superseded by -4SI

Carrier
HEATING & COOLING

30GN040-070
Flotronic™ II Reciprocating Liquid Chillers

Installation, Start-Up and Service Instructions

50 and 60 Hz

CONTENTS

IMPORTANT: This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with these instructions may cause radio interference. It has been tested and found to comply with the limits of a Class A computing device as defined by FCC regulations; Subpart J of Part 15, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

SAFETY CONSIDERATIONS

Installing, starting-up, and servicing this equipment can be hazardous due to system pressures, electrical components and equipment location (roofs, elevated structures, etc.)

Only trained, qualified installers and service mechanics should install, start-up, and service this equipment.

Untrained personnel can perform basic maintenance functions, such as cleaning coils. All other operations should be performed by trained service personnel.

When working on the 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 bulky equipment.

ELECTRIC SHOCK HAZARD

Open all remote disconnects before servicing this equipment.

INTRODUCTION

These instructions cover installation, start-up and service of 30GN040-070 Flotronic™ II liquid chillers with Carrier Comfort Network (CCN) compatible electronic controls and units with factory-installed options (FIOP).

Inspect the unit upon arrival for damage. If damage is found, file a claim right away with the shipping company. When considering location for the unit, be sure to consult National Electrical Code (NEC) and local code requirements. Allow sufficient space for airflow, wiring, piping, and service. See Fig. 1 and 2. Be sure flooring beneath the unit is level, and capable of supporting the operating weight of the unit. See Tables 1 - 3.

Book 2 Tab 5c | PC 903 | Catalog No 533-061 | Printed in U S.A. | Form 30GN-1SI | Pg 1 | 6-92 | Replaces: New

INSTALLATION

Step 1 — Rig and Place the Unit — These units are designed for overhead rigging. Lifting holes are provided in frame base channels, marked for rigging (see rigging label on unit). Use spreader bars or frame to keep cables or chains clear of unit sides. Run cables to a central suspension point so that angle from horizontal is not less than 45 degrees. Raise and set down unit carefully. Export units and domestic units with skids are rigged and placed as described below.

DOMESTIC UNITS — Standard units are shipped without skids and include coil protection. If, at the job site, overhead rigging is not possible, place chiller on skid or pad for rolling or dragging. When rolling, use minimum of 3 rollers. When dragging, pull the pad. *Do not apply force to the unit.* When in final position, raise from above to lift unit off the pad.

EXPORT UNITS AND DOMESTIC UNITS WITH SKIDS — All units are mounted on skids with vertical coil protection. At the job site, leave unit on the skid until it is in final position. *While on the skid, the unit can be rolled or skidded on the floor, with force applied to the skid, not the unit.* When the skid is removed, the unit must be handled by overhead rigging as described above. If it is necessary to remove the skid before the unit is in final position and it can be dragged, place it on a large pad and drag by the pad. *Do not apply force to the unit.* When in final position, raise from above to lift unit off the pad.

PLACING UNIT — Refer to Fig. 1 and 2 for air flow clearances. There must be at least 8 ft (2440 mm) air flow clearance above unit. Provide ample room for servicing and removing cooler, depending on unit location. Refer to cooler dimensions in Fig. 1 and 2. For multiple units, allow 8 ft (2440 mm) separation between units for airflow and service. Placement area must be level and strong enough to support operating weight of unit (see Tables 1 - 3). Weights at unit support points are shown in Table 1. Bolt unit securely to pad when unit is positioned and leveled. Fasteners for mounting unit are field supplied. Check that unit is mounted level to ensure proper oil return to compressors. If vibration isolators (field supplied) are required for a particular installation, refer to unit weight distribution in Table 1 to aid in proper selection of isolators.

Step 2 — Check Compressor Mounting — All compressors on 30GN040-070 units are mounted on pans and are held down by 4 bolts during shipment. After unit is installed, loosen each of these bolts until the snubber washer can be moved with finger pressure. See Fig. 3 and 4.

Step 3 — Cooler Water and Drain Piping Connections — When facing cooler-side of unit, inlet (return) water connection is on the right, nearest the control box. Outlet (supply) water connection is on the left. The cooler has water-side victaulic-type connections (follow connection directions as provided by the coupling manufacturer). If accessory grilles have been added, holes must be cut in grilles for field piping and insulation.

Although cooler has an air vent, it is recommended that field-supplied air vents be installed in system to facilitate servicing. Field-supplied shutoff valves should also be installed to facilitate servicing and flow balancing. Locate valves in return and supply cooler water lines as close to the chiller as possible. Locate air vents at highest point of the cooler water system. Install a strainer in the return water line as close as possible to the chiller.

Upon completion of the field piping installation, in areas where the piping is exposed to 32 F (0° C) or below ambient temperatures, freeze-up protection is recommended using ethylene glycol or electric heater tapes. Heat tapes should have a rating for area ambient temperatures, and be covered with a suitable thickness of closed-cell insulation. Route power for the heater tapes from a separate fused disconnect. Mount the disconnect within a line of sight as prescribed by local or NEC codes. Identify disconnect as heater tape power source, with warning that power must not be turned off except when servicing the unit.

IMPORTANT: Before starting unit, be sure all of the air has been purged from the system.

A drain connection is located at leaving (supply)-water end of cooler. See Fig. 1 and 2.

PREPARATION FOR YEAR-ROUND OPERATION — If unit is to operate all year round, add sufficient ethylene glycol to the cooler water to prevent freeze-up under cold operating conditions. Consult local water authority on characteristics of area water and a recommended inhibitor for the cooler water loop.

PREPARATION FOR WINTER SHUTDOWN — *Do not shut off control power disconnect during off-season shutdown.*

At end of cooling season, drain the water from the system. Replace the drain plug and add 2 gal. (8 L) of ethylene glycol to the cooler to prevent freezing of any remaining water in system. Glycol can be added through the vent on top of cooler. Open one of the thermistor connections to allow air to escape the vessel, and the glycol to enter. At the beginning of the next cooling season, refill cooler and add recommended inhibitor.

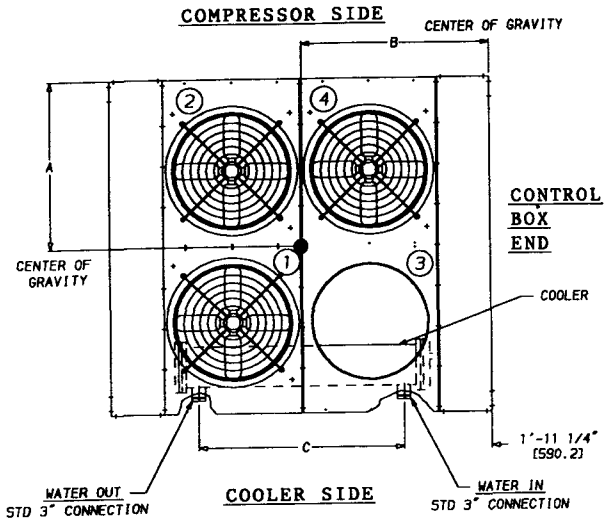
Step 4 — Make Electrical Connections — The electrical characteristics of the available power supply must agree with the unit nameplate rating. Supply voltage must be within the limits shown. The control box is divided into field power side on the right and control power supply on the left. See Fig. 1 and 2. See Fig. 5 for control panel (located inside control box). Control panel includes control power terminal block.

FIELD POWER CONNECTIONS (See Fig. 6.) — All power wiring must comply with applicable local and national codes. Install field-supplied, branch circuit fused disconnect(s) of a type that can be locked OFF or OPEN. Disconnect(s) must be located within sight from and readily accessible from unit in compliance with NEC Article 440-14. See Tables 4 - 7 for unit electrical data.

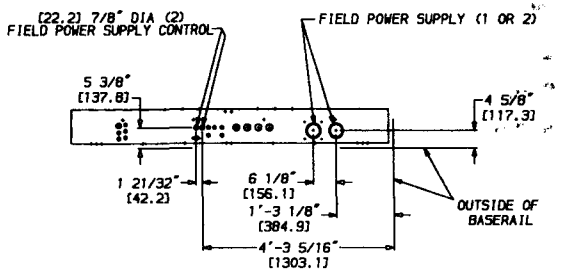
All field main power enters the unit through the control box at the left end when facing the compressors. An access hole is under the control box. All units have a single location for power connection (except 050-070, 208/230 units) to simplify the field power wiring. For all sizes, maximum wire size that the unit terminal block will accept is 500 kcmil. Unit may use copper, copper-clad aluminum, or aluminum conductors at all voltages.

For 208/230-3-60 units (sizes 050-070), parallel conductors are required. Power must be supplied by 6 parallel conductors for these units.

Continued on page 8.



TOP VIEW



VIEW A-A

TOP VIEW OF CONTROL BOX SHELF WITH FIELD POWER SUPPLY CONNECTIONS.

NOTES:
1. Unit must have clearances for airflow as follows:
   TOP — Do not restrict in any way.
   ENDS — 5 ft [1524 mm]
   SIDES — 6 ft [1829 mm]
2. Dimensions in [ ] are millimeters.

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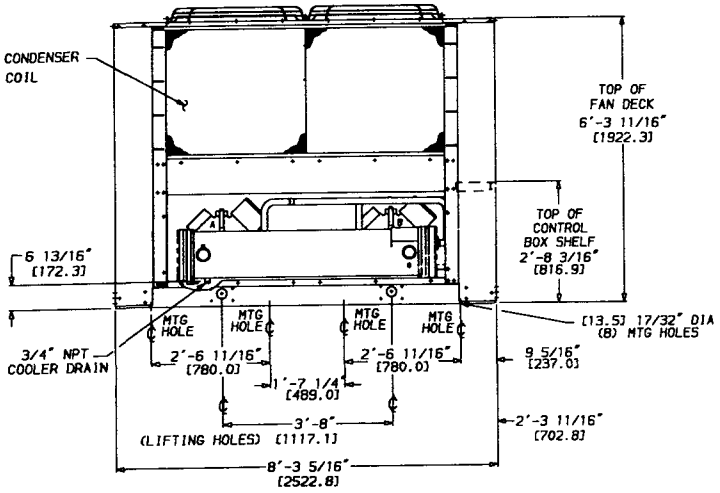
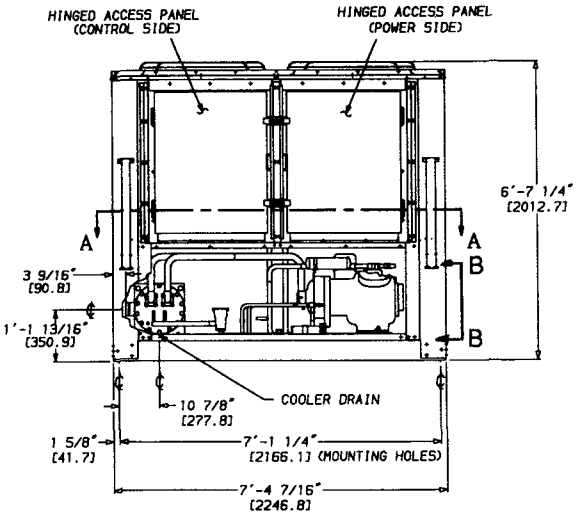


SIDE VIEW



END VIEW

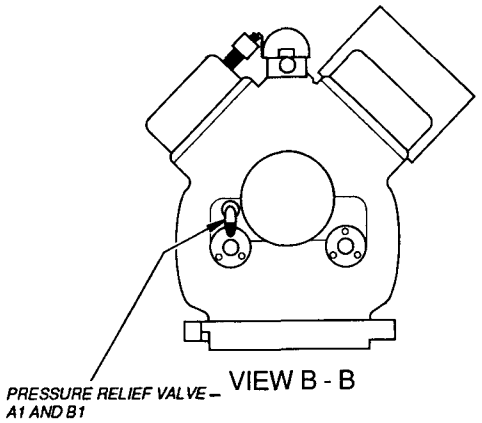
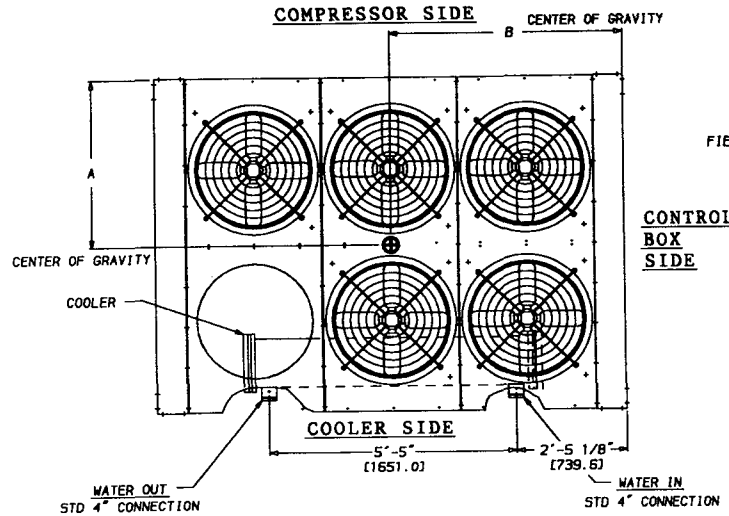
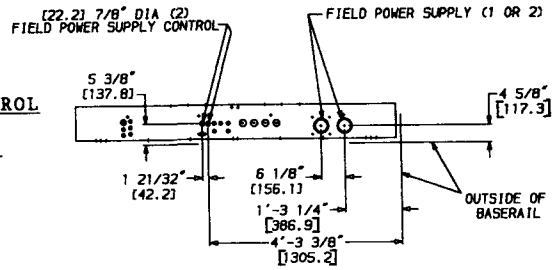


Fig. 1 — Dimensions, 30GN040,045,050



CONTROL BOX SIDE

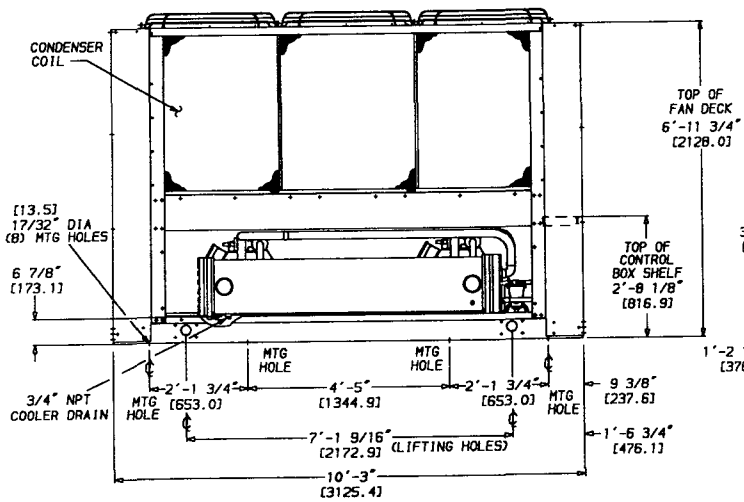


VIEW A-A

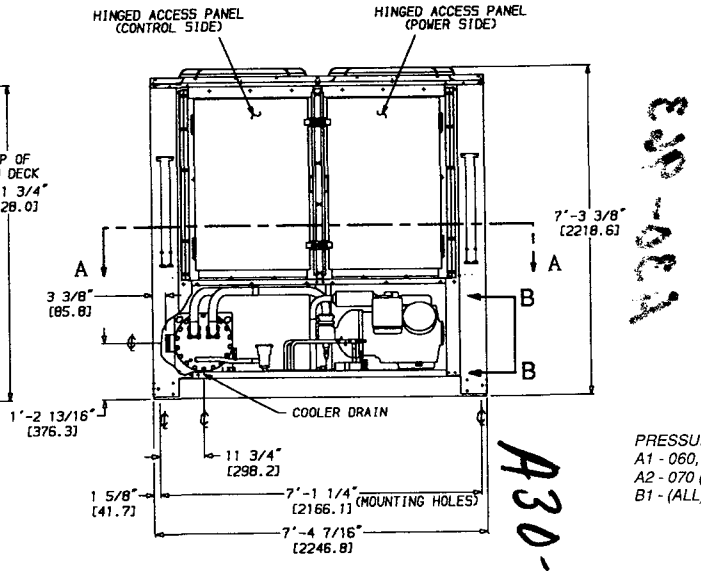
TOP VIEW OF CONTROL BOX SHELF
WITH FIELD POWER SUPPLY CONNECTIONS.

NOTES:
1. Unit must have clearances for airflow as follows:
   TOP — Do not restrict in any way.
   ENDS — 5 ft [1524 mm]
   SIDES — 6 ft [1829 mm]
2. Dimensions in [ ] are millimeters.

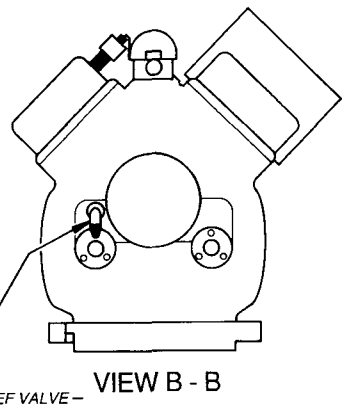
TOP VIEW



SIDE VIEW



END VIEW



VIEW B - B

PRESSURE RELIEF VALVE –
A1 - 060, 070 (60 Hz), 060 (50 Hz),
A2 - 070 (50 Hz),
B1 - (ALL)

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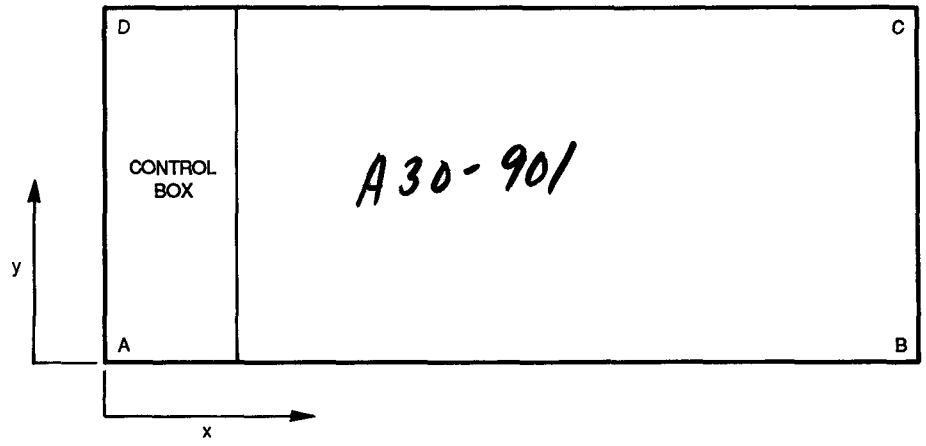
Fig. 2 — Dimensions, 30GN060,070

Table 1 — Mounting Weights (Approximate)



60 HZ

UNIT SIZE	CONDENSER COIL	lb				kg			
		A	B	C	D	A	B	C	D
040	C-AL	972	876	807	895	441	397	366	406
	C-C	1044	948	879	968	473	430	399	439
045	C-AL	999	895	845	943	453	406	383	428
	C-C	1071	967	917	1015	486	438	416	460
050	C-AL	1047	948	884	976	475	430	401	443
	C-C	1155	1057	992	1085	524	479	450	492
060	C-AL	1258	1130	1130	1113	570	512	505	562
	C-C	1362	1234	1217	1344	618	560	552	609
070	C-AL	1332	1212	1184	1301	604	550	537	590
	C-C	1489	1369	1340	1458	675	621	608	661

50 HZ

UNIT SIZE	CONDENSER COIL	lb				kg			
		A	B	C	D	A	B	C	D
040	C-AL	992	886	808	904	450	402	366	410
	C-C	1064	959	880	976	482	435	399	443
045	C-AL	1065	934	812	925	483	424	368	420
	C-C	1137	1007	883	998	515	457	401	452
050	C-AL	1074	968	889	986	487	439	403	447
	C-C	1182	1076	997	1095	536	488	452	496
060	C-AL	1269	1151	1123	1238	575	522	509	561
	C-C	1373	1255	1227	1342	623	569	556	609
070	C-AL	1508	1369	1226	1350	684	621	556	612
	C-C	1664	1526	1383	1508	755	692	627	684

LEGEND

C-AL — Copper Tubing — Aluminum Fins
C-C — Copper Tubing — Copper Fins

RIGGING CENTER OF GRAVITY

UNIT SIZE	040		045		050		060		070	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
X Dimension	46 13/16	1189	46 13/16	1189	47	1194	58 5/16	1481	58 1/2	1486
Y Dimension	41 11/16	1059	42 1/8	1069	41 7/8	1064	42 7/8	1090	42	1067

Table 2 — Physical Data — 60 Hz

ENGLISH

UNIT SIZE		040	045	050	060	070
APPROX OPERATING WEIGHT — lb	C-AL	3550	3681	3856	4740	5028
	C-C	3838	3969	4289	5157	5656
REFRIGERANT CHARGE — lb						
R-22	Ckt A	39/12	40/12	48/12	52/14	70/15
Total/Over Clear Glass	Ckt B	48/12	46/12	60/12	54/14	69/15
COMPRESSORS, Type...rpm		Reciprocating, Semi-Hermetic 1750				
06E*	(No.) Ckt A	(1) 2250	(1) 2250	(1) 6265	(1) 6275	(1) 6299
	(No.) Ckt B	(1) A250	(1) F265	(1) F275	(1) F299	(1) F299
Oil Charge — Compressor/pt		250/17, 265/21, 275/21, 299/19				
Capacity Control Steps		4	4	4	4	4
% Cap.	Ckt A	50	42.4	47 6	43.3	50
	Ckt B	50 0	57.6	52.4	56 7	50 0
Minimum Step Capacity (%)		25.0	21 2	31 7	28.8	33.3
CONDENSER FANS — Type		Propeller, Direct Drive				
Fan Speed — rpm		1140	1140	1140	1140	1140
No. Blades...Diameter — in.		4 30	4 30	4 30	4. .30	4. 30
No. Fans...Total kW		4. .6.2	4. 6.2	4. 6.2	6. 9.3	6...9.3
Total Airflow — cfm		35,000	35,000	34,000	52,000	51,000
CONDENSER COILS — Type		Vertical and Horizontal, Plate Fin, Enhanced Tubing				
Tubes (Copper), OD — in.		0.375	0 375	0.375	0 375	0 375
Fins/in.		17	17	17	17	17
No. Rows — Ckt A or B		2	2	3	2	3
Face Area sq ft — Ckt A and B Total		80 5	80 5	80 5	116 7	116.7
Max Working Pressure Refrigerant — psig		450				
COOLER — No. ...Type		One . Direct Expansion, Shell and Tube				
No. Refrigerant Circuits		2	2	2	2	2
Net Water Volume — Gal. (includes nozzles)		10 9	13 5	13.5	18.0	18 0
Max Working Pressure						
Refrigerant Side/Water Side — psig						
Standard Cooler		278/300				
Australian Code Cooler		207/150				
WATER CONNECTIONS — in.		Cooler Inlet and Outlet; Victaulic Type				
Inlet and Outlet		3	3	3	4	4
Drain		¾ NPT				

SI

UNIT SIZE		040	045	050	060	070
APPROX OPERATING WEIGHT — kg	C-AL	1610	1669	1749	2150	2280
	C-C	1741	1800	1945	2339	2565
REFRIGERANT CHARGE — kg						
R-22	Ckt A	17 7/5 4	18.1/5.4	21.8/5.4	23.6/6.3	31.7/6.8
Total/Over Clear Glass	Ckt B	21.8/5.4	20.9/5.4	27.2/5.4	24.5/6.3	31.3/6.8
COMPRESSORS, Type...rpm		Reciprocating, Semi-Hermetic 29 2				
06E*	(No.) Ckt A	(1) 2250	(1) 2250	(1) 6265	(1) 6275	(1) 6299
	(No.) Ckt B	(1) A250	(1) F265	(1) F275	(1) F299	(1) F299
Oil Charge — Compressor/L		250/8.0, 265/9.9, 275/9.9, 299/9.0				
Capacity Control Steps		4	4	4	4	4
% Cap.	Ckt A	50 0	42 4	47.6	43 3	50.0
	Ckt B	50.0	57 6	52.4	56 7	50.0
Minimum Step Capacity (%)		25.0	21.2	31.7	28.8	33.3
CONDENSER FANS — Type		Propeller, Direct Drive				
Fan Speed — r/s		19	19	19	19	19
No. Blades...Diameter — mm		4 762	4 .762	4 762	4 762	4. 762
No. Fans...Total kW		4.. 6.2	4. 6.2	4. 6 2	6.. 9.3	6...9.3
Total Airflow — L/s		16 517	16 517	16 045	24 540	24 068
CONDENSER COILS — Type		Vertical and Horizontal, Plate Fin, Enhanced Tubing				
Tubes (Copper), OD — mm		9 53	9 53	9 53	9.53	9 53
Fins/m		669	669	669	669	669
No. Rows — Ckt A or B		2	2	3	2	3
Face Area m^2 — Ckt A and B Total		7 48	7.48	7 48	10.84	10.84
Max Working Pressure Refrigerant — kPa		3103				
COOLER — No. ...Type		One...Direct Expansion, Shell and Tube				
No. Refrigerant Circuits		2	2	2	2	2
Net Water Volume — L (includes nozzles)		41 3	51.2	51.2	68 3	68 3
Max Working Pressure						
Refrigerant Side/Water Side — kPa						
Standard Cooler		1916/2068				
Australian Code Cooler		1430/1034				
WATER CONNECTIONS — in.		Cooler Inlet and Outlet; Victaulic Type				
Inlet and Outlet		3	3	3	4	4
Drain		¾ NPT				

LEGEND

C-AL — Copper Tubing — Aluminum Fins Condenser Coil
C-C — Copper Tubing — Copper Fins Condenser Coil
OD — Outside Diameter

*06E250 compressors have 4 cylinders; all others have 6.

NOTE: Facing the compressors, Circuit A is on the right and Circuit B is on the left

Table 3 — Physical Data — 50 Hz

ENGLISH

UNIT SIZE			040	045	050	060	070
APPROX OPERATING WEIGHT — lb		C-AL	3550	3736	3916	4780	5453
		C-C	3878	4024	4349	5197	6081
REFRIGERANT CHARGE — lb							
R-22	Ckt A	Total/Over Clear Glass	39/12	40/12	48/12	52/14	71/15
	Ckt B		48/12	46/12	60/12	54/14	69/15
COMPRESSORS, Type...rpm			Reciprocating, Semi-Hermetic . 1450				
06E*	(No.) Ckt A		(1) 2250	(1) 6265	(1) 6275	(1) 6299	(1) 6265, (1) F265
	(No.) Ckt B		(1) F265	(1) F275	(1) F299	(1) F299	(1) F299
Oil Charge — Compressor/pt			250/17, 265/21, 275/21, 299/19				
Capacity Control Steps			4	4	4	4	6
% Cap.	Ckt A		42.4	47.6	43.3	50 0	58.0
	Ckt B		57 6	52 4	56.7	50 0	42 0
Minimum Step Capacity (%)			21 2	31 7	28.8	33.3	19.3
CONDENSER FANS — Type			Propeller, Direct Drive				
Fan Speed — rpm			950	950	950	950	950
No. Blades...Diameter — in.			6 ..30	6 30	6...30	6 30	6.. 30
No. Fans...Total kW			4...6.2	4. 6.2	4. .6.2	6.. 9.3	6. 9.3
Total Airflow — cfm			35,000	35,000	34,000	52,000	51,000
CONDENSER COILS — Type			Vertical and Horizontal, Plate Fin, Enhanced Tubing				
Tubes (Copper), OD — in.			0 375	0 375	0.375	0 375	0 375
Fins/in.			17	17	17	17	17
No. Rows — Ckt A or B			2	2	3	2	3
Face Area sq ft — Ckt A and B Total			80.5	80.5	80.5	116 7	116 7
Max Working Pressure Refrigerant — psig			450				
COOLER — No. ...Type			One...Direct Expansion, Shell and Tube				
No. Refrigerant Circuits			2	2	2	2	2
Net Water Volume — Gal. (includes nozzles)			10 9	13 5	13 5	18.0	18 0
Max Working Pressure							
Refrigerant Side/Water Side — psig							
Standard Cooler			278/300				
Australian Code Cooler			207/150				
WATER CONNECTIONS — in.			Cooler Inlet and Outlet; Victaulic Type				
Inlet and Outlet			3	3	3	4	4
Drain			¾ NPT				

SI

UNIT SIZE			040	045	050	060	070
APPROX OPERATING WEIGHT — kg		C-AL	1628	1694	1776	2168	2473
		C-C	1759	1825	1972	2357	2758
REFRIGERANT CHARGE — kg							
R-22	Ckt A	Total/Over Clear Glass	17 7/5.4	18 1/5.4	21 8/5 4	23.6/6 3	32 2/16.8
	Ckt B		21.8/5.4	20.9/5 4	27.2/5 4	24.5/6.3	31 3/16.8
COMPRESSORS, Type...r/s			Reciprocating, Semi-Hermetic...24 2				
06E*	(No.) Ckt A		(1) 2250	(1) 6265	(1) 6275	(1) 6299	(1) 6265, F265
	(No.) Ckt B		(1) F265	(1) F275	(1) F299	(1) F299	(1) F299
Oil Charge — Compressor/pt			250/8 0, 265/9.9, 275/9 9, 299/9 0				
Capacity Control Steps			4	4	4	4	6
% Cap.	Ckt A		42.4	47.6	43.3	50.0	58.0
	Ckt B		57 6	52 4	56 7	50 0	42 0
Minimum Step Capacity (%)			21.2	31.7	28.8	33.3	19.3
CONDENSER FANS — Type			Propeller, Direct Drive				
Fan Speed — r/s			15.8	15.8	15.8	15.8	15.8
No. Blades...Diameter — mm			6 762	6. 762	6...762	6 . 762	6 762
No. Fans...Total kW			4. .6.2	4. 6.2	4. 6.2	6. 9.3	6...9.3
Total Airflow — L/s			16 517	16 517	16 045	24 540	24 068
CONDENSER COILS — Type			Vertical and Horizontal, Plate Fin, Enhanced Tubing				
Tubes (Copper), OD — mm			9 53	9 53	9 53	9 53	9 53
Fins/m			669	669	669	669	669
No. Rows — Ckt A or B			2	2	3	2	3
Face Area m^2 — Ckt A and B Total			7 48	7.48	7 48	10.84	10.84
Max Working Pressure Refrigerant — kPa			3103				
COOLER — No. ...Type			One Direct Expansion, Shell and Tube				
No. Refrigerant Circuits			2	2	2	2	2
Net Water Volume — L (includes nozzles)			41 3	51 2	51 2	68 3	68 3
Max Working Pressure							
Refrigerant Side/Water Side — kPa							
Standard Cooler			1916/2068				
Australian Code Cooler			1430/1034				
WATER CONNECTIONS — in.			Cooler Inlet and Outlet; Victaulic Type				
Inlet and Outlet			3	3	3	4	4
Drain			¾ NPT				

LEGEND

C-AL — Copper Tubing — Aluminum Fins Condenser Coil
C-C — Copper Tubing — Copper Fins Condenser Coil
OD — Outside Diameter

*06E250 compressors have 4 cylinders; all others have 6

NOTE: Facing the compressors, Circuit A is on the right and Circuit B is on the left

30-291

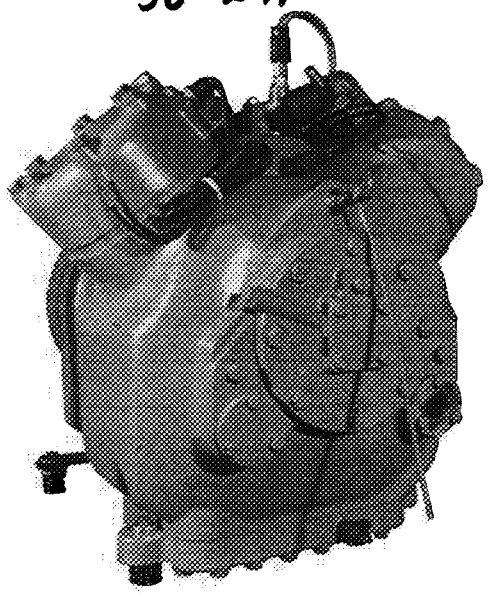
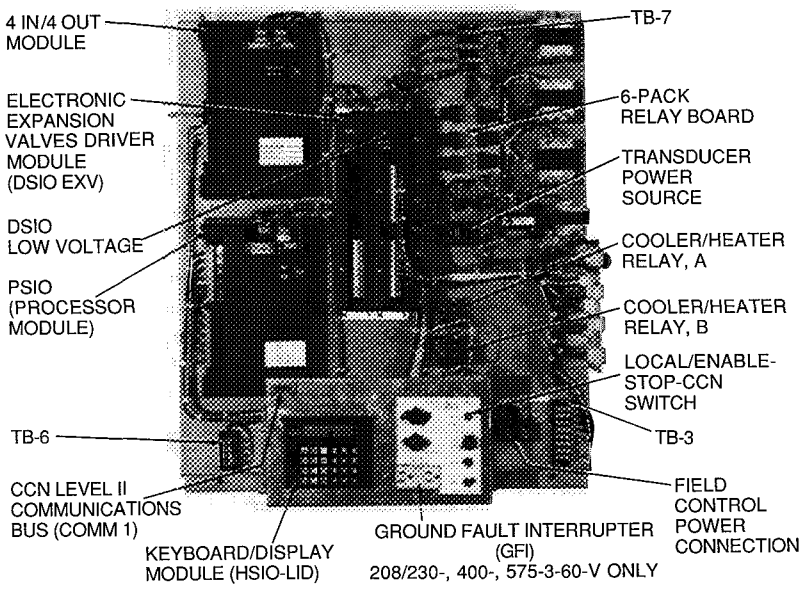


Fig. 3 — Compressor Mounting View

Fig. 4 — Compressor Mounting Bolt

30-291



30-295

Fig. 5 — 30GN Control Panel

FIELD CONTROL POWER CONNECTIONS (See Fig. 6.) — *For 208/230-, 460- and 575-3-60 units:* If the accessory transformer is not used, provide a single-phase power source for the control circuit, through a field-supplied fused disconnect per NEC. This conductor *must be copper only.* Control power enters the control box through a 7/8-in. (22.2-mm) conduit connection located on the left side of the control section. *For 380-3-60, and 346- and 380/415-3-50 units:* Control circuit voltage is taken from the line voltage, therefore, no additional power supply is required. If a separate power source is required, follow these instructions, and disconnect the wires between the control and power terminal blocks.

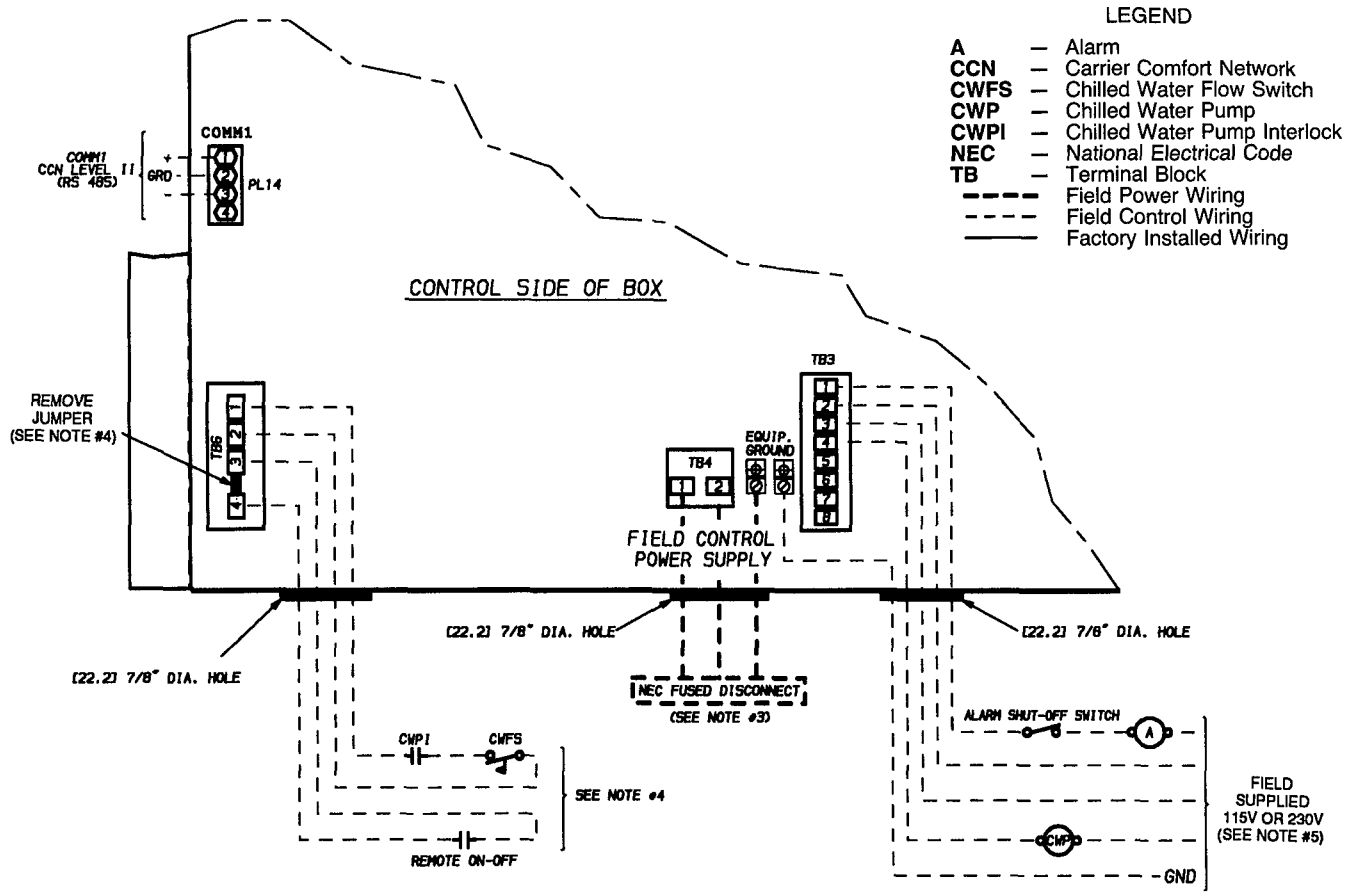
Units with a power supply of 208/230-, 460- and 575-3-60 require 115-1-60 control circuit power. Units with a power supply of 380-3-60 have 230-1-60 control circuit power, which is taken from the unit's power supply voltage. Units with a power supply of 346- or 380/415-3-50 have 230-1-50 control circuit power, which is also taken from the unit's power supply voltage. For control circuit current draw, see Table 5.

Control circuit power draw includes the compressor crankcase heaters at 180 watts each, the cooler heaters (if equipped) at 210 watts each, and the electronic board heater at 120 watts. Sizes 040-050 have 4 cooler heaters, sizes 060,070 have 6 cooler heaters.

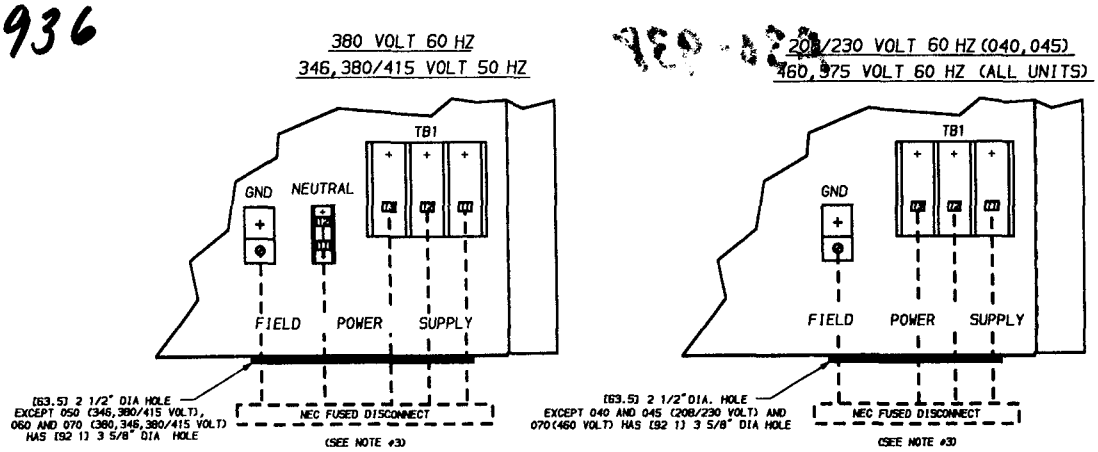
⚠ CAUTION

Crankcase heaters, cooler heaters, and board heater are all wired into the control circuit ahead of the control circuit switch. Therefore, they are always active even if the control circuit switch is OFF.

Terminals TB6-1 and TB6-2 are provided for field installation of a Chilled Water Pump Interlock (CWPI) and a Chilled Water Flow Switch (CWFS). These devices are to be installed in series, if used.



A30-936



NOTES:
1. Factory wiring is in accordance with National Electrical Code (NEC). Field modifications or additions must be in compliance with all applicable codes.
2. Wiring for main field power supply must be rated 75 C minimum. Use copper, copper clad aluminum, or aluminum conductors for all units.
3. Power for control circuit should be supplied from a separate source through a field-supplied fused disconnect with 20 amp maximum protection for 115-v control circuits, 10 amp maximum protection for 230-v control circuit for a unit with cooler heaters, and 5 amp maximum for a unit without cooler heaters. Connect control circuit power to terminals 1 and 2 of TB4. Connect neutral side of supply to terminal 2 of TB4. Control circuit conductors for all units must be copper only.
4. Terminals 1, 2, 3, and 4 of TB6 are for field external connection for remote ON-OFF or CWP interlock and CWFS. The contacts must be rated for dry circuit application capable of reliably switching a 5 vdc 1 mA to 20 mA load. Remove jumper between 3 and 4 of TB6 if remote ON-OFF is installed.
5. Terminals 1 and 2 on TB3 are for control of remote alarm functions. Terminals 3 and 4 on TB3 are for control of chilled water pump starter. The maximum load allowed for the alarm circuit and the chilled water pump circuit is 125 va sealed, 1250 va inrush at 115 or 230 v.
6. Dimensions in ( ) are millimeters.

A30-987

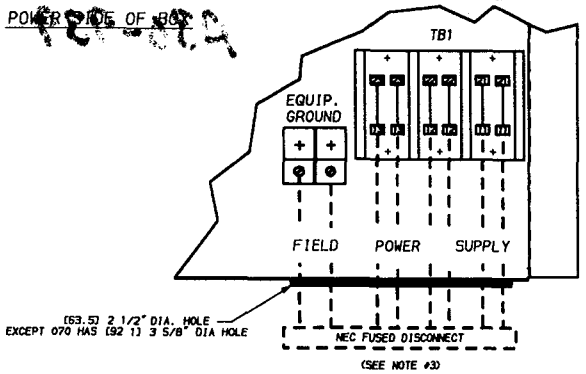


Fig. 6 — Field Wiring (30GN040-070)

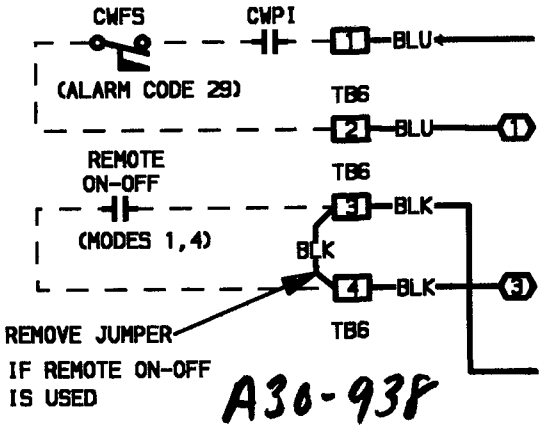
TB6-3 and TB6-4 is the circuit that the Remote On-Off switch can be wired into. To use this feature, remove the factory-installed jumper and install the device in series. See Fig. 7 for interlock circuit wiring.

⚠ CAUTION

Do not use interlocks or other safety device contacts connected between TB6 terminals 1 and 2 as remote ON-OFF. If remote ON-OFF unit control is required, a field-supplied relay must be installed in unit control box and wired as shown in Fig. 7.

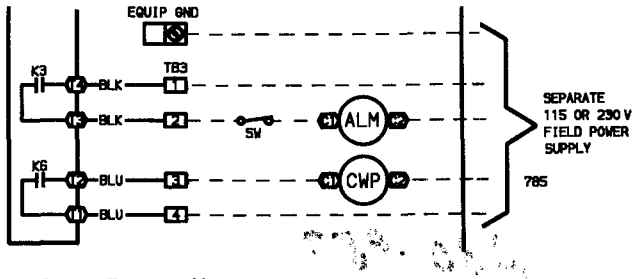
Terminals TB3-1 and TB3-2 have been provided for a Remote Alarm (ALM). It is recommended that if an audible alarm is installed, an alarm shutoff also be installed. See Fig. 8.

Terminals TB3-3 and TB-3-4 have been provided for a field-installed Chilled Water Pump Relay (CWP). A field-supplied power supply of appropriate voltage must be provided. See Fig. 8.



CWFS — Chilled Water Flow Switch
CWPI — Chilled Water Pump Interlock
TB — Terminal Board

Fig. 7 — Interlock Circuit



ALM — Remote Alarm
CWP — Chilled Water Pump Relay
TB — Terminal Board

Fig. 8 — Remote Alarm and Chilled Water Pump Relay

Step 5 — Install Accessories

ELECTRICAL — A number of electrical accessories are available to provide the following optional features (for details, refer to the Controls and Troubleshooting book):

- Accessory unloaders
- Compressor Protection Control System (CPCS)
- Cooler pump control
- Cooler pump/flow switch interlock
- Demand limit control
- Dual set point control
- Level II Communications (CCN)
- Pulldown control
- Remote alarm
- Remote On/Off
- Temperature reset

LOW-AMBIENT OPERATION — If operating temperatures below 0° F (-18 C) are expected, refer to separate installation instructions for low-ambient operation, Motormaster® III control.

HOT GAS BYPASS — Hot gas bypass usually is *not* recommended because it results in application of equipment out of its normal design application range. However, if its use is required, the appropriate hot gas bypass package may be used. For installation details, refer to separate instructions supplied with the accessory package.

MISCELLANEOUS ACCESSORIES — For applications requiring special accessories, the following packages are available: Condenser Hail Guard, Security Grille, and Sound Reduction Kit.

Table 4 — Unit Electrical Data

UNIT SIZE	VOLTAGE			MCA		MOCP		ICF	
	Nameplate	Supplied*		XL	PW	XL	PW	XL	PW
		Min	Max						
040	208/230-3-60	187	253	174.6	174.6	225	225	434.7	296.7
	460-3-60	414	506	100.0	100.0	100	100	218.6	148.3
	575-3-60	518	633	100.0	100.0	100	100	162.4	113.7
	380-3-60	342	418	100.0	100.0	125	100	241.2	163.9
	346-3-50	325	380	107.0	107.0	150	150	297.9	198.9
	380/415-3-50	342	440	101.1	101.4	125	125	269.6	179.3
045	208/230-3-60	187	253	201.8	201.8	250	250	535.7	357 7
	460-3-60	414	506	100 1	100.4	125	125	268.6	178.3
	575-3-60	518	633	100 0	100 0	125	100	206.4	139.8
	380-3-60	342	418	107.1	105.0	150	150	297.2	196.9
	346-3-50	325	380	129.8	129.8	175	175	342.5	230.5
	380/415-3-50	342	440	114.1	117.8	150	150	335.6	208.9
050	208/230-3-60	187	253	244 5	244.5	350	350	617.5	415.5
	460-3-60	414	506	113.1	116.8	150	150	307.6	207.9
	575-3-60	518	633	100.6	100.0	125	100	226.1	152.9
	380-3-60	342	418	126.9	127.8	175	175	341.1	228.5
	346-3-50	325	380	170.8	170.8	250	250	453.4	300.4
	380/415-3-50	342	440	140.6	145.6	200	200	403.8	267.7
060	208/230-3-60	187	253	323.3	323.3	450	450	823.6	547.6
	460-3-60	414	506	139.6	144.6	200	200	408.2	272 1
	575-3-60	518	633	125.4	121.0	175	150	336.8	218.7
	380-3-60	342	418	174.5	176.6	250	250	458.0	306.2
	346-3-50	325	380	205.3	205.3	250	250	487.9	334.9
	380/415-3-50	342	440	165.2	170.8	225	225	428.4	292.9
070	208/230-3-60	187	253	364.3	364 3	500	500	864.6	588.6
	460-3-60	414	506	163.6	169.2	225	225	426.8	291.3
	575-3-60	518	633	148 9	141 5	200	175	353.5	239.2
	380-3-60	342	418	200.7	202.3	250	250	484.2	331.9
	346-3-50	325	380	215.6	215.6	250	250	498.2	345.2
	380/415-3-50	342	440	187.0	192.7	250	250	450.2	314.8

Table 5 — Control Circuit

UNIT POWER	CONTROL POWER			AMPS
V-Ph-Hz	V-Ph-Hz	Min	Max	
208/230-3-60	115-1-60	104	127	20/10†
460-3-60	115-1-60	104	127	20/10†
575-3-60	115-1-60	104	127	20/10†
380-3-60	230-1-60	207	254	10/5†
346-3-50	230-1-50	198	254	10/5†
380/415-3-50	230-1-50	198	254	10/5†

LEGEND AND NOTES FOR ELECTRICAL DATA FOR TABLES 4 - 7

LEGEND

FLA — Full Load Amps (Fan Motors)
ICF — Maximum Instantaneous Current Flow during starting (the point in the starting sequence where the sum of the LRA for the starting compressor, plus the total RLA for all running compressors, plus the total FLA for all running fan motors is maximum)
kW — Total condenser fan motor power input
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing) — complies with NEC Section 430-24
MOCP — Maximum Overcurrent Protective Device Amps
NEC — National Electrical Code, U.S.A.
PW — Part Wind
RLA — Rated Load Amps (Compressors)
XL — Across-the-Line

*Units are suitable for use on electrical systems where voltage supplied to the unit terminals is not below or above the listed minimum and maximum limits. Maximum allowable phase imbalance is voltage, 2%; amps, 10%.
†First value is for chiller with cooler heater. Second value (if applicable) is for chiller without cooler heater.

NOTES:
1. All units have single point primary power connection. Main power must be supplied from a field-supplied disconnect.
2. The unit control circuit power (115 v, 1-ph for 208/230-, 460-, and 575-v units; 230 v, 1-ph for all other voltages) must be supplied from a separate source, through a field-supplied disconnect. The control circuit transformer accessory may be applied to power from primary unit power.
3. Crankcase and cooler heaters are wired into the control circuit so they are always operable as long as the control circuit power supply disconnect is on, even if any safety device is open or the unit LOCAL/ENABLE-STOP-CCN circuit switch is off.
4. Units have the following power wiring terminal blocks and parallel conductors:

UNIT SIZE	VOLTAGE	TERMINAL BLOCKS	PARALLEL CONDUCTORS
040 to 070	208/230	1	3 (040,045),6 (050-070)
	460	1	3
	575	1	3
	380	1	3
	346	1	3
	380/415	1	3

5. Maximum incoming wire size for each terminal block is 500 kcmil.
6. Power draw of control circuits includes both crankcase heaters (where used) and cooler heaters. Each compressor has a crankcase heater which draws 180 watts of power.

   Units ordered with cooler heater option have 4 cooler heaters (040-050) 6 cooler heaters (060,070), 210 w each, and a 120-w circuit board heater

Table 6 – Compressor Electrical Data

UNIT SIZE	NAMEPLATE VOLTAGE	COMPRESSOR NUMBERS					
		A1		A2		B1	
		RLA	LRA	RLA	LRA	RLA	LRA
040	208/230-3-60	67.9	345	—	—	67 9	345
	460-3-60	34 6	173	—	—	34.6	173
	575-3-60	28 8	120	—	—	28.8	120
	380-3-60	34 6	191	—	—	34 6	191
	346-3-50	33 3	191	—	—	44 9	247
	380/415-3-50	34.6	173	—	—	43.6	223
040-PW	208/230-3-60	67.9	207	—	—	67 9	207
	460-3-60	33 3	104	—	—	33.3	104
	575-3-60	28 2	72	—	—	28.2	72
	380-3-60	33.3	115	—	—	33 3	115
	346-3-50	33 3	115	—	—	44.9	148
	380/415-3-50	33.3	104	—	—	44.9	134
045	208/230-3-60	67.9	345	—	—	89 7	446
	460-3-60	34.6	173	—	—	43.6	223
	575-3-60	28.8	120	—	—	36 5	164
	380-3-60	34.6	191	—	—	45 5	247
	346-3-50	44 9	247	—	—	53 8	280
	380/415-3-50	43 6	223	—	—	46 8	280
045-PW	208/230-3-60	67.9	207	—	—	89 7	268
	460-3-60	33.3	104	—	—	44.9	134
	575-3-60	28.2	72	—	—	33.3	98
	380-3-60	33.3	115	—	—	44 9	148
	346-3-50	44 9	148	—	—	53 8	168
	380/415-3-50	44.9	134	—	—	48 7	152
050	208/230-3-60	89 7	446	—	—	106.4	506
	460-3-60	43.6	223	—	—	46.8	253
	575-3-60	36 5	164	—	—	40 4	176
	380-3-60	45 5	247	—	—	52 6	280
	346-3-50	53 8	280	—	—	79 5	382
	380/415-3-50	46.8	280	—	—	65 4	345
050-PW	208/230-3-60	89.7	268	—	—	106.4	304
	460-3-60	44 9	134	—	—	48.7	152
	575-3-60	33 3	98	—	—	33.3	106
	380-3-60	44 9	148	—	—	53.8	168
	346-3-50	53 8	168	—	—	79.5	229
	380/415-3-50	48.7	152	—	—	67 9	207
060	208/230-3-60	106 4	506	—	—	147 7	690
	460-3-60	46.8	253	—	—	65 4	345
	575-3-60	40 4	176	—	—	57 1	276
	380-3-60	52 6	280	—	—	78 8	382
	346-3-50	79.5	382	—	—	79 5	382
	380/415-3-50	65.4	345	—	—	67 9	345
060-PW	208/230-3-60	106 4	304	—	—	147.4	414
	460-3-60	48 7	152	—	—	65 4	207
	575-3-60	33 3	106	—	—	57.1	165
	380-3-60	53 8	168	—	—	78 8	229
	346-3-50	79.5	229	—	—	79 5	229
	380/415-3-50	67.9	207	—	—	65.4	207
070	208/230-3-60	147 7	690	—	—	147.4	690
	460-3-60	65 4	345	—	—	65 4	345
	575-3-60	57.1	276	—	—	57 1	276
	380-3-60	78.8	382	—	—	78 8	382
	346-3-50	44 9	247	44 9	247	79.5	382
	380/415-3-50	43.6	223	43.6	223	65.4	345
070-PW	208/230-3-60	147 4	414	—	—	147 4	414
	460-3-60	67.9	207	—	—	67 9	207
	575-3-60	53.8	165	—	—	53.8	165
	380-3-60	79 5	229	—	—	79 5	229
	346-3-50	44 9	148	44.9	247	79.5	229
	380/415-3-50	44 9	134	44 9	223	67.9	207

Table 7 — Condenser Fan Electrical Data

UNIT SIZE	NAMEPLATE VOLTAGE	CONDENSER FAN				
		No.	Hp	kW	FLA (ea)	LRA (ea)
040	208/230-3-60 460-3-60 575-3-60 380-3-60 346-3-50 380/415-3-50	4	1	746	(2) 5 4, (2) 5.5 (2) 2 7, (2) 2 8 (4) 3.4 (4) 3 9 (4) 4 4 (4) 3.0	(2) 31 6, (2) 30 0 (2) 31.6, (2) 30 0 (4) 30 0 (4) 20 9 (4) 20 9 (4) 30.0
045	208/230-3-60 460-3-60 575-3-60 380-3-60 346-3-50 380/415-3-50	4	1	.746	(2) 5 4, (2) 5.5 (2) 2 7, (2) 2 8 (4) 3 4 (4) 3 9 (4) 4.4 (4) 3.0	(2) 31 6, (2) 30 0 (2) 31.6, (2) 30.0 (4) 30.0 (4) 20.9 (4) 20 9 (4) 30.0
050	208/230-3-60 460-3-60 575-3-60 380-3-60 346-3-50 380/415-3-50	4	1	746	(2) 5 4, (2) 5 5 (2) 2 7, (2) 2 8 (4) 3 4 (4) 3 9 (4) 4 4 (4) 3 0	(2) 31.6, (2) 30.0 (2) 31.6, (2) 30 0 (4) 30 0 (4) 20.9 (4) 20 9 (4) 30.0
060	208/230-3-60 460-3-60 575-3-60 380-3-60 346-3-50 380/415-3-50	6	1	746	(4) 5.4, (2) 5 5 (4) 2.7, (2) 2 8 (6) 3 4 (6) 3 9 (6) 4 4 (6) 3 0	(4) 31.6, (2) 30 0 (4) 31.6, (2) 30 0 (6) 30.0 (6) 20 9 (6) 20 9 (6) 30.0
070	208/230-3-60 460-3-60 575-3-60 380-3-60 346-3-50 380/415-3-50	6	1	746	(4) 5 4, (2) 5 5 (4) 2.7, (2) 2.8 (6) 3.4 (6) 3 9 (6) 4 4 (6) 3.0	(4) 31 6, (2) 30 0 (4) 31.6, (2) 30 0 (6) 30 0 (6) 20 9 (6) 20.9 (6) 30 0

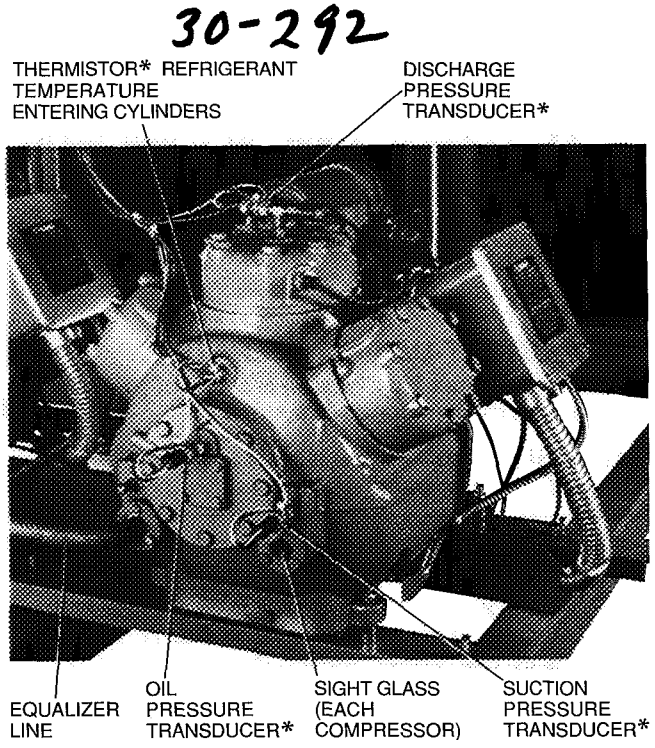
PRE-START-UP

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, review Start-Up Checklist for Flotronic™ II Chiller Systems at center of this publication. 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 water 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 shut-off valves. Close valves one turn to allow refrigerant pressure to reach the test gages.
3. Open liquid line service valves.
4. Fill the chiller water 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 ethylene glycol 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 glasses. See Fig. 9. An acceptable oil level in the compressor is from ⅛ to ⅜ 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 Service section, Compressors, for Carrier-approved oils.



*Lead compressor only

Fig. 9 — Lead Compressor Transducer and Thermistor Locations

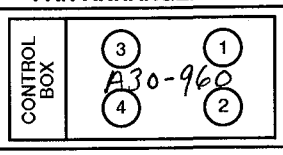
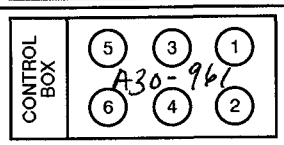
UNIT SIZE	FAN ARRANGEMENT	FAN NO.	FAN CONTACTOR	CONTROLLED BY
040, 045, 050		1	FC-A1	Compressor No. A1
		2	FC-B1	Compressor No. B1
		3	FC-A2	First Stage of Microprocessor
		4	FC-B2	Second Stage of Microprocessor
060, 070		1	FC-A1	Compressor No. A1
		2	FC-B1	Compressor No. B1
		3, 4	FC-A2	First Stage of Microprocessor
		5, 6	FC-B2	Second Stage of Microprocessor

Fig. 10 — Condenser Fan Operating Sequence

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 Test Function. Fan rotation is clockwise as viewed from top of unit. See Fig. 10. If fan is not turning clockwise, reverse 2 of the power wires.
10. Check compressor suspension. Snubber washers (for noise suppression) can be moved with finger pressure.
11. Check all field configuration data and set points. Units are shipped with pre-programmed values as follows:

Cooling Set Point Control Select (CSPTYP)	0
Chiller Fluid Set Point 1 (CSP1)	44
Ramp Load Select (RAMP)	1
Pulldown Limit (CRAMP)	1
Cooler Pump Interlock Select (LOCK)	1
Cooler Pump Control Select (CPC)	1
Cooling Reset Control Select (CRTYP)	0
Demand Limit Control Select (LSTYP)	0
Clock Control Select (CLOCK)	0
Number of Circuit A Unloaders (NULA)	1
Number of Circuit B Unloaders (NULB)	1

Enter desired set points, field configurations, and the current date and time. See Controls, Operation and Troubleshooting Guide for details.

12. Perform Test Function. See Controls, Operation and Troubleshooting Guide for details.

START-UP AND OPERATION

NOTE: Refer to Start-Up Checklist at center of publication, which can be easily removed if necessary.

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 open.
2. Set leaving-water temperature. No cooling range adjustment is necessary.
3. If optional control functions or accessories are being used, the unit must be properly configured. Refer to Controls, Operation and Troubleshooting Guide for details.
4. Start chilled water pump.
5. Turn LOCAL/STOP/CCN switch to LOCAL.
6. Allow unit to operate and confirm that everything is functioning properly. Check to see that leaving water temperature agrees with leaving set point (CSP1), or if reset is used, with the leaving set point (CSP2).

Operating Limitations

TEMPERATURES (See Table 8.) — 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.

Table 8 — Temperature Limits

	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	40	4.5

EWT — Entering Water Temp **LWT** — Leaving Water Temp

*For sustained operation, it is recommended that EWT not exceed 85 F (29.4 C).

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

High Cooler LCWT (Leaving Chilled Water Temperature) — During start-up with leaving-water temperatures above approximately 60 F (16 C), expansion valves will limit suction pressure to approximately 55 F saturated suction temperature to avoid overloading compressor.

Low Cooler LCWT — Application of standard chillers for LCWT temperature below 40 F (4.5 C) is possible with proper field change of control configuration. See Controls, Operation and Troubleshooting Guide for details.

⚠ CAUTION

Brine duty application (below 40 F LCWT) for chiller normally requires factory modification. Contact your Carrier representative for applicable LCWT range for standard chiller.

START-UP CHECKLIST FOR FLOTRONIC™ II CHILLER SYSTEMS
(Remove and use for job file)

A. Preliminary Information

JOB NAME _____

LOCATION _____

INSTALLING CONTRACTOR _____

DISTRIBUTOR _____

START-UP PERFORMED BY _____

EQUIPMENT: Chiller: MODEL #_____ SERIAL #_____

COMPRESSORS:

CIRCUIT #A

1) M#_____
   S#_____
   MTR#_____
2) M#_____
   S#_____
   MTR#_____

CIRCUIT #B

1) M#_____
   S#_____
   MTR#_____
2) M#_____
   S#_____
   MTR#_____

COOLER:

MODEL # _____ MANUFACTURED BY_____

SERIAL # _____ DATE_____

AIR HANDLING EQUIPMENT:

MANUFACTURER _____

MODEL #_____ SERIAL #_____

ADDITIONAL AIR HANDLING UNITS AND ACCESSORIES _____

_____

B. Preliminary Equipment Check (YES or NO)

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

_____

WILL THIS DAMAGE PREVENT UNIT START-UP?_____

ASSURE COMPRESSOR BASE RAIL ISOLATORS HAVE 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?_____

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

INSPECT PLUG CONNECTORS FOR TIGHTNESS._____

B. Preliminary Equipment Check (cont)

CHECK AIR SYSTEMS (YES or NO)

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

ARE ALL CHILLED WATER VALVES OPEN?_____

IS THE WATER PIPING CONNECTED PROPERLY?_____

HAS ALL AIR BEEN VENTED FROM THE COOLER LOOP?_____

IS THE CHILLED WATER PUMP (CWP) OPERATING?_____

IS THE CWP ROTATION CORRECT?_____

CWP MOTOR AMPERAGE: Rated _____ Actual _____

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

HAS THE CHILLER BEEN PROPERLY INTERLOCKED WITH THE AUXILIARY CONTACTS OF THE CHILLED WATER PUMP STARTER?_____

ASSURE THAT THE UNIT IS SUPPLIED WITH CORRECT CONTROL VOLTAGE POWER.

_____ 115- AND 230- (380*-v) V (60 Hz) UNITS _____ 230* V (50 Hz) UNITS *(Export Units)

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

ASSURE COMPRESSOR OIL LEVEL IS CORRECT. _____

ASSURE BOTH LIQUID LINE SERVICE VALVES ARE BACKSEATED. _____

ASSURE **ALL** COMPRESSOR DISCHARGE SERVICE VALVES ARE BACKSEATED. _____

ASSURE **ALL** COMPRESSOR SUCTION SERVICE VALVES ARE BACKSEATED. _____

LOOSEN COMPRESSOR SHIPPING HOLD-DOWN BOLTS._____

LEAK CHECK **THOROUGHLY:** ALL COMPRESSORS, CONDENSER MANIFOLDS AND HEADERS, EXVs, TXVs, SOLENOID VALVES, FILTER DRIERS, FUSIBLE PLUGS, THERMISTORS, TRANSDUCERS, AND COOLER HEADS, WITH GE H-10-B ELECTRONIC LEAK DETECTOR. _____

LOCATE, REPAIR, AND REPORT ANY R-22 LEAKS. _____

_____

CHECK VOLTAGE IMBALANCE: AB_____ AC_____ BC_____

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

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____

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

IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START CHILLER!
CALL LOCAL POWER COMPANY FOR ASSISTANCE.

ASSURE THAT INCOMING POWER VOLTAGE TO CHILLER MODULES IS WITHIN RATED UNIT VOLTAGE RANGE. _____

SYSTEM WATER VOLUME IN LOOP: TYPE SYSTEM:

AIR CONDITIONING — MINIMUM 3 GAL. PER NOMINAL TON = _____ GAL.

PROCESS COOLING — MINIMUM 6 GAL. PER NOMINAL TON = _____ GAL.

C. Unit Start-Up (cont)

CHECK PRESSURE DROP ACROSS COOLER.

WATER ENTERING COOLER: _____ PSIG (kPa) WATER LEAVING COOLER: _____ PSIG (kPa)

(PSIG DIFFERENCE) x 2.31 = FT OF WATER 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. PRESS. DROP = _____
(Refer to product data literature)

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

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

COOLER LOOP PROTECTION IF REQUIRED:

GALLONS (LITERS) OF BRINE ADDED. _____

PIPING INCLUDES ELECTRIC TAPE HEATERS. _____

PERFORM TEST FUNCTION:

FOLLOW THE CONTROLS AND TROUBLESHOOTING TEST FUNCTION INSTRUCTIONS. BE SURE TO CHECK FOR PROPER FAN ROTATION ON TEST FUNCTION FAN RELAY STEPS. BE SURE COMPRESSOR SERVICE VALVES AND LIQUID LINE VALVES ARE OPEN.

TEST FUNCTION COMPONENTS — INDICATE RESULTS BELOW:

1 TEST : COMPONENT	RESULT
TEST DISPLAY	_____
ALARM RELAY	_____
FAN RELAY A1	_____
FAN RELAY A2	_____
FAN RELAY B1	_____
FAN RELAY B2	_____
COOLER WATER PUMP RELAY	_____
EXV A	_____
EXV B	_____

2 TEST : COMPONENT	RESULT
COMPR A1	_____
COMPR A2	_____
COMPR B1	_____

CHECK FOR BLINKING RED AND GREEN LEDs ON ALL MODULES. _____

ENTER CHILLED WATER SET POINTS. _____

SET THE CURRENT DATE AND TIME. _____

REVIEW AND RECORD UNIT FACTORY, FIELD AND SERVICE CONFIGURATIONS. _____

FACTORY CONFIGURATION: ENTER 3 SRVC ON KEYBOARD AND DISPLAY MODULE (LID).

Configuration Code 1 _____ Configuration Code 4 _____
Configuration Code 2 _____ Configuration Code 5 _____
Configuration Code 3 _____ Configuration Code 6 _____

FIELD CONFIGURATION: Enter 4 SRVC ON KEYBOARD AND DISPLAY MODULE (LID).

CCN Element Address _____ Oil Pressure Switch Select _____
CCN Bus Number _____ Head Pressure Control Type _____
CCN Baud Rate _____ Head Pressure Control Method _____
Cooler Fluid Select _____ Motormaster® Select _____
Display Unit Select _____ Cooling Set Point Control Select _____
Display Language Select _____ Cooling Reset Control Select _____
No. of Circuit A Unloaders _____ External Reset Sensor Select _____
No. of Circuit B Unloaders _____ Demand Limit Control Select _____
Hot Gas Bypass Select _____ Ramp Load Select _____
Loading Sequence Select _____ Cooler Pump Interlock Select _____
Lead/Lag Sequence Select _____ Cooler Pump Control Select _____

C. Unit Start-Up (cont)

SERVICE CONFIGURATION: ENTER [5] [SRVC] ON KEYBOARD AND DISPLAY MODULE (LID).

Configuration Code 7 _____
Configuration Code 8 _____
Refrigerant Type _____
Pressure Transducer Select _____
Oil Transducer Set Point _____
Low Pressure Set Point _____
Fan Staging Select _____
EXV Superheat Set Point _____
EXV MOP Set Point _____

TO START THE CHILLER:

TURN THE LOCAL/ENABLE-STOP-CCN SWITCH TO "LOCAL".

MEASURE THE FOLLOWING: MEASURE WHILE MACHINE IS IN STABLE OPERATING CONDITION.

	CIRCUIT #A	CIRCUIT #B
OIL PRESSURE		
SUCTION PRESSURE		
SUCTION LINE TEMP		
DISCHARGE PRESSURE		
DISCHARGE LINE TEMP		

NOTES:

VOLTAGE

Main Power Supply — Minimum and maximum acceptable supply voltages are listed in Table 4.

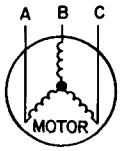
Unbalanced 3-Phase Supply Voltage

Never operate a motor where a phase imbalance between phases is greater than 2%. To determine % 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:

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

$$= \frac{717}{3} = 239 \text{ v}$$

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 % voltage imbalance:

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

This voltage imbalance is satisfactory as it is below the maximum allowable 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 range is shown in Table 5.

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

FLOW RATE REQUIREMENTS — Standard chillers should be applied with nominal flow rates approximating those listed in Table 9. 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.

⚠ WARNING

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

Consult application data and job design requirements to determine flow rate requirements for particular installation.

Table 9 — Nominal and Minimum Cooler Water Flow Rates

UNIT SIZE	NOMINAL FLOW RATE*		MINIMUM FLOW RATE (See Notes)	
	Gpm	L/s	Gpm	L/s
040	86	5.43	36 8	2.38
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

LEGEND

ARI — Air Conditioning and Refrigeration Institute

*Nominal flow rates required at ARI conditions 44 F (7 C) leaving- water temperature, 54 F (12 C) entering-water temperature, 95 F (35 C) ambient Fouling factor 00025 (.044).

APPLICATION	V	N
Normal Air Conditioning	3	3 25
Process Type Cooling	6	6.5
Low Ambient Unit Operation	6	6 5

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 (tons)
Liters = N x ARI Cap (kW)

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 LOCAL/ENABLE-STOP-CCN switch in LOCAL or CCN position. When the unit receives a call for cooling (either from the internal control or CCN network command) the unit stages up in capacity to maintain the cooler fluid set point. The first compressor starts 1½ 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. 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. The compressor starts and continues to run with the electronic expansion valve (EXV) closed, to purge the refrigerant lines and cooler of refrigerant, until the saturated suction temperature is 20° F (11.1° C) below the saturated suction temperature at initiation, or is 10° F (5.5° C) below the leaving-water temperature. When this condition is satisfied, the EXV begins to modulate to feed refrigerant into the cooler.

The head pressure is controlled by fan cycling. The desired head pressure set point is entered, and is controlled by EXV position or saturated discharge temperature measurement. For proper operation, maintain set point of 113 F as shipped from factory. The usual head pressure control method (also field configured) is EXV control, which maintains the lowest head pressure that provides enough pressure drop across the valve.

If temperature reset is being used, the unit controls to a higher leaving-water temperature (cooler fluid set point 2), as the building load reduces. If demand limit is used, the unit may temporarily be unable to maintain the desired leaving-water temperature because of imposed power limitations.

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 signalled requiring immediate shutdown, pumpout is omitted.

Loading sequence for compressors is shown in Table 10.

Table 10 — Capacity Control Steps

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
040 (60 Hz) 1 Unloader A1†	1	25.0	A1*	—	—
	2	50.0	A1	—	—
	3	75 0	A1*, B1	—	—
	4	100.0	A1,B1	—	—
040 (60 Hz) 2 Unloaders A1†,B1**	1	25.0	A1*	25.0	B1*
	2	50.0	A1	50.0	B1
	3	75.0	A1*,B1	75 0	A1,B1*
	4	100.0	A1,B1	100.0	A1,B1
040 (50 Hz) 045 (60 Hz) 1 Unloader A1†	1	21.2	A1*	—	—
	2	42.4	A1	—	—
	3	78.8	A1*,B1	—	—
	4	100.0	A1,B1	—	—
040 (50 Hz) 045 (60 Hz) 2 Unloaders A1†,B1**	1	21 2	A1*	38.4	B1*
	2	42 4	A1	57.6	B1
	3	59 6	A1*,B1*	59.6	A1*,B1*
	4	78.8	A1*,B1	80.8	A1,B1*
	5	100.0	A1,B1	100 0	A1,B1
040 (50 Hz) 045 (60 Hz) 3 Unloaders A1†,B1**(2)	1	—	—	19.2	B1*(2)
	2	—	—	38.4	B1*
	3	—	—	40.4	A1*,B1*(2)
	4	—	—	57.6	B1
	5	—	—	59.6	A1*,B1*
	6	—	—	61.6	A1,B1*(2)
	7	—	—	78.8	A1*,B1
	8	—	—	80.8	A1,B1*
	9	—	—	100.0	A1,B1
045 (50 Hz) 050 (60 Hz) 1 Unloader A1†	1	31 7	A1*	—	—
	2	47.6	A1	—	—
	3	84 1	A1*,B1	—	—
	4	100.0	A1,B1	—	—
045 (50 Hz) 050 (60 Hz) 2 Unloaders A1†,B1**	1	31 7	A1*	34 9	B1*
	2	47 6	A1	52 4	B1
	3	66.7	A1*,B1*	66.7	A1*,B1*
	4	84.1	A1*,B1	82.5	A1,B1*
	5	100.0	A1,B1	100.0	A1,B1
045 (50 Hz) 050 (60 Hz) 3 Unloaders A1†**,B1**	1	15 8	A1*(2)	—	—
	2	31 7	A1*	—	—
	3	47.6	A1	—	—
	4	50.8	A1*(2),B1*	—	—
	5	66.7	A1*,B1*	—	—
	6	68.2	A1*(2),B1	—	—
	7	82.5	A1,B1*	—	—
	8	84.1	A1*,B1	—	—
	9	100.0	A1,B1	—	—
045 (50 Hz) 060 (60 Hz) 3 Unloaders A1†,B1**(2)	1	—	—	17.5	B1*(2)
	2	—	—	34.9	B1
	3	—	—	49.2	A1*,B1*(2)
	4	—	—	52.4	B1
	5	—	—	65.1	A1,B1*(2)
	6	—	—	66 7	A1*,B1*
	7	—	—	82.5	A1,B1*
	8	—	—	84.1	A1*,B1
	9	—	—	100.0	A1,B1
045 (50 Hz) 050 (60 Hz) 4 Unloaders A1†**,B1**(2)	1	15.8	A1*(2)	17 5	B1*(2)
	2	31 7	A1*	33.3	A1*(2),B1*(2)
	3	33 3	A1*(2),B1*(2)	34.9	B1*
	4	47 6	A1	49 2	A1*,B1*(2)
	5	50 8	A1*(2),B1*	52 4	B1
	6	66.7	A1*,B1*	65.1	A1,B1*(2)
	7	68.2	A1*(2),B1	66.7	A1*,B1*
	8	84 1	A1*,B1	82.5	A1,B1*
	9	100 0	A1,B1	100.0	A1,B1
050 (50 Hz) 060 (60 Hz) 1 Unloader A1†	1	28.8	A1*	—	—
	2	43.2	A1	—	—
	3	85.6	A1*,B1	—	—
	4	100.0	A1,B1	—	—
050 (50 Hz) 060 (60 Hz) 2 Unloaders A1†,B1**	1	28.8	A1*	37.9	B1*
	2	43.2	A1	56.8	B1
	3	66.7	A1*,B1*	66 7	A1*,B1*
	4	85 6	A1*,B1	81.1	A1,B1*
	5	100.0	A1,B1	100.0	A1,B1

*Unloaded compressor
†Compressor unloader, standard
**Compressor unloader, accessory.

NOTE: Number in ( ) indicates quantity of unloaders

Table 10 — Capacity Control Steps (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
050 (50 Hz) 060 (60 Hz) 3 Unloaders A1†**,B1**	1	14 4	A1*(2)	—	—
	2	28.8	A1*	—	—
	3	43.2	A1	—	—
	4	52.3	A1*(2),B1*	—	—
	5	66.7	A1*,B1*	—	—
	6	71.2	A1*(2),B1	—	—
	7	81 1	A1,B1*	—	—
	8	85 6	A1*,B1	—	—
	9	100.0	A1,B1	—	—
050 (50 Hz) 060 (60 Hz) 3 Unloaders A1†,B1**(2)	1	—	—	18 9	B1*(2)
	2	—	—	37.9	B1*
	3	—	—	47 7	A1*,B1*(2)
	4	—	—	56.8	B1
	5	—	—	62.1	A1,B1*(2)
	6	—	—	66.7	A1*,B1*
	7	—	—	81 1	A1,B1*
	8	—	—	85 6	A1*,B1
	9	—	—	100.0	A1,B1
050 (50 Hz) 060 (60 Hz) 4 Unloaders A1†**,B1**(2)	1	14.4	A1*(2)	18.9	B1*(2)
	2	28.8	A1*	33.0	A1*(2),B1*(2)
	3	33.0	A1*(2),B1*(2)	37.9	B1*
	4	43.2	A1	47.7	A1*,B1*(2)
	5	52.3	A1*(2),B1*	56.8	B1
	6	66.7	A1*,B1*	62.1	A1,B1*(2)
	7	71.2	A1*(2),B1	66.7	A1*,B1*
	8	85.6	A1*,B1	81.1	A1,B1*
	9	100.0	A1,B1	100.0	A1,B1
060 (50 Hz) 070 (60 Hz) 1 Unloader A1†	1	33.3	A1*	—	—
	2	50.0	A1	—	—
	3	83.3	A1*,B1	—	—
	4	100.0	A1,B1	—	—
060 (50 Hz) 070 (60 Hz) 2 Unloaders A1†,B1**	1	33.3	A1*	33.3	B1*
	2	50.0	A1	50.0	B1
	3	66.7	A1*,B1*	66 7	A1*,B1*
	4	83 3	A1*,B1	83.3	A1,B1*
	5	100.0	A1,B1	100.0	A1,B1
060 (50 Hz) 070 (60 Hz) 3 Unloaders A1†**,B1**	1	16 7	A1*(2)	—	—
	2	33.3	A1*	—	—
	3	50.0	A1	—	—
	4	66 7	A1*(2),B1	—	—
	5	83.3	A1*,B1	—	—
	6	100.0	A1,B1	—	—
060 (50 Hz) 070 (60 Hz) 3 Unloaders A1†,B1**(2)	1	—	—	16.7	B1*(2)
	2	—	—	33.3	B1*
	3	—	—	50.0	B1
	4	—	—	66.7	A1,B1*(2)
	5	—	—	83.3	A1,B1*
	6	—	—	100.0	A1,B1
060 (50 Hz) 070 (60 Hz) 4 Unloaders A1†**,B1**(2)	1	16.7	A1*(2)	16 7	B1*(2)
	2	33.3	A1*	33.3	B1*
	3	50.0	A1	50 0	B1
	4	66.7	A1*(2),B1	66.7	A1,B1*(2)
	5	83.3	A1*,B1	83.3	A1,B1*
	6	100.0	A1,B1	100.0	A1,B1
070 (50 Hz) 1 Unloader A1†	1	19 3	A1*	—	—
	2	29.0	A1	—	—
	3	48 3	A1*,A2	—	—
	4	61.3	A1*,B1	—	—
	5	71.0	A1,B1	—	—
	6	90 3	A1*,A2,B1	—	—
	7	100 0	A1,A2,B1	—	—

*Unloaded compressor.
†Compressor unloader, standard.
**Compressor unloader, accessory.

NOTE: Number in ( ) indicates quantity of unloaders

Table 10 — Capacity Control Steps (cont)

UNIT 30GN	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displacement (Approx)	Compressors	% Displacement (Approx)	Compressors
070 (50 Hz) 2 Unloaders A1†,B1†	1	19 3	A1*	28 0	B1*
	2	29 0	A1	42.0	B1
	3	47.3	A1*,B1*	47.3	A1*,B1*
	4	48.3	A1*,A2	57.0	A1,B1*
	5	58.0	A1,A2	71 0	A1,B1
	6	61.3	A1*,B1	76 3	A1*,A2,B1*
	7	71.0	A1,B1	86 0	A1,A2,B1*
	8	90.3	A1*,A2,B1	100.0	A1,A2,B1
	9	100.0	A1,A2,B1	—	—
070 (50 Hz) 3 Unloaders A1†**,B1**	1	9.7	A1*(2)	—	—
	2	19.3	A1*	—	—
	3	29.0	A1	—	—
	4	37.7	A1*(2),B1*	—	—
	5	38.7	A1*(2),A2	—	—
	6	47.3	A1*,B1*	—	—
	7	51.7	A1*(2),B1	—	—
	8	66.7	A1*(2),A2,B1*	—	—
	9	76.3	A1*,A2,B1*	—	—
	10	86.0	A1,A2,B1*	—	—
	11	90.3	A1*,A2,B1	—	—
	12	100.0	A1,A2,B1	—	—
070 (50 Hz) 3 Unloaders A1†,B1**(2)	1	—	—	14.0	B1*(2)
	2	—	—	28.0	B1*
	3	—	—	33.0	A1*,B1*(2)
	4	—	—	42.0	B1
	5	—	—	43.0	A1,B1*(2)
	6	—	—	47.3	A1*,B1*
	7	—	—	57.0	A1,B1*
	8	—	—	62.3	A1*,A2,B1*(2)
	9	—	—	72.0	A1,A2,B1*(2)
	10	—	—	76.3	A1*,A2,B1*
	11	—	—	86 0	A1,A2,B1*
	12	—	—	90.3	A1*,A2,B1
	13	—	—	100.0	A1,A2,B1
070 (50 Hz) 4 Unloaders A1†**,B1**(2)	1	9.7	A1*(2)	14.0	B1*(2)
	2	19.3	A1*	23.7	A1*(2),B1*(2)
	3	23.7	A1*(2),B1*(2)	28.0	B1*
	4	29.0	A1	33.0	A1*,B1*(2)
	5	37.7	A1*(2),B1*	42.0	B1
	6	38.7	A1*(2),A2	43.0	A1,B1*(2)
	7	47 3	A1*,B1*	47 3	A1*,B1*
	8	51.7	A1*(2),B1	57.0	A1,B1*
	9	66.7	A1*(2),A2,B1*	62.3	A1*,A2,B1*(2)
	10	76 3	A1*,A2,B1*	72 0	A1,A2,B1*(2)
	11	80 7	A1*(2),A2,B1	76 3	A1*,A2,B1*
	12	90.3	A1*,A2,B1	86.0	A1,A2,B1*
	13	100 0	A1,A2,B1	100 0	A1,A2,B1

*Unloaded compressor.
†Compressor unloader, standard
**Compressor unloader, accessory

NOTE: Number in ( ) indicates quantity of unloaders.

SERVICE

ELECTRIC SHOCK HAZARD.
Turn off all power to unit before servicing. The LOCAL/ENABLE-STOP-CCN switch on control panel does *not* shut off control power; *use field disconnect.*

Diagnostics and Troubleshooting — Refer to Controls and Troubleshooting book.

For field service use, a factory-installed Ground Fault Interrupter (GFI) convenience outlet is provided in the 208/230-, 460- and 575-v units. The GFI is rated for 15 amps. However, in units with active cooler heaters, only 5 amps are available.

Refrigerant Circuit

LEAK TESTING — Units are shipped with complete operating charge of refrigerant R-22 (see Tables 2 and 3) 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. *Do not use compressor to evacuate system.*

REFRIGERANT CHARGE (Refer to Tables 2 and 3.) — Immediately ahead of filter drier in each circuit is a factory-installed liquid line service valve. On each valve is a ¼-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 Tables 1 and 3). 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, it will be necessary to have all condenser fans and compressors 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. Randomly 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 Tables 2 and 3.

IMPORTANT: When adjusting refrigerant charge, circulate water 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.

Electronic Components

CONTROL COMPONENTS — Unit uses an advanced electronic control system that normally will not require service. For details on controls refer to Controls and Troubleshooting book.

ELECTRICAL NOISE SUPPRESSORS — Units have electrical noise suppressors (snubbers) for certain inductive loads. These snubbers are supplied for all options in the electrical harness.

⚠ WARNING

Do not remove these snubber devices. Serious damage to the microprocessor may result.

UNIT CONTROL BOX — Viewed 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. Remove bottom pin from door retainer assembly, swing retainer out horizontally, engage pin in one of the retainer ears and the hinge assembly.

Compressors

FOR UNIT SIZE 070 (50 Hz only) — If lead compressor on refrigerant circuit A 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 other compressor in circuit to run.*

FOR UNIT SIZE 070, 50 Hz (circuit A) — If a replacement compressor is not immediately available and the equipment must be operated, it is recommended that the other compressor in that circuit be operated as the lead compressor.

⚠ CAUTION

Be sure to disconnect all power to system, and tag disconnects, before any work begins.

Valve off the affected lead compressor and electrically deactivate the lag compressor circuit by opening the compressor's circuit breaker. Transfer transducers and thermistors to the lag compressor. Refer to Fig. 11 for locations.

⚠ CAUTION

When removing safeties, exercise caution as they may be under pressure.

Switch the power conduit from the lead compressor to the lag compressor. Since the lag compressor for the circuit does not have an unloader, the unloader leads must be electrically isolated if not left on the faulty compressor. Failure to electrically isolate the unloader when not engaged with the unloader stem will result in an unloader coil failure. Since this procedure is to be only temporary, it is not recommended that the microprocessor be reconfigured.

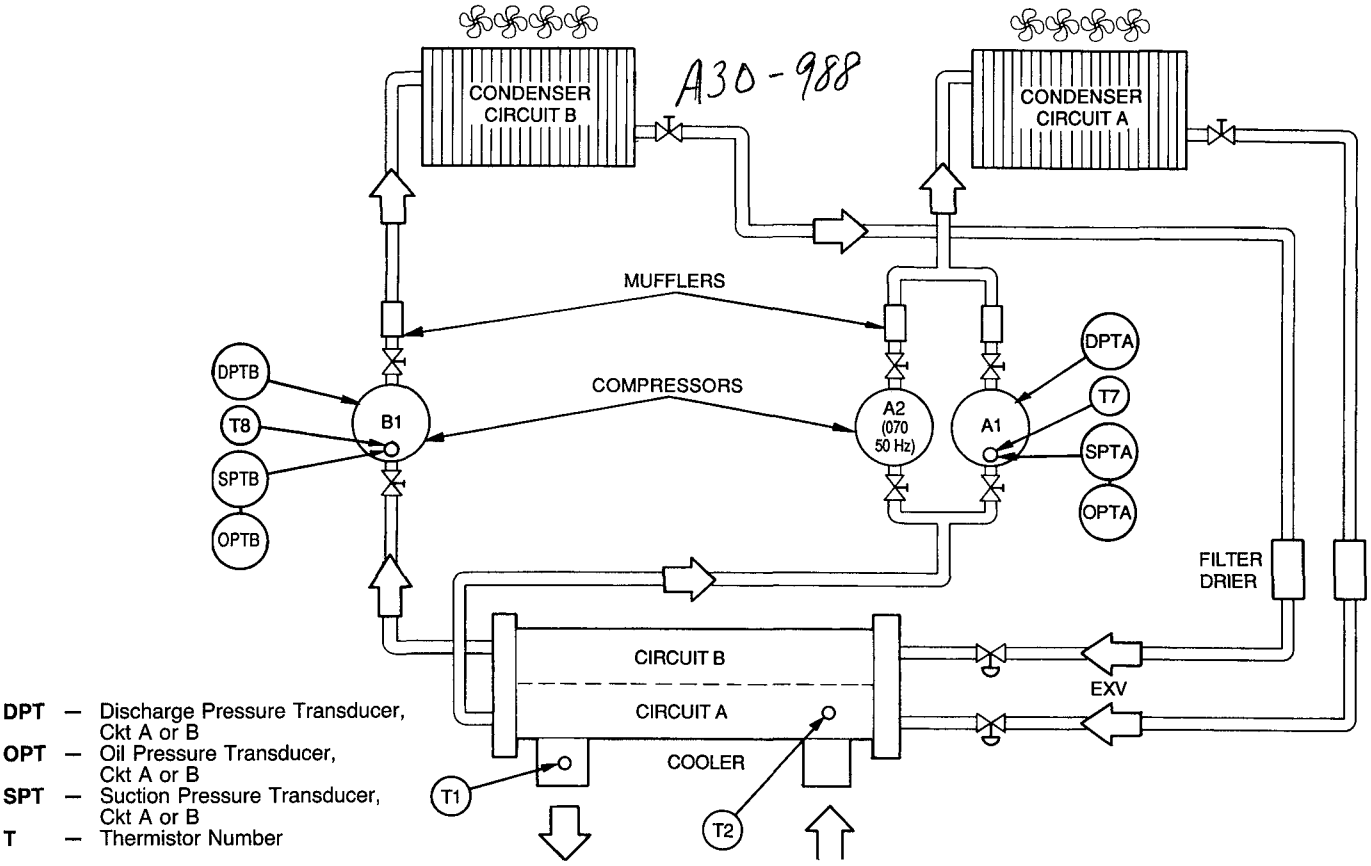


Fig. 11 — Thermistor and Transducer Locations

COMPRESSOR REMOVAL — Access to the 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 service valves to —

	Compressor(s)
20 - 25 ft-lbs (27 - 34 N-m)	06E250
80 - 90 ft-lbs (109 - 122 N-m)	06E265,275,299

Tighten suction service valves to —

80 - 90 ft-lbs (109 - 122 N-m)	06E250
90 - 120 ft-lbs (122 - 163 N-m)	06E265,275,299

Tighten the following fittings to —

60 ft-lbs (81 N-m)	Discharge Gas Thermostat
120 in.-lbs (13.5 N-m)	High-Pressure Switch
120 in.-lbs (13.5 N-m)	Loss-of-Charge Switch

OIL CHARGE (Refer to Tables 2 and 3.) — All units are factory charged with oil. Acceptable oil level for each compressor is from ⅛ to ⅜ of the compressor sight glass (see Fig. 9).

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

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

COMPRESSOR	OIL REQUIRED	
	Pts	L
06E250	17	8.0
06E265	21	9.9
06E275	21	9.9
06E299	19	9.0

Do not reuse drained oil, and do not use 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:

1. To ensure the refrigerant is in the condenser, follow this procedure:
   a. For 30GN070 (50 Hz) only, open the circuit breaker for the lag compressor (A2), and close the discharge valve for this compressor.

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

   b. Close the liquid line service valve for one circuit. Allow the lead compressor to pump down that circuit until it reaches approximately 10 - 15 psig (68.8 - 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.

⚠ CAUTION

Open and tag all electrical disconnects before any work begins. Keep in mind that cooler is heavy and both water-side and refrigerant-side may be under pressure.

2. Close the shutoff valves, if installed, in the cooler fluid lines, and remove the cooler fluid piping.
3. 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. 12.
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. Thermistors T1 and T2 are immersed directly in the fluid.
5. Remove the insulation on the refrigerant connection end of the cooler.
6. Unbolt the suction flanges from the cooler head. Save the bolts for installation later.
7. Remove the liquid lines by breaking the silver-soldered joints at the cooler liquid line nozzles.
8. Remove the screws in the cooler feet. Slide the cooler slightly to the left to clear the refrigerant tubing. Save all screws. Remove the cooler carefully.

REPLACING COOLER — To replace cooler, reverse the above procedure. Use new gaskets for the suction line flanges. The suction flange is a 4-bolt pattern. See Carrier specified parts for replacement part number. Use compressor oil to aid in gasket sealing. Tighten the suction flange bolts to 70 - 90 ft-lb (94 - 122 N-m). Use adhesive to reinstall the cooler insulation. Reinstall the thermistors. See Thermistors, page 28. Apply pipe sealant to the ¼-in. NPT threads on the replacement coupling for the water-side and install it in place of the original. *Do not use the packing nut to tighten the coupling. Damage to the ferrules will result.*

Insert thermistor T1 into the coupling body to its full depth. Thermistor T2 (entering fluid temperature) should not be touching an internal refrigerant tube, but should be close enough to sense a freeze condition. The recommended distance is ⅛ in. (3.2 mm) from the cooler tube. Tighten the packing nut finger tight, then tighten 1¼ turns more using a back-up wrench. Install the cooler heater and conduit (if equipped), connecting the wires as shown in the schematic. Connect the chilled water lines. Be sure to purge the fluid of air before starting unit.

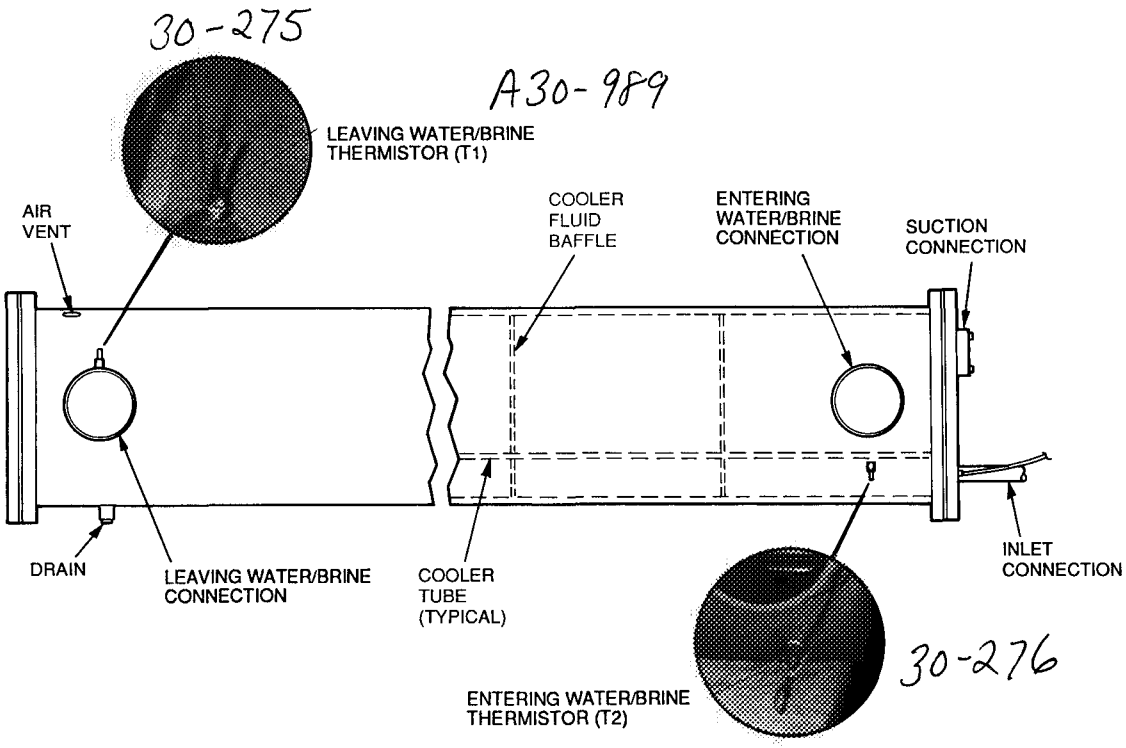


Fig. 12 — Cooler Thermistor Locations

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. 13. *If any of these tubes have developed a leak, plug the tube(s) as described under Tube Plugging.*

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. 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 14 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.

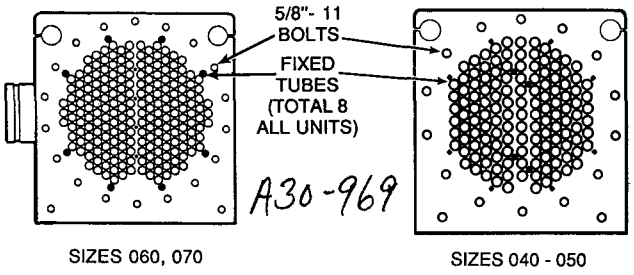


Fig. 13 — Typical Tube Sheets, Cover Off (Non-Removable Tubes)

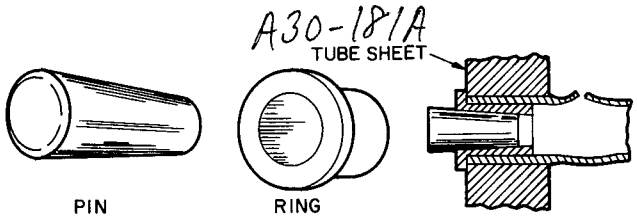


Fig. 14 — Elliott Tube Plug

Retubing (See Table 11.) — 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 tube sheet. An 8% crush can be achieved by setting the torque on the gun at 48 - 50 in.-lbs (5.4 - 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.

Tube information:

	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).

Table 11 — 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.

Tightening Cooler Head Bolts

Gasket Preparation — When reassembling cooler heads, always use new gaskets. Gaskets are neoprene-based, brushed with a light film of compressor oil. *Do not soak gasket.* 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:

⅝-in. Diameter Perimeter Bolts ..... 150 - 170 ft-lbs (201 - 228 N-m)
½-in. Diameter Flange Bolts ..... 70 - 90 ft-lbs (94 - 121 N-m)

1. Install all bolts finger tight.
2. Bolt tightening sequence is outlined in Fig. 15. Follow the numbering 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.

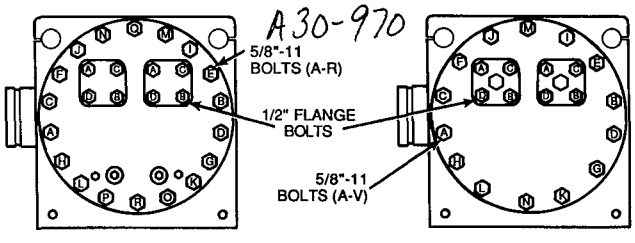


Fig. 15 — Cooler Head Bolt Tightening Sequence (Typical Tube Sheet)

Condenser Coils

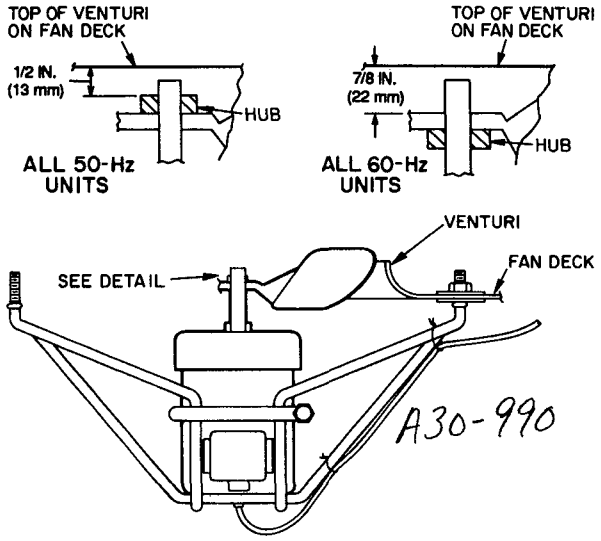
COIL CLEANING — Clean coils with a vacuum cleaner, fresh water, compressed air or a bristle brush (not wire). Units installed in corrosive environments should have coil cleaning as part of a planned maintenance schedule. In this type of application, all accumulations of dirt should be cleaned off the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

⚠ CAUTION

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

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 ⅞ in. (22 mm) below top of venturi on the fan deck to top of the fan hub for 60 Hz units, and ½ in. (13 mm) for 50 Hz units. Tighten set screws to 15 ± 1 ft-lbs (20 ± 1.3 N-m). Figure 16 shows proper position of mounted fan.

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



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

Fig. 16 — Condenser Fan Adjustment

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

ELECTRONIC EXPANSION VALVE (EXV) — A cutaway drawing of valve is shown in Fig. 17.

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, sleeve moves up and down over orifice and modulates orifice size. Sleeve is moved by a linear stepper motor. Stepper motor moves in increments and is controlled directly by processor board. As stepper motor rotates, motion is transferred into linear movement by lead screw. Through stepper motor and lead screw, 760 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 of sizes 045, 050 is 60 steps, and for sizes 040, 060, 070, 145 steps.

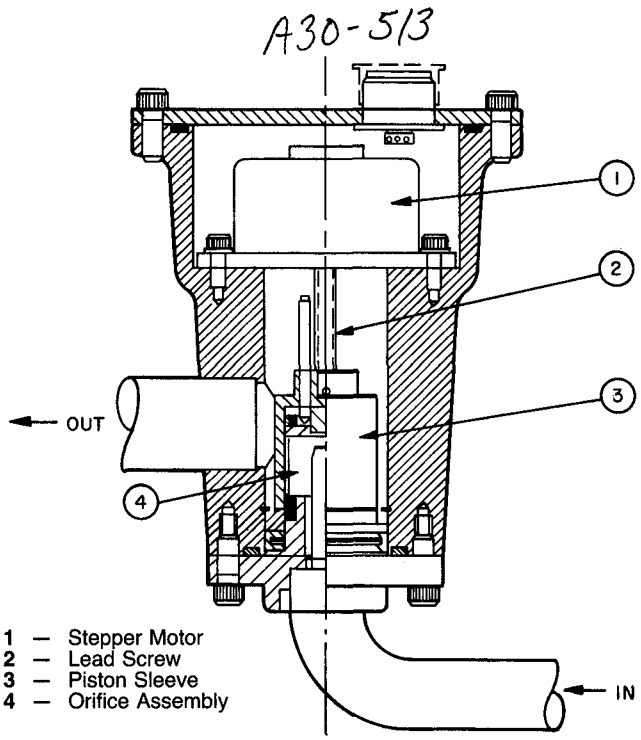


Fig. 17 — Electronic Expansion Valve

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

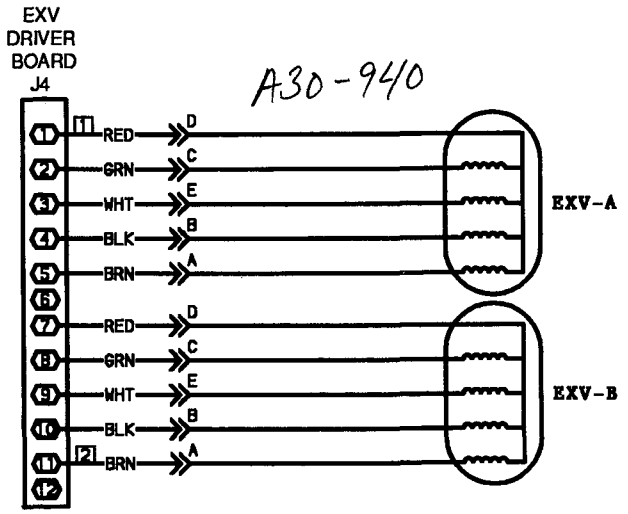
EXV controls superheat entering cylinders to approximately 29° F (16° C). Thus, superheat leaving cooler is approximately 3° to 5° F (2° to 3° C), or less.

Because EXVs are controlled by processor board and EXV driver board (see Fig. 18), 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 processor by constantly observing amount of valve movement.

The EXV is also used to limit cooler saturated suction temperature to 55 F (13 C). This makes it possible for 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 operating suction pressure or superheat, there are a number of

checks that can be made using Test Functions and initialization features built into the microprocessor control. See Controls, Operation and Troubleshooting guide.



EXV — Electronic Expansion Valve

Fig. 18 — Printed Circuit Board Connector

NOTE: The EXV orifice is a screw-in type and may be removed for inspection and cleaning. Once the top cover has been removed, the EXV motor may be taken out by removing the 2 cap screws securing motor to valve body. Pull motor, lead screw, and the slide assembly up off the orifice assembly. See Fig. 17. A slot has been cut in top of orifice assembly to facilitate removal using a large screwdriver. Turn orifice assembly counterclockwise to remove.

When cleaning or reinstalling orifice assembly, care must be taken not to damage orifice assembly seals. The bottom seal acts as a liquid shut-off, replacing a liquid line solenoid valve.

Reasssembly of valve is made easier by screwing the slide and lead screw assembly out of the motor. Align hole in top of slide with the guide pin in orifice assembly and gently push slide and lead screw onto orifice assembly about half way. Screw motor onto lead screw and secure EXV motor with cap screws. Care must be taken not to twist or pull on wires from EXV motor to valve cover pin connections. Check EXV operation using Test Functions described in separate Controls, Operation and Troubleshooting guide.

MOISTURE-LIQUID INDICATOR — Clear flow of liquid refrigerant indicates sufficient charge in system. Bubbles in the sight glass indicate undercharged system or presence of noncondensables. 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 cores 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 cores (see below).

UNIT SIZES	CORES/DRIER
040-070	One Each Circuit

LIQUID LINE SERVICE VALVE — This valve is located immediately ahead of filter drier, provided with a ¼-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.

Transducers — Model 30GN uses 2 types of transducers to sense pressures in the system. These pressures are used to control the chiller. The low-pressure transducers monitor compressor suction and oil pressure and are identified with a white dot on the transducer body. The high-pressure transducer monitors the discharge pressure and is identified by a red dot on the transducer body. See Fig. 19. Three transducers are located on the lead compressor of each circuit, 2 low-pressure and one high-pressure. Each transducer is supplied with 5 vdc power from a rectifier which changes 24 vac to 5 vdc.

To replace a faulty transducer: Relieve the refrigerant pressure using good refrigerant practices, and disconnect transducer wiring at the transducer by pulling up on the locking tab while pulling the weather-tight connection plug from the end of the transducer. *Do not pull on the transducer wires.* Unscrew transducers from the ¼-in. male flare fitting. Use caution when performing this step since the transducer may be under slight pressure. When installing a new pressure transducer, do not use thread sealer. Thread sealer can plug the transducer and render it inoperative. Insert the weather-tight wiring plug into the end of the transducer until the locking tab snaps in place. Check for refrigerant leaks.

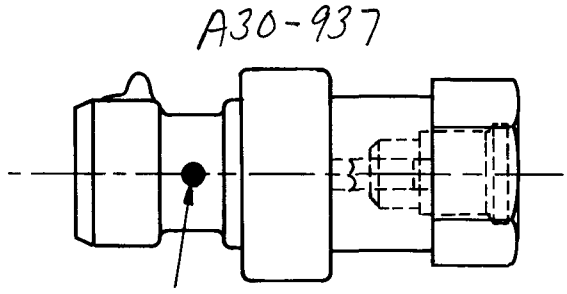


Fig. 19 — Pressure Transducer

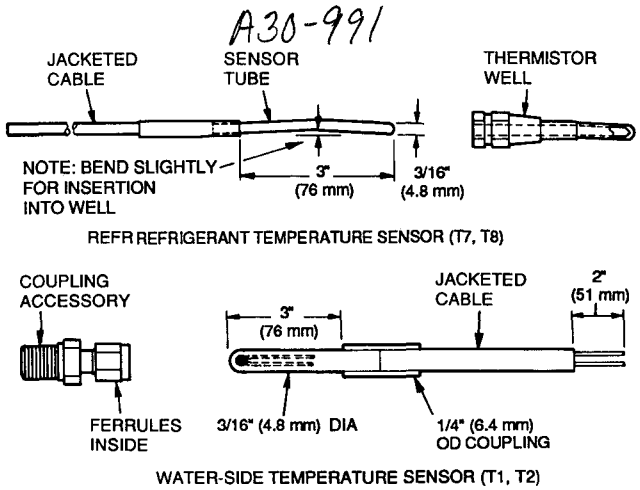


Fig. 20 — Thermistors

Thermistors — Flotronic™ II control uses 4 or 5 thermistors to sense temperatures used to control the operation of chiller.

SENSOR	TEMPERATURE
T1	Cooler Leaving Fluid
T2	Cooler Entering Fluid
T7	Compressor Return Gas Temperature — Circuit A
T8	Compressor Return Gas Temperature — Circuit B
T10	Remote Temperature Sensor (Accessory)

All thermistors are identical in their temperature vs resistance and voltage drop performance. Resistances at various temperatures are listed in Tables 12A and B.

LOCATION — General locations of thermistor sensors are shown in Fig. 11 and 12.

Cooler Leaving Fluid Sensor, T1, is located in the leaving water nozzle. The probe is immersed directly in the water. Connection is made through a ¼-in. coupling (Fig. 20). Actual location is shown in Fig. 11 and 12.

Cooler Entering Water Sensor, T2, is located in the cooler shell in first baffle space, in close proximity to tube bundle. The ¼-in. coupling is used (Fig. 20). Actual location is shown in Fig. 11 and 12.

Compressor Return Gas Temperature Sensors, T7 and T8, are located in lead compressor in each circuit in a suction passage between motor and cylinders above oil pump. They are well-type thermistors. Location is shown in Fig. 11.

Remote Sensor T10, is an accessory sensor and is mounted remotely from unit. It is used for outside air or space temperature reset.

⚠ CAUTION

Sensors T1 and T2 are installed directly in fluid circuit. Relieve all pressure or drain fluid before removing.

To troubleshoot a sensor, refer to separate Controls, Operation, and Troubleshooting guide.

To replace sensors T1 and T2 :

1. Remove and discard original sensor and coupling. Do not disassemble new coupling. Install assembly as received.
2. Apply pipe sealant to ¼-in. NPT threads on replacement coupling, and install it in place of original. *Do not use packing nut to tighten coupling. Damage to ferrules will result.*
3. Insert thermistor T1 into coupling body to its full depth. 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 ⅛ in. (3.2 mm) from cooler tube. Tighten packing nut finger tight to position ferrules, then tighten 1¼ turns more using a back-up wrench. Ferrules are now attached to the sensor, which can be withdrawn from coupling for service.

To replace thermistors T7 and T8 : Add a small amount of thermal conductive grease to thermistor well. Thermistors are friction-fit thermistors, which must be slipped into receiver located in the compressor pump end.

Safety Devices — Chillers contain many safety devices and protection logic built into electronic control.

Following is a brief summary of major safeties. For complete details refer to Controls and Troubleshooting book.

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.

Compressor Protection Board (CPCS) or Control Relay (CR) — Compressor protection board and control relay control and protect compressors and crankcase heaters. They provide the following features:

- Compressor contactor control
- Crankcase heater control
- Ground current protection (CPCS only)
- Status communication to processor board
- High-pressure protection
- High discharge gas temperature protection

One large relay is located on CPCS board, or CR, that controls crankcase heater and compressor contactor; also, relay provides a set of contacts that microprocessor monitors to determine operating status of compressor. If processor board determines that compressor is not operating properly through signal contacts, control locks compressor off.

The CPCS module board 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 13. Switch is wired in series with the CPCS board or control relay. If switch opens, CPCS or CR relay opens and processor detects it through signal contacts; compressor locks off.

A discharge gas thermostat (DGT) mounted in center head of compressor detects excessive discharge gas temperatures. The DGT is set to trip at 295 ± 5 F (146 ± 3 C) and to reset at minimum 235 F (113 C). Switch is wired in series with CPCS board or control relay.

If any of these switches open during operation, the compressor stops and the failure is detected by processor when signal contacts open. On 070 size 50 Hz only, if lead compressor in circuit A is shut down by high-pressure switch, discharge gas thermostat, ground current protector, loss-of-charge switch, or oil pressure switch, all compressors in the circuit are locked off.

Table 12A – Thermistor Temperature (° F) vs Resistance/Voltage Drop, Flotronic™ II

TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
−25 0	4 821	98010
−24.0	4 818	94707
−23 0	4 814	91522
−22 0	4.806	88449
−21 0	4.800	85486
−20 0	4.793	82627
−19 0	4 786	79871
−18 0	4 779	77212
−17 0	4 772	74648
−16.0	4 764	72175
−15.0	4 757	69790
−14 0	4 749	67490
−13 0	4.740	65272
−12.0	4.734	63133
−11.0	4 724	61070
−10.0	4 715	59081
−9.0	4 705	57162
−8.0	4 696	55311
−7.0	4 688	53526
−6.0	4 676	51804
−5 0	4.666	50143
−4.0	4.657	48541
−3.0	4 648	46996
−2 0	4 636	45505
−1.0	4 624	44066
0.0	4 613	42679
1 0	4 602	41339
2.0	4.592	40047
3 0	4.579	38800
4.0	4 567	37596
5.0	4 554	36435
6.0	4 540	35313
7 0	4 527	34231
8 0	4 514	33185
9 0	4 501	32176
10.0	4.487	31202
11 0	4.472	30260
12 0	4 457	29351
13 0	4 442	28473
14.0	4.427	27624
15.0	4 413	26804
16 0	4.397	26011
17.0	4.381	25245
18 0	4 366	24505
19 0	4 348	23789
20 0	4 330	23096
21.0	4 313	22427
22.0	4 295	21779
23 0	4.278	21153
24 0	4.258	20547
25 0	4.241	19960
26 0	4 223	19393
27 0	4 202	18843
28 0	4 184	18311
29.0	4 165	17796
30.0	4.145	17297
31 0	4.125	16814
32 0	4.103	16346
33 0	4.082	15892
34 0	4 059	15453
35 0	4 037	15027
36 0	4 017	14614
37.0	3 994	14214
38 0	3.968	13826
39 0	3.948	13449
40 0	3 927	13084
41 0	3 902	12730
42 0	3 878	12387
43 0	3 854	12053
44.0	3 828	11730
45 0	3 805	11416
46 0	3.781	11112
47.0	3.757	10816
48.0	3 729	10529
49 0	3 705	10250
50.0	3 679	9979
51.0	3 653	9717
52.0	3 627	9461
53 0	3 600	9213
54 0	3 575	8973
55.0	3.547	8739
56 0	3.520	8511
57 0	3.493	8291
58 0	3 464	8076
59.0	3 437	7868
60.0	3 409	7665
61.0	3.382	7468
62 0	3 353	7277
63.0	3.323	7091
64.0	3.295	6911
65.0	3 267	6735
66.0	3 238	6564
67.0	3 210	6399
68 0	3 181	6238
69.0	3 152	6081
70 0	3 123	5929
71	3 093	5781
72	3 064	5637
73	3.034	5497
74	3.005	5361
75	2 977	5229
76	2 947	5101
77	2 917	4976
78	2 884	4855
79	2 857	4737
80	2 827	4622
81	2 797	4511
82	2.766	4403
83	2.738	4298
84	2 708	4196
85	2.679	4096
86	2.650	4000
87	2 622	3906
88	2 593	3814
89	2 563	3726
90	2.533	3640
91	2.505	3556
92	2 476	3474
93	2 447	3395
94	2.417	3318
95	2.388	3243
96	2 360	3170
97	2.332	3099
98	2 305	3031
99	2 277	2964
100	2 251	2898
101	2 217	2835
102	2 189	2773
103	2 162	2713
104	2 136	2655
105	2 107	2597
106	2.080	2542
107	2.053	2488
108	2 028	2436
109	2 001	2385
110	1 973	2335
111	1 946	2286
112	1.919	2239
113	1.897	2192
114	1.870	2147
115	1 846	2103
116	1 822	2060
117	1.792	2018
118	1 771	1977
119	1 748	1937
120	1 724	1898
121	1 702	1860
122	1.676	1822
123	1 653	1786
124	1 630	1750
125	1 607	1715
126	1.585	1680
127	1 562	1647
128	1.538	1614
129	1.517	1582
130	1.496	1550
131	1.474	1519
132	1 453	1489
133	1 431	1459
134	1.408	1430
135	1 389	1401
136	1 369	1373
137	1.348	1345
138	1 327	1318
139	1.308	1291
140	1.291	1265
141	1 289	1240
142	1.269	1214
143	1.250	1190
144	1 230	1165
145	1 211	1141
146	1 192	1118
147	1 173	1095
148	1 155	1072
149	1 136	1050
150	1 118	1029
151	1.100	1007
152	1 082	986
153	1.064	965
154	1 047	945
155	1 029	925
156	1.012	906
157	0 995	887
158	0.978	868
159	0 962	850
160	0 945	832
161	0.929	815
162	0 914	798
163	0.898	782
164	0 883	765
165	0.868	750
166	0 853	734
167	0.838	719
168	0 824	705
169	0 810	690
170	0 797	677
171	0 783	663
172	0 770	650
173	0.758	638
174	0 745	626
175	0 734	614
176	0 722	602
177	0 710	591
178	0 700	581
179	0 689	570
180	0 678	561
181	0 668	551
182	0.659	542
183	0 649	533
184	0.640	524
185	0.632	516
186	0.623	508
187	0.615	501
188	0.607	494
189	0 600	487
190	0.592	480
191	0.585	473
192	0.579	467
193	0.572	461
194	0.566	456
195	0.560	450
196	0 554	445
197	0.548	439
198	0.542	434
199	0.537	429
200	0.531	424
201	0 526	419
202	0 520	415
203	0 515	410
204	0 510	405
205	0 505	401
206	0.499	396
207	0.494	391
208	0 488	386
209	0.483	382
210	0.477	377
211	0 471	372
212	0.465	367
213	0 459	361
214	0 453	356
215	0.446	350
216	0 439	344
217	0 432	338
218	0 425	332
219	0 417	325
220	0 409	318
221	0 401	311
222	0 393	304
223	0.384	297
224	0.375	289
225	0 366	282

Table 12B — Thermistor Temperature (°C) vs Resistance/Voltage Drop; Flotronic™ II

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
-40	4.896	168 230
-39	4.889	157 440
-38	4.882	147 410
-37	4.874	138 090
-36	4.866	129 410
-35	4 857	121 330
-34	4 848	113 810
-33	4 838	106 880
-32	4.828	100 260
-31	4.817	94 165
-30	4.806	88 480
-29	4.794	83 170
-28	4.782	78 125
-27	4.769	73 580
-26	4.755	69 250
-25	4.740	65 205
-24	4.725	61 420
-23	4.710	57 875
-22	4.693	54 555
-21	4.676	51 450
-20	4.657	48 536
-19	4 639	45 807
-18	4 619	43 247
-17	4.598	40 845
-16	4.577	38 592
-15	4 554	38 476
-14	4.531	34 489
-13	4 507	32 621
-12	4.482	30 866
-11	4.456	29 216
-10	4.428	27 633
-9	4.400	26 202
-8	4 371	24 827
-7	4.341	23 532
-6	4 310	22 313
-5	4.278	21 163
-4	4.245	20 079
-3	4 211	19 058
-2	4.176	18 094
-1	4.140	17 184
0	4.103	16 325
1	4.065	15 515
2	4.026	14 749
3	3.986	14 026
4	3.945	13 342
5	3.903	12 696
6	3.860	12 085
7	3.816	11 506
8	3 771	10 959
9	3.726	10 441
10	3.680	9 949
11	3.633	9 485
12	3.585	9 044
13	3.537	8 627
14	3.487	8 231
15	3.438	7 855
16	3 387	7 499
17	3 337	7 161
18	3.285	6 840
19	3.234	6 536
20	3.181	6 246
21	3.129	5 971
22	3 076	5 710
23	3.023	5 461
24	2.970	5 225
25	2.917	5 000
26	2 864	4 786
27	2 810	4 583
28	2.757	4 389
29	2.704	4 204
30	2 651	4 028
31	2 598	3 861
32	2 545	3 701
33	2.493	3 549
34	2 441	3 404
35	2 389	3 266
36	2.337	3 134
37	2.286	3 008
38	2 236	2 888
39	2.186	2 773
40	2 137	2 663
41	2.087	2 559
42	2.039	2 459
43	1.991	2 363
44	1.944	2 272
45	1.898	2 184
46	1 852	2 101
47	1 807	2 021
48	1 763	1 944
49	1.719	1 871
50	1.677	1 801
51	1 635	1 734
52	1.594	1 670
53	1.553	1 609
54	1.513	1 550
55	1.474	1 493
56	1 436	1 439
57	1.399	1 387
58	1.363	1 337
59	1.327	1 290
60	1 291	1 244
61	1 258	1 200
62	1.225	1 158
63	1.192	1 118
64	1.160	1 079
65	1.129	1 041
66	1.099	1 006
67	1 069	971
68	1 040	938
69	1.012	906
70	0.984	876
71	0 949	836
72	0 920	805
73	0.892	775
74	0.865	747
75	0.838	719
76	0.813	693
77	0.789	669
78	0.765	645
79	0.743	623
80	0.722	602
81	0.702	583
82	0.683	564
83	0.665	547
84	0.648	531
85	0.632	516
86	0.617	502
87	0.603	489
88	0.590	477
89	0.577	466
90	0.566	456
91	0.555	446
92	0.545	436
93	0.535	427
94	0.525	419
95	0.515	410
96	0.506	402
97	0.496	393
98	0.486	385
99	0.476	376
100	0.466	367
101	0 454	357
102	0.442	346
103	0.429	335
104	0.416	324
105	0.401	312
106	0 386	299
107	0.370	285

Table 13 — Pressure Switch Settings, psig (kPa)

SWITCH	CUTOUT	CUT-IN
High Pressure	426 ± 7 (2936 ± 48)	320 ± 20 (2205 ± 138)

LOW OIL PRESSURE PROTECTION — Lead compressor in each circuit is equipped with a pressure transducer to monitor low oil pressure. If the oil pressure differential is less than the set point for more than 2 minutes at start-up, the affected circuit is disabled without a pump-out cycle. Factory setting for oil pressure differential is 6 psig (41.3 kPa). See Controls, Operation and Troubleshooting guide for alarm code description.

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 a service job, energize crankcase heaters for 24 hours before starting unit.

COOLER PROTECTION

Freeze Protection — Cooler is wrapped with heater cables (optional) as shown in Fig. 21, 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 ethylene glycol or other suitable solution be used in chilled-liquid circuit.

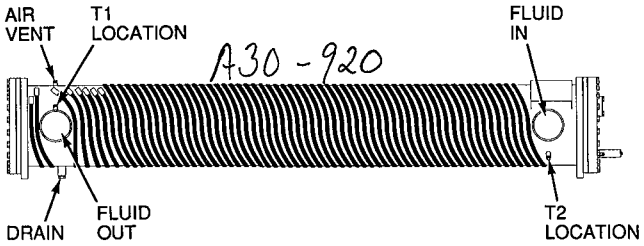


Fig. 21 — Cooler Heater Cables

Low Water Temperature — Microprocessor is programmed to shut chiller down if leaving-water temperature drops below 35 F (1.7 C). When water temperature rises 6° F (3.3° C) above leaving-water set point, safety resets and chiller restarts.

Loss of Water Flow Protection — Microprocessor contains internal logic that protects cooler against loss of cooler flow. Entering- and leaving-water temperature thermistors in cooler detect a no-flow condition. Leaving thermistor is located in leaving water nozzle and entering thermistor is located in first cooler baffle space in close proximity to cooler tubes, as shown in Fig. 12. When there is no cooler flow and the compressors start, leaving-water temperature does not change. However, entering-water temperature drops rapidly as refrigerant enters cooler through EXV. Entering thermistor detects this temperature drop and when entering temperature is 3° F (1.7° C) below leaving temperature, unit stops and is locked off.

Loss-of-Charge — A pressure transducer connected to high side of each refrigerant circuit protects against total loss-of-charge.

A low charge is detected by monitoring EXV position and superheat entering the compressor. If EXV is wide open, superheat is greater than 75° F (42° C) and saturated cooler suction is less than MOP for more than 5 minutes, circuit is stopped and locked off.

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 on a temperature rise to approximately 210 F (99 C).

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

COMPRESSOR PROTECTION

Pressure Relief Valves — Valves for unit sizes 040-070, 60 Hz, and 040-060, 50 Hz, are installed in compressors A1 and B1. Valves for unit size 070, 50 Hz are installed in compressors A2 and B1. These valves are designed to relieve if an abnormal pressure condition arises. The valves are designed to relieve at 450 psig (3103 kPa). *These valves should not be capped.* If a valve relieves, it should be replaced. If 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 ⅜-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 Controls and Troubleshooting book.