superseded by -375I

30GT080-420
Flotronic™ Reciprocating Liquid Chillers
50/60 Hz

COMMERCIAL UNITARY SYSTEMS

Installation, Start-Up and Service Instructions

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 (Federal Communications Commission, U.S.A.) 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.

- 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 30GT080-420 Flotronic liquid chillers with electronic controls and units with factory-installed options (FIOPs).

Chillers are equipped with electronic expansion valves as standard. Conventional thermostatic expansion valves and liquid line solenoid valves are included as options on 30GT080-110 units. Differences in Quick Test procedures and operation sequences between the standard and optional units should be carefully noted when following these instructions.

Book 2 Tab 5c PC 903 Catalog No 563-064 Printed in U S.A Form 30GT-36SI Pg 1 1-95 Replaces: 30GT-26SI

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

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, U.S.A.) and local code requirements. Allow sufficient space for airflow, wiring, piping, and service. See Fig. 1-8. Be sure surface beneath the unit is level, and is capable of supporting the operating weight of the unit. See Fig. 9-11 and Tables 2A-3B for unit mounting and operating weights.

NOTE: To facilitate refrigerant vent piping, unit sizes 130-210, 240A, 270A, and 300-420 will have fusible plugs with ⅜-in. SAE (Society of Automotive Engineers, U.S.A.) flares if required by local codes.

Table 1 — Unit Sizes and Modular Combinations

UNIT MODEL 30GT	NOMINAL TONS	SECTION A UNIT	SECTION B UNIT
080	80	—	—
090	90	—	—
100	100	—	—
110	110	—	—
130	125	—	—
150	145	—	—
170	160	—	—
190	180	—	—
210	200	—	—
240	225	30GT130	30GT100
270	260	30GT170	30GT100
300	285	30GT130	30GT170
330	325	30GT170	30GT170
360	350	30GT190	30GT190/ 30GT170*
390	380	30GT210	30GT190
420	400	30GT210	30GT210

*60 Hz units/50 Hz units.

INSTALLATION

Step 1 — Rig and Place the Unit — These units are designed for overhead rigging and *it is important that this method be used.* Holes are provided in frame base channels, marked for rigging (see rigging label on unit). It is recommended that field-supplied 2-in. pipes be passed through these holes, extending beyond frame enough to attach cables or chains on both sides for 080-110, 240B, and 270B units. All other units come with 6 lifting lugs. Use spreader bars to keep cables or chains clear of unit sides. As further protection for the coil faces, plywood sheets may be placed against sides of unit, behind cables or chains. Run cables or chains to a central suspension point so that angle from horizontal is not less than 45 degrees. Raise and set unit down carefully. See Fig. 9-11 for centers of gravity.

⚠ CAUTION

1. Do not use forklift on these units.
2. Modular (240-420) units MUST be rigged and placed as separate sections.

For shipping, some domestic units and all export units are mounted on a wooden skid under entire base of unit. Skid can be removed before unit is moved to installation site. *Lift the unit from above to remove skid.* See Fig. 9-11 for centers of gravity. On export units, the top skid can be used as the spreader bars. If the unit is shipped with coil protection, it must be removed before start-up. The shipping bag for export units must be removed before start-up. On export units with a full crate, the crate sides must be removed to aid in rigging.

If overhead rigging is not available, the unit can be moved on rollers or dragged. When unit is moved on rollers, the unit skid, if equipped, must be removed. To lift the unit, use jacks at the rigging points. Use a minimum of 3 rollers to distribute the load. If the unit is to be dragged, lift the unit as described above, and place unit on a pad. *Apply moving force to the pad, and not the unit.* When in its final location, raise the unit and remove the pad.

Locate the unit so that the condenser airflow is unrestricted both above and on the sides of the unit. See Fig. 1-8 for required clearances. The unit may be mounted on a level pad directly on the base rails or on a raised perimeter rail around the unit. If unit is mounted on a raised perimeter rail, fasten the unit to the rail using the mounting holes provided.

NOTE: Once the unit is in place, check to be sure unit is level so that oil will equalize properly.

IMPORTANT: When placing unit modules for unit sizes 300-420, either end of module A can be placed next to either end of module B. When placing unit modules for unit sizes 240 and 270, make sure modules are placed to permit access to the control box located in module B.

Step 2 — Join Modules A and B (240-420 Units Only) — Trim pieces are shipped with each module, and are attached to the cross rails near the compressors. Each module comes with 1 side panel and half of a top panel. See Fig. 12.

After the modules have been set and leveled end-to-end:

1. Locate the bag of screws (thread-cutting ¼-20 x ⅝ in.) attached to one of the trim panels in each module.
2. Fasten 1 side panel (panels with flanges) on each side of the combined unit so that each side panel bridges both modules using screws provided. (See Fig. 12.)
3. Fasten the 2 halves of the top trim panel end-to-end on top of the modules so that they bridge both modules using screws provided. (See Fig. 12.)

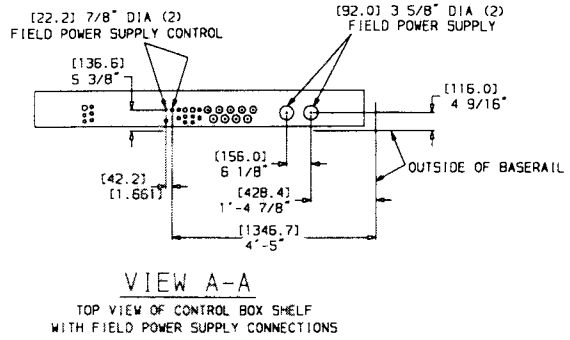
Step 3 — Check Compressor Mounting — Compressors are mounted on rails. Each rail is mounted on springs (one at each end, and one between each compressor) when applicable. For shipping, the rails are secured to the frame base at each support. Before start-up, loosen the holddown bolts so that the compressor rails float freely. See Fig. 13 and 14 for views of compressor mounting.

Instructions continued on page 22.

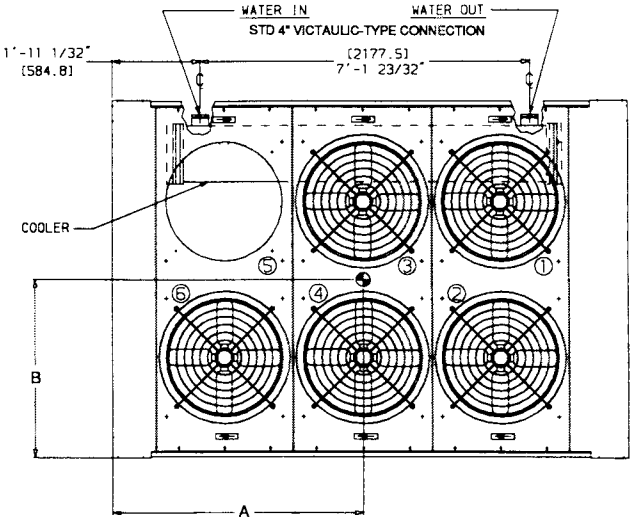
NOTES:
1. Unit must have clearances for airflow (from solid surfaces) as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
2. Mounting holes may be used to mount unit to concrete pad. They are not recommended for spring isolator location.
3. If spring isolators are used, a perimeter support channel between the unit and the isolators is recommended.
4. Dimensions in [ ] are in millimeters.

CENTER OF GRAVITY
(ft-in.)

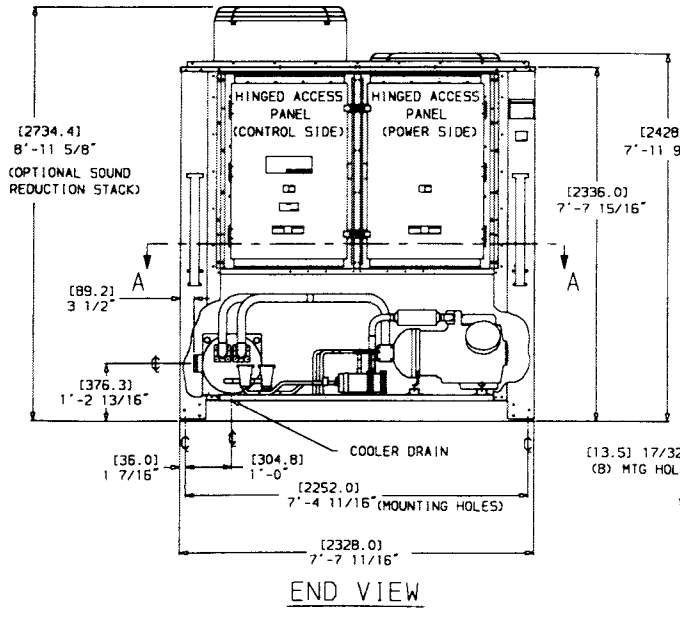
SIZE	080	090
A	5-9⅝ [1769]	5-7⁵⁄₁₆ [1710]
B	3-6 [1067]	3-2¾ [984]



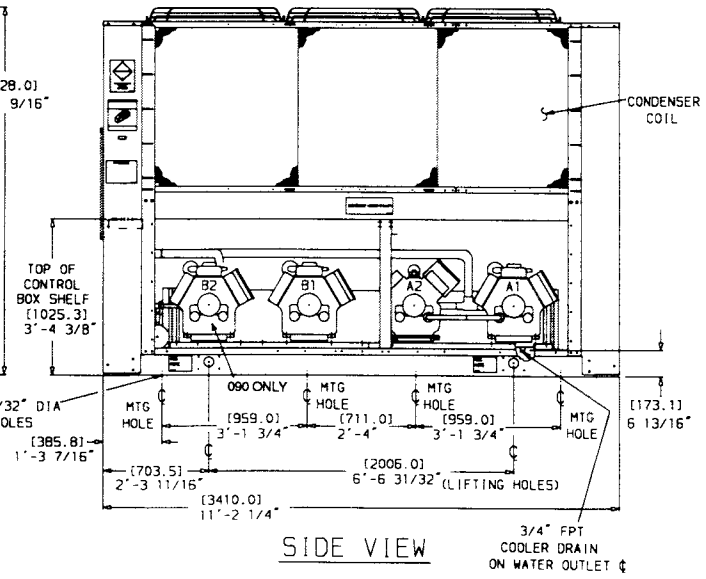
VIEW A-A
TOP VIEW OF CONTROL BOX SHELF WITH FIELD POWER SUPPLY CONNECTIONS



TOP VIEW



END VIEW



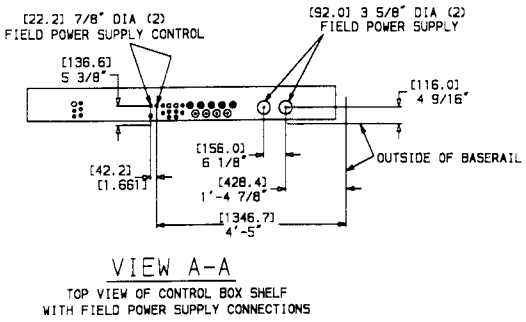
SIDE VIEW

Fig. 1 — Dimensions; 30GT080,090

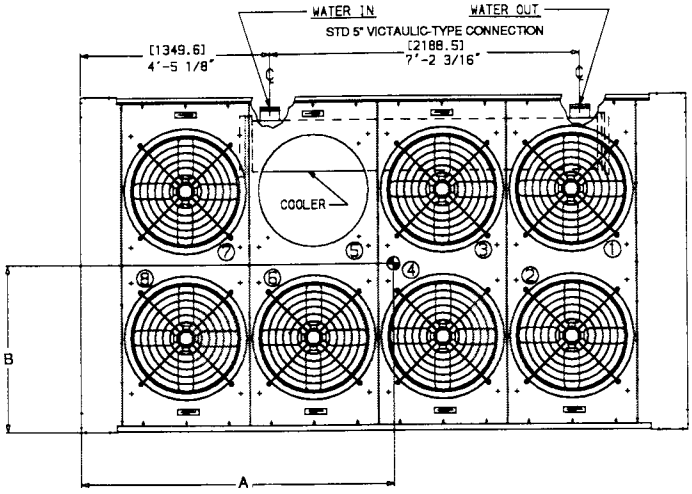
NOTES:
1. Unit must have clearances for airflow (from solid surfaces) as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
2. Mounting holes may be used to mount unit to concrete pad. They are not recommended for spring isolator location.
3. If spring isolators are used, a perimeter support channel between the unit and the isolators is recommended.
4. 30GT100 also Module B for 30GT240,270.
5. Dimensions in [ ] are in millimeters.

CENTER OF GRAVITY
(ft-in.)

SIZE	A	B
100,110	7-3¾ [2229]	3-4 [1016]
240B	9-⅜ [239]	1-4⅝ [423]
270B	8-½ [216]	1-⅝ [448]



VIEW A-A
TOP VIEW OF CONTROL BOX SHELF WITH FIELD POWER SUPPLY CONNECTIONS



TOP VIEW

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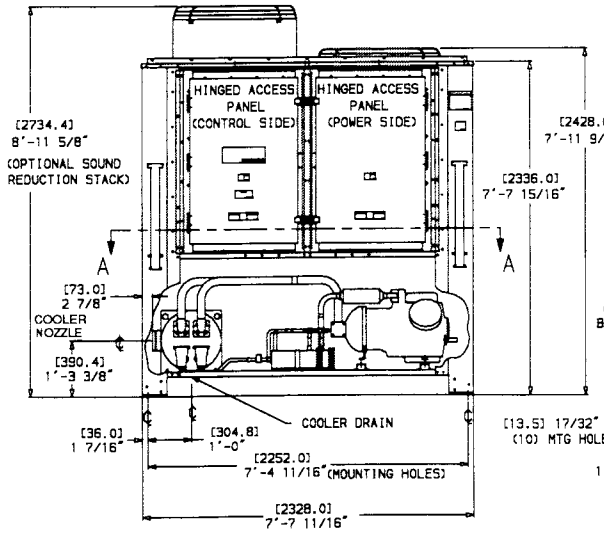

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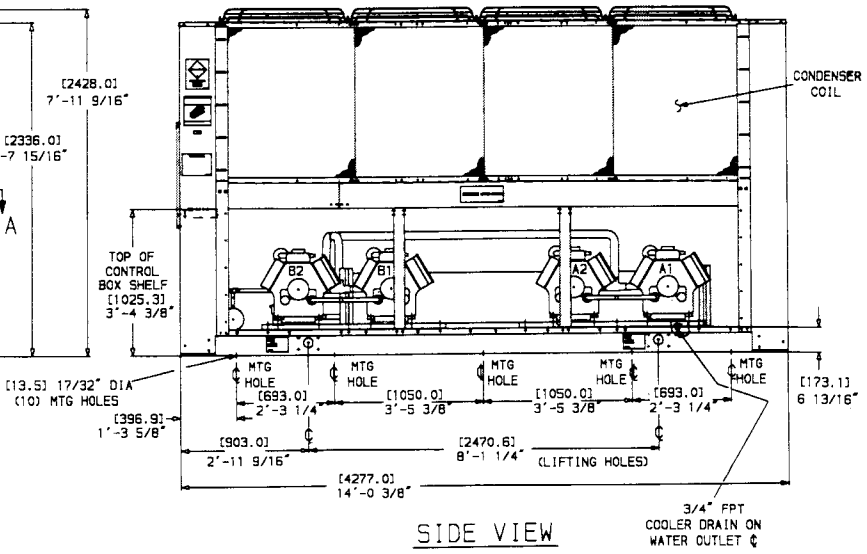


SIDE VIEW

Fig. 2 — Dimensions; 30GT100,110; 30GT240B,270B Modules

NOTES:
1. Unit must have clearances for airflow (from solid surfaces) as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
2. Mounting holes may be used to mount unit to concrete pad. They are not recommended for spring isolator location.
3. If spring isolators are used, a perimeter support channel between the unit and the isolators is recommended.
4. 30GT130 also Module A for 30GT240,300.
   30GT170 also Module A for 30GT270,330.
   30GT170 also Module B for 30GT300,330, 360-50 Hz.
5. Dimensions in [ ] are in millimeters.

CENTER OF GRAVITY (ft-in.)

SIZE	A	B	C	D
130	9-4½ [2858]	4-1⅛ [1267]	1-4¾ [425]	0-9½ [242]
130 [50 Hz]	9-4½ [2858]	4-1⅛ [1267]	1-4¾ [425]	0-9½ [242]
150	9-4 [2849]	4-2½ [1283]	1-4¾ [425]	0-9½ [242]
170	9-4⅛ [2865]	4-2½ [1283]	1-5⅝ [448]	0-8⅝ [219]
240	*	*	1-4⅝ [423]	0-9⅜ [239]
270,300,330 360 [50 Hz]	*	*	1-5⅝ [448]	0-8½ [216]

*See individual modular sections.

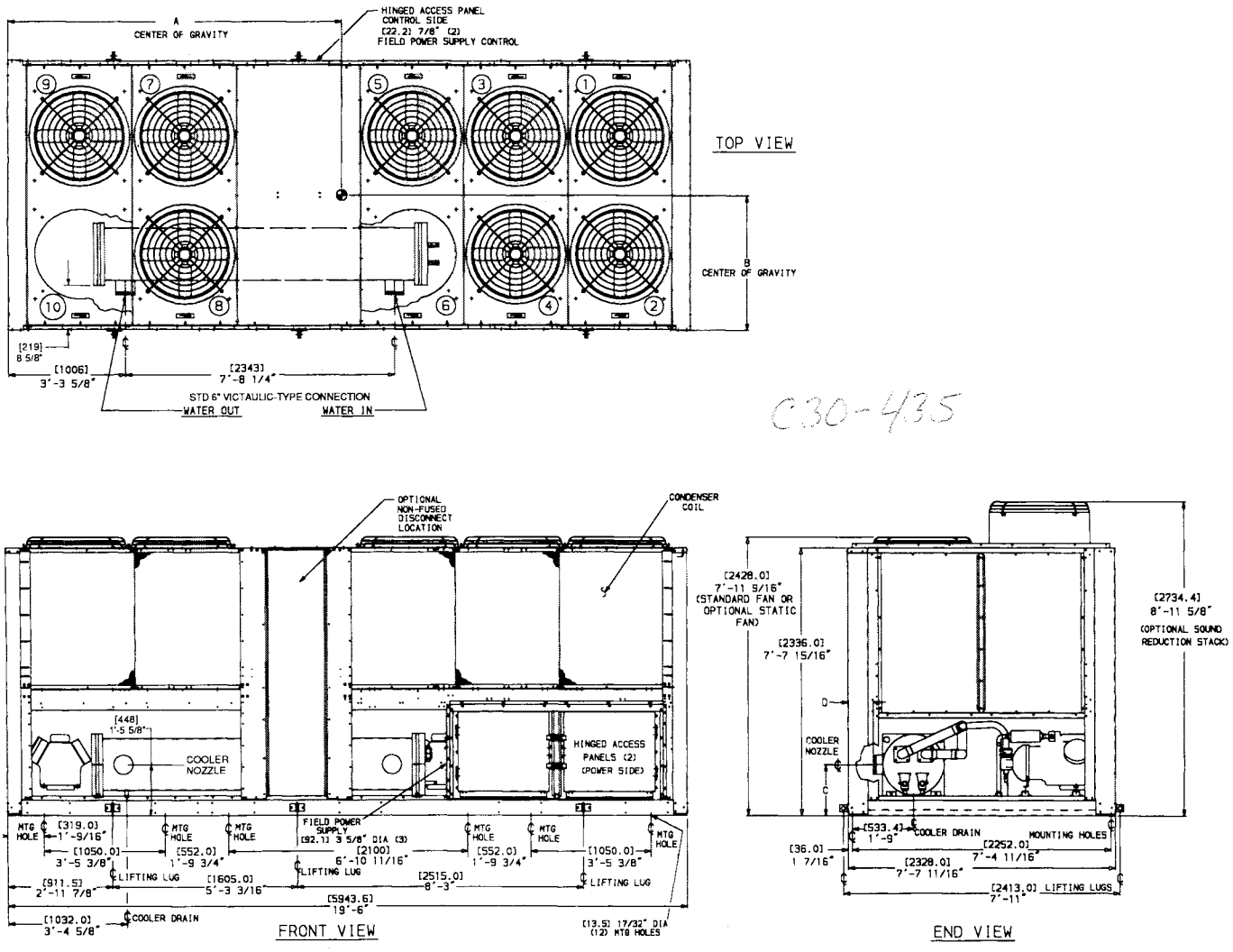
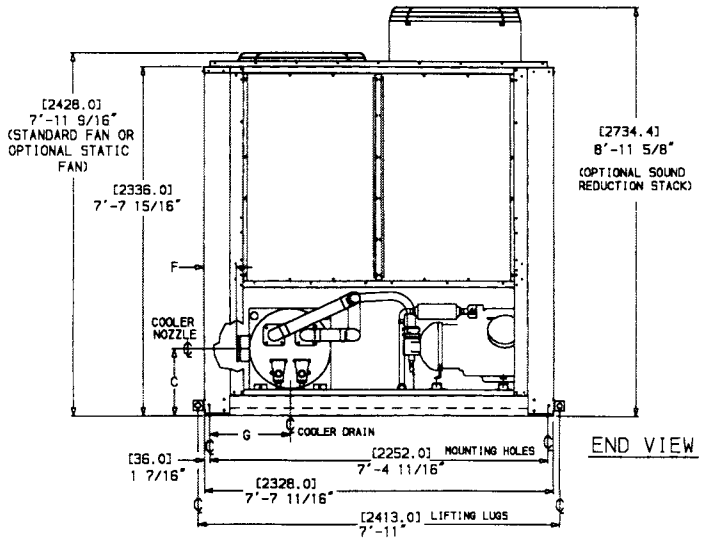


Fig. 3 — Dimensions; 30GT130-170; 30GT240, 270 A Modules; 30GT300 A and B Modules; 30GT330 A and B Modules; 30GT360 50 Hz B Module

DIMENSIONS (ft-in.)

SIZE	A	B	C	D	E	F	G	H
190,360A,B,390B	11-4 [3454]	4-2½ [1283]	1-5⅝ [448]	6- 3⁷⁄₁₆ [1916]	7-8¼ [2343]	8⅝ [219]	1- 9 [533.4]	6- 4⁷⁄₁₆ [1941.3]
210,390A,420A,B	11-3 [3444]	4-2 [1285]	1-6⁷⁄₁₆ [468]	5-11½ [1816]	8-2⁹⁄₁₆ [2504]	9½ [242]	1-11 [584]	5-11½ [1816.2]



NOTES:
1. Unit must have clearances for airflow (from solid surfaces) as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
2. Mounting holes may be used to mount unit to concrete pad. They are not recommended for spring isolator location.
3. If spring isolators are used, a perimeter support channel between the unit and the isolators is recommended.
4. 30GT190 also Module A for 30GT360.
   30GT190 also Module B for 30GT360,390.
   30GT210 also Module A for 30GT390,420.
   30GT210 also Module B for 30GT420.
5. Dimensions in [ ] are in millmeters.

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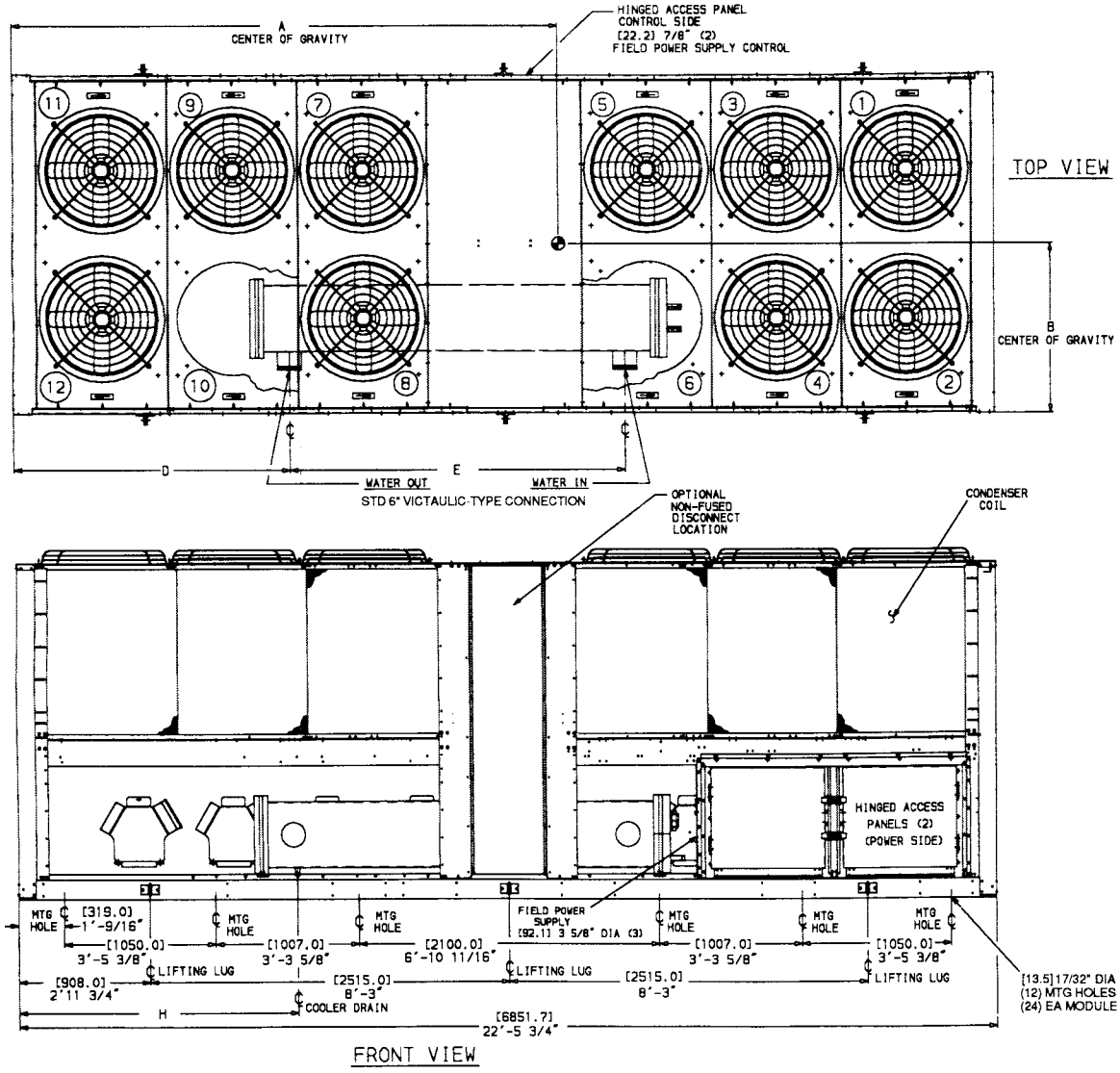
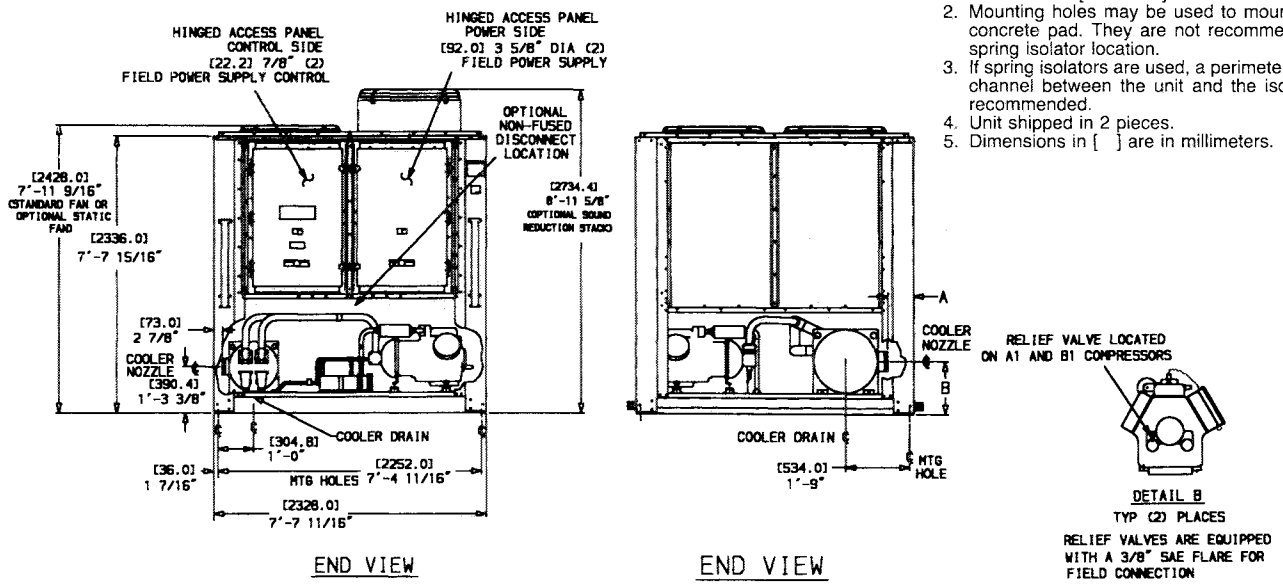


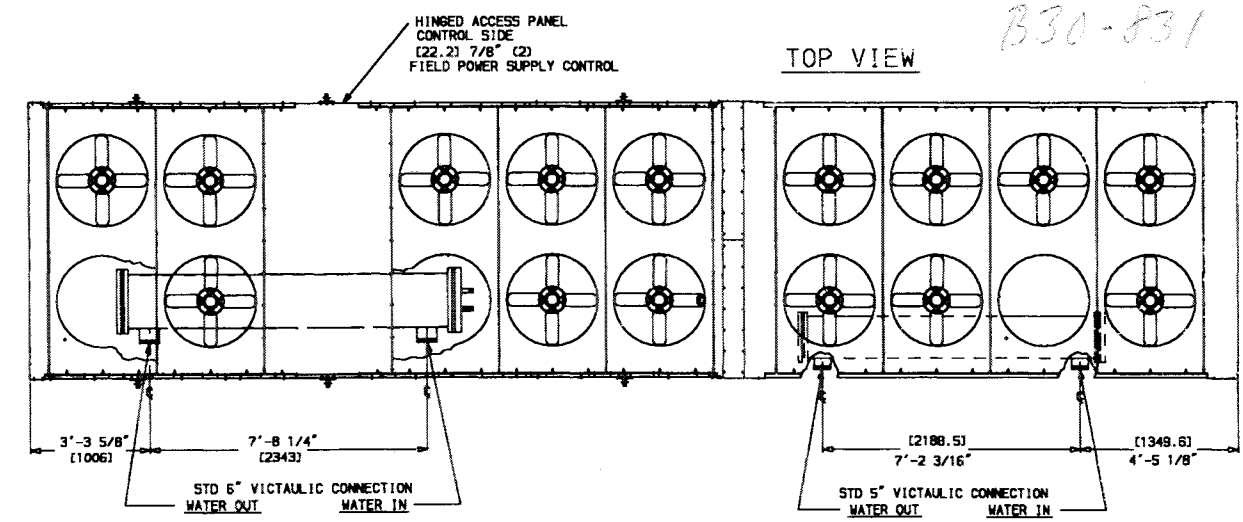
Fig. 4 — Dimensions; 30GT190,210; 30GT360-420 A and B Modules (Except 30GT360B, 50 Hz)

DIMENSIONS

UNIT 30GT	A	B
240	9⅜" [239]	1'-4⅝" [423]
270	8½" [216]	1'-5⅝" [448]

NOTES:
1. Unit must have clearances for airflow (from solid surfaces) as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
2. Mounting holes may be used to mount unit to concrete pad. They are not recommended for spring isolator location.
3. If spring isolators are used, a perimeter support channel between the unit and the isolators is recommended.
4. Unit shipped in 2 pieces.
5. Dimensions in [ ] are in millimeters.





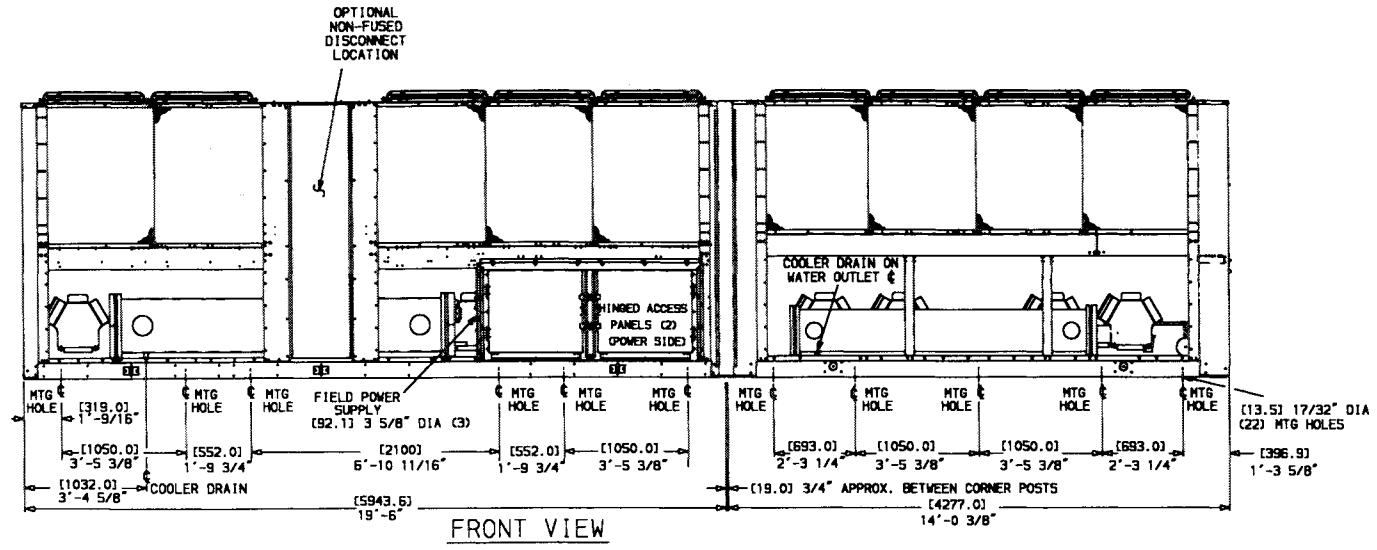
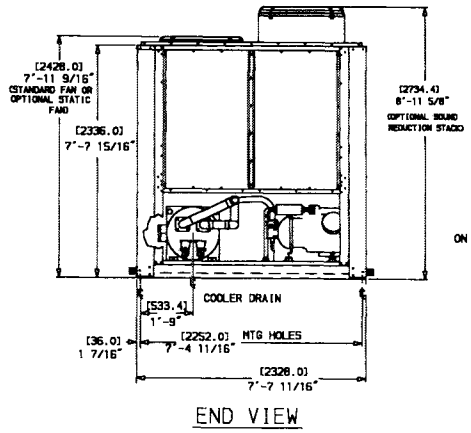
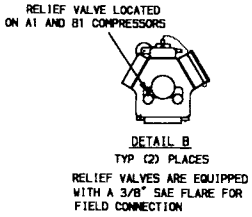


Fig. 5 — Dimensions; 30GT240,270 Complete Unit (Modules A and B Connected)





DIMENSIONS

UNIT 30GT	A	B
300	8⅝" [219]	1'-4¾" [425]
330	9½" [242]	1'-5⅝" [448]

NOTES:
1. Unit must have clearances for airflow (from solid surfaces) as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
2. Mounting holes may be used to mount unit to concrete pad. They are not recommended for spring isolator location.
3. If spring isolators are used, a perimeter support channel between the unit and the isolators is recommended.
4. Unit shipped in 2 pieces.
5. Dimensions in [ ] are in millimeters.

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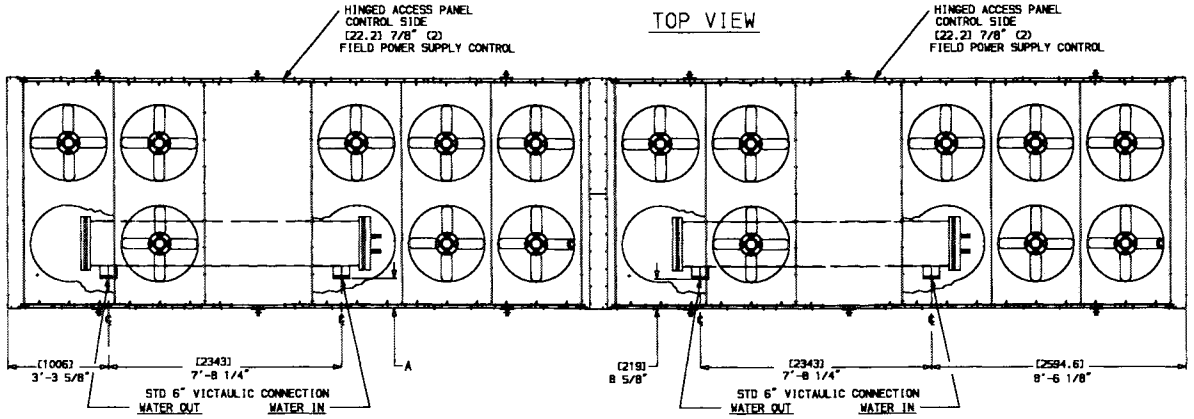


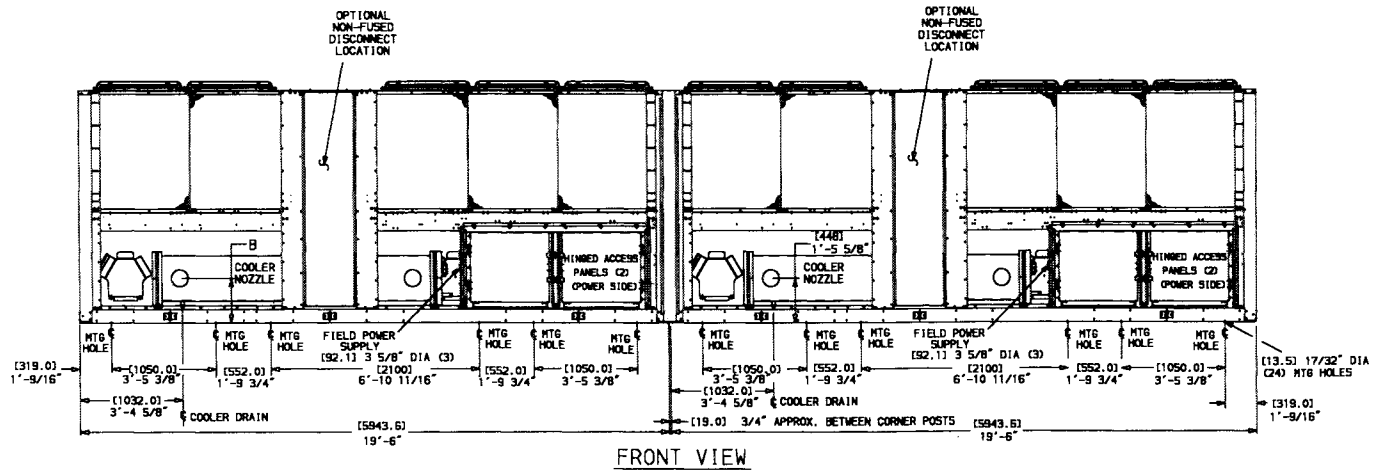
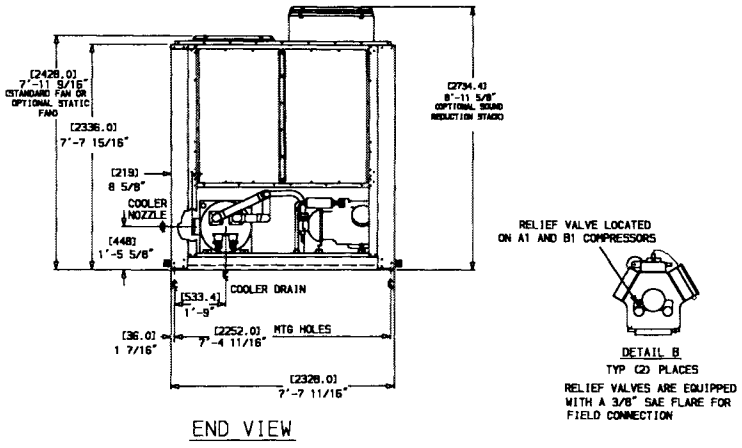


Fig. 6 — Dimensions; 30GT300,330 Complete Unit (Modules A and B Connected)



NOTES:
1. Unit must have clearances for airflow (from solid surfaces) as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
2. Mounting holes may be used to mount unit to concrete pad. They are not recommended for spring isolator location.
3. If spring isolators are used, a perimeter support channel between the unit and the isolators is recommended.
4. Unit shipped in 2 pieces.
5. Dimensions in [ ] are in millimeters.

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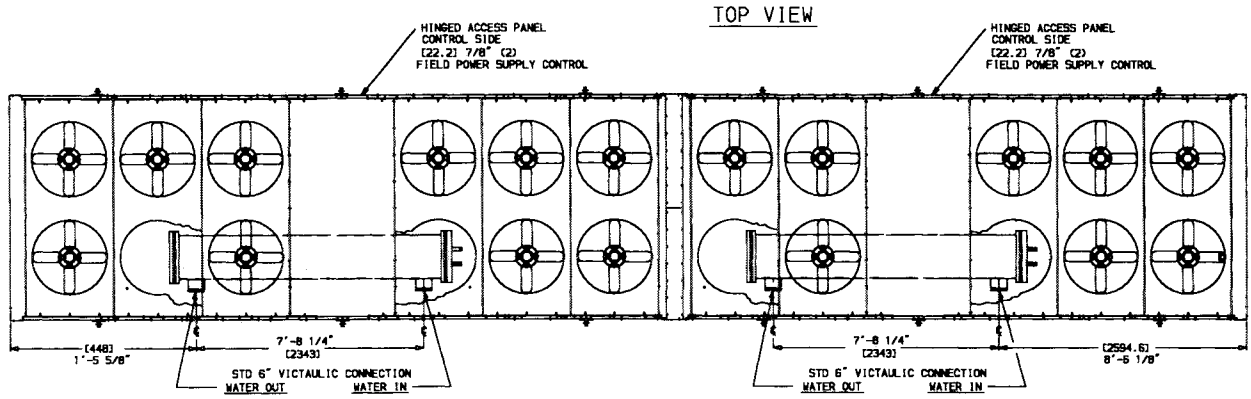


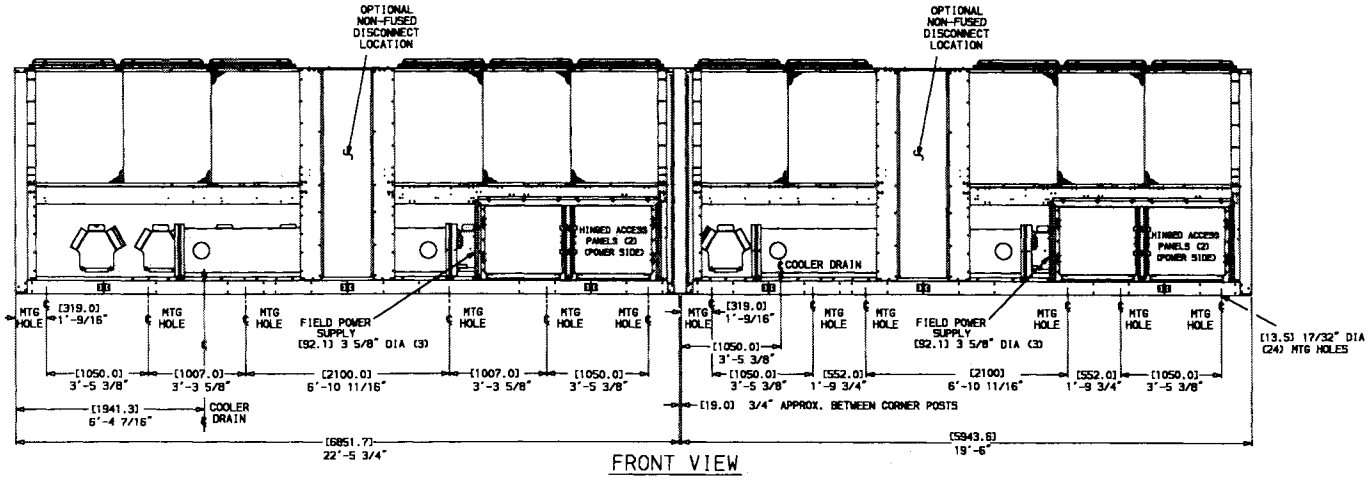
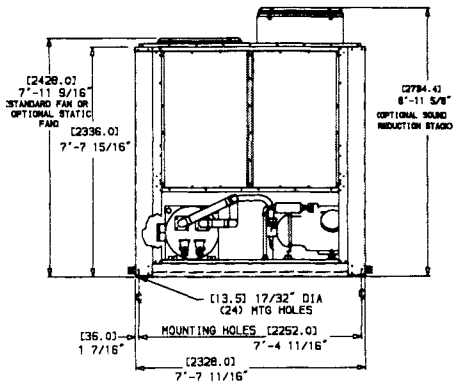


Fig. 7 — Dimensions; 30GT360 (50 Hz) Complete Unit (Modules A and B Connected)

DIMENSIONS (ft-in.)

UNIT 30GT	A	B	C	D	E	F	G	H	J	K	L	M
360 [60 Hz]	0-8⅝ [219]	0-8⅝ [219]	7-8¼ [2343]	7-8¼ [2343]	1-10⁷⁄₁₆ [570]	1-10⁷⁄₁₆ [570]	6- 3⁷⁄₁₆ [1916]	8-6¹⁄₁₆ [2593]	1-5⅝ [448]	1-5⅝ [448]	6- 4½ [1942]	5-11½ [1816]
390	0-9½ [242]	0-8⅝ [219]	8-2⁹⁄₁₆ [2504]	7-8¼ [2343]	2- 2⅜ [620]	1-10⁷⁄₁₆ [570]	5-11½ [1816]	8-6¹⁄₁₆ [2593]	1-6⁷⁄₁₆ [468]	1-5⅝ [448]	5-11½ [1816]	6- 4½ [1942]
420	0-9½ [242]	0-9½ [242]	8-2⁹⁄₁₆ [2504]	8-2⁹⁄₁₆ [2504]	2- 2⅜ [620]	2- 2⅜ [620]	5-11½ [1816]	8-3¹¹⁄₁₆ [2532]	1-6⁷⁄₁₆ [468]	1-6⁷⁄₁₆ [468]	5-11½ [1816]	6- 4½ [1942]



END VIEW

NOTES:
1. Unit must have clearances for airflow (from solid surfaces) as follows:
   Top — Do not restrict in any way
   Ends — 5 ft [1524 mm]
   Sides — 6 ft [1829 mm]
2. Mounting holes may be used to mount unit to concrete pad. They are not recommended for spring isolator location.
3. If spring isolators are used, a perimeter support channel between the unit and the isolators is recommended.
4. Unit is shipped in 2 modules.
5. Dimensions in [ ] are in millimeters.

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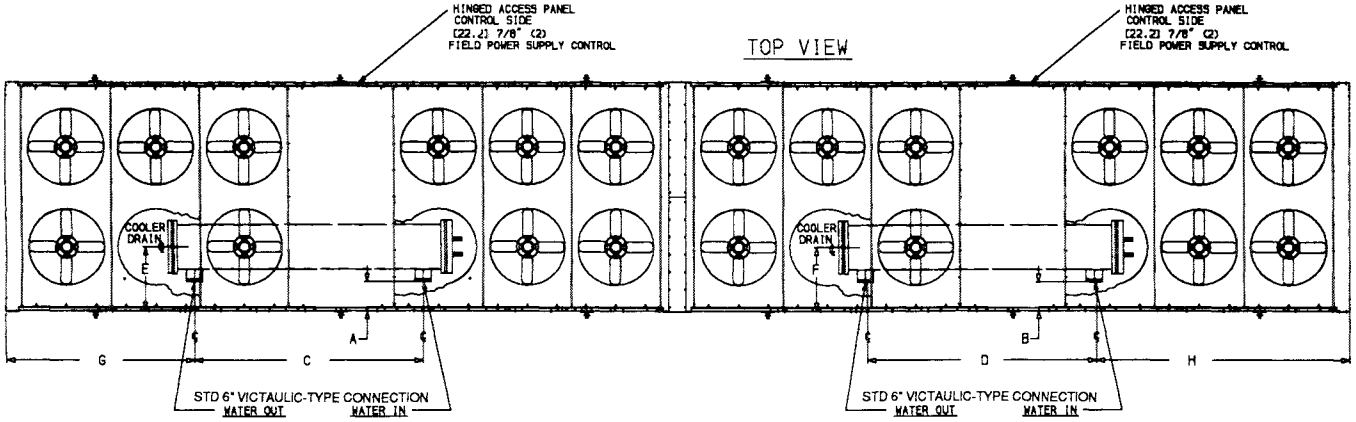
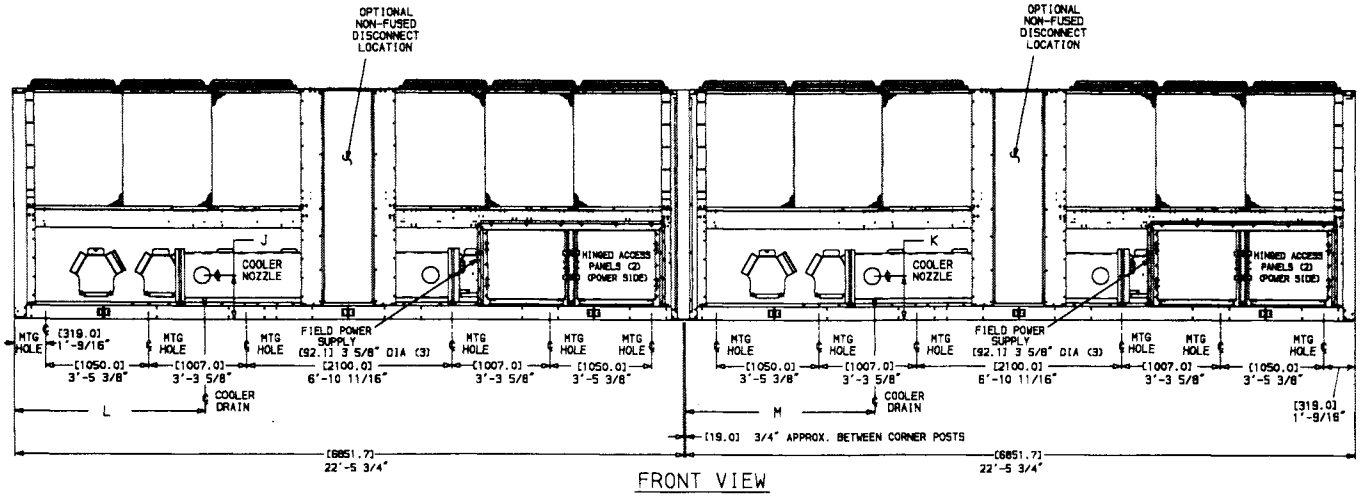
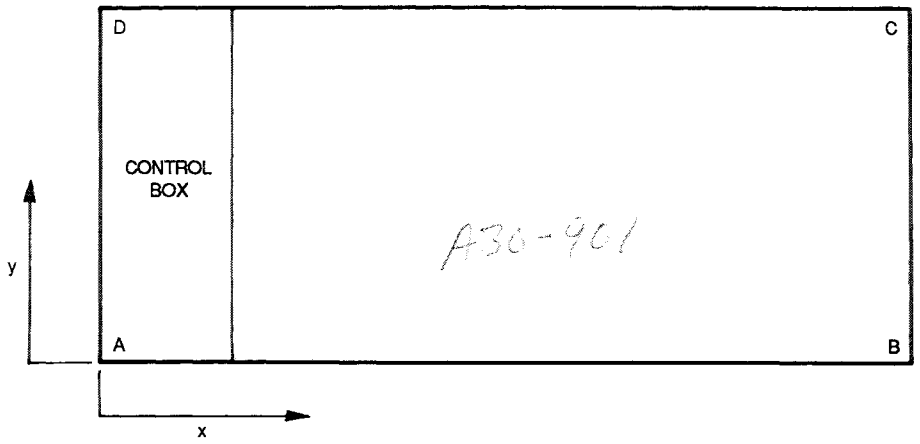




FRONT VIEW

Fig. 8 — Dimensions; 30GT360 (60 Hz), 390,420 Complete Unit (Modules A and B Connected)



60 HZ

UNIT SIZE	CONDENSER COIL	lb				kg			
		A	B	C	D	A	B	C	D
080	C-AL	1624	1690	1666	1650	738	768	757	750
	C-C	1797	1880	1847	1831	817	854	840	832
090	C-AL	1817	1793	1720	1685	826	815	782	766
	C-C	1997	1970	1893	1880	908	895	860	855
100,240B,270B	C-AL	2185	2185	2120	2120	993	993	964	964
	C-C	2420	2420	2360	2360	1100	1100	1073	1073
110	C-AL	2191	2217	2136	2116	996	1007	970	962
	C-C	2428	2454	2374	2354	1104	1115	1079	1070

50 HZ

UNIT SIZE	CONDENSER COIL	lb				kg			
		A	B	C	D	A	B	C	D
080	C-AL	1650	1730	1680	1660	750	786	764	755
	C-C	1830	1910	1863	1842	832	868	847	837
090	C-AL	1833	1864	1724	1714	833	847	784	779
	C-C	2014	2040	1907	1899	915	927	867	863
100,240B,270B	C-AL	2222	2222	2133	2133	1010	1010	970	970
	C-C	2460	2460	2370	2370	1118	1118	1077	1077
110	C-AL	2271	2271	2149	2149	1032	1032	976	976
	C-C	2508	2508	2387	2387	1140	1140	1085	1085

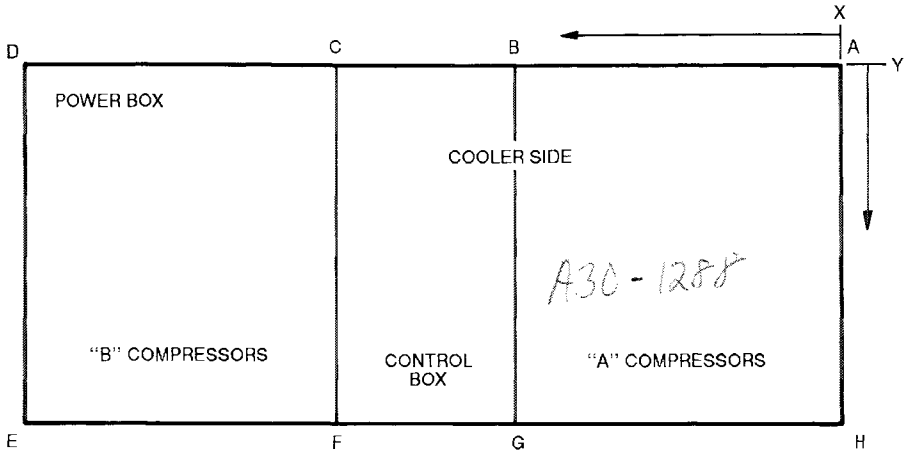
LEGEND

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

RIGGING CENTER OF GRAVITY

UNIT SIZE	080		090		100,240B,270B		110	
	in.	mm	in.	mm	in.	mm	in.	mm
X Dimension	69⅝	1768	67 5/16	1710	87 5/16	2218	87¾	2229
Y Dimension	42	1067	38¾	984	40	1016	39½	1002

Fig. 9 — Unit Mounting Weights (Approximate); 30GT080-110, 240B, 270B



60 HZ

UNIT SIZE	CONDENSER COIL	lb							
		A	B	C	D	E	F	G	H
130,240A,300A	C-AL	923	1466	1156	825	1411	1365	1469	1439
	C-C	1051	1593	1283	952	1601	1556	1659	1622
150	C-AL	926	1563	1160	834	1438	1375	1747	1438
	C-C	1053	1690	1287	961	1628	1566	1938	1629
170,270A,300B,330A,B	C-AL	962	1732	1333	862	1497	1629	1816	1462
	C-C	1089	1860	1460	990	1688	1819	2007	1653
190,360A,B,390B	C-AL	1346	1942	1793	1111	1385	1799	1733	1567
	C-C	1536	2132	1983	1301	1575	1989	1923	1757
210,390A,420A,B	C-AL	1376	2128	1871	1120	1407	1846	2037	1595
	C-C	1566	2318	2061	1310	1597	2036	2227	1784

60 HZ

UNIT SIZE	CONDENSER COIL	kg							
		A	B	C	D	E	F	G	H
130,240A,300A	C-AL	419	666	525	375	641	620	668	650
	C-C	478	723	583	433	728	707	754	737
150	C-AL	420	710	527	379	653	625	794	653
	C-C	478	768	585	436	285	711	880	740
170,270A,300B,330A,B	C-AL	437	787	605	392	680	740	825	664
	C-C	495	845	663	450	767	826	912	751
190,360A,B,390B	C-AL	611	882	815	505	629	817	787	712
	C-C	698	969	901	591	715	904	874	798
210,390A,420A,B	C-AL	625	967	850	509	639	384	925	725
	C-C	711	1053	937	595	725	925	1012	810

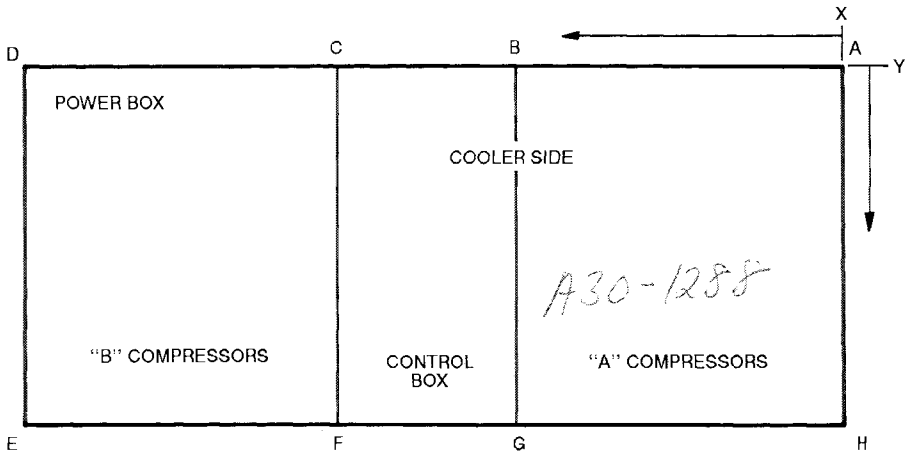
LEGEND

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

RIGGING CENTER OF GRAVITY

UNIT SIZE	130,240A,300A		150		170,270A,300B, 330A,B		190,360A,B, 390B		210,390A, 420A,B	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
X Dimension	112.5	2858	112.1	2849	112.8	2865	136.0	3454	135.6	3444
Y Dimension	49.9	1267	50.5	1283	50.5	1283	50.5	1283	50.6	1285

Fig. 10 — Unit Mounting Weights (Approximate); 30GT130-210, 240A-420A, 300B-420B (60 Hz)



50 HZ

UNIT SIZE	CONDENSER COIL	lb							
		A	B	C	D	E	F	G	H
130,240A,300A	C-AL	928	1569	1160	834	1438	1375	1764	1444
	C-C	1056	1696	1287	961	1628	1566	1954	1635
150	C-AL	948	1591	1160	834	1438	1375	1829	1502
	C-C	1075	1719	1287	961	1628	1566	2020	1692
170,270A,300B,330A,B 360A	C-AL	963	1744	1348	873	1527	1673	1849	1466
	C-C	1090	1871	1475	1000	1718	1864	2040	1657
190,360B,390B	C-AL	1365	1953	1807	1127	1430	1839	1765	1621
	C-C	1555	2143	1997	1316	1620	2029	1955	1811
210,390A,420A,B	C-AL	1383	2151	1876	1128	1430	1860	2102	1615
	C-C	1573	2341	2066	1318	1620	2050	2292	1805

50 HZ

UNIT SIZE	CONDENSER COIL	kg							
		A	B	C	D	E	F	G	H
130,240A,300A	C-AL	422	714	527	379	654	625	802	656
	C-C	480	770	585	436	740	711	888	743
150	C-AL	430	723	527	379	653	625	831	682
	C-C	486	781	585	437	740	711	918	769
170,270A,300B,330A,B 360A	C-AL	437	792	612	397	694	760	840	666
	C-C	495	850	670	454	780	847	927	753
190,360B,390B	C-AL	620	887	821	512	650	835	802	736
	C-C	707	974	907	598	736	922	977	823
210,390A,420A,B	C-AL	628	977	852	512	650	845	955	734
	C-C	715	1064	940	599	736	931	1042	820

LEGEND

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

RIGGING CENTER OF GRAVITY

UNIT SIZE	130,240A,300A		150		170,270A,300B, 330A,B,360A		190,360B, 390B		210,390A, 420A,B	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
X Dimension	112.5	2858	112.1	2849	112.8	2865	136.0	3454	135.6	3444
Y Dimension	49.9	1267	50.5	1283	50.5	1283	50.5	1283	50.6	1285

Fig. 11 — Unit Mounting Weights (Approximate); 30GT130-210, 240A-420A, 300B-420B (50 Hz)

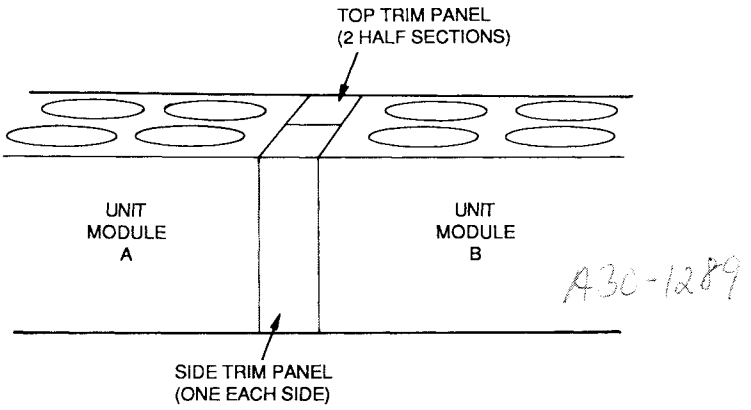


Fig. 12 – Positioning Trim Panels to Join Module A to Module B

Table 2A – Physical Data – 60 Hz, English

UNIT SIZE		080	090	100,240B,270B	110
APPROX OPERATING WEIGHT – lb	C-AL*	6630	7015	8610	8660
	C-C†	7355	7740	9560	9610
REFRIGERANT CHARGE – lb					
R-22	Ckt A	78/15	78/15	98/20	98/20
	Ckt B	78/15	78/15	105/20	105/20
COMPRESSORS, Type...rpm		Reciprocating, Semi-Hermetic...1750			
06E**	(Qty) Ckt A	(1) 275, (1) 250	(1) 265, (1) 250	(1) 265, (1) 275	(1) 265, (1) 299
	(Qty) Ckt B	(1) 299	(2) 265	(1) 265, (1) 275	(1) 265, (1) 275
Oil Charge – Compressor/pt		250/17.0, 265/19.0, 275/19.0, 299/19.0			
Capacity Control Steps		6	8	8	8
% Cap.	Ckt A	56	47	50	54
	Ckt B	44	53	50	46
Minimum Step Capacity (%)		22	18	15	14
CONDENSER FANS – Type		Propeller, Direct Drive			
Standard/Low Noise					
Fan Speed – rpm		1140	1140	1140	1140
No. Blades...Diameter – in.		4...30	4...30	4...30	4...30
No. Fans...Total kW		6...9.4	6...9.4	8...12.7	8...12.7
Total Airflow – cfm		57,000	57,000	76,000	76,000
High Static					
Fan Speed – Rpm		1750	1750	1750	1750
No. Blades...Diameter – in.		12...30	12...30	12...30	12...30
No. Fans...Total kW		6...22.2	6...22.2	8...29.6	8...29.6
Total Airflow...cfm††		60,000	60,000	80,000	80,000
CONDENSER COILS – Type		Vertical and Horizontal, Plate Fin, Enhanced Tubing			
Tubes (Copper), OD – in.		0.375	0.375	0.375	0.375
Fins/in.		17	17	17	17
No. Rows – Ckt A or B		3	3	3	3
Face Area sq ft – Ckt A and B Total		128.3	128.3	168	168
Max Working Pressure Refrigerant – psig		450			
COOLER – No. ...Type		1...10HB090	1...10HB090	1...10HB110	1...10HB110
No. Refrigerant Circuits		2	2	2	2
Net Water Volume – Gal. (includes nozzles)		24.5	24.5	30.3	30.3
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		4	4	5	5
Drain		¾ NPT			

LEGEND

OD – Outside Diameter

*C-AL – Copper Tubing – Aluminum Fins Condenser Coil.
†C-C – Copper Tubing – Copper Fins Condenser Coil.
**06E250 compressors have 4 cylinders; all others have 6.
††Based on rated external static pressure (ESP) of 0.4 in. wg or 1.0 in. wg as appropriate.

NOTE: When facing the compressors, Circuit A is on the right and Circuit B is on the left.

Table 2A — Physical Data — 60 Hz, English (cont)

UNIT SIZE		130,240A,300A	150	170,270A,300B, 330A,B	190,360A, 360B,390B	210,390A, 420A,B
APPROX OPERATING WEIGHT — lb	C-AL*	10,046	10,481	11,293	12,676	13,380
	C-C†	11,318	11,753	12,565	14,195	14,899
REFRIGERANT CHARGE — lb						
R-22 Ckt A	Total/Over Clear Glass	133/28	143/35	153/45	178/30	190/40
R-22 Ckt B	Total/Over Clear Glass	137/28	144/35	162/45	173/30	185/40
COMPRESSORS, Type...rpm		Reciprocating, Semi-Hermetic...1750				
06E** (Qty) Ckt A		(1) 275, (1) 299	(3) 265	(3) 275	(1) 265, (1) 275, (1) 299	(3) 265, (1) 275
06E** (Qty) Ckt B		(1) 275, (1) 299	(2) 299	(3) 275	(1) 265, (1) 275, (1) 299	(1) 275, (2) 299
Oil Charge — Compressor/pt		265/19.0, 275/19.0, 299/19.0				
Capacity Control Steps						
% Cap. Ckt A		50	50	50	50	50
% Cap. Ckt B		50	50	50	50	50
Minimum Step Capacity (%)		14	11	11	14	12
CONDENSER FANS — Type		Propeller				
Standard/Low Noise						
Fan Speed — rpm		1140	1140	1140	1140	1740
No. Blades...Diameter — in.		4...30	4...30	4...30	4...30	4...30
No. Fans...Total kW		10...15.9	10...15.9	10...15.9	12...19.1	12...19.1
Total Airflow — cfm		100,000	100,000	100,000	120,000	120,000
High Static						
Fan Speed — rpm		1740	1740	1740	1740	1740
No. Blades...Diameter — in.		12...30	12...30	12...30	12...30	12...30
No. Fans...Total kW		10...37	10...37	10...37	12...44.4	12...44.4
Total Airflow — cfm††		100,000	100,000	100,000	120,000	120,000
CONDENSER COILS — Type		Vertical and Horizontal, Plate Fin, Enhanced Tubing				
Tubes (Copper), OD — in.		.375	.375	.375	.375	.375
Fins/in. Standard/Heresite		17/15	17/15	17/15	17/15	17
No. Rows — Ckt A or B		3	3	3	3	3
Face Area sq ft — Ckt A and B Total		225.1	225.1	225.1	268.9	268.9
Max Working Pressure Refrigerant — psig		450	450	450	450	450
COOLER — No. ...Type		1...10HB160	1...10HB160	1...10HB200	1...10HB200	1...10HB210
No. Refrigerant Circuits		2	2	2	2	2
Net Water Volume — Gal. (includes nozzles)		52.0	52.0	61.0	61.0	70.4
Max Working Pressure Refrigerant Side/Water Side — psig		278/300	278/300	278/300	278/300	278/300
WATER CONNECTIONS — in.		Victaulic Type				
Inlet and Outlet		6				
Drain		¾ NPT				

LEGEND

OD — Outside Diameter

*C-AL — Copper Tubing — Aluminum Fins Condenser Coil.
†C-C — Copper Tubing — Copper Fins Condenser Coil.
**All compressors have 6 cylinders.
††Based on rated external static pressure (ESP) of 0.4 in. wg or 1.0 in. wg as appropriate.

NOTE: When facing the compressors, Circuit A is on the right and Circuit B is on the left.

Table 2B — Physical Data — 60 Hz, SI

UNIT SIZE			080	090	100,240B,270B	110
APPROX OPERATING WEIGHT — kg		C-AL*	3013	3189	3914	3935
		C-C†	3343	3518	4346	4368
REFRIGERANT CHARGE — kg						
R-22	Ckt A	Total/Over Clear Glass	35.4/6.8	35.4/6.8	44.5/9.1	44.5/9.1
	Ckt B		35.4/6.8	35.4/6.8	47.7/9.1	47.7/9.1
COMPRESSORS, Type...r/s			Reciprocating, Semi-Hermetic...29.2			
06E**	(Qty) Ckt A		(1) 275, (1) 250	(1) 265, (1) 250	(1) 265, (1) 275	(1) 265, (1) 299
	(Qty) Ckt B		(1) 299	(2) 265	(1) 265, (1) 275	(1) 265, (1) 275
Oil Charge — Compressor/L			250/8.0, 265/9.0, 275/9.0, 299/9.0			
Capacity Control Steps			6	8	8	8
% Cap.	Ckt A		56	47	50	54
	Ckt B		44	53	50	46
Minimum Step Capacity (%)			22	18	15	14
CONDENSER FANS — Type			Propeller, Direct Drive			
Standard/Low Noise						
Fan Speed — r/s			19	19	19	19
No. Blades...Diameter — mm			4...762	4...762	4...762	4...762
No. Fans...Total kW			6...9.4	6...9.4	8...12.7	8...12.7
Total Airflow — L/s			26 898	26 898	35 864	35 864
High Static						
Fan Speed — r/s			29	29	29	29
No. Blades...Diameter — mm			12...762	12...762	12...762	12...762
No. Fans...Total kW			6...22.2	6...22.2	8...29.6	8...29.6
Total Airflow...L/s††			28 315	28 315	37 750	37 750
CONDENSER COILS — Type			Vertical and Horizontal, Plate Fin, Enhanced Tubing			
Tubes (Copper), OD — mm			9.53	9.53	9.53	9.53
Fins/m			669.3	669.3	669.3	669.3
No. Rows — Ckt A or B			3	3	3	3
Face Area m^2 — Ckt A and B Total			11.92	11.92	15.61	15.61
Max Working Pressure Refrigerant — kPa			3103			
COOLER — No. ...Type			1...10HB090	1...10HB090	1...10HB110	1...10HB110
No. Refrigerant Circuits			2	2	2	2
Net Water Volume — L (includes nozzles)			92.9	92.9	114.6	114.6
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			4	4	5	5
Drain			¾ NPT			

LEGEND

OD — Outside Diameter

*C-AL — Copper Tubing — Aluminum Fins Condenser Coil.
†C-C — Copper Tubing — Copper Fins Condenser Coil.
**06E250 compressors have 4 cylinders; all others have 6.
††Based on rated external static pressure (ESP) of 100 Pa or 250 Pa as appropriate.

NOTE: When facing the compressors, Circuit A is on the right and Circuit B is on the left.

Table 2B — Physical Data — 60 Hz, SI (cont)

UNIT SIZE		130,240A,300A	150	170,270A,300B, 330A,B	190,360A, 360B,390B	210,390A, 420A,B
APPROX OPERATING WEIGHT — kg	C-AL*	4566	4754	5133	5761	6081
	C-C†	5144	5342	5711	6452	6772
REFRIGERANT CHARGE — kg						
R-22	Ckt A	60.5/12.7	65.0/15.9	69.5/20.5	80.9/13.6	86.4/18.2
	Ckt B (Total/Over Clear Glass)	62.3/12.7	65.0/15.9	73.6/20.5	78.6/13.6	84.1/18.2
COMPRESSORS, Type...r/s		Reciprocating, Semi-Hermetic...29.2				
06E**	(Qty) Ckt A	(1) 275, (1) 299	(3) 265	(3) 275	(1) 265, (1) 275, (1) 299	(3) 265, (1) 275
	(Qty) Ckt B	(1) 275, (1) 299	(2) 299	(3) 275	(1) 265, (1) 275, (1) 299	(1) 275, (2) 299
Oil Charge — Compressor/L		265/9.0, 275/9.0, 299/9.0				
Capacity Control Steps						
% Cap.	Ckt A	50	50	50	50	50
	Ckt B	50	50	50	50	50
Minimum Step Capacity (%)		14	11	11	14	12
CONDENSER FANS — Type		Propeller				
Standard/Low Noise						
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		10...15.9	10...15.9	10...15.9	12...19.1	12...19.1
Total Airflow — L/s		47 190	47 190	47 190	56 630	56 630
High Static						
Fan Speed — r/s		29	29	29	29	29
No. Blades...Diameter — mm		12...762	12...762	12...762	12...762	12...762
No. Fans...Total kW		10...37.0	10...37.0	10...37.0	12...44.4	12...44.4
Total Airflow — L/s††		47 190	47 190	47 190	56 630	56 630
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/in. Standard/Heresite		669.3/590.6	669.3/590.6	669.3/590.6	669.3/590.6	669.3/590.6
No. Rows — Ckt A or B		3	3	3	3	3
Face Area m^2 — Ckt A and B Total		20.92	20.92	20.92	20.92	20.92
Max Working Pressure Refrigerant — kPa		3103	3103	3103	3103	3103
COOLER — No. ...Type		1...10HB160	1...10HB160	1...10HB200	1...10HB200	1...10HB210
No. Refrigerant Circuits		2	2	2	2	2
Net Water Volume — L (includes nozzles)		197	197	229	229	267
Max Working Pressure						
Refrigerant Side/Water Side — kPa		1916/2068	1916/2068	1916/2068	1916/2068	1916/2068
WATER CONNECTIONS — in.		Victaulic Type				
Inlet and Outlet		6				
Drain		¾ NPT				

LEGEND

OD — Outside Diameter

*C-AL — Copper Tubing — Aluminum Fins Condenser Coil.
†C-C — Copper Tubing — Copper Fins Condenser Coil.
**All compressors have 6 cylinders.
††Based on rated external static pressure (ESP) of 100 Pa or 250 Pa as appropriate.

NOTE: When facing the compressors, Circuit A is on the right and Circuit B is on the left.

Table 3A — Physical Data — 50 Hz, English

UNIT SIZE		080	090	100,240B,270B	110
APPROX OPERATING WEIGHT — lb	C-AL*	6720	7135	8710	8840
	C-C†	7445	7860	9660	9790
REFRIGERANT CHARGE — lb					
R-22 Ckt A	Total/Over Clear Glass	78/15	78/15	98/20	98/20
R-22 Ckt B	Total/Over Clear Glass	78/15	78/15	105/20	105/20
COMPRESSORS, Type...rpm		Reciprocating, Semi-Hermetic...1450			
06E** (Qty) Ckt A		(1) 265, (1) 299	(1) 265, (1) 299	(1) 265, (1) 299	(2) 299
06E** (Qty) Ckt B		(1) 299	(1) 265, (1) 275	(1) 265, (1) 299	(2) 299
Oil Charge — Compressor/pt		250/17.0, 265/19.0, 275/19.0, 299/19.0			
Capacity Control Steps		6	8	8	8
% Cap. Ckt A		62	54	50	50
% Cap. Ckt B		38	46	50	50
Minimum Step Capacity (%)		16	14	13	17
CONDENSER FANS — Type		Propeller, Direct Drive			
Standard/Low Noise					
Fan Speed — rpm		950	950	950	950
No. Blades...Diameter — in.		6...30	6...30	6...30	6...30
No. Fans...Total kW		6...9.4	6...9.4	8...12.7	8...12.7
Total Airflow — cfm		57,000	57,000	76,000	76,000
High Static					
Fan Speed — rpm		1445	1445	1445	1445
No. Blades...Diameter — in.		12...30	12...30	12...30	12...30
No. Fans...Total kW		6...22.2	6...22.2	8...29.6	8...29.6
Total Airflow...cfm††		60,000	60,000	80,000	80,000
CONDENSER COILS — Type		Vertical and Horizontal, Plate Fin, Enhanced Tubing			
Tubes (Copper), OD — in.		0.375	0.375	0.375	0.375
Fins/in.		17	17	17	17
No. Rows — Ckt A or B		3	3	3	3
Face Area sq ft — Ckt A and B Total		128.3	128.3	168	168
Max Working Pressure Refrigerant — psig		450			
COOLER — No. ...Type		1...10HB090	1...10HB090	1...10HB110	1...10HB110
No. Refrigerant Circuits		2	2	2	2
Net Water Volume — Gal. (includes nozzles)		24.5	24.5	30.3	30.3
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		4	4	5	5
Drain		¾ NPT			

LEGEND

OD — Outside Diameter

*C-AL — Copper Tubing — Aluminum Fins Condenser Coil.
†C-C — Copper Tubing — Copper Fins Condenser Coil.
**06E250 compressors have 4 cylinders; all others have 6.
††Based on rated external static pressure (ESP) of 0.4 in. wg or 1.0 in. wg as appropriate.

NOTE: When facing the compressors, Circuit A is on the right and Circuit B is on the left.

Table 3A — Physical Data — 50 Hz, English (cont)

UNIT SIZE		130,240A,300A	150	170,270A,300B, 330A,B,360A	190,360B, 390B	210,390A, 420A,B
APPROX OPERATING WEIGHT — lb	C-AL*	10,511	10,676	11,443	12,906	13,545
	C-C†	11,783	11,948	12,715	14,425	15,064
REFRIGERANT CHARGE — lb						
R-22	Ckt A	133/28	143/35	153/45	178/30	190/40
Total/Over Clear Glass	Ckt B	137/28	143/35	162/45	173/30	185/40
COMPRESSORS, Type...rpm		Reciprocating, Semi-Hermetic...1450				
06E**	(Qty) Ckt A	(1) 265, (2) 275	(3) 299	(2) 275, (1) 299	(3) 299	(2) 265, (2) 299
	(Qty) Ckt B	(2) 299	(2) 299	(1) 275, (2) 299	(3) 299	(3) 299
Oil Charge — Compressor/pt		265/19.0, 275/19.0, 299/19.0				
Capacity Control Steps						
% Cap.	Ckt A	52	60	48	50	52
	Ckt B	48	40	52	50	48
Minimum Step Capacity (%)		10	13	10	17	10
CONDENSER FANS — Type		Propeller				
Standard/Low Noise						
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		10...15.9	10...15.9	10...15.9	12...19.1	12...19.1
Total Airflow — cfm		100,000	100,000	100,000	120,000	120,000
High Static						
Fan Speed — rpm		1445	1445	1445	1445	1445
No. Blades...Diameter — in.		6...30	6...30	6...30	6...30	6...30
No. Fans...Total kW		10...37	10...37	10...37	12...44.4	12...44.4
Total Airflow — cfm††		100,000	100,000	100,000	120,000	120,000
CONDENSER COILS — Type		Vertical and Horizontal, Plate Fin, Enhanced Tubing				
Tubes (Copper), OD — in.		.375	.375	.375	.375	.375
Fins/in. Standard/Heresite		17/15	17/15	17/15	17/15	17/15
No. Rows — Ckt A or B		3	3	3	3	3
Face Area sq ft — Ckt A and B Total		225.1	225.1	225.1	268.9	268.9
Max Working Pressure Refrigerant — psig		450	450	450	450	450
COOLER — No. ...Type		1...10HB160	1...10HB160	1...10HB200	1...10HB200	1...10HB210
No. Refrigerant Circuits		2	2	2	2	2
Net Water Volume — Gal. (includes nozzles)		52.0	52.0	61.0	61.0	70.4
Max Working Pressure						
Refrigerant Side/Water Side — psig		278/300	278/300	278/300	278/300	278/300
WATER CONNECTIONS — in.		Victaulic Type				
Inlet and Outlet		6				
Drain		¾ NPT				

LEGEND

OD — Outside Diameter

*C-AL — Copper Tubing — Aluminum Fins Condenser Coil.
†C-C — Copper Tubing — Copper Fins Condenser Coil.
**All compresssors have 6 cylinders.
††Based on rated external static pressure (ESP) of 0.4 in. wg or 1.0 in. wg as appropriate.

NOTE: When facing the compressors, Circuit A is on the right and Circuit B is on the left.

Table 3B — Physical Data — 50 Hz, SI

UNIT SIZE		080	090	100,240B,270B	110
APPROX OPERATING WEIGHT — kg	C-AL*	3055	3243	3960	4018
	C-C†	3384	3573	4390	4450
REFRIGERANT CHARGE — kg					
R-22	Ckt A	35.4/6.8	35.4/6.8	44.5/9.1	44.5/9.1
	Ckt B	35.4/6.8	35.4/6.8	47.7/9.1	47.7/9.1
	Total/Over Clear Glass				
COMPRESSORS, Type...r/s		Reciprocating, Semi-Hermetic...24.2			
06E** (Qty) Ckt A		(1) 265, (1) 299	(1) 265, (1) 299	(1) 265, (1) 299	(2) 299
06E** (Qty) Ckt B		(1) 299	(1) 265, (1) 275	(1) 265, (1) 299	(2) 299
Oil Charge — Compressor/L		250/8.0, 265/9.0, 275/9.0, 299/9.0			
Capacity Control Steps		6	8	8	8
% Cap.	Ckt A	62	54	50	50
	Ckt B	38	46	50	50
Minimum Step Capacity (%)		16	14	13	17
CONDENSER FANS — Type		Propeller, Direct Drive			
Standard/Low Noise					
Fan Speed — r/s		15.8	15.8	15.8	15.8
No. Blades...Diameter — mm		6...762	6...762	6...762	6...762
No. Fans...Total kW		6...9.4	6...9.4	8...12.7	8...12.7
Total Airflow — L/s		26 898	26 898	35 864	35 864
High Static					
Fan Speed — r/s		29	29	29	29
No. Blades...Diameter — mm		12...762	12...762	12...762	12...762
No. Fans...Total kW		6...22.2	6...22.2	8...29.6	8...29.6
Total Airflow — L/s††		28 315	28 315	37 750	37 750
CONDENSER COILS — Type		Vertical and Horizontal, Plate Fin, Enhanced Tubing			
Tubes (Copper), OD — mm		9.53	9.53	9.53	9.53
Fins/m		669.3	669.3	669.3	669.3
No. Rows — Ckt A or B		3	3	3	3
Face Area m^2 — Ckt A and B Total		11.92	11.92	15.61	15.61
Max Working Pressure Refrigerant — kPa		3103			
COOLER — No. ...Type		1...10HB090	1...10HB090	1...10HB110	1...10HB110
No. Refrigerant Circuits		2	2	2	2
Net Water Volume — L (includes nozzles)		92.9	92.9	114.6	114.6
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		4	4	5	5
Drain		¾ NPT			

LEGEND

OD — Outside Diameter

*C-AL — Copper Tubing — Aluminum Fins Condenser Coil.
†C-C — Copper Tubing — Copper Fins Condenser Coil.
**06E250 compressors have 4 cylinders; all others have 6.
††Based on rated external static pressure (ESP) of 100 Pa or 250 Pa as appropriate.

NOTE: When facing the compressors, Circuit A is on the right and Circuit B is on the left.

Table 3B — Physical Data — 50 Hz, SI (cont)

UNIT SIZE		130,240A,300A	150	170,270A,300B, 330A,B,360A	190,360B,390B	210,390A, 420A,B
APPROX OPERATING WEIGHT — kg	C-AL*	4778	4852	5201	5866	6156
	C-C†	5335	5430	5779	6556	6847
REFRIGERANT CHARGE — kg						
R-22	Ckt A — Total/Over Clear Glass	60.5/12.7	65.0/15.9	69.5/20.5	80.9/13.6	86.4/18.2
	Ckt B	62.3/12.7	65.0/15.9	73.6/20.5	78.6/13.6	84.1/18.2
COMPRESSORS, Type...r/s		Reciprocating, Semi-Hermetic...24.2				
06E**	(Qty) Ckt A	(1) 265, (2) 275	(3) 299	(2) 275, (1) 299	(3) 299	(2) 265, (1) 299
	(Qty) Ckt B	(2) 299	(2) 299	(1) 275, (2) 299	(3) 299	(3) 299
Oil Charge — Compressor/L		265/9.0, 275/9.0, 299/9.0				
Capacity Control Steps						
% Cap.	Ckt A	52	60	48	50	52
	Ckt B	48	40	52	50	48
Minimum Step Capacity (%)		10	13	10	17	10
CONDENSER FANS — Type		Propeller				
Standard/Low Noise						
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		10...15.9	10...15.9	10...15.9	12...19.1	12...19.1
Total Airflow — L/s		47 190	47 190	47 190	56 630	56 630
High Static						
Fan Speed — r/s		24.1	24.1	24.1	24.1	24.1
No. Blades...Diameter — mm		6...762	6...762	6...762	6...762	6...762
No. Fans...Total kW		10...37	10...37	10...37	12...44.4	12...44.4
Total Airflow — L/s††		47 190	47 190	47 190	56 630	56 630
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/in. Standard/Heresite		17/15	17/15	17/15	17/15	17/15
No. Rows — Ckt A or B		3	3	3	3	3
Face Area m^2 — Ckt A and B Total		20.92	20.92	20.92	24.98	24.98
Max Working Pressure Refrigerant — kPa		3103	3103	3103	3103	3103
COOLER — No. ...Type		1...10HB160	1...10HB160	1...10HB200	1...10HB200	1...10HB210
No. Refrigerant Circuits		2	2	2	2	2
Net Water Volume — L (includes nozzles)		197	197	229	229	267
Max Working Pressure						
Refrigerant Side/Water Side — kPa		1916/2068	1916/2068	1916/2068	1916/2068	1916/2068
WATER CONNECTIONS — in.		Victaulic Type				
Inlet and Outlet		6				
Drain		¾ NPT				

LEGEND

OD — Outside Diameter

*C-AL — Copper Tubing — Aluminum Fins Condenser Coil.
†C-C — Copper Tubing — Copper Fins Condenser Coil.
**All compressors have 6 cylinders.
††Based on rated external static pressure (ESP) of 100 Pa or 250 Pa as appropriate.

NOTE: When facing the compressors, Circuit A is on the right and Circuit B is on the left.

Step 4 — Cooler Water and Drain Piping Connections — When facing cooler side of unit, inlet (return) water connection is on the right. It is recommended that a screen strainer with a minimum of 20 mesh be installed ahead of the cooler inlet to prevent debris from damaging internal tubes of cooler. 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 compressor and cooler zrilles have been added, holes must be cut in grilles for field piping and insulation.

NOTE: For 130-210 and associated modular units, be sure that cooler piping does not interfere with the electrical connections.

Although cooler has an air vent, it is recommended that field-supplied air vents be installed in system to facilitate servicing. Field-supplied shut-off 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.

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 and 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 sight from the unit per 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.

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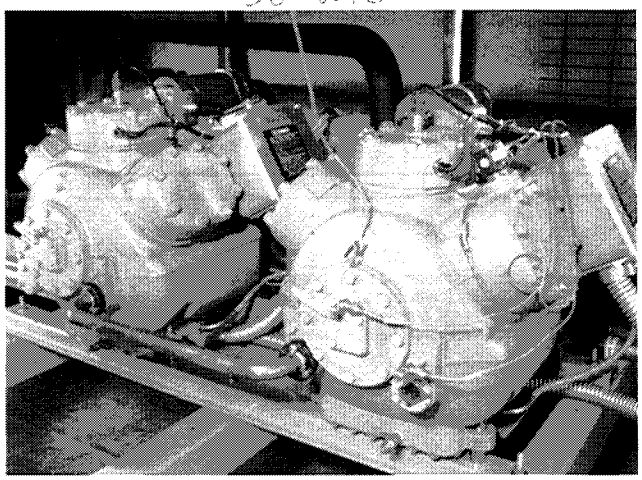

Fig. 13 — Compressor Mounting View

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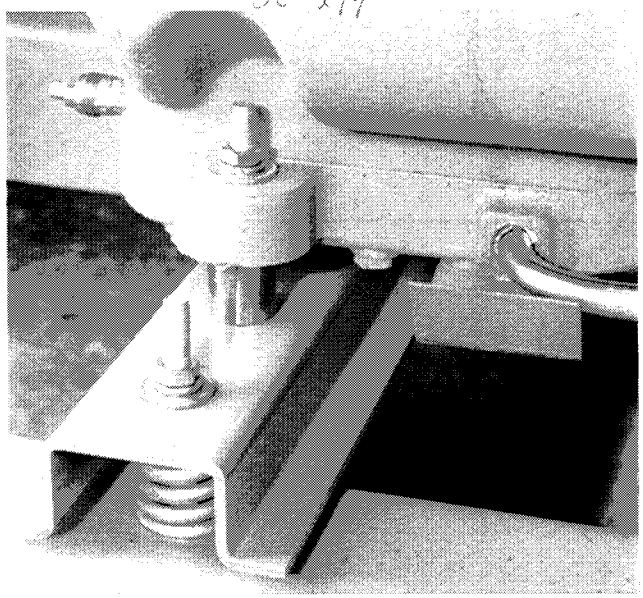


Fig. 14 — Compressor Mounting Bolts

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. 1-8 for connection location.

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:

1. Drain the water from the system.
2. Replace the drain plug and add 2 gallons (8 liters) (080-110 units), 3 gallons (11.4 liters) (130-190 units), or 4 gallons (15.1 liters) (210 units) 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.
3. Open one of the thermistor connections to allow air to escape the vessel and the glycol to enter.
4. At the beginning of the next cooling season, refill cooler and add recommended inhibitor.

Step 5 — 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 (when facing control box) on 080-110 units. On 130-210 units, the power box is located on the cooler side of the unit, and the control box is located on the compressor side.

FIELD POWER CONNECTIONS (See Fig. 15-18.) — 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.

IMPORTANT: The 30GT130-420 units have a factory-installed option for a non-fused disconnect for power and control entry. If the unit is equipped with this option, all field wiring should be to the non-fused disconnect rather than the terminal blocks.

30GT080-110, 240B, and 270B Units — All field 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 to simplify the field power wiring. 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, except 30GT110 346-3-50 units and 30GT110 380/415-3-50 part wind units. These units require copper-only conductors.

Instructions continued on page 34.

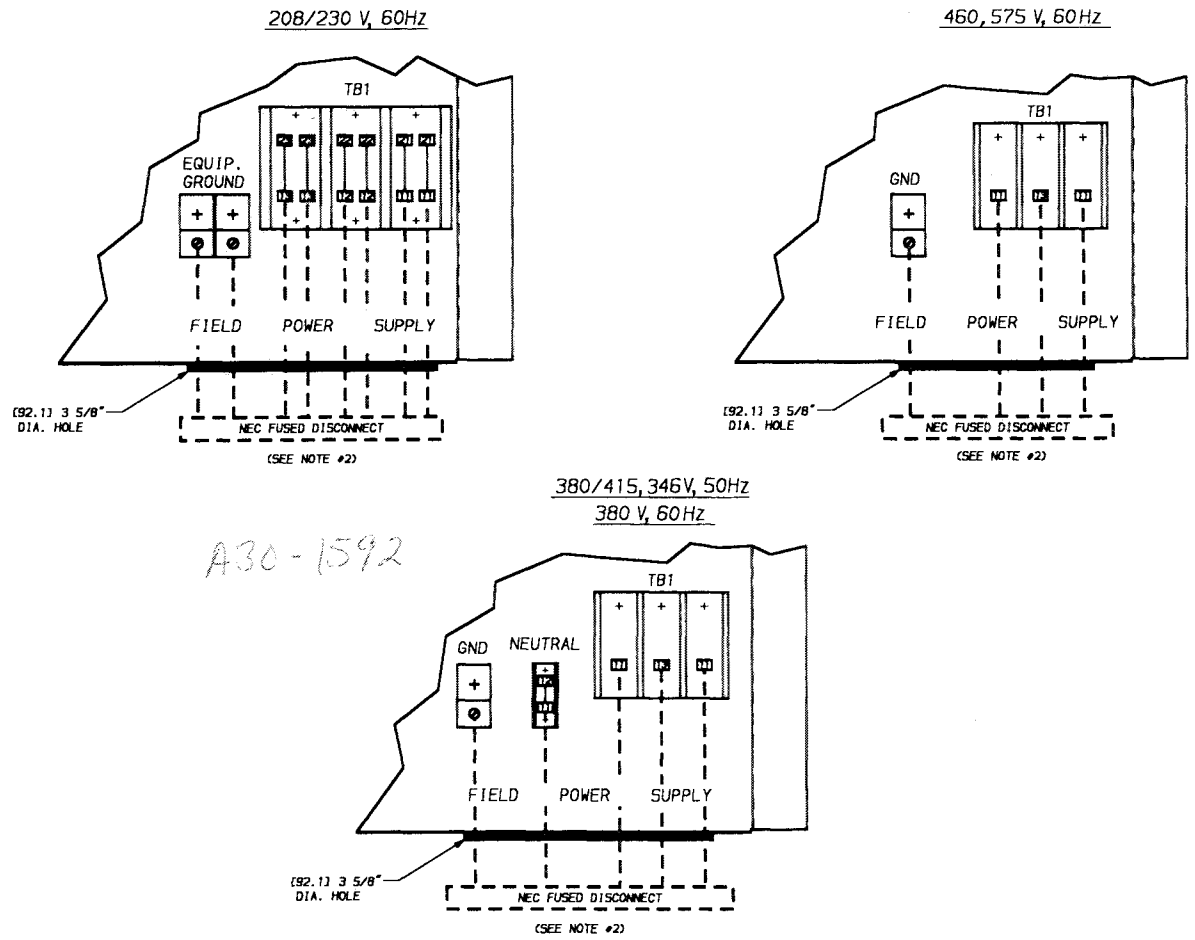


Fig. 15 – Field Power Wiring; Unit Sizes 080-110

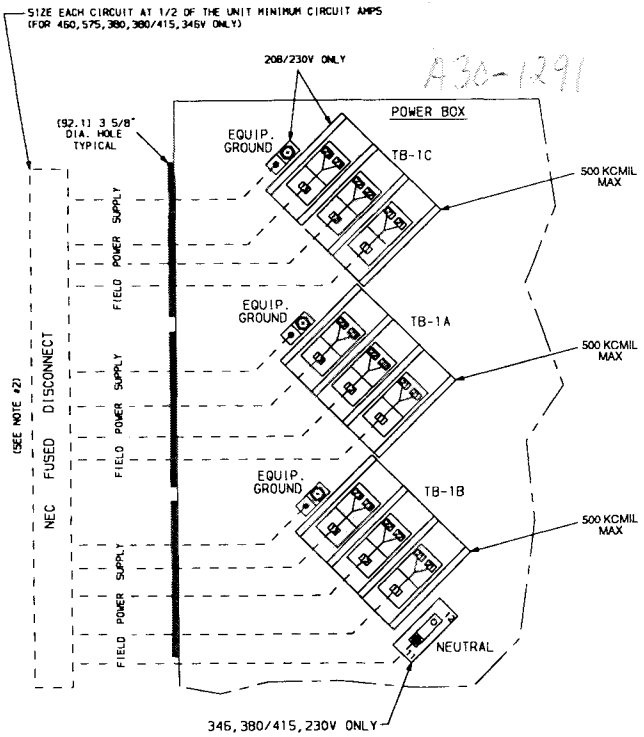


Fig. 16 – Field Power Wiring; Unit Sizes 130-210

LEGEND AND NOTES FOR WIRING DIAGRAMS (FIG. 15-18)

A	–	Alarm
CWFS	–	Chilled Water Flow Switch
CWPI	–	Chilled Water Pump Interlock
GND	–	Ground
Kcmil	–	Thousand Circular Mils
NEC	–	National Electrical Code
O.A.	–	Outdoor Air
TB	–	Terminal Block
▬▬▬		Field Power Wiring
- - - -		Field Control Wiring
———		Factory Installed Wiring

NOTES:

1. Factory wiring is in accordance with NEC (U.S.A.). 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, except use copper conductors only for the following units: 30GT110 346-v; 30GT110 380/415-v part-wind start; 30GT210 208/230-v part-wind start and across-the-line start.
3. Power for control circuit should be supplied from a separate source through a field-supplied fused disconnect with 30-amp maximum protection for 115-v circuits, and 15-amp maximum protection for 230-v control circuit. For a unit with cooler heaters (unit sizes 080-110), the field-supplied disconnect must have 30-amp maximum protection for 115-v control circuits, and 15-amp maximum protection for 230-v control circuit, 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 3 and 4 of TB6 are for field connection for remote ON-OFF control. The contacts must be rated for dry circuit application capable of reliably switching a 5 vdc, .5 mA load. Remove jumper between 3 and 4 of TB6 if remote ON-OFF is installed.
5. The maximum load allowed for the remote alarm circuit is 75 va sealed, 360 va inrush at 115- or 230-v, depending on model. Remove resistor across terminals 1 and 2 of TB3 (TB5 on unit sizes 080-110 and 240B, 270B) when using remote alarm.
6. Dimensions in [ ] are millimeters.

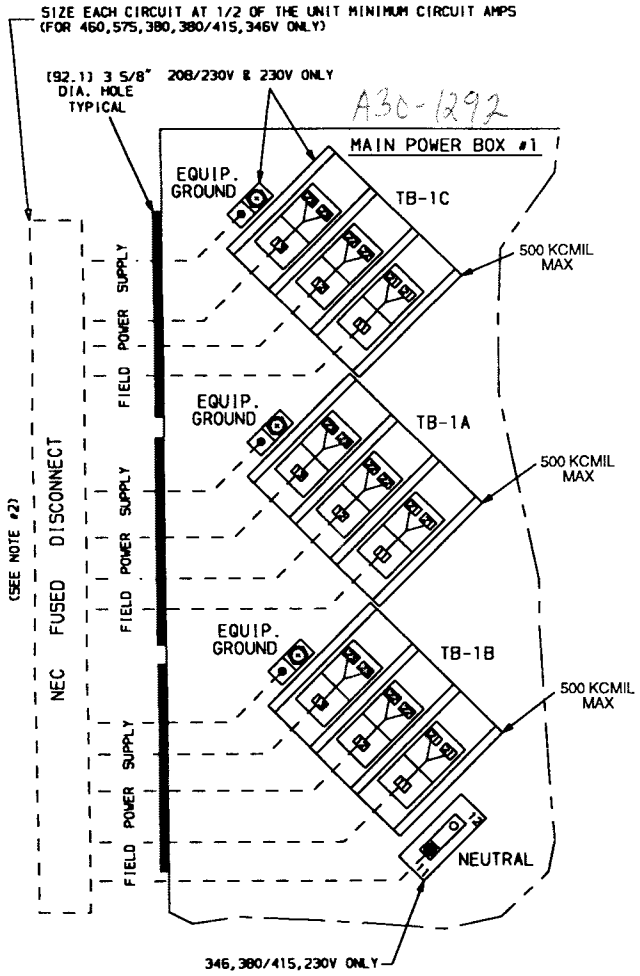


Fig. 17A — Field Power Wiring;
Unit Sizes 240A, 270A

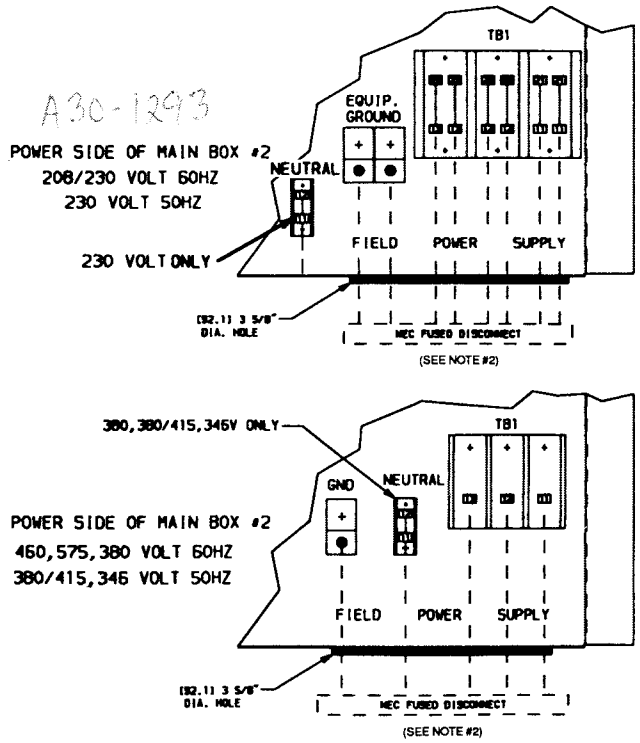


Fig. 17B — Field Power Wiring;
Unit Sizes 240B, 270B

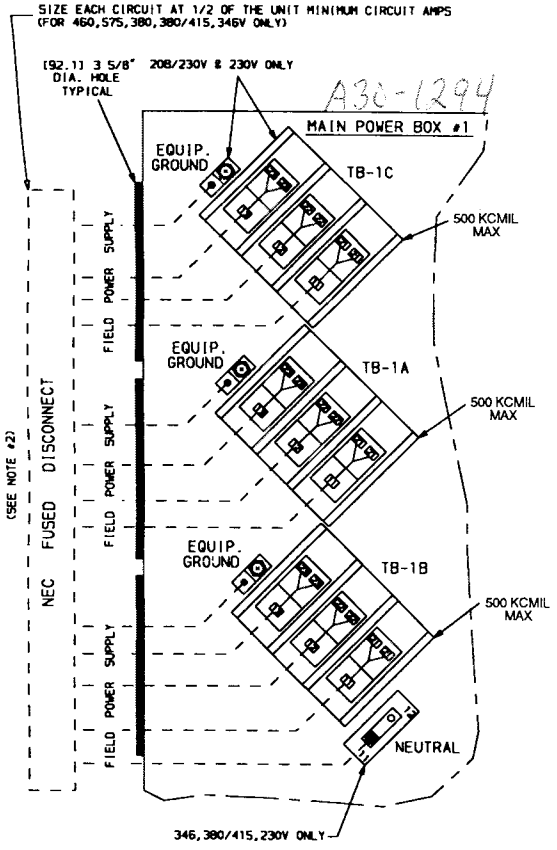


Fig. 18A — Field Power Wiring;
Unit Sizes 300A, 330A, 360A, 390A, 420A

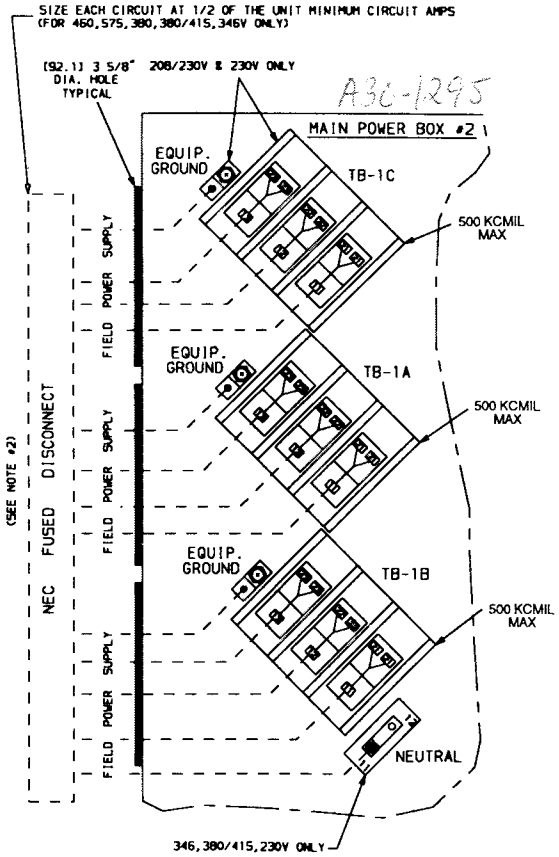


Fig. 18B — Field Power Wiring;
Unit Sizes 300B, 330B, 360B, 390B, 420B

Table 4A – Unit Electrical Data, 30GT080-110

UNIT SIZE	VOLTAGE			STANDARD CONDENSER FAN				HIGH STATIC CONDENSER FAN			
	Nameplate V-Hz (3 Phase)	Supplied*		MCA	MOCP	ICF		MCA	MOCP	ICF	
		Min	Max			XL	PW			XL	PW
080	208/230-60	187	253	391.3	500	896.9	620.9	446.5	500	951.9	675.9
	460-60	414	506	183.4	250	442.8	305.4	204.7	250	464.2	326.8
	575-60	518	633	160.9	200	365.6	246.9	171.8	225	376.4	257.7
	380-60	342	418	209.9	250	492.6	339.5	230.9	300	513.6	360.5
	346-50	325	380	250.1	300	532.8	379.8	276.0	350	558.6	405.6
	380/415-50	342	440	215.8	250	472.0	337.8	234.6	250	497.8	257.7
090	208/230-60	187	253	392.2	450	722.3	547.9	447.0	500	780.9	602.9
	460-60	414	506	195.6	225	361.2	273.5	217.0	250	382.6	294.9
	575-60	518	633	168.0	200	286.2	213.2	178.6	200	297.0	230.4
	380-60	342	418	205.9	250	396.0	294.5	226.9	250	417.0	315.5
	346-50	325	380	269.3	300	552.0	399.0	295.2	350	577.8	424.8
	380/415-50	342	440	241.4	300	497.0	363.5	267.2	300	522.8	389.3
100	208/230-60	187	253	462.3	500	835.2	633.2	535.6	600	908.6	706.6
	460-60	414	506	221.2	250	408.8	312.3	242.9	250	437.4	336.4
	575-60	518	633	191.1	225	289.4	233.1	205.5	225	331.0	261.0
	380-60	342	418	242.1	250	454.8	342.8	268.6	300	482.8	370.8
	346-50	325	380	303.8	350	586.5	433.5	366.3	400	648.9	495.9
	380/415-50	342	440	266.6	300	521.6	388.7	292.8	350	556.0	418.0
110	208/230-60	187	253	513.6	600	1019.2	743.2	587.2	700	1092.6	816.6
	460-60	414	506	245.2	300	500.8	367.3	273.8	300	529.4	395.9
	575-60	518	633	212.0	250	416.6	292.1	208.8	250	394.6	306.5
	380-60	342	418	274.1	350	556.8	403.8	302.2	350	585.2	431.8
	346-50	325	380	373.0	450	655.7	502.7	407.5	450	690.1	537.1
	380/415-50	342	440	312.8	350	565.2	434.7	344.9	400	599.6	467.6

NOTE: See Legend and Notes on page 33.

Table 4B – Unit Electrical Data, 30GT130-210

UNIT SIZE	VOLTAGE			STANDARD CONDENSER FAN				HIGH STATIC CONDENSER FAN			
	Nameplate V-Hz (3 Phase)	Supplied*		MCA	MOCP	ICF		MCA	MOCP	ICF	
		Min	Max			XL	PW			XL	PW
130	208/230-60	187	253	610.2	700	1111.1	835.1	701.8	800	1202.7	926.7
	460-60	414	506	305.5	350	555.9	417.9	341.1	400	591.5	453.5
	575-60	518	633	257.4	300	355.6	323.6	275.4	300	373.6	341.6
	380-60	342	418	331.1	400	612.8	460.8	366.1	400	647.8	495.8
	230-50	207	253	559.1	600	969.5	751.5	617.1	700	1027.5	809.5
	346-50	325	380	382.9	450	682.6	522.6	425.9	500	725.6	565.6
	380/415-50	342	440	353.0	400	603.4	465.4	396.0	450	646.4	508.4
150	208/230-60	187	253	664.2	800	1165.1	889.1	755.8	800	1256.7	980.7
	460-60	414	506	332.4	400	582.8	444.8	368.0	400	618.4	480.4
	575-60	518	633	283.8	300	446.0	350.0	301.8	350	464.0	368.0
	380-60	342	418	359.9	400	641.6	489.6	394.9	450	676.6	524.6
	230-50	207	253	629.4	700	1039.8	821.8	629.4	700	1039.8	879.8
	346-50	325	380	465.1	500	764.8	604.8	508.1	600	807.8	647.8
	380/415-50	342	440	427.4	500	677.8	539.8	470.4	500	720.8	508.4
170	208/230-60	187	253	727.5	800	1098.9	896.9	819.1	1000	1190.5	988.5
	460-60	414	506	364.3	400	549.9	448.9	399.9	450	585.5	484.5
	575-60	518	633	294.6	300	418.5	348.5	312.6	350	436.5	366.5
	380-60	342	418	387.8	400	598.0	486.0	422.8	450	633.0	521.0
	230-50	207	253	677.7	700	1088.1	870.1	735.7	800	1146.1	928.1
	346-50	325	380	472.1	500	771.8	611.8	515.1	600	814.8	654.8
	380/415-50	342	440	437.7	500	688.1	550.1	480.7	500	731.1	593.1
190	208/230-60	187	253	800.0	800	1301.5	1025.5	910.6	1000	1411.5	1135.5
	460-60	414	506	400.7	450	651.1	513.1	443.5	500	693.9	555.9
	575-60	518	633	337.4	350	499.6	403.6	359.0	400	521.2	425.2
	380-60	342	418	432.5	500	714.2	562.2	474.5	500	756.2	604.2
	230-50	207	253	749.9	800	1160.3	942.3	819.5	700	1229.9	1011.9
	346-50	325	380	554.1	600	853.8	693.8	605.7	1000	905.4	745.4
	380/415-50	342	440	509.1	600	759.5	621.5	560.7	600	811.1	673.1
210	208/230-60	187	253	890.4	1000	1391.3	1115.3	1000.0	1000	1501.3	1225.3
	460-60	414	506	445.6	500	696.0	558.0	488.4	500	738.8	600.8
	575-60	518	633	374.0	400	536.2	440.2	395.6	450	557.8	461.8
	380-60	342	418	479.3	500	761.0	609.0	521.3	600	803.0	651.0
	230-50	207	253	796.2	800	1206.6	988.3	865.8	1000	1276.2	1058.2
	346-50	325	380	567.5	600	867.2	707.2	619.1	700	918.8	758.8
	380/415-50	342	440	523.2	600	773.6	635.6	574.8	600	825.2	687.2

NOTE: See Legend and Notes on page 33.

Table 4C – Unit Electrical Data, 30GT240-420

UNIT SIZE	VOLTAGE			MODULE A								MODULE B							
				Standard Condenser Fan				High Static Condenser Fan				Standard Condenser Fan				High Static Condenser Fan			
	Nameplate V-Hz (3 Phase)	Supplied*		MCA	MOCP	ICF		MCA	MOCP	ICF		MCA	MOCP	ICF		MCA	MOCP	ICF	
		Min	Max			XL	PW			XL	PW			XL	PW			XL	PW
240	208/230-60	187	253	610.2	700	1111.1	835.1	701.8	800	1202.7	926.7	462.3†	500†	896.9	620.9	535.6	600	908.6	706.6
	460-60	414	506	305.5	350	555.9	417.9	341.1	400	591.5	453.5	221.2†	250†	442.8	305.4	242.9	250	437.4	336.4
	575-60	518	633	257.4	300	355.6	323.6	275.4	300	373.6	341.6	191.1†	225†	365.6	246.9	205.5	225	331.0	261.0
	380-60	342	418	331.1	400	612.8	460.8	366.1	400	647.8	495.8	242.1†	250†	492.6	339.5	268.6	300	482.8	370.8
	230-50	207	253	559.1	600	969.5	751.5	617.1	700	1027.5	809.5	447.6†	500†	601.7	448.7	465.9	500	876.3	658.3
	346-50	325	380	382.9	450	682.6	522.6	425.9	500	725.6	565.6	303.8†	350†	532.8	379.8	366.3	400	648.9	495.9
	380/415-50	342	440	353.0	400	603.4	465.4	396.0	450	646.4	508.4	266.6†	300†	472.0	292.9	292.8	350	556.0	418.0
270	208/230-60	187	253	727.5	800	1098.9	896.9	819.1	1000	1190.5	988.5	462.3†	500†	896.9	620.9	535.6	600	908.6	706.6
	460-60	414	506	364.3	400	549.9	448.9	399.9	450	585.5	484.5	221.2†	250†	442.8	305.4	242.9	250	437.4	336.4
	575-60	518	633	294.6	300	418.5	348.5	312.6	350	436.5	366.5	191.1†	225†	365.6	246.9	205.5	225	331.0	261.0
	380-60	342	418	387.8	400	598.0	486.0	422.8	450	633.0	521.0	242.1†	250†	492.6	339.5	268.6	300	482.8	370.8
	230-50	207	253	677.7	700	1088.1	870.1	735.7	800	1146.1	928.1	447.6†	500†	601.7	448.7	465.9	500	876.3	658.3
	346-50	325	380	472.1	500	771.8	611.8	515.1	600	814.8	654.8	303.8†	350†	532.8	379.8	366.3	400	648.9	495.9
	380/415-50	342	440	437.7	500	688.1	550.1	480.7	500	731.1	593.1	266.6†	300†	472.0	292.9	292.8	350	556.0	418.0
300	208/230-60	187	253	610.2	700	1111.1	835.1	701.8	800	1202.7	926.7	727.5	800	1098.9	896.9	819.1	1000	1190.5	988.5
	460-60	414	506	305.5	350	555.9	417.9	341.1	400	591.5	453.5	364.3	400	549.9	448.9	399.9	450	585.5	484.5
	575-60	518	633	257.4	300	355.6	323.6	275.4	300	373.6	341.6	294.6	300	418.5	348.5	312.6	350	436.5	366.5
	380-60	342	418	331.1	400	612.8	460.8	366.1	400	647.8	495.8	387.8	400	598.0	486.0	422.8	450	633.0	521.0
	230-50	207	253	559.1	600	969.5	751.5	617.1	700	1027.5	809.5	677.7	700	1088.1	870.1	735.7	800	1146.1	928.1
	346-50	325	380	382.9	450	682.6	522.6	425.9	500	725.6	565.6	472.1	500	771.8	611.8	515.1	600	814.8	654.8
	380/415-50	342	440	353.0	400	603.4	465.4	396.0	450	646.4	508.4	437.7	500	688.1	550.1	480.7	500	731.1	593.1
330	208/230-60	187	253	727.5	800	1098.9	896.9	819.1	1000	1190.5	988.5	727.5	800	1098.9	896.9	819.1	1000	1190.5	988.5
	460-60	414	506	364.3	400	549.9	448.9	399.9	450	585.5	484.5	364.3	400	549.9	448.9	399.9	450	585.5	484.5
	575-60	518	633	294.6	300	418.5	348.5	312.6	350	436.5	366.5	294.6	300	418.5	348.5	312.6	350	436.5	366.5
	380-60	342	418	387.8	400	598.0	486.0	422.8	450	633.0	521.0	387.8	400	598.0	486.0	422.8	450	633.0	521.0
	230-50	207	253	677.7	700	1088.1	870.1	735.7	800	1146.1	928.1	677.7	700	1088.1	870.1	735.7	800	1146.1	928.1
	346-50	325	380	472.1	500	771.8	611.8	515.1	600	814.8	654.8	472.1	500	771.8	611.8	515.1	600	814.8	654.8
	380/415-50	342	440	437.7	500	688.1	550.1	480.7	500	731.1	593.1	437.7	500	688.1	550.1	480.7	500	731.1	593.1
360	208/230-60	187	253	800.0	800	1301.5	1025.5	910.6	1000	1411.5	1135.5	800.0	800	1301.5	1025.5	910.6	1000	1411.5	1135.5
	460-60	414	506	400.7	450	651.1	513.1	443.5	500	693.9	555.9	400.7	450	651.1	513.1	443.5	500	693.9	555.9
	575-60	518	633	337.4	350	499.6	403.6	359.0	400	521.2	425.2	337.4	350	499.6	403.6	359.0	400	521.2	425.2
	380-60	342	418	432.5	500	714.2	562.2	474.5	500	756.2	604.2	432.5	500	714.2	562.2	474.5	500	756.2	604.2
	230-50	207	253	749.9	800	1160.3	942.3	819.5	700	1229.9	1011.9	677.7	700	1088.1	870.1	735.7	800	1146.1	928.1
	346-50	325	380	554.1	600	853.8	693.8	605.7	1000	905.4	745.4	472.1	500	771.8	611.8	515.1	600	814.8	654.8
	380/415-50	342	440	509.1	600	759.5	621.5	560.7	600	811.1	673.1	437.7	500	688.1	550.1	480.7	500	731.1	593.1
390	208/230-60	187	253	890.4	1000	1391.3	1115.3	1000.0	1000	1501.3	1225.3	800.0	800	1301.5	1025.5	910.6	1000	1411.5	1135.5
	460-60	414	506	445.6	500	696.0	558.0	488.4	500	738.8	600.8	400.7	450	651.1	513.1	443.5	500	693.9	555.9
	575-60	518	633	374.0	400	536.2	440.2	395.6	450	557.8	461.8	337.4	350	499.6	403.6	359.0	400	521.2	425.2
	380-60	342	418	479.3	500	761.0	609.0	521.3	600	803.0	651.0	432.5	500	714.2	562.2	474.5	500	756.2	604.2
	230-50	207	253	796.2	800	1206.6	988.3	865.8	1000	1276.2	1058.2	749.9	800	1160.3	942.3	819.5	700	1229.9	1011.9
	346-50	325	380	567.5	600	867.2	707.2	619.1	700	918.8	758.8	554.1	600	853.8	693.8	605.7	1000	905.4	745.4
	380/415-50	342	440	523.2	600	773.6	635.6	574.8	600	825.2	687.2	509.1	600	759.5	621.5	560.7	600	811.1	673.1
420	208/230-60	187	253	890.4	1000	1391.3	1115.3	1000.0	1000	1501.3	1225.3	890.4	1000	1391.3	1115.3	1000.0	1000	1501.3	1225.3
	460-60	414	506	445.6	500	696.0	558.0	488.4	500	738.8	600.8	445.6	500	696.0	558.0	488.4	500	738.8	600.8
	575-60	518	633	374.0	400	536.2	440.2	395.6	450	557.8	461.8	374.0	400	536.2	440.2	395.6	450	557.8	461.8
	380-60	342	418	479.3	500	761.0	609.0	521.3	600	803.0	651.0	479.3	500	761.0	609.0	521.3	600	803.0	651.0
	230-50	207	253	796.2	800	1206.6	988.3	865.8	1000	1276.2	1058.2	796.2	800	1206.6	988.3	865.8	1000	1276.2	1058.2
	346-50	325	380	567.5	600	867.2	707.2	619.1	700	918.8	758.8	567.5	600	867.2	707.2	619.1	700	918.8	758.8
	380/415-50	342	440	523.2	600	773.6	635.6	574.8	600	825.2	687.2	523.2	600	773.6	635.6	574.8	600	825.2	687.2

NOTE: See Legend and Notes on page 33.

Table 5 – Control Circuit

UNIT POWER SUPPLY (V-Ph-Hz)	CONTROL POWER			AMPS			
	V-Ph-Hz	Min	Max	080-110, 240B,270B Units		130-210,240A,270A, 300-420 Units	
				With Cooler Heater	Without Cooler Heater	With Cooler Heater	Without Cooler Heater
203/230-3-60	115-1-60	104	127	30	30	30	30
460-3-60	115-1-60	104	127	30	30	30	30
575-3-60	115-1-60	104	127	30	30	30	30
380-3-60	230-1-60	207	254	15	5	15	10
346-3-50	230-1-50	198	254	15	5	15	10
230-3-50	230-1-50	198	254	15	5	15	10
380/415-3-50	230-1-50	198	254	15	5	15	10

Table 6A – Compressor Electrical Data, 30GT080-110

UNIT SIZE	NAMEPLATE V-Hz (3 Phase)	COMPRESSOR NUMBERS							
		A1		A2		B1		B2	
		RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA
080	208/230-60	106.4	506	67.9	345	147.7	690	—	—
	460-60	46.8	253	34.6	173	65.4	345	—	—
	575-60	40.4	176	28.8	120	57.1	276	—	—
	380-60	52.6	280	34.6	191	78.8	382	—	—
	346-50	44.9	247	79.5	382	79.5	382	—	—
	380/415-50	43.6	223	65.4	345	65.4	345	—	—
080-PW	208/230-60	106.4	304	67.9	207	147.4	414	—	—
	460-60	48.7	152	33.3	104	67.9	207	—	—
	575-60	33.3	106	28.2	72	53.8	165	—	—
	380-60	53.8	168	33.3	115	79.5	229	—	—
	346-50	44.9	148	79.5	229	79.5	229	—	—
	380/415-50	44.9	134	67.9	207	67.9	207	—	—
090	208/230-60	89.7	446	67.9	345	89.7	446	89.7	446
	460-60	43.6	223	34.6	173	43.6	223	43.6	223
	575-60	36.5	164	28.8	120	36.5	164	36.5	164
	380-60	45.5	247	34.6	191	45.5	247	45.5	247
	346-50	44.9	247	79.5	382	44.9	247	53.8	280
	380/415-50	43.6	223	65.4	345	43.6	223	46.8	280
090-PW	208/230-60	89.7	268	67.9	207	89.7	268	89.7	268
	460-60	44.9	134	33.3	104	44.9	134	44.9	134
	575-60	33.3	98	28.2	72	33.3	98	33.3	98
	380-60	44.9	148	33.3	115	44.9	148	44.9	148
	346-50	44.9	148	79.5	229	44.9	148	53.8	168
	380/415-50	43.6	134	67.9	207	44.9	134	48.7	152
100	208/230-60	89.7	446	106.4	506	89.7	446	106.4	506
	460-60	43.6	223	46.8	253	43.6	223	46.8	253
	575-60	36.5	164	40.4	176	36.5	164	40.4	176
	380-60	45.5	247	52.6	280	45.5	247	52.6	280
	346-50	44.9	247	79.5	382	44.9	247	79.5	382
	380/415-50	43.6	223	65.4	345	43.6	223	65.4	345
100-PW	208/230-60	89.7	268	106.4	304	89.7	268	106.4	304
	460-60	44.9	134	48.7	152	44.9	134	48.7	152
	575-60	33.3	98	33.3	106	33.3	98	33.3	106
	380-60	44.9	148	53.8	168	44.9	148	53.8	168
	346-50	44.9	148	79.5	229	44.9	148	79.5	229
	380/415-50	44.9	134	67.9	207	44.9	134	67.9	207
110	208/230-60	89.7	446	147.4	690	89.7	446	106.4	506
	460-60	43.6	223	65.4	345	43.6	223	46.8	253
	575-60	36.5	164	57.1	276	36.5	164	40.4	176
	380-60	45.5	247	78.8	382	45.5	247	52.6	280
	346-50	79.5	382	79.5	229	79.5	382	79.5	382
	380/415-50	65.4	345	65.4	207	65.4	345	65.4	345
110-PW	208/230-60	89.7	268	147.4	414	89.7	268	106.4	304
	460-60	44.9	134	67.9	207	44.9	134	48.7	152
	575-60	33.3	98	53.8	165	33.3	98	33.3	106
	380-60	44.9	148	79.5	229	44.9	148	53.8	168
	346-50	79.5	229	79.5	229	79.5	229	79.5	229
	380/415-50	67.9	207	67.9	207	67.9	207	67.9	207

NOTE: See Legend and Notes on page 33.

Table 6B – Compressor Electrical Data, 30GT130-210

UNIT SIZE	NAMEPLATE V-Hz (3 Phase)	COMPRESSOR NUMBERS						
		A1	A2	A3	A4	B1	B2	B3
		RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA
130	208/230-60	107.7/506	151.3/690	—/—	—/—	107.7/506	151.3/690	—/—
	460-60	53.9/253	75.7/345	—/—		53.9/253	75.7/345	
	575-60	41.7/176	62.2/176	—/—		41.7/176	62.2/176	
	380-60	55.8/280	80.2/382	—/—		55.8/280	80.2/382	
	346-50	46.8/259	55.8/294	55.8/294		80.2/400	80.2/400	
	230-50	77.0/342	87.9/366	87.9/366		107.7/545	107.7/545	
	380/415-50	44.9/223	53.9/253	53.9/253		75.7/345	75.7/345	
130-PW	208/230-60	107.7/304	151.3/414	—/—	—/—	107.7/304	151.3/414	—/—
	460-60	53.9/152	75.7/207	—/—		53.9/152	75.7/207	
	575-60	41.7/106	62.2/144	—/—		41.7/106	62.2/144	
	380-60	55.8/168	80.2/230	—/—		55.8/168	80.2/230	
	346-50	46.8/155	55.8/155	55.8/155		80.2/240	80.2/240	
	230-50	77.0/206	87.9/220	87.9/220		107.7/327	107.7/327	
	380/415-50	44.9/134	53.9/152	53.9/152		75.7/207	75.7/207	
150	208/230-60	89.8/446	89.8/446	89.8/446	—/—	151.3/690	151.3/690	—/—
	460-60	44.9/223	44.9/223	44.9/223		75.7/345	75.7/345	
	575-60	36.6/164	36.6/164	36.6/164		62.2/240	62.2/240	
	380-60	46.8/247	46.8/247	46.8/247		80.2/382	80.2/382	
	346-50	80.2/400	80.2/400	80.2/400		80.2/400	80.2/400	
	230-50	107.7/545	107.7/545	107.7/545		107.7/545	107.7/545	
	380/415-50	75.7/345	75.7/345	75.7/345		75.7/345	75.7/345	
150-PW	208/230-60	89.8/268	89.8/268	89.8/268	—/—	151.3/414	151.3/414	—/—
	460-60	44.9/134	44.9/134	44.9/134		75.7/207	75.7/207	
	575-60	36.6/ 99	36.6/ 99	36.6/ 99		62.2/144	62.2/144	
	380-60	46.8/149	46.8/149	46.8/149		80.2/230	80.2/230	
	346-50	80.2/240	80.2/240	80.2/240		80.2/240	80.2/240	
	230-50	107.7/268	107.7/268	107.7/268		107.7/327	107.7/327	
	380/415-50	75.7/327	75.7/327	75.7/327		75.7/207	75.7/207	
170	208/230-60	107.7/506	107.7/506	107.7/506	—/—	107.7/506	107.7/506	107.7/506
	460-60	53.9/253	53.9/253	53.9/253		53.9/253	53.9/253	53.9/253
	575-60	41.7/176	41.7/176	41.7/176		41.7/176	41.7/176	41.7/176
	380-60	55.8/280	55.8/280	55.8/280		55.8/280	55.8/280	55.8/280
	346-50	55.8/294	55.8/294	80.2/400		55.8/294	80.2/400	80.2/400
	230-50	87.9/366	87.9/366	107.7/545		87.9/366	107.7/545	107.7/545
	380/415-50	53.9/253	53.9/253	75.7/345		53.9/253	75.7/345	75.7/345
170-PW	208/230-60	107.7/304	107.7/304	107.7/304	—/—	107.7/304	107.7/304	107.7/304
	460-60	53.9/152	53.9/152	53.9/152		53.9/152	53.9/152	53.9/152
	575-60	41.7/106	41.7/106	41.7/106		41.7/106	41.7/106	41.7/106
	380-60	55.8/168	55.8/168	55.8/168		55.8/168	55.8/168	55.8/168
	346-50	55.8/177	55.8/177	80.2/240		55.8/177	80.2/240	80.2/240
	230-50	87.9/220	87.9/220	107.7/327		87.9/220	107.7/327	107.7/327
	380/415-50	53.9/152	53.9/152	75.7/207		53.9/152	75.7/207	75.7/207
190	208/230-60	89.8/446	107.7/506	151.3/690	—/—	89.8/446	107.7/506	151.3/690
	460-60	44.9/223	53.9/253	75.7/345		44.9/223	53.9/253	75.7/345
	575-60	36.6/164	41.7/176	62.2/240		36.6/164	41.7/176	62.2/240
	380-60	46.8/247	55.8/280	80.2/382		46.8/247	55.8/280	80.2/382
	346-50	80.2/400	80.2/400	80.2/400		80.2/400	80.2/400	80.2/400
	230-50	107.7/545	107.7/545	107.7/545		107.7/545	107.7/545	107.7/545
	380/415-50	75.7/345	75.7/345	75.7/345		75.7/345	75.7/345	75.7/345
190-PW	208/230-60	89.8/268	107.7/304	151.3/414	—/—	89.8/268	107.7/304	151.3/414
	460-60	44.1/349	53.9/152	75.7/207		44.9/134	53.9/152	75.7/207
	575-60	36.6/ 99	41.7/106	62.2/144		36.6/ 99	41.7/106	62.2/144
	380-60	46.8/149	55.8/168	80.2/230		46.8/149	55.8/168	80.2/230
	346-50	80.2/240	80.2/240	80.2/240		80.2/240	80.2/240	80.2/240
	230-50	107.7/327	107.7/327	107.7/327		107.7/327	107.7/327	107.7/327
	380/415-50	75.7/207	75.7/207	75.7/207		75.7/207	75.7/207	75.7/207
210	208/230-60	89.8/446	89.8/446	89.8/446	107.7/506	107.7/506	151.3/690	151.3/690
	460-60	44.9/223	44.9/223	44.9/223	53.9/253	53.9/253	75.7/345	75.7/345
	575-60	36.6/164	36.6/164	36.6/164	41.7/176	41.7/176	62.2/240	62.2/240
	380-60	46.8/247	46.8/247	46.8/247	55.8/280	55.8/280	80.2/382	80.2/382
	346-50	46.8/259	46.8/259	80.2/400	80.2/400	80.2/400	80.2/400	80.2/400
	230-50	77.0/342	77.0/342	107.7/545	107.7/545	107.7/545	107.7/545	107.7/545
	380/415-50	44.9/223	44.9/223	75.7/345	75.7/345	75.7/345	75.7/345	75.7/345
210-PW	208/230-60	89.8/268	89.8/268	89.8/268	107.7/304	107.7/304	151.3/414	151.3/414
	460-60	44.9/134	44.9/134	44.9/134	53.9/152	53.9/152	75.7/207	75.7/207
	575-60	36.6/ 99	36.6/ 99	36.6/ 99	41.7/106	41.7/106	62.2/144	62.2/144
	380-60	46.8/149	46.8/149	46.8/149	55.8/168	55.8/168	80.2/230	80.2/230
	346-50	46.8/155	46.8/155	80.2/240	80.2/240	80.2/240	80.2/240	80.2/240
	230-50	77.0/206	77.0/206	107.7/327	107.7/327	107.7/327	107.7/327	107.7/327
	380/415-50	44.9/134	44.9/134	75.7/207	75.7/207	75.7/207	75.7/207	75.7/207

NOTE: See Legend and Notes on page 33.

Table 6C – Compressor Electrical Data, 30GT240-330

UNIT SIZE	NAMEPLATE V-Hz (3 Phase)	MODULE A Compressor Numbers						
		A1	A2	A3	A4	B1	B2	B3
		RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA
240	208/230-60	107.7/506	151.3/690	—/—	—/—	107.7/506	151.3/690	—/—
	460-60	53.9/253	75.7/345	—/—		53.9/253	75.7/345	
	575-60	41.7/176	62.2/176	—/—		41.7/176	62.2/176	
	380-60	55.8/280	80.2/382	—/—		55.8/280	80.2/382	
	346-50	46.8/259	55.8/294	55.8/294		80.2/400	80.2/400	
	230-50	77.0/342	87.9/366	87.9/366		107.7/545	107.7/545	
	380/415-50	44.9/223	53.9/253	53.9/253		75.7/345	75.7/345	
240-PW	208/230-60	107.7/304	151.3/414	—/—	—/—	107.7/304	151.3/414	—/—
	460-60	53.9/152	75.7/207	—/—		53.9/152	75.7/207	
	575-60	41.7/106	62.2/144	—/—		41.7/106	62.2/144	
	380-60	55.8/168	80.2/230	—/—		55.8/168	80.2/230	
	346-50	46.8/155	55.8/155	55.8/155		80.2/240	80.2/240	
	230-50	77.0/206	87.9/220	87.9/220		107.7/327	107.7/327	
	380/415-50	44.9/134	53.9/152	53.9/152		75.7/207	75.7/207	
270	208/230-60	107.7/506	107.7/506	107.7/506	—/—	107.7/506	107.7/506	107.7/506
	460-60	53.9/253	53.9/253	53.9/253		53.9/253	53.9/253	53.9/253
	575-60	41.7/176	41.7/176	41.7/176		41.7/176	41.7/176	41.7/176
	380-60	55.8/280	55.8/280	55.8/280		55.8/280	55.8/280	55.8/280
	346-50	55.8/294	55.8/294	80.2/400		55.8/294	80.2/400	80.2/400
	230-50	87.9/366	87.9/366	107.7/545		87.9/366	107.7/545	107.7/545
	380/415-50	53.9/253	53.9/253	75.7/345		53.9/253	75.7/345	75.7/345
270-PW	208/230-60	107.7/304	107.7/304	107.7/304	—/—	107.7/304	107.7/304	107.7/304
	460-60	53.9/152	53.9/152	53.9/152		53.9/152	53.9/152	53.9/152
	575-60	41.7/106	41.7/106	41.7/106		41.7/106	41.7/106	41.7/106
	380-60	55.8/168	55.8/168	55.8/168		55.8/168	55.8/168	55.8/168
	346-50	55.8/177	55.8/177	80.2/240		55.8/177	80.2/240	80.2/240
	230-50	87.9/220	87.9/220	107.7/327		87.9/220	107.7/327	107.7/327
	380/415-50	53.9/152	53.9/152	75.7/207		53.9/152	75.7/207	75.7/207
300	208/230-60	107.7/506	151.3/690	—/—	—/—	107.7/506	151.3/690	—/—
	460-60	53.9/253	75.7/345	—/—		53.9/253	75.7/345	
	575-60	41.7/176	62.2/176	—/—		41.7/176	62.2/176	
	380-60	55.8/280	80.2/382	—/—		55.8/280	80.2/382	
	346-50	46.8/259	55.8/294	55.8/294		80.2/400	80.2/400	
	230-50	77.0/342	87.9/366	87.9/366		107.7/545	107.7/545	
	380/415-50	44.9/223	53.9/253	53.9/253		75.7/345	75.7/345	
300-PW	208/230-60	107.7/304	151.3/414	—/—	—/—	107.7/304	151.3/414	—/—
	460-60	53.9/152	75.7/207	—/—		53.9/152	75.7/207	
	575-60	41.7/106	62.2/144	—/—		41.7/106	62.2/144	
	380-60	55.8/168	80.2/230	—/—		55.8/168	80.2/230	
	346-50	46.8/155	55.8/155	55.8/155		80.2/240	80.2/240	
	230-50	77.0/206	87.9/220	87.9/220		107.7/327	107.7/327	
	380/415-50	44.9/134	53.9/152	53.9/152		75.7/207	75.7/207	
330	208/230-60	107.7/506	107.7/506	107.7/506	—/—	107.7/506	107.7/506	107.7/506
	460-60	53.9/253	53.9/253	53.9/253		53.9/253	53.9/253	53.9/253
	575-60	41.7/176	41.7/176	41.7/176		41.7/176	41.7/176	41.7/176
	380-60	55.8/280	55.8/280	55.8/280		55.8/280	55.8/280	55.8/280
	346-50	55.8/294	55.8/294	80.2/400		55.8/294	80.2/400	80.2/400
	230-50	87.9/366	87.9/366	107.7/545		87.9/366	107.7/545	107.7/545
	380/415-50	53.9/253	53.9/253	75.7/345		53.9/253	75.7/345	75.7/345
330-PW	208/230-60	107.7/304	107.7/304	107.7/304	—/—	107.7/304	107.7/304	107.7/304
	460-60	53.9/152	53.9/152	53.9/152		53.9/152	53.9/152	53.9/152
	575-60	41.7/106	41.7/106	41.7/106		41.7/106	41.7/106	41.7/106
	380-60	55.8/168	55.8/168	55.8/168		55.8/168	55.8/168	55.8/168
	346-50	55.8/177	55.8/177	80.2/240		55.8/177	80.2/240	80.2/240
	230-50	87.9/220	87.9/220	107.7/327		87.9/220	107.7/327	107.7/327
	380/415-50	53.9/152	53.9/152	75.7/207		53.9/152	75.7/207	75.7/207

NOTE: See Legend and Notes on page 33.

Table 6C — Compressor Electrical Data, 30GT240-330 (cont)

UNIT SIZE	NAMEPLATE V-Hz (3 Phase)	MODULE B						
		Compressor Numbers						
		A1	A2	A3	A4	B1	B2	B3
		RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA
240	208/230-60	89.7/446	106.4/506			89.7/446	106.4/506	
	460-60	43.6/223	46.8/253			43.6/223	46.8/253	
	575-60	36.5/164	40.4/176			36.5/164	40.4/176	
	380-60	45.5/247	52.6/280	—/—	—/—	45.5/247	52.6/280	—/—
	346-50	44.9/247	79.5/382			44.9/247	79.5/382	
	230-50	77.0/342	107.7/545			77.0/342	107.7/545	
	380/415-50	43.6/223	65.4/345			43.6/223	65.4/345	
240-PW	208/230-60	89.7/268	106.4/304			89.7/268	106.4/304	
	460-60	44.9/134	48.7/152			44.9/134	48.7/152	
	575-60	33.3/ 98	33.3/106			33.3/ 98	33.3/106	
	380-60	44.9/148	53.8/168	—/—	—/—	44.9/148	53.8/168	—/—
	346-50	44.9/148	79.5/229			44.9/148	79.5/229	
	230-50	77.0/206	107.7/327			77.0/206	107.7/327	
	380/415-50	44.9/134	67.9/207			44.9/134	67.9/207	
270	208/230-60	89.7/446	106.4/506			89.7/446	106.4/506	
	460-60	43.6/223	46.8/253			43.6/223	46.8/253	
	575-60	36.5/164	40.4/176			36.5/164	40.4/176	
	380-60	45.5/247	52.6/280	—/—	—/—	45.5/247	52.6/280	—/—
	346-50	44.9/247	79.5/382			44.9/247	79.5/382	
	230-50	77.0/342	107.7/545			77.0/342	107.7/545	
	380/415-50	43.6/223	65.4/345			43.6/223	65.4/345	
270-PW	208/230-60	89.7/268	106.4/304			89.7/268	106.4/304	
	460-60	44.9/134	48.7/152			44.9/134	48.7/152	
	575-60	33.3/ 98	33.3/106			33.3/98	33.3/106	
	380-60	44.9/148	53.8/168	—/—	—/—	44.9/148	53.8/168	—/—
	346-50	44.9/148	79.5/229			44.9/148	79.5/229	
	230-50	77.0/206	107.7/327			77.0/206	107.7/327	
	380/415-50	44.9/134	67.9/207			44.9/134	67.9/207	
300	208/230-60	107.7/506	107.7/506	107.7/506		107.7/506	107.7/506	107.7/506
	460-60	53.9/253	53.9/253	53.9/253		53.9/253	53.9/253	53.9/253
	575-60	41.7/176	41.7/176	41.7/176		41.7/176	41.7/176	41.7/176
	380-60	55.8/280	55.8/280	55.8/280	—/—	55.8/280	55.8/280	55.8/280
	346-50	55.8/294	55.8/294	80.2/400		55.8/294	80.2/400	80.2/400
	230-50	87.9/366	87.9/366	107.7/545		87.9/366	107.7/545	107.7/545
	380/415-50	53.9/253	53.9/253	75.7/345		53.9/253	75.7/345	75.7/345
300-PW	208/230-60	107.7/304	107.7/304	107.7/304		107.7/304	107.7/304	107.7/304
	460-60	53.9/152	53.9/152	53.9/152		53.9/152	53.9/152	53.9/152
	575-60	41.7/106	41.7/106	41.7/106		41.7/106	41.7/106	41.7/106
	380-60	55.8/168	55.8/168	55.8/168	—/—	55.8/168	55.8/168	55.8/168
	346-50	55.8/177	55.8/177	80.2/240		55.8/177	80.2/240	80.2/240
	230-50	87.9/220	87.9/220	107.7/327		87.9/220	107.7/327	107.7/327
	380/415-50	53.9/152	53.9/152	75.7/207		53.9/152	75.7/207	75.7/207
330	208/230-60	107.7/506	107.7/506	107.7/506		107.7/506	107.7/506	107.7/506
	460-60	53.9/253	53.9/253	53.9/253		53.9/253	53.9/253	53.9/253
	575-60	41.7/176	41.7/176	41.7/176		41.7/176	41.7/176	41.7/176
	380-60	55.8/280	55.8/280	55.8/280	—/—	55.8/280	55.8/280	55.8/280
	346-50	55.8/294	55.8/294	80.2/400		55.8/294	80.2/400	80.2/400
	230-50	87.9/366	87.9/366	107.7/545		87.9/366	107.7/545	107.7/545
	380/415-50	53.9/253	53.9/253	75.7/345		53.9/253	75.7/345	75.7/345
330-PW	208/230-60	107.7/304	107.7/304	107.7/304		107.7/304	107.7/304	107.7/304
	460-60	53.9/152	53.9/152	53.9/152		53.9/152	53.9/152	53.9/152
	575-60	41.7/106	41.7/106	41.7/106		41.7/106	41.7/106	41.7/106
	380-60	55.8/168	55.8/168	55.8/168	—/—	55.8/168	55.8/168	55.8/168
	346-50	55.8/177	55.8/177	80.2/240		55.8/177	80.2/240	80.2/240
	230-50	87.9/220	87.9/220	107.7/327		87.9/220	107.7/327	107.7/327
	380/415-50	53.9/152	53.9/152	75.7/207		53.9/152	75.7/207	75.7/207

NOTE: See Legend and Notes on page 33.

Table 6D — Compressor Electrical Data, 30GT360-420

UNIT SIZE	NAMEPLATE V-Hz (3 Phase)	MODULE A						
		Compressor Numbers						
		A1	A2	A3	A4	B1	B2	B3
		RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA
360	208/230-60	89.8/446	107.7/506	151.3/690	—/—	89.8/446	107.7/506	151.3/690
	460-60	44.9/223	53.9/253	75.7/345		44.9/223	53.9/253	75.7/345
	575-60	36.6/164	41.7/176	62.2/240		36.6/164	41.7/176	62.2/240
	380-60	46.8/247	55.8/280	80.2/382		46.8/247	55.8/280	80.2/382
	346-50	80.2/400	80.2/400	80.2/400		80.2/400	80.2/400	80.2/400
	230-50	107.7/545	107.7/545	107.7/545		107.7/545	107.7/545	107.7/545
	380/415-50	75.7/345	75.7/345	75.7/345		75.7/345	75.7/345	75.7/345
360-PW	208/230-60	89.8/268	107.7/304	151.3/414	—/—	89.8/268	107.7/304	151.3/414
	460-60	44.1/349	53.9/152	75.7/207		44.9/134	53.9/152	75.7/207
	575-60	36.6/ 99	41.7/106	62.2/144		36.6/ 99	41.7/106	62.2/144
	380-60	46.8/149	55.8/168	80.2/230		46.8/149	55.8/168	80.2/230
	346-50	80.2/240	80.2/240	80.2/240		80.2/240	80.2/240	80.2/240
	230-50	107.7/327	107.7/327	107.7/327		107.7/327	107.7/327	107.7/327
	380/415-50	75.7/207	75.7/207	75.7/207		75.7/207	75.7/207	75.7/207
390	208/230-60	89.8/446	89.8/446	89.8/446	107.7/506	107.7/506	151.3/690	151.3/690
	460-60	44.9/223	44.9/223	44.9/223	53.9/253	53.9/253	75.7/345	75.7/345
	575-60	36.6/164	36.6/164	36.6/164	41.7/176	41.7/176	62.2/240	62.2/240
	380-60	46.8/247	46.8/247	46.8/247	55.8/280	55.8/280	80.2/382	80.2/382
	346-50	46.8/259	46.8/259	80.2/400	80.2/400	80.2/400	80.2/400	80.2/400
	230-50	77.0/342	77.0/342	107.7/545	107.7/545	107.7/545	107.7/545	107.7/545
	380/415-50	44.9/223	44.9/223	75.7/345	75.7/345	75.7/345	75.7/345	75.7/345
390-PW	208/230-60	89.8/268	89.8/268	89.8/268	107.7/304	107.7/304	151.3/414	151.3/414
	460-60	44.9/134	44.9/134	44.9/134	53.9/152	53.9/152	75.7/207	75.7/207
	575-60	36.6/ 99	36.6/ 99	36.6/ 99	41.7/106	41.7/106	62.2/144	62.2/144
	380-60	46.8/149	46.8/149	46.8/149	55.8/168	55.8/168	80.2/230	80.2/230
	346-50	46.8/155	46.8/155	80.2/240	80.2/240	80.2/240	80.2/240	80.2/240
	230-50	77.0/206	77.0/206	107.7/327	107.7/327	107.7/327	107.7/327	107.7/327
	380-415-50	44.9/134	44.9/134	75.7/207	75.7/207	75.7/207	75.7/207	75.7/207
420	208/230-60	89.8/446	89.8/446	89.8/446	107.7/506	107.7/506	151.3/690	151.3/690
	460-60	44.9/223	44.9/223	44.9/223	53.9/253	53.9/253	75.7/345	75.7/345
	575-60	36.6/164	36.6/164	36.6/164	41.7/176	41.7/176	62.2/240	62.2/240
	380-60	46.8/247	46.8/247	46.8/247	55.8/280	55.8/280	80.2/382	80.2/382
	346-50	46.8/259	46.8/259	80.2/400	80.2/400	80.2/400	80.2/400	80.2/400
	230-50	77.0/342	77.0/342	107.7/545	107.7/545	107.7/545	107.7/545	107.7/545
	380/415-50	44.9/223	44.9/223	75.7/345	75.7/345	75.7/345	75.7/345	75.7/345
420-PW	208/230-60	89.8/268	89.8/268	89.8/268	107.7/304	107.7/304	151.3/414	151.3/414
	460-60	44.9/134	44.9/134	44.9/134	53.9/152	53.9/152	75.7/207	75.7/207
	575-60	36.6/ 99	36.6/ 99	36.6/ 99	41.7/106	41.7/106	62.2/144	62.2/144
	380-60	46.8/149	46.8/149	46.8/149	55.8/168	55.8/168	80.2/230	80.2/230
	346-50	46.8/155	46.8/155	80.2/240	80.2/240	80.2/240	80.2/240	80.2/240
	230-50	77.0/206	77.0/206	107.7/327	107.7/327	107.7/327	107.7/327	107.7/327
	380/415-50	44.9/134	44.9/134	75.7/207	75.7/207	75.7/207	75.7/207	75.7/207

NOTE: See Legend and Notes on page 33.

Table 6D — Compressor Electrical Data, 30GT360-420 (cont)

UNIT SIZE	NAMEPLATE V-Hz (3 Phase)	MODULE B						
		Compressor Numbers						
		A1	A2	A3	A4	B1	B2	B3
		RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA	RLA/LRA
360	208/230-60	89.8/446	107.7/506	151.3/690	—/—	89.8/446	107.7/506	151.3/690
	460-60	44.9/223	53.9/253	75.7/345		44.9/223	53.9/253	75.7/345
	575-60	36.6/164	41.7/176	62.2/240		36.6/164	41.7/176	62.2/240
	380-60	46.8/247	55.8/280	80.2/382		46.8/247	55.8/280	80.2/382
	346-50	55.8/294	55.8/294	80.2/400		55.8/294	80.2/400	80.2/400
	230-50	87.9/366	87.9/366	107.7/545		87.9/366	107.7/545	107.7/545
	380/415/50	53.9/253	53.9/253	75.7/345		53.9/253	75.7/345	75.7/345
360-PW	208/230-60	89.8/268	107.7/304	151.3/414	—/—	89.8/268	107.7/304	151.3/414
	460-60	44.1/349	53.9/152	75.7/207		44.9/134	53.9/152	75.7/207
	575-60	36.6/ 99	41.7/106	62.2/144		36.6/ 99	41.7/106	62.2/144
	380-60	46.8/149	55.8/168	80.2/230		46.8/149	55.8/168	80.2/230
	346-50	55.8/177	55.8/177	80.2/240		55.8/177	80.2/240	80.2/240
	230-50	87.9/220	87.9/220	107.7/327		87.9/220	107.7/327	107.7/327
	380/415/50	53.9/152	53.9/152	75.7/207		53.9/152	75.7/207	75.7/207
390	208/230-60	89.8/446	107.7/506	151.3/690	—/—	89.8/446	107.7/506	151.3/690
	460-60	44.9/223	53.9/253	75.7/345		44.9/223	53.9/253	75.7/345
	575-60	36.6/164	41.7/176	62.2/240		36.6/164	41.7/176	62.2/240
	380-60	46.8/247	55.8/280	80.2/382		46.8/247	55.8/280	80.2/382
	346-50	80.2/400	80.2/400	80.2/400		80.2/400	80.2/400	80.2/400
	230-50	107.7/545	107.7/545	107.7/545		107.7/545	107.7/545	107.7/545
	380/415/50	75.7/345	75.7/345	75.7/345		75.7/345	75.7/345	75.7/345
390-PW	208/230-60	89.8/268	107.7/304	151.3/414	—/—	89.8/268	107.7/304	151.3/414
	460-60	44.1/349	53.9/152	75.7/207		44.9/134	53.9/152	75.7/207
	575-60	36.6/ 99	41.7/106	62.2/144		36.6/ 99	41.7/106	62.2/144
	380-60	46.8/149	55.8/168	80.2/230		46.8/149	55.8/168	80.2/230
	346-50	80.2/240	80.2/240	80.2/240		80.2/240	80.2/240	80.2/240
	230-50	107.7/327	107.7/327	107.7/327		107.7/327	107.7/327	107.7/327
	380/415/50	75.7/207	75.7/207	75.7/207		75.7/207	75.7/207	75.7/207
420	208/230-60	89.8/446	89.8/446	89.8/446	107.7/506	107.7/506	151.3/690	151.3/690
	460-60	44.9/223	44.9/223	44.9/223	53.9/253	53.9/253	75.7/345	75.7/345
	575-60	36.6/164	36.6/164	36.6/164	41.7/176	41.7/176	62.2/240	62.2/240
	380-60	46.8/247	46.8/247	46.8/247	55.8/280	55.8/280	80.2/382	80.2/382
	346-50	46.8/259	46.8/259	80.2/400	80.2/400	80.2/400	80.2/400	80.2/400
	230-50	77.0/342	77.0/342	107.7/545	107.7/545	107.7/545	107.7/545	107.7/545
	380/415/50	44.9/223	44.9/223	75.7/345	75.7/345	75.7/345	75.7/345	75.7/345
420-PW	208/230-60	89.8/268	89.8/268	89.8/268	107.7/304	107.7/304	151.3/414	151.3/414
	460-60	44.9/134	44.9/134	44.9/134	53.9/152	53.9/152	75.7/207	75.7/207
	575-60	36.6/ 99	36.6/ 99	36.6/ 99	41.7/106	41.7/106	62.2/144	62.2/144
	380-60	46.8/149	46.8/149	46.8/149	55.8/168	55.8/168	80.2/230	80.2/230
	346-50	46.8/155	46.8/155	80.2/240	80.2/240	80.2/240	80.2/240	80.2/240
	230-50	77.0/206	77.0/206	107.7/327	107.7/327	107.7/327	107.7/327	107.7/327
	380/415/50	44.9/134	44.9/134	75.7/207	75.7/207	75.7/207	75.7/207	75.7/207

NOTE: See Legend and Notes on page 33.

START-UP CHECKLIST FOR FLOTRONIC 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#_____
3) M#_____
   S#_____
   MTR#_____
4) M#_____
   S#_____
   MTR#_____

CIRCUIT #B

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

COOLER:

MODEL # _____ MANUFACTURED BY_____

SERIAL # _____ DATE_____

TYPE OF EXPANSION VALVES (check one): EXV_____ TXV_____

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_____

_____

B. Preliminary Equipment Check (cont)

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?_____

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 units only) 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 HOLDDOWN BOLTS._____

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

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

_____

C. Unit Start-Up (cont)

CHECK VOLTAGE IMBALANCE: AB_____ AC_____ BC_____

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

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____

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

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

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.

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 PRESSURE 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._____

VISUALLY CHECK PROCESSOR BOARD FOR THE FOLLOWING:

ASSURE ALL DIP SWITCHES ARE PROPERLY SET. _____

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

INSPECT ALL RIBBON CABLES AND PIN CONNECTORS FOR TIGHTNESS. _____

INSPECT RELAY BOARDS AND DISPLAY SET POINT BOARD CONNECTIONS FOR TIGHTNESS. _____

CHECK DIP SWITCH POSITIONS:

	ON	OFF		ON	OFF
1	_____	_____	5	_____	_____
2	_____	_____	6	_____	_____
3	_____	_____	7	_____	_____
4	_____	_____	8	_____	_____

C. Unit Start-Up (cont)

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

TURN THE START/STOP SWITCH TO "START". _____

THE SETPOINT BOARD'S "LED" SHOULD DISPLAY NUMBER "20". _____

PUSH THE DISPLAY BUTTON ONCE TO ENTER QUICK TEST MODE. _____

SET POINT BOARD SHOULD DISPLAY NUMBER "88". _____

FOLLOW THE CONTROLS AND TROUBLESHOOTING QUICK TEST INSTRUCTIONS. BE SURE TO CHECK FOR PROPER FAN ROTATION ON QUICK TEST STEPS 3.1 AND 3.2.

QUICK TEST NUMBER READOUTS — INDICATE RESULTS BELOW:

STEPS #												
	1	_____	8	_____	15	_____	22	_____	29	_____	36	_____
	2	_____	9	_____	16	_____	23	_____	30	_____	37	_____
	3	_____	10	_____	17	_____	24	_____	31	_____	38	_____
	4	_____	11	_____	18	_____	25	_____	32	_____	39	_____
	5	_____	12	_____	19	_____	26	_____	33	_____	40	_____
	6	_____	13	_____	20	_____	27	_____	34	_____	41	_____
	7	_____	14	_____	21	_____	28	_____	35	_____	42	_____

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	_____	_____

TXV UNITS ONLY: CHECK AND ADJUST SUPERHEAT.

USING A DC VOLT-METER AND VOLTAGE VS. TEMPERATURE CHART: MEASURE THE VOLTAGE AT THE J1 THERMISTOR CONNECTIONS ON THE PROCESSOR BOARD WHILE THE UNIT IS OPERATING. INDICATE THE CORRESPONDING VOLTAGE AND TEMPERATURE FOR EACH THERMISTOR:

T1 = _____ VDC = _____

T2 = _____ VDC = _____

T3 = _____ VDC = _____

T4 = _____ VDC = _____

T5 = _____ VDC = _____

T6 = _____ VDC = _____

T7 = _____ VDC = _____

T8 = _____ VDC = _____

NOTES:

_____

_____

_____

_____

_____

Table 7 — Condenser Fan Electrical Data

UNIT SIZE	NAMEPLATE VOLTAGE (V-Ph-Hz)	STANDARD CONDENSER FANS					HIGH STATIC CONDENSER FANS				
		Total Quantity	Hp	kW	(Quantity) FLA (ea)	(Quantity) LRA (ea)	Total Quantity	Hp	kW	(Quantity) FLA (ea)	(Quantity) LRA (ea)
080,090	208/230-3-60	6	1	0.746	(4) 5.4, (2) 5.5	(4) 31.6, (2) 30.0	6	5	3.730	(6) 14.6	(6) 41.6
	460-3-60				(4) 2.7, (2) 2.8	(4) 31.6, (2) 30.0				(6) 6.3	(6) 41.6
	575-3-60				(6) 3.4	(6) 30.0				(6) 5.2	(6) 42.0
	380-3-60				(6) 3.9	(6) 20.9				(6) 7.4	(6) 54.0
	346-3-50				(6) 4.4	(6) 20.9				(6) 8.7	(6) 53.0
	380/415-3-50				(6) 3.0	(6) 30.0				(6) 7.3	(6) 41.0
100,110, 240B,270B	208/230-3-60	8	1	0.746	(6) 5.4, (2) 5.5	(6) 31.6, (2) 30.0	8	5	3.730	(8) 14.6	(8) 41.6
	460-3-60				(6) 2.7, (2) 2.8	(6) 31.6, (2) 30.0				(8) 6.3	(8) 41.6
	575-3-60				(8) 3.4	(8) 30.0				(8) 5.2	(8) 42.0
	380-3-60				(8) 3.9	(8) 20.9				(8) 7.4	(8) 54.0
	346-3-50				(8) 4.4	(8) 20.9				(8) 8.7	(8) 53.0
	230-3-50**				(8) 6.4	(8) 30.0				(8) 12.2	(8) 41.6
	380/415-3-50				(8) 3.0	(8) 30.0				(8) 7.3	(8) 41.0
130-170	208/230-3-60	10	1	0.746	(6) 5.4, (4) 5.5	(6) 31.6, (4) 30.0	10	5	3.730	(10) 14.6	(10) 41.6
	460-3-60				(6) 2.7, (4) 2.8	(6) 31.6, (4) 30.0				(10) 6.3	(10) 41.6
	575-3-60				(10) 3.4	(10) 30.0				(10) 5.2	(10) 42.0
	380-3-60				(10) 3.9	(10) 20.9				(10) 7.4	(10) 54.0
	346-3-50				(10) 4.4	(10) 20.9				(10) 8.7	(10) 53.0
	230-3-50				(10) 6.4	(10) 30.3				(10) 12.2	(10) 41.6
	380/415-3-50				(10) 3.0	(10) 30.0				(10) 7.3	(10) 41.0
190-210, 240A,270A, 300A,B-420A,B	208/230-3-60	12	1	0.746	(8) 5.4, (4) 5.5	(8) 31.6, (4) 30.0	12	5	3.730	(12) 14.6	(12) 41.6
	460-3-60				(8) 2.7, (4) 2.8	(8) 31.6, (4) 30.0				(12) 6.3	(12) 41.6
	575-3-60				(12) 3.4	(12) 30.0				(12) 5.2	(12) 42.0
	380-3-60				(12) 3.9	(12) 20.9				(12) 7.4	(12) 54.0
	346-3-50				(12) 4.4	(12) 20.9				(12) 8.7	(12) 53.0
	230-3-50				(12) 6.4	(12) 30.3				(12) 12.2	(12) 41.6
	380/415-3-50				(12) 3.0	(12) 30.0				(12) 7.3	(12) 41.0

LEGEND AND NOTES 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%.
†Wherever across-the-line and part-wind data differs, the higher value of the two is listed.
**240B, 270B only.

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 ON-OFF circuit switch is off.
4. Units have the following power wiring terminal blocks and parallel conductors:

UNIT SIZE	VOLTAGE	TERMINAL BLOCKS	PARALLEL CONDUCTORS
080 to 110, 240B, 270B	208/230	1	6
	460	1	3
	575	1	3
	380	1	3
	230**	1	6
	346	1	3
	380/415	1	3
130 to 210, 240A, 270A, 300A,B to 420A,B	208/230	3	9
	460	2	6
	575	2	6
	380	2	6
	230	3	9
	346	2	6
	380/415	2	6

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 8 cooler heaters, 210 w each, and a 120-w circuit board heater.

For 208/230-3-60 and 240B, 270B, 230-3-50 units, larger than 500 kcmil conductors are required. Power must be supplied by 6 parallel conductors for these units.

30GT130-210, 240A, 270A, and 300-420 Units — The field power wiring enters the unit through the left side of the cooler side power box. The control power enters the control box on the compressor side of the unit.

NOTE: If optional non-fused disconnect is installed, power wiring must enter through center panel of unit (disconnect location).

IMPORTANT: Do not obstruct the field cooler connections when installing field power into the power box. Use 90-degree liquid-tight conduit fittings to connect field power to the unit and avoid the cooler piping area.

All units have a single location for power connection to simplify field power wiring. The maximum acceptable wire size for the terminal block is 500 kcmil. Copper, copper-clad aluminum, or aluminum conductors are acceptable for all units except 30GT210, 390A, and 420 208/230-3-60 units. These units require copper only. For 208/230-3-60 and 230-3-50 units, 9 parallel conductors are required. All other voltages require 6 parallel conductors.

IMPORTANT: The 30GT130-420 units have a factory-installed option for a non-fused disconnect for power and control entry. If the unit is equipped with this option, all field wiring should be made to the non-fused disconnect rather than the unit terminal blocks.

FIELD CONTROL POWER CONNECTIONS (See Fig. 19-22.) — *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 right side of the control section.

For 30GT080-110, 240B, 270B, 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.

For 30GT130-210 380/415-3-50 units: Control voltage is tapped from line to neutral. 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 230-, 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 8 cooler heaters (if equipped) at 210 watts each, and the electronic board heater at 120 watts.

⚠ 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.

An interlock circuit for external safeties, such as the chilled water flow switch (CWFS), remote on-off, and chilled water pump interlock (CWPI) is provided between terminals TB6-3 and TB6-4 for field use. To use this circuit, remove the factory jumper and install the switches.

Step 6 — 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 temperature reset board and accessory thermistor (used for any of the following types of temperature reset):
  - — Return water temperature reset
  - — Space temperature reset (requires accessory thermistor)
  - — Outside air temperature reset (requires accessory thermistor)
- Chilled water flow switch

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, Gage Panel, Sound Reduction Kit and Security Grille Package.

LEGEND AND NOTES FOR WIRING DIAGRAMS
(FIG. 19-22)

A	—	Alarm
CWFS	—	Chilled Water Flow Switch
CWPI	—	Chilled Water Pump Interlock
GND	—	Ground
NEC	—	National Electrical Code
O.A.	—	Outdoor Air
TB	—	Terminal Block
▬▬▬		Field Power Wiring
- - - -		Field Control Wiring
———		Factory Installed Wiring

NOTES:
1. Factory wiring is in accordance with NEC (U.S.A.). 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, except use copper conductors only for the following units: 30GT110 346-v; 30GT110 380/415-v part-wind start; 30GT210 208/230-v part-wind start and across-the-line start.
3. Power for control circuit should be supplied from a separate source through a field-supplied fused disconnect with 30-amp maximum protection for 115-v circuits, and 15-amp maximum protection for 230-v control circuit. For a unit with cooler heaters (unit sizes 080-110), the field-supplied disconnect must have 30-amp maximum protection for 115-v control circuits, and 15-amp maximum protection for 230-v control circuit, 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 3 and 4 of TB6 are for field connection for remote ON-OFF control. The contacts must be rated for dry circuit application capable of reliably switching a 5 vdc, .5 mA load. Remove jumper between 3 and 4 of TB6 if remote ON-OFF is installed.
5. The maximum load allowed for the remote alarm circuit is 75 va sealed, 360 va inrush at 115- or 230-v, depending on model. Remove resistor across terminals 1 and 2 of TB3 (TB5 on unit sizes 080-110 and 240B, 270B) when using remote alarm.
6. Dimensions in [ ] are millimeters.

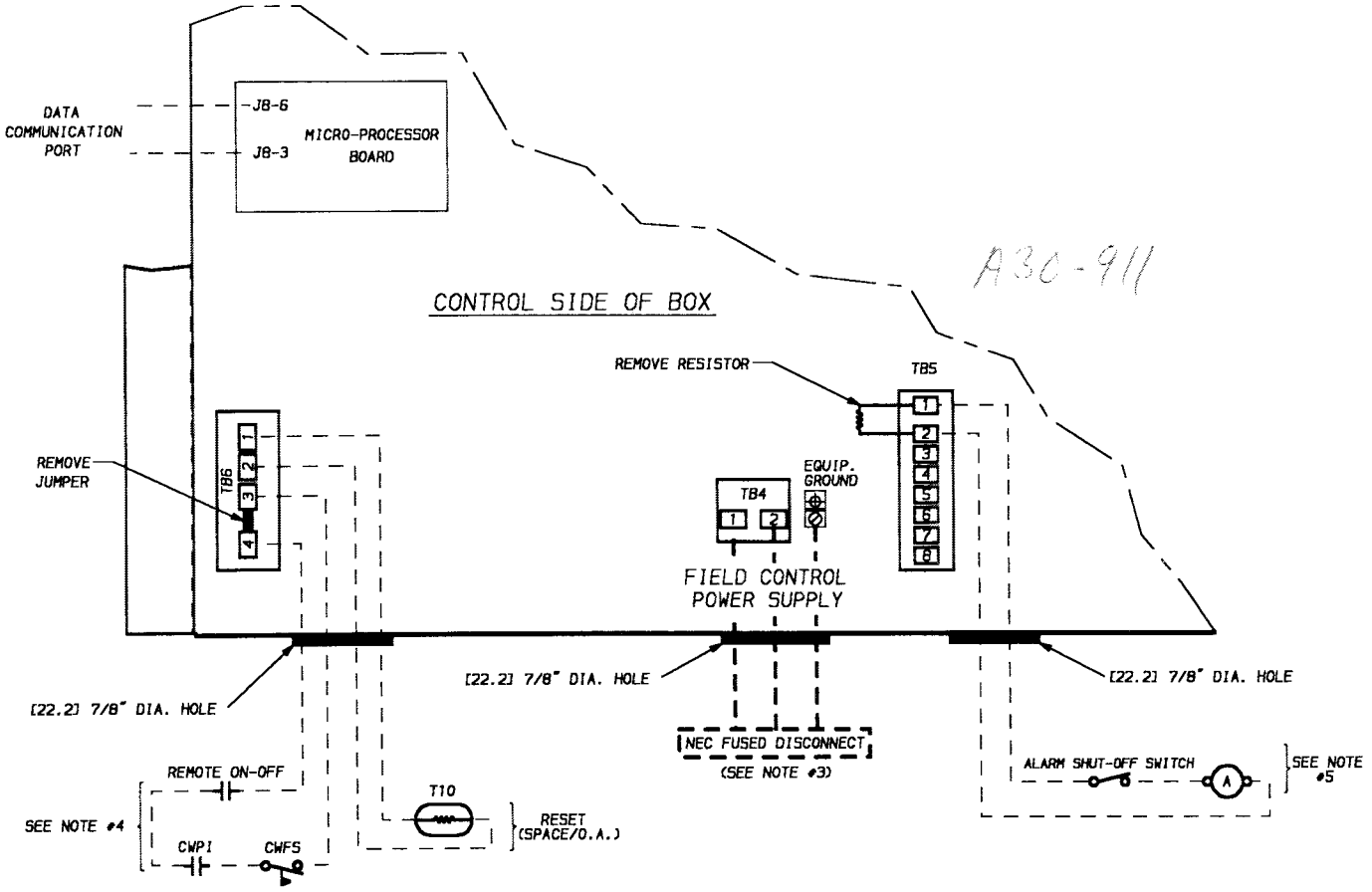


Fig. 19 – Field Control Power Wiring; Unit Sizes 080-110

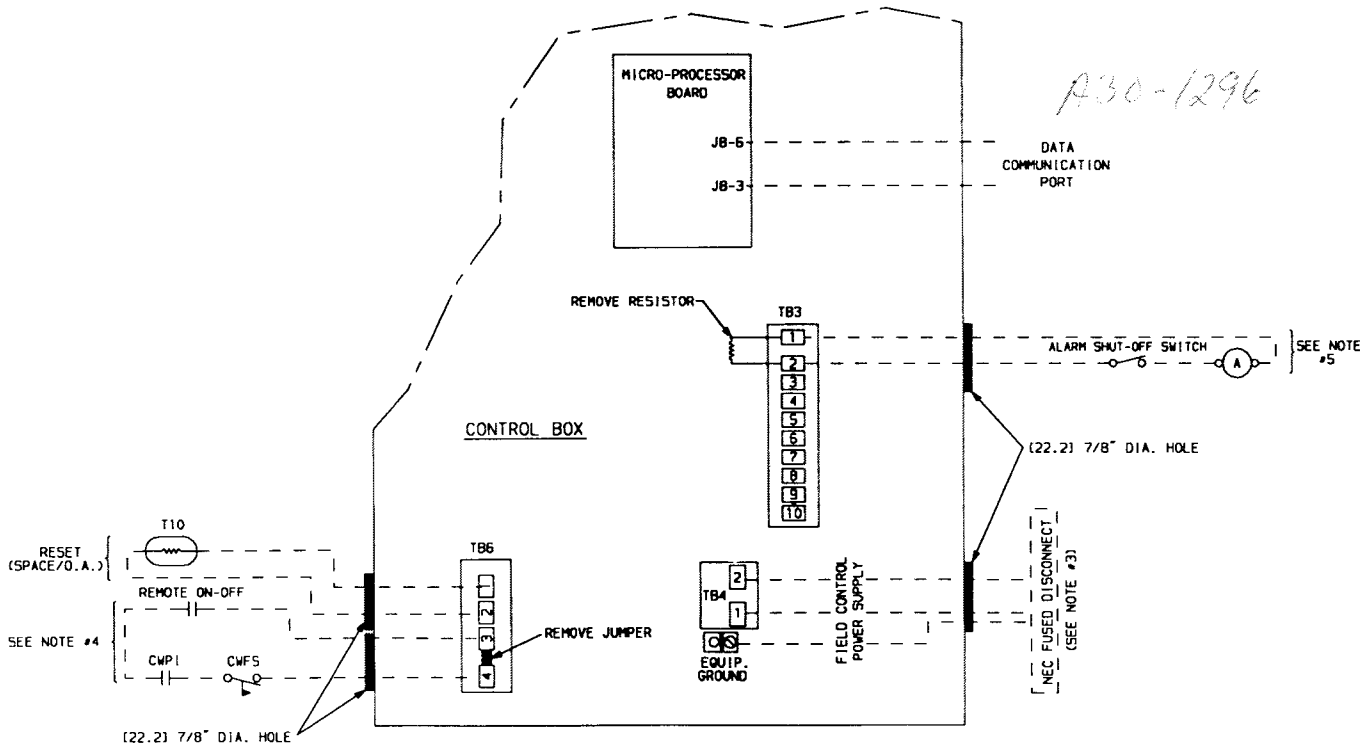


Fig. 20 – Field Control Power Wiring; Unit Sizes 130-210

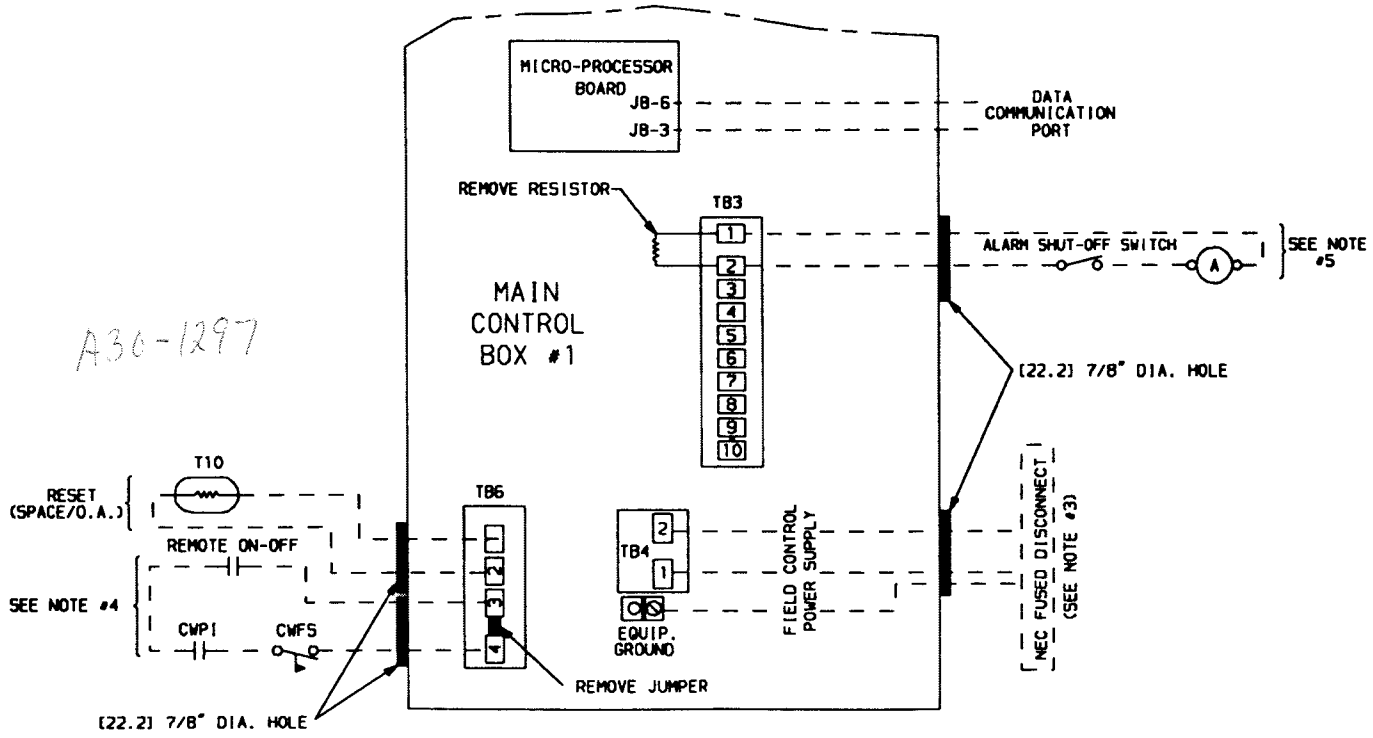


Fig. 21A — Field Control Power Wiring; Unit Sizes 240A, 270A

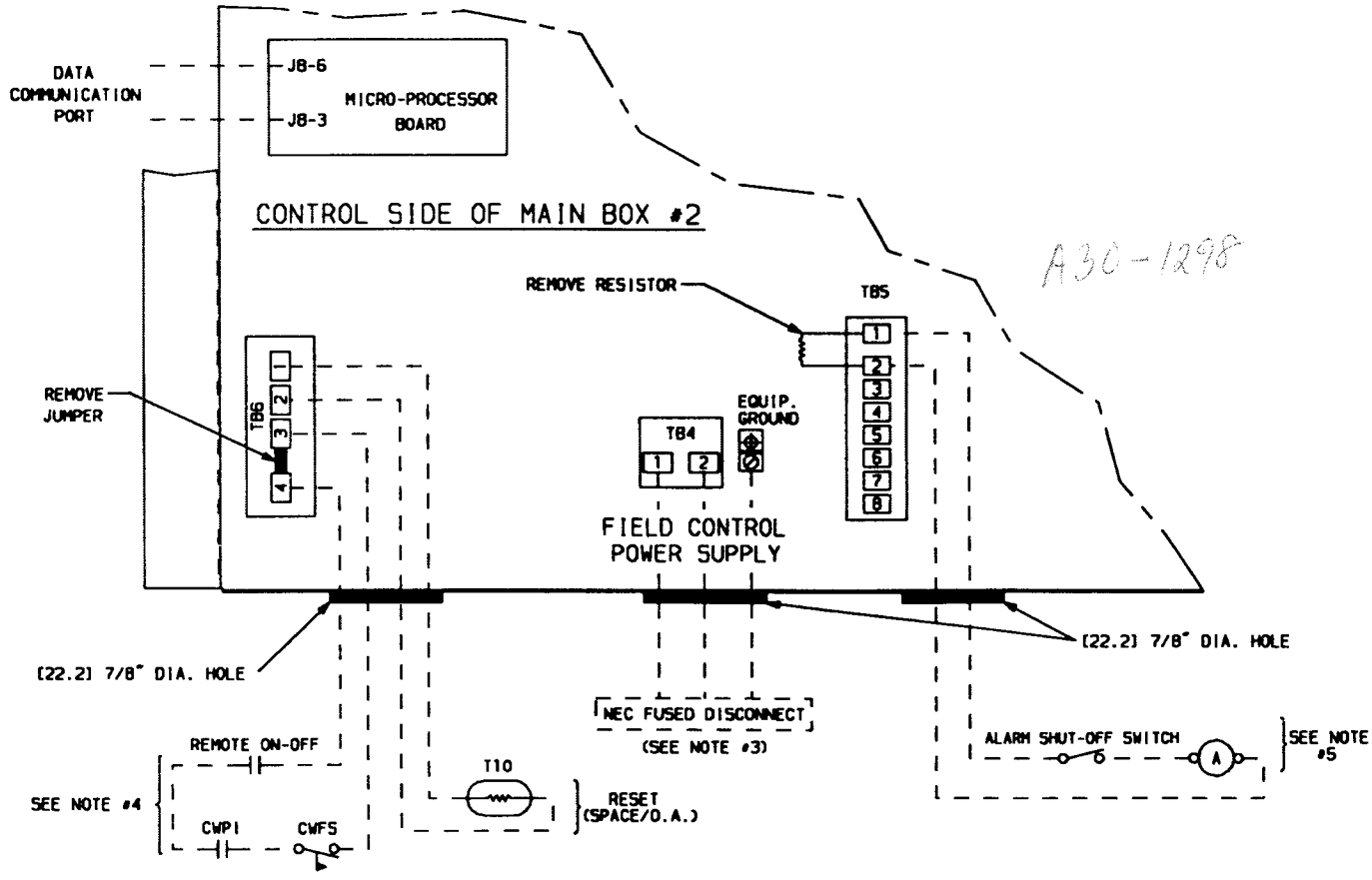


Fig. 21B — Field Control Power Wiring; Unit Sizes 240B, 270B

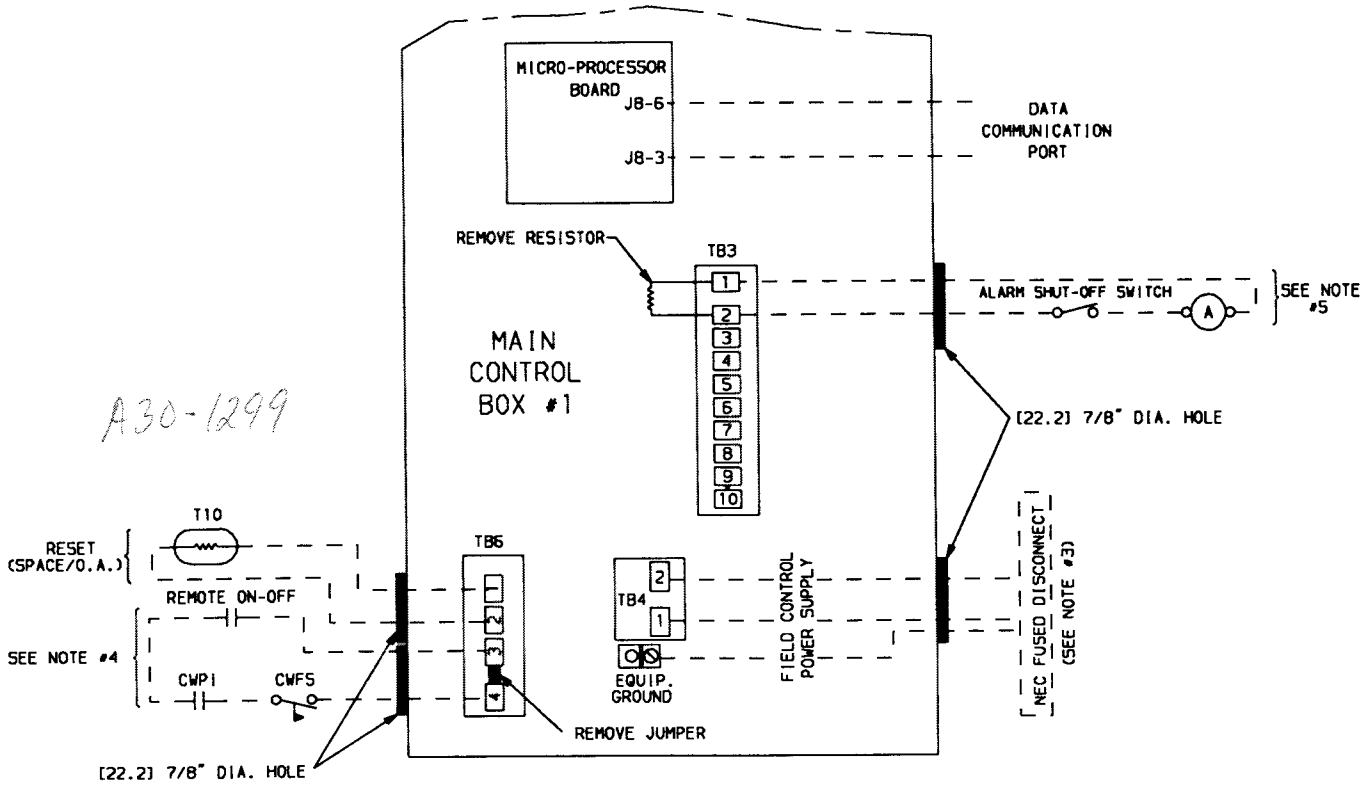


Fig. 22A — Field Control Power Wiring; Unit Sizes 300A, 330A, 360A, 390A, 420A

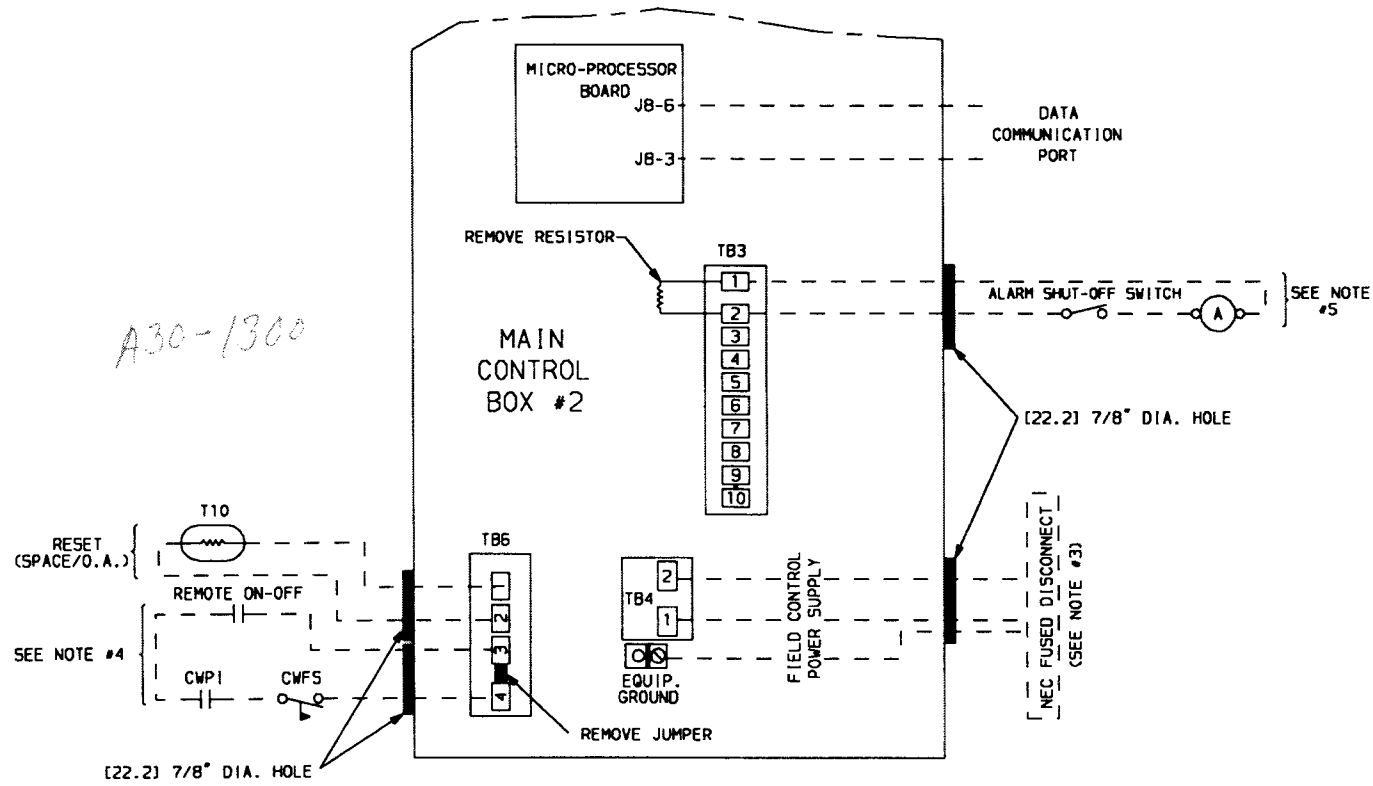


Fig. 22B — Field Control Power Wiring; Unit Sizes 300B, 330B, 360B, 390B, 420B

PRE-START-UP

IMPORTANT: Before beginning Pre-Start-Up or Start-Up, review Start-Up Checklist for Flotronic™ 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

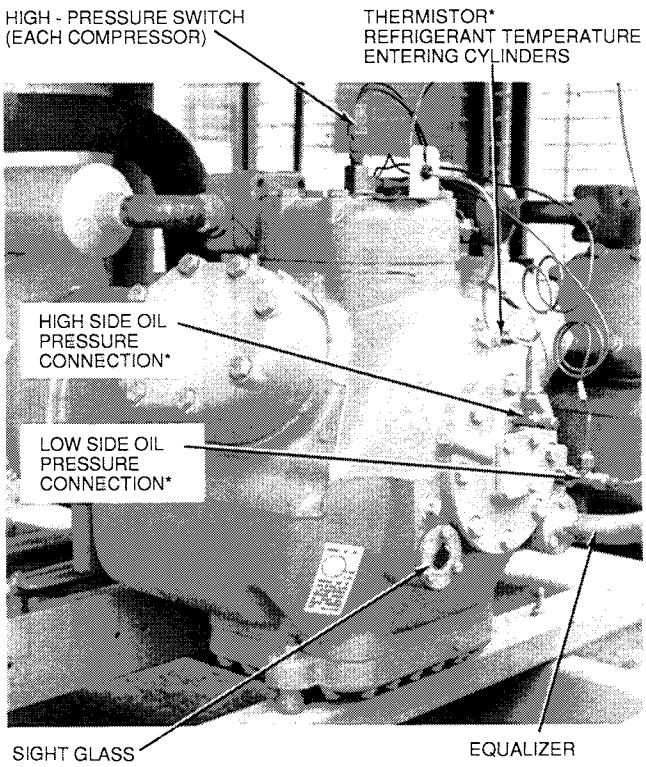
1. Check all auxiliary components, such as the chilled water circulating pump, air-handling equipment, or other equipment to which the chiller supplies liquid. Consult manufacturer's instructions. If the unit has field-installed accessories, be sure all are properly installed and wired correctly. Refer 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 glass. See Fig. 23. 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 Compressors section on page 51 for Carrier-approved oils.
7. Electrical power source must agree with unit nameplate.
8. *Crankcase heaters must be firmly locked into compressors, and must be on for 24 hours prior to start-up.*
9. Fan motors are 3 phase. Check rotation of fans during the Quick Test (see below). Fan rotation is clockwise as viewed from top of unit. If fan is not turning clockwise, reverse 2 of the power wires.
10. Check compressor suspension. Mounting rails must be floating freely on the springs.
11. Perform Quick Test to verify proper settings.

Quick Test (See Fig. 24 and Table 8.) — *Both main power and control circuit power must be on.*

The Quick Test program utilizes a 2-digit LED display (Fig. 24) on set point board to show status of all input and output signals to microprocessor control. Display action and Quick Test procedure are described as follows:

The Quick Test is a 42-step program that provides a means of checking all input and output signals of microprocessor control prior to unit start-up. This check ensures that all control options, thermistors, and status switches are in proper working order.

To initiate the Quick Test program, first turn unit control switch to the ON position. When a **20** appears in display, immediately press display button *once*. An **88** will



*Lead compressor only.

Fig. 23 — Compressor Connections (Lead Compressor Shown)

appear in display and alarm light will be energized; this indicates that microprocessor in control system is ready to run Quick Test program.

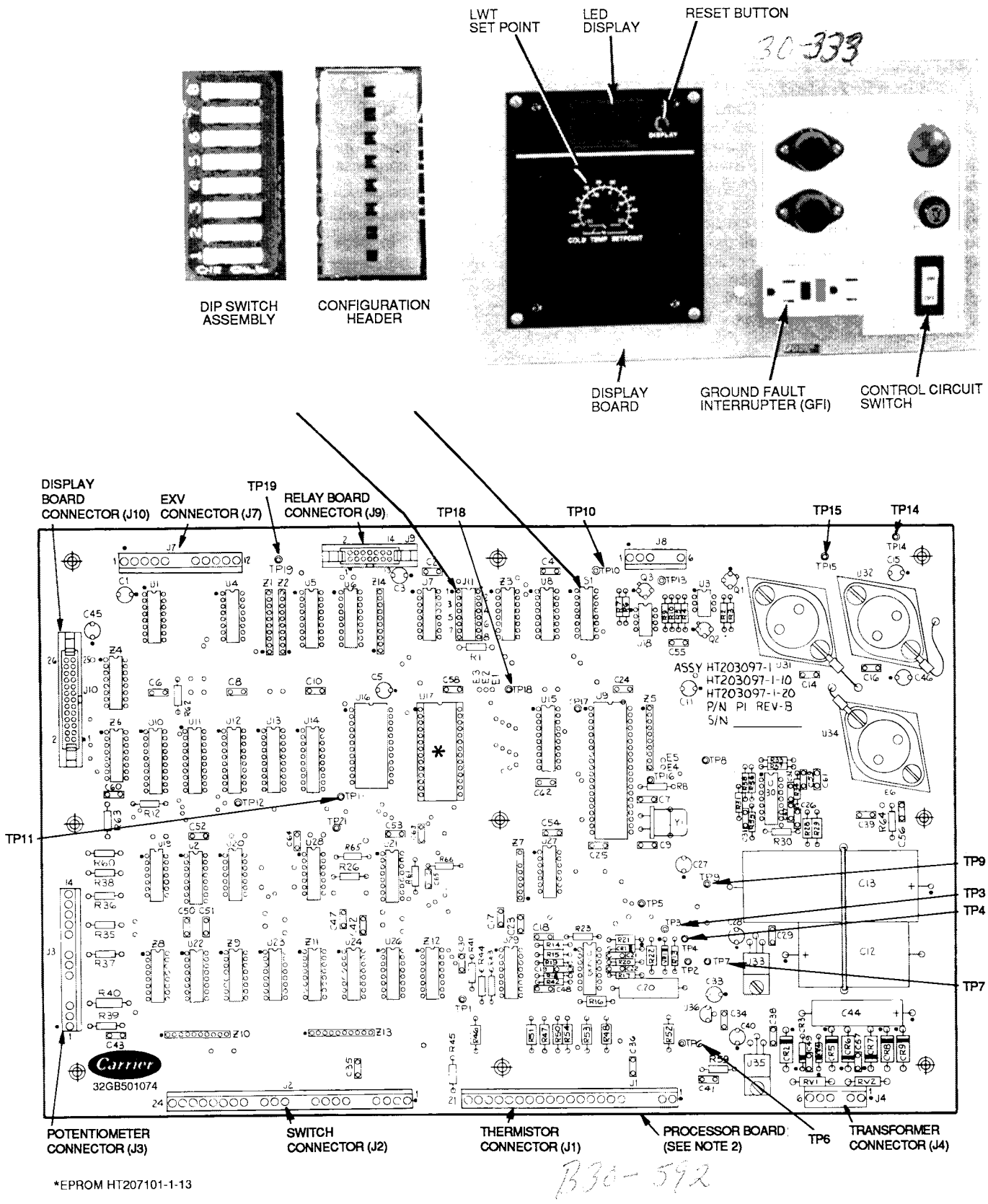
IMPORTANT: Do not allow unit control circuit to remain energized with **20** showing in display for more than 2 minutes. If display button is not pressed within this time, control will attempt to start unit.

For each step of the 42-step program, display button must be pressed *twice*. On first press, step number is displayed; second press initiates required action, and code as shown in Table 8 is displayed.

NOTE: Step number is a numeral followed by a decimal point (a 2-digit number has a decimal point after *each* numeral). Action code number is one or 2 digits with no decimal point(s).

IMPORTANT: Once Quick Test is initiated, display button must be pressed at least once every 10 minutes for control to remain in Quick Test mode. If button is not pressed within this time, control will attempt to start unit.

To recheck any step in Quick Test, control must be recycled by turning unit control circuit switch off for a few seconds, then on again. Restart Quick Test program as described above and proceed through Quick Test steps. Press display button *twice* for each step until step to be rechecked is reached.



*EPROM HT207101-1-13

NOTE: Do not remove label covering EPROM. Removal causes program to be erased.

NOTES:
1. Refer to Controls and Troubleshooting publication for details.
2. Processor Board is inverted from position shown when installed in unit.

Fig. 24 – Center of Flotronic™ Control System (080-110 Unit Shown)

The Quick Test program is divided into 3 sections as described below and shown in Table 8. For more detailed information, refer to Controls and Troubleshooting publication.

A. QUICK TEST STEPS 1 - 15: UNIT CONFIGURATION — Microprocessor in unit control system is programmed by 2 switch assemblies located on processor board (Fig. 24). Configuration header is factory set and cannot be changed in the field. The DIP switch assembly contains 8 microswitches that must be set in accordance with various options and accessories selected by customer. As shipped from factory, all DIP switches except those controlling pulldown option (switch no. 3) and those controlling compressor unloaders (switch no. 7 on 30GT080-330, and 360B 50 Hz units) are in OFF position. Switch no. 8 is OFF for water units, and ON for brine units. All DIP switches should be checked and set to proper position for options selected during Quick Test.

DIP switch assembly, functions and display codes are shown in Fig. 24 and in Tables 8 and 9. Refer to Controls and Troubleshooting publication for details.

B. QUICK TEST STEPS 16 - 30; THERMISTORS AND SET POINT POTENTIOMETERS — In these steps, microprocessor checks resistance values of all sensors and set point potentiometers to ensure they are functional and set within proper range for unit configuration.

Nominal resistance values for all sensors range from 363,000 to 216 ohms. Normal display code for good sensors and potentiometers is 1. Display code 0 indicates a faulty potentiometer, thermistor or wiring. A 0 display will indicate a particular option is not being used, i.e., demand limit not installed.

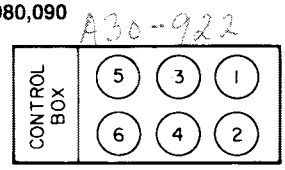
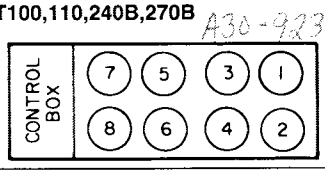
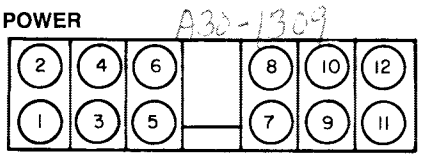
Tables 8 and 10 show set point potentiometer functions, locations, and Quick Test display codes.

C. OUTPUT RELAYS, STEPS 31 - 42 — These Quick Test steps allow microprocessor to check output signals from relay boards in unit control system. In addition, operation of all condenser fans and compressors is checked at each step.

Normal display code for steps 3.1 through 3.4 is 1. In steps 3.5 through 4.2, when appropriate, each compressor is started and allowed to run for approximately 10 seconds. At start-up 0 will appear, followed by a 1 in a few seconds. At end of 10-second test, code 0 returns to display indicating that test step has been successfully completed. Code 1 indicated that compressor protection circuit (CPCS) or control relay (CR) was tested.

Fan and compressor operating sequence for Quick Test steps 3.1 through 4.2 are shown in Table 8 and Fig. 25.

If Quick Test steps do not operate as described, a defect exists in one or more of the following; relay being tested; electronic control; unit wiring. Refer to Controls and Troubleshooting publication for additional information.

FAN ARRANGEMENT	FAN NO.	CONTROLLED BY	
		During Quick Test*	Normal Control
30GT080,090 	1	3.5.	Compressor No. A1
	2	3.9.	Compressor No. B1
	3,4	3.1.	First Stage of Condenser Fans
	5,6	3.2.	Second Stage of Condenser Fans
30GT100,110,240B,270B 	1	3.5.	Compressor No. A1
	2	3.9.	Compressor No. B1
	3,4	3.1.	First Stage of Condenser Fans
	5,6,7,8	3.2.	Second Stage of Condenser Fans
30GT130-420 (except 240B, 270B)† 	5,7	3.5.	Compressor No. A1
	6,8	3.9.	Compressor No. B1
	3,4,9,10	3.1.	First Stage of Condenser Fans
	1,2,11,12	3.2.	Second Stage of Condenser Fans

*Quick Test display numbers.
†Fan numbers 11 and 12 do not apply to 130-170 units.

Fig. 25 — Condenser Fan Sequence

Table 8 – Quick Test 88

SECTION A. – Configuration and Switch Check

QUICK TEST STEP NO.	NORMAL DISPLAY	STEP DESCRIPTION	HEADER POSITION OR CONTROL SWITCH
1	00	Type Unit — Air-Cooled Chiller	Configuration Header: 1 and 2
2	3 through 7	No. of Compressors	Configuration Header: 3, 4, and 5
		3 = 080	
		4 = 090-110, 130 (60 Hz), 240A (60 Hz) 240B, 270B, 300A (60 Hz)	
		5 = 130 (50 Hz), 150, 240A (50 Hz), 300A (50 Hz)	
		6 = 170, 190, 270A, 300B, 330, 360, 390B	
		7 = 210, 390A, 420	
3	0 or 2	No. of Unloaders (080-170, 240-330, 360 [50 Hz]) NOTE: There are no unloaders on 190-210 units.	DIP Switches 6 and 7
4	0 or 1	0 = Water	DIP Switch 8
		1 = Brine*	
5	1 or 0	1 = EXV	Configuration Header: 6
		0 = TXV	
6	50 or 60	50 = 50 Hz	Configuration Header: 7
		60 = 60 Hz	
7	0 or 1	0 = External Reset	DIP Switch 1
		1 = Return Water Reset	
8	0 or 1	0 = Reset Disabled	DIP Switch 2
		1 = Reset Enabled	
9	0 or 1	0 = Pulldown Disabled	DIP Switch 3
		1 = Pulldown Enabled	
10	0 or 1	0 = Demand Limit Disabled	DIP Switch 5
		1 = Demand Limit Enabled	
11	0 or 1	0 = Remote On/Off — Switch/Jumper Open	TB6-3 and TB6-4
		1 = Remote On/Off — Switch/Jumper Closed	
12	0 or 1	0 = Loss-of-Charge Switch A Open	Circuit A Loss-of-Charge Switch
		1 = Loss-of-Charge Switch A Closed	
13	0 or 1	0 = Loss-of-Charge Switch B Open	Circuit B Loss-of-Charge Switch
		1 = Loss-of-Charge Switch B Closed	
14	0 or 1	0 = Low Oil Pressure Switch A Open	Circuit A Low Oil Pressure Switch
		1 = Low Oil Pressure Switch A Closed	
15	0 or 1	0 = Low Oil Pressure Switch B Open	Circuit B Low Oil Pressure Switch
		1 = Low Oil Pressure Switch B Closed	

*Do not change select switch to brine on units that do not have modifications for brine. Special modifications are required. Contact Carrier for details.

NOTE: See Legend on page 42.

Table 8 — Quick Test 88 (cont)

SECTION B. — Thermistor and Potentiometer Checkout

QUICK TEST STEP NO.	NORMAL DISPLAY	STEP DESCRIPTION	THERMISTOR OR POTENTIOMETER
1.6	1	1 — Thermistor OK 0 — Thermistor Faulty	T1 — Cooler Leaving Water Thermistor
1.7	1	1 — Thermistor OK 0 — Thermistor Faulty	T2 — Cooler Entering Water Thermistor
1.8	1	1 — Thermistor OK 0 — Thermistor Faulty	T3 — Saturated Condensing Thermistor, Circuit A
1.9	1	1 — Thermistor OK 0 — Thermistor Faulty	T4 — Saturated Condensing Thermistor, Circuit B
2.0	1 or 0	1† — Thermistor OK 0 — Thermistor Faulty or Not Used	T5 — Cooler Thermistor, Circuit A (EXV Units)
2.1	1 or 0	1† — Thermistor OK 0 — Thermistor Faulty or Not Used	T6 — Cooler Thermistor, Circuit B (EXV Units)
2.2	1 or 0	1† — Thermistor OK 0 — Thermistor Faulty or Not Used	T7 — Compressor Thermistor, Circuit B (EXV Units)
2.3	1 or 0	1† — Thermistor OK 0 — Thermistor Faulty or Not Used	T8 — Compressor Thermistor, Circuit B (EXV Units)
2.4	1 or 0	1 — Thermistor OK 0 — Thermistor Faulty or Not Used	T10 — Accessory Remote Thermistor
2.5	1	1 — Potentiometer OK 0 — Potentiometer Faulty	P1 — Leaving Fluid Set Point Potentiometer
2.6	0	No Significance	—
2.7	1 or 0	1 — Potentiometer OK 0 — Potentiometer Faulty or Option Not Used	P3 — Accessory Reset Limit Potentiometer
2.8	1 or 0	1 — Potentiometer(s) OK 0 — Potentiometer(s) Faulty or Option Not Used	P4 — Accessory Demand Limit Potentiometer(s)
2.9	1 or 0	1 — Potentiometer OK 0 — Potentiometer Faulty or Option Not Used	P5 — Accessory Reset Ratio Potentiometer
3.0	1 or 0	1 — Potentiometer OK 0 — Potentiometer Faulty or Option Not Used	P6 — Accessory Reset Set Point Potentiometer

LEGEND

CPCS — Compressor Protection Control System
CR — Control Relay
EXV — Electronic Expansion Valve
FIOP — Factory-Installed Option
TXV — Thermostatic Expansion Valve

†Display is 1 for Flotronic™ EXV units only.

Display is 0 for 080-110 Flotronic FIOP units (with TXV).

Table 8 — Quick Test 88 (cont)

SECTION C. — Output Relay Check

QUICK TEST STEP NO.	NORMAL DISPLAY	STEP DESCRIPTION	RELAY NO.
3.1	1	Energize First Stage of Condenser Fans 080-110 — OFM3, OFM4 130-210 — OFM3, OFM4, OFM9, OFM10	K11
3.2	1	Energize Second Stage of Condenser Fans 080, 090 — OFM5, OFM6 100, 110 — OFM5, OFM6, OFM7, OFM8 130-170 — OFM1, OFM2 190-210 — OFM1, OFM2, OFM11, OFM12	K12
3.3	1	Energize Liquid Line Solenoid Valve (080-110, TXV only), Circuit A	K9
3.4	1	Energize Liquid Line Solenoid Valve (080-110, TXV only), Circuit B	K10
3.5	0 → 1 → 0 **	Energize Compressor A1 and OFM1 (080-110) Energize Compressor A1, OFM5, and OFM7 (all other unit sizes)	K1
3.6	0 → 1 → 0 **	Energize Compressor A2	K2
3.7	0	No Action (080-110, 130 [60 Hz])	K3
	0 → 1 → 0 **	Energize Compressor A3 (130, [50 Hz], 150-210)	
3.8	0	Energize Unloader A1 (080-170)	K4
	0 → 1 → 0 **	Energize Compressor A4 (210)	
3.9	0 → 1 → 0 **	Energize Compressor B1, OFM2 (080-110) Energize Compressor B1, OFM6, and OFM8 (all other unit sizes)	K5
4.0	0 → 1 → 0 **	No Action (080) Energize Compressor B2 (all other unit sizes)	K6
4.1	0	No Action (080-150)	K7
	0 → 1 → 0 **	Energize Compressor B3 (170-210)	
4.2	0	Energize Unloader B1 (080-170) No Action (190-210)	K8

LEGEND

CPCS — Compressor Protection Control System
CR — Control Relay
EXV — Electronic Expansion Valve
FIOP — Factory-Installed Option
TXV — Thermostatic Expansion Valve

**Compressors will be energized for 10 seconds. 0 indicates open CPCS or CR module contacts (compressor energized). 1 indicates closed CPCS or CR contacts (compressor deenergized).

Table 9 — DIP Switch Functions

DIP SWITCH NO.	SELECTED FUNCTION*
1	Type of Reset
2	Reset
3	Pull Down Limit
4	Not Used
5	Demand Limit
6	1 Unloader
7	2 Unloaders
8	Brine

*Refer to Table 8, Quick Test steps 3 through 10.

Table 10 — Potentiometer Locations

POTENTIOMETER	LOCATION
Leaving Water Set Point	Set Point Board (Standard)
Reset Limit Set Point	Accessory Board (Option)
Reset Ratio Set Point	Accessory Board (Option)
Reset Temp Set Point	Accessory Board (Option)

START-UP AND OPERATION

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

Digital Display Action — The electronic control system uses a 2-digit LED display located on display set point board (see Fig. 24) to show operational information and diagnostic codes.

When control ON-OFF switch is turned on, display shows 20 for 2 minutes to indicate control is in initialization mode. Electronic expansion valve will be closed as part of initialization sequence. This does not occur on FIOP units, where a conventional thermostatic expansion valve is used.

After a 2-minute period, display turns off and unit is allowed to start. If button is pressed after the 20 has been removed from display, operational status codes or diagnostic information will be shown as long as button is held in. Code numbers on display will have following significance:

CODE NUMBER	OPERATIONAL STATUS
0-12	Capacity stage
20-26	Operational information
51-87	Overload information

Under normal operation, only stage number will be displayed. If an operational status code or an overload code is displayed, the display will rotate every 2 seconds and will display up to 3 numbers. Overload information will take priority over all other codes and the alarm light will be energized. The codes will be stored by the microprocessor as long as board is energized.

IMPORTANT: The memory is cleared when control power is removed.

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. The unit is shipped from the factory with the suction, discharge, and liquid line service valves closed.
2. Set leaving water temperature. No cooling range adjustment is necessary.
3. If accessory reset boards are used, set potentiometers properly. Refer to Controls and Troubleshooting book for details.
4. Start chilled water pump.
5. Turn ON-OFF switch to ON. The display will read 20. During this time the machine will check all potentiometers and thermistors for valid readings. In approximately 2 minutes, the 20 reading will not be displayed, and the machine will be operational.

   Allow the unit to operate and confirm that everything is functioning properly. Check the leaving water temperature and be sure that it agrees with the set point potentiometer P1. If the temperature setting does not agree, the set point can be compensated by shifting the control point slightly. If temperature reset is in effect, the leaving water temperature may not agree with the set point.

Operating Limitations

TEMPERATURES (See Table 11.) — 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 11 — Temperature Limits

TEMPERATURES	F	C
Maximum Ambient Temp	125	52
Minimum Ambient Temp	0	−18
Maximum Cooler EWT*	95	35
Maximum Cooler LWT	70	21
Minimum Cooler LWT	40	4.5

LEGEND
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 (EXV and FIOP 080-110 TXV) will limit suction pressure to approximately 90 psig (620 kPa) to avoid overloading compressor.

Low Cooler LCWT — Application of chillers for brine duty within 39.9 F to 34 F (4.4 C to 1.1 C) temperature range is possible with proper field change of control configuration. This requires that DIP switch no. 8 (brine switch) of S1 on the processor board be set to ON. See Tables 8 and 9.

⚠ WARNING

Do not operate with leaving water temperature below 34 F (1.1 C). Application in the range 34 F to 15 F (1° C to -9.4 C) requires chiller with factory modification for brine duty. Contact your Carrier representative for details.

VOLTAGE

Main Power Supply — Minimum and maximum acceptable supply voltages are listed in Tables 4A-4C.

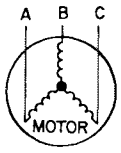
Unbalanced 3-Phase Supply Voltage:

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

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

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

EXAMPLE: Supply voltage is 240-3-60.



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

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

$$= \frac{717}{3}$$

$$= 239 \text{ v}$$

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:

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

$$= 1.7\%$$

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 12. 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 12 — Nominal and Minimum Cooler Water Flow Rates

UNIT SIZE	NOMINAL FLOW RATE*		MINIMUM FLOW RATE (See Notes)	
	Gpm	L/s	Gpm	L/s
080	192	12.11	66.7	4.2
090	216	13.62	66.7	4.2
100,240B,270B	240	15.14	84.1	5.3
110	264	16.65	84.1	5.3
130,240A,300A	300	18.9	110	6.9
150	348	21.9	110	6.9
170,270A,300B,330, 360B (50 Hz)	384	24.2	120	7.5
190,360 (60 Hz), 360A (50 Hz), 390B	432	27.2	120	7.5
210,390A,420	480	30.2	148	9.3

LEGEND

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

*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 (.000044).

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

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 and a microprocessor board heater are also energized.

When control ON-OFF switch is turned to ON, control first goes through a 2-minute initialization period, during which the display will continuously show 20 . Ninety (90) seconds after 20 leaves display, control begins to bring on compressors. Rate at which compressors are started depends on leaving chilled water temperature and rate of change of leaving water temperature.

On standard units, an automatic lead-lag feature in control system determines by random selection either circuit A or B to start first.

At first call for cooling, microprocessor starts first compressor, deenergizes crankcase heater and starts one condenser fan.

UNITS WITH ELECTRONIC EXPANSION VALVE (EXV) — The EXV remains closed for 10 seconds to purge cooler and suction line of any liquid refrigerant that may have migrated to these areas during off period. After 10 seconds, expansion valve starts to open. As more cooling is required, control brings on additional stages of capacity. Loading sequence for compressors is shown in Table 13. Automatic lead-lag control is provided on all units.

30GT080-110 UNITS WITH OPTIONAL THERMOSTATIC EXPANSION VALVE (TXV) — Liquid line solenoid valve is not energized for first 10 seconds of compressor operation. This is called pre-pumpout cycle.

Microprocessor determines how rapidly capacity stages are added or subtracted based on deviation from leaving chilled water temperature set point and rate of change of leaving water temperature. If water temperature is very warm and pulldown option is being used, microprocessor limits rate of temperature drop of leaving water to 1° F (0.56° C) per minute to avoid high peak kW charges. If the capacity is being limited by pulldown, the control display shows a 24 when the display button is pressed. Once capacity has been satisfied, the unit will start to shut down.

UNITS WITH EXV — Lag compressor will shut down, and lead compressor will continue to run. After lag compressor has shut down, the EXV is signaled to close. Lead compressor remains on until EXV is less than 300 steps open, and the saturated suction temperature is less than 25 F (−4 C) as sensed by cooler thermistor T5 or T6, or one minute has elapsed.

UNITS WITH TXV(30GT080-110 ONLY) — Lag compressor will be shut down and lead compressor continues to run for 10 seconds to purge cooler of any refrigerant.

LOAD SHED — If load shed option is being used, control limits maximum capacity to load shed input value. Refer to Controls and Troubleshooting publication for details. If capacity is limited by a load shed signal, display shows a 22 when display button is pressed.

ALL UNITS — If temperature reset is being used, microprocessor adjusts leaving water temperature to obtain greater part-load efficiency. Refer to Controls and Troubleshooting book for details. If leaving water temperature is being reset, display shows a 21 when the display button is pressed.

For head pressure control:

UNITS WITH EXV — Microprocessor also controls electronic expansion valve (EXV) to maintain a superheat of 30° F (16.7° C) entering compressor cylinders.

Microprocessor control also cycles condenser fans on and off to maintain an adequate pressure differential across expansion valves. Fans are controlled by position of EXV and saturated condensing temperature thermistors. When expansion valve is fully open and superheat is greater than 40° F (22° C), fan stages are removed; when the valve is approximately half open, fan stages are added. This allows unit to run at very low condensing temperatures at part load. Thus chiller has very high part-load EERs (energy efficiency ratios). Fan sequence is shown in Fig. 25.

UNITS WITH TXV (30GT080-110 ONLY) — Thermostatic expansion valves, one for each refrigerant circuit, are factory set to maintain 8 to 10 F (5 to 6 C) superheat of vapor leaving cooler to control flow of liquid refrigerant into cooler. Superheat can be reset but should be done only if necessary.

Logic to cycle microprocessor-controlled fans is based on saturated condensing temperature only. This temperature is sensed by thermistors T3 and T4 (Fig. 26 and 27). The microprocessor will turn on an additional stage of fans when either of coil thermistors (T3 or T4) is greater than 113 F (45 C) and will turn off a fan stage when T3 and T4 are both below 73 F (23 C). Between each change in fan stage, control will wait one minute to allow head pressure to stabilize unless either T3 or T4 is greater than 125 F (52 C), in which case all microprocessor-controlled fans will come on immediately.

Condenser fan sequence is shown in Fig. 25.

REMOTE ON-OFF — When it is required to control the starting and stopping of the chiller from a remote location, such as a timeclock, the remote ON-OFF feature is used. See Fig. 19-22 for wiring information. If the chiller is being held "OFF" by the remote ON-OFF switch, a 26 appears in the display when the display button is pressed.

NOTE: DO NOT USE WATER PUMP to cycle chiller on and off except as a safety feature. Cycling of chiller must be accomplished through the remote ON-OFF switch, since the water pump must continue to run for 1 minute after initialization of pumpdown.

REMOTE ALARM — See Fig. 19-22 for remote alarm field wiring. Remove the resistor across terminals [1] and [2] on TB5 when remote alarm is being used.

Table 13 — Capacity Control Steps

UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displ.	Compressors	% Displ.	Compressors
080 (60 Hz)	1	22	A1*	29	B1*
	2	52	A1*,B1*	52	A1*,B1*
	3	67	A1*, B1	63	A1,B1*
	4	78	A1,B1	78	A1,B1
	5	89	A1*,A2,B1	89	A1*,A2,B1
	6	100	A1,A2,B1	100	A1,A2,B1
080 (50 Hz)	1	16	A1*	25	B1*
	2	42	A1*,B1*	42	A1*,B1*
	3	54	A1*,B1	50	A1,B1*
	4	62	A1,B1	62	A1,B1
	5	92	A1*,A2,B1	92	A1*,A2,B1
	6	100	A1,A2,B1	100	A1,A2,B1
090 (60 Hz)	1	18	A1*	18	B1*
	2	35	A1*,B1*	35	A1*,B1*
	3	44	A1*,B1	44	A1,B1*
	4	53	A1,B1	53	A1,B1
	5	65	A1*,A2,B1	71	A1,B1*,B2
	6	73	A1,A2,B1	80	A1,B1,B2
	7	91	A1*,A2,B1,B2	91	A1,A2,B1*,B2
	8	100	A1,A2,B1,B2	100	A1,A2,B1,B2
090 (50 Hz)	1	14	A1*	14	B1*
	2	29	A1*,B1*	29	A1*,B1*
	3	36	A1*,B1	36	A1,B1*
	4	43	A1,B1	43	A1,B1
	5	68	A1*,A2,B1	60	A1,B1*,B2
	6	75	A1,A2,B1	67	A1,B1,B2
	7	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	8	100	A1,A2,B1,B2	100	A1,A2,B1,B2
100,240B,270B (60 Hz)	1	15	A1*	15	B1*
	2	31	A1*,B1*	31	A1*,B1*
	3	39	A1*,B1	39	A1,B1*
	4	46	A1,B1	46	A1,B1
	5	65	A1*,A2,B1	65	A1,B1*,B2
	6	73	A1,A2,B1	73	A1,B1,B2
	7	92	A1*,A2,B1,B2	92	A1,A2,B1*,B2
	8	100	A1,A2,B1,B2	100	A1,A2,B1,B2
100,240B,270B (50 Hz)	1	13	A1*	13	B1*
	2	26	A1*,B1*	26	A1*,B1*
	3	33	A1*, B1	33	A1,B1*
	4	40	A1,B1	40	A1,B1
	5	63	A1*,A2,B1	63	A1,B1*,B2
	6	70	A1,A2,B1	70	A1,B1,B2
	7	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	8	100	A1,A2,B1,B2	100	A1,A2,B1,B2
110 (60 Hz)	1	14	A1*	14	B1*
	2	29	A1*,B1*	29	A1*,B1*
	3	36	A1*,B1	36	A1,B1*
	4	43	A1,B1	43	A1,B1
	5	68	A1*,A2,B1	60	A1,B1*,B2
	6	75	A1,A2,B1	67	A1,B1,B2
	7	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	8	100	A1,A2,B1,B2	100	A1,A2,B1,B2
110 (50 Hz)	1	17	A1*	17	B1*
	2	33	A1*,B1*	33	A1*,B1*
	3	42	A1*,B1	42	A1,B1*
	4	50	A1,B1	50	A1,B1
	5	67	A1*,A2,B1	67	A1,B1*,B2
	6	75	A1,A2,B1	75	A1,B1,B2
	7	92	A1*,A2,B1,B2	92	A1,A2,B1*,B2
	8	100	A1,A2,B1,B2	100	A1,A2,B1,B2

LEGEND

DISPL. — Displacement (Approx)

*Compressor unloaded.

NOTES:
1. The microprocessor selects loading sequence A or B, which in turn determines the compressor circuit that is energized first. This evens out operating hours on each circuit over an extended period of time.
2. The staging of modular units (30GT240-420) will be random due to variables within the system. The loading sequence of each individual module will be as listed.

Table 13 — Capacity Control Steps (cont)

UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displ. (Approx)	Compressors	% Displ. (Approx)	Compressors
130,240A,300A (60 Hz)	0	0	—	0	—
	1	14	A1*	14	B1*
	2	29	A1*,B1*	29	A1*,B1*
	3	36	A1*,B1	36	A1,B1*
	4	43	A1,B1	43	A1,B1
	5	64	A1*,A2,B1	64	A1,B1*,B2
	6	72	A1,A2,B1	72	A1,B1,B2
	7	93	A1*,A2,B1,B2	93	A1,A2,B1*,B2
	8	100	A1,A2,B1,B2	100	A1,A2,B1,B2
130,240A,300A (50 Hz)	0	0	—	0	—
	1	10	A1*	16	B1*
	2	21	A1*,B1*	21	A1*,B1*
	3	29	A1*,B1	32	A1,B1*
	4	34	A1,B1	34	A1,B1
	5	47	A1*,A2,B1	56	A1*,B1,B2
	6	58	A1,A2,B1	64	A1,B1,B2
	7	77	A1*,A2,B1,B2	74	A1,A2,B1*,B2
	8	82	A1,A2,B1,B2	82	A1,A2,B1,B2
	9	95	A1*,A2,A3,B1,B2	92	A1,A2,A3,B1*,B2
	10	100	A1,A2,A3,B1,B2	100	A1,A2,A3,B1,B2
150 (60 Hz)	0	0	—	0	—
	1	11	A1*	17	B1*
	2	19	A1*,B1*	19	A1*,B1*
	3	28	A1*,B1	33	A1,B1*
	4	33	A1,B1	33	A1,B1
	5	44	A1*,A2,B1	58	A1*,B1,B2
	6	58	A1,A2,B1	67	A1,B1,B2
	7	78	A1*,A2,B1,B2	75	A1,A2,B1*,B2
	8	83	A1,A2,B1,B2	83	A1,A2,B1,B2
	9	94	A1*,A2,A3,B1,B2	92	A1,A2,A3,B1*,B2
	10	100	A1,A2,A3,B1,B2	100	A1,A2,A3,B1,B2
150 (50 Hz)	0	0	—	0	—
	1	13	A1*	13	B1*
	2	27	A1*,B1*	27	A1*,B1*
	3	33	A1*,B1	33	A1,B1*
	4	40	A1,B1	40	A1,B1
	5	53	A1*,A2,B1	53	A1*,B1,B2
	6	60	A1,A2,B1	60	A1,B1,B2
	7	73	A1*,A2,B1,B2	73	A1,A2,B1*,B2
	8	80	A1,A2,B1,B2	80	A1,A2,B1,B2
	9	93	A1*,A2,A3,B1,B2	93	A1,A2,A3,B1*,B2
	10	100	A1,A2,A3,B1,B2	100	A1,A2,A3,B1,B2
170,270A,300B,330A/B (60 Hz)	0	0	—	0	—
	1	11	A1*	11	B1*
	2	22	A1*,B1*	22	A1*,B1*
	3	28	A1*,B1	28	A1,B1*
	4	33	A1,B1	33	A1,B1
	5	44	A1*,A2,B1	44	A1,B1*,B2
	6	50	A1,A2,B1	50	A1,B1,B2
	7	61	A1*,A2,B1,B2	61	A1,A2,B1*,B2
	8	67	A1,A2,B1,B2	67	A1,A2,B1,B2
	9	78	A1*,A2,A3,B1,B2	78	A1,A2,B1*,B2,B3
	10	83	A1,A2,A3,B1,B2	83	A1,A2,B1,B2,B3
	11	94	A1*,A2,A3,B1,B2,B3	94	A1,A2,A3,B1*,B2,B3
	12	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
170,270A,300B,330A/B,360B (50 Hz)	0	0	—	0	—
	1	10	A1*	10	B1*
	2	24	A1*,B1*	24	A1*,B1*
	3	29	A1*,B1	24	A1,B1*
	4	29	A1,B1	28	A1,B1
	5	43	A1*,A2,B1	43	A1,B1*,B2
	6	43	A1,A2,B1	48	A1,B1,B2
	7	57	A1*,A2,B1,B2	57	A1,A2,B1*,B2
	8	62	A1,A2,B1,B2	62	A1,A2,B1,B2
	9	76	A1*,A2,A3,B1,B2	76	A1,A2,B1*,B2,B3
	10	81	A1,A2,A3,B1,B2	81	A1,A2,B1,B2,B3
	11	95	A1*,A2,A3,B1,B2,B3	95	A1,A2,A3,B1*,B2,B3
	12	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3

LEGEND

DISPL. — Displacement

*Compressor unloaded.
†One additional, field-supplied unloader on compressor A1.

NOTES:
1. The microprocessor selects loading sequence A or B, which in turn determines the compressor circuit that is energized first. This evens out operating hours on each circuit over an extended period of time.
2. The staging of modular units (30GT240-420) will be random due to variables within the system. The loading sequence of each individual module will be as listed.

Table 13 – Capacity Control Steps (cont)

UNIT SIZE	CONTROL STEPS	LOADING SEQUENCE A		LOADING SEQUENCE B	
		% Displ. (Approx)	Compressors	% Displ. (Approx)	Compressors
190,360A/B,390B (60 Hz)	0	0	—	0	—
	1	14	A1	14	B1
	2	27	A1,B1	27	A1,B1
	3	43	A1,A2,B1	43	A1,B1,B2
	4	59	A1,A2,B1,B2	59	A1,A2,B1,B2
	5	79	A1,A2,A3,B1,B2	79	A1,A2,B1,B2,B3
	6	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
190,360A/B,390B (60 Hz) A1†	0	0	—	0	—
	1	9	A1*	9	A1*
	2	14	A1	14	A1
	3	23	A1*,B1	23	A1*,B1
	4	27	A1,B1	27	A1,B1
	5	38	A1*,A2,B1	38	A1*,A2,B1
	6	43	A1,A2,B1	43	A1,A2,B1
	7	54	A1*,A2,B1,B2	54	A1*,A2,B1,B2
	8	59	A1,A2,B1,B2	59	A1,A2,B1,B2
	9	75	A1*,A2,A3,B1,B2	75	A1*,A2,A3,B1,B2
	10	79	A1,A2,A3,B1,B2	79	A1,A2,A3,B1,B2
	11	95	A1*,A2,A3,B1,B2,B3	95	A1*,A2,A3,B1,B2,B3
	12	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
190,360A/B,390B (60 Hz) A1 & B1**	0	0	—	0	—
	1	9	A1*	9	B1*
	2	18	A1*,B1*	18	A1*,B1*
	3	23	A1*,B1	23	A1,B1*
	4	27	A1,B1	27	A1,B1
	5	38	A1*,A2,B1	38	A1,B1*,B2
	6	43	A1,A2,B1	43	A1,B1,B2
	7	54	A1*,A2,B1,B2	54	A1,A2,B1*,B2
	8	59	A1,A2,B1,B2	59	A1,A2,B1,B2
	9	75	A1*,A2,A3,B1,B2	75	A1,A2,B1*,B2,B3
	10	79	A1,A2,A3,B1,B2	79	A1,A2,B1,B2,B3
	11	95	A1*,A2,A3,B1,B2,B3	95	A1,A2,A3,B1*,B2,B3
	12	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
190,360A,390B (50 Hz)	0	0	—	0	—
	1	17	A1	17	B1
	2	33	A1,B1	33	A1,B1
	3	50	A1,A2,B1	50	A1,B1,B2
	4	67	A1,A2,B1,B2	67	A1,A2,B1,B2
	5	83	A1,A2,A3,B1,B2	83	A1,A2,B1,B2,B3
	6	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
190,360A,390B (50 Hz) A1†	0	0	—	0	—
	1	11	A1*	11	A1*
	2	17	A1	17	A1
	3	28	A1*,B1	28	A1*,B1
	4	33	A1,B1	33	A1,B1
	5	44	A1*,A2,B1	44	A1*,A2,B1
	6	50	A1,A2,B1	50	A1,A2,B1
	7	61	A1*,A2,B1,B2	61	A1*,A2,B1,B2
	8	67	A1,A2,B1,B2	67	A1,A2,B1,B2
	9	78	A1*,A2,A3,B1,B2	78	A1*,A2,A3,B1,B2
	10	83	A1,A2,A3,B1,B2	83	A1,A2,A3,B1,B2
	11	94	A1*,A2,A3,B1,B2,B3	94	A1*,A2,A3,B1,B2,B3
	12	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
190,360A,390B (50 Hz) A1 & B1**	0	0	—	0	—
	1	11	A1*	11	B1*
	2	22	A1*,B1*	22	A1*,B1*
	3	28	A1*,B1	28	A1,B1*
	4	33	A1,B1	33	A1,B1
	5	44	A1*,A2,B1	44	A1,B1*,B2
	6	50	A1,A2,B1	50	A1,B1,B2
	7	61	A1*,A2,B1,B2	61	A1,A2,B1*,B2
	8	67	A1,A2,B1,B2	67	A1,A2,B1,B2
	9	78	A1*,A2,A3,B1,B2	78	A1,A2,B1*,B2,B3
	10	83	A1,A2,A3,B1,B2	83	A1,A2,B1,B2,B3
	11	94	A1*,A2,A3,B1,B2,B3	94	A1,A2,A3,B1*,B2,B3
	12	100	A1,A2,A3,B1,B2,B3	100	A1,A2,A3,B1,B2,B3
210,390A,420A/B (60 Hz)	0	0	—	0	—
	1	12	A1	14	B1
	2	26	A1,B1	26	A1,B1
	3	37	A1,A2,B1	44	A1,B1,B2
	4	56	A1,A2,B1,AB2	56	A1,A2,B1,B2
	5	68	A1,A2,A3,B1,B2	74	A1,A2,B1,B2,B3
	6	86	A1,A2,A3,B1,B2,B3	86	A1,A2,A3,B1,B2,B3
	7	100	A1,A2,A3,A4,B1,B2,B3	100	A1,A2,A3,A4,B1,B2,B3
210,390A,420A/B (50 Hz)	0	0	—	0	—
	1	10	A1	16	B1
	2	26	A1,B1	26	A1,B1
	3	37	A1,A2,B1	42	A1,B1,B2
	4	52	A1,A2,B1,B2	52	A1,A2,B1,B2
	5	68	A1,A2,A3,B1,B2	68	A1,A2,B1,B2,B3
	6	84	A1,A2,A3,B1,B2,B3	84	A1,A2,A3,B1,B2,B3
	7	100	A1,A2,A3,A4,B1,B2,B3	100	A1,A2,A3,A4,B1,B2,B3

LEGEND

DISPL. — Displacement

*Compressor unloaded.
†One additional, field-supplied unloader on compressor A1.
**Two additional, field-supplied unloaders; one on compressor A1 and one on compressor B1.

SERVICE

ELECTRIC SHOCK HAZARD.
Turn off all power to unit before servicing. The ON-OFF 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 30GT080-110, 240B, and 270B, 208/230-, 460- and 575-v units. It is available as a field-installed accessory for all other 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 2A-3B) and should be under sufficient pressure to conduct a leak test. If there is no pressure in the system, use standard refrigeration practices to search for the leak. Repair the leak using good refrigeration practices. After leaks are repaired, system must be evacuated and dehydrated.

DEHYDRATION — Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants, Sections 6 and 7 for details. *Do not use compressor to evacuate system.*

REFRIGERANT CHARGE (Refer to Tables 2A-3B) — Immediately ahead of filter drier in each circuit is a factory-installed liquid line service valve. On each valve is a ¼-in.

Charging with Unit Off and Evacuated — Close liquid line service valve before charging. Weigh in charge shown on unit nameplate (also in Tables 2A-3B). 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 2A-3B.

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.

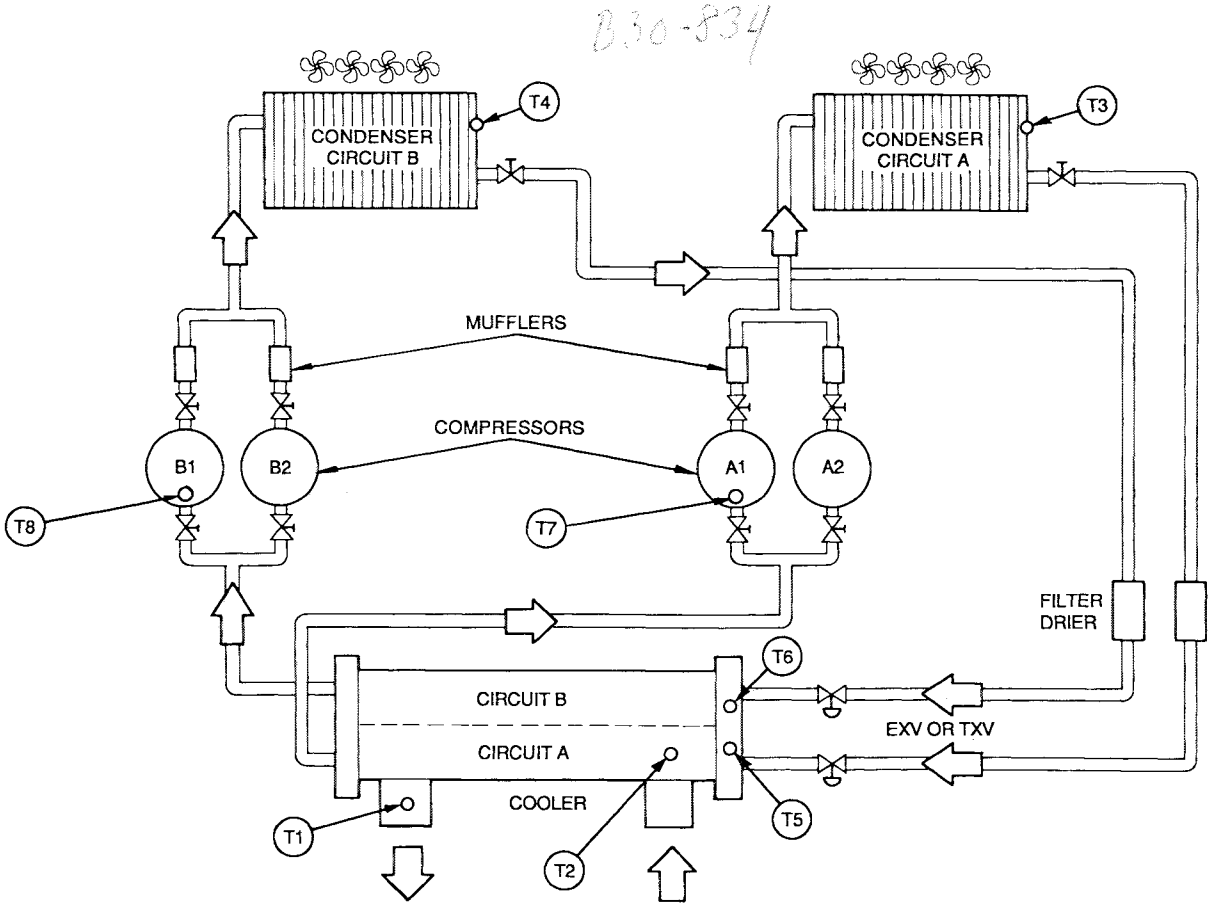
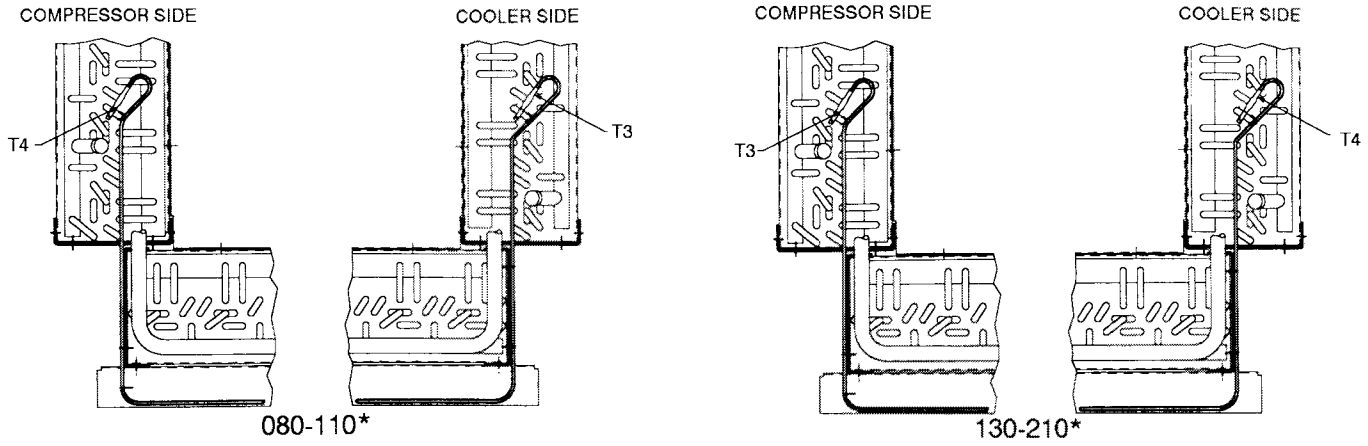


Fig. 26 — Typical Thermistor Locations

A20-1310



*And associated modular units.

Fig. 27 — Thermistor T3 and T4 Locations

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.

30GT080-110, 240B, 270B 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.

30GT130-210, 240A, 270A, 300-420 UNIT CONTROL AND MAIN POWER BOXES — The main power box is on the cooler side of the unit, and the control box is on the compressor side. Outer panels are hinged and latched for easy opening. Remove screws to remove inner panels.

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

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 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 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 —

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 2A-3B.) — All units are factory charged with oil. Acceptable oil level for each compressor is from ⅛ to ⅜ of sight glass (see Fig. 23).

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	19	9.0
06E275	19	9.0
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. Open the circuit breakers for the lag compressors (A2 and B2), and close the discharge valves for these compressors.

⚠ WARNING

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

   b. After the lag compressor has shut down, close the liquid line service valve for one circuit. Allow the lead compressor to pump down that circuit until it reaches approximately 10 to 15 psig (68.8 to 103.2 kPa).
   c. As soon as the system reaches that pressure, shut down the lead compressor by opening the compressor circuit breaker, then quickly close the discharge service valve for that compressor.
   d. Repeat the procedure for the other circuit.

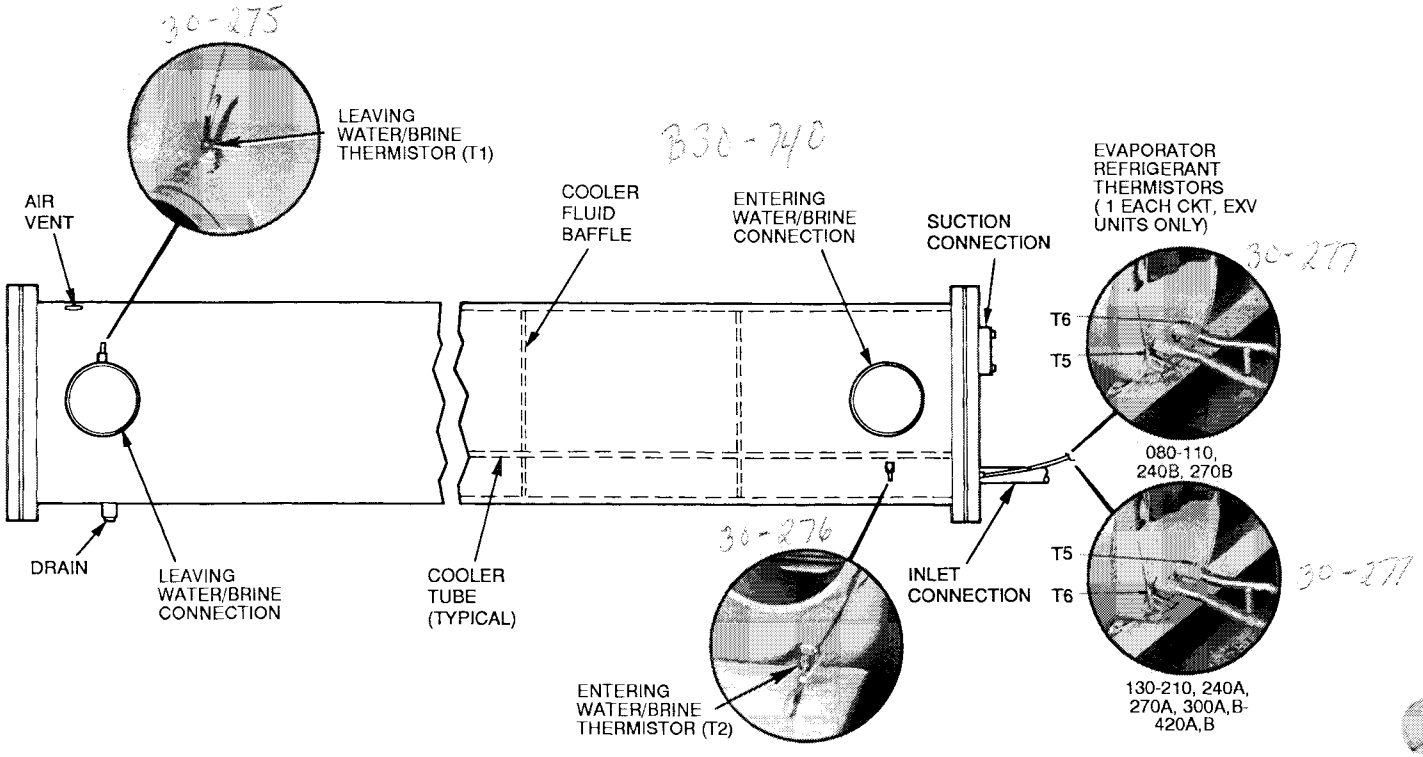
⚠ CAUTION

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. Remove the cooler waterside strainer (130-210, 240A, 270A, 300-420 only).
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. 28.
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. T5 and T6 thermistors are friction-fit well-type thermistors. See Fig. 28.
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. On 30GT080-110, 240B, and 270B units, remove the two vertical supports under the condenser coil, in front of the cooler. *Provide temporary support as needed.* Save all screws for reinstallation later.
9. Remove the screws in the cooler feet. Slide the cooler slightly to the left to clear the refrigerant tubing. Save all screws.

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

REPLACING COOLER — To replace cooler, reverse the appropriate procedure above. 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 to 90 ft-lb (94 to 122 N-m). Use adhesive to reinstall the cooler insulation. Reinstall the thermistors. See Thermistors, page 59. Apply pipe sealant to



EXV — Electronic Expansion Valve

Fig. 28 — Cooler Thermistor Locations

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.* Install the cooler heater and conduit (if equipped), and connect the wires as shown in the unit wiring schematic. Connect the chilled water lines. Be sure to purge the fluid side of air before starting unit.

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. 29. *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 of thermistor T2, 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 30 shows an Elliott tube plug and a cross-sectional view of a plug in place.

⚠ CAUTION

Use extreme care when installing plugs, to prevent damage to the tube sheet section between the holes.

Retubing (See Table 14.) — 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 to 50 in.-lbs (5.4 to 5.6 N-m).

The following Elliott Co. tube rolling tools are required:

B3400 Expander Assembly

B3401 Cage

B3405 Mandrel

B3408 Rolls

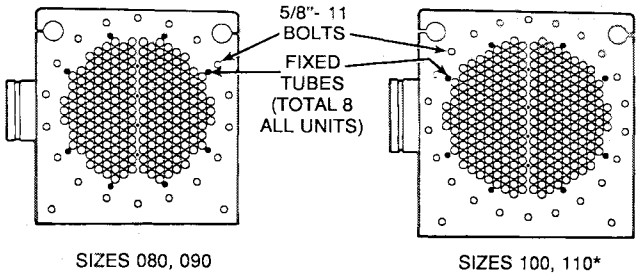
Table 14 — Plugs

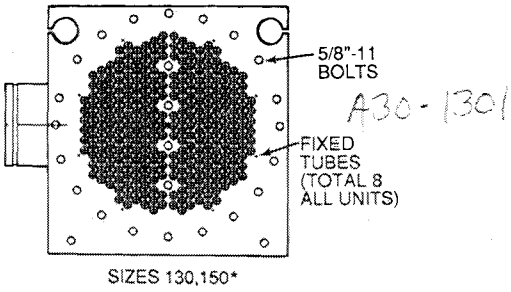
COMPONENTS FOR PLUGGING	PART NUMBER
For Tubes	
Brass Pin	853103-500*
Brass Ring	853002-570*
For Holes without Tubes	
Brass Pin	853103-1*
Brass Ring	853002-631*
Loctite	No. 675†
Locquic	"N"†

*Order directly from: Elliott Tube Company, Dayton, Ohio

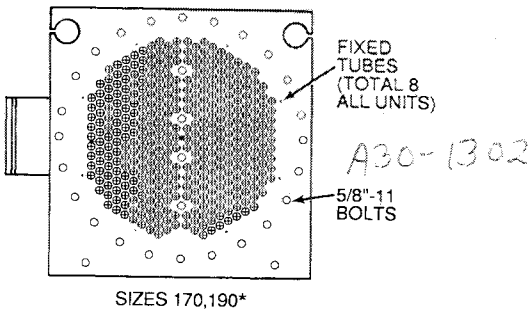
†Can be obtained locally.

A30-921

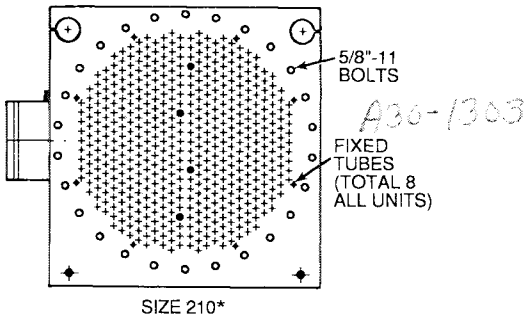




A30-1301



A30-1302



A30-1303

*And associated modular units.

Fig. 29 — Typical Tube Sheets, Cover Off (Non-Removable Tubes)

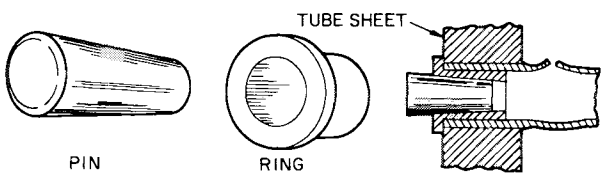


Fig. 30 — Elliott Tube Plug

A30-181A

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).

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 or gasket deterioration will result.* Use new gaskets within 30 minutes to prevent deterioration. Reassemble cooler nozzle end or plain end cover of the cooler with the gaskets. Torque all cooler bolts to the following specification and sequence:

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. 31. 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.

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.

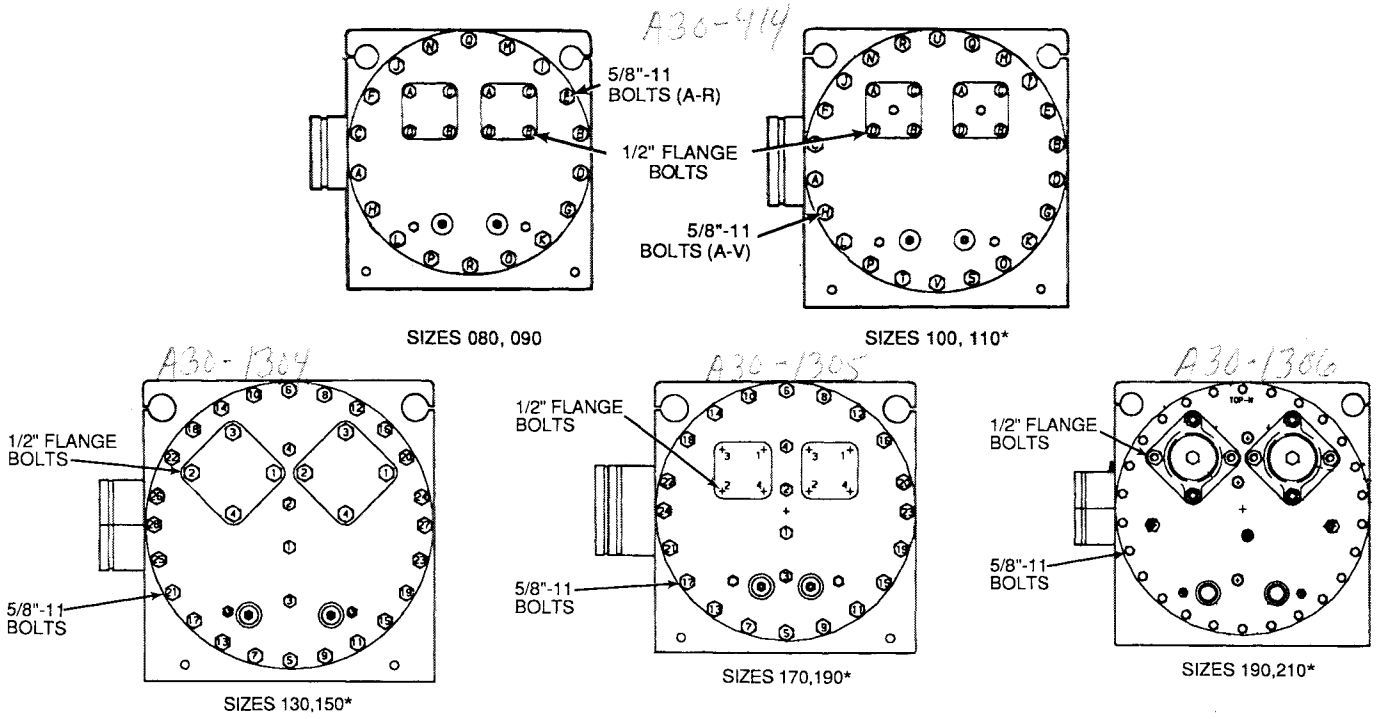
⚠ CAUTION

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 positioned as in Fig. 32 (standard and low-noise applications). Tighten setscrews to 15 ± 1 ft-lbs (20 ± 1.3 N-m).

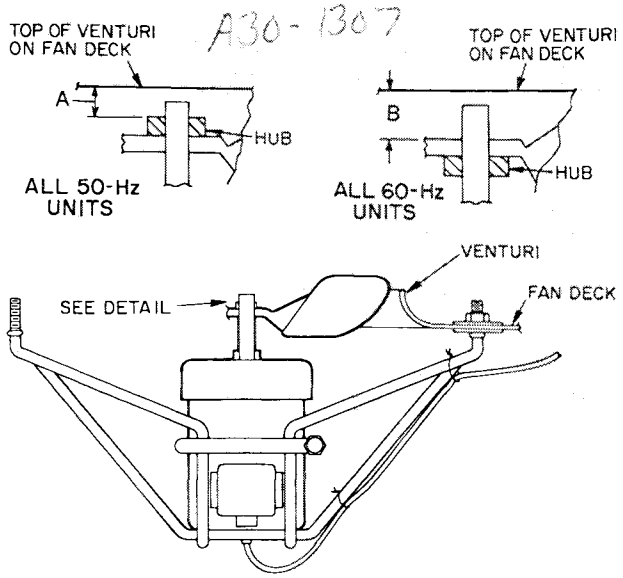
If the unit is equipped with the high static fan option, the fan must be set from the top of the fan deck to the plastic ring or center of the fan to a distance of 2.13 in. ± 0.13 in. (54 ± 3 mm). This is different from standard fans, since there is no area available to measure from the top of the orifice ring to the fan hub itself. See Fig. 33.

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



*And associated modular units.

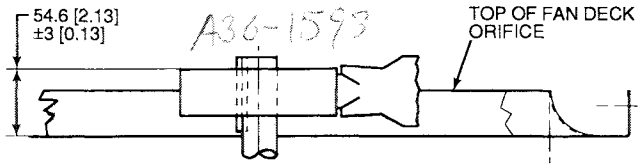
Fig. 31 – Cooler Head Bolt Tightening Sequence (Typical Tube Sheet)



DIMENSION	FAN TYPE	
	Standard	Low-Noise (Optional)
A	0.50" (13 mm)	1.50" (38 mm)
B	0.88" (22 mm)	1.13" (29 mm)

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

Fig. 32 – Condenser Fan Adjustment



NOTE: Dimensions in [ ] are in inches.

Fig. 33 – Condenser Fan Adjustment, Units with High Static Fan Option

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

ELECTRONIC EXPANSION VALVE (EXV) – A cutaway view of valve is shown in Fig. 34.

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, 1500 discrete steps of motion are obtained. The large number of steps and long stroke results in very accurate control of refrigerant flow. The valve orifice begins to be exposed at 320 steps. Since there is not a tight seal with the orifice and the sleeve, the minimum position for operation is 120 steps.

The microprocessor controls the valve. Two thermistor temperature sensors are used to determine superheat. One thermistor is located in cooler and other is located in passage between compressor motor and cylinders. The difference between the 2 temperatures controls superheat. On a normal TXV and EXV system, superheat leaving evaporator is normally 10° F (5.6° C) and motor then adds approximately 15° to 20° F (8° to 11° C) resulting in approximately 30° F (16.7° C) superheat entering cylinders.

Because EXVs are controlled by the processor board, it is possible to track 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 the chiller to start at higher cooler fluid temperatures without overloading the compressor. This is commonly referred to as MOP (maximum operating pressure).

If it appears that electronic expansion valve is not properly controlling operating suction pressure or superheat, there are a number of checks that can be made using Quick Test and initialization features built into the microprocessor control. See Controls and Troubleshooting book.

Follow steps below to diagnose and correct EXV problems.

Step 1 – Check Processor EXV Outputs – Check EXV output signals at appropriate terminals on J4 terminal strip, as follows:

1. Turn power off.
2. Connect positive test lead of meter to terminal 8 on connector J7 (see Fig. 35).
3. Set meter for approximately 20 vdc.
4. Turn power on, but do not enter Quick Test mode. For first 50 seconds valve motor windings will be alternately energized to close valve in circuit 1.
5. During this time, connect negative test lead to terminals 9, 10, 11, and 12 in succession. Voltage should rise and fall at each pin. If it remains constant at a voltage or at 0 v, remove connector and recheck. If problem is still there, replace processor board. If it is no longer there, expansion valve should be checked.
6. Turn power off and connect positive lead to terminal 1 on connector J7.

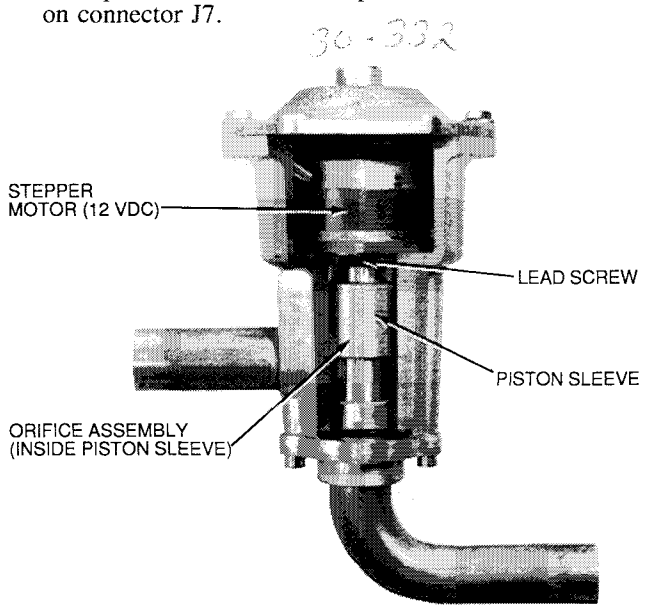


Fig. 34 – Electronic Expansion Valve (EXV)

7. Turn power on. After 50 seconds, motor windings in circuit 2 valve will begin to be energized.
8. During this time, connect negative test lead to terminals 2, 3, 4, and 5. Voltage should rise and fall at each pin. If it remains constant at a voltage or at 0 v, remove connector and recheck. If problem is still there, replace processor board. If it is no longer there, expansion valve should be checked.

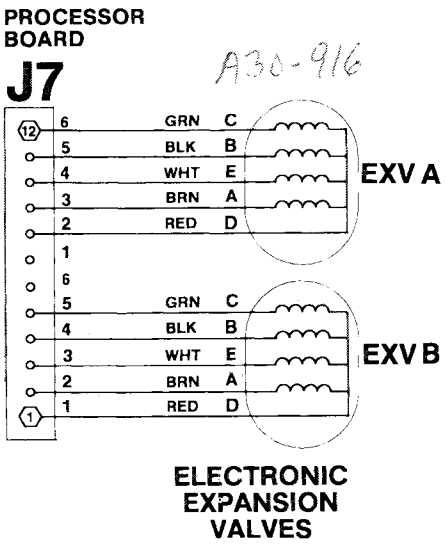


Fig. 35 – Processor Board Connections

Step 2 – Check EXV Wiring – Check wiring to electronic expansion valves from J7 terminal strip on processor board (see Fig. 35).

1. Check color coding and wire connections. Make sure they are connected to correct terminals at J7 and EXV plug connections.
2. Check for continuity and tight connection at all pin terminals.
3. Check plug connections at J7 and at EXVs. Be sure EXV connections are not crossed.

Step 3 – Check Resistance of EXV Motor Windings – Remove plug at J7 terminal strip and check resistance between common lead (red wire, terminal D) and remaining leads A, B, C, and E. Resistance should be 25 ohms ± 2 ohms.

Step 4 – Check Thermistors that Control EXV – Check thermistors that control processor output voltage pulses to EXVs. Circuit A thermistors are T5 and T7, and circuit B thermistors are T6 and T8. Refer to Fig. 26 for location.

1. Use Quick Test steps 2.0. through 2.3. to determine if thermistors are shorted or open.
2. Check thermistor calibration at a known temperature by measuring actual resistance and comparing value measured with values listed in Tables 15 and 16.
3. Make sure that thermistor leads are connected to proper pin terminals at J1 terminal strip on processor board and that thermistor probes are located in proper position in refrigerant circuit (Fig. 26 and 27).

When above checks have been completed, actual operation of EXV can be checked by using procedures outlined in Step 5. During Quick Test steps 3.5. and 3.9., each EXV is opened approximately 500 steps by processor. This Quick Test feature, along with initialization mode 20 ,can be used to verify proper valve operation.

Step 5 – Check Operation of the EXV – Use following procedure to check actual operation of electronic expansion valves.

1. Close liquid line service valve for circuit to be checked and run through appropriate Quick Test step 3.5. or 3.9. to pump down low side of system. Repeat Quick Test step 3 times to ensure all refrigerant has been pumped from low side and that EXV has been driven fully open (1500 steps).

   NOTE: Do not use control ON-OFF switch to recycle control during this step, and be sure to allow compressors to run full 10 seconds at each step.
2. Turn OFF control circuit switch and compressor circuit breaker(s). Close compressor service valves and remove any remaining refrigerant from low side of system.
3. Remove screws holding top cover of EXV. Carefully remove top cover, using caution to avoid damage to the O-ring seal and motor leads. If EXV plug was disconnected during this process, reconnect it after the cover is removed.
4. Note position of lead screw (see Fig. 34). If valve has responded properly to processor signals in Step 5.1 above, valve should be fully open and lead screw should protrude approximately ¼ in. (6 mm) to ¾ in. (19 mm) above top of motor.
5. Recycle control by turning control circuit switch to ON position. This puts control in initialization mode 20 . During first 100 seconds of initialization mode, each valve is driven to fully closed position (1500 steps) by processor. With cover lifted off EXV valve body, observe operation of valve motor and lead screw. The motor should turn in the counterclockwise (CCW) direction and lead screw should move down into motor hub until valve is fully closed. Lead screw movement should be smooth and uniform from full open to fully closed position.
6. When test has been completed, carefully reassemble expansion valve. Be careful not to damage motor or O-ring when reassembling valve. Open compressor service valves and close compressor circuit breakers. Open liquid line service valve. Turn control circuit switch to ON, and allow unit to operate. Verify proper operation of unit.

This process of opening and closing EXV can be repeated by repeating Quick Test steps 3.5. or 3.9. and recycling control as described in preceeding steps. If valve does not operate as described (when properly connected to processor and receiving correct signals), replace valve.

If operating problems persist after reassembly, they may be due to out-of-calibration thermistor(s), or intermittent connections between processor board terminals and EXV plug. Recheck all wiring connections and voltage signals.

Another possible cause of improper refrigerant flow control could be restrictions in liquid line. Check for plugged filter drier(s), stuck liquid line solenoid valve(s), or restricted metering slots in the EXV. Formation of ice or frost on lower body of electronic expansion valve is one symptom of restricted metering slots. Clean or replace valve if necessary.

NOTE: Frosting of valve is normal during Quick Test steps 3.5., 3.9., and at initial start-up. Frost should dissipate after a 5- to 10-minute operation of a system that is operating properly. If valve is to be replaced, wrap valve with a wet cloth to prevent excessive heat from damaging internal components. Superheat control built into valve is *not* adjustable.

Table 15 – Sensor Temperature (°F) vs Resistance/Voltage Drop: Flotronic™

TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
-25	4.684	98,010
-24	4.673	94,707
-23	4.662	91,522
-22	4.651	88,449
-21	4.640	85,485
-20	4.628	82,627
-19	4.616	79,871
-18	4.604	77,212
-17	4.591	74,648
-16	4.578	72,175
-15	4.565	69,790
-14	4.551	67,490
-13	4.537	65,272
-12	4.523	63,133
-11	4.509	61,070
-10	4.494	59,081
- 9	4.479	57,162
- 8	4.463	55,311
- 7	4.448	53,526
- 6	4.431	51,804
- 5	4.415	50,143
- 4	4.398	48,541
- 3	4.381	46,996
- 2	4.363	45,505
- 1	4.345	44,066
0	4.327	42,678
1	4.308	41,339
2	4.289	40,047
3	4.270	38,800
4	4.250	37,596
5	4.230	36,435
6	4.209	35,313
7	4.188	34,231
8	4.167	33,185
9	4.145	32,176
10	4.123	31,201
11	4.101	30,260
12	4.078	29,351
13	4.055	28,472
14	4.032	27,624
15	4.008	26,804
16	3.984	26,011
17	3.959	25,245
18	3.934	24,505
19	3.909	23,789
20	3.883	23,096
21	3.858	22,427
22	3.831	21,779
23	3.805	21,153
24	3.778	20,547
25	3.751	19,960
26	3.723	19,392
27	3.696	18,843
28	3.668	18,311
29	3.639	17,796
30	3.611	17,297
31	3.582	16,814
32	3.553	16,346
33	3.523	15,892
34	3.494	15,453
35	3.464	15,027
36	3.434	14,614
37	3.404	14,214
38	3.373	13,826
39	3.343	13,449
40	3.312	13,084
41	3.281	12,730
42	3.250	12,387
43	3.219	12,053
44	3.187	11,730
45	3.156	11,416
46	3.124	11,111
47	3.093	10,816
48	3.061	10,529
49	3.029	10,250
50	2.997	9,979
51	2.965	9,717
52	2.933	9,461
53	2.901	9,213
54	2.869	8,973
55	2.837	8,739
56	2.805	8,511
57	2.772	8,291
58	2.740	8,076
59	2.708	7,868
60	2.676	7,665
61	2.644	7,468
62	2.612	7,277
63	2.581	7,091
64	2.549	6,911
65	2.517	6,735
66	2.486	6,564
67	2.454	6,399
68	2.423	6,237
69	2.391	6,081
70	2.360	5,929
71	2.329	5,781
72	2.299	5,637
73	2.268	5,497
74	2.237	5,361
75	2.207	5,229
76	2.177	5,101
77	2.147	4,976
78	2.117	4,855
79	2.088	4,737
80	2.058	4,622
81	2.029	4,511
82	2.000	4,403
83	1.972	4,298
84	1.943	4,195
85	1.915	4,096
86	1.887	4,000
87	1.859	3,906
88	1.832	3,814
89	1.805	3,726
90	1.778	3,640
91	1.751	3,556
92	1.725	3,474
93	1.699	3,395
94	1.673	3,318
95	1.647	3,243
96	1.622	3,170
97	1.597	3,099
98	1.572	3,031
99	1.548	2,964
100	1.523	2,898
101	1.500	2,835
102	1.476	2,773
103	1.453	2,713
104	1.430	2,655
105	1.407	2,598
106	1.385	2,542
107	1.362	2,488
108	1.341	2,436
109	1.319	2,385
110	1.298	2,335
111	1.277	2,286
112	1.256	2,238
113	1.236	2,192
114	1.216	2,147
115	1.196	2,103
116	1.176	2,060
117	1.157	2,018
118	1.138	1,977
119	1.120	1,937
120	1.101	1,898
121	1.083	1,860
122	1.065	1,822
123	1.048	1,786
124	1.030	1,750
125	1.013	1,715
126	0.997	1,680
127	0.980	1,647
128	0.964	1,614
129	0.948	1,582
130	0.932	1,550
131	0.917	1,519
132	0.902	1,489
133	0.887	1,459
134	0.872	1,430
135	0.857	1,401
136	0.843	1,373
137	0.829	1,345
138	0.815	1,318
139	0.802	1,291
140	0.788	1,265
141	0.775	1,239
142	0.762	1,214
143	0.750	1,189
144	0.737	1,165
145	0.725	1,141
146	0.713	1,118
147	0.701	1,095
148	0.689	1,072
149	0.678	1,050
150	0.666	1,028
151	0.655	1,007
152	0.644	986
153	0.634	965
154	0.623	945
155	0.613	925
156	0.602	906
157	0.592	887
158	0.582	868
159	0.573	850
160	0.563	832
161	0.554	815
162	0.545	798
163	0.536	782
164	0.527	765
165	0.518	749
166	0.509	734
167	0.501	719
168	0.493	705
169	0.484	690
170	0.476	677
171	0.468	663
172	0.461	650
173	0.453	638
174	0.446	626
175	0.438	614
176	0.431	602
177	0.424	591
178	0.417	581
179	0.410	570
180	0.403	560
181	0.397	551
182	0.390	542
183	0.384	533
184	0.378	524
185	0.371	516
186	0.365	508
187	0.360	501
188	0.354	494
189	0.348	487
190	0.342	480
191	0.337	473
192	0.332	467
193	0.326	461
194	0.321	456
195	0.316	450
196	0.311	444
197	0.306	439
198	0.301	434
199	0.297	429
200	0.292	424
201	0.288	419
202	0.283	415
203	0.279	410
204	0.274	405
205	0.270	401
206	0.266	396
207	0.262	391
208	0.258	386
209	0.254	382
210	0.250	377
211	0.247	372
212	0.243	366
213	0.239	361
214	0.236	356
215	0.232	350
216	0.229	344
217	0.225	338
218	0.222	332
219	0.219	325
220	0.215	318
221	0.212	311
222	0.209	304
223	0.206	297
224	0.203	289
225	0.200	282

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

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
-32.0	4.690	100 049
-31.5	4.680	97 006
-31.0	4.671	94 061
-30.5	4.661	91 209
-30.0	4.651	88 449
-29.5	4.641	85 777
-29.0	4.630	83 191
-28.5	4.620	80 687
-28.0	4.609	78 264
-27.5	4.597	75 918
-27.0	4.586	73 648
-26.5	4.574	71 451
-26.0	4.562	69 324
-25.5	4.550	67 265
-25.0	4.537	65 272
-24.5	4.525	63 344
-24.0	4.512	61 477
-23.5	4.499	59 670
-23.0	4.485	57 921
-22.5	4.471	56 228
-22.0	4.457	54 589
-21.5	4.443	53 003
-21.0	4.428	51 467
-20.5	4.413	49 980
-20.0	4.398	48 541
-19.5	4.383	47 148
-19.0	4.367	45 799
-18.5	4.351	44 492
-18.0	4.334	43 228
-17.5	4.318	42 003
-17.0	4.301	40 817
-16.5	4.283	39 668
-16.0	4.266	38 556
-15.5	4.248	37 478
-15.0	4.230	36 435
-14.5	4.211	35 424
-14.0	4.193	34 444
-13.5	4.174	33 495
-13.0	4.154	32 576
-12.5	4.135	31 685
-12.0	4.115	30 821
-11.5	4.094	29 984
-11.0	4.074	29 173
-10.5	4.053	28 386
-10.0	4.032	27 624
- 9.5	4.010	26 884
- 9.0	3.989	26 168
- 8.5	3.967	25 472
- 8.0	3.944	24 798
- 7.5	3.922	24 144
- 7.0	3.899	23 509
- 6.5	3.876	22 893
- 6.0	3.852	22 296
- 5.5	3.829	21 716
- 5.0	3.805	21 153
- 4.5	3.781	20 606
- 4.0	3.756	20 076
- 3.5	3.732	19 561
- 3.0	3.707	19 061
- 2.5	3.682	18 575
- 2.0	3.656	18 103
- 1.5	3.631	17 645
- 1.0	3.605	17 199
- 0.5	3.579	16 766
0.0	3.553	16 346
0.5	3.526	15 937
1.0	3.500	15 539
1.5	3.473	15 153
2.0	3.446	14 777
2.5	3.419	14 412
3.0	3.392	14 057
3.5	3.364	13 711
4.0	3.337	13 375
4.5	3.309	13 048
5.0	3.281	12 730
5.5	3.253	12 420
6.0	3.225	12 119
6.5	3.197	11 826
7.0	3.169	11 541
7.5	3.140	11 263
8.0	3.112	10 992
8.5	3.083	10 729
9.0	3.054	10 472
9.5	3.026	10 223
10.0	2.997	9 979
10.5	2.968	9 742
11.0	2.939	9 512
11.5	2.911	9 287
12.0	2.882	9 068
12.5	2.853	8 855
13.0	2.824	8 647
13.5	2.795	8 444
14.0	2.766	8 247
14.5	2.737	8 055
15.0	2.708	7 868
15.5	2.680	7 685
16.0	2.651	7 507
16.5	2.622	7334
17.0	2.593	7165
17.5	2.565	7000
18.0	2.536	6840
18.5	2.508	6683
19.0	2.479	6531
19.5	2.451	6382
20.0	2.423	6237
20.5	2.395	6096
21.0	2.367	5959
21.5	2.339	5825
22.0	2.311	5694
22.5	2.283	5566
23.0	2.256	5442
23.5	2.228	5321
24.0	2.201	5203
24.5	2.174	5088
25.0	2.147	4976
25.5	2.120	4867
26.0	2.094	4760
26.5	2.067	4656
27.0	2.041	4555
27.5	2.015	4457
28.0	1.989	4360
28.5	1.963	4267
29.0	1.938	4175
29.5	1.912	4086
30.0	1.887	4000
30.5	1.862	3915
31.0	1.837	3832
31.5	1.813	3752
32.0	1.789	3674
32.5	1.764	3597
33.0	1.741	3523
33.5	1.717	3450
34.0	1.693	3379
34.5	1.670	3310
35.0	1.647	3243
35.5	1.624	3177
36.0	1.602	3113
36.5	1.579	3051
37.0	1.557	2990
37.5	1.536	2931
38.0	1.514	2873
38.5	1.492	2816
39.0	1.471	2761
39.5	1.450	2707
40.0	1.430	2655
40.5	1.409	2603
41.0	1.389	2553
41.5	1.369	2504
42.0	1.349	2457
42.5	1.330	2410
43.0	1.311	2364
43.5	1.292	2320
44.0	1.273	2276
44.5	1.254	2234
45.0	1.236	2192
45.5	1.218	2152
46.0	1.200	2112
46.5	1.182	2073
47.0	1.165	2035
47.5	1.148	1997
48.0	1.131	1961
48.5	1.114	1925
49.0	1.098	1890
49.5	1.081	1856
50.0	1.065	1822
50.5	1.049	1789
51.0	1.034	1757
51.5	1.019	1725
52.0	1.003	1694
52.5	0.988	1663
53.0	0.974	1634
53.5	0.959	1604
54.0	0.945	1575
54.5	0.931	1547
55.0	0.917	1519
55.5	0.903	1492
56.0	0.890	1465
56.5	0.876	1438
57.0	0.863	1412
57.5	0.850	1387
58.0	0.837	1362
58.5	0.825	1337
59.0	0.812	1313
59.5	0.800	1289
60.0	0.788	1265
60.5	0.776	1242
61.0	0.765	1219
61.5	0.753	1197
62.0	0.742	1175
62.5	0.731	1153
63.0	0.720	1132
63.5	0.709	1111
64.0	0.698	1090
64.5	0.688	1070
65.0	0.678	1050
65.5	0.667	1030
66.0	0.657	1011
66.5	0.648	992
67.0	0.638	973
67.5	0.628	955
68.0	0.619	937
68.5	0.609	919
69.0	0.600	902
69.5	0.591	885
70.0	0.582	868
70.5	0.574	852
71.0	0.565	836
71.5	0.557	820
72.0	0.548	805
72.5	0.540	790
73.0	0.532	775
73.5	0.524	761
74.0	0.516	746
74.5	0.508	733
75.0	0.501	719
75.5	0.493	706
76.0	0.486	693
76.5	0.479	681
77.0	0.472	669
77.5	0.465	657
78.0	0.458	645
78.5	0.451	634
79.0	0.444	623
79.5	0.437	613
80.0	0.431	602
80.5	0.425	592
81.0	0.418	583
81.5	0.412	573
82.0	0.406	564
82.5	0.400	556
83.0	0.394	547
83.5	0.388	539
84.0	0.383	531
84.5	0.377	524
85.0	0.371	516
85.5	0.366	509
86.0	0.361	502
86.5	0.355	496
87.0	0.350	489
87.5	0.345	483
88.0	0.340	477
88.5	0.335	472
89.0	0.331	466
89.5	0.326	461
90.0	0.321	456
90.5	0.317	451
91.0	0.312	446
91.5	0.308	441
92.0	0.303	436
92.5	0.299	432
93.0	0.295	427
93.5	0.291	423
94.0	0.287	419
94.5	0.283	415
95.0	0.279	410
95.5	0.275	406
96.0	0.271	402
96.5	0.267	398
97.0	0.264	393
97.5	0.260	389
98.0	0.257	385
98.5	0.253	380
99.0	0.250	376
99.5	0.246	371
100.0	0.243	367
100.5	0.240	362
101.0	0.236	357
101.5	0.233	352
102.0	0.230	346
102.5	0.227	341
103.0	0.224	335
103.5	0.221	330
104.0	0.218	324
104.5	0.215	318
105.0	0.212	312
105.5	0.209	305
106.0	0.206	299
106.5	0.204	292
107.0	0.201	285

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. 34. 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, be careful not to damage orifice assembly seals. The bottom seal acts as a liquid shut-off, replacing a liquid line solenoid valve.

Reassembly 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. Be careful not to twist or pull on wires from EXV motor to valve cover pin connections. Check EXV operation in Quick Step steps outlined on page 38.

THERMOSTATIC EXPANSION VALVE (TXV) (080-110 ONLY)— The chiller with optional TXV is equipped with 2 conventional thermostatic expansion valves, (one per circuit). This control system necessitates use of a liquid line solenoid valve. TXVs are factory set to maintain 8° to 10° F (4.4° to 5.6° C) superheat of vapor leaving cooler by controlling flow of refrigerant into cooler. *Superheat can be reset but should be done only if absolutely necessary.*

When optional TXVs are used, thermistors T5, T6, T7, T8 are eliminated (see Fig. 26).

TXVs also incorporate an MOP feature to limit cooler suction to 55 F (13 C), making it possible for compressor to start at higher cooler water temperatures without overloading.

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. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants, for details on servicing filter driers.

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

LIQUID LINE SERVICE VALVE — This valve is located immediately ahead of filter drier, 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.

Thermistors — Electronic control uses 4 to 9 thermistors to sense temperatures used to control the operation of chiller. See Table 17.

Table 17 — Thermistor Designations

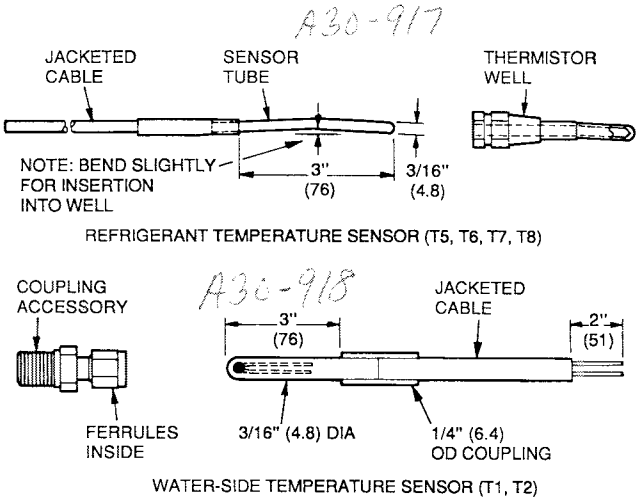
SENSOR	TEMPERATURE
T1	Cooler Leaving Fluid
T2	Cooler Entering Fluid
T3	Saturated Condensing Temperature — Circuit A
T4	Saturated Condensing Temperature — Circuit B
T5*	Evaporator Refrigerant Temperature — Circuit A
T6*	Evaporator Refrigerant Temperature — Circuit B
T7*	Compressor Return Gas Temperature — Circuit A
T8*	Compressor Return Gas Temperature — Circuit B
T10	Remote Temperature Sensor (Accessory)

*Not used on units with optional TXV (080-110, 240B, 270B only).

All thermistors are identical in their temperature vs resistance and voltage drop performance. Resistances at various temperatures are listed in Table 15 or 16.

LOCATION — General locations of thermistor sensors are shown in Fig. 26.

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. 36). Actual location is shown in Fig. 26 and 28.



NOTE: Dimensions in ( ) are in millimeters.

Fig. 36 — Thermistors

Cooler Entering Fluid 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. 36). Actual location is shown in Fig. 26 and 28.

Saturated Condensing Temperature Sensors, T3 and T4, are each clamped to outside of a return bend on condenser coil. Exact locations for all units are shown in Fig. 26 and 27.

Evaporator Refrigerant Sensors, T5 and T6, are located next to refrigerant inlet in cooler head. Thermistors are well-type thermistors. Typical location is shown in Fig. 26 and 28. (Not used on units with TXV.)

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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. 26. (Not used on units with TXV.)

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 the fluid circuit. Relieve all pressure or drain fluid before removing.

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

TO REPLACE SENSORS T1 AND T2 (Cooler):

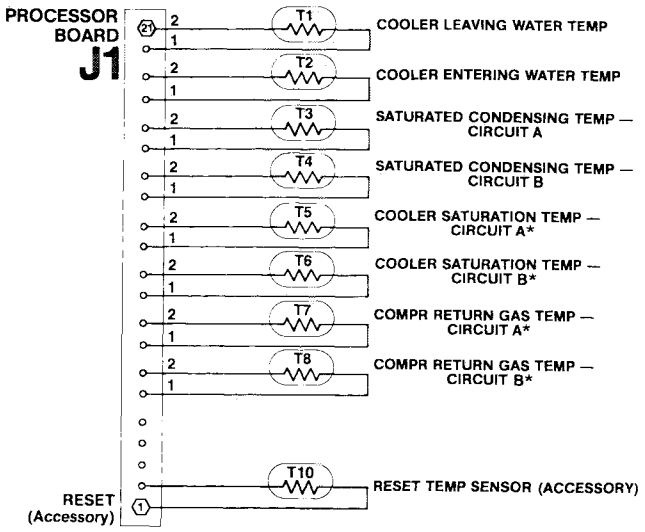
1. Remove and discard original sensor and coupling. Do not disassemble new coupling. Install assembly as received.
2. Apply pipe sealant to ¼-in. NPT threads on replacement coupling, and install in place of original. Do not use the packing nut to tighten coupling. Damage to ferrules will result.
3. Insert 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 T5, T6, T7, AND T8 (EXV Units Only) — Add a small amount of thermal conductive grease to thermistor well. Thermistors are friction-fit thermistors, which must be slipped into receivers located in the cooler head for T5 or T6, and in the compressor pump end for T7 or T8.

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

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

1. Connect the digital voltmeter across the appropriate thermistor terminals at the J1 terminal strip on the processor board (see Fig. 37 and Fig. 24). Using the voltage reading obtained, read the sensor temperature from Table 15 or 16. To check thermistor accuracy, measure temperature at probe location with an accurate thermocouple-type temperature measuring instrument. Insulate thermocouple to avoid ambient temperatures from influencing reading. Temperature measured by thermocouple and temperature determined from thermistor voltage reading should be close, ± 5° F (3° C) if care was taken in applying thermocouple and taking readings.
2. If a more accurate check is required, machine must be shut down. Remove thermistor and check at a known temperature (freezing point or boiling point of water) using either voltage drop measured across thermistor at the J1 terminals with unit in Quick Test mode 88 or by determining the resistance with chiller shut down and thermistor disconnected from J1.



T1-T8, T10 THERMISTORS

*Not used on 080-110 units with optional TXV.

Fig. 37 — Thermistor Connections to J1, Processor Board

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.

30GT080-110, 240B, AND 270B Compressor Protection Board (CPCS) — Compressor protection board is used to control and protect compressors and crankcase heaters. Board provides following features:

- Compressor contactor control
- Crankcase heater control
- Ground current protection
- Status communication to processor board
- High-pressure protection

One large relay is located on CPCS board 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 (2,936 ± 48 kPa) is mounted on each compressor; switch setting is shown in Table 18. Switch is wired in series with the CPCS board. If switch opens, CPCS relay opens and processor detects it through signal contacts; compressor locks off.

If any of these switches open during operation, the compressor stops and the failure is detected by processor when signal contacts open. If lead compressor in either circuit is

shut down by high pressure switch, ground current protector, loss of charge switch, or oil pressure switch, all compressors in the circuit are locked off.

30GT130-210, 240A, 270A, 300-420 — A control relay in conjunction with a ground fault module replaces the function of the CPCS (above). To reset, press the push-button switch on the module.

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

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

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

COOLER PROTECTION

Freeze Protection — Cooler is wrapped with heater cables as shown in Fig. 38, 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.

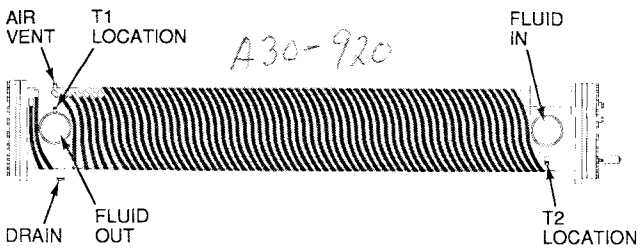


Fig. 38 — Cooler Heater Cables

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 sensors in cooler detect a no-flow condition. Leaving sensor is located in leaving water nozzle and entering sensor is located in first cooler baffle space in close proximity to cooler tubes, as shown in Fig. 28. 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 sensor detects this temperature drop and when entering temperature is 5° F (2.8° C) below leaving temperature, unit stops and is locked off.

Loss-of-Charge — A pressure switch connected to high side of each refrigerant circuit protects against total loss-of-charge. Switch settings are listed in Table 18. If switch is open, unit cannot start; if it opens during operation, unit locks out and cannot restart until switch is closed. Low charge is also monitored by the processor when an EXV is used.

Table 18 — Pressure Switch Settings, psig (kPa)

SWITCH	CUTOUT	CUT-IN
High Pressure	426 ± 7 (2936 ± 48)	320 ± 20 (2205 ± 138)
Loss-of-Charge	7 (48.2)	22 (151.6)

A low charge is detected by monitoring EXV position and superheat entering the compressor. If EXV is wide open, superheat is greater than 50 F (28 C) and saturated cooler suction is less than 55 F (13 C), 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 pressure on a temperature rise to approximately 210 F (99 C).

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

PRESSURE RELIEF VALVES — Where relief valves are installed, there is one in each circuit. 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 3/8-in. SAE flare for field connection. Some local building codes require that relieved gases be removed. This connection will allow conformance to this requirement.

Other Safeties — There are several other safeties that are provided by microprocessor control. For details refer to Controls and Troubleshooting book.