankcase heater will be turned off and the compressor contactor will be turned on. The feedback contacts will close and the Main Base Board (MBB) will read the feedback status.

If the board does not perform properly, use standard wiring troubleshooting procedures to check the wiring for open circuits. Refer to Alarms and Alerts section on page 48 for alarm or alert codes for possible causes for failure.

If a compressor short-to-ground exists, the compressor board may detect the short before the circuit breaker trips. If this is suspected, check the compressor for short-to-ground failures with an ohmmeter. The ground current is sensed with a current toroid (coil) around all 3 or 6 wires between the main terminal block and the compressor circuit breaker(s).

Compressor Ground Current (CGF) Board (30GTN,R and 30GUN,R 130-210, 230A-315A, and 330A/B-420A/B) — One board is used for each circuit of these units. Each board receives input from up to 4 toroids wired in series, one toroid per compressor. With 24 v supplied at terminals A and B, a current imbalance (compressor ground current) sensed by any toroid causes the NC (normally closed) contacts to open, shutting down the lead compressor in the affected circuit. All other compressors in that circuit shut down as a result. The NC contacts remain open until the circuit is reset by momentarily deenergizing the board using the push-button switch.

If the NC contacts open, it is necessary to remove toroids from the T1-T2 circuit to determine which toroid is causing the trip. The chiller circuit can then be put back on line after the circuit breaker of the faulty compressor is opened. The compressor problem can then be diagnosed by normal troubleshooting procedures.

EXV Troubleshooting — If it appears that the EXV is not properly controlling operating suction pressure or superheat, there are a number of checks that can be made using the quick test and initialization features built into the *Comfort*Link™ control.

Follow the procedure below to diagnose and correct EXV problems.

STEP 1 — CHECK PROCESSOR EXV OUTPUTS — Check EXV output signals at the J6 and J7 terminals of the EXV board.

Turn unit power off. Connect the positive lead of the meter to terminal 3 on connector J6 on the EXV board. Set meter for approximately 20 vdc. Turn unit power on. Enter and enable the Service Test mode. Locate the appropriate EXV under 'OUTS.' Select the desired percentage and press Enter to move the valve. The valve will overdrive in both directions when either 0% or 100% are entered. During this time, connect the negative test lead to terminals 1, 2, 4, and 5 in succession. The voltage should fluctuate at each pin. If it remains constant at a voltage or at 0 v, replace the EXV board. If the outputs are correct, then check the EXV.

To test Circuit B outputs, follow the same procedure above, except connect the positive lead of the meter to terminal 3 on connector J7 on the EXV board and the negative lead to terminals 1, 2, 4, and 5 in succession.

STEP 2 — CHECK EXV WIRING — Check wiring to EXVs from J6 and J7 connectors on EXV board.

1. Check color coding and wire connections. Make sure that wires are connected to correct terminals at J6 and J7 connectors and EXV plug connections. Check for correct wiring at driver board input and output terminals. See Fig. 2-4.
2. Check for continuity and tight connection at all pin terminals.
3. Check plug connections at J6 and J7 connectors and at EXVs. Be sure EXV connections are not crossed.

STEP 3 — CHECK RESISTANCE OF EXV MOTOR WINDINGS — Remove connector at J6 and/or J7 of EXV board and check resistance between common lead (red wire, terminal D) and remaining leads A, B, C, and E. Resistance should be 25 ohms ± 2 ohms. Check all leads to ground for shorts.

STEP 4 — CHECK THERMISTORS THAT CONTROL EXV — Check thermistors that control processor output voltage pulses to the EXVs. Circuit A thermistor is T7, and circuit B thermistor is T8. Refer to Fig. 9 and 10 for location.

1. Refer to Thermistors section on page 59 for details on checking thermistor calibration.

2. Make sure that thermistor leads are connected to the proper pin terminals at the J5 connector on EXV board and that thermistor probes are located in proper position in the refrigerant circuit.

When these checks have been completed, the actual operation of the EXV can be checked by using the procedures outlined in Step 5 — Check Operation of the EXV section below.

STEP 5 — CHECK OPERATION OF THE EXV — Use the following procedure to check the actual operation of the EXVs. The ENABLE/OFF/REMOTE contact switch must be in the OFF position.

1. Close the liquid line service valve for the circuit to be checked and run through the appropriate service test to pump down the low side of the system. Run lead compressor for at least 30 seconds to ensure all refrigerant has been pumped from the low side and that the EXV has been driven fully open (1500 steps).

   NOTE: Do not use the Emergency ON-OFF switch to recycle the control during this step.
2. Turn off the compressor circuit breaker(s) and the control circuit power and then turn the Emergency ON/OFF switch to the OFF position. Close compressor service valves and remove any remaining refrigerant from the low side of the system.
3. Carefully loosen the 2-$^{1}/_{8}$ in. nut. Do not twist the valve. Remove the motor canister from the valve body using caution to avoid damage to the o-ring seal. If the EXV plug was disconnected during this process reconnect it after the motor canister is removed.
4. Note position of lead screw (see Fig. 15). If valve has responded properly to processor signals in Step 5.1 above, the lead screw should be fully retracted.
5. Recycle the control by turning the Emergency ON-OFF switch to the ON position. This puts the control in initialization mode. During the first 60 seconds of the initialization mode, each valve is driven to the fully closed position (1500 steps) by the processor. Observe the movement of the lead screw. It should be smooth and uniform from the fully retracted (open) to the fully extended (closed) position.
6. When the test has been completed, carefully reassemble expansion valve. Apply a small amount of O-ring grease to the housing seal O-ring before installing the motor canister. Be careful not to damage the O-ring. Tighten the motor nut to 15 to 25 lb-ft (20 to 34 N-m). Evacuate the low side of the open refrigerant circuit. Open compressor service valves and close compressor circuit breakers. Open liquid line service valve. Check for any refrigerant leaks. Turn the ENABLE/OFF/REMOTE switch back to ENABLE or REMOTE and allow the unit to operate. Verify proper unit operation.

NOTE: The EXV orifice is a screw-in type and may be removed for inspection and cleaning. Once the motor canister is removed the orifice can be removed by using the orifice removal tool (part no. TS429). A slot has been cut in the top of the orifice to facilitate removal. Turn orifice counterclockwise to remove. A large screwdriver may also be used.

When cleaning or reinstalling orifice assembly be careful not to damage orifice assembly seals. The bottom seal acts as a liquid shut-off, replacing a liquid line solenoid valve. If the bottom seal should become damaged it can be replaced. Remove the orifice. Remove the old seal. Using the orifice as a guide, add a small amount of O-ring grease, to the underside of the orifice. Be careful not to plug the vent holes. Carefully set the seal with the O-ring into the orifice. The O-ring grease will hold the seal in place. If the O-ring grease is not used, the seal O-ring will twist and bind when the orifice is screwed into the EXV base. Install the orifice and seal assembly. Remove the orifice to verify that the seal is properly positioned. Clean any O-ring grease from the bottom of the orifice. Reinstall the orifice and tighten to 100 in.-lb (11 N-m). Apply a small amount of O-ring grease to the housing seal O-ring before installing the motor canister. Reinstall the motor canister assembly. Tighten the motor nut to 15 to 25 ft-lb (20 to 34 N-m).

Alarms and Alerts — These are warnings of abnormal or fault conditions, and may cause either one circuit or the whole unit to shut down. They are assigned code numbers as described in Table 29.

Automatic alarms will reset without operator intervention if the condition corrects itself. The following method must be used to reset manual alarms:

Before resetting any alarm, first determine the cause of the alarm and correct it. Enter the Alarms mode indicated by the LED on the side of the Scrolling Marquee Display. Press [ENTER] and [▼] until the sub-menu item RCRN “RESET ALL CURRENT ALARMS” is displayed. Press [ENTER] . The control will prompt the user for a password, by displaying PASS and WORD. Press [ENTER] to display the default password, 1111. Press [ENTER] for each character. If the password has been changed, use the arrow keys to change each individual character. Toggle the display to “YES” and press [ENTER] . The alarms will be reset.

Table 29 — Alarm and Alert Codes

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
T051	Alert	Circuit A, Compressor 1 Failure	Compressor feedback signal does not match relay state	Circuit A shut down.	Manual	High-pressure or loss-of-charge switch open, faulty control relay or CPCS board, loss of condenser air, liquid valve closed, operation beyond capability.
T052	Alert	Circuit A, Compressor 2 Failure	Compressor feedback signal does not match relay state	Circuit A shut down. Circuit restarted in 1 minute. Compressor A2 not used until alarm is reset.	Manual	High-pressure switch open, faulty control relay or CPCS board, loss of condenser air, liquid valve closed, operation beyond capability.
T053	Alert	Circuit A, Compressor 3 Failure	Compressor feedback signal does not match relay state	Circuit A shut down. Circuit restarted in 1 minute. Compressor A3 not used until alarm is reset.	Manual	High-pressure switch open, faulty control relay or CPCS board, loss of condenser air, liquid valve closed, operation beyond capability.
T054	Alert	Circuit A, Compressor 4 Failure	Compressor feedback signal does not match relay state	Circuit A shut down. Circuit restarted in 1 minute. Compressor A4 not used until alarm is reset.	Manual	High-pressure switch open, faulty control relay or CPCS board, loss of condenser air, liquid valve closed, operation beyond capability.
T055	Alert	Circuit B, Compressor 1 Failure	Compressor feedback signal does not match relay state	Circuit B shut down.	Manual	High-pressure or loss-of-charge switch open, faulty control relay or CPCS board, loss of condenser air, liquid valve closed, operation beyond capability.
T056	Alert	Circuit B, Compressor 2 Failure	Compressor feedback signal does not match relay state	Circuit B shut down. Circuit restarted in 1 minute. Compressor B2 not used until alarm is reset.	Manual	High-pressure switch open, faulty control relay or CPCS board, loss of condenser air, liquid valve closed, operation beyond capability.
T057	Alert	Circuit B, Compressor 3 Failure	Compressor feedback signal does not match relay state	Circuit B shut down. Circuit restarted in 1 minute. Compressor B3 not used until alarm is reset.	Manual	High-pressure switch open, faulty control relay or CPCS board, loss of condenser air, liquid valve closed, operation beyond capability.
A060	Alarm	Cooler Leaving Fluid Thermistor Failure (T1)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Chiller shutdown after pumpdown complete.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
A061	Alarm	Cooler Entering Fluid Thermistor Failure (T2)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Chiller shutdown after pumpdown complete.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
T064	Alert	Circuit A Saturated Condensing Thermistor Failure (T3)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Circuit A shutdown after pumpdown complete.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
T065	Alert	Circuit B Saturated Condensing Thermistor Failure (T4)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Circuit B shutdown after pumpdown complete.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
T066	Alert	Circuit A Saturated Suction Thermistor Failure (T5)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Circuit A shutdown after pumpdown complete. (EXV only)	Automatic	Thermistor failure, damaged cable/wire or wiring error.
T067	Alert	Circuit B Saturated Suction Thermistor Failure (T6)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Circuit B shutdown after pumpdown complete. (EXV only).	Automatic	Thermistor failure, damaged cable/wire or wiring error.
T068	Alert	Compressor A1 Suction Gas Thermistor Failure (T7)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Circuit A shutdown after pumpdown complete. (EXV only).	Automatic	Thermistor failure, damaged cable/wire or wiring error.
T069	Alert	Compressor B1 Suction Gas Thermistor Failure (T8)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Circuit B shutdown after pumpdown complete. (EXV only).	Automatic	Thermistor failure, damaged cable/wire or wiring error.
T073	Alert	Outside Air Thermistor Failure (T9)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Temperature reset disabled. Chiller runs under normal control/set points.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
T074	Alert	Space Temperature Thermistor Failure (T10)	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Temperature reset disabled. Chiller runs under normal control/set points.	Automatic	Thermistor failure, damaged cable/wire or wiring error.
T077	Alert	Circuit A Saturated Suction Temperature exceeds Cooler Leaving Fluid Temperature	Saturated suction is greater than leaving fluid temperature for more than 5 minutes	Circuit A shutdown after pumpdown complete.	Automatic	Faulty expansion valve or EXV board, faulty cooler suction thermistor (T5) or leaving fluid thermistor (T1).
T078	Alert	Circuit B Saturated Suction Temperature exceeds Cooler Leaving Fluid Temperature	Saturated suction is greater than leaving fluid temperature for more than 5 minutes	Circuit B shutdown after pumpdown complete	Automatic	Faulty expansion valve or EXV board, faulty cooler suction thermistor (T6) or leaving fluid thermistor (T1).
T079	Alert	Lead/Lag Thermistor Failure	Thermistor outside range of –40 to 245 F (–40 to 118 C)	Lead/lag algorithm runs using Master LWT sensor Master is lead chiller.	Automatic	Dual chiller LWT thermistor failure, damaged cable/wire or wiring error.

Table 29 — Alarm and Alert Codes (cont)

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
T112	Alert	Circuit A High Suction Superheat	If EXV is greater than 98%, suction superheat is greater than 75 F (41.7 C) and saturated suction temperature is less than MOP for 5 minutes	Circuit A shutdown after pumpdown complete.	Manual	Faulty expansion valve or EXV board, low refrigerant charge, plugged filter drier, faulty suction gas thermistor (T7) or cooler thermistor (T5).
T113	Alert	Circuit B High Suction Superheat	If EXV is greater than 98% suction superheat is greater than 75 F (41.7 C) and saturated suction temperature is less than MOP for 5 minutes	Circuit B shutdown after pumpdown complete.	Manual	Faulty expansion valve or EXV board, low refrigerant charge, plugged filter drier, faulty suction gas thermistor (T8) or cooler thermistor (T6).
T114	Alert	Circuit A Low Suction Superheat	If EXV is greater than 10%, and either suction superheat is less than superheat set point –10 F (5.6 C) or saturated suction temperature is greater than MOP for 5 minutes	Circuit A shutdown after pumpdown complete.	Automatic restart after first daily occurrence. Manual restart thereafter.	Faulty expansion valve or EXV board, faulty suction gas thermistor (T7) or cooler thermistor (T5).
T115	Alert	Circuit B Low Suction Superheat	If EXV is greater than 10%, and either suction superheat is less than superheat set point –10 F (5.6 C) or saturated suction temperature is greater than MOP for 5 minutes	Circuit B shutdown after pumpdown complete.	Automatic restart after first daily occurrence. Manual restart thereafter.	Faulty expansion valve or EXV board, faulty suction gas thermistor (T8) or cooler thermistor (T6).
T116	Alert	Circuit A Low Cooler Suction Temperature	1. If the saturated suction temperature is 24 to 29° F (13.3 to 16.1° C) below cooler LWT and is also 2° F (1.1° C) less than freeze* 2. If the saturated suction temperature is 30° F (16.7° C) below cooler LWT and is also 2° F (1.1° C) less than freeze* for 10 minutes	1. Mode 7 initiated. No additional capacity increases. Alert not tripped. 2. Circuit shutdown without going through pumpdown.	1. Automatic reset if corrected. 2. Manual	Faulty expansion valve or EXV board, low refrigerant charge, plugged filter drier, faulty suction gas thermistor (T7) or cooler thermistor (T5), low cooler fluid flow.
T117	Alert	Circuit B Low Cooler Suction Temperature	1. If the saturated suction temperature is 24 to 29°F (13.3 to 16.1° C) below cooler LWT and is also 2°F (1.1° C) less than freeze* 2. If the saturated suction temperature is 30° F (16.7° C) below cooler LWT and is also 2° F (1.1° C) less than freeze* for 10 minutes	1. Mode 8 initiated. No additional capacity increases. Alert not tripped. 2. Circuit shutdown without going through pumpdown.	1. Automatic reset if corrected. 2. Manual	Faulty expansion valve or EXV board, low refrigerant charge, plugged filter drier, faulty suction gas thermistor (T8) or cooler thermistor (T6), low cooler fluid flow.
T118	Alert	Circuit A Low Oil Pressure	Oil pressure switch open after 1 minute of continuous operation	Circuit shutdown without going through pumpdown.	Manual	Oil pump failure, low oil level, switch failure or compressor circuit breaker tripped.
T119	Alert	Circuit B Low Oil Pressure	Oil pressure switch open after 1 minute of continuous operation	Circuit shutdown without going through pumpdown.	Manual	Oil pump failure, low oil level, switch failure or compressor circuit breaker tripped.

LEGEND

CCN — Carrier Comfort Network
CPCS — Compressor Protection Control System
CXB — Compressor Expansion Board
EMM — Energy Management Module
EWT — Entering Fluid Temperature
EXV — Electronic Expansion Valve
FSM — Flotronic™ System Manager
LCW — Leaving Chilled Water
LWT — Leaving Fluid Temperature
MBB — Main Base Board
MOP — Maximum Operating Pressure
WSM — Water System Manager

*Freeze is defined as 34° F (1.1 C) for water. For brine fluids, freeze is CSP.1 –8° F (4.4 C) for single set point and lower of CSP.1 or CSP.2 –8° F (4.4 C) for dual set point configuration.

Table 29 — Alarm and Alert Codes (cont)

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
A150	Alarm	Emergency Stop	CCN emergency stop command received	Chiller shutdown without going through pumpdown.	Automatic once CCN command for EMSTOP returns to normal	CCN Network command.
A151	Alarm	Illegal Configuration	One or more of the illegal configurations exists.	Chiller is not allowed to start.	Manual once configuration errors are corrected	Configuration error. See Note on page 52.
A152	Alarm	Unit Down Due to Failure	Both circuits are down due to alarms/alerts.	Chiller is unable to run.	Automatic once alarms/alerts are cleared that prevent the chiller from starting.	Alarm notifies user that chiller is100% down.
T153	Alert	Real Time Clock Hardware Failure	Internal clock on MBB fails	Occupancy schedule will not be used. Chiller defaults to Local On mode.	Automatic when correct clock control restarts.	Time/Date/Month/ Day/Year not properly set.
A154	Alarm	Serial EEPROM Hardware Failure	Hardware failure with MBB	Chiller is unable to run.	Manual	Main Base Board failure.
T155	Alert	Serial EEPROM Storage Failure	Configuration/storage failure with MBB	No Action	Manual	Potential failure of MBB. Download current operating software. Replace MBB if error occurs again.
A156	Alarm	Critical Serial EEPROM Storage Failure	Configuration/storage failure with MBB	Chiller is not allowed to run.	Manual	Main Base Board failure.
A157	Alarm	A/D Hardware Failure	Hardware failure with peripheral device	Chiller is not allowed to run.	Manual	Main Base Board failure.
T170	Alert	Loss of Communication with CXB	MBB loses communication with CXB	Compressors A3, A4 and B3 and unloaders A2/B2 unable to operate.	Automatic	Wiring error, faulty wiring or failed CXB module.
A172	Alarm	Loss of Communication with EXV	MBB loses communication with EXV	Chiller shutdown without going through pumpdown.	Automatic	Wiring error, faulty wiring or failed EXV module.
T173	Alert	Loss of Communication with EMM	MBB loses communication with EMM	4 to 20 mA temperature reset disabled. Demand Limit set to 100%. 4 to 20 mA set point disabled.	Automatic	Wiring error, faulty wiring or failed Energy Management Module (EMM).
T174	Alert	4 to 20 mA Cooling Set Point Input Failure	If configured with EMM and input less than 2 mA or greater than 22 mA	Set point function disabled. Chiller controls to CSP.1.	Automatic	Faulty signal generator, wiring error, or faulty EMM.
T176	Alert	4 to 20 mA Temperature Reset Input Failure	If configured with EMM and input less than 2 mA or greater than 22 mA	Reset function disabled. Chiller returns to normal set point control.	Automatic	Faulty signal generator, wiring error, or faulty EMM.
T177	Alert	4 to 20 mA Demand Limit Input Failure	If configured with EMM and input less than 2 mA or greater than 22 mA	Demand limit function disabled. Chiller returns to 100% demand limit control.	Automatic	Faulty signal generator, wiring error, or faulty EMM.
A200	Alarm	Cooler Pump Interlock Failure to Close at Start-Up	Interlock not closed within 5 minutes after unit is started	Cooler pump shut off. Chiller shutdown without going through pumpdown.	Manual	Failure of cooler pump, flow switch, or interlock.
A201	Alarm	Cooler Pump Interlock Opened During Normal Operation	Interlock opens during operation	Cooler pump shut off. Chiller shutdown without going through pumpdown.	Manual	Failure of cooler pump, flow switch, or interlock.
A202	Alarm	Cooler Pump Interlock Closed When Pump is Off	If configured for cooler pump control and interlock closes while cooler pump relay is off	Chiller is not allowed to start.	Manual	Failure of cooler pump relay or interlock, welded contacts.

Table 29 — Alarm and Alert Codes (cont)

ALARM/ ALERT CODE	ALARM OR ALERT	DESCRIPTION	WHY WAS THIS ALARM GENERATED?	ACTION TAKEN BY CONTROL	RES METHOD	PROBABLE CAUSE
T203	Alert	Loss of Communication with Slave Chiller	Master MBB loses communication with Slave MBB	Dual chiller control disabled. Chiller runs as a stand-alone machine.	Automatic	Wiring error, faulty wiring, failed Slave MBB module, power loss at Slave chiller, wrong slave address.
T204	Alert	Loss of Communication with Master Chiller	Slave MBB loses communication with Master MBB	Dual chiller control disabled. Chiller runs as a stand-alone machine	Automatic	Wiring error, faulty wiring, failed Master MBB module, power loss at Master chiller.
T205	Alert	Master and Slave Chiller with Same Address	Master and slave chiller have the same CCN address (CCN.A)	Dual chiller routine disabled. Master/slave run as stand-alone chillers.	Automatic	CCN Address for both-chillers is the same. Must be different. Check CCN.A under the OPT2 sub-mode in configuration at both chillers.
T206	Alert	High Leaving Chilled Water Temperature	LWT read is greater than LCW Alert Limit, plus control point and Total capacity is 100% and LWT is greater than LWT reading one minute ago	Alert only. No action taken.	Automatic	Building load greater than unit capacity, low water/brine flow or compressor fault. Check for other alarms/alerts.
A207	Alarm	Cooler Freeze Protection	Cooler EWT or LWT is less than freeze*	Chiller shutdown without going through pumpdown. Cooler pump continues to run (if control enabled).	Automatic for first occurrence of day. Manual reset thereafter.	Faulty thermistor (T1/T2), low water flow.
A208	Alarm	Low Cooler Fluid Flow	Cooler EWT is less than LWT by 3° F (1.7° C) for 1 minute after a circuit is started	Chiller shutdown without going through pumpdown. Cooler pump shut off (if control enabled).	Manual	Faulty cooler pump, low water flow, plugged fluid strainer.
T950	Alert	Loss of Communication with WSM	No communications have been received by MBB within 5 minutes of last transmission	WSM forces removed. Chiller runs under own control.	Automatic	Failed module, wiring error, failed transformer, loose connection plug, wrong address.
T951	Alert	Loss of Communication with FSM	No communications have been received by MBB within 5 minutes of last transmission	FSM forces removed. Chiller runs under own control.	Automatic	Failed module, wiring error, failed transformer, loose connection plug, wrong address.

LEGEND

CCN — Carrier Comfort Network
CPCS — Compressor Protection Control System
CXB — Compressor Expansion Board
EMM — Energy Management Module
EXV — Electronic Expansion Valve
FSM — Flotronic™ System Manager
LCW — Leaving Chilled Water
LWT — Leaving Fluid Temperature
MBB — Main Base Board
MOP — Maximum Operating Pressure
WSM — Water System Manager

*Freeze is defined as 34° F (1.1 C) for water. For brine fluids, freeze is CSP.1 –8° F (4.4 C) for single set point and lower of CSP.1 or CSP.2 –8° F (4.4 C) for dual set point configuration.

NOTE: The following table shows illegal configurations:

1	Unit type = 0.
2	4 Compressors in a circuit with 2 unloaders.
3	4 Compressors in a circuit with 1 unloader and hot gas bypass.
4	2 Unloaders and hot gas bypass in a circuit.
5	More than one compressor difference between circuits (e.g., 4 compressors in Ckt A, 2 in Ckt B).
6	Water cooled units with optional thermistors and configured for head pressure control.
7	Split system chillers with optional thermistors and configured for head pressure control.
8	Low temperature brine selected for air cooled chillers or split systems with air cooled head pressure control.
9	Water cooled unit configured for air cooled head pressure control.
10	Air cooled head pressure control with common fan staging and different head pressure control methods for each circuit (EXV controlled vs. set point controlled).
11	Lead/lag enabled, Master selected and Cooling Set Point select is LWT POT.
12	Water cooled or split units (units types 2, 3, 4) with more than one compressor on a circuit.
13	Condenser pump interlock enabled on air cooled unit.
14	Unit type changed.
15	Low pressure set points out of range.
16	Cooler fluid type is water and ice mode is enabled.

SERVICE

ELECTRIC SHOCK HAZARD.

Turn off all power to unit before servicing. The ENABLE/OFF/REMOTE CONTACT switch on control panel does *not* shut off control power; *use field disconnect.*

Electronic Components

CONTROL COMPONENTS — Unit uses an advanced electronic control system that normally does not require service. For details on controls refer to Operating Data section.

30GTN,R AND 30GUN,R 040-110, AND 230B-315B UNIT CONTROL BOX — When facing compressors, main control box is at left end of unit. All incoming power enters through main box. Control box contains power components and electronic controls.

Outer panels are hinged and latched for easy opening. Remove screws to remove inner panels. Outer panels can be held open for service and inspection by using door retainer on each panel. To use door retainers: remove bottom pin from door retainer assembly, swing retainer out horizontally, and engage pin in one of the retainer ears and the hinge assembly.

30GTN,R AND 30GUN,R 130-210, 230A-315A, AND 330A/B-420A/B UNIT CONTROL AND MAIN POWER BOXES — The main power box is on the cooler side of the unit, and the control box is on the compressor side. Outer panels are hinged and latched for easy opening. Remove screws to remove inner panels.

Compressors — If lead compressor on either refrigerant circuit becomes inoperative for any reason, circuit is locked off and cannot be operated due to features built into the electronic control system. *Do not attempt to bypass controls to force compressors to run.*

COMPRESSOR REMOVAL — Access to the oil pump end of the compressor is from the compressor side of the unit. Access to the motor end of the compressor is from the inside of the unit. All compressors can be removed from the compressor side of the unit.

IMPORTANT: All compressor mounting hardware and support brackets removed during servicing must be reinstalled prior to start-up.

Following the installation of the new compressor:

Tighten discharge valves to —	
	Compressor(s)
20 to 25 ft-lb (27 to 34 N-m)	06E250
80 to 90 ft-lb (109 to 122 N-m)	06E265,275,299
Tighten suction valves to —	
80 to 90 ft-lb (109 to 122 N-m)	06E250
90 to 120 ft-lb (122 to 163 N-m)	06E265,275,299
Tighten the following fittings to —	
120 in.-lb (13.5 N-m)	High-Pressure Switch

OIL CHARGE (Refer to Table 30) — All units are factory charged with oil. Acceptable oil level for each compressor is from $^1/_8$ to $^3/_8$-in. of sight glass (see Fig. 35).

When additional oil or a complete charge is required, use only Carrier-approved compressor oil.

30GTN,R approved oils are as follows:

Petroleum Specialties, Inc.	— Cryol 150 (factory oil charge)
Texaco, Inc.	— Capella WF-32
Witco Chemical Co.	— Suniso 3GS

30GUN,R approved polyolester (POE) oils are as follows:

- Mobil Artic EAL 68
- Castrol SW68
- ICI Emkarate RL68H
- Lubrizol 29168 (Texaco HFC Capella 68NA)
- CPI Solest 68

Table 30 — Oil Charge

COMPRESSOR	OIL REQUIRED	
	Pts	L
06E250	14	6.6
06E265	19	9.0
06E275	19	9.0
06E299	19	9.0

Do not reuse drained oil or any oil that has been exposed to atmosphere.

Cooler — The cooler is easily accessible from the cooler side of the unit. The refrigerant feed components are accessible from the control box end of the unit.

COOLER REMOVAL — Cooler can be removed from the cooler side of the unit as follows:

⚠ CAUTION

Open and tag all electrical disconnects before any work begins. Note that cooler is heavy and both fluid-side and refrigerant-side may be under pressure.

1. To ensure the refrigerant is in the condenser, follow this procedure:
   a. Open the circuit breakers and close the discharge valves for the lag compressors in both circuits.

⚠ CAUTION

Do not close the discharge valve of an operating compressor. Severe damage to the compressor can result.

   b. After the lag compressor discharge service valves have been closed, close the liquid line service valve for one circuit. Allow the lead compressor to pump down that circuit until it reaches approximately 10 to 15 psig (68.8 to 103.2 kPa).
   c. As soon as the system reaches that pressure, shut down the lead compressor by opening the compressor circuit breaker, then quickly close the discharge service valve for that compressor.
   d. Repeat the procedure for the other circuit.
2. Close the shutoff valves, if installed, in the cooler fluid lines. Remove the cooler fluid piping.
3. Cooler may be under pressure. Open the air vent at the top of the cooler, and open the drain on the bottom of the cooler (near the leaving fluid outlet) to drain the cooler. Both the drain and the air vent are located on the leaving fluid end of cooler. See Fig. 24. Remove the cooler water-side strainer.
4. Disconnect the conduit and cooler heater wires, if equipped. Remove all thermistors from the cooler, being sure to label all thermistors as they are removed. Thermistor T1 is a well-type thermistor, and thermistor T2 is immersed directly in the fluid. See Fig. 24.
5. Remove the insulation on the refrigerant connection end of the cooler.
6. Unbolt the suction flanges from the cooler head. Save the bolts.

7. Remove the liquid lines by breaking the silver-soldered joints at the cooler liquid line nozzles.
8. On 30GTN,GTR and 30GUN,R 080-110 and 230B-315B units, remove the vertical support(s) under the condenser coil in front of the cooler. *Provide temporary support as needed*. Save all screws for reinstallation later.
9. Remove the screws in the cooler feet. Slide the cooler slightly to the left to clear the refrigerant tubing. Save all screws.

Removing the cooler can be accomplished in one of 2 ways, depending on the jobsite. Either continue sliding the cooler toward the end of the unit opposite the tubing and carefully remove, or pivot the cooler and remove it from the cooler side of the unit.

REPLACING COOLER — To replace the cooler:

1. Insert new cooler carefully into place. Reattach the screws into the cooler feet (using saved screws).

   On 30GTN,GTR and 30GUN,GUR080-110 and 230B-315B units, reattach the 2 vertical supports under the condenser coil in front of the cooler using screws saved.
2. Replace the liquid lines and solder at the cooler liquid line nozzles.
3. Rebolt the suction flanges onto the cooler head using bolts saved during removal. Use new gaskets for the suction line flanges. Use compressor oil to aid in gasket sealing and tighten the suction flange bolts to 70 to 90 ft-lb (94 to 122 N-m).

   NOTE: The suction flange has a 4-bolt pattern. See Carrier specified parts for replacement part number, if necessary.
4. Using adhesive, reinstall the cooler insulation on the refrigerant connection end of the cooler.
5. Reinstall the thermistors. Refer to Thermistors section on page 59, and install as follows:
   a. Apply pipe sealant to the $^1/_4$-in. NPT threads on the replacement coupling for the fluid side, and install it in place of the original.

⚠ CAUTION

Do not use the packing nut to tighten the coupling. Damage to the ferrules will result.

   b. Reinstall thermistor T1 well, and insert thermistor T1 into well.
   c. Install thermistor T2 (entering fluid temperature) so that it is not touching an internal refrigerant tube, but so that it is close enough to sense a freeze condition. The recommended distance is $^1/_8$ in. (3.2 mm) from the cooler tube. Tighten the packing nut finger tight, and then tighten $1^1/_4$ turns more using a back-up wrench.
6. Install the cooler heater and conduit (if equipped), connecting the wires as shown in the unit wiring schematic located on the unit.
7. Close the air vent at the top of the cooler, and close the drain on the bottom of the cooler near the leaving fluid outlet. Both the drain and the air vent are located on the leaving fluid end of the cooler. See Fig. 24.
8. Reconnect the cooler fluid piping and strainer, and open the shutoff valves (if installed). Purge the fluid of all air before starting unit.
9. Open the discharge service valves, close the circuit breakers, and open the liquid line service valves for the compressors.

SERVICING THE COOLER — When cooler heads and partition plates are removed, tube sheets are exposed showing ends of tubes.

⚠ CAUTION

Certain tubes in the 10HB coolers cannot be removed. Eight tubes in the bundle are secured inside the cooler to the baffles and *cannot be removed*. These tubes are marked by a dimple on the tube sheet. See Fig. 25. *If any of these tubes have developed a leak, plug the tube(s) as described under Tube Plugging section on page 55*.

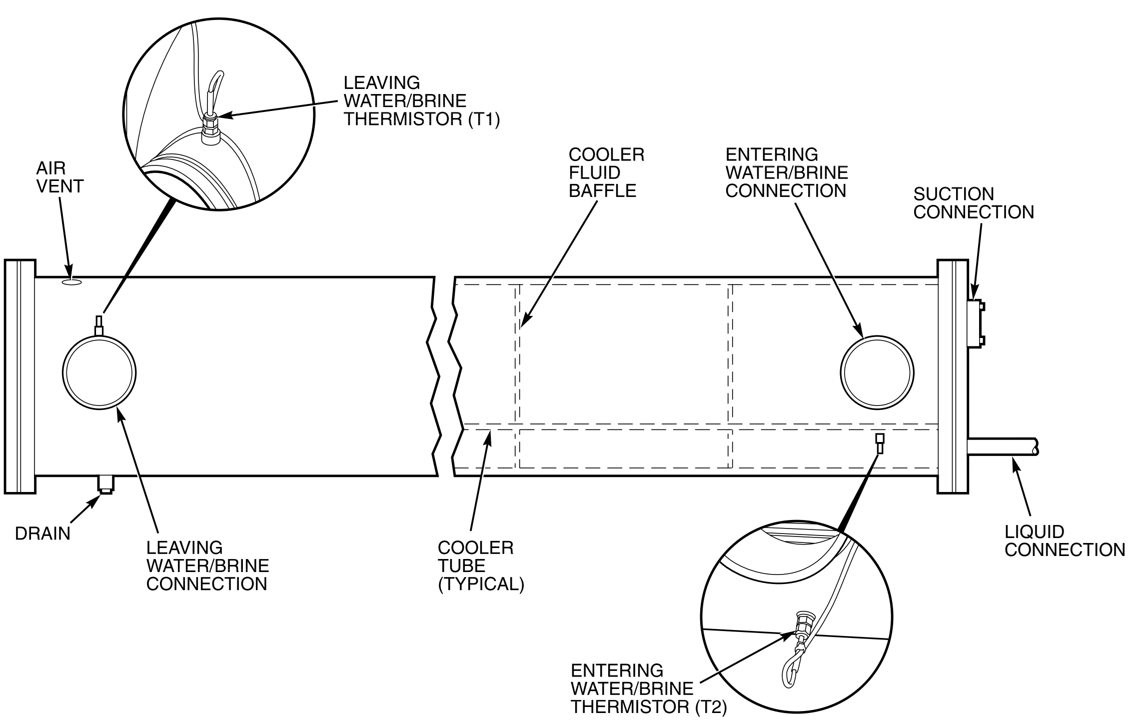
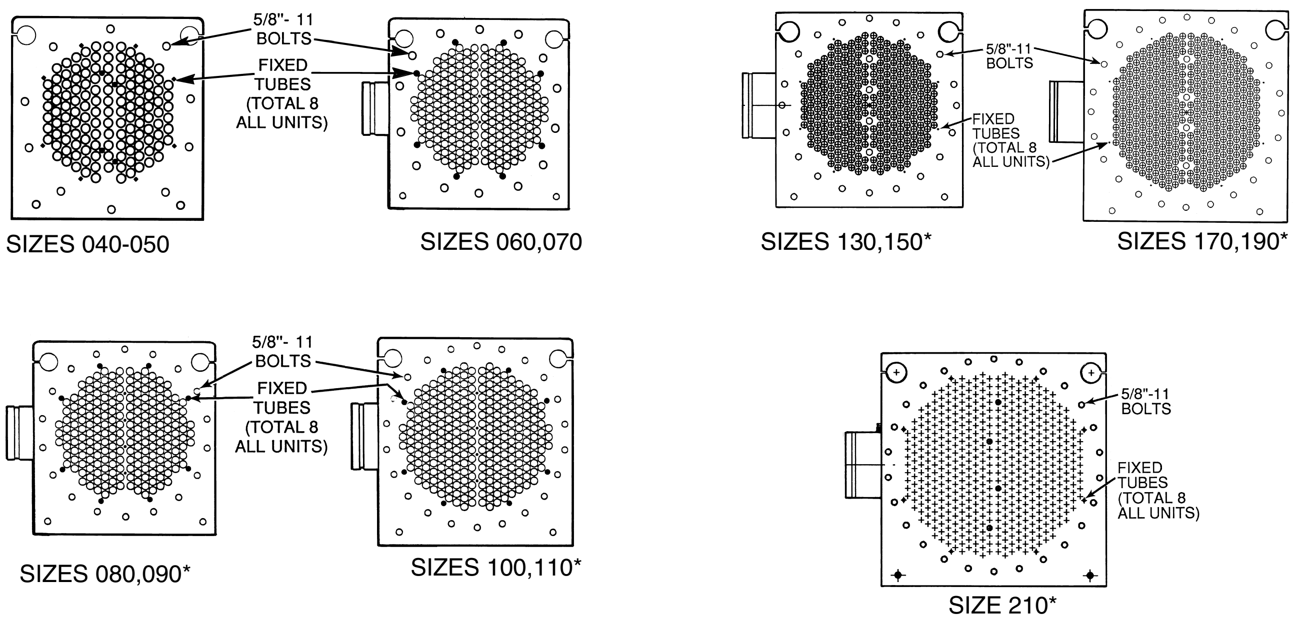


Fig. 24 — Cooler Thermistor Locations



*And associated modular units (see Tables 1A and 1B).

Fig. 25 — Typical Tube Sheets, Cover Off (Non-Removable Tubes)

Tube Plugging — A leaky tube can be plugged until retubing can be done. The number of tubes plugged determines how soon cooler *must* be retubed. Tubes plugged in the following locations will affect the performance of the unit: Any tube in the area, particularly the tube that thermistor T2 is adjacent to, will affect unit reliability and performance. Thermistor T2 is used in the freeze protection algorithm for the controller. If several tubes require plugging, check with your local Carrier representative to find out how number and location can affect unit capacity.

Figure 26 shows an Elliott tube plug and a cross-sectional view of a plug in place.

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

Retubing (See Table 31) — When retubing is to be done, obtain service of qualified personnel experienced in boiler maintenance and repair. Most standard procedures can be followed when retubing the 10HB coolers. An 8% crush is recommended when rolling replacement tubes into the tubesheet. An 8% crush can be achieved by setting the torque on the gun at 48 to 50 in.-lb (5.4 to 5.6 N-m).

The following Elliott Co. tube rolling tools are required:

B3400 Expander Assembly
B3401 Cage
B3405 Mandrel
B3408 Rolls

Place one drop of Loctite No. 675 or equivalent on top of tube prior to rolling. This material is intended to “wick” into the area of the tube that is not rolled into the tube sheet, and prevent fluid from accumulating between the tube and the tube sheet.

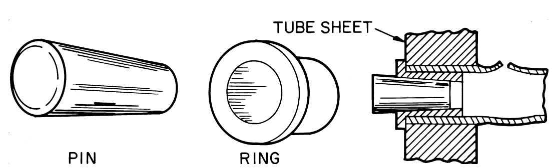


Fig. 26 — Elliott Tube Plug

Table 31 — Plugs

COMPONENTS FOR PLUGGING	PART NUMBER
For Tubes **Brass Pin**	853103-500*
Brass Ring	853002-570*
For Holes without Tubes **Brass Pin**	853103-1*
Brass Ring	853002-631*
Loctite	No. 675†
Locquic	“N”†

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

Tube information follows:

	in.	mm
• Tube sheet hole diameter	0.631	16.03
• Tube OD	0.625	15.87
• Tube ID after rolling. (includes expansion due to clearance)	0.581 to 0.588	14.76 to 14.94

NOTE: Tubes next to gasket webs must be flush with tube sheet (both ends).

Tightening Cooler Head Bolts

Gasket Preparation — When reassembling cooler heads, always use new gaskets. Gaskets are neoprene-based and are brushed with a light film of compressor oil. *Do not soak gasket or gasket deterioration will result.* Use new gaskets within 30 minutes to prevent deterioration. Reassemble cooler nozzle end or plain end cover of the cooler with the gaskets. Torque all cooler bolts to the following specification and sequence:

$^5/_8$-in. Diameter Perimeter Bolts . . . . 150 to 170 ft-lb (201 to 228 N-m)

$^1/_2$-in. Diameter Flange Bolts . . . . 70 to 90 ft-lb (94 to 121 N-m)

1. Install all bolts finger tight.
2. Bolt tightening sequence is outlined in Fig. 27. Follow the numbering or lettering sequence so that pressure is evenly applied to gasket.

3. Apply torque in one-third steps until required torque is reached. Load *all* bolts to each one-third step before proceeding to next one-third step.
4. No less than one hour later, retighten all bolts to required torque values.
5. After refrigerant is restored to system, check for refrigerant leaks with soap solution or Halide device.
6. Replace cooler insulation.

Condenser Coils

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

⚠ CAUTION

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

CLEANING E-COATED COILS — Follow the outlined procedure below for proper care, cleaning and maintenance of E-coated aluminum or copper fin coils:

Coil Maintenance and Cleaning Recommendations — Routine cleaning of coil surfaces is essential to maintain proper operation of the unit. Elimination of contamination and removal of harmful residues will greatly increase the life of the coil and extend the life of the unit.

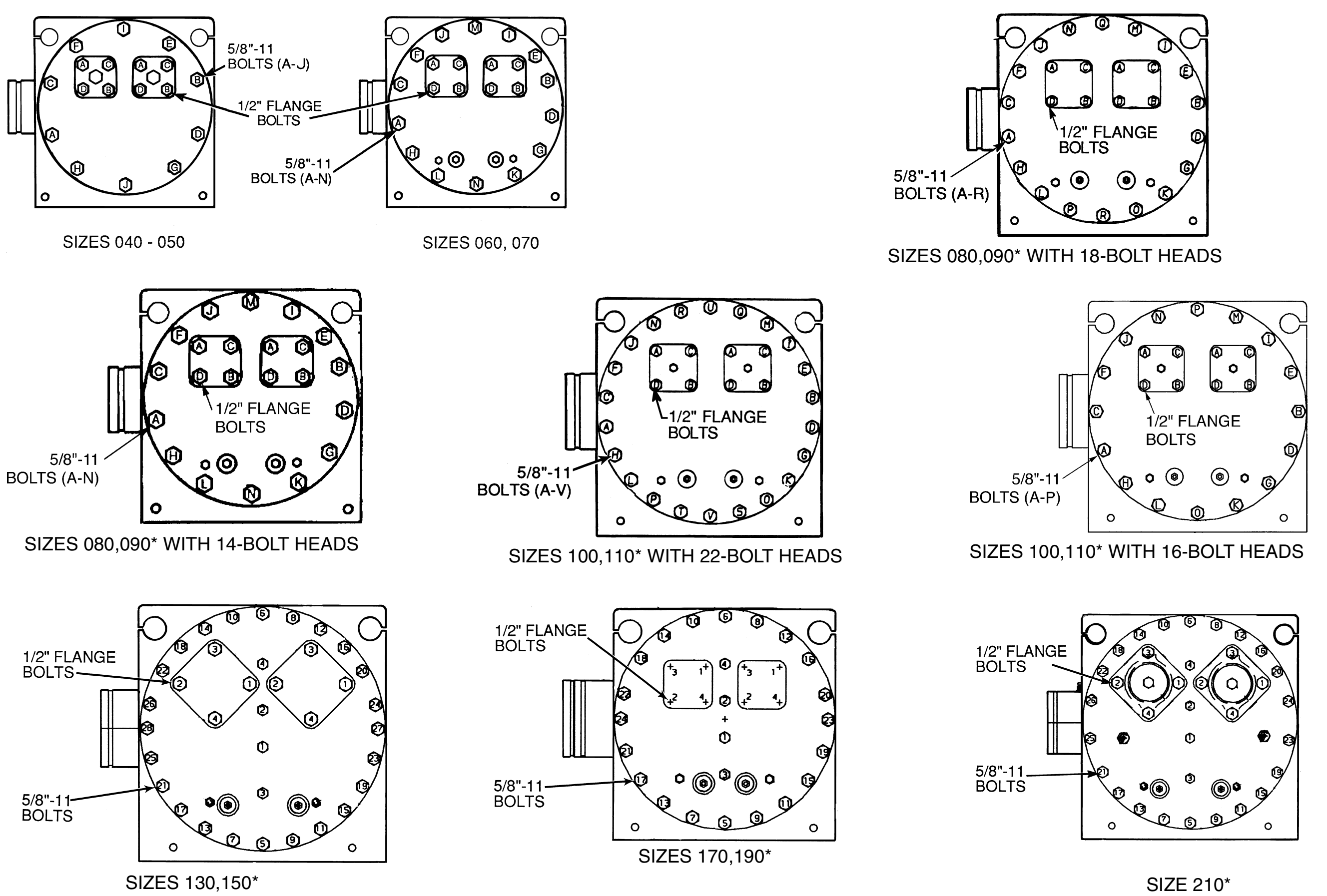
Remove Surface Loaded Fibers — Surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges bent over) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

Periodic Clean Water Rinse — A periodic clean water rinse is very beneficial for coils that are applied in coastal or industrial environments. However, it is very important that the water rinse is made with very low velocity water stream to avoid damaging the fin edges. Monthly cleaning as described below is recommended.

Routine Cleaning of Coil Surfaces — Monthly cleaning with *Enviro-Shield*™ Coil cleaner is essential to extend the life of coils. It is recommended that all coils, including standard aluminum, pre-coated, copper/copper or E-coated coils are cleaned with the *Enviro-Shield* Coil Cleaner as described below. Coil cleaning should be part of the units regularly scheduled maintenance procedures to ensure long life of the coil. Failure to clean the coils may result in reduced durability in the environment.

Enviro-Shield Coil Cleaner is non-flammable, hypoallergenic, non-bacterial, USDA accepted biodegradable and 100% ecologically safe agent that will not harm the coil or surrounding components such as electrical wiring, painted metal surfaces or insulation. Use of non-recommended coil cleaners is strongly discouraged since coil and unit durability could be affected.



*And associated modular units.

Fig. 27 — Cooler Head Bolt Tightening Sequence (Typical Tube Sheet)

Enviro-Shield™ Coil Cleaner Application Equipment

- $2^1/_2$ Gallon Garden Sprayer
- Water Rinse with Low Velocity Spray Nozzle

Enviro-Shield Coil Cleaner Application Instructions

- Although *Enviro-Shield* Coil cleaner is harmless to humans, animals, and marine life, proper eye protection such as safety glasses is recommended during mixing and application.
- Remove all surface loaded fibers and dirt with a vacuum cleaner as described above.
- Thoroughly wet finned surfaces with clean water and a low velocity garden hose being careful not to bend fins.
- Mix *Enviro-Shield* Coil Cleaner in a $2^1/_2$ gallon garden sprayer according to the instructions included with the Enzyme Cleaner. The optimum solution temperature is 100 F.

NOTE: DO NOT USE water in excess of 130 F as the enzymatic activity will be destroyed.

- Thoroughly apply *Enviro-Shield* Coil cleaner solution to all coil surfaces including finned area, tube sheets and coil headers.
- Hold garden sprayer nozzle close to finned areas and apply cleaner with a vertical, up-and-down motion. Avoid spraying in horizontal pattern to minimize potential for fin damage.
- Ensure cleaner thoroughly penetrates deep into finned areas.
- Interior and exterior finned areas must be thoroughly cleaned.
- Finned surfaces should remain wet with cleaning solution for 10 minutes.
- Ensure surfaces are not allowed to dry before rinsing. Reapply cleaner as needed to ensure 10-minute saturation is achieved.
- Thoroughly rinse all surfaces with low velocity clean water using downward rinsing motion of water spray nozzle. Protect fins from damage from the spray nozzle.

⚠ CAUTION

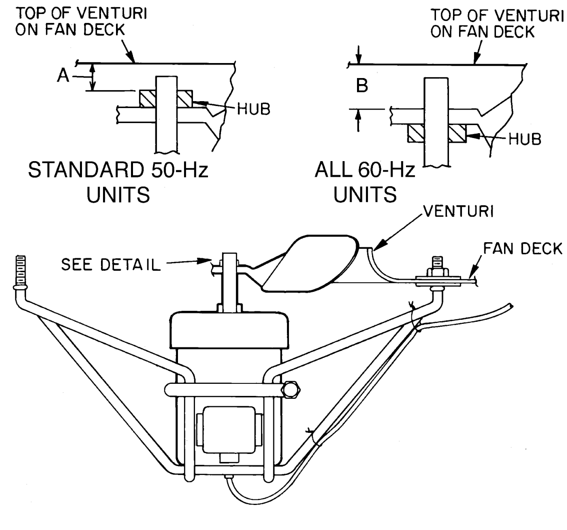
Harsh Chemical and Acid Cleaners — Harsh chemical, household bleach or acid cleaners should not be used to clean outdoor or indoors coils of any kind. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the *Enviro-Shield* Coil Cleaner as described above.

High Velocity Water or Compressed Air — High velocity water from a pressure washer, garden hose or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase airside pressure drop. Reduced unit performance or nuisance unit shutdown may occur.

Condenser Fans — Each fan is supported by a formed wire mount bolted to fan deck and covered with a wire guard. The exposed end of fan motor shaft is protected from weather by grease. If fan motor must be removed for service or replacement, be sure to regrease fan shaft and reinstall fan guard. For proper performance, fan should be positioned as in Fig. 28A and 28B (standard and low-noise applications). Tighten setscrews to 15 ± 1 ft-lb (20 ± 1.3 N-m).

If the unit is equipped with the high-static fan option, the fan must be set from the top of the fan deck to the plastic ring or center of the fan to a distance of 2.13 in. ± 0.12 in. (54 ± 3 mm). This is different from standard fans, since there is no area available to measure from the top of the orifice ring to the fan hub itself. See Fig. 29.

IMPORTANT: Check for proper fan rotation (clockwise viewed from above). If necessary, switch any 2 power leads to reverse fan rotation.



DIMENSION	FAN TYPE	
	Standard	Low Noise 60 Hz Only (Optional)
A	0.50” (13 mm)	1.50” (38 mm)
B	0.88” (22 mm)	1.13” (29 mm)

NOTE: Fan rotation is clockwise as viewed from top of unit.

Fig. 28A — Condenser Fan Adjustment — Standard 50 and 60 Hz Units and 60 Hz Low Noise Fan Option Units

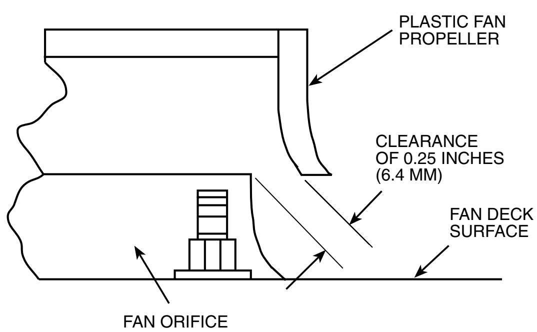
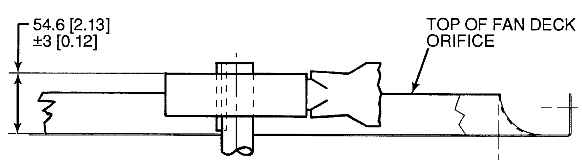


Fig. 28B — Condenser Fan Adjustment — 50 Hz Low Noise Fan Option Units



NOTE: Dimensions are in millimeters. Dimensions in [ ] are in inches.

Fig. 29 — Condenser Fan Adjustment, Units with High-Static Fan Operation

Refrigerant Feed Components — Each circuit has all necessary refrigerant controls.

ELECTRONIC EXPANSION VALVE (EXV) — A cut-away view of valve is shown in Fig. 30.

High-pressure liquid refrigerant enters valve through bottom. A series of calibrated slots have been machined 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, a sleeve moves up and down over orifice and modulates orifice size. A sleeve is moved by a linear stepper motor. Stepper motor moves in increments and is controlled directly by EXV module. As stepper motor rotates, motion is transferred into linear movement by lead screw. Through stepper motor and lead screw, 1500 discrete steps of motion are obtained. The large number of steps and long stroke results in very accurate control of refrigerant flow. The minimum position for operation is 120 steps.

The EXV module controls the valve. The lead compressor in each circuit has a thermistor located in the suction manifold after the compressor motor and a thermistor located in a well where the refrigerant enters the cooler. The thermistors measure the temperature of the superheated gas entering the compressor cylinders and the temperature of the refrigerant entering the cooler. The difference between the temperature of the superheated gas and the cooler suction temperature is the superheat. The EXV module controls the position of the electronic expansion valve stepper motor to maintain superheat set point.

The superheat leaving cooler is approximately 3° to 5° F (2° to 3° C), or less.

Because EXV status is communicated to the Main Base Board (MBB) and is controlled by the EXV modules (see Fig. 31), it is possible to track the valve position. By this means, head pressure is controlled and unit is protected against loss of charge and a faulty valve. During initial start-up, EXV is fully closed. After initialization period, valve position is tracked by the EXV module by constantly monitoring amount of valve movement.

The EXV is also used to limit cooler saturated suction temperature to 50 F (10 C). This makes it possible for the chiller to start at higher cooler fluid temperatures without overloading the compressor. This is commonly referred to as MOP (maximum operating pressure).

If it appears that EXV is not properly controlling circuit operation to maintain correct superheat, there are a number of checks that can be made using test functions and initialization features built into the microprocessor control. See Service Test section on page 29 to test EXVs.

NOTE: The EXV orifice is a screw-in type and may be removed for inspection and cleaning. Once the motor canister is removed the orifice can be removed by using the orifice removal tool (part no. TS429). A slot has been cut in the top of the orifice to facilitate removal. Turn orifice counterclockwise to remove. A large screwdriver may also be used.

When cleaning or reinstalling orifice assembly be careful not to damage orifice assembly seals. The bottom seal acts as a liquid shut-off, replacing a liquid line solenoid valve. If the bottom seal should become damaged it can be replaced. Remove the orifice. Remove the old seal. Using the orifice as a guide, add a small amount of O-ring grease, to the underside of the orifice. Be careful not to plug the vent holes. Carefully set the seal with the O-ring into the orifice. The O-ring grease will hold the seal in place. If the O-ring grease is not used, the seal O-ring will twist and bind when the orifice is screwed into the EXV base. Install the orifice and seal assembly. Remove the orifice to verify that the seal is properly positioned. Clean any O-ring grease from the bottom of the orifice. Reinstall the orifice and tighten to 100 in.-lb (11 N-m). Apply a small amount of O-ring grease to the housing seal O-ring before installing the motor canister. Reinstall the motor canister assembly. Tighten the motor nut to 15 to 25 ft-lb (20 to 34 N-m).

Check EXV operation using test functions described in the Service Test section on page 29.

MOISTURE-LIQUID INDICATOR — Clear flow of liquid refrigerant indicates sufficient charge in system. Bubbles in the sight glass indicate undercharged system or presence of non-condensables. Moisture in system measured in parts per million (ppm), changes color of indicator:

Green — moisture is below 45 ppm;
Yellow-green (chartreuse) — 45 to 130 ppm (caution);
Yellow (wet) — above 130 ppm.

Change filter drier at first sign of moisture in system.

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

FILTER DRIER — Whenever moisture-liquid indicator shows presence of moisture, replace filter drier(s). There is one filter drier on each circuit. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants, for details on servicing filter driers.

LIQUID LINE SOLENOID VALVE — All TXV units have a liquid line solenoid valve to prevent liquid refrigerant migration to low side of system during the off cycle.

LIQUID LINE SERVICE VALVE — This valve is located immediately ahead of filter drier, and has a 1/4-in. Schrader connection for field charging. In combination with compressor discharge service valve, each circuit can be pumped down into the high side for servicing.

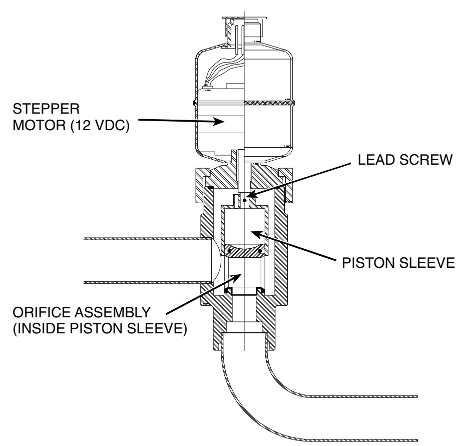
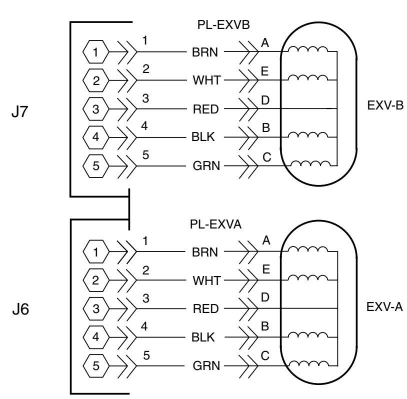


Fig. 30 — Electronic Expansion Valve (EXV)



ELECTRONIC EXPANSION VALVES (EXVs)

Fig. 31 — Printed Circuit Board Connector

Thermistors — Electronic control uses 4 to 10 thermistors to sense temperatures used to control the operation of chiller.

Thermistors T1-T9 vary in their temperature vs resistance and voltage drop performance. Thermistor T10 is a 10 kΩ input channel and has a different set of temperature vs resistance and voltage drop performance. Resistances at various temperatures are listed in Tables 32A-33B.

LOCATION — General locations of thermistor sensors are shown in Fig. 7-10. See Table 2 for pin connection points.

> **⚠ CAUTION**
>
> Sensor T2 is installed directly in the fluid circuit. Relieve all pressure or drain fluid before removing.

REPLACING THERMISTOR T2

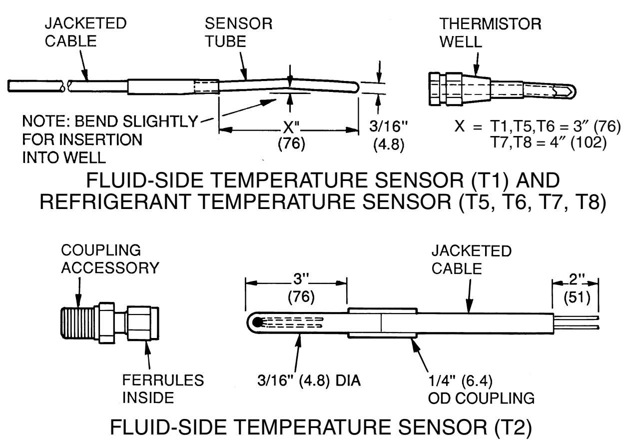
1. Remove and discard original sensor and coupling. Do not disassemble new coupling. Install assembly as received. See Fig. 32.
2. Apply pipe sealant to $^{1}/_{4}$-in. NPT threads on replacement coupling, and install in place of original. Do not use the packing nut to tighten coupling. Damage to ferrules will result.
3. Thermistor T2 (entering fluid temperature) should not be touching an internal refrigerant tube, but should be close enough to sense a freeze condition. Recommended distance is $^{1}/_{8}$ in. (3.2 mm) from cooler tube. Tighten packing nut finger tight to position ferrules, then tighten $1^{1}/_{4}$ turns more using a back-up wrench. Ferrules are now attached to the sensor, which can be withdrawn from coupling for service.

REPLACING THERMISTORS T1, T5, T6, T7, AND T8 — Add a small amount of thermal conductive grease to thermistor well. Thermistors are friction-fit thermistors, which must be slipped into wells located in the cooler leaving fluid nozzle for T1, in the cooler head for T5 and T6 (EXV units only), and in the compressor pump end for T7 and T8 (EXV units only).

THERMISTORS T3 AND T4 — These thermistors are located on header end of condenser coil. They are clamped on a return bend.

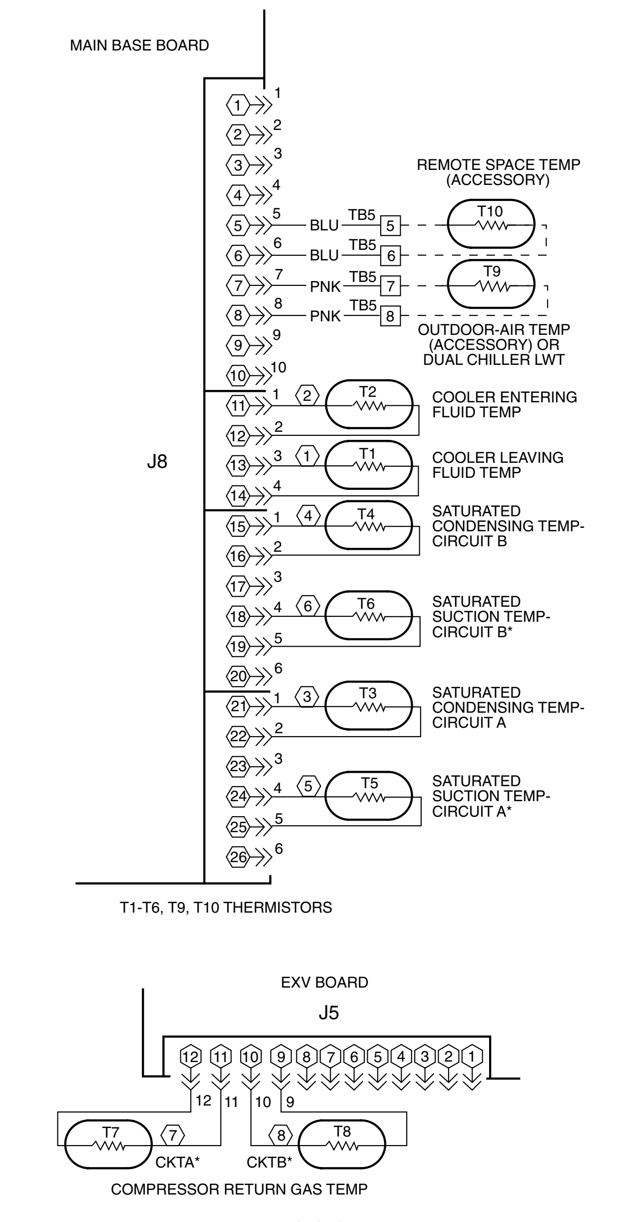
THERMISTOR/TEMPERATURE SENSOR CHECK — A high quality digital volt-ohmmeter is required to perform this check.

1. Connect the digital voltmeter across the appropriate thermistor terminals at the J8 terminal strip on the Main Base Board for thermistors T1-T6, T9, T10; or the J5 terminal strip on the EXV Board for thermistors T7 and T8 (see Fig. 33). Using the voltage reading obtained, read the sensor temperature from Tables 32A-33B. To check thermistor accuracy, measure temperature at probe location with an accurate thermocouple-type temperature measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be close, ± 5° F (3° C) if care was taken in applying thermocouple and taking readings.
2. If a more accurate check is required, unit must be shut down and thermistor removed and checked at a known temperature (freezing point or boiling point of water) using either voltage drop measured across thermistor at the J8 or J5 terminals, by determining the resistance with chiller shut down and thermistor disconnected from J8 or J5. Compare the values determined with the value read by the control in the Temperatures mode using the Marquee display.



NOTE: Dimensions in ( ) are in millimeters.

Fig. 32 — Thermistors (Temperature Sensors)



LEGEND

LWT — Leaving Fluid Temperature

*Not used on units with TXV (Thermostatic Expansion Valve) FIOP (Factory-Installed Option).

Fig. 33 — Thermistor Connections to J5 and J8 Processor Boards

Table 32A — 5K Thermistor Temperature (F) vs Resistance/Voltage

VOLTAGE DROP A FOR THERMISTORS T1, T2, T7-T9
VOLTAGE DROP B FOR THERMISTORS T3-T6

TEMP (F)	VOLTAGE DROP A (V)	VOLTAGE DROP B (V)	RESISTANCE (Ohms)
–25	3.699	4.538	98,010
–24	3.689	4.523	94,707
–23	3.679	4.508	91,522
–22	3.668	4.493	88,449
–21	3.658	4.476	85,486
–20	3.647	4.460	82,627
–19	3.636	4.444	79,871
–18	3.624	4.427	77,212
–17	3.613	4.409	74,648
–16	3.601	4.391	72,175
–15	3.588	4.373	69,790
–14	3.576	4.354	67,490
–13	3.563	4.335	65,272
–12	3.550	4.316	63,133
–11	3.536	4.296	61,070
–10	3.523	4.276	59,081
–9	3.509	4.255	57,162
–8	3.494	4.234	55,311
–7	3.480	4.213	53,526
–6	3.465	4.191	51,804
–5	3.450	4.169	50,143
–4	3.434	4.146	48,541
–3	3.418	4.123	46,996
–2	3.402	4.100	45,505
–1	3.386	4.076	44,066
0	3.369	4.052	42,679
1	3.352	4.027	41,339
2	3.335	4.002	40,047
3	3.317	3.976	38,800
4	3.299	3.951	37,596
5	3.281	3.924	36,435
6	3.262	3.898	35,313
7	3.243	3.871	34,231
8	3.224	3.844	33,185
9	3.205	3.816	32,176
10	3.185	3.788	31,202
11	3.165	3.760	30,260
12	3.145	3.731	29,351
13	3.124	3.702	28,473
14	3.103	3.673	27,624
15	3.082	3.643	26,804
16	3.060	3.613	26,011
17	3.038	3.583	25,245
18	3.016	3.552	24,505
19	2.994	3.522	23,789
20	2.972	3.490	23,096
21	2.949	3.459	22,427
22	2.926	3.428	21,779
23	2.903	3.396	21,153
24	2.879	3.364	20,547
25	2.856	3.331	19,960
26	2.832	3.299	19,393
27	2.808	3.266	18,843
28	2.784	3.234	18,311
29	2.759	3.201	17,796
30	2.735	3.168	17,297
31	2.710	3.134	16,814
32	2.685	3.101	16,346
33	2.660	3.068	15,892
34	2.634	3.034	15,453
35	2.609	3.000	15,027
36	2.583	2.966	14,614
37	2.558	2.933	14,214
38	2.532	2.899	13,826
39	2.506	2.865	13,449
40	2.480	2.831	13,084
41	2.454	2.797	12,730
42	2.428	2.764	12,387
43	2.402	2.730	12,053
44	2.376	2.696	11,730
45	2.349	2.662	11,416
46	2.323	2.628	11,112
47	2.296	2.594	10,816
48	2.270	2.561	10,529
49	2.244	2.527	10,250
50	2.217	2.494	9,979
51	2.191	2.461	9,717
52	2.165	2.427	9,461
53	2.138	2.395	9,213
54	2.112	2.362	8,973
55	2.086	2.329	8,739
56	2.060	2.296	8,511
57	2.034	2.264	8,291
58	2.008	2.232	8,076
59	1.982	2.200	7,686
60	1.956	2.168	7,665
61	1.930	2.137	7,468
62	1.905	2.105	7,277
63	1.879	2.074	7,091
64	1.854	2.043	6,911
65	1.829	2.013	6,735
66	1.804	1.982	6,564
67	1.779	1.952	6,399
68	1.754	1.923	6,238
69	1.729	1.893	6,081
70	1.705	1.864	5,929
71	1.681	1.835	5,781
72	1.656	1.806	5,637
73	1.632	1.778	5,497
74	1.609	1.749	5,361
75	1.585	1.722	5,229
76	1.562	1.694	5,101
77	1.538	1.667	4,976
78	1.516	1.640	4,855
79	1.493	1.613	4,737
80	1.470	1.587	4,622
81	1.448	1.561	4,511
82	1.426	1.535	4,403
83	1.404	1.510	4,298
84	1.382	1.485	4,196
85	1.361	1.460	4,096
86	1.340	1.436	4,000
87	1.319	1.412	3,906
88	1.298	1.388	3,814
89	1.278	1.365	3,726
90	1.257	1.342	3,640
91	1.237	1.319	3,556
92	1.217	1.296	3,474
93	1.198	1.274	3,395
94	1.179	1.253	3,318
95	1.160	1.231	3,243
96	1.141	1.210	3,170
97	1.122	1.189	3,099
98	1.104	1.169	3,031
99	1.086	1.148	2,964
100	1.068	1.128	2,898
101	1.051	1.109	2,835
102	1.033	1.089	2,773
103	1.016	1.070	2,713
104	0.999	1.051	2,655
105	0.983	1.033	2,597
106	0.966	1.015	2,542
107	0.950	0.997	2,488
108	0.934	0.980	2,436
109	0.918	0.963	2,385
110	0.903	0.946	2,335
111	0.888	0.929	2,286
112	0.873	0.913	2,239
113	0.858	0.896	2,192
114	0.843	0.881	2,147
115	0.829	0.865	2,103
116	0.815	0.850	2,060
117	0.801	0.835	2,018
118	0.787	0.820	1,977
119	0.774	0.805	1,937
120	0.761	0.791	1,898
121	0.748	0.777	1,860
122	0.735	0.763	1,822
123	0.723	0.750	1,786
124	0.710	0.736	1,750
125	0.698	0.723	1,715
126	0.686	0.710	1,680
127	0.674	0.698	1,647
128	0.663	0.685	1,614
129	0.651	0.673	1,582
130	0.640	0.661	1,550
131	0.629	0.650	1,519
132	0.618	0.638	1,489
133	0.608	0.627	1,459
134	0.597	0.616	1,430
135	0.587	0.605	1,401
136	0.577	0.594	1,373
137	0.567	0.584	1,345
138	0.557	0.573	1,318
139	0.548	0.563	1,291
140	0.538	0.553	1,265
141	0.529	0.543	1,240
142	0.520	0.534	1,214
143	0.511	0.525	1,190
144	0.502	0.515	1,165
145	0.494	0.506	1,141
146	0.485	0.497	1,118
147	0.477	0.489	1,095
148	0.469	0.480	1,072
149	0.461	0.471	1,050
150	0.453	0.463	1,029
151	0.445	0.455	1,007
152	0.438	0.447	986
153	0.430	0.449	965
154	0.423	0.432	945
155	0.416	0.424	925
156	0.408	0.417	906
157	0.402	0.410	887
158	0.395	0.403	868
159	0.388	0.396	850
160	0.381	0.389	832
161	0.375	0.382	815
162	0.369	0.376	798
163	0.362	0.369	782
164	0.356	0.363	765
165	0.350	0.357	750
166	0.344	0.351	734
167	0.339	0.345	719
168	0.333	0.339	705
169	0.327	0.333	690
170	0.322	0.327	677
171	0.317	0.322	663
172	0.311	0.316	650
173	0.306	0.311	638
174	0.301	0.306	626
175	0.296	0.301	614
176	0.291	0.295	602
177	0.286	0.291	591
178	0.282	0.286	581
179	0.277	0.281	570
180	0.272	0.276	561
181	0.268	0.272	551
182	0.264	0.267	542
183	0.259	0.263	533
184	0.255	0.258	524
185	0.251	0.254	516
186	0.247	0.250	508
187	0.243	0.246	501
188	0.239	0.242	494
189	0.235	0.238	487
190	0.231	0.234	480
191	0.228	0.230	473
192	0.224	0.226	467
193	0.220	0.223	461
194	0.217	0.219	456
195	0.213	0.216	450
196	0.210	0.212	445
197	0.206	0.209	439
198	0.203	0.205	434
199	0.200	0.202	429
200	0.197	0.199	424
201	0.194	0.196	419
202	0.191	0.192	415
203	0.188	0.189	410
204	0.185	0.186	405
205	0.182	0.183	401
206	0.179	0.181	396
207	0.176	0.178	391
208	0.173	0.175	386
209	0.171	0.172	382
210	0.168	0.169	377
211	0.165	0.167	372
212	0.163	0.164	367
213	0.160	0.162	361
214	0.158	0.159	356
215	0.155	0.157	350
216	0.153	0.154	344
217	0.151	0.152	338
218	0.148	0.150	332
219	0.146	0.147	325
220	0.144	0.145	318
221	0.142	0.143	311
222	0.140	0.141	304
223	0.138	0.138	297
224	0.135	0.136	289
225	0.133	0.134	282

Table 32B — 5K Thermistor Temperature (C) vs Resistance/Voltage (cont)

VOLTAGE DROP A FOR THERMISTORS T1, T2, T7-T9
VOLTAGE DROP B FOR THERMISTORS T3-T6

TEMP (C)	VOLTAGE DROP A (V)	VOLTAGE DROP B (V)	RESISTANCE (Ohms)
–32	3.705	4.547	100,260
–31	3.687	4.520	94,165
–30	3.668	4.493	88,480
–29	3.649	4.464	83,170
–28	3.629	4.433	78,125
–27	3.608	4.402	73,580
–26	3.586	4.369	69,250
–25	3.563	4.335	65,205
–24	3.539	4.300	61,420
–23	3.514	4.264	57,875
–22	3.489	4.226	54,555
–21	3.462	4.187	51,450
–20	3.434	4.146	48,536
–19	3.406	4.104	45,807
–18	3.376	4.061	43,247
–17	3.345	4.017	40,845
–16	3.313	3.971	38,592
–15	3.281	3.924	38,476
–14	3.247	3.876	34,489
–13	3.212	3.827	32,621
–12	3.177	3.777	30,866
–11	3.140	3.725	29,216
–10	3.103	3.673	27,633
–9	3.065	3.619	26,202
–8	3.025	3.564	24,827
–7	2.985	3.509	23,532
–6	2.945	3.453	22,313
–5	2.903	3.396	21,163
–4	2.860	3.338	20,079
–3	2.817	3.279	19,058
–2	2.774	3.221	18,094
–1	2.730	3.161	17,184
0	2.685	3.101	16,325
1	2.639	3.041	15,515
2	2.593	2.980	14,749
3	2.547	2.919	14,026
4	2.500	2.858	13,342
5	2.454	2.797	12,696
6	2.407	2.737	12,085
7	2.360	2.675	11,506
8	2.312	2.615	10,959
9	2.265	2.554	10,441
10	2.217	2.494	9,949
11	2.170	2.434	9,485
12	2.123	2.375	9,044
13	2.076	2.316	8,627
14	2.029	2.258	8,231

TEMP (C)	VOLTAGE DROP A (V)	VOLTAGE DROP B (V)	RESISTANCE (Ohms)
15	1.982	2.200	7,855
16	1.935	2.143	7,499
17	1.889	2.087	7,161
18	1.844	2.031	6,840
19	1.799	1.976	6,536
20	1.754	1.923	6,246
21	1.710	1.870	5,971
22	1.666	1.817	5,710
23	1.623	1.766	5,461
24	1.580	1.716	5,225
25	1.538	1.667	5,000
26	1.497	1.619	4,786
27	1.457	1.571	4,583
28	1.417	1.525	4,389
29	1.378	1.480	4,204
30	1.340	1.436	4,028
31	1.302	1.393	3,861
32	1.265	1.351	3,701
33	1.229	1.310	3,549
34	1.194	1.270	3,404
35	1.160	1.231	3,266
36	1.126	1.193	3,134
37	1.093	1.156	3,008
38	1.061	1.120	2,888
39	1.030	1.085	2,773
40	0.999	1.051	2,663
41	0.969	1.019	2,559
42	0.940	0.987	2,459
43	0.912	0.956	2,363
44	0.885	0.926	2,272
45	0.858	0.896	2,184
46	0.832	0.868	2,101
47	0.807	0.841	2,021
48	0.782	0.814	1,944
49	0.758	0.788	1,871
50	0.735	0.763	1,801
51	0.713	0.739	1,734
52	0.691	0.716	1,670
53	0.669	0.693	1,609
54	0.649	0.671	1,550
55	0.629	0.650	1,493
56	0.610	0.629	1,439
57	0.591	0.609	1,387
58	0.573	0.590	1,337
59	0.555	0.571	1,290
60	0.538	0.553	1,244
61	0.522	0.536	1,200

TEMP (C)	VOLTAGE DROP A (V)	VOLTAGE DROP B (V)	RESISTANCE (Ohms)
62	0.506	0.519	1,158
63	0.490	0.502	1,118
64	0.475	0.487	1,079
65	0.461	0.471	1,041
66	0.447	0.457	1,006
67	0.433	0.443	971
68	0.420	0.429	938
69	0.407	0.415	906
70	0.395	0.403	876
71	0.383	0.390	836
72	0.371	0.378	805
73	0.360	0.367	775
74	0.349	0.355	747
75	0.339	0.345	719
76	0.329	0.334	693
77	0.319	0.324	669
78	0.309	0.314	645
79	0.300	0.305	623
80	0.291	0.295	602
81	0.283	0.287	583
82	0.274	0.278	564
83	0.266	0.270	547
84	0.258	0.262	531
85	0.251	0.254	516
86	0.244	0.247	502
87	0.237	0.239	489
88	0.230	0.232	477
89	0.223	0.226	466
90	0.217	0.219	456
91	0.211	0.213	446
92	0.204	0.207	436
93	0.199	0.201	427
94	0.193	0.195	419
95	0.188	0.189	410
96	0.182	0.184	402
97	0.177	0.179	393
98	0.172	0.174	385
99	0.168	0.169	376
100	0.163	0.164	367
101	0.158	0.160	357
102	0.154	0.155	346
103	0.150	0.151	335
104	0.146	0.147	324
105	0.142	0.143	312
106	0.138	0.139	299
107	0.134	0.135	285

Table 33A — 10K Thermistor Temperatures (°F) vs Resistance/Voltage Drop (For Thermistor T10)

TEMP (F)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–25	4.758	196,453
–24	4.750	189,692
–23	4.741	183,300
–22	4.733	177,000
–21	4.724	171,079
–20	4.715	165,238
–19	4.705	159,717
–18	4.696	154,344
–17	4.686	149,194
–16	4.676	144,250
–15	4.665	139,443
–14	4.655	134,891
–13	4.644	130,402
–12	4.633	126,183
–11	4.621	122,018
–10	4.609	118,076
–9	4.597	114,236
–8	4.585	110,549
–7	4.572	107,006
–6	4.560	103,558
–5	4.546	100,287
–4	4.533	97,060
–3	4.519	94,020
–2	4.505	91,019
–1	4.490	88,171
0	4.476	85,396
1	4.461	82,729
2	4.445	80,162
3	4.429	77,662
4	4.413	75,286
5	4.397	72,940
6	4.380	70,727
7	4.363	68,542
8	4.346	66,465
9	4.328	64,439
10	4.310	62,491
11	4.292	60,612
12	4.273	58,781
13	4.254	57,039
14	4.235	55,319
15	4.215	53,693
16	4.195	52,086
17	4.174	50,557
18	4.153	49,065
19	4.132	47,627
20	4.111	46,240
21	4.089	44,888
22	4.067	43,598
23	4.044	42,324
24	4.021	41,118
25	3.998	39,926
26	3.975	38,790
27	3.951	37,681
28	3.927	36,610
29	3.903	35,577
30	3.878	34,569
31	3.853	33,606
32	3.828	32,654
33	3.802	31,752
34	3.776	30,860
35	3.750	30,009
36	3.723	29,177
37	3.697	28,373
38	3.670	27,597
39	3.654	26,838
40	3.615	26,113
41	3.587	25,396
42	3.559	24,715
43	3.531	24,042
44	3.503	23,399
45	3.474	22,770
46	3.445	22,161
47	3.416	21,573
48	3.387	20,998
49	3.357	20,447
50	3.328	19,903
51	3.298	19,386
52	3.268	18,874
53	3.238	18,384
54	3.208	17,904
55	3.178	17,441
56	3.147	16,991
57	3.117	16,552
58	3.086	16,131
59	3.056	15,714
60	3.025	15,317
61	2.994	14,925
62	2.963	14,549
63	2.932	14,180
64	2.901	13,824
65	2.870	13,478
66	2.839	13,139
67	2.808	12,814
68	2.777	12,493
69	2.746	12,187
70	2.715	11,884
71	2.684	11,593
72	2.653	11,308
73	2.622	11,031
74	2.592	10,764
75	2.561	10,501
76	2.530	10,249
77	2.500	10,000
78	2.470	9,762
79	2.439	9,526
80	2.409	9,300
81	2.379	9,078
82	2.349	8,862
83	2.319	8,653
84	2.290	8,448
85	2.260	8,251
86	2.231	8,056
87	2.202	7,869
88	2.173	7,685
89	2.144	7,507
90	2.115	7,333
91	2.087	7,165
92	2.059	6,999
93	2.030	6,838
94	2.003	6,683
95	1.975	6,530
96	1.948	6,383
97	1.921	6,238
98	1.894	6,098
99	1.867	5,961
100	1.841	5,827
101	1.815	5,698
102	1.789	5,571
103	1.763	5,449
104	1.738	5,327
105	1.713	5,210
106	1.688	5,095
107	1.663	4,984
108	1.639	4,876
109	1.615	4,769
110	1.591	4,666
111	1.567	4,564
112	1.544	4,467
113	1.521	4,370
114	1.498	4,277
115	1.475	4.185
116	1.453	4,096
117	1.431	4,008
118	1.409	3,923
119	1.387	3,840
120	1.366	3,759
121	1.345	3,681
122	1.324	3,603
123	1.304	3,529
124	1.284	3,455
125	1.264	3,383
126	1.244	3,313
127	1.225	3,244
128	1.206	3,178
129	1.187	3,112
130	1.168	3,049
131	1.150	2,986
132	1.132	2,926
133	1.114	2,866
134	1.096	2,809
135	1.079	2,752
136	1.062	2,697
137	1.045	2,643
138	1.028	2,590
139	1.012	2,539
140	0.996	2,488
141	0.980	2,439
142	0.965	2,391
143	0.949	2,343
144	0.934	2,297
145	0.919	2,253
146	0.905	2,209
147	0.890	2,166
148	0.876	2,124
149	0.862	2,083
150	0.848	2,043
151	0.835	2,003
152	0.821	1,966
153	0.808	1,928
154	0.795	1,891
155	0.782	1,855
156	0.770	1,820
157	0.758	1,786
158	0.745	1,752
159	0.733	1,719
160	0.722	1,687
161	0.710	1,656
162	0.699	1,625
163	0.687	1,594
164	0.676	1,565
165	0.666	1,536
166	0.655	1,508
167	0.645	1,480
168	0.634	1,453
169	0.624	1,426
170	0.614	1,400
171	0.604	1,375
172	0.595	1,350
173	0.585	1,326
174	0.576	1,302
175	0.567	1,278
176	0.558	1,255
177	0.549	1,233
178	0.540	1,211
179	0.532	1,190
180	0.523	1,169
181	0.515	1,148
182	0.507	1,128
183	0.499	1,108
184	0.491	1,089
185	0.483	1,070
186	0.476	1,052
187	0.468	1,033
188	0.461	1,016
189	0.454	998
190	0.447	981
191	0.440	964
192	0.433	947
193	0.426	931
194	0.419	915
195	0.413	900
196	0.407	885
197	0.400	870
198	0.394	855
199	0.388	841
200	0.382	827
201	0.376	814
202	0.370	800
203	0.365	787
204	0.359	774
205	0.354	762
206	0.349	749
207	0.343	737
208	0.338	725
209	0.333	714
210	0.328	702
211	0.323	691
212	0.318	680
213	0.314	670
214	0.309	659
215	0.305	649
216	0.300	639
217	0.296	629
218	0.292	620
219	0.288	610
220	0.284	601
221	0.279	592
222	0.275	583
223	0.272	574
224	0.268	566
225	0.264	557

Table 33B — 10K Thermistor Temperatures (°C) vs Resistance/Voltage Drop (For Thermistor T10)

TEMP (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
–32	4.762	200,510
–31	4.748	188,340
–30	4.733	177,000
–29	4.716	166,342
–28	4.700	156,404
–27	4.682	147,134
–26	4.663	138,482
–25	4.644	130,402
–24	4.624	122,807
–23	4.602	115,710
–22	4.580	109,075
–21	4.557	102,868
–20	4.533	97,060
–19	4.508	91,588
–18	4.482	86,463
–17	4.455	81,662
–16	4.426	77,162
–15	4.397	72,940
–14	4.367	68,957
–13	4.335	65,219
–12	4.303	61,711
–11	4.269	58,415
–10	4.235	55,319
–9	4.199	52,392
–8	4.162	49,640
–7	4.124	47,052
–6	4.085	44,617
–5	4.044	42,324
–4	4.003	40,153
–3	3.961	38,109
–2	3.917	36,182
–1	3.873	34,367
0	3.828	32,654
1	3.781	31,030
2	3.734	29,498
3	3.686	28,052
4	3.637	26,686
5	3.587	25,396
6	3,537	24,171
7	3.485	23,013
8	3.433	21,918
9	3.381	20,883
10	3.328	19,903
11	3.274	18,972
12	3.220	18,090
13	3.165	17,255
14	3.111	16,474
15	3.056	15,714
16	3.000	15,000
17	2.944	14,323
18	2.889	13,681
19	2.833	13,071
20	2.777	12,493
21	2.721	11,942
22	2.666	11,418
23	2.610	10,921
24	2.555	10,449
25	2.500	10,000
26	2.445	9,571
27	2.391	9,164
28	2.337	8,776
29	2.284	8,407
30	2.231	8,056
31	2.178	7,720
32	2.127	7,401
33	2.075	7,096
34	2.025	6,806
35	1.975	6,530
36	1.926	6,266
37	1.878	6,014
38	1.830	5,774
39	1.784	5,546
40	1.738	5,327
41	1.692	5,117
42	1.648	4,918
43	1.605	4,727
44	1.562	4,544
45	1.521	4,370
46	1.480	4,203
47	1.439	4,042
48	1.400	3,889
49	1.362	3,743
50	1.324	3,603
51	1.288	3,469
52	1.252	3,340
53	1.217	3,217
54	1.183	3,099
55	1.150	2,986
56	1.117	2,878
57	1.086	2,774
58	1.055	2,675
59	1.025	2,579
60	0.996	2,488
61	0.968	2,400
62	0.940	2,315
63	0.913	2,235
64	0.887	2,157
65	0.862	2,083
66	0.837	2,011
67	0.813	1,943
68	0.790	1,876
69	0.767	1,813
70	0.745	1,752
71	0.724	1,693
72	0.703	1,637
73	0.683	1,582
74	0.663	1,530
75	0.645	1,480
76	0.626	1,431
77	0.608	1,385
78	0.591	1,340
79	0.574	1,297
80	0.558	1,255
81	0.542	1,215
82	0.527	1,177
83	0.512	1,140
84	0.497	1,104
85	0.483	1,070
86	0.470	1,037
87	0.457	1,005
88	0.444	974
89	0.431	944
90	0.419	915
91	0.408	889
92	0.396	861
93	0.386	836
94	0.375	811
95	0.365	787
96	0.355	764
97	0.345	742
98	0.336	721
99	0.327	700
100	0.318	680
101	0.310	661
102	0.302	643
103	0.294	626
104	0.287	609
105	0.279	592
106	0.272	576
107	0.265	561

Safety Devices — Chillers contain many safety devices and protection logic built into electronic control. Following is a brief summary of major safeties.

COMPRESSOR PROTECTION

Circuit Breaker — One manual-reset, calibrated-trip magnetic circuit breaker for each compressor protects against overcurrent. Do not bypass or increase size of a breaker to correct problems. Determine cause for trouble and correct before resetting breaker. Circuit breaker must-trip amps (MTA) are listed on individual circuit breakers, and on unit label diagrams.

30GTN,R and 30GUN,R070 (50 Hz), 080-110 and 230B-315B Compressor Protection Board (CPCS) — The CPCS is used to control and protect compressors and crankcase heaters. Board provides following features:

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

One large relay is located on CPCS that controls crankcase heater and compressor contactor. In addition, this relay provides a set of contacts that the microprocessor monitors to determine operating status of compressor. If the MBB determines that compressor is not operating properly through signal contacts, control locks compressor off.

The CPCS contains logic that can detect if current-to-ground of any winding exceeds 2.5 amps; if so, compressor shuts down.

A high-pressure switch with a trip pressure of 426 ± 7 psig (2936 ± 48 kPa) is mounted on each compressor; switch setting is shown in Table 34. Switch is wired in series with the CPCS. If switch opens, CPCS relay opens, processor detects it through signal contacts, and compressor locks off. A loss-of-charge switch is also wired in series with the high-pressure switch and CPCS.

If any of these switches opens during operation, the compressor stops and the failure is detected by the MBB when signal contacts open. If lead compressor in either circuit is shut down by high-pressure switch, ground current protector, loss of charge switch, or oil pressure switch, all compressors in the circuit are locked off.

30GTN,R and 30GUN,R 130-210, 230A-315A and 330A/B-420A/B — A control relay in conjunction with a ground fault module replaces the function of the CPCS (above). To reset, press the push-button switch (near the Marquee display).

Table 34 — Pressure Switch Settings, psig (kPa)

SWITCH	CUTOUT	CUT-IN
High Pressure 30GTN,R Units	426 ± 7 (2936 ± 48)	320 ± 20 (2205 ± 138)
High Pressure 30GUN,R Units	280 ± 10 (1830 ± 69)	180 ± 20 (1240 ± 138)
Loss-of-Charge	7 (48.2)	22 (151.6)

LOW OIL PRESSURE PROTECTION — Lead compressor in each circuit is equipped with a switch to detect low oil pressure. Switch is connected directly to processor board. Switch is set to open at approximately 5 psig (35 kPa) and to close at 9 psig (62 kPa) maximum. If switch opens when compressor is running, CR or processor board stops all compressors in circuit. During start-up, switch is bypassed for 2 minutes.

CRANKCASE HEATERS — Each compressor has a 180-w crankcase heater to prevent absorption of liquid refrigerant by oil in crankcase when compressor is not running. Heater power source is auxiliary control power, independent of main unit power. This assures compressor protection even when main unit power disconnect switch is off.

> IMPORTANT: Never open any switch or disconnect that deenergizes crankcase heaters unless unit is being serviced or is to be shut down for a prolonged period. After a prolonged shutdown or service, energize crankcase heaters for 24 hours before starting unit.

COOLER PROTECTION

Freeze Protection — Cooler can be wrapped with heater cables as shown in Fig. 34, which are wired through an ambient temperature switch set at 36 F (2 C). Entire cooler is covered with closed-cell insulation applied over heater cables. Heaters plus insulation protect cooler against low ambient temperature freeze-up to 0° F (–18 C).

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

Low Fluid Temperature — Main Base Board is programmed to shut chiller down if leaving fluid temperature drops below 34 F (1.1 C) for water or more than 8° F (4.4° C) below set point for brine units. The unit will shut down without a pumpout. When fluid temperature rises to 6° F (3.3° C) above leaving fluid set point, safety resets and chiller restarts. Reset is automatic as long as this is the first occurrence.

Loss of Fluid Flow Protection — Main Base Board contains internal logic that protects cooler against loss of cooler flow. Entering and leaving fluid temperature sensors in cooler detect a no-flow condition. Leaving sensor is located in leaving fluid nozzle and entering sensor is located in first cooler baffle space in close proximity to cooler tubes, as shown in Fig. 34. When there is no cooler flow and the compressors start, leaving fluid temperature does not change. However, entering fluid temperature drops rapidly as refrigerant enters cooler through EXV. Entering sensor detects this temperature drop and when entering temperature is 3° F (1.6° C) below leaving temperature, unit stops and is locked off.

Loss-of-Charge — A pressure switch connected to high side of each refrigerant circuit protects against total loss-of-charge. Switch settings are listed in Table 34. If switch is open, unit cannot start; if it opens during operation, unit locks out and cannot restart until switch is closed. Low charge is also monitored by the processor when an EXV is used. The loss-of-charge switch is wired in series with the high-pressure switch on each circuit's lead compressor.

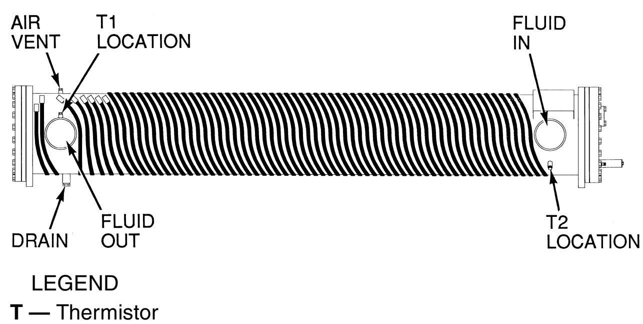


Fig. 34 — Cooler Heater Cables

Relief Devices — Fusible plugs are located in each circuit to protect against damage from excessive pressures.

HIGH-SIDE PROTECTION — One device is located between condenser and filter drier; a second is on filter drier. These are both designed to relieve pressure on a temperature rise to approximately 210 F (99 C).

LOW-SIDE PROTECTION — A device is located on suction line and is designed to relieve pressure on a temperature rise to approximately 170 F (77 C).

PRESSURE RELIEF VALVES (208/230, 460, 575 v; 60 Hz Units Only) — Valves are installed in each circuit (one per circuit). The valves are designed to relieve at 450 psig (3103 kPa). *These valves should not be capped*. If a valve relieves, it should be replaced. If valve is not replaced, it may relieve at a lower pressure, or leak due to trapped dirt from the system which may prevent resealing.

The pressure relief valves are equipped with a $^3/_8$-in. SAE flare for field connection. Some local building codes require that relieved gases be removed. This connection will allow conformance to this requirement.

Other Safeties — There are several other safeties that are provided by microprocessor control. For details refer to Alarms and Alerts section on page 48.

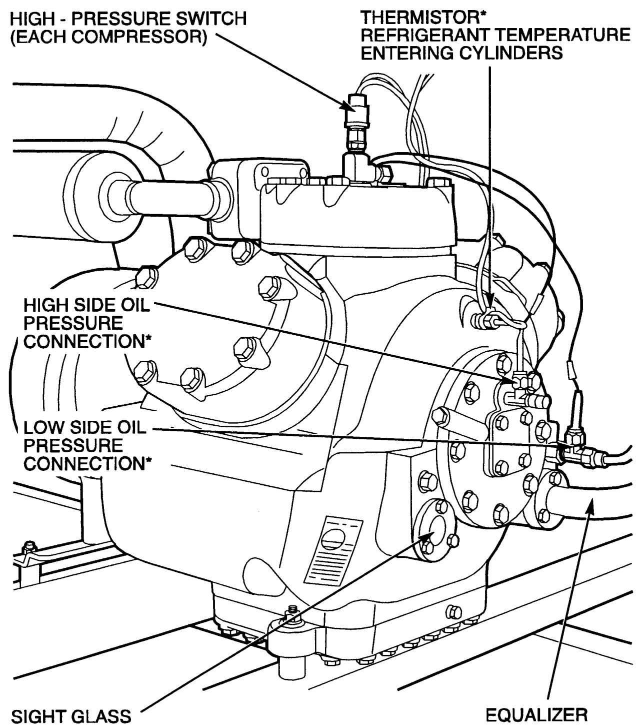
PRE-START-UP

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, complete Start-Up Checklist for *Comfort*Link™ Chiller Systems at end of this publication (page CL-1). The Checklist assures proper start-up of a unit, and provides a record of unit condition, application requirements, system information, and operation at initial start-up.

Do not attempt to start the chiller until following checks have been completed.

System Check

1. Check all auxiliary components, such as the chilled fluid circulating pump, air-handling equipment, or other equipment to which the chiller supplies liquid. Consult manufacturer's instructions. If the unit has field-installed accessories, be sure all are properly installed and wired correctly. Refer to unit wiring diagrams.
2. Backseat (open) compressor suction and discharge shutoff valves. Close valves one turn to allow refrigerant pressure to reach the test gages.
3. Open liquid line service valves.
4. Fill the chiller fluid circuit with clean water (with recommended inhibitor added) or other noncorrosive fluid to be cooled. Bleed all air out of high points of system. An air vent is included with the cooler. If outdoor temperatures are expected to be below 32 F (0° C), sufficient inhibited ethylene glycol or other suitable corrosion-inhibited antifreeze should be added to the chiller water circuit to prevent possible freeze-up.
5. Check tightness of all electrical connections.
6. Oil should be visible in the compressor sight glass. See Fig. 35. An acceptable oil level in the compressor is from $^1/_8$ in. to $^3/_8$ in. of sight glass. Adjust the oil level as required. No oil should be removed unless the crankcase heater has been energized for at least 24 hours. See Oil Charge section on page 53 for Carrier-approved oils.
7. Electrical power source must agree with unit nameplate.
8. *Crankcase heaters must be firmly locked into compressors, and must be on for 24 hours prior to start-up*.
9. Fan motors are 3 phase. Check rotation of fans during the service test. Fan rotation is clockwise as viewed from top of unit. If fan is not turning clockwise, reverse 2 of the power wires. For low noise fan option on 50 Hz chillers, fans rotate counterclockwise as viewed from top of unit. If fan is not turning counterclockwise, reverse 2 of the power wires.
10. Check compressor suspension. Mounting rails must be floating freely on the springs.
11. Perform service test to verify proper settings.



*Lead compressor only.

Fig. 35 — Compressor Connections (Lead Compressor Shown)

START-UP AND OPERATION

NOTE: Refer to Start-Up Checklist on pages CL-1 to CL-8.

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

1. Be sure all service valves are open. Units are shipped from factory with suction, discharge, and liquid line service valves closed.
2. Using the Marquee display, set leaving-fluid set point (CSP.1 is Set Point mode under sub-mode COOL). No cooling range adjustment is necessary.
3. If optional control functions or accessories are being used, the unit must be properly configured. Refer to Operating Data section for details.
4. Start chilled fluid pump.
5. Turn ENABLE/OFF/REMOTE CONTACT switch to ENABLE position.
6. Allow unit to operate and confirm that everything is functioning properly. Check to see that leaving fluid temperature agrees with leaving set point (CSP.1 or CSP.2), or if reset is used, with the control point (CTPT) in the Run Status mode under the sub-mode VIEW.

Operating Limitations

TEMPERATURES (See Table 35) — If unit is to be used in an area with high solar radiation, mounted position should be such that control box is not exposed to direct solar radiation. Exposure to direct solar radiation could affect the temperature switch controlling cooler heaters.

Table 35 — Temperature Limits for Standard Units

TEMPERATURE	F	C
Maximum Ambient Temperature	125	52
Minimum Ambient Temperature	0	–18
Maximum Cooler EWT*	95	35
Maximum Cooler LWT	70	21
Minimum Cooler LWT†	38	3.3

LEGEND

EWT — Entering Fluid (Water) Temperature
LWT — Leaving Fluid (Water) Temperature

*For sustained operation, EWT should not exceed 85 F (29.4 C).
†Unit requires modification below this temperature.

Low-Ambient Operation — If operating temperatures below 0° F (–18 C) are expected, refer to separate installation instructions for low-ambient operation using accessory Motormaster® III control. Contact your Carrier representative for details.

NOTE: Wind baffles and brackets must be field-fabricated for all units using accessory Motormaster III controls to ensure proper cooling cycle operation at low-ambient temperatures. See Installation Instructions shipped with the Motormaster III accessory for more details.

⚠ CAUTION

Brine duty application (below 38 F [3.3 C] LCWT) for chiller normally requires factory modification. Contact your Carrier representative for applicable LCWT range for standard water-cooled chiller in a specific application.

VOLTAGE

Main Power Supply — Minimum and maximum acceptable supply voltages are listed in the Installation Instructions.

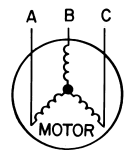
Unbalanced 3-Phase Supply Voltage — Never operate a motor where a phase imbalance between phases is greater than 2%. To determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from avg voltage}}{\text{average voltage}}$$

The maximum voltage deviation is the largest difference between a voltage measurement across 2 legs and the average across all 3 legs.

Example: Supply voltage is 240-3-60.

AB = 243 v
BC = 236 v
AC = 238 v



1. Determine average voltage:

$$\text{Average voltage} = \frac{243 + 236 + 238}{3} = \frac{717}{3} = 239$$

2. Determine maximum deviation from average voltage:

   (AB) 243 – 239 = 4 v
   (BC) 239 – 236 = 3 v
   (AC) 239 – 238 = 1 v

   Maximum deviation is 4 v.

3. Determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{239} = 1.7\%$$

This voltage imbalance is satisfactory as it is below the maximum allowable of 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately. Do not operate unit until imbalance condition is corrected.

Control Circuit Power — Electronic control includes logic to detect low control circuit voltage. Acceptable voltage ranges are shown in the Installation Instructions.

MINIMUM FLUID LOOP VOLUME — To obtain proper temperature control, loop fluid volume must be at least 3 gallons per ton (3.25 L per kW) of chiller nominal capacity for air conditioning and at least 6 gallons per ton (6.5 L per kW) for process applications or systems that must operate at low ambient temperatures (below 32 F [0° C]). Refer to application information in Product Data literature for details.

FLOW RATE REQUIREMENTS — Standard chillers should be applied with nominal flow rates approximating those listed in Table 36. Higher or lower flow rates are permissible to obtain lower or higher temperature rises. Minimum flow rates must be exceeded to assure turbulent flow and proper heat transfer in the cooler.

⚠ CAUTION

Operation below minimum flow rate could subject tubes to frost pinching in tube sheet, resulting in failure of cooler.

Consult application data section in the Product Data literature and job design requirements to determine flow rate requirements for a particular installation.

Table 36 — Nominal and Minimum Cooler Fluid Flow Rates

UNIT SIZE 30GTN,R AND 30GUN,R	NOMINAL FLOW RATE*		MINIMUM FLOW RATE (See Notes)	
	Gpm	L/s	Gpm	L/s
040	86	5.43	36.8	2.32
045	101	6.37	37.7	2.38
050	123	7.76	37.7	2.38
060	151	9.53	47.5	3.00
070	173	10.91	47.5	3.00
080,230B	192	12.11	66.7	4.20
090,245B	216	13.62	59.5	3.75
100,255B,270B	240	15.14	84.1	5.30
110,290B,315B	264	16.65	84.1	5.30
130	300	18.9	110	6.9
150,230A-255A	348	21.9	110	6.9
170,270A,330A/B, 360B (50 Hz)	384	24.2	120	7.5
190,290A,360A/B (60 Hz), 360A (50 Hz), 390B	432	27.2	120	7.5
210,315A,390A,420A/B	480	30.2	148	9.3

LEGEND

ARI — Air Conditioning and Refrigeration Institute
Gpm — Gallons per minute (U.S.)
L/s — Liters per second
N — Liters per kW
V — Gallons per ton

*Nominal flow rates required at ARI conditions are 44 F (6.7 C) leaving-fluid temperature, 54 F (12.2 C) entering-fluid temperature, 95 F(35 C) ambient. Fouling factor is .00001 $ft^2 \cdot hr \cdot F/Btu$ (.000018 $m^2 \cdot K/W$).

NOTES:
1. Minimum flow based on 1.0 fps (0.30 m/s) velocity in cooler without special cooler baffling.
2. Minimum Loop Volumes:
   Gallons = V x ARI Cap. in tons
   Liters = N x ARI Cap. in kW

APPLICATION	V	N
Normal Air Conditioning	3	3.25
Process Type Cooling	6 to 10	6.5 to 10.8
Low Ambient Unit Operation	6 to 10	6.5 to 10.8

Operation Sequence — During unit off cycle, crankcase heaters are energized. If ambient temperature is below 36 F (2 C), cooler heaters (if equipped) are energized.

The unit is started by putting the ENABLE/OFF/REMOTE CONTACT switch in ENABLE or REMOTE position. When the unit receives a call for cooling (either from the internal control or CCN network command or remote contact closure), the unit stages up in capacity to maintain the cooler fluid set point. The first compressor starts $1^1/_2$ to 3 minutes after the call for cooling.

The lead circuit can be specifically designated or randomly selected by the controls, depending on how the unit is field configured (for 040-070 sizes, Circuit A leads unless an accessory unloader is installed on Circuit B). A field configuration is also available to determine if the unit should stage up both circuits equally or load one circuit completely before bringing on the other.

When the lead circuit compressor starts, the unit starts with a pumpout routine. On units with the electronic expansion valve (EXV), compressor starts and continues to run with the EXV at minimum position for 10 seconds to purge the refrigerant lines and cooler of refrigerant. The EXV then moves to 23% and the compressor superheat control routine takes over, modulating the valve to feed refrigerant into the cooler.

On units with thermostatic expansion valve (TXV) (30GTN,R and 30GUN,R 040,045 units with brine option), head pressure control is based on set point control. When the lead compressor starts, the liquid line solenoid valve (LLSV) is kept closed for 15 seconds by a time delay relay. The microprocessor stages fans to maintain the set point temperature specified by the controller. There is no pumpout sequence during shutdown of TXV controlled chillers.

On all other units (EXV units), the head pressure is controlled by fan cycling. The desired head pressure set point is entered, and is controlled by EXV position or saturated condensing temperature measurement (T3 and T4). For proper operation, maintain set point of 113 F (45 C) as shipped from factory. The default head pressure control method is set point control. The head pressure control can also be set to EXV control or a combination of the 2 methods between circuits.

For all units, if temperature reset is being used, the unit controls to a higher leaving-fluid temperature as the building load reduces. If demand limit is used, the unit may temporarily be unable to maintain the desired leaving-fluid temperature because of imposed power limitations.

On EXV units, when the occupied period ends, or when the building load drops low enough, the lag compressors shut down. The lead compressors continue to run as the EXV closes, and until the conditions of pumpout are satisfied. If a fault condition is signaled requiring immediate shutdown, pumpout is omitted.

Loading sequence for compressors is shown in Tables 5A and 5B.

Refrigerant Circuit

LEAK TESTING — Units are shipped with complete operating charge of refrigerant R-22 for 30GTN,R and R-134a for 30GUN,R (see Physical Data tables supplied in the chiller's installation instructions) and should be under sufficient pressure to conduct a leak test. If there is no pressure in the system, introduce enough nitrogen to search for the leak. Repair the leak using good refrigeration practices. After leaks are repaired, system must be evacuated and dehydrated.

REFRIGERANT CHARGE (Refer to Physical Data tables supplied in the chiller's installation instructions) — Immediately ahead of filter drier in each circuit is a factory-installed liquid line service valve. Each valve has a $^1/_4$-in. Schrader connection for charging liquid refrigerant.

Charging with Unit Off and Evacuated — Close liquid line service valve before charging. Weigh in charge shown on unit nameplate (also in Physical Data tables supplied in the chiller's installation instructions). Open liquid line service valve; start unit and allow it to run several minutes fully loaded. Check for a clear sight glass. Be sure clear condition is liquid and not vapor.

Charging with Unit Running — If charge is to be added while unit is operating, all condenser fans and compressors must be operating. It may be necessary to block condenser coils at low ambient temperatures to raise condensing pressure to approximately 280 psig (1931 kPa) to turn all condenser fans on. Do not totally block a coil to do this. Partially block all coils in uniform pattern. Charge each circuit until sight glass shows clear liquid, then weigh in amount over a clear sight glass as listed in Physical data tables supplied in chiller's installation instructions.

> IMPORTANT: When adjusting refrigerant charge, circulate fluid through cooler continuously to prevent freezing and possible damage to the cooler. Do not overcharge, and never charge liquid into low-pressure side of system.

FIELD WIRING

Field wiring is shown in Fig. 36-41.

LEGEND FOR FIG. 36-41

ALM — Alarm
CWFS — Chilled Water Flow Switch
CWP — Chilled Water Pump
CWPI — Chilled Water Pump Interlock
CXB — Compressor Expansion Board
HGBPS — Hot Gas Bypass Switch
LWT — Leaving Fluid Temperature
MBB — Main Base Board
OAT — Outdoor-Air Temperature Sensor
SPT — Remote Space Temperature Sensor
SW — Switch
TB — Terminal Block
UL — Unloader
- - - - Field Supplied Wiring
——— Factory Wiring

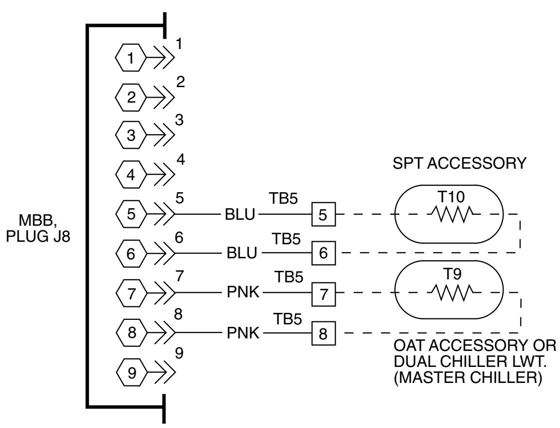


Fig. 36 — Accessory Sensor Control Wiring

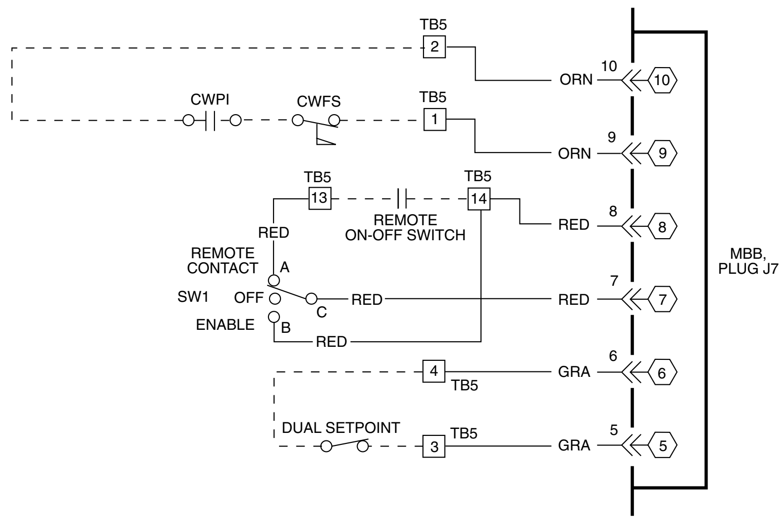


Fig. 37 — Control Wiring (24 V)

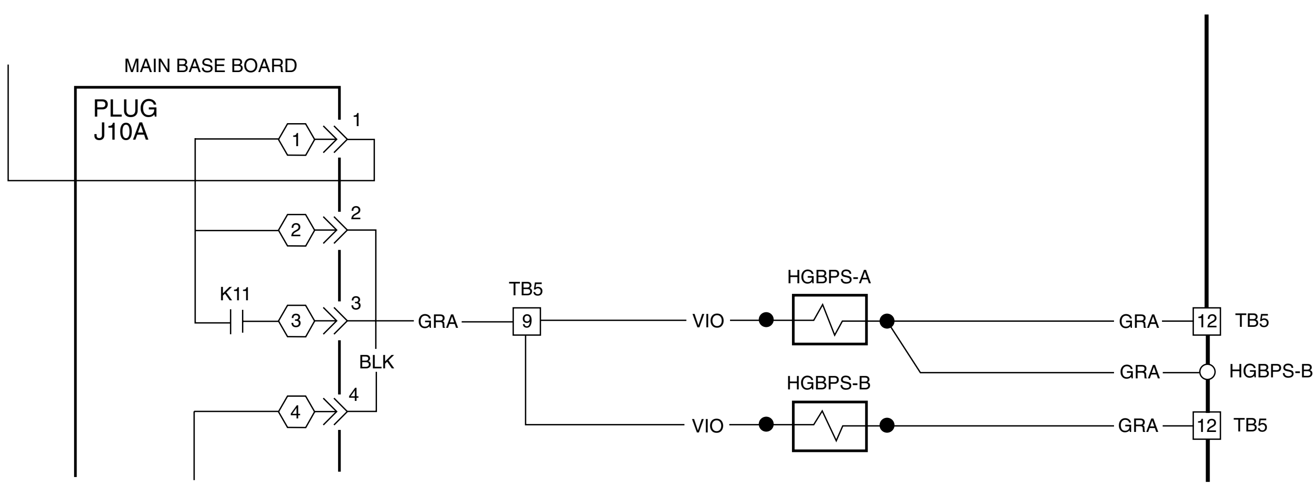


Fig. 38 — Hot Gas Bypass Control Wiring (115 V, 230 V)

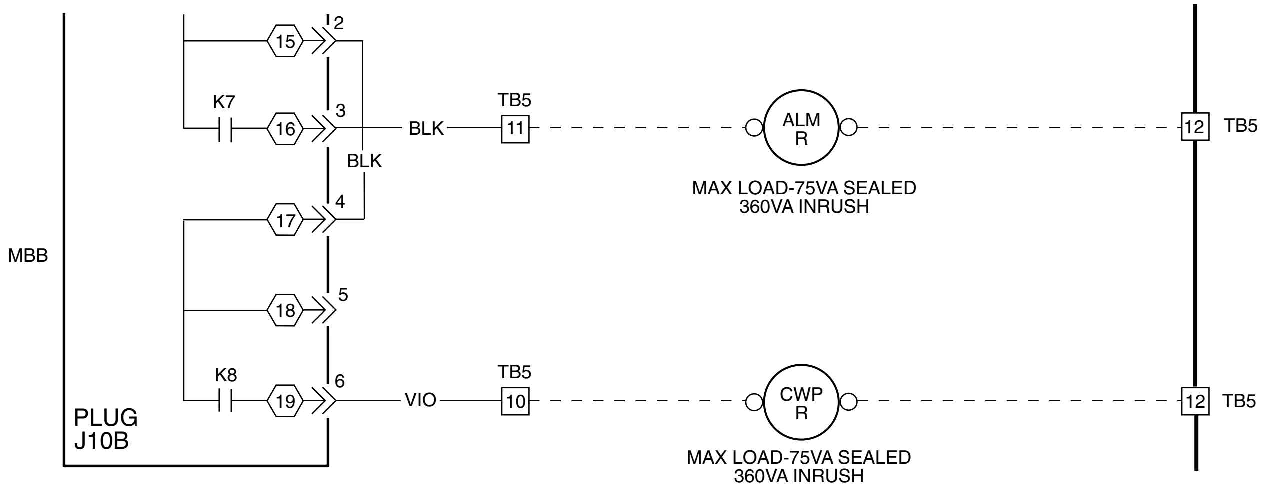


Fig. 39 — Chilled Water Pump Control Wiring and Remote Alarm 115 V Relay Wiring

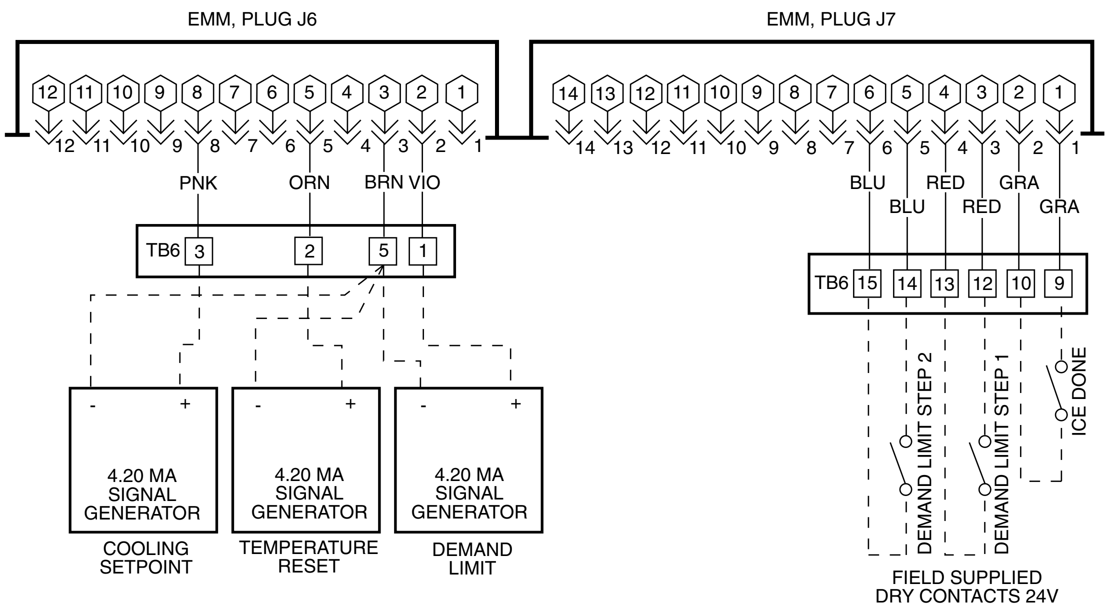


Fig. 40 — Energy Management Module (EMM) Wiring

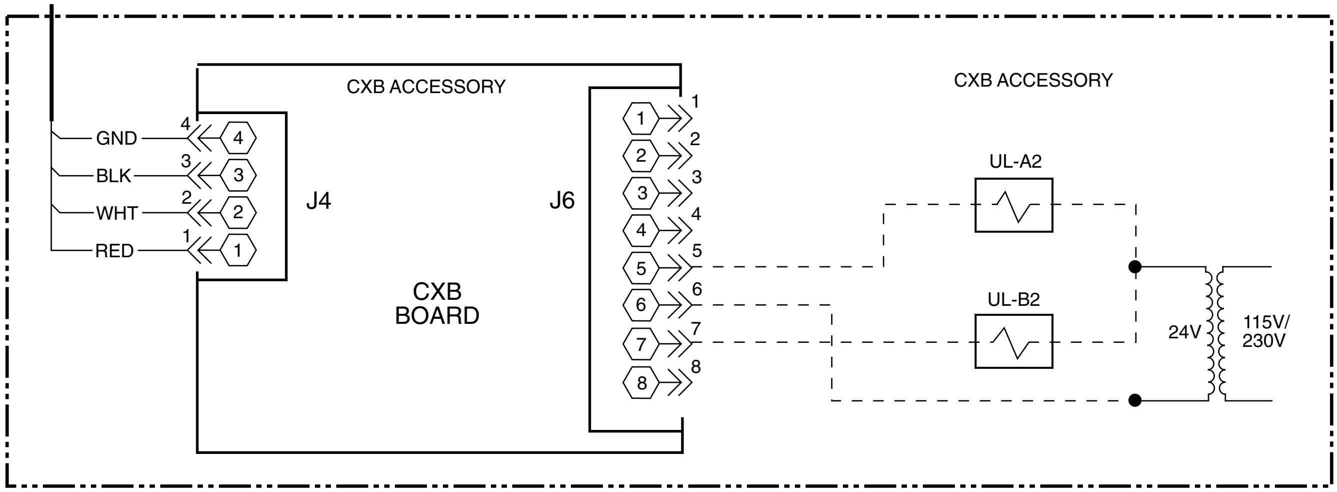


Fig. 41 — Compressor Expansion Board (CXB) Accessory Wiring

APPENDIX A — CCN TABLES

UNIT (Configuration Settings)

	DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
1	Unit Type	1 = Air Cooled 2 = Water Cooled 3 = Split System 4 = Heat Machine 5 = Air Cooled Heat Reclaim	1		UNIT_TYP
2	Unit Size	20 to 300	*	TONS	SIZE
3	Circuit A1% Capacity	0 to 100	*	%	CAP_A
4	Number Circ A Compressor	1 to 4	*		NUMCA
5	Compressor A1 Cylinders	4 or 6	*		NUM_CYLA
6	Number Circ B Compressor	1 to 4	*		NUMCB
7	Compressor B1 Cylinders	4 or 6	*		NUM_CYLB
8	EXV Module Installed	No/Yes	Yes		EXV_BRD
9	EXV Superheat Setpoint	10 to 40	29.0 (30GTN,R) 23.0 (30GUN,R)	^F	SH_SP
10	EXV MOP	40 to 80	50.0	°F	MOP_SP
11	EXV Superheat Offset	–20 to 20	0.0	^F	SH_OFFST
12	EXV Circ. A Min Position	0 to 100	8.0	%	EXVAMINP
13	EXV Circ. B Min Position	0 to 100	8.0	%	EXVBMINP
14	Refrigerant	1 = R22 2 = R134A	1 (30GTN,R) 2 (30GUN,R)		REFRIG_T
15	Low Pressure Setpoint	3 to 60	10.0	PSI	LOW_PRES
16	Fan Staging Select	1 = 2 Stage indpt. 2 = 3 Stage indpt. 3 = 2 Stage common 4 = 3 Stage common	*		FAN_TYPE

OPTIONS1 (Options Configuration)

	DESCRIPTION	STATUS	DEFAULT	POINT
1	Cooler Fluid	1 = Water 2 = Med. Brine 3 = Low Brine	1	FLUIDTYP
2	Hot Gas Bypass Select	No/Yes	No	HGBV_FLG
3	Head Press. Cont. Method	1 = EXV controlled 2 = Setpoint control 3 = Setpoint-A, EXV-B 4 = EXV-A, Setpoint-B	2	HEAD_MET
4	Head Press. Control Type	0 = None 1 = Air Cooled 2 = Water Cooled	1	HEAD_TYP
5	Motormaster Select	No/Yes	No	MTR_TYPE
6	Pressure Transducers	Off/On	Off	PRESS_TY
8	Cooler Pump Control	Off/On	Off	CPC
9	Condenser Pump Interlock	Off/On	Off	CND_LOCK
10	Condenser Pump Control	0 = No control 1 = On with Mode 2 = On with Compressors	0	CNPC
11	Condenser Fluid Sensors	No/Yes	No	CD_TEMP
12	No. Circuit A Unloaders	0-2	*	NUNLA
13	No. Circuit B Unloaders	0-2	*	NUNLB
14	EMM Module Installed	No/Yes	No	EMM_BRD

*Unit size dependent.

CONFIGURATION SCREEN (TYPE 10)

OPTIONS2 (Options Configuration)

	DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
1	Control Method	0 = Switch 1 = 7 day sched. 2 = Occupancy 3 = CCN	0		CONTROL
2	Loading Sequence Select	1 = Equal loading 2 = Staged loading	1		SEQ_TYPE
3	Lead/Lag Circuit Select	1 = Automatic 2 = Circuit A leads 3 = Circuit B leads	*		LEAD_TYP
4	Cooling Setpoint Select	0 = Single 1 = Dual, remote switch controlled 2 = Dual, 7-day occupancy 3 = Dual CCN occupancy 4 = 4-20 mA input 5 = External POT	0		CLSP_TYP
5	Heating Setpoint Select	0 = Single 1 = Dual, remote switch controlled 2 = Dual, 7 day occupancy 3 = Dual CCN occupancy 4 = 4-20 mA input	0		HTSP_TYP
6	Ramp Load Select	Enable/Disable	Disable		RAMP_EBL
7	Heat Cool Select	Cool/Heat	Cool		HEATCOOL
8	High LCW Alert Limit	2 to 60	60.0	^F	LCW_LMT
9	Minutes off time	0 to 15	0	min	DELAY
10	Deadband Multiplier	1.0 to 4.0	1.0		Z_GAIN
11	Ice Mode Enable	Enable/Disable	Disable		ICE_CNFG

DISPLAY (STDU SETUP)

	DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
1	Service Password	nnnn	1111		PASSWORD
2	Password Enable	Enable/Disable	Enable		PASS_EBL
3	Metric Display	Off/On	Off		DISPUNIT
4	Language Selection	0 = ENGLISH 1 = FRANCAIS 2 = ESPANOL 3 = PORTUGUES	0		LANGUAGE

SCHEDOVR (TIMED OVERRIDE SETUP)

	DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
1	Schedule Number	0-99	0		SCHEDNUM
2	Override Time Limit	0-4	0	hours	OTL
3	Timed Override Hours	0-4	0	hours	OTL_EXT
4	Timed Override	Yes/No	No		TIMEOVER

ALARMDEF (Alarm Definition Table)

	DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
1	Alarm Routing Control	00000000	00000000		ALRM_CNT
2	Equipment Priority	0 to 7	4		EQP_TYPE
3	Comm Failure Retry Time	1 to 240	10	min	RETRY_TM
4	Re-alarm Time	1 to 255	30	min	RE-ALARM
5	Alarm System Name	XXXXXXXX	Chiller		ALRM_NAM

*Unit size dependent.

RESETCON (Temperature Reset and Demand Limit)

	DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
1	COOLING RESET				
2	Cooling Reset Type	0 = No Reset 1 = 4-20 ma input 2 = External temp-OAT 3 = Return fluid 4 = External temp-SPT	0		CRST_TYP
3	No Cool Reset Temp	0 to 125	125.0	°F	CT_NO
4	Full Cool Reset Temp	0 to 125	0.0	°F	CT_FULL
5	Degrees Cool Reset	–30 to 30	0.0	^F	CT_DEG
6					
7	HEATING RESET				
8	Heating Reset Type	0 = No Reset 1 = 4-20 ma input 2 = External temp — OAT 3 = Return fluid 4 = External temp — SPT	0		HRST_TYP
9	No Heat Reset Temp	0 to 125	0.0		HT_NO
10	Full Heat Reset Temp	0 to 125	125.0	%	HT_FULL
11	Degrees Heat Reset	–30 to 30	0.0	min	HT_DEG
12					
13	DEMAND LIMIT				
14	Demand Limit Select	0 = None 1 = External switch input 2 = 4-20 ma input 3 = Loadshed	0		DMD_CTRL
15	Demand Limit at 20 mA	0 to 100	100	%	DMT20MA
16	Loadshed Group Number	0 to 99	0		SHED_NUM
17	Loadshed Demand Delta	0 to 60	0	%	SHED_DEL
18	Maximum Loadshed Time	0 to 120	60	min	SHED_TIM
19	Demand Limit Switch 1	0 to 100	80	%	DLSWSP1
20	Demand Limit Switch 2	0 to 100	50	%	DLSWSP2
21					
22	LEAD/LAG				
23	Lead/Lag Chiller Enable	Enable/Disable	Disable		LL_ENA
24	Master/Slave Select	Slave/Master	Master		MS_SEL
25	Slave Address	0 to 239	0		SLV_ADDR
26	Lead/Lag Balance Select	Enable/Disable	Disable		LL_BAL
27	Lead/Lag Balance Delta	40 to 400	168	hours	LL_BAL_D
28	Lag Start Delay	0 to 30	5	mins	LL_DELAY

BRODEFS (Broadcast POC Definition Table)

	DESCRIPTION	STATUS	DEFAULT	UNITS	POINT
1	CCN Time/Date Broadcast	Yes/No	No		CCNBC
2	CCN OAT Broadcast	Yes/No	No		OATBC
3	Global Schedule Broadcast	Yes/No	No		GSBC
4	CCN Broadcast Acker	Yes/No	No		CCNBCACK
5	Daylight Savings Start				
6	Month	1 to 12	4		STARTM
7	Week	1 to 5	1		STARTW
8	Day	1 to 7	7		STARTD
9	Minutes to add	0 to 99	60	min	MINADD
10	Daylight Savings Stop				
11	Month	1 to 12	10		STOPM
12	Week	1 to 5	5		STOPW
13	Day	1 to 7	7		STOPD
14	Minutes to subtract	0 to 99	60	min	MINSUB

A_UNIT (General Unit Parameters)

	DESCRIPTION	STATUS	UNITS	POINT	FORCEABLE
1	Control Mode	0 = Service 1 = OFF - local 2 = OFF-CCN 3 = OFF-time 4 = Emergency 5 = ON-local 6 = ON-CCN 7 = ON-time		STAT	N
2	Occupied	Yes/No		OCC	N
3	CCN Chiller	Start/Stop		CHIL_S_S	Y
4	Alarm State	Normal		ALM	N
5	Active Demand Limit	0-100	%	DEM_LIM	Y
6	Override Modes in Effect	Yes/No		MODE	N
7	Percent Total Capacity	0-100	%	CAP_T	N
8	Requested Stage	nn		STAGE	N
9	Active Setpoint	snnn.n	°F	SP	N
10	Control Point	snnn.n	°F	CTRL_PNT	Y
11	Entering Fluid Temp	snnn.n	°F	EWT	N
12	Leaving Fluid Temp	snnn.n	°F	LWT	N
13	Emergency Stop	Enable/Emstop		EMSTOP	Y
14	Minutes Left for Start	nn	min	MIN_LEFT	N
15	Heat Cool Select	Heat/Cool		HEATCOOL	Y

CIRCA_AN (Circuit A Analog Parameters)

	DESCRIPTION	STATUS	UNITS	POINT	FORCEABLE
1	Circuit A Analog Values				
2	Percent Total Capacity	0-100	%	CAPA_T	N
3	Percent Available Cap	0-100	%	CAPA_A	N
4	Discharge Pressure	nnn.n	PSI	DP_A	N
5	Suction Pressure	nnn.n	PSI	SP_A	N
6	Saturated Condensing Tmp	snnn.n	°F	TMP_SCTA	N
7	Saturated Suction Temp	snnn.n	°F	TMP_SSTA	N
8	Compressor Suction Temp	snnn.n	°F	CTA_TMP	N
9	Suction Superheat Temp	snnn.n	^F	SH_A	N
10	EXV % Open	0-100.0	%	EXV_A	N

CIRCA_DIO (Circuit A Discrete Parameters)

	DESCRIPTION	STATUS	UNITS	POINT	FORCEABLE
1	CIRC. A DISCRETE OUTPUTS				
2	Compressor A1 Relay	ON/OFF		K_A1_RLY	N
3	Compressor A2 Relay	ON/OFF		K_A2_RLY	N
4	Compressor A3 Relay	ON/OFF		K_A3_RLY	N
5	Compressor A4 Relay	ON/OFF		K_A4_RLY	N
6	Unloader A1 Relay	ON/OFF		UNL_A1	N
7	Unloader A2 Relay	ON/OFF		UNL_A2	N
8	Liq. Line Solenoid Valve	OPEN/CLOSE		LLSV_A	N
9	Hot Gas Bypass Relay	ON/OFF		HGB	N
10					
11	CIRC. A DISCRETE INPUTS				
12	Compressor A1 Feeback	ON/OFF		K_A1_FBK	N
13	Compressor A2 Feedback	ON/OFF		K_A2_FBK	N
14	Compressor A3 Feedback	ON/OFF		K_A3_FBK	N
15	Compressor A4 Feedback	ON/OFF		K_A4_FBK	N
16	Oil Pressure Switch A	OPEN/CLOSE		OILSW_A	N
17	Low Pressure Switch A	OPEN/CLOSE		LPS_A	N

CIRCB_AN (Circuit B Analog Parameters)

	DESCRIPTION	STATUS	UNITS	POINT	FORCEABLE
1	Circuit B Analog Values				
2	Percent Total Capacity	0-100	%	CAPB_T	N
3	Percent Available Cap	0-100	%	CAPB_A	N
4	Discharge Pressure	nnn.n	PSI	DP_B	N
5	Suction Pressure	nnn.n	PSI	SP_B	N
6	Saturated Condensing Tmp	snnn.n	°F	TMP_SCTB	N
7	Saturated Suction Temp	snnn.n	°F	TMP_SSTB	N
8	Compressor Suction Temp	snnn.n	°F	CTB_TMP	N
9	Suction Superheat Temp	snnn.n	^F	SH_B	N
10	EXV % Open	0-100.0	%	EXV_B	N

CIRCBDIO (Circuit B Discrete Parameters)

	DESCRIPTION	STATUS	UNITS	POINT	FORCEABLE
1	CIRC. B DISCRETE OUTPUTS				
2	Compressor B1 Relay	ON/OFF		K_B1_RLY	N
3	Compressor B2 Relay	ON/OFF		K_B2_RLY	N
4	Compressor B3 Relay	ON/OFF		K_B3_RLY	N
5	Compressor B4 Relay	ON/OFF		K_B4_RLY	N
6	Unloader B1 Relay	ON/OFF		UNL_B1	N
7	Unloader B2 Relay	ON/OFF		UNL_B2	N
8	Liq. Line Solenoid Valve	ON/OFF		LLSV_B	N
9	Hot Gas Bypass Relay	ON/OFF		HGB	N
10					
11	CIRC. B DISCRETE INPUTS				
12	Compressor B1 Feedback	ON/OFF		K_B1_FBK	N
13	Compressor B2 Feedback	ON/OFF		K_B2_FBK	N
14	Compressor B3 Feedback	ON/OFF		K_B3_FBK	N
15	Compressor B4 Feedback	ON/OFF		K_B4_FBK	N
16	Oil Pressure Switch B	OPEN/CLOSE		OILSW_B	N
17	Low Pressure Switch B	OPEN/CLOSE		LPS_B	N

OPTIONS (Unit Parameters)

	DESCRIPTION	STATUS	UNITS	POINT	FORCEABLE
1	FANS				
2	Fan 1 Relay	ON/OFF		FAN_1	N
3	Fan 2 Relay	ON/OFF		FAN_2	N
4	Fan 3 Relay	ON/OFF		FAN_3	N
5	Fan 4 Relay	ON/OFF		FAN_4	N
6					
7	UNIT ANALOG VALUES				
8	Cooler Entering Fluid	snnn.n	°F	COOL_EWT	N
9	Cooler Leaving Fluid	snnn.n	°F	COOL_LWT	N
10	Condensing Entering Fluid	snnn.n	°F	COND_EWT	N
11	Condenser Leaving Fluid	snnn.n	°F	COND_LWT	N
12	Lead/Lag Leaving Fluid	snnn.n	°F	DUAL_LWT	N
13					
14	TEMPERATURE RESET				
15	4-20 mA Reset Signal	nn.n	mA	RST_MA	N
16	Outside Air Temperature	snnn.n	°F	OAT	Y
17	Space Temperature	snnn.n	°F	SPT	Y
18					
19	DEMAND LIMIT				
20	4-20 mA Demand Signal	n.nn		LMT_MA	N
21	Demand Limit Switch 1	ON/OFF		DMD_SW1	N
22	Demand Limit Switch 2	ON/OFF		DMD_SW2	N
23	CCN Loadshed Signal	0 = Normal 1 = Redline 2 = Shed		OL_STAT	N
24					
25	PUMPS				
26	Cooler Pump Relay	ON/OFF		COOL_PMP	
27	Condenser Pump Relay	ON/OFF		COND_PMP	N
28					
29	MISCELLANEOUS				
30	Dual Setpoint Switch	ON/OFF		DUAL_IN	N
31	Cooler LWT Setpoint	snn.n	°F	LWR_SP	N
32	Cooler Flow Switch	ON/OFF		COOLFLOW	N
33	Condenser Flow Switch	ON/OFF		CONDFLOW	N
34	Ice Done	ON/OFF		ICE	N

STRTHOUR

	DESCRIPTION	STATUS	UNITS	POINT
1	Machine Operating Hours	nnnnn	hours	HR_MACH
2	Machine Starts	nnnnn		CY_MACH
3				
4	Circuit A Run Hours	nnnnn	hours	HR_CIRA
5	Compressor A1 Hours	nnnnn	hours	HR_A1
6	Compressor A2 Hours	nnnnn	hours	HR_A2
7	Compressor A3 Hours	nnnnn	hours	HR_A3
8	Compressor A4 Hours	nnnnn	hours	HR_A4
9	Circuit B Run Hours	nnnnn	hours	HR_CIRB
10	Compressor B1 Hours	nnnnn	hours	HR_B1
11	Compressor B2 Hours	nnnnn	hours	HR_B2
12	Compressor B3 Hours	nnnnn	hours	HR_B3
13	Compressor B4 Hours	nnnnn	hours	HR_B4
14				
15	Circuit A Starts	nnnnn		CY_CIRA
16	Compressor A1 Starts	nnnnn		CY_A1
17	Compressor A2 Starts	nnnnn		CY_A2
18	Compressor A3 Starts	nnnnn		CY_A3
19	Compressor A4 Starts	nnnnn		CY_A4
20	Circuit B Starts	nnnnn		CY_CIRB
21	Compressor B1 Starts	nnnnn		CY_B1
22	Compressor B2 Starts	nnnnn		CY_B2
23	Compressor B3 Starts	nnnnn		CY_B3
24	Compressor B4 Starts	nnnnn		CY_B4

ALARMS

	DESCRIPTION	STATUS	UNITS	POINT
1	Active Alarm #1	Axxx or Txxx		ALARM01C
2	Active Alarm #2	Axxx or Txxx		ALARM02C
3	Active Alarm #3	Axxx or Txxx		ALARM03C
4	Active Alarm #4	Axxx or Txxx		ALARM04C
5	Active Alarm #5	Axxx or Txxx		ALARM05C
6	Active Alarm #6	Axxx or Txxx		ALARM06C
7	Active Alarm #7	Axxx or Txxx		ALARM07C
8	Active Alarm #8	Axxx or Txxx		ALARM08C
9	Active Alarm #9	Axxx or Txxx		ALARM09C
10	Active Alarm #10	Axxx or Txxx		ALARM10C
11	Active Alarm #11	Axxx or Txxx		ALARM11C
12	Active Alarm #12	Axxx or Txxx		ALARM12C
13	Active Alarm #13	Axxx or Txxx		ALARM13C
14	Active Alarm #14	Axxx or Txxx		ALARM14C
15	Active Alarm #15	Axxx or Txxx		ALARM15C
16	Active Alarm #16	Axxx or Txxx		ALARM16C
17	Active Alarm #17	Axxx or Txxx		ALARM17C
18	Active Alarm #18	Axxx or Txxx		ALARM18C
19	Active Alarm #19	Axxx or Txxx		ALARM19C
20	Active Alarm #20	Axxx or Txxx		ALARM20C
21	Active Alarm #21	Axxx or Txxx		ALARM21C
22	Active Alarm #22	Axxx or Txxx		ALARM22C
23	Active Alarm #23	Axxx or Txxx		ALARM23C
24	Active Alarm #24	Axxx or Txxx		ALARM24C
25	Active Alarm #25	Axxx or Txxx		ALARM25C

NOTE: Alerts will displayed as Txxx.

APPENDIX A — CCN TABLES (cont)

CURRMODS

	DESCRIPTION	STATUS	UNITS	POINT
1	FSM controlling chiller	ON/OFF		MODE_1
2	WSM controlling chiller	ON/OFF		MODE_2
3	Master/Slave control	ON/OFF		MODE_3
4	Low source protection	ON/OFF		MODE_4
5	Ramp Load Limited	ON/OFF		MODE_5
6	Timed Override in effect	ON/OFF		MODE_6
7	Low Cooler Suction TempA	ON/OFF		MODE_7
8	Low Cooler Suction TempB	ON/OFF		MODE_8
9	Slow Change Override	ON/OFF		MODE_9
10	Minimum OFF Time	ON/OFF		MODE_10
11	Low Suction Superheat A	ON/OFF		MODE_11
12	Low Suction Superheat B	ON/OFF		MODE_12
13	Dual Setpoint	ON/OFF		MODE_13
14	Temperature Reset	ON/OFF		MODE_14
15	Demand Limit in effect	ON/OFF		MODE_15
16	Cooler Freeze Prevention	ON/OFF		MODE_16
17	Lo Tmp Cool/Hi Tmp Heat	ON/OFF		MODE_17
18	Hi Tmp Cool/Lo Tmp Heat	ON/OFF		MODE_18
19	Making Ice	ON/OFF		MODE_19
20	Storing Ice	ON/OFF		MODE_20
21	High SCT Circuit A	ON/OFF		MODE_21
22	High SCT Circuit B	ON/OFF		MODE_22

SETPOINT

	DESCRIPTION	STATUS	UNITS	POINT	DEFAULTS
1	COOLING				
2	Cool Setpoint 1	–20 to 70	°F	CSP1	44
3	Cool Setpoint 2	–20 to 70	°F	CSP2	44
4	Ice Setpoint	–20 to 32	°F	CSP3	32
5					
6	HEATING				
7	Heat Setpoint 1	80 to 140	°F	HSP1	100
8	Heat Setpoint 2	80 to 140	°F	HSP2	100
9					
10	RAMP LOADING				
11	Cooling Ramp Loading	0.2 to 2.0	°F/min	CRAMP	1.0
12	Heating Ramp Loading	0.2 to 2.0	°F/min	HRAMP	1.0
13					
14	HEAD PRESSURE				
15	Head Pressure Setpoint A	80 to 140	°F	HSP_A	113
16	Head Pressure Setpoint B	80 to 140	°F	HSP_B	113

LOADFACT

	DESCRIPTION	STATUS	UNITS	POINT
1	CAPACITY CONTROL			
2	Load/Unload Factor	snnn.n	%	SMZ
3	Control Point	snnn.n	°F	CTRL_PNT
4	Leaving Water Temp	snnn.n	°F	LWT

VERSIONS

	DESCRIPTION	STATUS	UNITS	POINT
1	MBB	CESR-131170 nn-nn		
2	EXV	CESR-131172 nn-nn		
3	CXB	CESR131173- nn-nn		
4	EMM	CESR131174- nn-nn		
5	MARQ	CESR131171- nn-nn		
6	NAV	CESR131227- nn-nn		

CSM/FSM EQUIPMENT TABLE (Type 621H, Block 2)

LINE	DESCRIPTION	POINT
1	Chiller Status 0 = Chiller is off 1 = Valid run state in CCN mode 2 = Recycle active 3 = Chiller is in Local Mode 4 = Power Fail Restart in Progress 5 = Shutdown due to fault 6 = Communication Failure	CHILSTAT
2	Lag Status	LAGSTAT
3	Percent Total Capacity Running	CAP_T
4	Service Runtime	HR_MACH
5	unused	
6	unused	
7	unused	
8	Power Fail Auto Restart	ASTART
9	Percent Available Capacity On	CAP_A

WSM EQUIPMENT PART COOL SOURCE MAINTENANCE TABLE

SUPERVISOR MAINTENANCE TABLE

DESCRIPTION	STATUS	POINT
WSM Active?	Yes	WSMSTAT
Chilled water temp	snn.n °F	CHWTEMP
Equipment status	On	CHLRST
Commanded state	Enable/Disable/None	CHLRENA
CHW setpoint reset value	nn.n^F	CHWRVAL
Current CHW setpoint	snn.n °F	CHWSTPT

OCCUPANCY MAINTENANCE TABLE

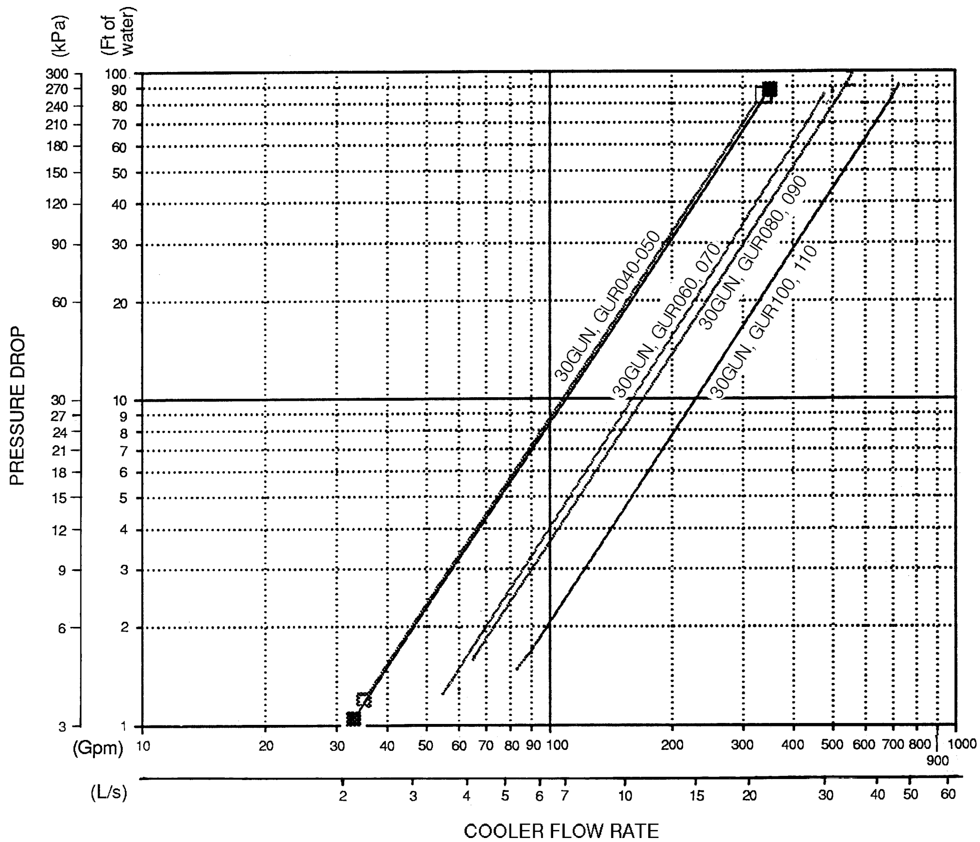
OCCUPANCY SUPERVISORY

DESCRIPTION	STATUS	POINT
Current Mode (1=Occup.)	0,1	MODE
Current Occup. Period #	0-8	PER-NO
Timed-Override in Effect	Yes/No	OVERLAST
Time-Override Duration	0-4 hours	OVR_HRS
Current Occupied Time	hh:mm	STRTTIME
Current Unoccupied Time	hh:mm	ENDTIME
Next Occupied Day		NXTOCDAY
Next Occupied Time	hh:mm	NXTOCTIM
Next Unoccupied Day		NXTUNDAY
Next Unoccupied Time	hh:mm	NXTUNTIM
Previous Unoccupied Day		NXTUNDAY
Previous Unoccupied Time	hh:mm	PRVUNTIM

APPENDIX B — FLUID DROP PRESSURE CURVES

Cooler Fluid Pressure Drop Curves — 30GUN,GUR040-110

ENGLISH AND SI



LEGEND

■ — 040

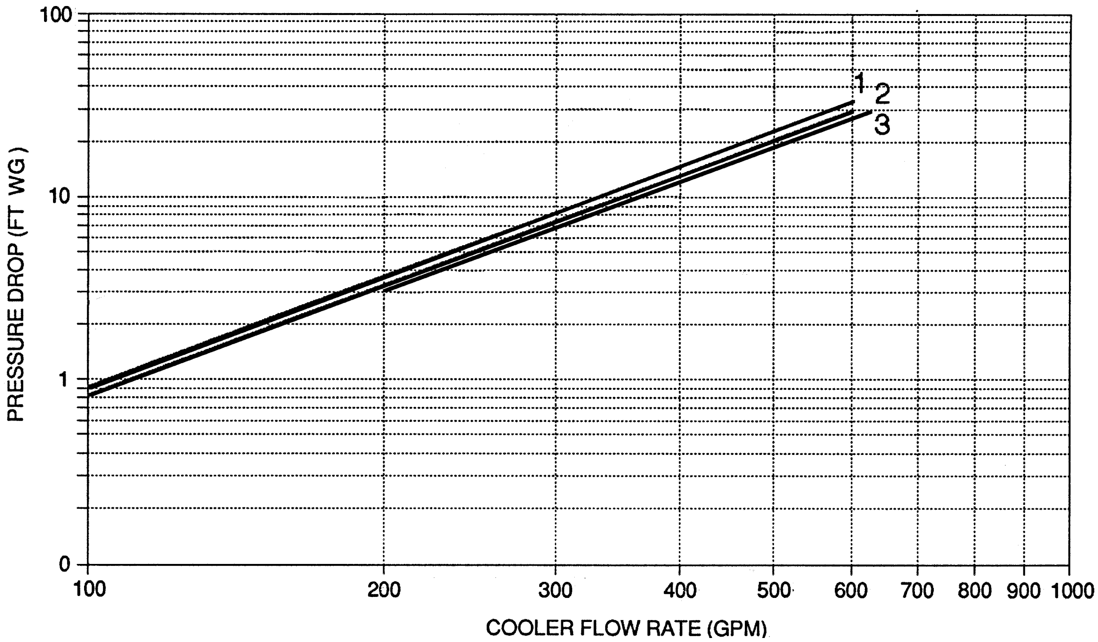
□ — 045,050

NOTE: Ft of water = 2.31 x change in psig.

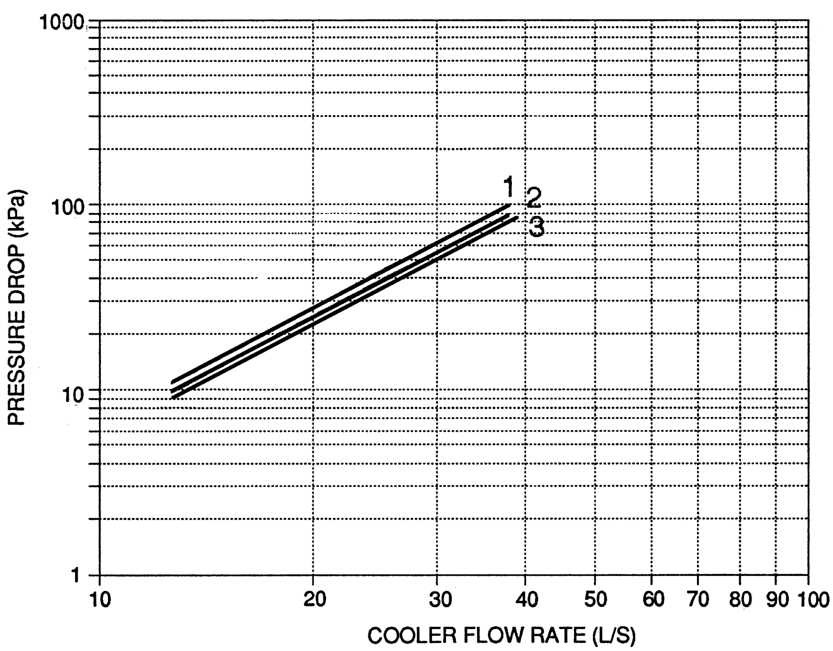
APPENDIX B — FLUID DROP PRESSURE CURVES (cont)

Cooler Fluid Pressure Drop Curves — 30GUN,GUR130-210

ENGLISH



SI



COOLER PRESSURE DROP KEY

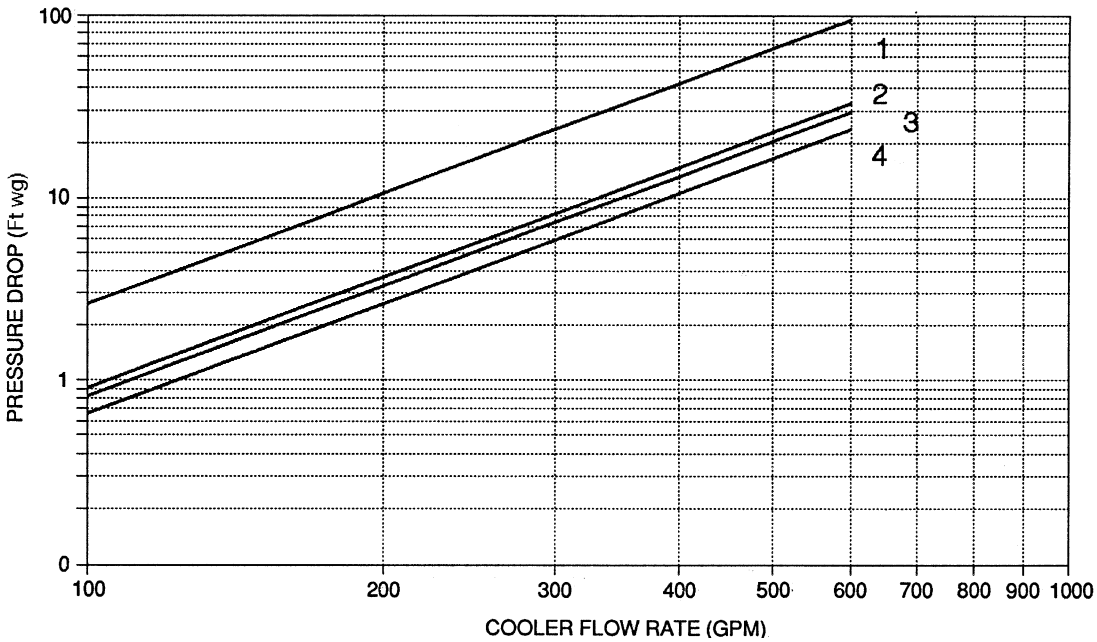
1 — 30GUN,GUR130,150
2 — 30GUN,GUR170,190
3 — 30GUN,GUR210

NOTE: Ft of water = 2.31 x change in psig.

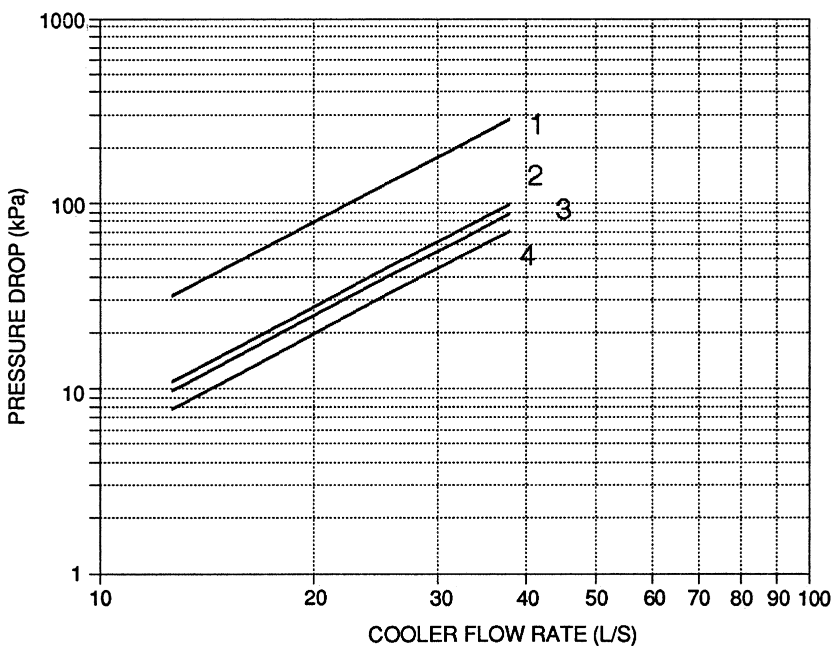
APPENDIX B — FLUID DROP PRESSURE CURVES (cont)

Cooler Fluid Pressure Drop Curves — 30GUN,GUR230A-255A, 270A/B-420A/B

ENGLISH



SI



COOLER PRESSURE DROP KEY

1 Module B — 30GUN,GUR270

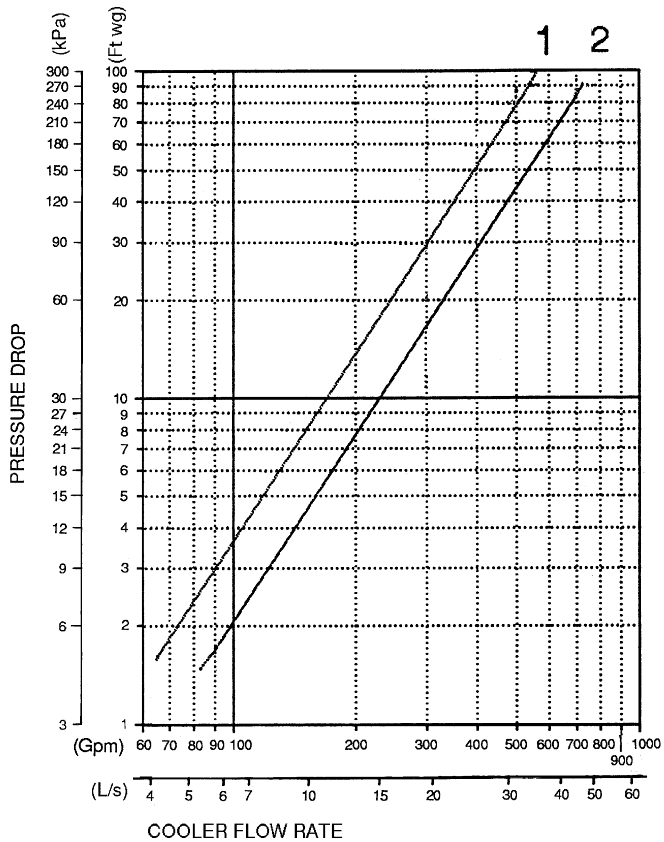
2 Module A — 30GUN,GUR230-255

3 Module A — 30GUN,GUR270,330
Module B — 30GUN,GUR330,360 (50 Hz)

4 Module A — 30GUN,GUR290,315,360 (50 or 60 Hz), 390, and 420
Module B — 30GUN,GUR360 (60 Hz), 390, and 420

Cooler Fluid Pressure Drop Curves — 30GUN,GUR230B-315B

ENGLISH AND SI



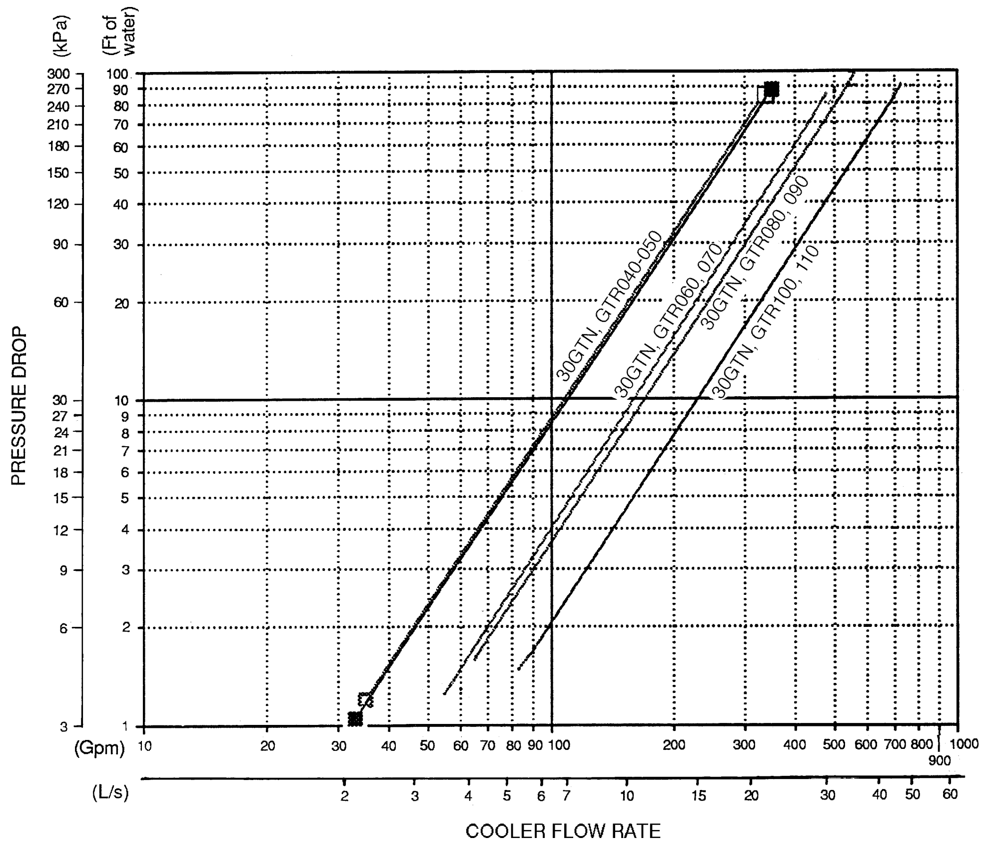
COOLER PRESSURE DROP KEY

1 Module B — 30GUN,GUR230,245
2 Module B — 30GUN,GUR255,290,315

NOTE: Ft of water = 2.31 x change in psig.

Cooler Fluid Pressure Drop Curves — 30GTN,GTR040-110

ENGLISH AND SI

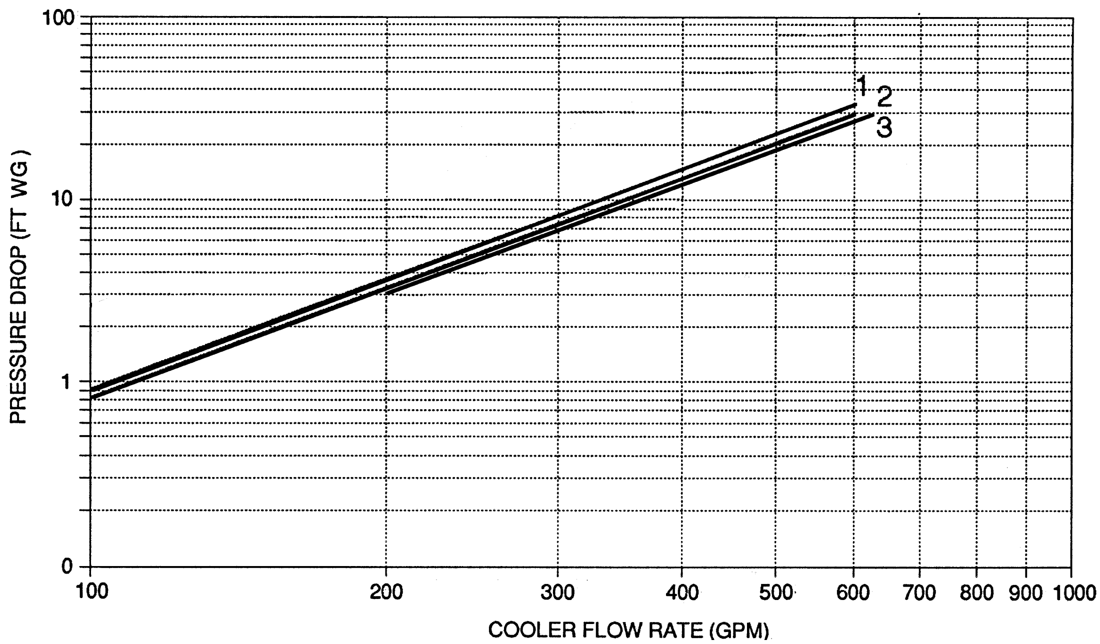


LEGEND
■ — 040
□ — 045,050

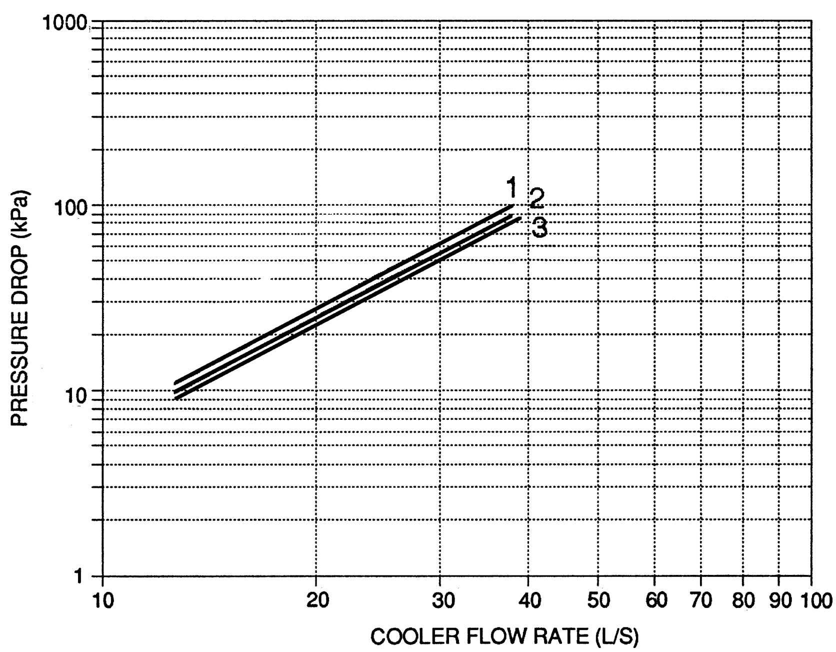
NOTE: Ft of water = 2.31 x change in psig.

Cooler Fluid Pressure Drop Curves — 30GTN,GTR130-210

ENGLISH



SI



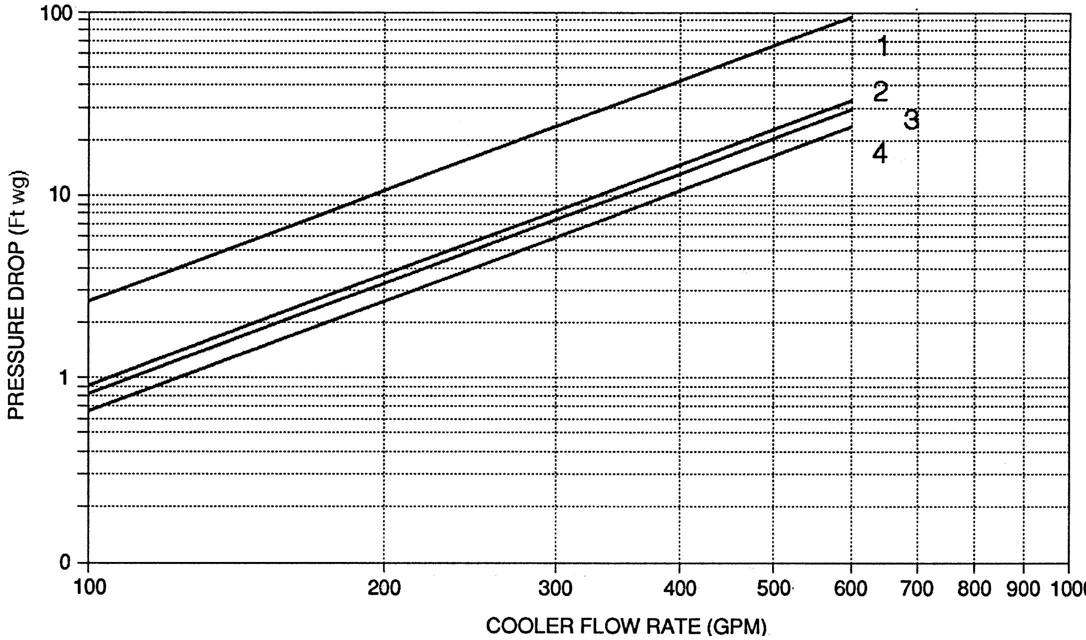
COOLER PRESSURE DROP KEY

1 — 30GTN,GTR130,150
2 — 30GTN,GTR170,190
3 — 30GTN,GTR210

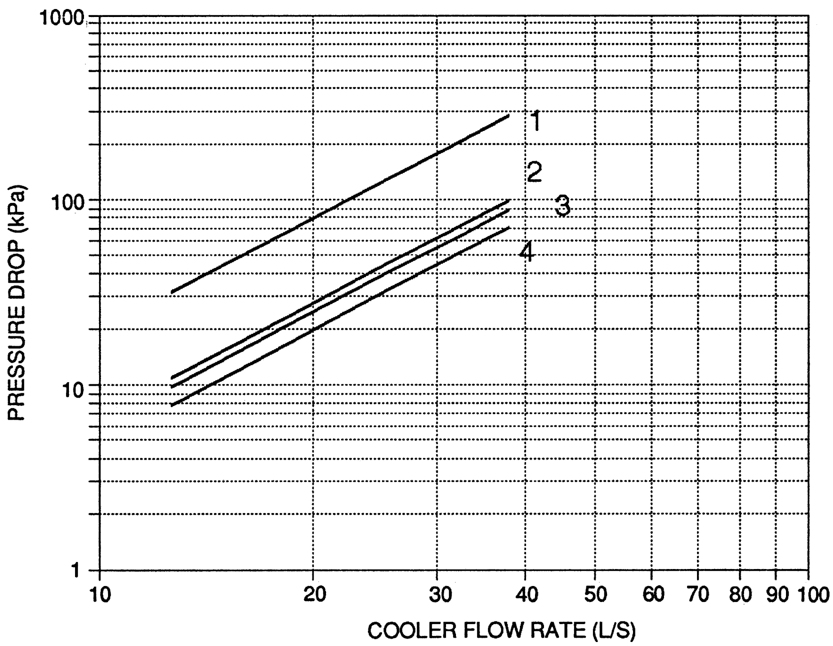
NOTE: Ft of water = 2.31 x change in psig.

Cooler Fluid Pressure Drop Curves — 30GTN,GTR230A-420A, 270B, 330B-420B

ENGLISH



SI



COOLER PRESSURE DROP KEY

1 Module B — 30GTN,GTR270

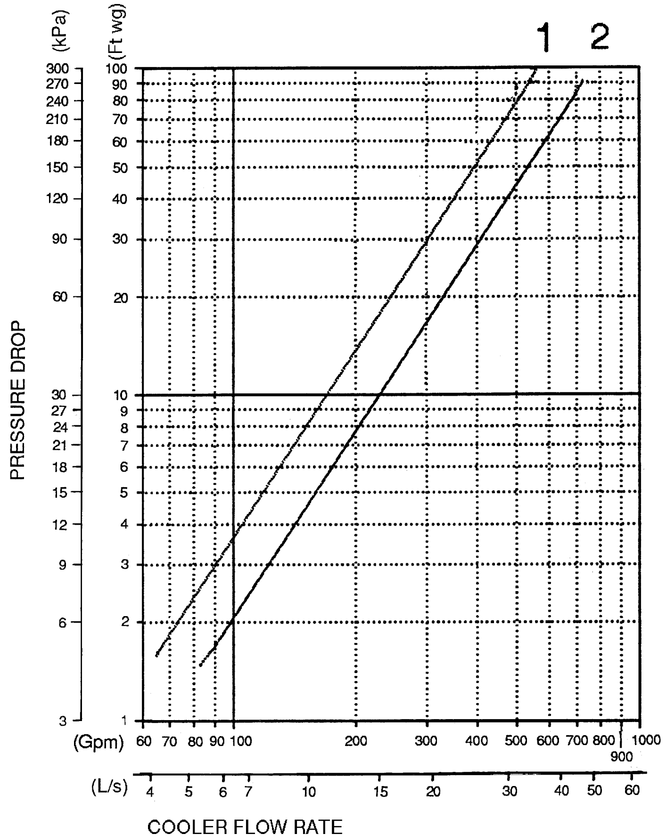
2 Module A — 30GTN,GTR230-255

3 Module A — 30GTN,GTR270,330
Module B — 30GTN,GTR330,360 (50 Hz)

4 Module A — 30GTN,GTR290,315,360 (50 or 60 Hz), 390, and 420
Module B — 30GTN,GTR360 (60 Hz), 390, and 420

Cooler Fluid Pressure Drop Curves — 30GTN,GTR230B, 245B, 255B, 290B, 315B

ENGLISH AND SI



COOLER PRESSURE DROP KEY

1 Module B — 30GTN,GTR230,245
2 Module B — 30GTN,GTR255,290,315

NOTE: Ft of water = 2.31 x change in psig.

SERVICE TRAINING

Packaged Service Training programs are an excellent way to increase your knowledge of the equipment discussed in this manual, including:

- Unit Familiarization
- Maintenance
- Installation Overview
- Operating Sequence

A large selection of product, theory, and skills programs are available, using popular video-based formats and materials. All include video and/or slides, plus companion book.

Classroom Service Training which includes “hands-on” experience with the products in our labs can mean increased confidence that really pays dividends in faster troubleshooting and fewer callbacks. Course descriptions and schedules are in our catalog.

CALL FOR FREE CATALOG 1-800-962-9212

[ ] Packaged Service Training [ ] Classroom Service Training

Book 2 Tab 5c PC 903 Catalog No. 563-025 Printed in U.S.A. Form 30GTN-3T Pg 88 3-00 Replaces: 30GTN-2T

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

START-UP CHECKLIST FOR *COMFORT*LINK™ CHILLER SYSTEMS
(Remove and use for job file)

A. Preliminary Information

JOB NAME ____________________

LOCATION ____________________

INSTALLING CONTRACTOR ____________________

DISTRIBUTOR ____________________

START-UP PERFORMED BY ____________________

EQUIPMENT: **Chiller:** MODEL NO. ____________ SERIAL NO. ____________

COMPRESSORS:

CIRCUIT A		CIRCUIT B	
1) MODEL NO.	______	1) MODEL NO.	______
SERIAL NO.	______	SERIAL NO.	______
MTR NO.	______	MTR NO.	______
2) MODEL NO.	______	2) MODEL NO.	______
SERIAL NO.	______	SERIAL NO.	______
MTR NO.	______	MTR NO.	______
3) MODEL NO.	______	3) MODEL NO.	______
SERIAL NO.	______	SERIAL NO.	______
MTR NO.	______	MTR NO.	______
4) MODEL NO.	______		
SERIAL NO.	______		
MTR NO.	______		

COOLER:

MODEL NO. ____________ MANUFACTURED BY ____________

SERIAL NO. ____________ DATE ____________

TYPE OF EXPANSION VALVES (check one): EXV ______ TXV ______

AIR-HANDLING EQUIPMENT:

MANUFACTURER ____________________

MODEL NO. ____________ SERIAL NO. ____________

ADDITIONAL AIR-HANDLING UNITS AND ACCESSORIES ____________________

____

B. Preliminary Equipment Check (Check box if complete)

IS THERE ANY SHIPPING DAMAGE? __________ IF SO, WHERE ______________________________________

____

WILL THIS DAMAGE PREVENT UNIT START-UP? ____

☐ HAVE COMPRESSOR BASE RAIL ISOLATORS ALL BEEN PROPERLY ADJUSTED?

☐ CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT?

☐ HAS THE CIRCUIT PROTECTION BEEN SIZED AND INSTALLED PROPERLY?
(refer to Installation Instructions)

☐ ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY?
(refer to Installation Instructions)

☐ HAS THE GROUND WIRE BEEN CONNECTED?

☐ ARE ALL TERMINALS TIGHT?

CHECK AIR SYSTEMS (Check box if complete)

☐ ALL AIR HANDLERS OPERATING? (refer to air-handling equipment Installation and Start-Up Instructions)

☐ ALL CHILLED FLUID VALVES OPEN?

☐ ALL FLUID PIPING CONNECTED PROPERLY?

☐ ALL AIR BEEN VENTED FROM THE COOLER LOOP?

☐ CHILLED WATER (FLUID) PUMP (CWP) OPERATING WITH THE CORRECT ROTATION?

CWP MOTOR AMPERAGE: Rated ________________ Actual ________________

PUMP PRESSURE: Inlet ________________ Outlet ________________

C. Unit Start-Up (insert check mark as each item is completed)

☐ CHILLER HAS BEEN PROPERLY INTERLOCKED WITH THE AUXILIARY CONTACTS OF THE CHILLED FLUID PUMP STARTER.

☐ UNIT IS SUPPLIED WITH CORRECT CONTROL VOLTAGE POWER
(115 V FOR 208/230, 460, AND 575 V UNITS; 230 V FOR 380 AND 380/415 UNITS)

☐ CRANKCASE HEATERS HAVE BEEN ENERGIZED FOR A MINIMUM OF **24 HOURS** PRIOR TO START-UP.

☐ COMPRESSOR OIL LEVEL IS CORRECT.

☐ BOTH LIQUID LINE SERVICE VALVES ARE BACKSEATED.

☐ **ALL** COMPRESSOR DISCHARGE SERVICE VALVES ARE BACKSEATED.

☐ **ALL** COMPRESSOR SUCTION SERVICE VALVES ARE BACKSEATED.

☐ LOOSEN COMPRESSOR SHIPPING HOLDDOWN BOLTS.

☐ LEAK CHECK **THOROUGHLY**: CHECK ALL COMPRESSORS, CONDENSER MANIFOLDS AND HEADERS, EXVs, TXVs, SOLENOID VALVES, FILTER DRIERS, FUSIBLE PLUGS, THERMISTORS, AND COOLER HEADS, WITH ELECTRONIC LEAK DETECTOR.

LOCATE, REPAIR, AND REPORT ANY REFRIGERANT LEAKS. ______________________________________

____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

C. Unit Start-Up (cont)

☐ CHECK VOLTAGE IMBALANCE: AB _______ AC _______ BC _______

AB + AC + BC (divided by 3) = AVERAGE VOLTAGE = __________________ V

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = ____________________

VOLTAGE IMBALANCE = $\frac{\text{(MAX. DEVIATION)}}{\text{AVERAGE VOLTAGE}}$ x 100 = ___________ % VOLTAGE IMBALANCE

IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START CHILLER!

CALL LOCAL POWER COMPANY FOR ASSISTANCE.

☐ INCOMING POWER VOLTAGE TO CHILLER MODULES IS WITHIN RATED UNIT VOLTAGE RANGE.

SYSTEM FLUID VOLUME IN LOOP: TYPE SYSTEM:

AIR CONDITIONING — MINIMUM 3 GAL PER NOMINAL TON (3.25 L PER kW) = _____________ GAL (L)

PROCESS COOLING — MINIMUM 6 GAL PER NOMINAL TON (6.50 L PER kW) = _____________ GAL (L)

CHECK PRESSURE DROP ACROSS COOLER.

FLUID ENTERING COOLER: _____________ PSIG (kPa)

FLUID LEAVING COOLER: _______________ PSIG (kPa)

(PSIG DIFFERENCE) x 2.31 = FT OF FLUID PRESSURE DROP =

PLOT COOLER PRESSURE DROP ON PERFORMANCE DATA CHART (LOCATED IN PRODUCT DATA LITERATURE) TO DETERMINE TOTAL GPM (L/s).

TOTAL GPM (L/s) = ______________________

UNIT'S RATED MIN GPM (L/s) = ____________________

GPM (L/s) PER TON = ____________________

UNIT'S RATED MIN PRESSURE DROP = _____________
(Refer to product data literature.)

JOB'S SPECIFIED GPM (L/s) (if available): _____________

NOTE: IF UNIT HAS LOW FLUID FLOW, FIND SOURCE OF PROBLEM: CHECK FLUID PIPING, IN-LINE FLUID STRAINER, SHUT-OFF VALVES, CWP ROTATION, ETC.

COOLER LOOP FREEZE PROTECTION IF REQUIRED:

GALLONS (LITERS) ADDED: ________________

PIPING INCLUDES ELECTRIC TAPE HEATERS (Y/N): ________________

VISUALLY CHECK MAIN BASE BOARD AND EXV BOARD FOR THE FOLLOWING:

☐ INSPECT ALL THERMISTORS AND EXV CABLES FOR POSSIBLE CROSSED WIRES.

☐ CHECK TO BE SURE ALL WELL-TYPE THERMISTORS ARE FULLY INSERTED INTO THEIR RESPECTIVE WELLS.

☐ ALL CABLES AND PIN CONNECTORS TIGHT?

☐ ALL EXV, EMM, AND CXB BOARDS (IF INSTALLED) AND DISPLAY CONNECTIONS TIGHT?

C. Unit Start-Up (cont)

UNIT (Configuration Settings)

ITEM	DESCRIPTION	STATUS	UNITS	VALUE
TYPE	Unit Type	1 = Air Cooled 2 = Water Cooled 3 = Split System 4 = Heat Machine 5 = Air Cooled Heat Reclaim		
TONS	Unit Size	15 to 300	TONS	
CAP.A	Circuit A1% Capacity	0 to 100	%	
CMP.A	Number Circ A Compressor	1 to 4		
CYL.A	Compressor A1 Cylinders	4 or 6		
CMP.B	Number Circ B Compressor	1 to 4		
CYL.B	Compressor B1 Cylinders	4 or 6		
EXV	EXV Module Installed	No/Yes		
SH.SP	EXV Superheat Setpoint	10 to 40	^F	
SH.OF	EXV Superheat Offset	–20 to 20	^F	
REFG	Refrigerant	1 = R22 2 = R134A		
FAN.S	Fan Staging Select	1 = 2 Stage indpt. 2 = 3 Stage indpt. 3 = 2 Stage common 4 = 3 Stage common		

PRESS ESCAPE KEY TO DISPLAY ‘UNIT’. PRESS DOWN ARROW KEY TO DISPLAY ‘OPT1’. PRESS ENTER KEY. RECORD CONFIGURATION INFORMATION BELOW:

OPTIONS1 (Options Configuration)

ITEM	DESCRIPTION	STATUS	VALUE
FLUD	Cooler Fluid	1 = Water 2 = Med. Brine 3 = Low Brine	
HGB.S	Hot Gas Bypass Select	No/Yes	
HPCM	Head Press. Cont. Method	1 = EXV controlled 2 = Setpoint controlled 3 = Setpoint-A, EXV-B 4 = EXV-A, Setpoint-B	
HPCT	Head Press. Control Type	0 = None 1 = Air Cooled 2 = Water Cooled	
MMR.S	Motormaster Select	No/Yes	
PRTS	Pressure Transducer	No/Yes	
PMP.I	Cooler Pump Interlock	Off/On	
CPC	Cooler Pump Control	Off/On	
CNP.I	Condenser Pump Interlock	Off/On	
CNPC	Condenser Pump Control	0 = No Control 1 = On with Mode 2 = On with Compressor(s)	
CWT.S	Condenser Fluid Sensors	No/Yes	
CA.UN	No. Circuit A Unloaders	0-2	
CB.UN	No. Circuit B Unloaders	0-2	
EMM	EMM Module Installed	No/Yes	

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

C. Unit Start-Up (cont)

PRESS ESCAPE KEY TO DISPLAY ‘OPT1’. PRESS DOWN ARROW KEY TO DISPLAY ‘OPT2’. PRESS ENTER KEY.

RECORD CONFIGURATION INFORMATION BELOW:

OPTIONS2 (Options Configuration)

ITEM	DESCRIPTION	STATUS	UNITS	VALUE
CTRL	Control Method	0 = Switch 1 = 7 day sched. 2 = Occupancy 3 = CCN		
CCNA	CCN Address	1 to 239		
CCNB	CCN Bus Number	0 to 239		
BAUD	CCN Baud Rate	1 = 240 2 = 480 3 = 9600 4 = 19,200 5 = 38,400		
LOAD	Loading Sequence Select	1 = Equal loading 2 = Staged loading		
LLCS	Lead/Lag Circuit Select	1 = Automatic 2 = Circuit A leads 3 = Circuit B leads		
LCWT	High LCW Alert Limit	2 to 60	^F	
DELY	Minutes off time	0 to 15	min.	
ICE.M	Ice Mode Enable	Enable/Disable		

PRESS ESCAPE KEY TO DISPLAY ‘OPT2’. PRESS DOWN ARROW KEY TO DISPLAY ‘RSET’. PRESS ENTER KEY.

RECORD CONFIGURATION INFORMATION BELOW:

RESETCON (Temperature Reset and Demand Limit)

ITEM	DESCRIPTION	STATUS	UNITS	VALUE
	COOLING RESET			
CRST	Cooling Reset Type	0 = No Reset 1 = 4-20 mA input 2 = External temp-OAT 3 = Return fluid 4 = External temp-SPT		
CRT1	No Cool Reset Temp	0 to 125	°F	
CRT2	Full Cool Reset Temp	0 to 125	°F	
DGRC	Degrees Cool Reset	–30 to 30	^F	
HRST	Heating Reset Type	0 = No Reset 1 = 4-20 mA input 2 = External temp-OAT 3 = Return fluid 4 = External temp-SPT		
HRT1	No Heat Reset Temp	Not Supported	°F	
HRT2	Full Heat Reset Temp	Not Supported	°F	
DGRH	Degrees Heat Reset	–30 to 30	^F	
	DEMAND LIMIT			
DMDC	Demand Limit Select	0 = None 1 = External switch input 2 = 4-20 ma input 3 = Loadshed	0	
DM20	Demand Limit at 20mA	0 to 100	%	
SHNM	Loadshed Group Number	0 to 99		
SHDL	Loadshed Demand Delta	0 to 60	%	
SHTM	Maximum Loadshed Time	0 to 120	min	
DLS1	Demand Limit Switch 1	0 to 100	%	
DLS2	Demand Limit Switch 2	0 to 100	%	
	LEAD/LAG			
LLEN	Lead/Lag Chiller Enable	Enable/Disable		
MSSL	Master/Slave Select	Slave/Master		
SLVA	Slave Address	0 to 239		
LLBL	Lead/Lag Balance Select	Enable/Disable		
LLBD	Lead/Lag Balance Delta	40 to 400	hours	
LLDY	Lag Start Delay	0 to 30	min	

C. Unit Start-Up (cont)

PRESS ESCAPE KEY TO DISPLAY ‘RSET’. PRESS DOWN ARROW KEY TO DISPLAY ‘SLCT’. PRESS ENTER KEY.

RECORD CONFIGURATION INFORMATION BELOW:

SLCT (Heating Cooling Setpoint Select)

ITEM	DESCRIPTION	STATUS	UNITS	VALUE
CLSP	Cooling Setpoint Select	0 = Single 1 = Dual Switch 2 = Dual Clock 3 = 4 to 20 mA Input 4 = 4-20 mA Input 5 = External Setpoint Potentiometer		
HTSP	Heating Setpoint Select	0 = Single 1 = Dual Switch 2 = Dual 7 day schedule 3 = Dual CCN occupancy 4 = 4-20 mA Input 5 = Setpoint Potentiometer		
RL.S	Ramp Load Select	Enable/Disable		
CRMP	Cooling Ramp Loading	0.2 to 2.0		
HRMP	Heating Ramp Loading	0.2 to 2.0		
HCSW	Heat Cool Select	Cool/Heat		
Z.GN	Deadband Multiplier	1.0 to 4.0		

PRESS ESCAPE KEY SEVERAL TIMES TO GET TO THE MODE LEVEL (BLANK DISPLAY). USE THE ARROW KEYS TO SCROLL TO THE SET POINT LED. PRESS ENTER TO DISPLAY SETPOINTS. RECORD CONFIGURATION INFORMATION BELOW:

SETPOINT

SUB-MODE	ITEM	DESCRIPTION	STATUS	UNITS	VALUE
COOL	CSP.1	Cooling Setpoint 1	–20 to 70	°F	
	CSP.2	Cooling Setpoint 2	–20 to 70	°F	
	CSP.3	Cooling Setpoint 3	–20 to 32	°F	
HEAT	HSP.1	Heating Setpoint 1	80 to 140	°F	
	HSP.2	Heating Setpoint 2	80 to 140	°F	
HEAD	HD.P.A	Head Pressure Setpoint A	80 to 140	°F	
	HD.P.B	Head Pressure Setpoint B	80 to 140	°F	

USE ARROW/ESCAPE KEYS TO ILLUMINATE TEMPERATURES LED. PRESS ENTER TO DISPLAY ‘UNIT’. PRESS ENTER AND USE THE ARROW KEYS TO RECORD TEMPERATURES FOR T1 AND T2 BELOW. RECORD T9 AND T10 IF INSTALLED. RECORD CONDENSER ENTERING AND LEAVING FLUID TEMPERATURES IF INSTALLED. PRESS ESCAPE TO DISPLAY ‘UNIT’ AGAIN AND PRESS THE DOWN ARROW KEY TO DISPLAY ‘CIR.A’. PRESS ENTER AND USE THE ARROW KEYS TO RECORD TEMPERATURE FOR T3 (30GTN,R ONLY). USING A DC VOLTMETER, MEASURE AND RECORD THE VOLTAGE FOR EACH THERMISTOR AT THE LOCATION SHOWN. FOR MODELS WITH QUICKSET, RECORD THE TEMPERATURES ACCORDING TO THE DC VOLTAGES USING TABLES 32A-33B.

	TEMPERATURE	VDC	BOARD LOCATION
T1 (CLWT)	____________	____________	MBB, J8 PINS 13,14
T2 (CEWT)	____________	____________	MBB, J8 PINS 11,12
T3 (SCT.A)	____________	____________	MBB, J8 PINS 21,22
T9 (OAT)	____________	____________	MBB, J8 PINS 7,8
T10 (SPT)	____________	____________	MBB, J8 PINS 5,6
(CNDE)	____________	____________	MBB, J8 PINS 1,2
(CNDL)	____________	____________	MBB, J8 PINS 3,4

C. Unit Start-Up (cont)

USE ESCAPE/ARROW KEYS TO ILLUMINATE CONFIGURATION LED. PRESS ENTER TO DISPLAY ‘DISP’. PRESS ENTER AGAIN TO DISPLAY ‘TEST’ FOLLOWED BY ‘OFF’. PRESS ENTER TO STOP DISPLAY AT ‘OFF’ AND ENTER AGAIN SO ‘OFF’ DISPLAY FLASHES. ‘PASS’ AND ‘WORD’ WILL FLASH IF PASSWORD NEEDS TO BE ENTERED. PRESS ENTER TO DISPLAY PASSWORD FIELD AND USE THE ENTER KEY FOR EACH OF THE FOUR PASSWORD DIGITS. USE ARROW KEYS IF PASSWORD IS OTHER THAN STANDARD. AT FLASHING ‘OFF’ DISPLAY, PRESS THE UP ARROW KEY TO DISPLAY ’ON’ AND PRESS ENTER. ALL LED SEGMENTS AND MODE LEDS WILL LIGHT UP. PRESS ESCAPE TO STOP THE TEST. PRESS ESCAPE TO RETURN TO THE ‘DISP’ DISPLAY. PRESS THE ESCAPE KEY AGAIN AND USE THE ARROW KEYS TO ILLUMINATE THE SERVICE TEST LED. PRESS ENTER TO DISPLAY ‘TEST’. PRESS ENTER TO STOP DISPLAY AT ‘OFF’ AND ENTER AGAIN SO ‘OFF’ FLASHES. PRESS THE UP ARROW KEY AND ENTER TO ENABLE THE MANUAL MODE. PRESS ESCAPE AND DISPLAY NOW SAYS ‘TEST’ ‘ON’.

PRESS THE DOWN ARROW TO DISPLAY ‘OUTS’. PRESS THE ENTER KEY TO DISPLAY ‘LLS.A’. PRESS THE ENTER KEY TO STOP DISPLAY AT ‘OFF’ AND ENTER AGAIN SO ‘OFF’ FLASHES. PRESS THE UP ARROW KEY AND ENTER TO TURN THE OUTPUT ON. PRESS ENTER SO THE ‘ON’ DISPLAY FLASHES, PRESS THE DOWN ARROW KEY AND THEN ENTER TO TURN THE OUTPUT OFF. OUTPUTS WILL ALSO BE TURNED OFF OR SENT TO 0% WHEN ANOTHER OUTPUT IS TURNED ON. CHECK OFF THE FOLLOWING THAT APPLY AFTER BEING TESTED:

LLS.A	N/A		EXV.A	____________
LLS.B	N/A		EXV.B	____________
FAN1	____________		FAN2	____________
FAN3	____________		FAN4	____________
CLR.P	____________	(TB5 — 10,12)	CND.P	N/A
RMT.A	____________	(TB5 — 11,12)		

USE ESCAPE KEY TO RETURN TO ‘OUTS’ DISPLAY. PRESS DOWN ARROW TO DISPLAY ‘COMP’. PRESS ENTER KEY TO DISPLAY ‘CC.A1’. NOTE THAT UNLOADERS AND HOT GAS BYPASS SOLENOIDS CAN BE TESTED BOTH WITH AND WITHOUT COMPRESSOR(S) RUNNING. MAKE SURE ALL SERVICE VALVES ARE OPEN AND COOLER/CONDENSER PUMPS HAVE BEEN TURNED ON BEFORE STARTING COMPRESSORS. CHECK OFF EACH ITEM AFTER SUCCESSFUL TEST. THE CONTROL WILL ONLY START ONE COMPRESSOR PER MINUTE. WHEN AT THE DESIRED ITEM, PRESS THE ENTER KEY TWICE TO MAKE THE ‘OFF’ FLASH. PRESS THE UP ARROW KEY AND ENTER TO TURN THE OUTPUT ON.

CC.A1	______________	CC.A2	______________
CC.A3	______________	CC.A4	______________
UL.A1	______________	UL.A2	______________
HGBP	______________		
CC.B1	______________	CC.B2	______________
CC.B3	______________	CC.B4	______________
UL.B1	______________	UL.B2	______________

CHECK AND ADJUST SUPERHEAT AS REQUIRED.

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

All Units:

MEASURE THE FOLLOWING (MEASURE WHILE MACHINE IS IN STABLE OPERATING CONDITION):

	CIRCUIT A	CIRCUIT B
DISCHARGE PRESSURE		
SUCTION PRESSURE		
OIL PRESSURE		
DISCHARGE LINE TEMP		
SUCTION LINE TEMP		
SATURATED COND TEMP (T3/T4)		
SATURATED SUCT TEMP (T5/T6)		
SUCTION GAS TEMP (T7/T8)		
COOLER ENT FLUID (T2)		
COOLER LVG FLUID (T1)		

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. 563-025 Printed in U.S.A. Form 30GTN-3T Pg CL-8 3-00 Replaces: 30GTN-2T