



Installation, Start-Up and Service Instructions

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SAFETY CONSIDERATIONS


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

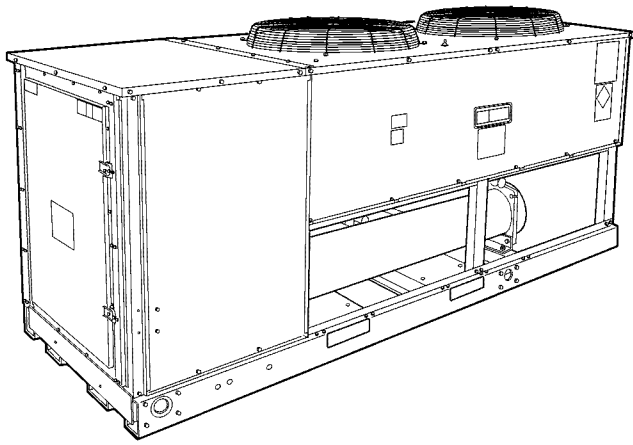
Only trained, qualified installers and service mechanics should install, start up, and service this equipment (Fig. 1).

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.

- Follow all safety codes.
- Wear safety glasses and work gloves.
- Keep quenching cloth and fire extinguisher nearby when brazing.
- Use care in handling, rigging, and setting bulky equipment.
- See Tables 1A and 1B for Physical Data.

	<p>ELECTRIC SHOCK HAZARD</p> <p>Open all remote disconnects before servicing this equipment.</p>
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→ Fig. 1 — Model 30GT (020 Shown)

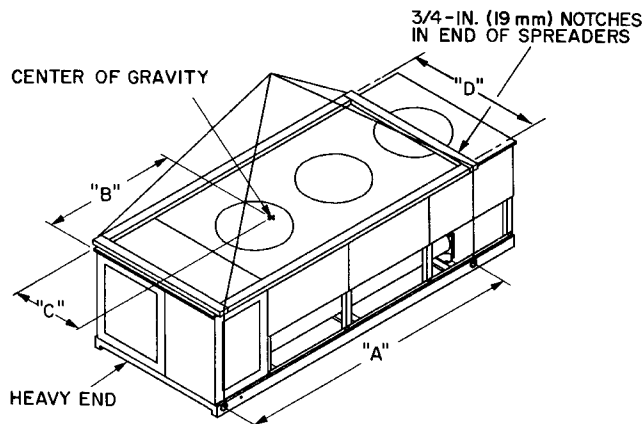
INSTALLATION

Rigging — Preferred method is with spreader bars from above the unit. Use 2-in. (50 mm) OD pipe or hooks in lifting holes. Rig with 4 cables and spreader bars. All panels must be in place when rigging. See rigging label on unit for details concerning shipping weights, distance between lifting holes, center of gravity, and spreader bar dimensions. See Fig. 2.

If overhead rigging is not possible, place chiller on skid or pad for rolling or dragging. When rolling, use a 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 pad.

⚠ CAUTION

All panels must be in place when rigging.



UNIT 30GT	MAXIMUM SHIP WT		LIFTING HOLES "A"		CENTER OF GRAVITY				"D"	
	Lb	Kg	in.	mm	in.	mm	in.	mm		
015	1876	851	94.0	2388	48.0	1219	23.0	583	49.5	1256
020	2031	921	94.0	2388	47.5	1207	23.0	583	49.5	1256
025	2415	1095	94.0	2388	51.0	1295	34.5	876	73.5	1867
030	2606	1182	94.0	2388	51.0	1295	34.5	876	73.5	1867
035	3365	1526	127.0	3225	66.5	1689	35.5	901	73.5	1867

Fig. 2 — Rigging with Spreader Bars
(Field Supplied)

Placing Unit — There must be at least 4 ft (1.2 m) for service and for unrestricted airflow on all sides of unit, and a minimum of 8 ft (2.4 m) clear air space above unit. Provide ample room for servicing cooler. For cooler removal see clearance requirements in Fig. 3-5. For multiple units, allow 8 ft (2.4 m) separation between units for airflow and service.

Mounting Unit — When unit is in proper location, use of mounting holes in base rails is recommended for securing unit to supporting structure, or for mounting unit on vibration isolators if required. See Fig. 3-5. Fasteners for mounting unit are field supplied. Be sure unit is level to ensure proper oil return to compressors.

Compressor Mounting — As shipped, compressor is held down by 4 bolts. After unit is installed, loosen each bolt using nut indicated in Fig. 6 until the flat washer (3/8 in.) can be moved with finger pressure.

Chilled Water and Drain Piping — When facing the cooler side of the unit, the return water connection is on the left and the leaving water connection is on the right. See Fig. 3-5 and 7. Install a minimum 20-mesh strainer in the cooler fluid inlet line just ahead of and as close as possible to the cooler. Provide a means of venting air from the high point of the field-installed piping.

After field piping is complete, freeze-up protection is recommended using inhibited ethylene glycol and electric heat tapes in area where piping is exposed to low ambient temperatures (34 F [1 C] or below). Heat tapes should possess a rating for area ambients and be covered with a suitable thickness of closed-cell insulation. Route power for heating tapes from a separately-fused disconnect. Identify disconnect as heat tape power source with a warning that power must not be turned off except when unit is being serviced.

The cooler drain connection is at the opposite end from the compressor (See Fig. 3-5). Insulate the drain piping (in the same manner as the chilled water piping) for at least one ft (305 mm) from cooler.

PREPARATION FOR YEAR-ROUND OPERATION — If unit is on year-round operation, add sufficient inhibited ethylene glycol to chilled water to prevent freezing under low-ambient operating conditions. Consult local water authority on characteristics of area water and add a recommended inhibitor to the chilled water.

PREPARATION FOR WINTER SHUTDOWN — *Do not shut off control power disconnect during off-season shutdown.* At end of cooling season:

1. Drain water from system.
2. Replace drain plug and put 2 gallons (8 liters) of inhibited ethylene glycol (or other suitable inhibited anti-freeze) in cooler to prevent freezing of residual water. (Remove plug on top of leaving chilled water nozzle to add liquid.)
3. At the beginning of the next cooling season, refill cooler and add recommended inhibitor.

Table 1A — Physical Data — 60 Hz

UNIT 30GT	015	020	025	030	035
COMPRESSOR No. ...Type No. Cyls (ea)...Speed, Rpm (r/s) Capacity Steps Oil Charge*, Pt (L)	1...06DG537 6...1750 (29) 3 8 (3.8)	1...06E2250 4...1750 (29) 2 17 (8.0)	Reciprocating, Semi-Hermetic 1...06E7265 6...1750 (29) 3 21 (9.9)	1...06E7275 6...1750 (29) 3 21 (9.9)	1...06E7299 6...1750 (29) 3 19 (9.0)
→ REFRIGERANT CHG, R-22 Total/Over Clear Glass, lb (kg)	25.0 (11.3)/5.0 (2.3)	31.0 (14.1)/7.0 (3.2)	40.0 (18.1)/12.0 (5.4)	47.0 (21.3)/14.0 (6.4)	57.0 (25.9)/8.0 (3.6)
CONDENSER FANS, Type No. ...Diameter, In. (mm) Total Airflow, Cfm (L/s) Speed, Rpm (r/s)	2...30 (762) 10,600 (5000) 1140 (19)		Propeller Type, Direct Driven 2...30 (762) 15,700 (7400) 1140 (19)		3...30 (762) 23,700 (11 200) 1140 (19)
CONDENSER COIL, Type Rows...Fins/in. (Fin Spacing mm) Total Face Area, sq ft (m ²)	2...19 (1.34) 23.5 (2.18)	3...17 (1.49) 23.5 (2.18)	Horizontal Plate Fin 2...19 (1.34) 39.2 (3.64)		3...17 (1.49) 58.4 (5.43)
COOLER Net Water Volume, gal. (L) Maximum Design Working Pressure psig (kPa)	6.8 (25.7)		Shell and Tube, Direct Expansion 9.9 (37.5)		12.8 (48.4)
WATER CONNECTIONS, in. Inlet and Outlet Drain	2 FPT ¾ MPT				2½ FPT ¾ MPT

*See Oil Charge section for Carrier-approved oil.

Table 1B — Physical Data — 50 Hz

UNIT 30GT	015	020	025	030
COMPRESSOR No. ...Type No. Cyls (ea)...Speed, Rpm (r/s) Capacity Steps Oil Charge*, Pt (L)	1...06E2250 4...1450 (24.2) 2 17 (8.0)	1...06E7265 6...1450 (24.2) 3 21 (9.9)	Reciprocating, Semi-Hermetic 1...06E7275 6...1450 (24.2) 3 21 (9.9)	1...06E7299 6...1450 (24.2) 3 19 (9.0)
→ REFRIGERANT CHG, R-22 Total/Over Clear Glass, lb (kg)	26.0 (11.8)/6.0 (2.7)	35.0 (15.9)/8.0 (3.6)	42.0 (19.0)/12.0 (5.4)	49.0 (22.2)/14.0 (6.4)
CONDENSER FANS, Type No. ...Diameter, In. (mm) Total Airflow, Cfm (L/s) Speed, Rpm (r/s)	2...30 (762) 10,600 (5000) 950 (15.8)		Propeller Type, Direct Driven 2...30 (762) 15,700 (7400) 950 (15.8)	
CONDENSER COIL, Type Rows...Fins/in. (Fin Spacing mm) Total Face Area, sq ft (m ²)	2...19 (1.34) 23.5 (2.18)	3...17 (1.49) 23.5 (2.18)	Horizontal, Plate Fin 2...19 (1.34) 39.2 (3.64)	
COOLER Net Water Volume, gal. (L) Maximum Design Working Pressure psig (kPa)	6.8 (25.7)		Shell and Tube, Direct Expansion 9.9 (37.5)	
WATER CONNECTIONS, in. Inlet and Outlet Drain	2 FPT ¾ MPT			

*See Oil Charge section for Carrier-approved oil.

NOTES:

1. There must be minimum 8 ft (2.4 m) clear air space above unit.
2. Dimensions in [] are in millimeters.
3. The approximate operating weight of the unit is:

60 Hz

UNIT	LB	Kg
30GT015	1640	744
30GT015C	1732	786
30GT020	1821	826
30GT020C	1945	882

50 Hz

UNIT	LB	Kg
30GT015	1741	790
30GT015C	1833	831
30GT020	1864	846
30GT020C	1988	902

UNIT	A
30GT015	(1219)
	4'-0"
30GT020	(1207)
	3'-11 1/2"

- LEGEND**
- C** — Copper Coils
 - COMPR** — Compressor
 - MTG** — Mounting
 - NEC** — National Electrical Code (U.S.A.)
 - VAV** — Variable-Air Volume

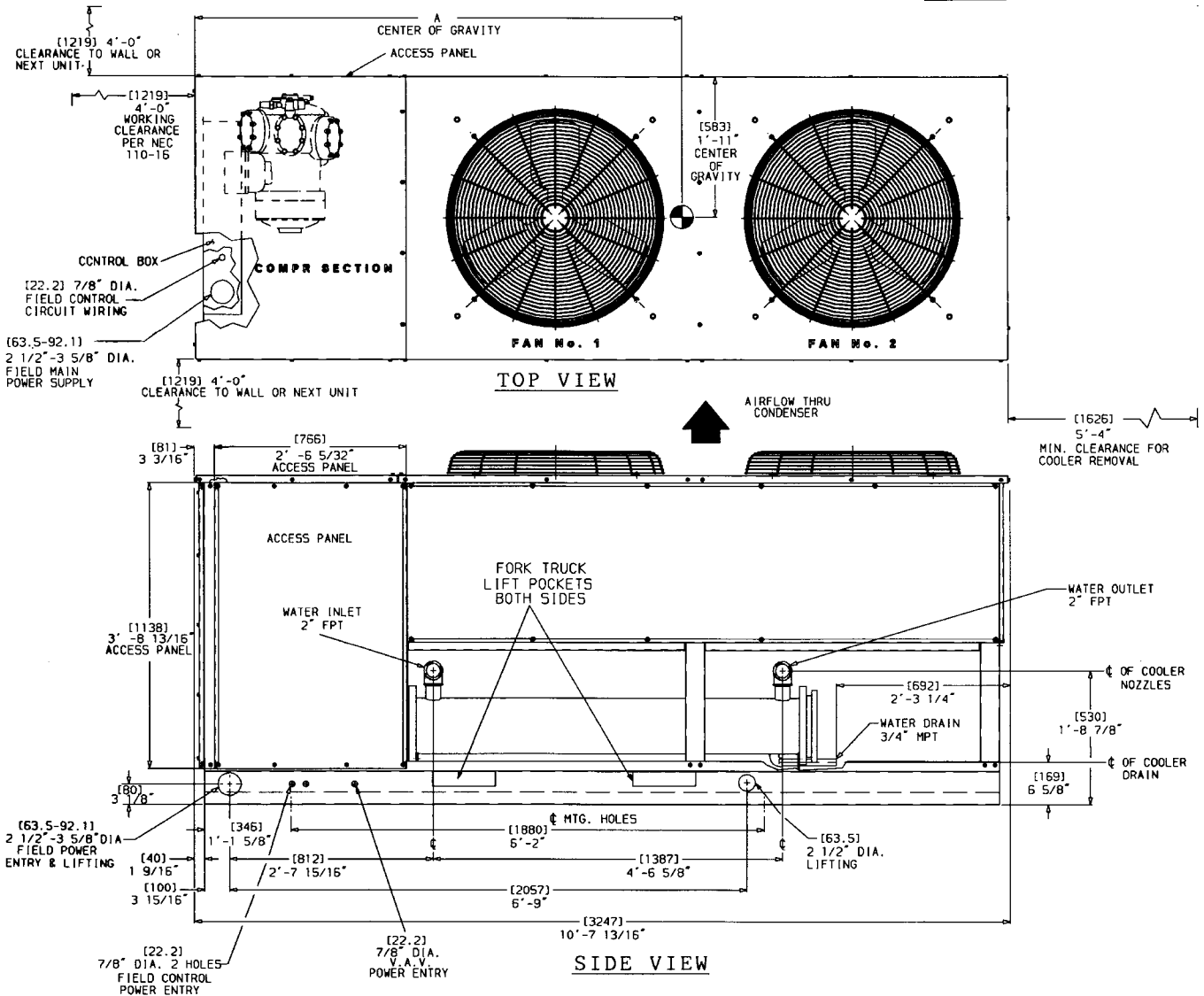
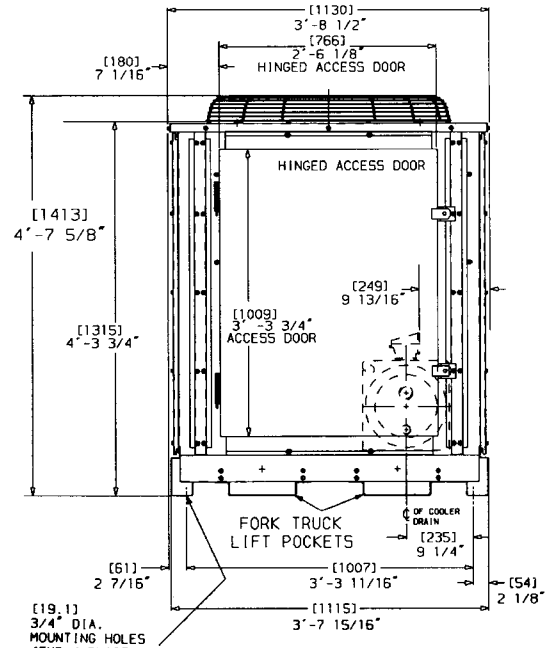


Fig. 3 — Dimensional Drawing, 30GT015,020

NOTES:

1. There must be minimum 8 ft (2.4 m) clear air space above unit.
2. Dimensions in [] are in millimeters.
3. The approximate operating weight of the unit is:

60 Hz			50 Hz		
UNIT	LB	Kg	UNIT	LB	Kg
30GT025	2170	984	30GT025	2193	995
30GT025C	2324	1054	30GT025C	2347	1065
30GT030	2268	1029	30GT030	2332	1058
30GT030C	2474	1122	30GT030C	2538	1151

LEGEND

- C** — Copper Coils
- COMPR** — Compressor
- MTG** — Mounting
- NEC** — National Electrical Code (U.S.A.)
- VAV** — Variable-Air Volume

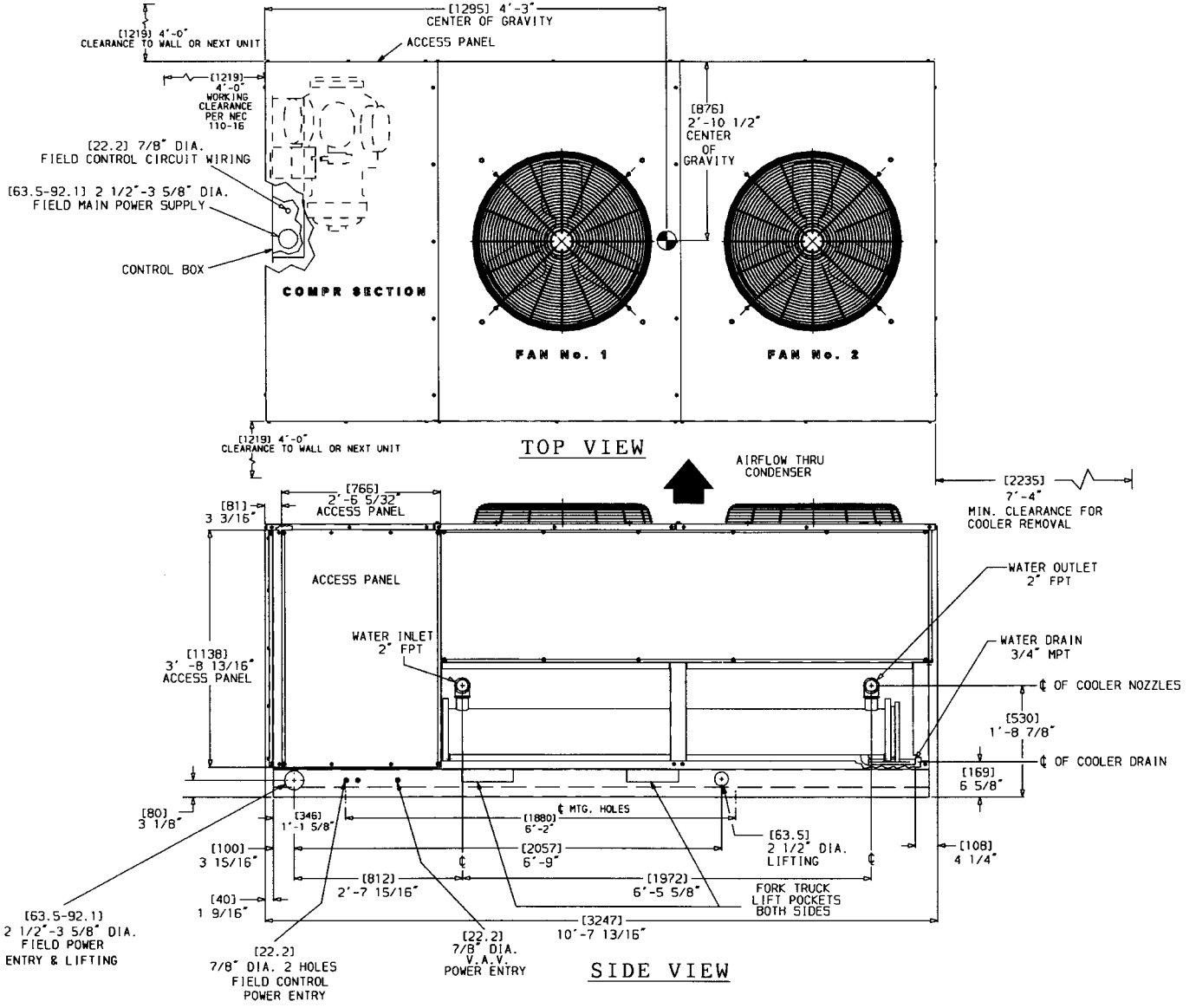
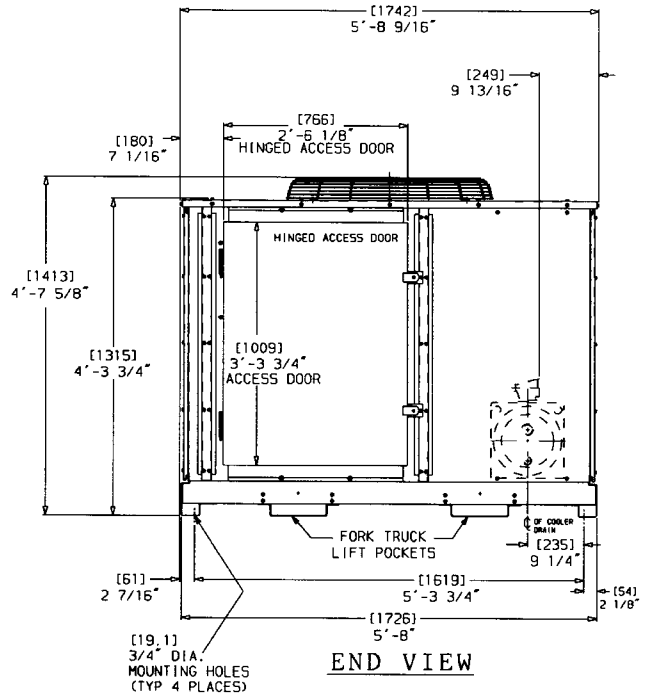
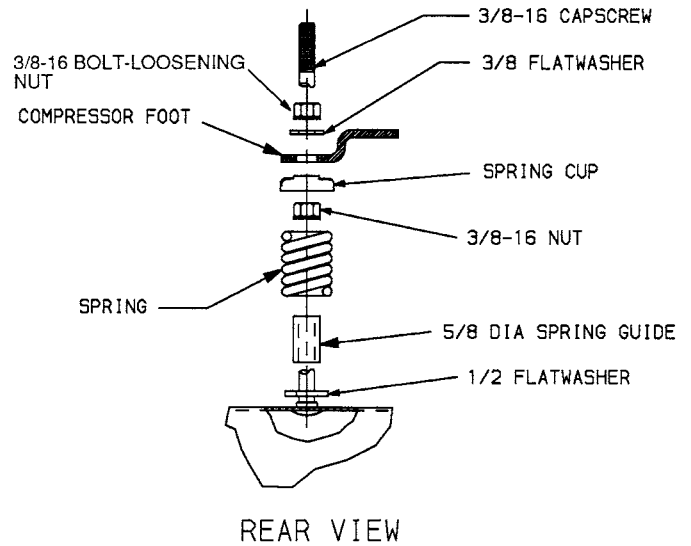
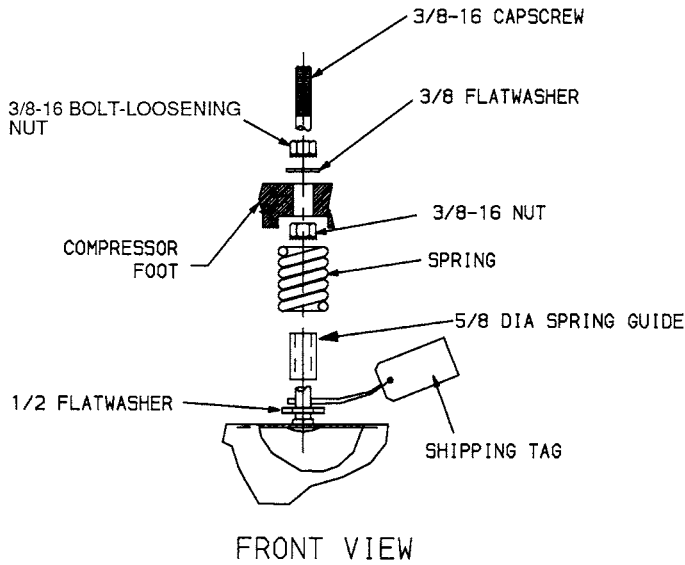


Fig. 4 — Dimensional Drawing, 30GT025,030



NOTE: All dimensions are in inches.

Fig. 6 — Compressor Mounting

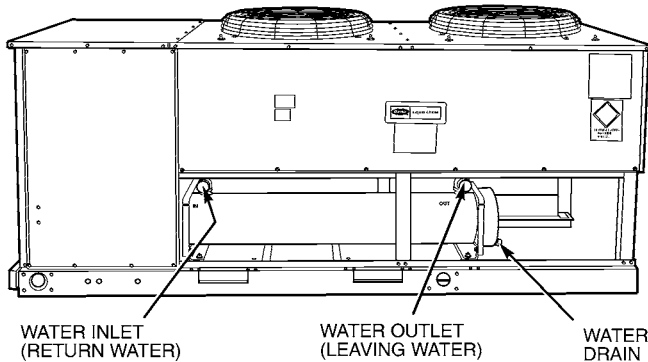


Fig. 7 — Water Connection Locations

Power Supply — Electrical characteristics of available power supply must agree with unit nameplate rating. Supply voltage must be within limits shown in Tables 2A and 2B.

IMPORTANT: Operating unit on improper supply voltage or with excessive phase imbalance constitutes abuse and may affect Carrier warranty. See Unbalanced 3-Phase Supply Voltage section, page 10.

Power Wiring — All power wiring must comply with applicable local and national codes. Install field-supplied branch circuit fused disconnect(s) per NEC (National Electrical Code, U.S.A.) of a type that can be locked OFF or ON. Disconnect(s) must be within sight from and readily accessible from unit in compliance with NEC Article 440-14.

GENERAL WIRING NOTES

1. The control circuit power must be from a separate source, and be brought through a field-supplied fused disconnect rated at 7 amps. A 24-v terminal block is provided for 24-v field wiring connections.
2. Crankcase and cooler heaters are wired in the control circuit so they are always operable as long as control power supply disconnect is on, even if any safety device is open or unit switch is in OFF position. Heaters are wired ahead of ON/OFF switch. They are protected by a 7-amp fuse in field-supplied control power supply disconnect.

3. The control circuit field-supplied disconnect should never be off except when unit is being serviced or is to be down for a prolonged period, in which case cooler should be drained. When operation is resumed, crankcase heater should be energized for 24 hours before start-up.
4. Power entry is at one end only.
5. Maximum field wire sizes allowed by lugs on terminal block are:
350 kcmil for 30GT030,035 (208/230-3-60) and 30GT030 (230-3-50) units.
2/0 AWG for all other units.
6. Terminals for field power supply are suitable for copper, copper-clad aluminum, or aluminum conductors. Insulation must be rated 167 F (75 C) minimum.

FIELD CONNECTIONS

Main Power — Bring wires from the fused disconnect switch through hole in bottom rail of unit to control box (Fig. 3-5) and connect to terminals **11**, **12**, and **13** on line side of terminal block TB1 (See Fig. 8).

Control Power — Bring separate source power (see Fig. 8, note 5) into unit as shown in Fig. 3-5. This supplies power for control circuit, compressor crankcase heater, and cooler heater. Connect incoming wires to TB2 in unit control box (L1 to **1** and L2 to **3**). Neutral side must be connected to terminal **3** (50 Hz only). In the auxiliary power supply a field-supplied disconnect with 7-amp circuit protection must be provided to accommodate crankcase heater and cooler heater cable.

To comply with NEC Article 440-14, the disconnect must be located within sight from and readily accessible from unit.

IMPORTANT: To ensure power to the heaters, make sure auxiliary power to unit is always on (except for servicing or prolonged shutdown).

A toggle switch (marked SW on the unit label diagram) allows the control circuit to be manually disconnected when necessary. This switch does not affect the crankcase heater and cooler heater cable.

Table 2A — Electrical Data, 60 Hz

UNIT 30GT	UNIT						COMPRESSOR		FAN MOTORS		CONTROL CIRCUIT	
	Volts (3 Ph, 60 Hz)	Supplied*		MCA	MOCP (Fuse)	ICF	RLA	LRA	FLA (ea)	Quantity	Volts (1 Ph, 60 Hz)	Amps
		Min	Max									
015	208/230	187	254	76.9	125	269.6	55.8	266	3.6	2	115	7
	380	342	418	42.9	70	148.4	28.9	145	3.4	2	220	7
	460	414	508	35.7	60	121.8	25.7	120	1.8	2	115	7
	575	518	632	29.6	45	98.4	19.9	96	2.4	2	115	7
020	208/230	187	254	92.1	150	348.6	68.0	345	3.6	2	115	7
	380	342	418	51.1	80	194.4	34.6	191	3.4	2	220	7
	460	414	508	46.9	80	174.8	34.7	173	1.8	2	115	7
	575	518	632	42.9	60	122.4	28.9	120	2.4	2	115	7
025	208/230	187	254	124.6	200	452.2	89.8	446	6.2	2	115	7
	380	342	418	63.7	110	250.4	45.5	247	3.4	2	220	7
	460	414	508	60.7	100	226.1	43.6	223	3.1	2	115	7
	575	518	632	50.5	80	166.4	36.5	164	2.4	2	115	7
030	208/230	187	254	145.5	250	512.2	106.0	506	6.2	2	115	7
	380	342	418	73.5	125	283.4	52.6	280	3.4	2	220	7
	460	414	508	68.7	110	256.1	50.0	253	3.1	2	115	7
	575	518	632	54.9	90	178.4	38.5	176	2.4	2	115	7
035	208/230	187	254	203.0	350	702.4	147.0	690	6.2	3	115	7
	380	342	418	111.1	175	388.8	79.5	382	3.4	3	220	7
	460	414	508	91.0	150	351.2	65.4	345	3.1	3	115	7
	575	518	632	81.5	125	280.8	57.1	276	2.4	3	115	7

Table 2B — Electrical Data, 50 Hz

UNIT 30GT	UNIT						COMPRESSOR		FAN MOTORS		CONTROL CIRCUIT	
	Volts (3 Ph, 50 Hz)	Supplied*		MCA	MOCP (Fuse)	ICF	RLA	LRA	FLA (ea)	Quantity	Volts (1 Ph, 50 Hz)	Amps
		Min	Max									
015	230	198	254	88.1	125	262.8	60.3	250	6.4	2	230	7
	346	311	380	50.5	80	208.8	33.3	200	4.4	2	200/220	7
	400	342	400	49.3	80	179.0	34.7	173	3.0	2	230	7
020	230	198	254	109.0	175	354.8	76.9	342	6.4	2	230	7
	346	311	380	64.9	100	267.8	44.9	259	4.4	2	200/220	7
	400	342	400	60.5	100	229.0	43.6	223	3.0	2	230	7
025	230	198	254	120.2	200	378.8	85.9	366	6.4	2	230	7
	346	311	380	76.1	125	302.8	53.9	294	4.4	2	200/220	7
	400	342	400	68.5	110	259.0	50.0	253	3.0	2	230	7
030	230	198	254	144.2	225	557.8	105.0	545	6.4	2	230	7
	346	311	380	108.2	175	408.8	79.5	400	4.4	2	200/220	7
	400	342	400	87.7	150	351.0	65.4	345	3.0	2	230	7

- FLA** — Full Load Amps
- 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).
- LRA** — Locked Rotor Amps
- MCA** — Minimum Circuit Amps (complies with National Electrical Code [NEC, U.S.A.], Section 430-24)
- MOCP** — Maximum Overcurrent Protection
- RLA** — Rated Load Amps

*Units are suitable for use on electrical systems where voltage supplied to unit terminals is not below or above listed minimum and maximum limits.

NOTES:

1. Factory wiring is in accordance with the NEC. Any field modifications or additions must be in compliance with all applicable codes.
2. Connect separate source of control power from field supplied fused disconnect to terminal 1 or TB2. Neutral side must be connected to terminal 3 (50 Hz only). This provides power for the unit control circuit, cooler heater and compressor crankcase heater.
3. All field interlock contacts must have minimum rating of 360 va pilot duty plus capacity required for field installed equipment.
4. For internal unit wiring, reference wiring book or unit wiring label diagram.
5. Voltage requirements.

MAIN POWER	CONTROL POWER
208/230-3-60	115-1-60
460-3-60	115-1-60
575-3-60	115-1-60
380-3-60	220-1-60
230-3-50	230-1-50
346-3-50	200/220-1-50
400-3-50	230-1-50

LEGEND

- | | |
|---|--|
| C — Contactor | FU — Fuse |
| CB — Circuit Breaker | GND — Ground |
| CWFS — Chilled Water Flow Switch | NC — Normally Closed |
| CWPS — Chilled Water Pump | NEC — National Electrical Code (U.S.A.) |
| EQUIP — Equipment | NO — Normally Open |
| | TB — Terminal Block |

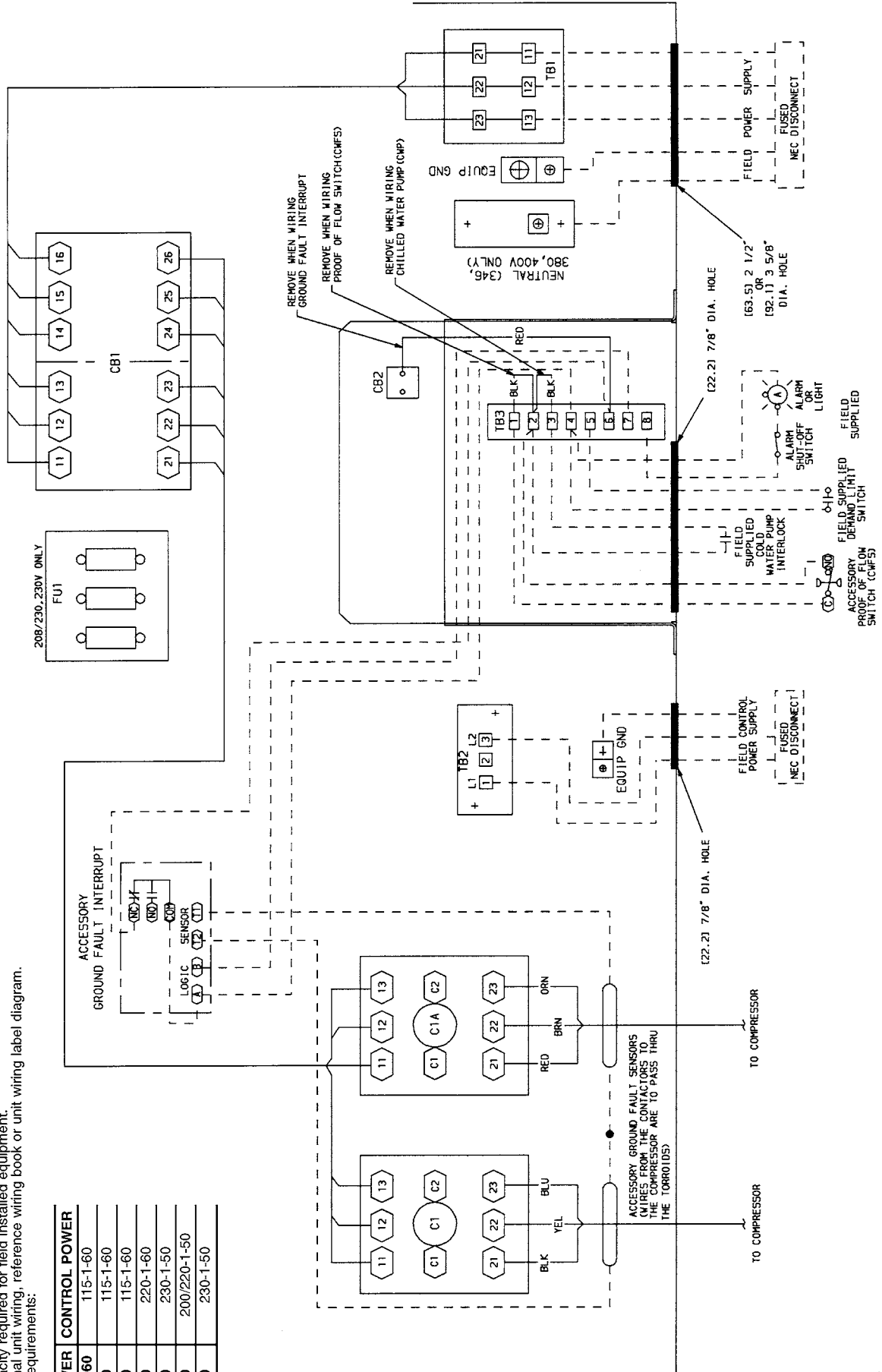


Fig. 8 — Field Wiring Schematic

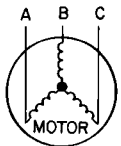
Control Circuit Interlocks — An accessory flow switch may be installed in the chilled water line to prevent unit from running when water is not circulating through the cooler. This switch (part no. 30HW900003) is available as an accessory, or an equivalent can be field supplied. Also, field-supplied auxiliary contacts for the chilled water pump starter should be installed in the control circuit as additional protection against unit operation when pump is not running. These items should be electrically interlocked in the control circuit, between terminals **1** and **2** (for flow switch), and **2** and **3** (for auxiliary contacts) on TB3. See Fig. 8 for field wiring.

Unbalanced 3-Phase Supply Voltage — Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percent voltage imbalance.

Percent Voltage Imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 240-3-60.



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

$$\begin{aligned} \text{Average voltage} &= \frac{243 + 236 + 238}{3} \\ &= 239 \text{ v} \end{aligned}$$

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. Determine percent voltage imbalance:

$$\begin{aligned} \% \text{ Voltage Imbalance} &= 100 \times \frac{4}{239} \\ &= 1.7\% \end{aligned}$$

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

IMPORTANT: Contact your local electric utility company immediately if the supply voltage phase imbalance is more than 2%.

START-UP

Initial Check — Do not attempt to start the liquid chiller, even momentarily, until the following steps and the Start-Up Checklist (page CL-1) have been completed.

1. Check all auxiliary components such as chilled liquid circulating pump, air-handling equipment, or other equipment to which the chiller supplies liquid. Consult the manufacturer's instructions. If used, pump auxiliary contactor and flow switch interlocks must be properly installed (See Fig. 8).
2. Set the temperature controller deadband as specified in Tables 3 and 4. Set point should be at the desired cooler leaving water temperature. Refer to Temperature Controller section on page 14 for additional deadband setting information.

3. Backseat (open) compressor suction and discharge shut-off valves. Close valves one turn to allow pressure to reach each test gage (if installed).
4. Backseat (open) liquid line shutoff valve.
5. Fill chilled liquid circuit with clean water (with recommended inhibitor or other non-corrosive fluid added) to be cooled. Bleed all air out of high points of system.
6. Set flow rate according to job requirements. See Table 5. If the chilled water is to be maintained at a temperature below 40 F (4.4 C), a brine of sufficient concentration must be used to prevent freeze-up at anticipated suction temperatures.
7. Check tightness of all electrical connections.
8. Compressor oil should be visible in sightglass (see Oil Charge section on page 11).
9. Be sure there are no refrigerant leaks (see Leak Test and Dehydration section on page 11).

Table 3 — Typical Deadband Requirements

COMPRESSOR STAGES OF LOADING	COOLER DESIGN RANGE, F (C)		
	5 (2.8)	10 (5.6)	15 (8.3)
2	1.3 (.7)	2.5 (1.4)	3.8 (2.1)
3	.8 (.4)	1.7 (.9)	2.5 (1.4)

Table 4 — Deadband Setting

MIN. REQUIRED DEADBAND		DEADBAND SETTING ON TEMPERATURE CONTROLLER
F	C	
0.5 to 1.5	0.28 to 0.83	1.0
2	1.1	2.0
2.5	1.4	2.5
3	1.7	2.8
3.5	1.9	3.0
4	2.2	3.7
4.5	2.5	4.0

Table 5 — Minimum/Maximum Cooler Flow Rates and Minimum Loop Volume

UNIT 30GT	MINIMUM FLOW		MAXIMUM FLOW		MINIMUM LOOP VOLUME	
	Gpm	L/s	Gpm	L/s	Gal.	L
015	25	2	294	19	45	171
020	25	2	294	19	60	228
025	30	2	356	22	75	285
030	30	2	356	22	90	342
035	34	2	406	26	105	399

LEGEND

- ARI — Air Conditioning and Refrigeration Institute
- Gpm — Gallons per Minute
- N — Liters per kW
- V — Gallons Per Ton

NOTES

1. Minimum flow based on 1.5 fps (0.46 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)

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

10. Be sure unit is fully charged with refrigerant (see Refrigerant Charge section on page 11).
11. Electrical power source must agree with nameplate rating.
12. Crankcase heater must be firmly locked into compressor crankcase. Be sure crankcase is warm (heater should be on for 24 hours before starting compressor).
13. Be sure compressor floats freely on the mounting springs. See Compressor Mounting section on page 2 and Fig. 6 for loosening compressor bolts.

Leak Test and Dehydration — All 30GT units are shipped with complete operating charge of Refrigerant 22 (Tables 1A and 1B) and should be under sufficient pressure to conduct leak test after installation. If there is no system pressure, admit nitrogen until a pressure is observed and then proceed to test for leaks. After leaks are repaired, the system must be dehydrated.

Refrigerant Charge — When additional or complete field charging is required, refer to Tables 1A and 1B and use approved liquid charging method.

Immediately ahead of the filter drier is a factory-installed liquid shutoff charging valve. A ¼-in. flare connection is provided for field charging.

Do not open condenser liquid line valve or compressor discharge valve until the charge (positive pressure) is found in remainder of system. With the unit operating at **full load**, check liquid line sight glass to be sure unit is fully charged (bubbles in the sight glass indicate the unit is **not** fully charged).

▲ CAUTION

Never charge liquid into low-pressure side of system. Do not overcharge. Overcharging results in higher discharge pressure, possible compressor damage, and higher power consumption. During charging or removal of refrigerant, be sure water is continuously circulating through the cooler to prevent freezing. Damage caused by freezing is considered abuse and may void the Carrier warranty.

Control Power Circuit — Switch field-supplied disconnect to ON position. The cooler heater is factory wired into the control circuit.

IMPORTANT: The compressor crankcase heater should be on as soon as auxiliary circuit is energized. Allow crankcase heater to operate at least 24 hours before starting unit, then close main power circuit breaker.

Actual Start-Up — Start-up of the unit should be done only under supervision of a qualified refrigeration mechanic:

1. Open any compressor and system valves that were closed during charging.
2. Turn control circuit toggle switch to ON position.
3. Be sure all safety devices are satisfied.
4. Check to see that the leaving chilled water temperature agrees with the dial setting on the temperature controller. If it is not the same as the dial setting, the variation can be compensated by shifting the control point slightly to obtain the proper leaving chilled water temperature. Refer to Temperature Controller section on page 14 for temperature controller status indicator information.

SERVICE

▲ CAUTION

Turn off all power to unit before proceeding.

Access for Servicing (See Fig. 9)

COMPRESSOR SECTION — The compressor compartment has 2 side access panels and one front door for servicing, providing access to compressor, all components of the refrigeration system, electrical controls, and control box. After opening front door, an inner cover must be removed for access to control box on 575-v and all export units.

CONDENSER SECTION — Condenser fan motors and fans can be serviced by removal of outlet grilles or side panels. If a fan motor is serviced, be sure the wire fan guard is in place over each fan before starting unit. See Fig. 10 for proper fan adjustment. Tighten fan hub securely on motor shaft with setscrew which bears against the key. Be sure to replace Permagum and rubber cap over end of motor shaft to protect against moisture causing fan to rust on shaft.

COOLER SECTION — The cooler can be serviced from the side or the end opposite the compressor compartment. To remove cooler tubes or entire cooler, see Fig. 3-5 for minimum clearance required. Cooler should be removed from end of unit.

Cooler Head Bolt Tightening

NOTE: When reassembling cooler heads, use new gaskets.

GASKET PREPARATION — To protect against leakage, apply light coating of compressor oil to both surfaces in contact with gasket. Gaskets are not to be soaked in oil as gasket deterioration results. *Dipped gaskets are to be used within 30 minutes to prevent deterioration.*

BOLT TORQUE — The following torque is to be applied during the bolt tightening sequence described below:

½-in. diameter flange bolts 70 to 90 lb-ft
(95 to 122 N-m)

BOLT TIGHTENING SEQUENCE (Fig. 11) — The recommended bolt tightening sequence is as follows:

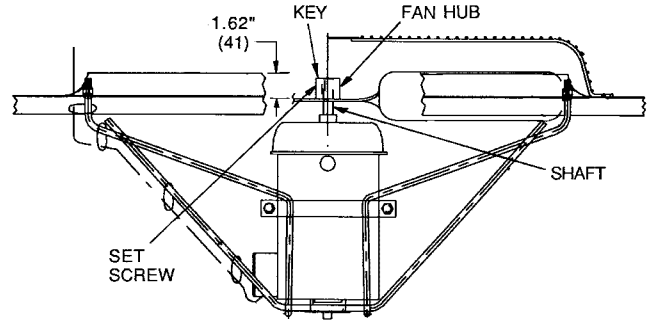
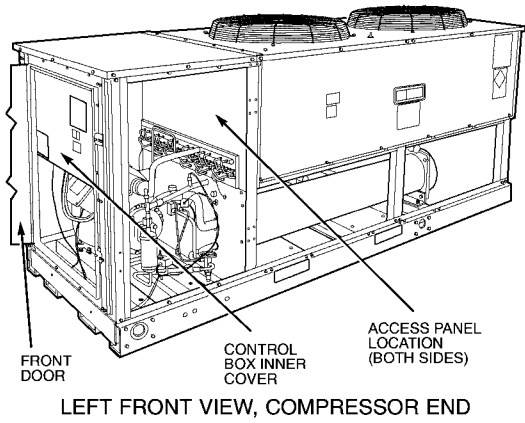
Step 1 — Tighten moderately (without torquing) all the flange bolts in the sequence shown.

Step 2 — Repeat Step 1, tightening the bolts to the specified torque.

Oil Charge — Compressors are factory charged with oil as follows:

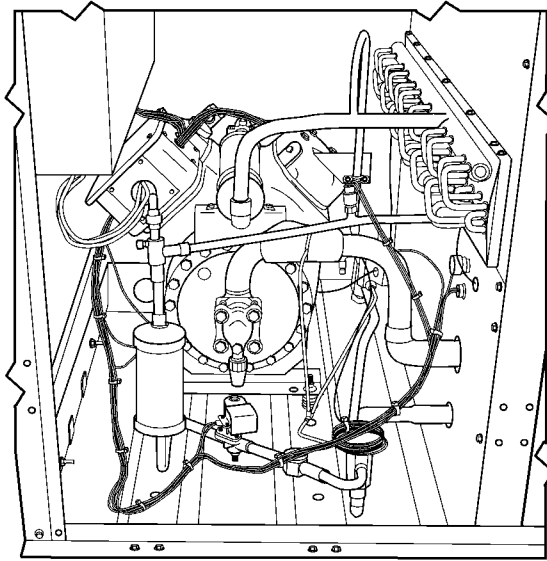
COMPRESSOR	AMOUNT pints (liters)
06DG537	9.5 (4.5)
06E2250	17 (8.0)
06E7265	21 (9.9)
06E7275	21 (9.9)
06E7299	19 (9.0)

If oil is visible in the compressor sight glass, check unit for operating readiness as described in Initial Check section (page 10), then start the unit. Observe oil level and add oil, if required, to bring oil level in compressor crankcase up to between ¼ and ⅓ of sight glass during steady operation.

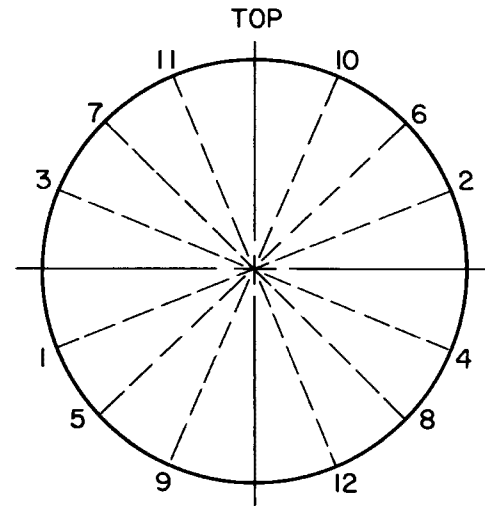


NOTE: Dimension in () is in millimeters.

Fig. 10 — Condenser-Fan Adjustment

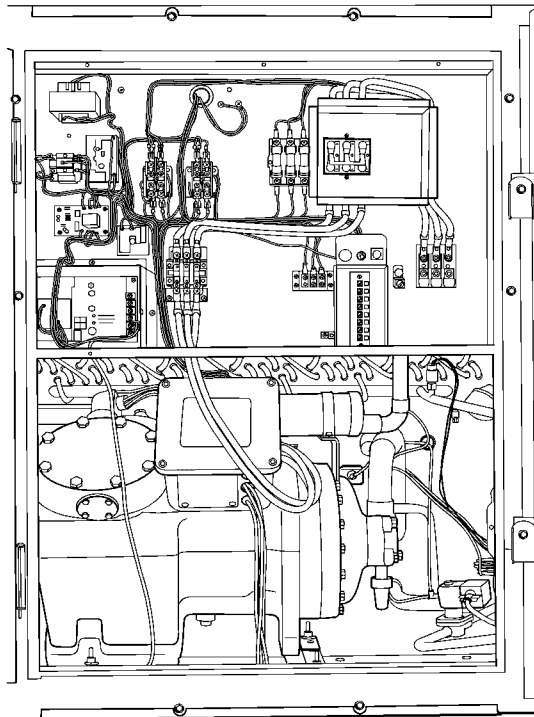


COMPRESSOR END, LEFT FRONT ACCESS DOOR (WHEN FACING COOLER)



NOTE: Numbers represent bolt locations.

Fig. 11 — Tightening Sequence, Cooler Head Bolts



COMPRESSOR END, CONTROL BOX PANEL REMOVED

→ **Fig. 9 — 30GT Unit With Access Panels Removed (30GT020 Shown)**

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

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

IMPORTANT: Do not use drained oil or oil that has been exposed to atmosphere. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants section, for procedures to add or remove oil.

Thermostatic Expansion Valve (TXV) — The TXV is factory set to maintain 8 to 10 F (4.4 to 5.6 C) superheat of vapor leaving cooler to control flow of liquid refrigerant to cooler. Superheat can be reset but should be done only if absolutely necessary.

Liquid Line Solenoid Valve (LLSV) — This valve provides a refrigerant charging port and, in combination with the compressor discharge service valve, allows the refrigerant to be pumped into the high side of the system. The LLSV remains closed for approximately 10 seconds after the compressor starts due to the time-delay relay (TDR). The LLSV is located immediately upstream of the TXV. This causes pumpout of refrigerant from the cooler, and allows the refrigerant pressure to build up on the high side. This establishes proper flow through the TXV once the LLSV opens and will enable the TXV to establish control more quickly and prevent hunting with a light load at start-up. The compressor does not restart until TC again calls for cooling.

Moisture-Liquid Indicator — Clear flow of liquid refrigerant indicates sufficient charge in system. Bubbles indicate undercharged system or presence of noncondensables. Moisture in the system, measured in parts per million (ppm), changes color of indicator as follows:

Green — moisture is below 45 ppm

Yellowish-Green (caution) — 45 to 130 ppm

Yellow (wet) — above 130 ppm.

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

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

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

Liquid Shutoff/Charging Valve — This valve is located immediately ahead of filter drier, and is factory provided with a ¼-in. flare connection for field charging.

Hot-Gas Bypass Valve — On units equipped with the factory-installed capacity reduction option (015, 50 Hz and 020, 60 Hz units), a hot-gas bypass valve is located between the discharge line and the cooler entering-refrigerant line. A solenoid valve is installed in the equalizer line of the hot-gas valve to allow the temperature control to cycle the hot-gas bypass function.

The amount of capacity reduction achieved by the hot-gas bypass valve may be altered by adjusting the spring tension of the hot-gas bypass valve. The total unit capacity should not be reduced below 10% of the nominal rating.

Compressor Protection

CIRCUIT BREAKER — Calibrated trip manual reset, ambient compensated, magnetic breaker protects against motor overload and locked rotor conditions.

THERMAL OVERLOAD — On 06D compressors, a sensor embedded in motor windings protects against overtemperature.

CONTROL MODULE (CM) DELAY — A 5-minute time delay in the CM protects compressor against short cycling. See Control Sequence section (page 17).

CRANKCASE HEATER — The heater minimizes absorption of liquid refrigerant by oil in crankcase during brief or extended shutdown periods. Source of power is the auxiliary control power, independent of the main unit power. This assures compressor protection even when main unit power disconnect switch is off.

IMPORTANT: The heater is located in the bottom cover of the compressor, and held in place by a clip and a bracket (06E only) or a bracket (06D). The heater must be tight to prevent it from backing out of the heater well. The heater eventually burns out if exposed to the air for an extended period.

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

OIL PRESSURE SAFETY SWITCH (OPS) — An OPS is a field-installed accessory on all 30GT standard temperature units and is standard on units equipped with the brine option. It is located in the compressor section with capillaries to the crankcase and oil pump. When used, the OPS is monitored by the unit control module (CM). If at any time after the compressor is started, the oil pressure safety switch is open for more than 2 minutes, the compressor shuts down and is locked off until control power is manually cycled off, then on. The OPS cuts out at 5 ± 1 psig (34.5 ± 6.9 kPa), and has a maximum cut-in of 9.5 ± 1 psig (65.5 ± 6.9 kPa).

Cooler Freeze-Up Protection

All units have the following freeze-up protection.

The temperature controller protects the system from freeze-up due to rapid loss of load and from low fluid flow by rapidly removing all steps of capacity and shutting down the compressor if an out-of-range condition exists. This normally occurs if the leaving-water temperature drops 6° to 7° F (3.3° C) below the temperature controller set point. Set point range is 40 to 60 F (4.4 to 15.6 C) for standard units and 15 to 39 F (-9.4 to 3.9 C) for units with medium temperature brine option.

▲ CAUTION

On medium temperature brine units, the brine must be mixed to prevent freezing at a temperature of at least 15 F (8.3 C) below the leaving-water temperature set point. Failure to provide the proper brine mixture is considered abusive and may void the Carrier warranty.

When cooler is exposed to lower ambient temperatures (34 F [1 C] or below), freeze-up protection is recommended using inhibited ethylene glycol.

HEATER CABLE — A heater cable is helically wound around the entire length of the cooler. A thermostat energizes the cable whenever the ambient temperature is 35 F (1.7 C) or lower. The cable is between the cooler and the insulation blanket around the cooler. The heater cable and the insulation protect the cooler down to -20 F (-29 C) ambient temperature.

Since the auxiliary power source (control power) for the heater cable is separate from main power source, power to heater is assured even though the main unit power may be off.

▲ CAUTION

Do not disconnect heater cable power when servicing compressor if ambient temperature is below 40 F (4.4 C). If power to the heater cable is cut off, or if unit is to be down for a prolonged period, drain the cooler.

WINTER SHUTDOWN — At the end of the cooling season:

1. Drain the water from the cooler (see drain location in Fig. 3-5).
2. Replace the drain plug and put 2 gallons (8 L) of ethylene glycol in the cooler to prevent any residual water in the cooler from freezing.
3. At the beginning of the next cooling season, refill the cooler and add the recommended inhibitor.

High-Pressure Switch — The switch has fixed, non-adjustable settings, and is mounted in the discharge side of the compressor. The switch is provided to protect the compressor and refrigeration system from unsafe high pressure conditions.

See Table 6 for high-pressure switch settings.

A snubber is provided between the compressor discharge manifold and the high-pressure switch to prevent pressure pulsations from damaging the switch.

If an unsafe, high-pressure condition should exist, the switch opens and shuts off the compressor. The unit control module prevents the unit from restarting. The unit will not restart until control power is manually cycled off, then on.

To check operation of the switch, slowly close the compressor discharge shutoff valve until the compressor shuts down. The switch should open at the pressure corresponding to the appropriate switch setting as shown in Table 6.

Low-Pressure Switch — The switch has fixed, non-adjustable settings. Switch is mounted on the compressor.

TO CHECK — Slowly close liquid shutoff valve and allow compressor to pump down. Do not allow compressor to pump down below 2 psig (13.8 kPa). Compressor should shut down when suction pressure drops to cutout pressure in Table 6, and should restart when pressure builds up to cut-in pressure shown.

NOTE: Unit should be in continuous operation for at least 10 minutes prior to checking low-pressure switch.

Table 6 — Pressure Switch Settings, psig (kPa)

HIGH PRESSURE		LOW PRESSURE	
Cutout	Cut-in	Cutout	Cut-in
426 ± 7 (2937 ± 48)	320 ± 20 (2206 ± 138)	27 ± 3 (186 ± 21)	44 ± 5 (303 ± 34)

Control Module (CM) — The unit control module is located in the control section of the control box. See Fig. 12. It performs several functions. The control module has a built-in compressor anti-short-cycle timer which will not allow the compressor to restart until 5 minutes have elapsed since the previous shutdown.

On brine units (and GT units equipped with the accessory OPS), the compressor oil pressure is monitored through the CM. The unit is allowed to remain operational as long as the OPS has not been open for more than 2 minutes after the compressor has started. If after start-up, the OPS is open for more than 2 minutes, the CM shuts down the compressor and places the unit in a lock-out condition. The CM activates the fault indication circuit, and the field-supplied unit service lamp is illuminated (if so equipped). The unit cannot be restarted until control power is manually cycled off, then on.

The CM also monitors the high-pressure switch and compressor thermal protection. If at any time one or both of these switches open(s), the CM shuts down the compressor and places the unit in a lock-out condition. The CM activates the fault indication circuit, and the field-supplied unit service lamp is illuminated (if so equipped). The unit cannot be restarted until control power is manually cycled off, then on.

If the unit shuts down on an automatic reset switch, such as the temperature controller or low-pressure switch, the compressor will be allowed to restart when the switch recloses and the control module anti-short-cycle time has elapsed.

For Servicing Only — To speed up the 5-minute anti-short cycle, a temporary jumper may be placed between terminals T1 and T6 of the control module.

▲ CAUTION

This jumper must be removed after servicing is complete. Failure to remove this jumper is considered abusive treatment and will void the Carrier warranty.

Bypass Relay (BPR) — All units are equipped with a BPR located in the control section of the control box. See Fig. 12. The function of the bypass relay is to provide a 2-minute bypass of the low-pressure switch at start-up, and to energize the unloader(s) at start-up to provide unloaded compressor starting. Two minutes after the compressor starts, the BPR completes its function and is no longer active in the control circuit until the next restart of the unit.

Temperature Controller (TC) — All units are equipped with a TC (see Fig. 13) which is capable of controlling up to 4 steps of capacity. A thermistor inserted into the cooler leaving-water piping supplies the input to the controller. The temperature controller can operate a system with cooling ranges of 5° to 15° F (2.8° to 8.3° C), and with a range of set points from 40 to 60 F (4.4 to 15.5 C) for standard units, and 15 to 39 F (-9.4 to 3.9 C) for units with the medium temperature brine option.

The set point of the TC should be adjusted to the desired leaving cooler water (brine) temperature, and verified by using a thermometer placed in the leaving-cooler piping. The amount of deadband around the set point value is adjusted through the use of the deadband adjustment knob on the temperature controller. See Tables 3 and 4 for the correct setting of the deadband.

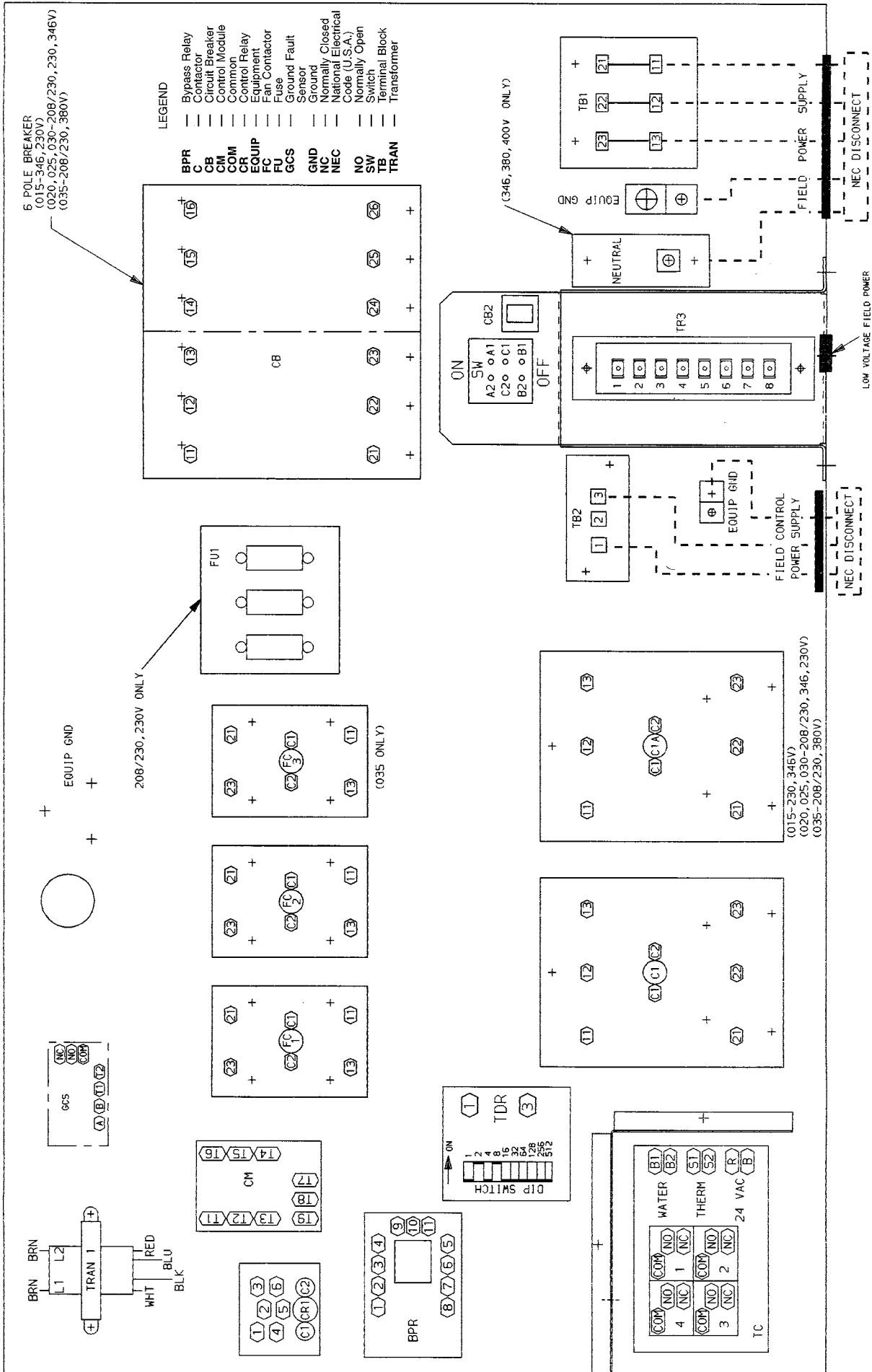


Fig. 12 — Control Box Component Arrangement

The unit should then control the average leaving-fluid temperature to this setting. If the leaving-fluid temperature does not correspond to the desired set point, slightly readjust the controller set point knob until the desired leaving-fluid temperature is obtained. The sample rate knob on the temperature controller should always be set at HI position for use in these liquid chillers.

⚠ CAUTION

Do not force the knob dials past the stops. This could cause loss of control point and damage to the controller.

If rapid cycling of the capacity steps occurs, the deadband setting is too low and should be raised just to the point that rapid cycling will cease.

The lights on the temperature controller will indicate the status of the control. If the light labeled ABOVE SETPOINT (green) is illuminated, the controller will add steps of capacity, if additional steps are available. If the light labeled BELOW SETPOINT (yellow) is illuminated, the controller removes steps of capacity.

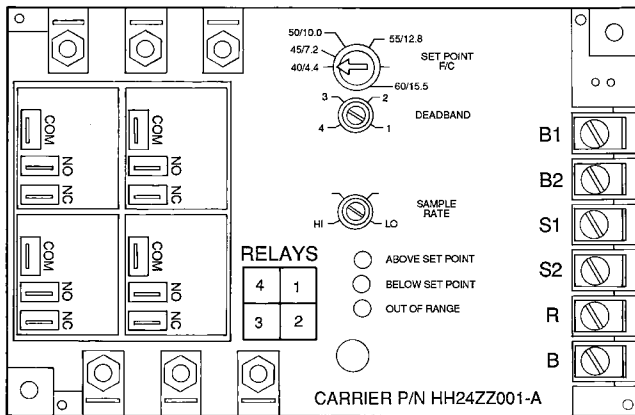
The temperature controller also has a light labeled OUT OF RANGE (red). This indicates that the system load was reduced faster than the controller could remove stages. If this occurs, the unit shuts down to avoid cooler freeze-up.

Once the temperature rises back into the control band, the unit restarts automatically. This also occurs if the thermistor fails in the open mode. In the case of a thermistor failure, the unit does not restart until the thermistor is replaced.

If a cooler design-range other than those shown in Table 3 is desired, determine the setting by using the following formula and Table 4:

Minimum required unit deadband:

$$\text{Minimum Deadband} = \frac{\text{Cooler design } \Delta t}{(2 \times \text{no. of Capacity Steps})} = \text{___ F (C)}$$



LEGEND

- COM — Common
- NC — Normally Closed
- NO — Normally Open

Fig. 13 — Temperature Controller

Head Pressure Control — This control reduces condensing capacity under low-ambient temperature conditions.

FAN CYCLING — These 30GT units have standard provision for fully automatic intermediate-season head pressure control through condenser fan cycling. Fan no. 2 is cycled by a fan cycling pressure switch (FCPS) which responds to variation in discharge pressure. The pressure sensor is located in the liquid line of the refrigerant circuit. Fan no. 3 (30GT035, 60 Hz units only) cycling is controlled by outdoor-air temperature through an air temperature switch (ATS).

The ATS is located in the lower divider panel between the compressor compartment and condenser section. Through a hole in the panel, the sensing element is exposed to air entering the no. 1 fan compartment. Fan no. 1 is non-cycling. Table 7 shows the operating settings of the fan cycling pressure switch and the air temperature switch.

Table 7 — Fan Cycling Controls

CONTROL BY	SWITCH OPENS	SWITCH CLOSSES
Temp. F (C)*	70 ± 3 (21 ± 1.7)	80 ± 3 (27 ± 1.7)
Pressure, psig (kPa)†	160 ± 10 (1103 ± 69)	260 ± 15 (1793 ± 103)

*Air temperature switch.

†Fan cycling pressure switch.

NOTE: See Fig. 3-5 for fan arrangement.

Time-Delay Relay (TDR) — This solid-state delay-on-make relay is factory set for a 10-second delay. The number 2 and number 8 dip switches are set to the ON position, and all the other dip switches are set to the OFF position. Once the control relays (CR) are energized, the compressor will start, and a 10-second pumpout sequence is initiated.

Ground Fault Sensor (GCS) (Accessory) —

Ground current accessory part number 30HW900004 detects a current to ground and shuts down unit. For installation details, see instructions included with the accessory package. For control box mounting location, refer to the component arrangement label diagram on the unit. The compressor shuts down when the resultant current of the 3-phase conductors as sensed by the current toroid(s) exceeds 2.5 ± 2 amps. Unit control module locks compressor off until control circuit power is manually cycled off, then on.

Capacity Control System —

This system consists of a multiple-step water temperature controller, electric cylinder bank unloader(s) and liquid line solenoid valve. A hot gas bypass arrangement on the final step of unloading is standard and factory supplied for models 30GT020, 60 Hz and 30GT015, 50 Hz. Factory-installed stubs are provided to facilitate field installation of hot gas bypass for all other units. See Table 8 for capacity control steps for each unit.

Table 8 — Capacity Control Steps

UNIT 30GT	HERTZ	CONTROL STEPS	% CAP.	OPER CYL
015	50	*	—	2
020	60	1	50	2
		2	100	4
015	60	1 2 3	33 67 100	2 4 6
020	50			
025	50/60			
030				
035	60			

CAP — Capacity
CYL — Cylinders
OPER — Operating
 *Uses hot gas bypass.

HOT GAS BYPASS VALVE — This valve is factory-installed on 30GT015, 50 Hz and 30GT020, 60 Hz units. It modulates flow of hot gas into refrigerant circuit in response to variations from preset suction pressure. A sudden decrease in suction pressure causes valve to admit more hot gas to restore the preset pressure level. The hot gas enters the refrigerant circuit through the connecting tube between the TXV and the cooler. With hot gas bypass, the 30GT unit operates down to a lower load condition; the result is less frequent off-on cycling of the chiller.

The bypass valve is factory set to begin opening when suction pressure drops to about 62 psig (427 kPa). This pressure corresponds to a chilled water controller set point of approximately 44 F (6.7 C). If the chilled water set point is lower than 44 F (6.7 C), it is necessary to decrease the bypass valve setting for proper operation. Conversely, for chilled water set points above 44 F (6.7 C), the bypass valve setting must be increased. A change in condensing temperature also requires a change in bypass valve set point. As condensing temperature decreases, decrease the bypass valve set point until it opens at desired conditions.

UNIT OPERATION

Control Sequence — The units have a multiple-step temperature controller, factory set to maintain capacity control through leaving chilled water temperature. The controller has 3 capacity steps. All units have electric solenoid operated unloaders. See Table 8 for capacity control steps of each unit.

At initial start-up, assume that all safety devices are satisfied and there is a call for cooling.

- At start-up, with the temperature controller (TC) calling for cooling and all safety devices satisfied, the control circuit switch is closed. With minimal demand for cooling, only the first TC switch is made. The timer sequence starts, the condenser fan no. 1 starts with the compressor liquid line solenoid valve closed for 10 seconds on compressor start. Fans no. 2 and 3 (30GT035, 60 Hz only) start if high side pressure is higher than 260 psig (1793 kPa). After a 5 minute delay (approximately) of the control module, the compressor starts unloaded. As cooling demand increases, unit capacity increases per Table 8.

Close the compressor circuit breaker and change the ON-OFF switch to ON position. In approximately 3 seconds the compressor starts unloaded. For 10 seconds, the liquid line solenoid valve remains closed until the TDR closes. For 2 minutes the low-pressure switch is bypassed and the unloaders are energized (compressor unloads when compressor unloader solenoid is energized). At end of 2-minute bypass period, the low-pressure switch activates in the control circuit. The temperature controller regulates the capacity steps based on set point and deadband settings on the temperature controller and leaving cooler water temperature.

If system load drops to the point where unit is fully unloaded and the water temperature is below the lower deadband limit, the compressor shuts off and is not able to restart until the 5-minute anti-short cycle has expired. If during normal operation, the water temperature rises above the upper deadband limit, the temperature controller adds a step of capacity (assuming a step is left to be added).

On brine units, or on units equipped with the accessory oil safety switch, the control module provides a 2-minute bypass of the oil safety switch.

If the unit is equipped with hot gas bypass, the hot gas bypass valve closes before unloaders are activated.

If the unit trips out on high pressure, ground current (accessory), or low oil pressure, the control module locks the unit off and must be manually reset (by turning the ON-OFF switch to OFF position, then back to ON position). If the unit trips out on low pressure, low water temperature, field-supplied chilled water flow switch, or chilled water pump switch, it restarts automatically when the condition is corrected.

HOT GAS BYPASS (Standard, Factory-Installed on 30GT015 50 Hz, and 30GT020 60 Hz) — On the last step of capacity control (only TC switch no. 1 is closed), the hot gas bypass valve is energized. This allows unit to operate at a lower load condition than is provided in the normal function of the TC, with less frequent on-off cycling of the compressor.

Complete Unit Stoppage

CAUSES — Interruption of supplied power, open control circuit switch (SW), open field-supplied chilled water flow switch (CWFS), open contacts in field-supplied auxiliary interlock (CWP), or compressor overtemperature protection (COTP, for 30GT015 60 Hz only), or open high-pressure switch (HPS).

RESTART — The unit recycles and restarts automatically under short-cycle 5 minute delay of CM when power is restored, or when SW is closed or when contacts in CWFS or CWP are closed (if so equipped).

Stoppage by COTP or HPS requires manual resetting of the control circuit to restart the CM 5-minute time delay. This is done by opening and closing the control circuit switch (SW).

After Stoppage by Low-Pressure Switch (LPS)

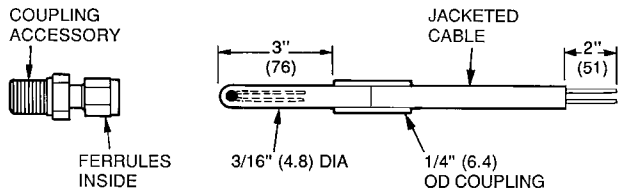
— If LPS is not closed 2 minutes after compressor starts, the compressor stops and locks out and LPS must be closed before CM can recycle to restart the compressor.

If LPS opens anytime during unit operation, compressor stops and timer starts. Compressor restarts in approximately 5 minutes. For 2 minutes, LPS is bypassed. If it has not closed by this time, the compressor stops and locks out. The compressor cannot restart until LPS is closed.

⚠ CAUTION

If unit or circuit stoppage occurs more than once due to any safety device, the trouble should be corrected before any attempt to restart.

Thermistor — The water-side temperature-sensing thermistor is located in the leaving water nozzle. The probe is immersed directly in the water, and the connection is made through a ¼-in. coupling (Fig. 14). The resistance at various temperatures for the thermistor are given in Tables 9A and 9B.



NOTE: Dimensions in () are in millimeters.

Fig. 14 — Thermistor

TO REPLACE THERMISTOR:

1. Remove and discard original sensor and coupling. Do not disassemble new coupling. Install assembly as received.
2. Apply pipe sealant to 1/4-in. NPT threads on replacement coupling, and install in place of original.

⚠ CAUTION

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

3. Insert thermistor into coupling body to its full depth. Tighten packing nut finger tight to position ferrules, then tighten 1 1/4 turns more using a back-up wrench. Ferrules are now attached to the sensor, which can be withdrawn from coupling for service.

Cooler Tubes — When the cooler heads and partition plates are removed, the tube sheets are exposed showing the ends of the tubes as seen in Fig. 15. Four tubes in the bundle are secured inside the cooler at the baffles and *cannot be removed*. These are identified on the tube sheets by a drill mark horizontally adjacent to each of the 4 tubes. See Fig. 15. *If leaks occur in any of these 4 tubes, plug the tube(s) as described in Tube Plugging section below.*

TUBE PLUGGING — A leaky tube(s) can be plugged until retubing can be done. The number of plugged tubes determines how soon the cooler *must* be retubed. If several tubes require plugging, check with your local Carrier representative to find out how the number and location will affect unit capacity.

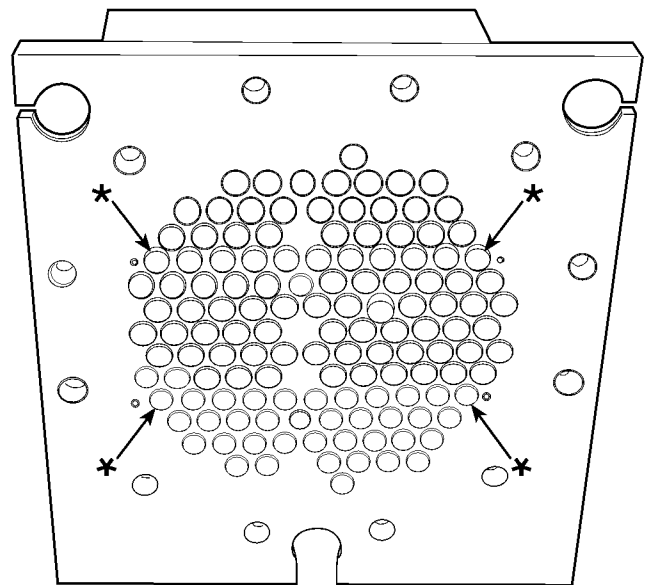
Figure 16 shows an Elliott tube plug and a cross-sectional view of a plug in place. Table 10 lists the components for plugging.

⚠ CAUTION

Use extreme care when installing plugs to prevent damaging the tube sheet sections between the holes.

Clean parts with Locquic “N” and apply a few drops of Loctite No. 75 to obtain a tight seal without using too much force to set the pin.

Usually plugs can be removed by heating the projecting end of the pin to approximately 1000 F (540 C) and chilling quickly with water. Apply the heating flame to the side of the pin to prevent overheating the tube sheet.



*Four fixed tubes (cannot be removed) identified by adjacent drill points.

Fig. 15 — Tube Sheet

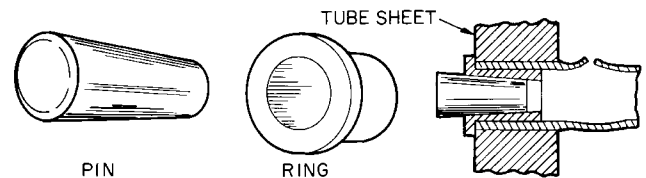


Fig. 16 — Elliott Tube Plug

RETUBING (See Table 10) — When retubing is to be done, obtain the service of qualified personnel experienced in boiler maintenance and repair. Most standard procedures can be followed, except that for the tubes in the 30GT coolers, a 5% crush is recommended in setting torque (5/8-in. [15.87-mm] diameter tubes are used in the 30GT cooler).

Example:

- a. Tube sheet hole diameter 0.630 in. (16.00 mm)
- b. Tube OD 0.625 in. (15.87 mm)
- c. Clearance (a minus b) 0.005 in. (0.13 mm)
- d. Tube ID before rolling
(use Elliott tube gage) 0.549 in. (13.9 mm)
- e. 5% of twice the wall thickness
(5% of b minus d) 0.004 in. (0.10 mm)
- f. Tube ID after rolling
(c + d + e) 0.558 in. (14.2 mm)

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

Table 9A — Sensor Temperature (F) vs Resistance

TEMPERATURE (F)	RESISTANCE (OHMS)	TEMPERATURE (F)	RESISTANCE (OHMS)	TEMPERATURE (F)	RESISTANCE (OHMS)
-25	98,010	63	7,091	151	1,007
-24	94,707	64	6,911	152	986
-23	91,522	65	6,735	153	965
-22	88,449	66	6,564	154	945
-21	85,485	67	6,399	155	925
-20	82,627	68	6,237	156	906
-19	79,871	69	6,081	157	887
-18	77,212	70	5,929	158	868
-17	74,648	71	5,781	159	850
-16	72,175	72	5,637	160	832
-15	69,790	73	5,497	161	815
-14	67,490	74	5,361	162	798
-13	65,272	75	5,229	163	782
-12	63,133	76	5,101	164	765
-11	61,070	77	4,976	165	749
-10	59,081	78	4,855	166	734
-9	57,162	79	4,737	167	719
-8	55,311	80	4,622	168	705
-7	53,526	81	4,511	169	690
-6	51,804	82	4,403	170	677
-5	50,143	83	4,298	171	663
-4	48,541	84	4,195	172	650
-3	46,996	85	4,096	173	638
-2	45,505	86	4,000	174	626
-1	44,066	87	3,906	175	614
0	42,678	88	3,814	176	602
1	41,339	89	3,726	177	591
2	40,047	90	3,640	178	581
3	38,800	91	3,556	179	570
4	37,596	92	3,474	180	560
5	36,435	93	3,395	181	551
6	35,313	94	3,318	182	542
7	34,231	95	3,243	183	533
8	33,185	96	3,170	184	524
9	32,176	97	3,099	185	516
10	31,201	98	3,031	186	508
11	30,260	99	2,964	187	501
12	29,351	100	2,898	188	494
13	28,472	101	2,835	189	487
14	27,624	102	2,773	190	480
15	26,804	103	2,713	191	473
16	26,011	104	2,655	192	467
17	25,245	105	2,598	193	461
18	24,505	106	2,542	194	456
19	23,789	107	2,488	195	450
20	23,096	108	2,436	196	444
21	22,427	109	2,385	197	439
22	21,779	110	2,335	198	434
23	21,153	111	2,286	199	429
24	20,547	112	2,238	200	424
25	19,960	113	2,192	201	419
26	19,392	114	2,147	202	415
27	18,843	115	2,103	203	410
28	18,311	116	2,060	204	405
29	17,796	117	2,018	205	401
30	17,297	118	1,977	206	396
31	16,814	119	1,937	207	391
32	16,346	120	1,898	208	386
33	15,892	121	1,860	209	382
34	15,453	122	1,822	210	377
35	15,027	123	1,786	211	372
36	14,614	124	1,750	212	366
37	14,214	125	1,715	213	361
38	13,826	126	1,680	214	356
39	13,449	127	1,647	215	350
40	13,084	128	1,614	216	344
41	12,730	129	1,582	217	338
42	12,387	130	1,550	218	332
43	12,053	131	1,519	219	325
44	11,730	132	1,489	220	318
45	11,416	133	1,459	221	311
46	11,111	134	1,430	222	304
47	10,816	135	1,401	223	297
48	10,529	136	1,373	224	289
49	10,250	137	1,345	225	282
50	9,979	138	1,318		
51	9,717	139	1,291		
52	9,461	140	1,265		
53	9,213	141	1,239		
54	8,973	142	1,214		
55	8,739	143	1,189		
56	8,511	144	1,165		
57	8,291	145	1,141		
58	8,076	146	1,118		
59	7,868	147	1,095		
60	7,665	148	1,072		
61	7,468	149	1,050		
62	7,277	150	1,028		

Table 9B — Sensor Temperature (C) vs Resistance

TEMPERATURE (C)	RESISTANCE (OHMS)	TEMPERATURE (C)	RESISTANCE (OHMS)	TEMPERATURE (C)	RESISTANCE (OHMS)
-32.0	100 049	16.0	7507	64.0	1090
-31.5	97 006	16.5	7334	64.5	1070
-31.0	94 061	17.0	7165	65.0	1050
-30.5	91 209	17.5	7000	65.5	1030
-30.0	88 449	18.0	6840	66.0	1011
-29.5	85 777	18.5	6683	66.5	992
-29.0	83 191	19.0	6531	67.0	973
-28.5	80 687	19.5	6382	67.5	955
-28.0	78 264	20.0	6237	68.0	937
-27.5	75 918	20.5	6096	68.5	919
-27.0	73 648	21.0	5959	69.0	902
-26.5	71 451	21.5	5825	69.5	885
-26.0	69 324	22.0	5694	70.0	868
-25.5	67 265	22.5	5566	70.5	852
-25.0	65 272	23.0	5442	71.0	836
-24.5	63 344	23.5	5321	71.5	820
-24.0	61 477	24.0	5203	72.0	805
-23.5	59 670	24.5	5088	72.5	790
-23.0	57 921	25.0	4976	73.0	775
-22.5	56 228	25.5	4867	73.5	761
-22.0	54 589	26.0	4760	74.0	746
-21.5	53 003	26.5	4656	74.5	733
-21.0	51 467	27.0	4555	75.0	719
-20.5	49 980	27.5	4457	75.5	706
-20.0	48 541	28.0	4360	76.0	693
-19.5	47 148	28.5	4267	76.5	681
-19.0	45 799	29.0	4175	77.0	669
-18.5	44 492	29.5	4086	77.5	657
-18.0	43 228	30.0	4000	78.0	645
-17.5	42 003	30.5	3915	78.5	634
-17.0	40 817	31.0	3832	79.0	623
-16.5	39 668	31.5	3752	79.5	613
-16.0	38 556	32.0	3674	80.0	602
-15.5	37 478	32.5	3597	80.5	592
-15.0	36 435	33.0	3523	81.0	583
-14.5	35 424	33.5	3450	81.5	573
-14.0	34 444	34.0	3379	82.0	564
-13.5	33 495	34.5	3310	82.5	556
-13.0	32 576	35.0	3243	83.0	547
-12.5	31 685	35.5	3177	83.5	539
-12.0	30 821	36.0	3113	84.0	531
-11.5	29 984	36.5	3051	84.5	524
-11.0	29 173	37.0	2990	85.0	516
-10.5	28 386	37.5	2931	85.5	509
-10.0	27 624	38.0	2873	86.0	502
- 9.5	26 884	38.5	2816	86.5	496
- 9.0	26 168	39.0	2761	87.0	489
- 8.5	25 472	39.5	2707	87.5	483
- 8.0	24 798	40.0	2655	88.0	477
- 7.5	24 144	40.5	2603	88.5	472
- 7.0	23 509	41.0	2553	89.0	466
- 6.5	22 893	41.5	2504	89.5	461
- 6.0	22 296	42.0	2457	90.0	456
- 5.5	21 716	42.5	2410	90.5	451
- 5.0	21 153	43.0	2364	91.0	446
- 4.5	20 606	43.5	2320	91.5	441
- 4.0	20 076	44.0	2276	92.0	436
- 3.5	19 561	44.5	2234	92.5	432
- 3.0	19 061	45.0	2192	93.0	427
- 2.5	18 575	45.5	2152	93.5	423
- 2.0	18 103	46.0	2112	94.0	419
- 1.5	17 645	46.5	2073	94.5	415
- 1.0	17 199	47.0	2035	95.0	410
- 0.5	16 766	47.5	1997	95.5	406
0.0	16 346	48.0	1961	96.0	402
0.5	15 937	48.5	1925	96.5	398
1.0	15 539	49.0	1890	97.0	393
1.5	15 153	49.5	1856	97.5	389
2.0	14 777	50.0	1822	98.0	385
2.5	14 412	50.5	1789	98.5	380
3.0	14 057	51.0	1757	99.0	376
3.5	13 711	51.5	1725	99.5	371
4.0	13 375	52.0	1694	100.0	367
4.5	13 048	52.5	1663	100.5	362
5.0	12 730	53.0	1634	101.0	357
5.5	12 420	53.5	1604	101.5	352
6.0	12 119	54.0	1575	102.0	346
6.5	11 826	54.5	1547	102.5	341
7.0	11 541	55.0	1519	103.0	335
7.5	11 263	55.5	1492	103.5	330
8.0	10 992	56.0	1465	104.0	324
8.5	10 729	56.5	1438	104.5	318
9.0	10 472	57.0	1412	105.0	312
9.5	10 223	57.5	1387	105.5	305
10.0	9 979	58.0	1362	106.0	299
10.5	9 742	58.5	1337	106.5	292
11.0	9 512	59.0	1313	107.0	285
11.5	9 287	59.5	1289		
12.0	9 068	60.0	1265		
12.5	8 855	60.5	1242		
13.0	8 647	61.0	1219		
13.5	8 444	61.5	1197		
14.0	8 247	62.0	1175		
14.5	8 055	62.5	1153		
15.0	7 868	63.0	1132		
15.5	7 685	63.5	1111		

Table 10 — Tubes and Plugs

UNIT 30GT	015,020	025,030	035
TUBE DATA	SPECIFICATIONS		
Part No. 10HA501—	033	053	063
Length in. (mm)	62.5 (1588)	85.5 (2172)	109.5 (2781)
OD in. (mm)	0.625 (15.9)		
Wall Thickness, in. (mm)			
Plain End	0.038 (0.97)		
Finned Section	0.025 (0.64*)		
COMPONENTS FOR PLUGGING	PART NO.		
For Tubes			
Brass Pin	853103-500†		
Brass Ring	853002-559†		
For Holes Without Tubes			
Brass Pin	853103†		
Brass Ring	853002-631†		
Loctite	No. 75**		
Locquic	"N"***		

*Check with thickness gage (23 ga).

†Order directly from Elliott Tube Company, Dayton, Ohio.

**Can be obtained locally.

TROUBLESHOOTING

Complete Unit Stoppage and Restart — Possible causes for unit stoppage and reset are (also see Table 11):

GENERAL POWER FAILURE — After power is restored, restart is automatic through the normal timer cycle.

UNIT ON-OFF SWITCH IS OPEN — When the switch is in the OFF position, the unit stops immediately. If the switch is closed immediately after it was opened, the unit restarts automatically after the 5-minute timer cycle is completed. If the switch is closed after an extended off period, the unit restarts automatically in approximately 3 seconds.

CONTACTS OF ANY AUXILIARY INTERLOCKS ARE OPEN (If Provided) — After the problem has been corrected, restart is automatic after completion of the 5-minute timer cycle.

CHILLED WATER PROOF-OF-FLOW SWITCH OPENS (If Provided) — After the problem causing the loss of flow has been corrected, restart is automatic after completion of the 5-minute timer cycle.

OPEN LOW-PRESSURE SWITCH — Reset and restart are automatic upon completion of the 5-minute timer cycle unless the refrigerant charge is very low or lost. If this is the case, determine the cause of the loss of charge, correct the problem, and properly recharge the unit before restarting.

TEMPERATURE CONTROLLER SHUTS UNIT DOWN ON OUT-OF-RANGE (See Fig. 13) — Check the thermistor for an open circuit failure. See Tables 9A and 9B for temperature-resistance values. If thermistor is damaged, replace it. If thermistor is not damaged, the unit restarts automatically after completion of the 5-minute timer cycle, and after the leaving cooler chilled water temperature rises above the upper deadband limit of the temperature controller.

OPEN HIGH-PRESSURE SWITCH — The CM alarm circuit is energized. Determine and correct the cause of the failure. The switch automatically resets but the unit must be manually reset by cycling the control power by moving ON-OFF switch to OFF position, then back to ON position. The unit restarts after completion of 5-minute timer cycle.

OPEN COMPRESSOR THERMAL PROTECTION (015, 60 Hz only) — CM alarm circuit is energized. Determine and correct cause of problem. The switch resets automatically but unit must be reset by cycling the control power by moving ON-OFF switch to OFF position, then back to ON position. The unit restarts after completion of 5-minute timer cycle.

OPEN OIL PRESSURE SWITCH (Standard on Brine Units Only) — If oil pressure switch remains open for more than 2 minutes during operation, the unit shuts down and is locked off. CM alarm circuit is energized. Determine and correct cause of failure. Unit must be reset by cycling the control power by moving ON-OFF switch to OFF position, then back to ON position. Unit restarts after completion of 5-minute timer cycle.

OPEN CONTACTS ON COMPRESSOR GROUND-CURRENT SENSOR (Accessory) — The light-emitting diode (LED) on the ground current accessory board (located in field control wiring section of control box) is illuminated. See Fig. 8 and 12. CM alarm circuit is energized. **Check the compressor motor windings for a short to ground.** Determine and correct cause of the failure. The unit must be reset by cycling the control power by moving ON-OFF switch to OFF position, then back to ON position. Unit restarts after completion of the 5-minute timer cycle.

OPEN 24-V CONTROL CIRCUIT BREAKER — Determine the cause of the failure and correct. Reset circuit breaker. Restart is automatic after completion of 5-minute timer cycle.

COOLING LOAD SATISFIED — Unit shuts down if cooling load is satisfied. Unit restarts if required after completion of 5-minute timer cycle.

THERMISTOR FAILURE — If thermistor fails in open mode, the temperature controller shuts down unit on an out-of-range condition. Replace thermistor. Unit restarts automatically after completion of 5-minute timer cycle, and when the leaving cooler chilled water temperature rises above upper deadband limit of temperature controller.

NOTE: If the thermistor fails in closed mode, the temperature controller keeps trying to load up.

⚠ CAUTION

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

Table 11 — Troubleshooting

SYMPTOM AND PROBABLE CAUSE	PROBABLE REMEDY
COMPRESSOR DOES NOT RUN <ol style="list-style-type: none"> 1. Control circuit breaker tripped 2. Power line open 3. Control circuit ON-OFF switch is off 4. Safety device tripped 5. Contactor stuck open 6. Loose terminal connection 7. Improperly wired controls 8. Seized compressor 9. Chilled water flow switch (if provided) open 10. Low line voltage 11. Compressor motor defective 	<ol style="list-style-type: none"> 1. Reset control circuit breaker. 2. Reset circuit breaker. 3. Reset switch. 4. Reset control circuit with ON-OFF switch. 5. Replace contactor. 6. Check connections. 7. Check and rewire. 8. Check motor winding for open or short. Replace compressor if necessary. 9. Check chilled water pump, check switch. 10. Check line voltage — determine location of voltage drop and remedy deficiency. 11. Check motor winding for open or short. Replace compressor if necessary.
COMPRESSOR STOPS ON LOW-PRESSURE CONTROL <ol style="list-style-type: none"> 1. Compressor suction shutoff valve partially closed 2. Low refrigerant charge 3. Liquid line solenoid valve(s) fails to open 	<ol style="list-style-type: none"> 1. Open valve. 2. Add refrigerant. 3. Check liquid line solenoid valve for proper operation. Replace if necessary.
COMPRESSOR STOPS ON HIGH-PRESSURE CONTROL <ol style="list-style-type: none"> 1. Compressor discharge valve partially closed 2. Air in system 3. Condenser fan(s) not operating 	<ol style="list-style-type: none"> 1. Open valve or replace if defective. 2. Purge system. 3. Check motor wiring and repair or replace if defective.
UNIT OPERATES TOO LONG OR CONTINUOUSLY <ol style="list-style-type: none"> 1. Low refrigerant charge 2. Control contacts fused 3. Air in system 4. Partially plugged expansion valve or filter drier 	<ol style="list-style-type: none"> 1. Add refrigerant. 2. Replace control. 3. Purge system. 4. Clean or replace.
SYSTEM IS NOISY <ol style="list-style-type: none"> 1. Piping vibration 2. Compressor noisy 	<ol style="list-style-type: none"> 1. Support piping as required. 2. Check valve plates for valve noise. Replace compressor if bearings are worn.
COMPRESSOR LOSES OIL <ol style="list-style-type: none"> 1. Leak in system 2. Crankcase heaters not energized during shutdown 	<ol style="list-style-type: none"> 1. Repair leak. 2. Check wiring and relays. Check heater and replace if defective.
FROSTED SUCTION LINE <ol style="list-style-type: none"> 1. Expansion valve admitting excess refrigerant 	<ol style="list-style-type: none"> 1. Adjust expansion valve.
HOT LIQUID LINE <ol style="list-style-type: none"> 1. Shortage of refrigerant due to leak 2. Expansion valve opens too wide 	<ol style="list-style-type: none"> 1. Repair leak and recharge. 2. Adjust expansion valve.
FROSTED LIQUID LINE <ol style="list-style-type: none"> 1. Restricted filter drier 	<ol style="list-style-type: none"> 1. Remove restriction or replace.
COMPRESSOR WILL NOT UNLOAD <ol style="list-style-type: none"> 1. Burned-out coil 2. Defective capacity control valve 3. Miswired solenoid 4. Weak, broken, or wrong valve body spring 	<ol style="list-style-type: none"> 1. Replace coil. 2. Replace valve. 3. Rewire correctly. 4. Replace spring.
COMPRESSOR WILL NOT LOAD <ol style="list-style-type: none"> 1. Miswired solenoid 2. Defective capacity control valve 3. Plugged strainer (high side) 4. Stuck or damaged unloader piston or piston ring(s) 	<ol style="list-style-type: none"> 1. Rewire correctly. 2. Replace valve. 3. Clean or replace strainer. 4. Clean or replace the necessary parts.

PACKAGED SERVICE TRAINING

Our packaged service training programs provide an excellent way to increase your knowledge of the equipment discussed in this manual. Product programs cover:

- Unit Familiarization
- Maintenance
- Installation Overview
- Operating Sequence

A large selection of product, theory, and skills programs is available. All programs include a video cassette and/or slides and a companion booklet. Use these for self teaching or to conduct full training sessions.

For a free Service Training Material Catalog (STM), call 1-800-962-9212. Ordering instructions are included.

START-UP CHECKLIST

A. Preliminary Information

JOB NAME _____

LOCATION _____

INSTALLING CONTRACTOR _____

DISTRIBUTOR _____

START-UP PERFORMED BY _____

EQUIPMENT: Chiller: MODEL # _____ SERIAL # _____

COMPRESSOR:

MODEL # _____

SERIAL # _____

MOTOR # _____

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? _____

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 THE TERMINALS TIGHT? _____

B. Preliminary Equipment Check (cont)

IS CORRECT VOLTAGE GOING TO TRANSFORMER 1 (POWER TRANSFORMER) ON THE CORRECT TERMINAL (TERMINAL H2 FOR 208 V, 346 V AND 575 V; TERMINAL H3 FOR 230 V, 380 V, AND 400 V; TERMINAL H4 FOR 460 V)? _____

IF UNIT IS A MEDIUM TEMPERATURE BRINE UNIT, IS TEMPERATURE CONTROLLER SET FOR BRINE AND NOT FOR WATER? IF UNIT IS NOT A BRINE UNIT, IS TEMPERATURE CONTROLLER SET FOR WATER AND NOT FOR BRINE? _____

HAVE TEMPERATURE CONTROLLER, CONTROL MODULE, BYPASS RELAY, TIME-DELAY RELAY, TERMINAL BLOCK, AND CONTROL RELAY CONNECTIONS BEEN CHECKED FOR TIGHTNESS? _____

HAVE POWER SIDE ELECTRICAL COMPONENT CONNECTIONS BEEN CHECKED FOR TIGHTNESS? _____

CHECK AIR SYSTEMS (YES or NO)

IS AIR HANDLER OPERATING? (refer to air handling equipment Installation and Start-Up Instructions) _____

IS CHILLED WATER VALVE 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? _____

RECORD CWP MOTOR AMPERAGE: Rated Amps _____ Actual Amps _____

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? _____

ENSURE CRANKCASE HEATER HAS BEEN ENERGIZED FOR A MINIMUM OF **24 HOURS** PRIOR TO START-UP. ENSURE COMPRESSOR OIL LEVEL IS CORRECT. _____

ENSURE LIQUID LINE SERVICE VALVE IS BACKSEATED. _____

ENSURE COMPRESSOR DISCHARGE SERVICE VALVE IS BACKSEATED. _____

ENSURE COMPRESSOR SUCTION SERVICE VALVE IS BACKSEATED. _____

LOOSEN COMPRESSOR SHIPPING HOLDDOWN BOLTS. _____

BE SURE TEMPERATURE CONTROLLER DEADBAND AND SAMPLE RATE SETTINGS ARE SET. _____

SET POINT SHOULD BE ADJUSTED TO THE DESIRED COOLER LEAVING WATER TEMPERATURE. (refer to installation instructions) _____

CHECK FOR POSSIBLE LEAKS CAUSED BY SHIPMENT:

LEAK CHECK **THOROUGHLY**: COMPRESSORS, THERMOSTATIC EXPANSION VALVE (TXV), FILTER DRIER, FUSIBLE PLUGS, AND COOLER CONNECTIONS WITH GE H-10-B ELECTRONIC LEAK DETECTOR. _____

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

C. Unit Start-Up (cont)

VOLTAGE IMBALANCE: AB_____ AC_____ BC_____

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

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____

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

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

ENSURE INCOMING POWER VOLTAGE TO CHILLER 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.

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 = _____

(kPa DIFFERENCE) x .335 = 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. PRESSURE DROP = _____
(Refer to product data literature.)

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

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

COOLER LOOP PROTECTION:

GAL. (L) OF BRINE ADDED (IF REQUIRED). _____

IN-LINE WATER STRAINER INSTALLED ADJACENT TO COOLER WATER INLET.

YES _____ NO _____

TO START THE CHILLER: (insert check mark as each item is completed)

PLACE ON-OFF SWITCH IN THE ON POSITION. _____

ASSUMING THERE IS A CALL FOR CHILLED WATER, THE COMPRESSOR WILL START UNLOADED AFTER 5-MINUTE DELAY (APPROXIMATELY). _____

THE LOW-PRESSURE SWITCH (ALL UNITS) AND OIL-PRESSURE SWITCH (BRINE UNITS — ACCESSORY ON STANDARD GT UNITS) ARE BYPASSED FOR 2 MINUTES. _____

IF ADDITIONAL CAPACITY IS REQUIRED AFTER THE 2-MINUTE PERIOD, COMPRESSOR WILL LOAD UP. _____

C. Unit Start-Up (cont)

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

SUCTION PRESSURE _____
SUCTION LINE TEMP. _____
SUCTION SUPERHEAT _____
DISCHARGE PRESSURE _____
DISCHARGE LINE TEMP. _____
DISCHARGE SUPERHEAT _____

CHECK AND ADJUST SUCTION SUPERHEAT (9 to 11 F/5 to 6 C). _____