



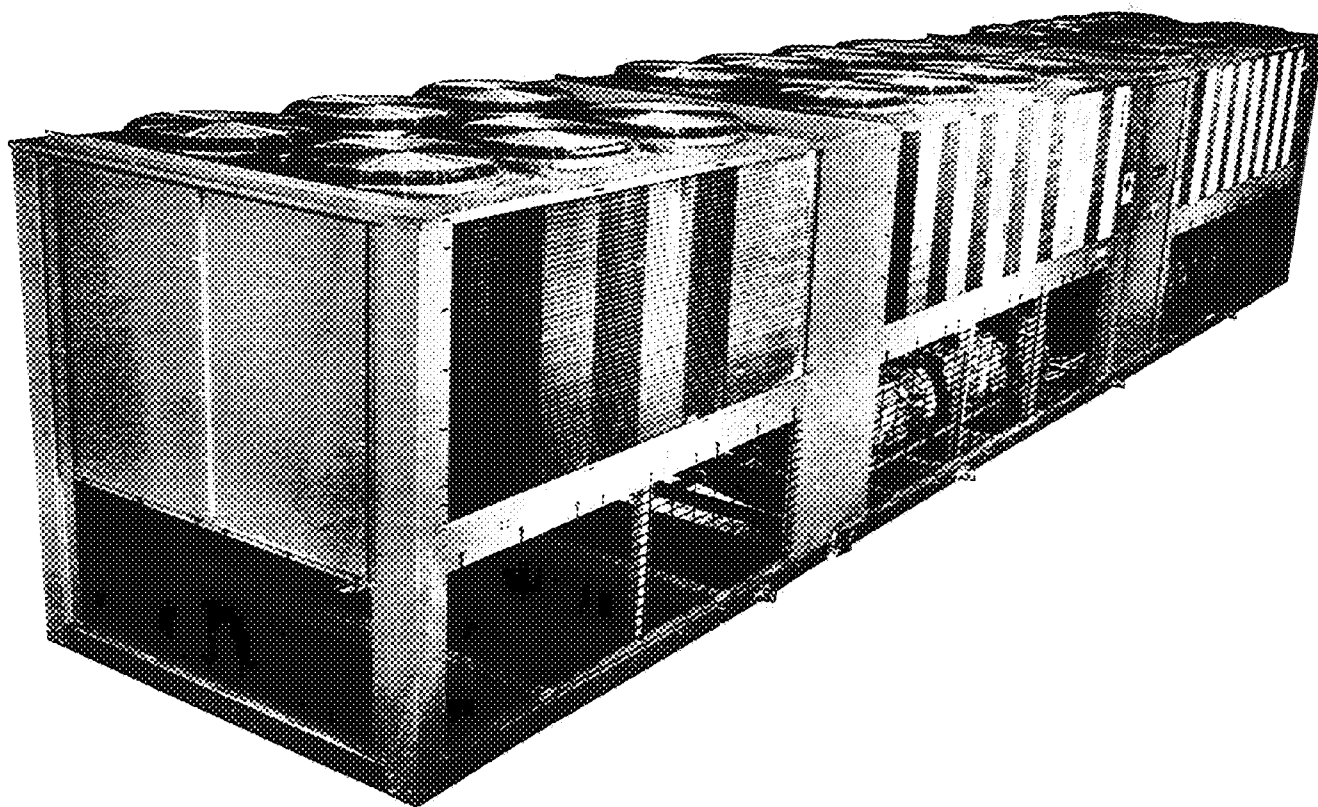
Advance Product Data

Nominal Capacity: 225 to 280 tons
790 to 980 kW

Packaged Air-Cooled Flotronic™ Chillers

30GT225-280
60 Hz

30GT225,250
50 Hz



Features

New 225, 250, 280 ton sizes for those large installations.

Fully packaged for fast track installation needs.

Dual refrigerant circuits for occupant assurance.

Single point electrical, cooler connections make installation easy.

Factory run tested for quick start-up. UL (460-volt unit) and CSA (575-volt unit) listed — to save time at start-up.

Serviceability — Hinged access doors allow convenient, quick service calls.

Serviceable semi-hermetic compressors — Familiar for quick service.

Flotronic controls offer optimum performance:

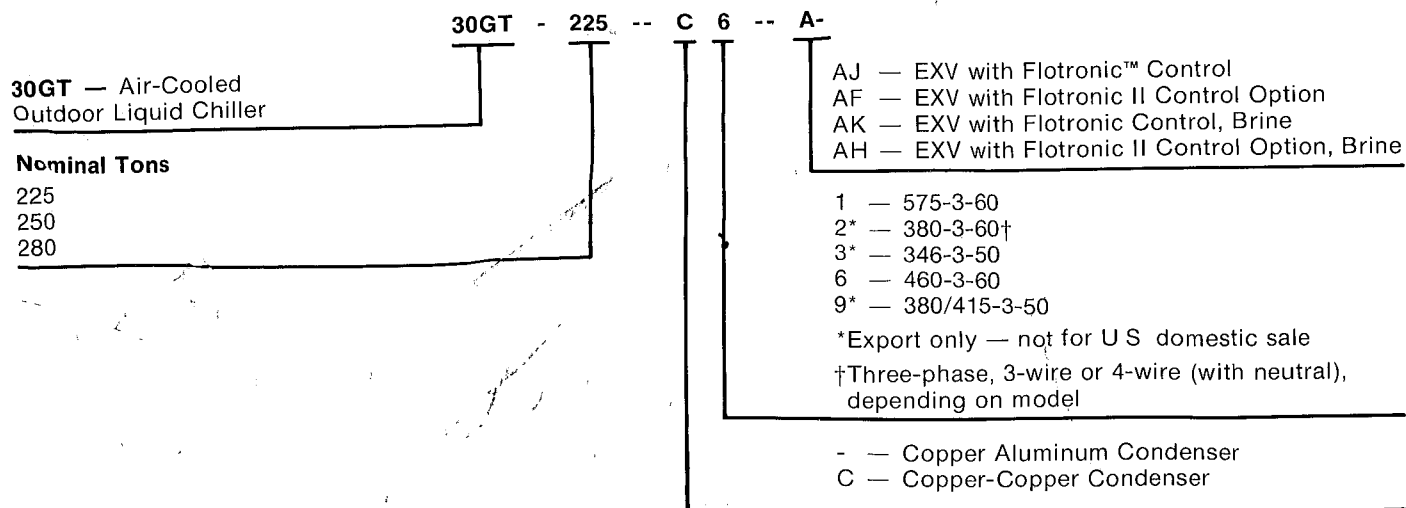
- Microprocessor control of compressors, fans and expansion valve.
- Leaving control of water temperature with return compensation.
- Electronic expansion valve provides the best part-load performance available.
- 2-digit diagnostic display offers quick on-site diagnosis.

Low ambient temperature operation (to -20 F optional)
— Suitable for coldest of climates.

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Model number nomenclature



Physical data

30GT	60 Hz			50 Hz	
SIZE (tons)	225	250	280	225	250
COMPRESSOR	Reciprocating, Semi-Hermetic				
Ckt A (Qty...Type)	3 6E275 1...6E299	2 6E275 2...6E299	4 6E299	1 6E275 3...6E299	4 6E299
Ckt B (Qty...Type)	3 6E275 1 6E299	2 6E275 2 6E299	4 6E299	4 6E299	4 6E299
Capacity Steps	8	8	8	8	8
REFRIGERANT	R-22				
COOLER	Shell and Tube, Direct Expansion Type				
Max. Design Working Pressure (psig)	235				
Refrigerant Side	300				
Water Side					
Inlet and Outlet (in.)	6	8	8	6	8
CONDENSER COIL	Plate Fin, Copper Tube, Aluminum Fin (Optional Copper Fin)				
Type					
CONDENSER FAN	Propeller, Direct Drive, 1 55 kW each				
Type					
Qty	16	20	22	16	20

Options and Accessories

Factory-installed options

Copper fin coils

Medium temperature brine operation — for 15 to 34 F leaving water temperature applications.

Control option includes standard features, plus — 7-day time schedule;

8-digit alphanumeric diagnostic display/set point panel, remote mountable (displays evaporator, condensing pressures, actual temperatures); standard return reset, CCN (Carrier ComfortNetwork) compatible

Field-installed accessories

Demand limit control module —

Provides 2 demand limit steps:
1) Between 50% and 100% of maximum compressor displacement; 2) Between 0% and 50% displacement. The external switching device determines when to limit unit capacity.

Leaving chilled water temperature reset accessory board —

Permits adjustment of LCWT based on return water, space or outdoor temperature.

Sensor kit assembly — For outdoor or space temperature reset of chilled water temperature.

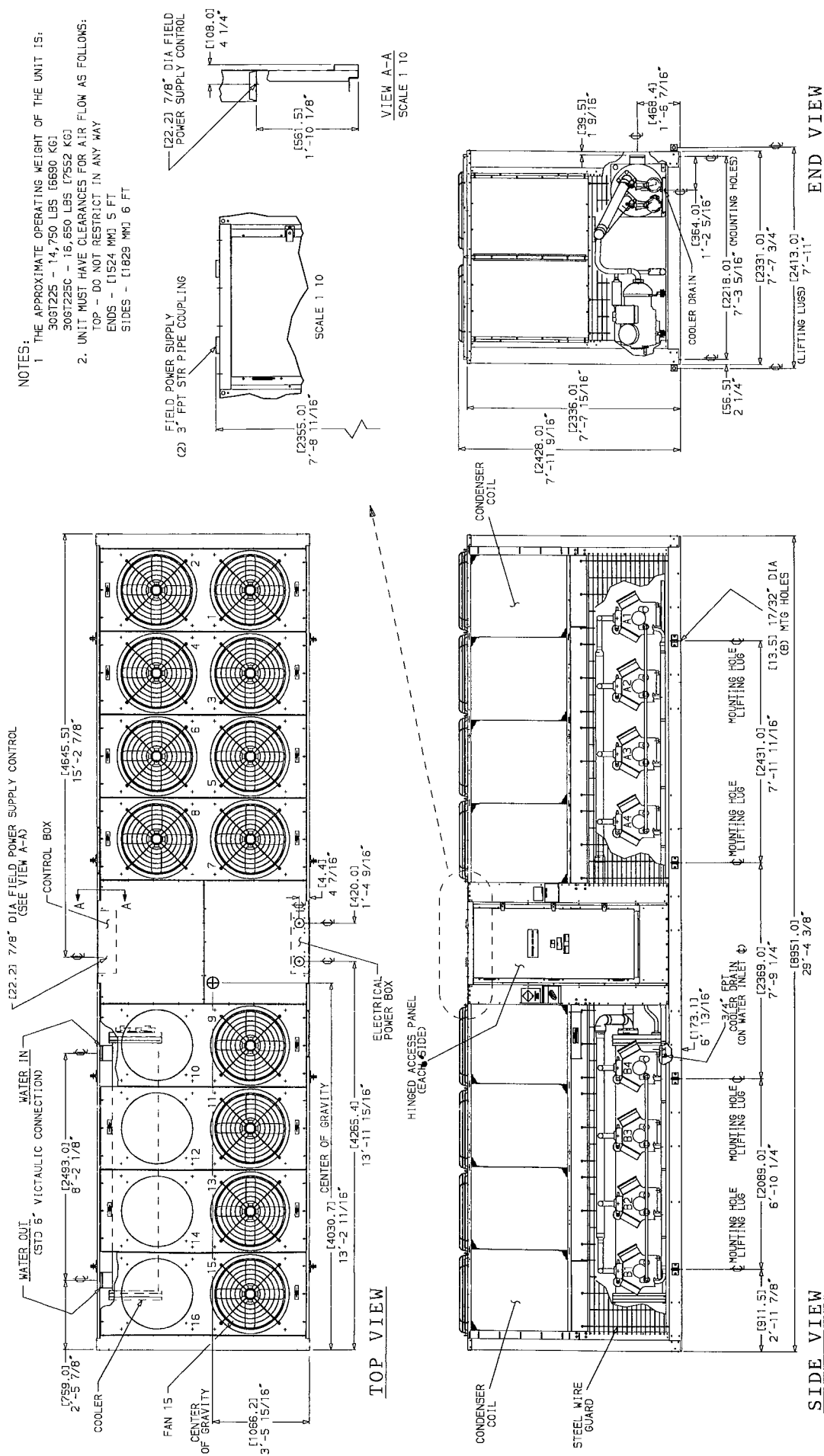
Discharge and suction pressure gage panel —

Both pressure gages mounted on a common panel. Each gage equipped with a shutoff valve. Each compressor requires a separate gage panel. Panels mount on top of the chiller control panel. Designed for routine maintenance requiring reading of system pressures.

Motormaster® head-pressure control —

All 30GT Flotronic™ chillers (either with electronic expansion valve or with factory-option thermal expansion valve) operate at ambient temperatures down to 35 F (1.8 C) without modification. Motormaster accessory permits modification to allow unit to operate down to -20 F (-28.8 C).

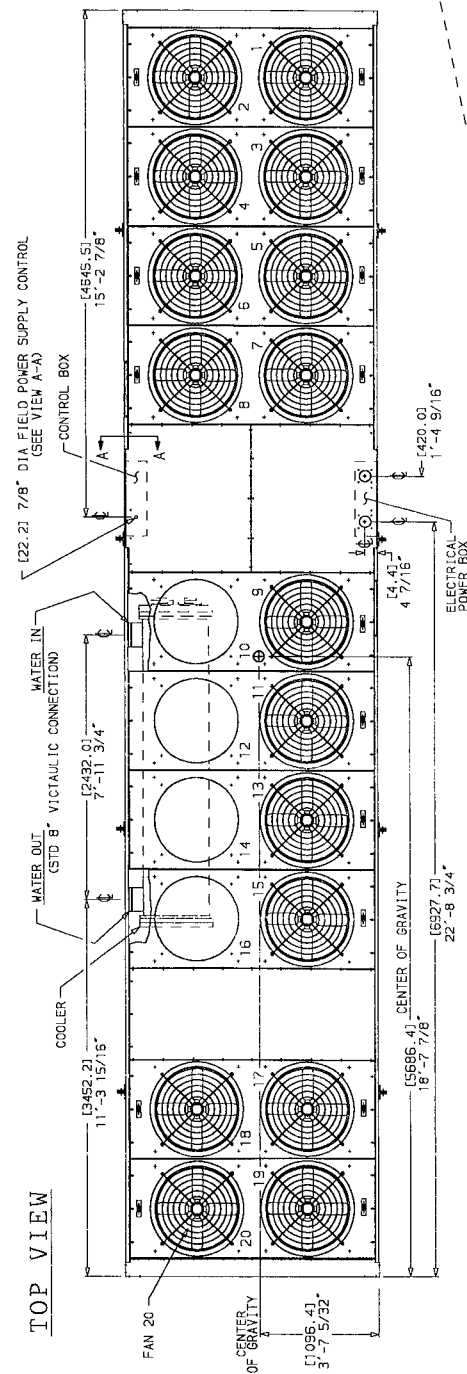
Dimensions — 30GT225



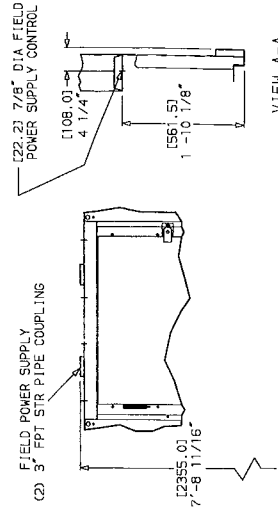
Dimensions — 30GT250

- NOTES:
- 1 THE APPROXIMATE OPERATING WEIGHT OF THE UNIT IS:
30GT250 — 18,450 LBS (8369 KG)
 2. UNIT MUST HAVE CLEARANCES FOR AIR FLOW AS FOLLOWS:
TOP — DO NOT RESTRICT IN ANY WAY
ENDS — [1524 MM] 5 FT
SIDES — [1829 MM] 6 FT

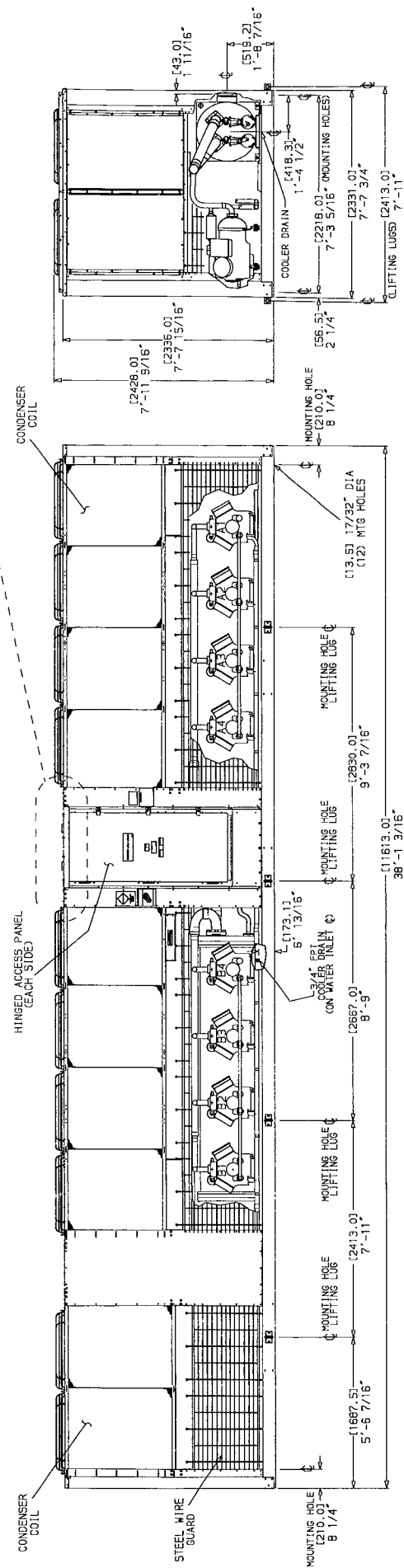
TOP VIEW



VIEW A-A



SIDE VIEW



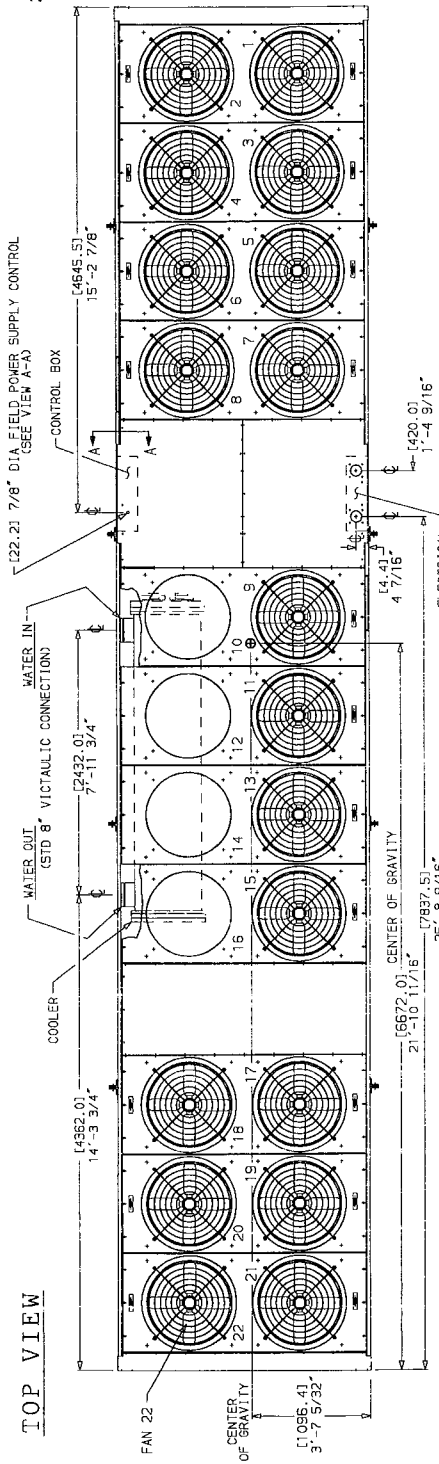
END VIEW

SIDE VIEW

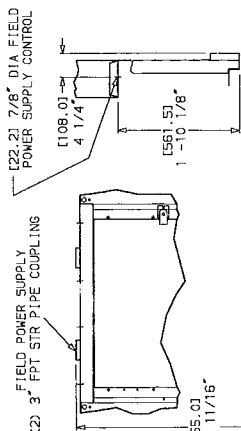
Dimensions — 30GT280

- NOTES:
- 1 THE APPROXIMATE OPERATING WEIGHT OF THE UNIT IS:
30GT280 — 18,750 LBS (8505 KG)
UNIT MUST HAVE CLEARANCES FOR AIR FLOW AS FOLLOWS:
TOP — DO NOT RESTRICT IN ANY WAY
ENDS — [1524 MM] 5 FT
SIDES — [1829 MM] 6 FT
 - 2

TOP VIEW



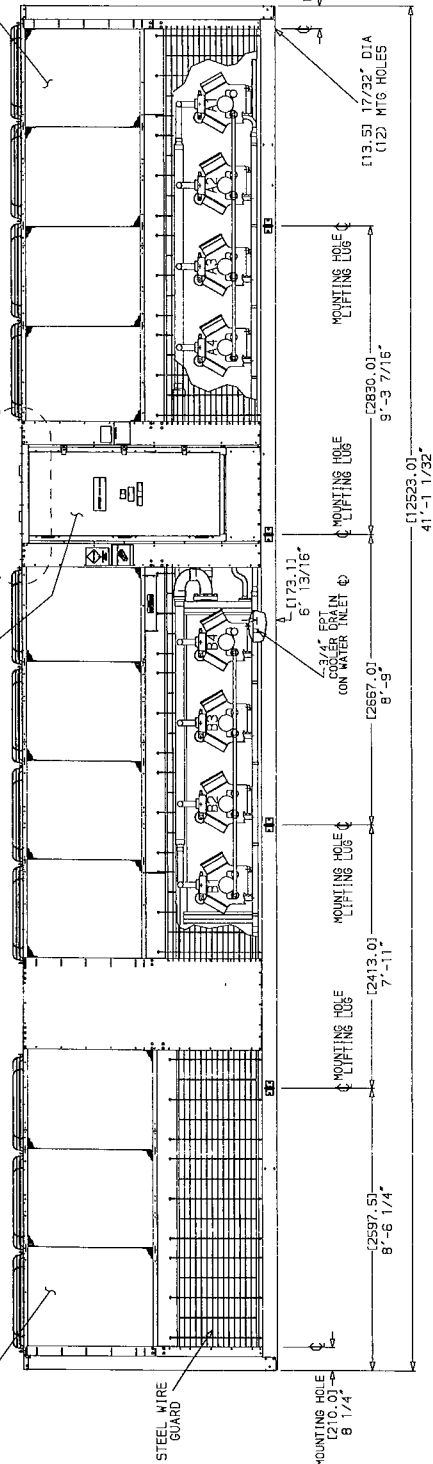
VIEW A-A



CONDENSER COIL

HINGED ACCESS PANEL (EACH SIDE)

CONDENSER COIL



SIDE VIEW

END VIEW

Selection procedure — English

I Determine unit size and operating conditions required to provide specified capacity at given conditions:

Capacity required 224 tons
Leaving chilled water temperature (LCWT) 45 F
Chilled water temperature rise 14 F
Condenser entering air temperature (CEAT) 95 F
Loop volume 765 gallons

Ratings are based on 10 F rise and are suitable for rise from 5 F to 15 F without adjustment. In this case, however, greater accuracy is desired

II Correct LCWT for 14 F cooler water temperature rise.

Enter correction curve at 14 F and read a correction of 0.3 F. Corrected LCWT is, therefore, 45 + 0.3 = 45.3 F.

III Determine capacity, unit size and power input.

Enter rating table at given CEAT and LCWT — respectively 95 F and 45 F.

Read down capacity column until the capacity nearest to but higher than specified required capacity is reached. Select 30GT225. Interpolate between 44 F and 46 F to

find determined capacity and power input at corrected LCWT (45.3 F). Values are:

Capacity 231.9 tons

Power input 270.2 kW

IV Calculate corrected cooler water flow.

$$\begin{aligned}\text{Water flow} &= \frac{24 \times \text{corr cap. in tons}}{\text{temperature rise } F} = \text{U.S. gpm} \\ &= \frac{24 \times 231.9}{14} = 366.7 \text{ U.S. gpm}\end{aligned}$$

V Calculate the cooler pressure drop.

Enter cooler pressure drop curve at the corrected flow rate (366.7 U.S. gpm) and read, for the 30GT225 a pressure drop of 7.4 ft of water

VI Check loop volume and cooler water flow rate.

Minimum loop volume, from application data, is 678 gallons for 30GT225. Therefore, given volume of 765 gallons is satisfactory. Minimum water flow rate, from application data, is 219 gpm for 30GT225. Flow rate of 366.7 gpm is well above minimum required.

Selection procedure — SI

I Determine unit size and operating conditions required to provide specified capacity at given conditions:

Capacity required 790 kW
Leaving chilled water temperature (LCWT) 6 C
Chilled water temperature rise 7.8 C
Condenser entering air temperature (CEAT) ... 35 C
Loop volume 2900 L

Ratings are based on 6 C rise and are suitable for rise from 2.8 C to 8.3 C without adjustment. In this case, however, greater accuracy is desired.

II Correct LCWT for 7.8 C cooler water temperature rise.

Enter correction curve at 7.8 C and read a correction of 0.17 C. Corrected LCWT is, therefore, 6 + 0.17 = 6.2 C.

III Determine capacity, unit size and power input.

Enter rating table at given CEAT and LCWT — respectively 35 C and 6 C. Read down the capacity column until the capacity nearest to but higher than the specified required capacity is reached. In this case, 789.9 kW

is delivered by a 30GT225. Interpolate between 6 C and 7 C to find the determined capacity and power input at corrected LCWT (6.2 C). Values are:

Capacity 795.2 kW

Power input 270.5 kW

IV Calculate corrected cooler water flow.

$$\begin{aligned}\text{Water flow} &= \frac{0.239 \times \text{corr cap. in kW}}{\text{temperature rise } C} = \text{L/s} \\ &= \frac{0.239 \times 795.2}{7.8} = 24.4 \text{ L/s}\end{aligned}$$

V Calculate cooler pressure drop.

Enter cooler pressure drop curve at corrected flow rate (24.4 L/s) and read, for 30GT225, a pressure drop of 28 kPa.

VI Check loop volume and cooler water flow rate.

Minimum loop volume, from application data, is 2588 L for 30GT225. Therefore, given volume of 2900 L is satisfactory. Minimum water flow rate, from application data, is 9.2 L/s for 30GT225. Flow rate of 24.4 L/s is well above minimum required.

Performance data — 30GT225-280, 60 Hz

COOLING CAPACITIES — ENGLISH

LCWT	UNIT SIZE	CONDENSER ENTERING AIR TEMPERATURE (F)														
		85.0			95.0			105.0			115.0			125.0		
		Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate
40.0	225	223 1	242 5	534 0	210 4	254 9	503 6	197.5	266 0	472 7	184 4	275 7	441 3	171 1	284 2	409 7
	250	243 2	258 9	582.2	229 6	273 3	549.6	215 8	286 4	516.5	202 0	298 3	483 5	188 0	308 8	450 1
	280	273 1	296.0	653 7	258 4	311.2	618 7	243 9	325 4	583 7	229.1	338 5	548 5	214 5	350 6	513 5
42.0	225	231 3	247 7	554 0	218 3	260.6	522 9	205 1	272 2	491 4	191 8	282 6	459 4	178.2	291 5	427 0
	250	252 3	264 0	604 5	238 3	279 0	571.0	224 3	292 8	537 2	210 0	305 1	503 0	195 7	316 2	468 8
	280	283 0	302 1	678 0	267 9	317 9	641 8	253 0	332 7	606 1	238 0	346.3	570 1	222 8	358 9	533.7
44.0	225	239 8	253 0	574 8	226 5	266 4	542 9	212.9	278 5	510 4	199 3	289.4	477 8	185 4	298 9	444.3
	250	261 5	269 2	626 9	247.3	284 8	592 9	232 8	299 1	558 2	218 3	312 1	523 3	203.5	323 8	487.9
	280	293.0	308 1	702 3	277.7	324 6	665 8	262 4	340 0	629 0	246 9	354 2	591.9	231 4	367.4	554.8
46.0	225	248 4	258 3	595 8	234.8	272 3	563 2	220 9	284.9	529 8	206 9	296 4	496 4	192 8	306 5	462 5
	250	271 1	274 4	650 3	256.3	290 6	614 9	241.7	305 6	579 6	226 7	319 1	543 8	211 5	331 3	507 3
	280	303 2	314 3	727 2	287 6	331 4	689.8	272 0	347 4	652 3	256 1	362 2	614.3	240 1	375 9	576 0
48.0	225	257 1	263 7	617 1	243 2	278 2	583.8	229.0	291 4	549 7	214.7	303 4	515.4	200 3	314 0	480.6
	250	280 8	279 7	673.8	265 8	296 5	637 9	250 5	312 0	601 2	235 3	326 2	564 8	219 8	339 1	527 6
	280	313.6	320 6	752.7	297 6	338 3	714 2	281 5	354 8	675.7	265 5	370 3	637 1	249 1	384 6	597 7
50.0	225	266 0	269 2	638 7	251 8	284 2	604 7	237 4	298 0	570 1	222.7	310 4	534 8	207 9	321 1	499 2
	250	290 5	285 0	697 5	275 3	302 4	661 0	259 8	318 6	623 8	244 0	333 3	585 9	228 3	346 8	548 1
	280	324 5	327.0	779 1	307 9	345 2	739 2	291 4	362 3	699 6	274 7	378 3	659 7	258 2	393 3	620 0
55.0	225	288 8	283 3	694 2	273 9	299 6	658 4	258 8	314 7	622 0	243 5	328 6	585 1	—	—	—
	250	315 9	298 6	759 3	299 9	317 5	720 7	282 4	334 5	678 9	264 7	349 8	636 2	246 9	363.8	593 5
	280	352 0	343.2	846 1	334 6	362 9	804.2	317 1	381 5	762 1	299 3	398 9	719 3	280 4	414.3	673 9
60.0	225	307 8	294.4	740 4	289 1	309 5	695 4	270 3	323 1	650 2	251 5	335.1	605 0	—	—	—
	250	327.4	304 1	787 6	308 1	321 9	741 1	288 7	338 2	694 5	269 4	352.9	648 0	250 0	365 9	601 5
	280	371 6	353 8	893 9	350 2	372 4	842 4	328 9	389 5	791 2	307 8	405 1	740 4	286.6	419.4	689 5

LEGEND

Cap. — Cooling Capacity Tons of Refrigeration
kW — Compressor Power Input
LCWT — Leaving Chilled Water Temperature (F)
Flow Rate — U S Gpm

NOTES.

- Ratings apply to units with electronic or thermal expansion valves
- All ratings are based on
 - A cooler chilled water temperature rise of 10 F. When greater accuracy is desired, correct design LCWT, before entering rating tables, by reference to the LCWT correction curve
 - A fouling factor of 0.00025 in the cooler
 - Refrigerant 22

- When a corrected LCWT is used, cooler pressure drop must also be corrected for new LCWT
 - Enter rating table for corrected LCWT. By interpolation, determine corrected capacity (tons) and power input (kW) to compressor at its rated voltage
 - Calculate corrected flow rate through the cooler

$$= \frac{24 \times \text{capacity in tons}}{\text{temperature rise } F} = \text{U S gpm}$$
 - Enter cooler pressure drop curve at corrected flow rate and read pressure drop
- When chilled water temperature rise is less than 5°F, high flow rate will normally be accompanied by an excessive pressure drop. In such cases, contact your Carrier representative for special selection of a cooler with wider baffle spacing

Performance data — 30GT225-280, 60 Hz (cont)

COOLING CAPACITIES — SI

LCWT	UNIT SIZE	CONDENSER ENTERING AIR TEMPERATURE (C)														
		30.0			35.0			40.0			45.0			50.0		
		Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate
4.0	225	799.5	243.7	33.8	738.5	254.6	32.0	696.7	264.4	30.2	655.1	273.2	28.4	612.9	280.9	26.6
	250	846.6	259.7	36.7	802.6	272.5	34.8	759.0	284.2	32.9	715.0	294.8	31.0	670.7	304.4	29.1
	280	952.3	297.0	41.3	905.5	310.6	39.3	858.8	323.2	37.2	811.8	334.9	35.2	765.2	345.8	33.2
5.0	225	805.7	248.5	35.0	764.1	259.8	33.2	721.9	270.2	31.3	678.8	279.3	29.5	635.8	287.5	27.6
	250	875.5	264.5	38.0	831.0	277.7	36.1	785.7	289.8	34.1	740.8	300.9	32.1	695.5	311.0	30.2
	280	983.5	302.6	42.7	936.1	316.7	40.6	888.2	329.7	38.5	840.3	341.9	36.5	792.0	353.2	34.4
6.0	225	832.5	253.3	36.1	789.9	265.1	34.3	747.1	275.9	32.4	703.5	285.6	30.5	659.0	294.1	28.6
	250	905.1	269.2	39.3	859.4	282.9	37.3	813.6	295.6	35.3	767.0	307.1	33.3	720.7	317.6	31.3
	280	1016.2	308.3	44.1	966.8	322.7	42.0	918.2	336.3	39.9	869.1	349.0	37.7	819.9	360.8	35.6
7.0	225	860.4	258.3	37.4	816.4	270.5	35.5	772.5	281.6	33.6	728.2	291.8	31.6	683.2	300.8	29.7
	250	934.8	274.0	40.6	888.6	288.2	38.6	841.6	301.4	36.6	794.4	313.4	34.5	746.4	324.3	32.4
	280	1049.0	314.0	45.6	999.0	329.0	43.4	948.4	343.0	41.2	898.5	356.1	39.0	848.0	368.3	36.8
8.0	225	887.8	263.2	38.6	843.9	275.9	36.7	798.5	287.5	34.7	753.2	298.0	32.7	707.4	307.6	30.8
	250	965.9	278.9	42.0	918.3	293.6	39.9	870.2	307.2	37.8	821.8	319.7	35.7	773.2	331.2	33.6
	280	1081.4	319.7	47.0	1031.2	335.2	44.8	980.0	349.7	42.6	928.1	363.3	40.3	876.7	376.0	38.1
9.0	225	916.6	268.3	39.9	871.4	281.4	37.9	825.2	293.4	35.9	778.8	304.4	33.9	731.9	314.3	31.8
	250	997.0	283.8	43.4	948.4	299.0	41.2	899.5	313.1	39.1	850.0	326.1	37.0	800.1	338.0	34.8
	280	1115.2	325.5	48.5	1063.4	341.4	46.2	1011.6	356.5	44.0	959.0	370.6	41.7	905.7	383.7	39.4
10.0	225	945.5	273.4	41.1	899.3	286.9	39.1	852.6	299.4	37.1	804.9	310.8	35.0	757.0	321.2	32.9
	250	1028.4	288.7	44.7	979.1	304.4	42.6	929.1	319.0	40.4	878.6	332.5	38.2	827.6	344.9	36.0
	280	1150.2	331.4	50.0	1096.4	347.8	47.7	1042.9	363.3	45.4	990.0	377.9	43.1	935.9	391.6	40.7
13.0	225	1034.4	289.2	45.1	985.7	303.9	42.9	936.2	317.7	40.8	886.3	330.5	38.6	—	—	—
	250	1121.5	302.9	48.8	1065.3	319.4	46.4	1009.2	334.7	44.0	952.0	348.7	41.5	895.0	361.6	39.0
	280	1257.1	349.4	54.8	1199.6	367.3	52.2	1138.4	383.3	49.6	1077.7	398.4	46.9	1016.4	412.4	44.3
16.0	225	1076.5	296.1	46.9	1017.2	309.6	44.3	957.7	321.8	41.8	898.1	332.8	39.2	—	—	—
	250	1145.5	306.0	49.9	1084.2	322.0	47.3	1022.9	336.7	44.6	961.6	350.2	41.9	900.4	362.3	39.3
	280	1300.3	355.8	56.7	1232.5	372.5	53.7	1165.1	387.9	50.8	1098.0	402.2	47.9	1031.1	415.3	45.0

LEGEND

Cap. — Cooling Capacity kW of Refrigeration
 kW — Compressor Power Input
 LCWT — Leaving Chilled Water Temperature (C)
 Flow Rate — L/s

NOTES:

- Ratings apply to units with electronic or thermal expansion valves
- All ratings are based on
 - A cooler chilled water temperature rise of 6°C. When greater accuracy is desired, correct design LCWT, before entering rating tables, by reference to the LCWT correction curve
 - A fouling factor of 0.000044 in the cooler
 - Refrigerant 22.

- When a corrected LCWT is used, cooler pressure drop must also be corrected for new LCWT
 - Enter rating table for corrected LCWT. By interpolation, determine corrected capacity (kW) and power input (kW) to compressor at its rated voltage
 - Calculate corrected flow rate through the cooler.

$$= \frac{0.239 \times \text{capacity in kW}}{\text{temperature rise } ^\circ\text{C}} = \text{L/s}$$
 - Enter cooler pressure drop curve at corrected flow rate and read pressure drop
- When chilled water temperature rise is less than 3°C, high flow rate will normally be accompanied by an excessive pressure drop. In such cases, contact your Carrier representative for special selection of a cooler with wider baffle spacing

Performance data — 30GT225,250, 50 Hz

COOLING CAPACITIES — ENGLISH

LCWT	UNIT SIZE	CONDENSER ENTERING AIR TEMPERATURE (F)														
		85.0			95.0			105.0			115.0			125.0		
		Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate
40.0	225	225.1	254.4	538.8	212.9	266.7	509.7	200.7	278.2	480.5	188.5	288.6	451.1	176.1	298.2	421.6
	250	242.0	256.2	579.3	228.7	269.9	547.6	215.7	282.6	516.3	202.6	294.4	484.9	189.4	305.2	453.4
42.0	225	233.3	260.0	558.8	220.8	272.8	529.0	208.3	284.7	499.0	195.7	295.7	468.9	183.1	305.7	438.6
	250	251.0	261.3	601.2	237.5	275.7	568.9	223.9	288.9	536.4	210.4	301.1	504.1	197.0	312.4	471.8
44.0	225	241.6	265.7	579.3	229.0	279.1	548.9	216.0	291.4	517.9	203.2	302.8	487.0	190.2	313.3	455.9
	250	260.2	266.6	623.7	246.3	281.4	590.4	232.5	295.2	557.3	218.5	307.9	523.8	204.6	319.7	490.5
46.0	225	250.3	271.5	600.4	237.1	285.3	568.7	224.0	298.1	537.2	210.7	310.0	505.4	197.4	321.0	473.5
	250	269.6	271.9	646.6	255.3	287.3	612.5	241.1	301.6	578.3	226.9	314.9	544.2	212.5	327.1	509.6
48.0	225	259.0	277.3	621.6	245.6	291.7	589.5	232.1	305.0	557.1	218.6	317.4	524.5	—	—	—
	250	279.1	277.3	669.9	264.6	293.2	635.0	250.0	308.1	599.9	235.3	321.8	564.7	220.6	334.7	529.4
50.0	225	267.9	283.3	643.2	254.2	298.1	610.3	240.4	311.9	577.2	226.3	324.7	543.5	—	—	—
	250	288.8	282.7	693.4	274.0	299.2	657.8	259.0	314.6	621.9	244.0	328.9	585.8	228.8	342.2	549.4
55.0	225	290.6	298.6	698.6	276.2	314.6	663.7	261.5	329.7	628.6	246.9	343.8	593.3	—	—	—
	250	314.1	296.5	755.0	298.3	314.3	716.9	281.3	330.5	676.2	264.2	345.2	635.1	247.2	358.9	594.2
60.0	225	309.6	310.8	744.8	291.4	325.5	700.9	273.2	338.9	657.2	255.1	351.1	613.7	—	—	—
	250	325.0	301.9	781.9	306.2	318.7	736.5	287.4	334.1	691.4	268.8	348.3	646.7	250.3	361.1	602.1

LEGEND

Cap. — Cooling Capacity Tons of Refrigeration
kW — Compressor Power Input
LCWT — Leaving Chilled Water Temperature (F)
Flow Rate — U S Gpm

NOTES.

- 1 Ratings apply to units with electronic or thermal expansion valves
- 2 All ratings are based on
 - a. A cooler chilled water temperature rise of 10 F. When greater accuracy is desired, correct design LCWT, before entering rating tables, by reference to the LCWT correction curve
 - b. A fouling factor of 0.00025 in the cooler
 - c. Refrigerant 22

3. When a corrected LCWT is used, cooler pressure drop must also be corrected for new LCWT
 - a. Enter rating table for corrected LCWT. By interpolation, determine corrected capacity (tons) and power input (kW) to compressor at its rated voltage
 - b. Calculate corrected flow rate through the cooler

$$= \frac{24 \times \text{capacity in tons}}{\text{temperature rise F}} = \text{U S gpm}$$
 - c. Enter cooler pressure drop curve at corrected flow rate and read pressure drop
4. When chilled water temperature rise is less than 5°F, high flow rate will normally be accompanied by an excessive pressure drop. In such cases, contact your Carrier representative for special selection of a cooler with wider baffle spacing

Performance data — 30GT225,250, 50 Hz (cont)

COOLING CAPACITIES — SI

LCWT	UNIT SIZE	CONDENSER ENTERING AIR TEMPERATURE (C)														
		30.0			35.0			40.0			45.0			50.0		
		Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate	Cap.	Input kW	Cooler Flow Rate
4.0	225	786.7	255.6	34.1	747.7	266.5	32.4	708.5	276.7	30.7	669.2	286.0	29.0	629.8	294.6	27.3
	250	842.5	256.9	36.5	800.2	269.1	34.7	758.5	280.4	32.9	716.8	290.9	31.1	674.9	300.7	29.3
5.0	225	813.0	260.7	35.3	773.0	272.1	33.5	733.0	282.6	31.8	692.8	292.4	30.1	652.4	301.3	28.3
	250	871.0	261.7	37.8	828.1	274.3	35.9	784.8	286.0	34.1	742.1	297.0	32.2	699.3	307.1	30.3
6.0	225	840.1	266.0	36.5	798.8	277.7	34.7	757.8	288.6	32.9	716.7	298.8	31.1	675.3	308.1	29.3
	250	900.1	266.5	39.1	856.1	279.6	37.2	812.2	291.8	35.5	767.9	303.1	33.3	724.0	313.6	31.4
7.0	225	867.5	271.3	37.7	825.6	283.4	35.9	783.2	297.4	34.0	741.1	305.2	32.2	698.8	315.0	30.4
	250	929.6	271.4	40.4	884.8	284.8	38.4	839.7	297.5	36.5	794.7	309.3	34.5	749.2	320.2	32.6
8.0	225	895.3	276.7	38.9	852.0	289.2	37.0	809.5	300.9	35.2	765.9	311.8	33.3	722.6	322.0	31.4
	250	960.4	276.3	41.7	913.8	290.2	39.7	867.8	303.3	37.7	821.7	315.5	35.7	775.4	326.9	33.7
9.0	225	923.5	282.2	40.2	879.8	295.1	38.3	835.4	307.1	36.3	791.7	318.5	34.4	746.9	329.0	32.5
	250	991.2	281.2	43.1	944.0	295.7	41.1	896.3	309.1	39.0	849.2	321.7	36.9	801.8	333.6	34.9
10.0	225	952.2	287.7	41.4	907.6	301.0	39.5	862.7	313.5	37.5	817.1	325.2	35.6	772.0	336.2	33.6
	250	1022.3	286.2	44.5	974.3	301.1	42.4	926.0	315.1	40.3	877.4	328.1	38.2	828.7	340.3	36.1
13.0	225	1040.9	304.8	45.3	993.5	319.3	43.3	945.7	333.1	41.2	897.7	346.0	39.1	—	—	—
	250	1114.1	300.7	48.5	1059.3	316.2	46.1	1005.0	330.8	43.8	949.8	344.2	41.4	895.1	356.8	39.0
16.0	225	1082.9	312.4	47.2	1025.2	325.5	44.7	967.7	337.6	42.2	910.5	348.7	39.7	—	—	—
	250	1137.3	303.7	49.6	1077.5	318.8	47.0	1018.1	332.7	44.4	959.1	345.6	41.8	900.4	357.4	39.3

LEGEND

Cap. — Cooling Capacity kW of Refrigeration
kW — Compressor Power Input
LCWT — Leaving Chilled Water Temperature (C)
Flow Rate — L/s

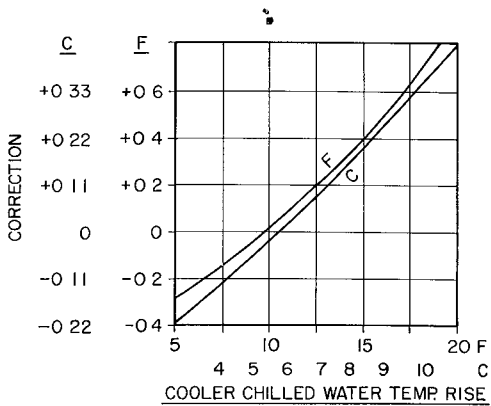
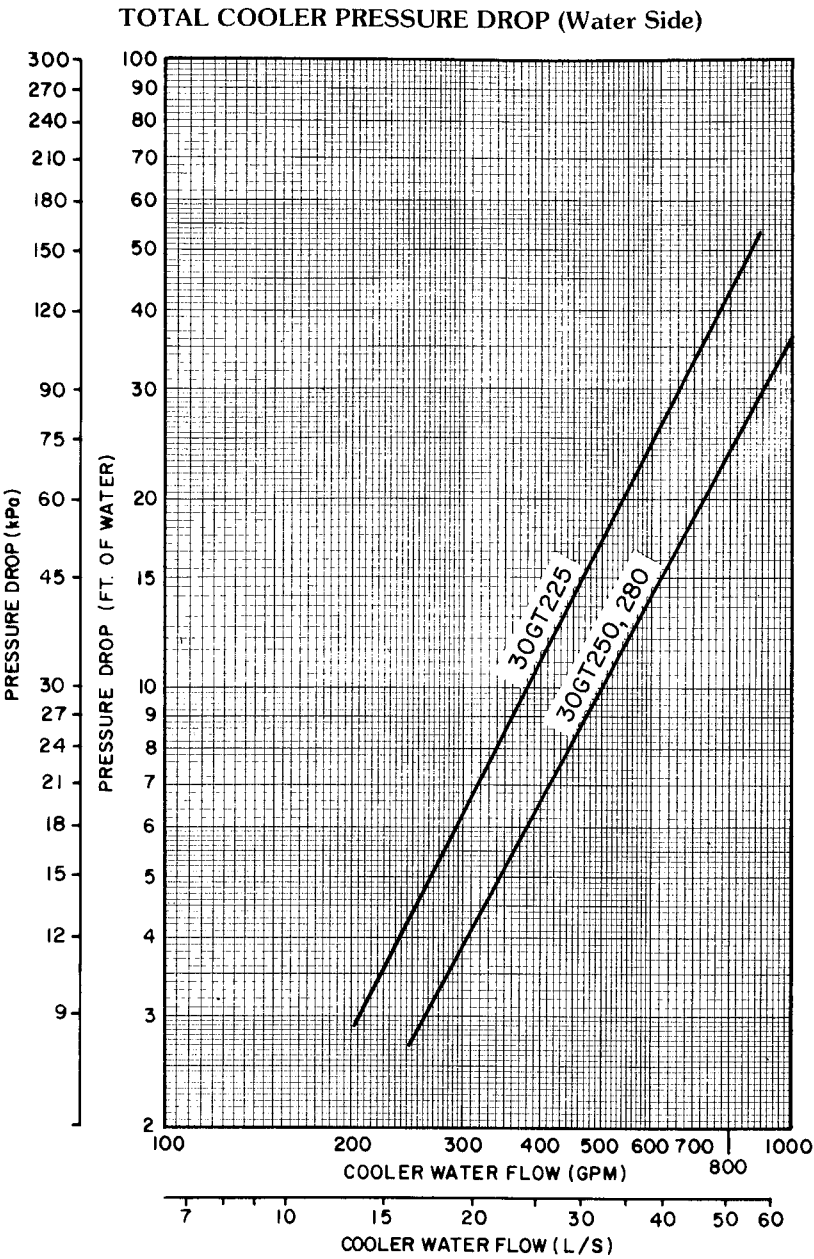
NOTES

- Ratings apply to units with electronic or thermal expansion valves
- All ratings are based on
 - A cooler chilled water temperature rise of 6°C. When greater accuracy is desired, correct design LCWT, before entering rating tables, by reference to the LCWT correction curve
 - A fouling factor of 0.000044 in the cooler
 - Refrigerant 22

- When a corrected LCWT is used, cooler pressure drop must also be corrected for new LCWT
 - Enter rating table for corrected LCWT. By interpolation, determine corrected capacity (kW) and power input (kW) to compressor at its rated voltage
 - Calculate corrected flow rate through the cooler

$$= \frac{0.239 \times \text{capacity in kW}}{\text{temperature rise } ^\circ\text{C}} = \text{L/s}$$
 - Enter cooler pressure drop curve at corrected flow rate and read pressure drop
- When chilled water temperature rise is less than 3°C, high flow rate will normally be accompanied by an excessive pressure drop. In such cases, contact your Carrier representative for special selection of a cooler with wider baffle spacing

Performance data (cont)



Above 10 F, ADD correction to design LCWT
Below 10 F, SUBTRACT
Above 6 C, ADD correction to design LCWT
Below 6 C, SUBTRACT

Electrical data

60 Hz

30GT	VOLTAGE				MOCP (Fuse Only)	ICF	06E299 COMP 1			06E275 COMP 2			FAN MOTORS		CONTROL CIRCUIT	
	Nameplate (Volts-Ph-Hz)	Supply Voltage					Qty	RLA	LRA	Qty	RLA	LRA	FLA (ea)	Qty	Volts-Ph-Hz	Amps
		Min	Max	MCA												
225	380-3-60	342	418	569	600	849	2	81.4	382	6	53.8	280	3.9	16	220-1-60	15
	460-3-60	414	508	493	500	754	2	67.6	345	6	48.4	253	3.2	16	115-1-60	30
	575-3-60	518	632	420	450	627	2	54.5	276	6	40.4	176	3.4	16	115-1-60	30
250	380-3-60	342	418	640	700	919	4	81.4	382	4	53.8	280	3.9	20	220-1-60	15
	460-3-60	414	508	544	600	805	4	67.6	345	4	48.4	253	3.2	20	115-1-60	30
	575-3-60	518	632	462	500	669	4	54.5	276	4	40.4	176	3.4	20	115-1-60	30
280	380-3-60	342	418	750	800	1038	4	81.4	382	4	81.4	382	3.9	22	220-1-60	15
	460-3-60	414	508	621	700	889	4	67.6	345	4	67.6	345	3.2	22	115-1-60	30
	575-3-60	518	632	518	600	632	4	54.5	276	4	54.5	276	3.4	22	115-1-60	30

50 Hz

30GT	VOLTAGE				MOCP (Fuse Only)	ICF	06E299 COMP 1			06E275 COMP 2			FAN MOTORS		CONTROL CIRCUIT	
	Nameplate (Volts-Ph-Hz)	Supply Voltage					Qty	RLA	LRA	Qty	RLA	LRA	FLA (ea)	Qty	Volts-Ph-Hz	Amps
		Min	Max	MCA												
225	346-3-50	311	380	715	800	984	7	81.4	400	1	53.8	294	2.6	16	200/220-1-50	15
	380/415-3-50	342	400	593	600	853	7	67.6	345	1	48.4	253	3.4	16	230-1-50	15
250	346-3-50	311	380	760	800	1022	4	81.4	400	4	81.4	400	2.6	20	200/220-1-50	15
	380/415-3-50	342	400	626	700	886	4	67.6	345	4	67.6	345	3.4	20	230-1-50	15

FLA — Full Load Amps
ICF — Maximum Instantaneous Current Flow during starting (the point in starting sequence where the sum of the LRA for the starting compressor, plus the total RLA for all running compressors, plus the total FLA for all running fan motors is maximum)
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
Ph — Phase
RLA — Rated Load Amps

NOTES
 1 All motors are 3 phase, nominal unit voltage
 2 All units constructed in accordance with NEC (National Electrical Code)
 3 460-3-60 units are UL listed.
 4 575-3-60 units are CSA listed.

Controls

Microprocessor — Microprocessor controls overall unit operation. Its central executive routine controls a number of processes simultaneously. These include internal timers, reading inputs, A to D conversions, fan control, display control, diagnostic control, output relay control, demand limit, capacity control, head pressure control and temperature reset. Some processes are updated almost continuously, others every 2 to 3 seconds, and some every 30 seconds.

The microprocessor routine is started by switching control circuit ON-OFF circuit breaker switch to ON. (This switch is also used to reset microprocessor should any safety trip and also functions as circuit breaker for electronic processor and relay boards.)

When the switch is closed, a 2-minute initialization routine is begun. During this time, inputs are checked, EXV and internal constants are initialized and a **20** appears on display. If display button is pushed during this period, control goes into a 42-step Quick Test routine, normally used for a readiness check during start-up, or for service.

Microprocessor controls capacity of chiller by cycling compressors on and off at a rate to satisfy actual dynamic load conditions. Control will maintain leaving water temperature set with dial on display board through intelligent cycling of compressors. Accuracy will depend on loop volume, loop flow rate, load, outside air temperature, number of stages, and particular stage being cycled off. No adjustment for cooling range or cooler flow rate is required, because the control automatically compensates for cooling range by measuring both return water temperature and leaving water temperature. This is referred to as *leaving water temperature control with return water temperature compensation*.

The basic logic for determining when to add or remove a stage is a time band integration of deviation from set point plus rate of change of leaving water temperature. When leaving water temperature is close to set point and slowly moving closer, logic prevents addition of another stage. If leaving water temperature is less than 35°F (1.7°C) for water, or 6°F (21°C) below

the set point for brine units, the unit is shut off until the water temperature goes to 6°F (3.3°C) above the set point, to protect against freezing.

If 1°F/minute (0.6°C/minute) pulldown control has been selected (factory setting), no additional steps of capacity will be added as long as difference between leaving water temperature and set point is greater than 4°F (2.2°C) and rate of change in leaving water temperature is less than 1°F/minute (0.6°C/minute).

If it has been less than 90 seconds since the last capacity change, compressors will continue to run unless a safety trips. This prevents rapid cycling and also helps return oil during short on periods.

Two sequences are used to obtain circuit lead-lag operation, which evens out compressor operating hours. First, as unit turns on, microprocessor functioning as a random number generator, determines which circuit will start first. Also, when decreasing from maximum stage, control will again randomly select which circuit to run longest.

Controls (cont)

The control also performs other special functions when turning on or off. When a circuit is to be turned off, EXV is closed first and compressor is run for an additional 10 seconds to pump out refrigerant that was in the cooler. Again, at start-up, if compressor hasn't run in the last 15 minutes, EXV is held closed for 10 seconds while compressor runs to pump out any refrigerant that has migrated to the cooler. The oil pressure switch is bypassed for one minute during start-up and for 45 seconds during normal operation.

Thermistors — Eight thermistors are used for temperature sensing inputs to microprocessor. (A ninth [T10] may be used as a remote temperature sensor for optional LCWT reset.)

- T1 Cooler leaving chilled water temperature
- T2 Cooler entering water (return temperature)
- T3 Saturated condensing temperature — Circuit A
- T4 Saturated condensing temperature — Circuit B
- T5 Cooler saturation temperature — Circuit A
- T6 Cooler saturation temperature — Circuit B
- T7 Return gas temperature entering compressor cylinder — Circuit A
- T8 Return gas temperature entering compressor cylinder — Circuit B
- T10 Remote temperature sensor (accessory)

The microprocessor uses these temperatures to control capacity, fan cycling and electronic expansion valve (EXV) operation.

Electronic expansion valve (EXV)

— To control flow of refrigerant for different operating conditions, EXV piston moves up and down over slot orifices through which refrigerant flows to modulate size of opening. Piston is moved by a stepper motor through 760 discrete steps. The piston is repositioned by microprocessor every 3 seconds.

The EXV is used to control superheat in compressor. Two thermistors in each circuit (T5 and T7/T6 and T8) are used to determine superheat. One thermistor (T5/T6) is located in cooler and other (T7/T8) in compressor after motor in the gas passage entering the cylinders. The EXV is controlled to maintain superheat entering pistons at

approximately 15 F (8.3 C) to 20 F (11.1 C), which results in slightly superheated refrigerant leaving cooler.

The electronic control provides for a prepurge and pumpout cycle each time the lead compressor in a circuit is started or stopped. The compressor is allowed to run for approximately 10 seconds before and after the liquid line solenoid valve and/or electronic expansion valve opens or closes. Prepurge cycle is eliminated if compressor has operated in last 15 minutes. These pumpout cycles minimize amount of excess refrigerant that can go to compressor on start-up and cause oil dilution which would result in eventual bearing wear.

The microprocessor software is programmed so that EXV functions as a MOP. (maximum operating pressure) valve, limiting the suction temperatures to 55 F (12.8 C). This makes it possible to start unit at high water temperatures, up to 95 F (35 C), without overloading compressor. Another feature that is factory set (which may be eliminated in the field by repositioning a dip switch on the microprocessor) limits rate of pulldown to 1°F (0.6°C) per minute thereby reducing the kW demand on start-up.

Accessory controls — Demand can be further limited by keeping a selected number of compressors from turning on by utilizing demand limit control accessory. This interfaces with microprocessor to control unit so that chiller's kW demand does not exceed its setting. It is activated from an external switch.

Microprocessor is programmed to accept various accessory temperature reset options, based on return water temperature, outdoor temperature, or space temperature, that reset the LCWT. An accessory thermistor (T10, above) is required if outdoor temperature or space temperature reset is elected.

Compressor protection and control system (CPCS)

— The board provides compressor ground current protection, shutting off circuit if a 2 to 3 ampere ground current is sensed by a toroid around the compressor power leads.

The CPCS control system is standard.

Complete electronic control system contains several additional components.

Relay board — Relay board, connected to microprocessor by a ribbon cable, drives all of 24-v, 115-v, or 230-v loads. Relays control compressors, fans, and unloaders, if used.

Display board (standard) — Display board, also connected to microprocessor by a ribbon cable, is used to communicate with operator. In addition to leaving water set point potentiometer, board contains 2-digit LED display. The LED display is normally off after initialization period, to extend its life. Pressing display button will result in LED displaying the appropriate overload or status code.

If this is done, display will show from one to 3 codes alternating every 2 seconds, as follows:

CODE	STATUS
1 0-12	Capacity stage Number of stages in operation
2 20-26	Operating Mode
20	Initialization
21	Temperature Reset
22	Demand Limit
24	Pulldown Control
26	Remote ON-OFF
3 51-87	Overload Codes
	Alarm light/circuit energized
	NOTE: These codes take priority
51-58	Compressor fault
59,60	Loss of charge (circuit A, circuit B)
61	Low water flow
63,64	Low oil pressure (circuit A, circuit B)
65	Low water temperature
70	Illegal configuration
71-80	Thermistor failure
81-87	Reset/Set Point/Limit Failure

These codes are summarized on a chart in each unit's control box, and are described in detail in the Controls and Troubleshooting book.

Display board (optional) — Eight-digit LCD alphanumeric panel displays all of the above (with explanation of codes), plus set points, time of day, and actual temperatures, pressures and superheat.

Control sequence

Off cycle — During unit off cycle, crankcase and, if ambient temperature is below 36 F (2 C), cooler and control box heaters are energized. Electronic expansion valves are closed

Start-up — After control circuit ON-OFF circuit breaker switched ON, prestart process takes place for 2 minutes, when microprocessor checks itself and waits for temperature to stabilize. First circuit to start may be A or B, (automatic lead/lag feature). The controlled pull down feature limits compressor loading on start-up to reduce demand on start-up and unnecessary compressor usage. The microprocessor limits supply water temperature decrease (start-up only) to 1°F (0.6 C) per minute.

Capacity control — On first call for cooling, microprocessor starts initial compressor and fan stage on lead circuit. The electronic expansion valve remains closed for 10 seconds, permitting a pumpout on start-up. After pumpout, the valves open and, if necessary, additional outdoor fans are energized. Crankcase heaters are de-energized when a compressor is started. As additional cooling is required, lag circuit starts. If further cooling is needed, compressors are added, alternating between lead and lag circuits. Speed at which capacity is added or decreased is controlled by temperature deviation from set point and rate of temperature change of chilled water.

As less cooling is required, circuits shut down (or unload) in an order that evens out each circuit's compressor run time. When no further cooling is called for (in each compressor circuit), expansion valve closes and compressor

and fans continue to run while pumping down cooler.

Low-temperature override feature prevents LCWT from overshooting the set point and possibly causing a nuisance trip-out by the freeze protection.

High-temperature override feature allows chiller to add capacity quickly during rapid load variations

Demand limit — If applied, unit step controls limit total power draw of unit to selected point by controlling number of operational compressors during periods of peak electrical demand. Consult Accessory Demand Limit Control Module Installation Instructions for further details.

Reset accessory — If applied, microprocessor compares either return water, space or outdoor temperature with the accessory board settings, and adjusts leaving chilled water temperature appropriately

Electronic expansion valve and outdoor fan control — Expansion valve opens and closes on signal from microprocessor to maintain an approximate 20 F (11 C) refrigerant superheat entering the compressor cylinders. (The compressor motor increases the refrigerant superheat from the approximate 5 F [3 C] leaving the cooler to that entering the cylinders.) Outdoor fans (operated by microprocessor) run to as low an ambient as possible to maintain a minimum expansion valve pressure differential.

Abnormal conditions (alarm light)

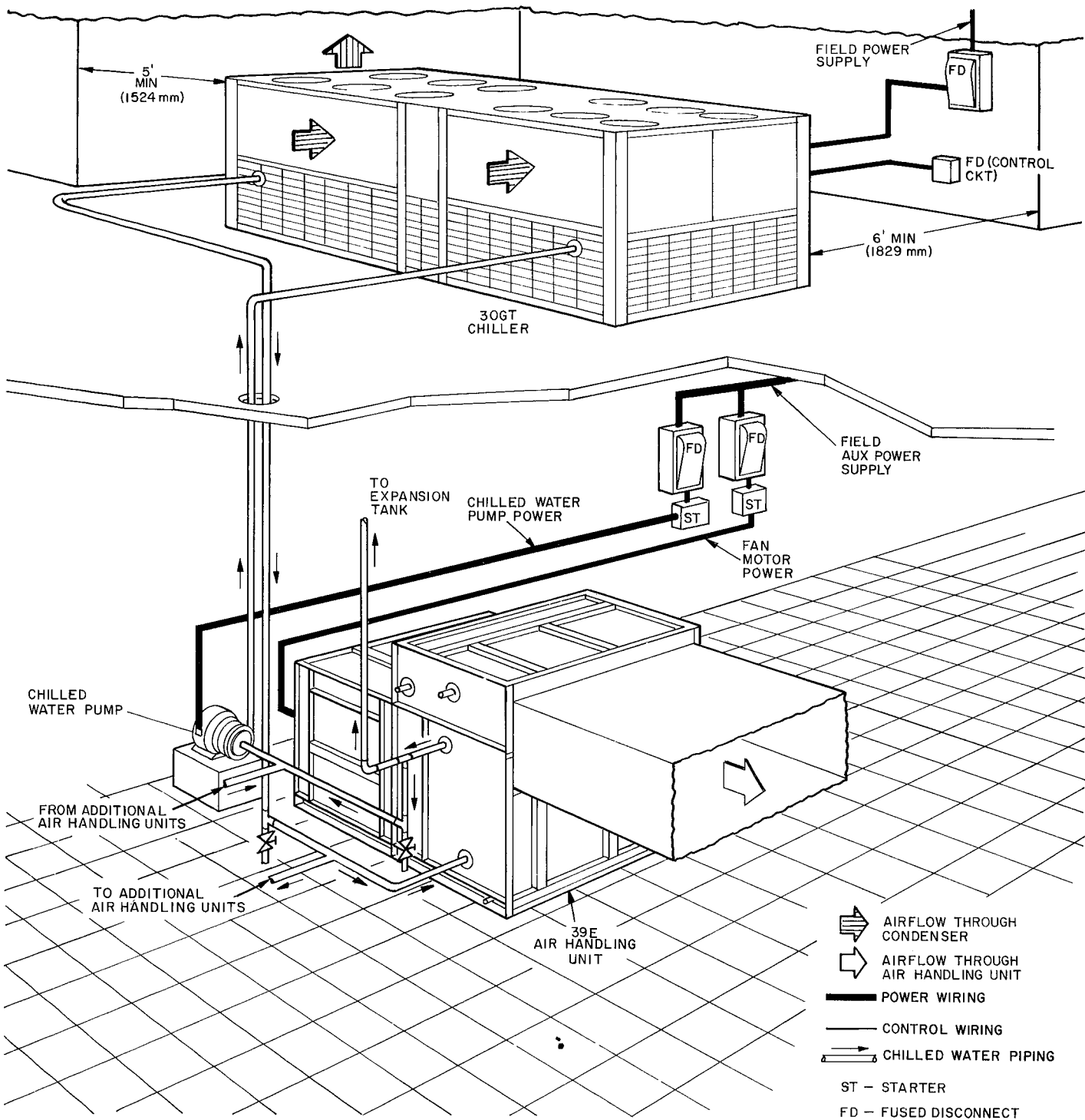
— All control safeties in chiller operate through compressor protection board or control relay and microprocessor. High-pressure switch and

discharge gas thermostat directly shuts down compressor(s) through compressor protection board or control relay. For other safeties, microprocessor (1) makes appropriate decision to shut down a compressor due to a safety trip or bad sensor reading (2) energizes *alarm light* and (3) displays appropriate failure code on the display. Chiller holds safety mode until reset. It then reverts to normal control when unit is reset.

Safeties include: *Oil pressure safety* cuts out if pressure differential is below minimum. Safety is bypassed on start-up for 45 seconds. *Loss-of-charge safety* cuts out if system pressure drops below minimum. *High-pressure switch* cuts out compressors if compressor discharge pressure increases to 426 psig (2937 kPa). *Discharge gas thermostat opens* when discharge gas temperature exceeds maximum 295 F (146 C). *Ground current safety* opens on sensing a current-to-ground in compressor windings in excess of 2.5 amps. *Loss of flow protection* provided by temperature differences between entering and leaving water temperature sensor if cooler temperature drops to 35 F (1.8 C). *Sensor failures* are detected by the microprocessor

Diagnostics — Microprocessor may be put through Quick Test (see Controls and Troubleshooting book) without additional equipment or tools. Quick Test confirms microprocessor is functional, informs observer through LED display the condition of each sensor and switch in chiller, and allows observer to check for proper operation of fans and compressor(s).

Typical piping and wiring



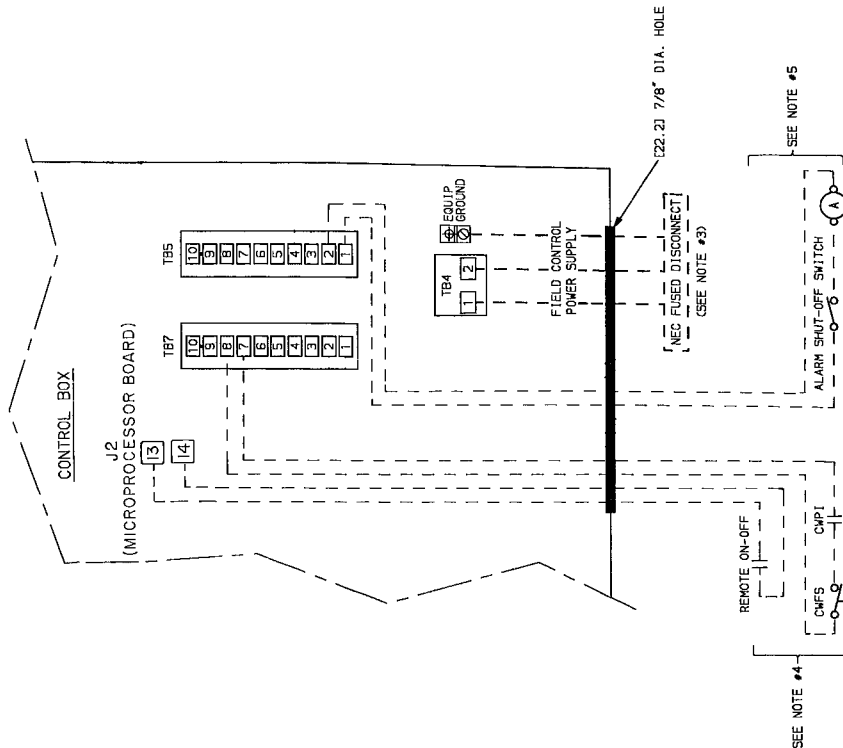
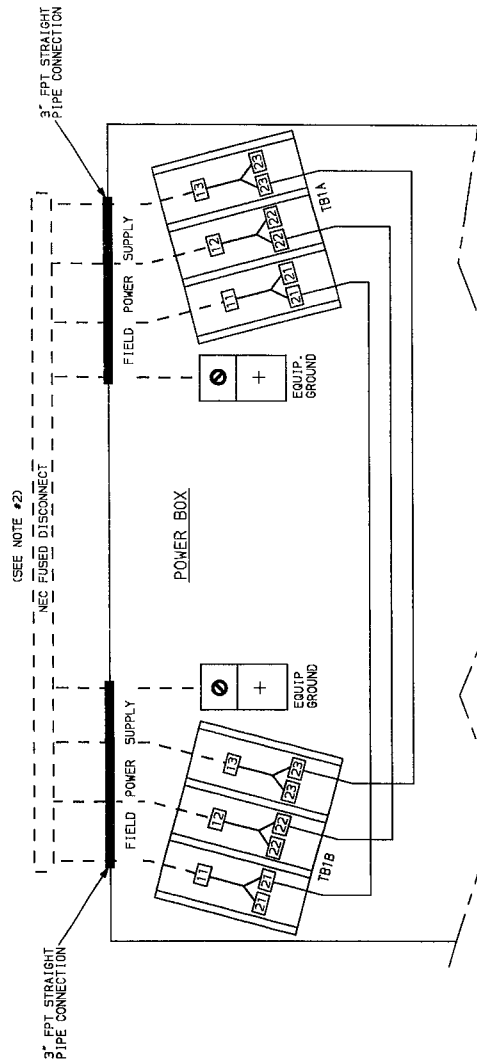
NOTES:

- 1 30GT chiller must be installed *level* to maintain proper compressor oil return
- 2 Wiring and piping shown are general points-of-connection guides only and are not intended for a specific installation. Wiring and piping shown are for a quick overview of system and not in accordance with recognized standards.
- 3 All wiring must comply with applicable local and national codes.
- 4 All piping must follow standard piping techniques. Refer to Carrier System Design Manual or appropriate ASHRAE handbook for details.
5. See *Application* data for minimum system water volume. This may require the addition of a holding tank to ensure adequate volume.

Typical control wiring

NOTES:

1. FACTORY WIRING IS IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE (NEC). FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. WIRING FOR MAIN FIELD POWER SUPPLY MUST BE RATED 75°C MINIMUM. USE COPPER, COPPER CLAD ALUMINUM OR ALUMINUM CONDUCTORS FOR ALL UNITS EXCEPT USE COPPER CONDUCTORS ONLY FOR ALL 346 & 380 VOLT UNITS, THE 30GT250 400 VOLT UNIT AND THE 30GT280 460 VOLT UNIT. MAXIMUM INCOMING WIRE SIZE FOR EACH TERMINAL BLOCK IS 500 MCM.
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 VOLT CONTROL CIRCUITS AND 15 AMP MAXIMUM PROTECTION FOR 230 VOLT CONTROL CIRCUIT. 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 7 & 8 OF TB7 ARE FOR FIELD EXTERNAL INTERLOCK CONNECTION. FOR REMOTE ON-OFF USE TERMINALS 13 & 14 ON MICROPROCESSOR BOARD J2. THE CONTACTS MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA. TO 20 MA. LOAD. REMOVE JUMPER BETWEEN 13 & 14 OF J2 ON MICROPROCESSOR BOARD IF REMOTE ON-OFF IS INSTALLED.
5. THE MAXIMUM LOAD ALLOWED FOR THE ALARM CIRCUIT IS 125 VA SEALED, 1250 VA INRUSH AT 115 OR 230 VOLT.



LEGEND

- A — Alarm
- CWFS — Chilled Water Flow Switch
- CWPI — Chilled Water Pump Interlock
- TB — Terminal Block
- — — Field Power Wiring
- — — Field Control Wiring
- — — Factory-Installed Wiring

Application data

Leveling unit

Unit must be level when installed to ensure proper oil return to the compressors.

While most outdoor locations are suitable for 30GT units, the roof is a common site that presents a problem if roof has been pitched to aid in water removal. To assure proper oil return, be sure that unit is level, particularly in its major lengthwise dimension, as compressor oil return piping runs in that direction.

It should be determined prior to installation if any special treatment is required to assure a level installation.

Cooler temperature

1. Maximum leaving chilled water temperature (LCWT) for Model 30GT is 70 F (21 C). Unit can start and pull down with up to 95 F (35 C) entering water temperature due to MOP (maximum operating pressure) feature of the expansion valve. For sustained operation, it is recommended that entering water temperature not exceed 85 F (29.4 C).
2. Minimum LCWT for standard Model 30GT is 40 F (4.5 C). It is permissible to use a standard microprocessor-controlled Flotronic chiller with leaving water temperatures in the range of 34 F (1°C) to 39.9 F (4.4 C) only if a protective brine solution (20% antifreeze solution, or greater) is used and microprocessor dip switch is properly set. (See Controls and Troubleshooting book for further information.) Medium temperature brine units must be ordered for operation with leaving water temperatures in the range of 34 F (1°C) to 15 F (-9 C). For ratings below 40 F (4.5 C) LCWT, contact your local Carrier representative

Leaving water temperature reset

Accessory board* may be installed in 30GT chillers to provide reset of LCWT in constant water flow systems. Reset reduces compressor power usage at part load when design LCWT is not necessary. Humidity control should be considered since higher coil temperatures resulting from reset will reduce latent heat capacity. Three reset options are offered:

From return water temperature* — Increase LCWT temperature set point as return (or entering) water temperature decreases (indicating load decrease). Option may be used in any application where return water provides accurate load indication. Limitation of return water reset is: LCWT may only be reset to value of design return water temperature. Return reset is the simplest of 3 reset accessories available, as return water sensor is already installed.

From outdoor temperature* — Increases LCWT as outdoor ambient temperature decreases (indicating load decrease). This reset should be applied only where outdoor ambient is an accurate indication of load. An accessory thermistor is required.

From space temperature* — Increases LCWT as space temperature decreases (indicating load decrease). This reset should be applied only where space temperature is an accurate indication of load.

For details on applying a reset option, refer to 30GT Controls and Troubleshooting Instructions.

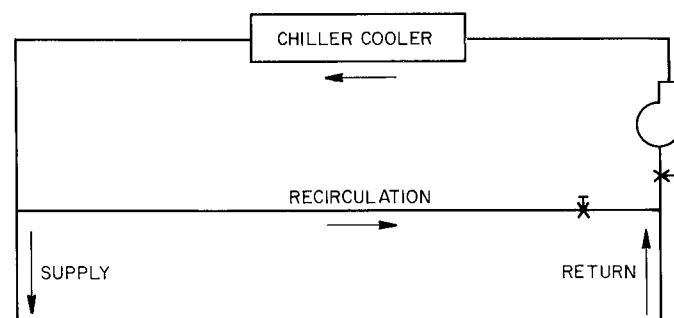
*Obtain ordering part numbers from current price pages

Cooler flow range

Ratings and performance data in this publication are for a cooling range of 10°F or 6°C. Flotronic chillers with microprocessor control may be operated at a different temperature range provided flow limits are not exceeded. For minimum flow rates, see Table. High flow rate is limited by pressure drop that can be tolerated. If another range is used, apply LCWT correction as given in selection example.

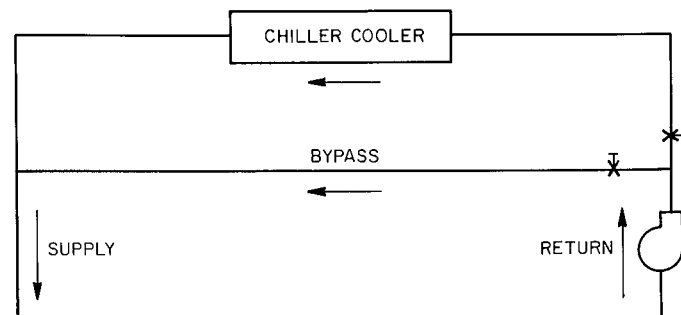
Minimum cooler flow (maximum cooler temperature range) for standard units is shown in Table. When gpm (L/s) required is lower (or range higher), follow recommendations below:

- a. Multiple smaller chillers may be applied in series, each providing a portion of the design temperature range.
- b. Cooler water may be recirculated to raise flow rate. However, mixed temperature entering cooler must be maintained at a minimum of at least 5°F (2.8°C) above the leaving chilled water temperature.
- c. Special cooler baffling is required to allow minimum flow rate to be reduced 12%.



Maximum cooler flow (>5 gpm/ton or <5 F range [$>0.09 \text{ L/s} \cdot \text{kW}$ or $<2.7 \text{ C range}$]) results in practical maximum pressure drop through cooler.

- a. Return water may bypass the cooler to keep pressure drop through cooler within acceptable limits. This permits a higher ΔT with lower water flow through cooler and mixing after the cooler.
- b. Special cooler baffling is available by special order, to permit a cooler flow rate increase of 10%.



Application data (cont)

Variable cooler flow rates may be applied to standard 30GT chiller. Unit will, however, attempt to maintain a constant leaving chilled water temperature. In such cases, minimum flow must be in excess of minimum flow given in Table and flow rate must change in steps of less than 10% per minute. Apply 6 gallons per ton (6.5 liters per kW) water loop volume minimum if flow rate changes more rapidly.

Water loop volume — In circulation must equal or exceed 3 gallons (11.4 liters) per nominal ton of cooling (3.25 liters per kW) for temperature stability and accuracy in normal air conditioning applications. (For example, a 30GT225 would require 678 gallons [2588 liters] in jobs where accuracy is vital or for operation at ambient below 32 F (0°C) with low unit loading conditions, there should be from 6 to 10 gallons per ton (6.5 to 10.8 liters per kW). To achieve this volume, it is often necessary to install a tank in the loop. Tank should be baffled to insure that there is no stratification and that water (or brine) entering tank is adequately mixed with liquid in the tank.

MINIMUM COOLER WATER FLOW RATES

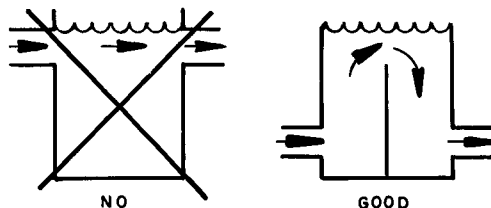
UNIT 30GT	MINIMUM FLOW*	
	Gpm	L/s
225	219	9.2
250	285	12.0
280	285	12.0

Gpm — Gallons per Minute
L/s — Liters per Second

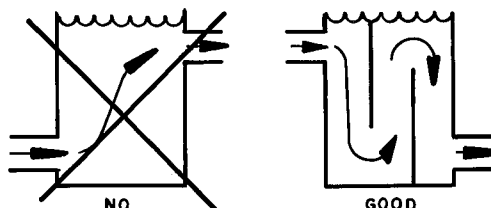
*Minimum flow based on 1.5 fps (0.46 m/s) velocity in cooler without special cooler baffling

NOTE: Minimum Loop Volumes.
Gallons = V x ARI Cap (tons)
Liters = N x ARI Cap (kW)

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



EXAMPLES OF TANK BAFFLING



Cooler fouling factor used to calculate tabulated ratings was 0.00025 ft² • hr • °F/Btu (0.000044 m² • °K/W). As fouling factor is increased, both unit capacity and compressor power decrease. Standard ratings should be corrected using following multipliers:

FOULING FACTOR		CAPACITY MULTIPLIER	COMPRESSOR POWER MULTIPLIER
English (ft ² • hr • °F/Btu)	SI (m ² • °K/W)		
0.00025	0.000044	1.00	1.00
0.00075	0.000132	0.97	0.98
0.00175	0.000308	0.91	0.91

Cooler protection in form of ethylene glycol (or other suitable brine) is recommended when operating in areas which experience temperatures below 32 F (0°C) to protect cooler should there be a loss of cooler heater power. Even though unit cooler is protected with insulation and an electric heater that protects the cooler down to 10 F (-12°C), it does not protect water piping external to unit. Use only antifreeze solutions approved for heat exchanger duty. Use of automotive type antifreezes is not recommended because of the fouling that can occur once their relatively short-lived inhibitor breaks down.

Draining cooler and outdoor piping is recommended if system is not to be used during freezing weather conditions. See section below for low-ambient operation.

Condenser

Altitude correction factors must be applied to standard ratings at altitudes above 2000 ft (610 m) using following multipliers

ALTITUDE		CAPACITY MULTIPLIER	COMPRESSOR POWER MULTIPLIER
English (ft)	SI (m)		
0	0	1.00	1.00
2000	610	0.99	1.01
4000	1220	0.98	1.02
6000	1830	0.97	1.03
8000	2440	0.96	1.04
10000	3050	0.95	1.05

Condenser airflow restrictions will affect the unit capacity, condenser head pressure and compressor power input. Correction factors to be applied for external static restrictions up to 0.2 in wg (50 Pa) are shown below

EXTERNAL STATIC		CAPACITY MULTIPLIER	COMPRESSOR POWER MULTIPLIER
English (in. wg)	SI (Pa)		
0.0	0.0	1.00	1.00
0.1	25	0.986	1.01
0.2	50	0.968	1.03

High-ambient temperature — Standard 30GT chillers can start and operate to 125 F (52°C) ambient temperature at nominal voltage.

Application data (cont)

Low-ambient operation

Flotronic 30GT chillers with electronic expansion valves (EXV) will start and operate at ambients down to 35 F (1.8 C) with following field provisions:

Wind baffles must be added for operation below 32 F (0°C).

⚠ WARNING

Operation at low ambient is not recommended if minimum load on chiller is below minimum step of unloading.

Protection against freeze-up — It is recommended that field-installed chilled water piping be protected at lower ambient temperatures by wrapping with field-supplied heating cable and covering with 2-in. (50-mm) thick closed-cell insulation.

Antifreeze solution must be added to water loop to protect loop down to 15 F (8 C) below minimum operating ambient temperature.

For operation of chillers below 35 F (1.8 C) the Carrier Motormaster® condenser head pressure control and its associated components must be added. Consult your local Carrier representative for complete details.

Provide sufficient volume in the chilled water loop — At least 6 gallons per ton of refrigeration (6.5 liters per kilowatt) is recommended minimum, provided there is a moderate system load.

Capacity Correction (Antifreeze)

Ethylene glycol (or other suitable brine) should be used in installations where subfreezing temperatures are expected. Unit performance data must be corrected for the addition of ethylene glycol as shown in following example. Correction factors may be derived from following curves.

Example: English — Where a 5 F outdoor temperature is anticipated, determine concentration of ethylene glycol to protect system to -10 F ambient temperature at zero flow.

Enter the solution crystallization point curve at -10 F, read 40% concentration of ethylene glycol is required to prevent crystals from forming in solution.

Consider the 30GT225 unit from the Selection Procedure (Water) example (refer to correction curves at 40% solution).

Correct unit capacity — On glycol performance capacity correction curve, read 0.95.

Corrected capacity = 0.95 x determined capacity
= 0.95 x 231.9
= 220 tons

Correct chilled water flow — On the gpm correction factor curve, read 1.15.

Chilled water flow (at corrected capacity)

$$= \frac{24 \times \text{corrected capacity}}{\text{temperature rise}} = \text{U.S. gpm}$$

$$= \frac{24 \times 220 \text{ tons}}{14 \text{ F}} = 377.7 \text{ U.S. gpm}$$

$$\begin{aligned} \text{Chilled water flow (40\% solution)} &= 1.15 \times 377.7 \\ &= 434.3 \text{ U.S. gpm} \end{aligned}$$

Corrected cooler pressure drop — On cooler pressure drop correction curve, read 1.33.

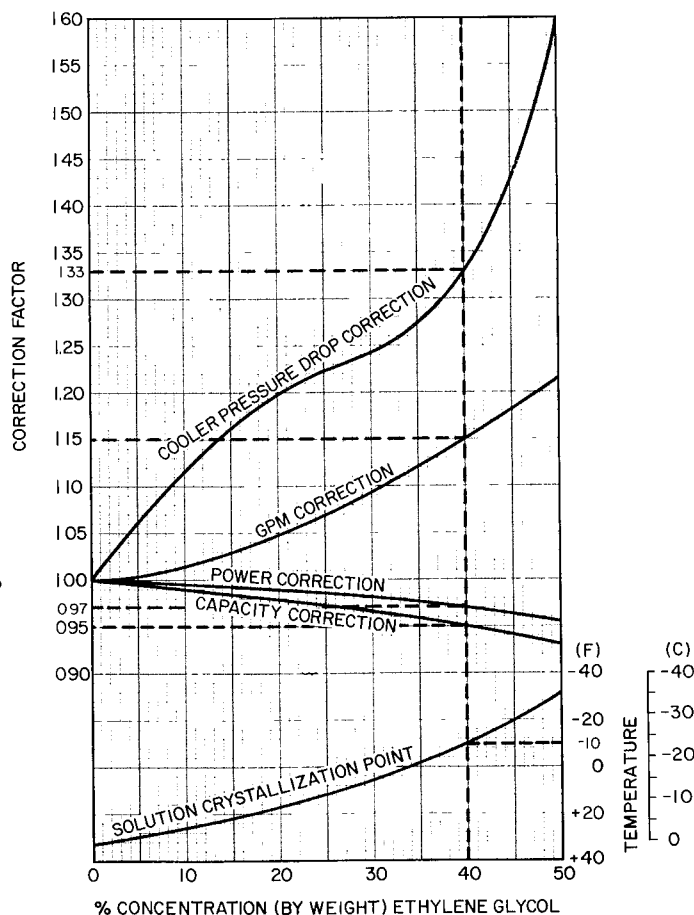
On cooler pressure drop curve, for 434.3 gpm, read PD = 13 ft water gage. The pressure drop for 40% solution = 1.33 x 13 = 17.20 ft of water.

Correct compressor power input (kW) — On power correction curve, read 0.97 correction factor at 40% EG concentration

Power input from Selection Procedure example = 270.2 kW.

Corrected power input = 0.97 x 270.2 = 262 kW.

ETHYLENE GLYCOL PERFORMANCE
CORRECTION FACTORS AND SOLUTION
CRYSTALLIZATION POINTS



Example: SI — Determine concentration of ethylene glycol to protect the system to -23 C ambient temperature at zero flow.

Application data (cont)

Enter correction curves and on the solution crystallization point curve, at -23 C read 40% concentration ethylene glycol is required to prevent crystals from forming in solution.

Consider 30GT225 unit selected in the preceding example (refer to correction curves at 40% solution).

Correct unit capacity — On capacity correction curve read 0.95.

$$\begin{aligned}\text{Corrected capacity} &= 0.95 \times \text{determined capacity} \\ &= 0.95 \times 795.2 \\ &= 755.4 \text{ kW}\end{aligned}$$

Correct chilled water flow — On cooler flow correction curve, read 1.15.

Chilled water flow (at corrected capacity)

$$\begin{aligned}&= \frac{0.239 \times \text{corr cap. in kW}}{\text{temperature rise } ^\circ\text{C}} = \text{L/s} \\ &= \frac{0.239 \times 755.4}{7.8} = 23.1 \text{ L/s}\end{aligned}$$

$$\begin{aligned}\text{Chilled water flow (40\% solution)} &= 1.15 \times 23.1 \\ &= 26.6 \text{ L/s}\end{aligned}$$

Correct cooler pressure drop — On cooler pressure drop correction curve, read 1.33.

On cooler pressure drop curve, for 26.6 L/s, read PD = 36 kPa. The pressure drop for 40% solution = $1.33 \times 36 = 47.9$ kPa.

Correct compressor power input (kW) — On the power correction curve, read 0.97 correction factor at 40% EG concentration.

Power input from Selection Procedure example = 270.5 kW.
Corrected power input = $0.97 \times 270.5 = 262.4$ kW.

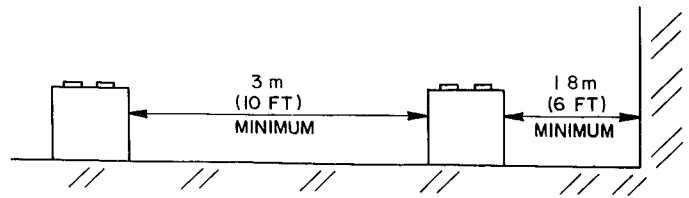
Oversizing chillers

Oversizing chillers by more than 15% at design conditions must be avoided as the system operating efficiency would be affected adversely (resulting in greater/excessive electrical demand). When future expansion of equipment is anticipated, it is strongly recommended that a single chiller be installed to meet present load requirements and a second chiller added to meet the additional load demand.

It is also recommended that the installation of 2 smaller chillers be considered where operation at minimum load is critical. The operation of a smaller chiller loaded to a greater percent of minimum is preferred to operating a single chiller at or near its minimum recommended value.

Multiple chillers

Where chillers capacities greater than 280 tons (980 kW) are required, or where stand-by capability is desired, chillers may be installed in *parallel*. Units should be of equal size to ensure balanced water flows. Where a large temperature drop ($>25^\circ\text{F}$ [13.9°C]) is desired, chillers may be installed in *series*. Water temperature sensors need not be moved for multiple chiller operation. A 10-ft (3-m) separation is required between units for airflow, and a 6-ft (1.8-m) distance is required from units to obstructions. See figure. See Dimensions for service clearances.



MULTIPLE UNIT SEPARATION

Electrical/utility interests.

Energy management — See 30GT Controls and Troubleshooting manual and accessory installation instructions for details.

Demand limiting (also called load shedding) — When utilities demand for electricity exceeds a certain level, loads are shed to keep electricity demand below a prescribed maximum level. Typically, this happens on hot days when air conditioning is most needed.

Load shedding must be done intelligently. Demand may be limited on Model 30GT by resetting water temperature, or by using a demand limit accessory that unloads the chiller to a given predetermined percent of the load. Both features require signal from an intelligent central control. Do not cycle demand limiter for less than 10 minutes on and 5 minutes off.

Duty cycling cycles electrical loads at regular intervals regardless of need. This reduces electrical operating costs of a building by “fooling” demand indicating devices. Duty cycling of compressors or fans is *not* recommended since motor winding and bearing life suffer from constant cycling.

Remote ON-OFF control — If remote ON-OFF unit control is required, an ON-OFF relay must be installed in unit control box and wired in accordance with unit installation instructions.

Part-wind start

Not generally required on 30GT chillers due to use of multiple compressors allowing smaller electrical load increments, but is available if required. Maximum instantaneous current flow (see ICF in Electrical Data) should be used in determining need.

Vibration isolation

Compressors are spring isolated. External vibration isolation is not generally required.

Hot gas bypass usage

Hot gas bypass usage, while frequently specified, is not normally recommended because it results in equipment being applied below its normal application range. Before applying hot gas bypass, it is recommended that use of 2 machines be considered, including one that can be run at the system minimum load without addition of hot gas bypass. In those instances where there is no alternative, it is recommended that the appropriate hot gas bypass package can be used with the factory option 30GB TXV units.

Guide specifications

Reciprocating Air-Cooled Liquid Chiller

HVAC Guide Specifications — Section 15703

Size Range: **225 to 280 Tons, Nominal**

Carrier Model Number: **30GT**

Part 1 — General

1.01 SYSTEM DESCRIPTION

- A. Microprocessor controlled air-cooled liquid chiller utilizing reciprocating compressors and electronic expansion valves.

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standard 590, latest edition.
- B. Unit construction shall comply with ANSI B9.1 Safety Code, NEC (National Electric Code) and ASME applicable codes.
- C. Unit cabinet shall be capable of withstanding Federal Test Method Standard No. 141 (method 6061) 500 hour salt spray test.
- D. Cooler shall be tested and stamped in accordance with ASME Code for a refrigerant working side pressure of 235 psig (1620 kPa) and a minimum water side pressure of 150 psig (1034 kPa).
- E. Air-cooled condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa).
- F. Unit shall be fully tested at the factory.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Unit controls shall be capable of withstanding 185 F storage temperatures in the control compartment for an indefinite period of time.
- B. Unit shall be stored and handled per unit manufacturer's recommendations.

Part 2 — Products

2.01 EQUIPMENT

A. General:

Factory assembled, single piece, air-cooled liquid chiller. Contained within the unit cabinet shall be all factory wiring, piping, controls, refrigerant charge (R-22) and special features required prior to field start-up.

B. Unit Cabinet:

Galvanized steel casing, zinc phosphatized, with an electrostatically applied baked enamel finish

C. Fans:

Condenser fans shall be direct driven propeller type discharging air vertically upward:

- 1. Equipped with permanently lubricated bearings.
- 2. Equipped with PVC coated steel wire safety guards.
- 3. Shafts shall have inherent corrosion resistance.
- 4. Statically and dynamically balanced

D. Compressors:

- 1. Reciprocating semi-hermetic type built by equipment manufacturer only.

- 2. Each equipped with an automatically reversible oil pump, operating oil charge, discharge shutoff valves, and an insert-type factory sized crankcase heater to control oil dilution.

- 3. Each mounted on spring vibration isolators with an isolation efficiency of no less than 95%.

- 4. Speed shall not exceed 1750 rpm (29.2 rps).

- 5. Cycles per hour per compressor shall not exceed six (6).

E. Cooler:

- 1. Shell and tube type with removable heads.
- 2. Tubes shall be internally enhanced seamless copper type rolled into tube sheets.
- 3. Equipped with flanged type water connections.
- 4. Shell shall be insulated with 3/4-in. (17-mm) closed cell polyvinyl chloride foam of maximum K factor 0.28.
- 5. Equipped with electric heaters along the shell under the insulation to protect against cooler freeze-up.
- 6. Design shall incorporate 2 independent direct expansion refrigerant circuits

F. Condenser:

Coil shall be air-cooled with integral subcooler, constructed of aluminum fins mechanically bonded to seamless copper tubes which are then cleaned, dehydrated and sealed.

G. Refrigeration Components.

Refrigerant circuit components shall include hot gas muffler, high side pressure relief device, liquid line shutoff valve, replaceable core filter drier, moisture indicating sight glass, stepper motor actuated electronic expansion valve, and complete operating charge of refrigerant R-22 and compressor oil.

H. Controls, Safeties and Diagnostics:

1. Controls:

- a. Unit controls shall include the following minimum components:
 - 1) Microprocessor
 - 2) Power and control circuit terminal blocks.
 - 3) On/off control switch.
 - 4) Replaceable solid-state relay panel
 - 5) Leaving chilled water set point panel.
 - 6) 2-digit diagnostic display.
 - 7) Thermistors and/or potentiometer.
- b. Capable of performing the following functions:
 - 1) Automatic compressor lead-lag.
 - 2) Pumpout at beginning and end of every circuit cycle.
 - 3) Capacity control based on leaving chilled water temperature and compensated by rate of change of return water temperature.
 - 4) Limit the chilled water temperature pull-down rate at start-up to 1 degree F per minute to prevent excessive demand spikes (charges) at start-up.

- c. Control compartment shall be equipped with a 115-volt convenience outlet.
2. Safeties:
- a. Unit shall be equipped with thermistors and/or potentiometers and all necessary components in conjunction with the control system to provide the unit with the following protections:
 - 1) Loss of refrigerant charge protection.
 - 2) Low water flow protection.
 - 3) Low chilled water temperature protection.
 - 4) Low and high superheat protection.
 - 5) Low oil protection for each compressor circuit.
 - 6) Low control voltage (to unit) protection
 - 7) Ground current protection for each circuit which shuts down compressor when no more than 2.5 supply amps are measured to prevent formation of acids
 - b. Compressors shall be equipped with the following manual reset type protections:
 - 1) Thermal overload.
 - 2) Pressure overload.
 - 3) Electrical overload through the use of definite-purpose contactors and calibrated, ambient compensated, magnetic trip circuit breakers. Circuit breakers shall open all three phases in the event of an overload in any one phase, or single phasing condition
 - c. Fan motors shall have inherent overcurrent protection.
3. Diagnostics:
- a. Diagnostic display module shall be capable of indicating the safety lockout condition through displaying a 2 number code for which a legend shall be provided in the control panel. The protections included for display shall be:
 - 1) Compressor lockout.
 - 2) Loss of charge.
 - 3) Low water flow.
 - 4) Low oil pressure.
 - 5) Cooler freeze protection.
 - 6) High or low suction superheat.
 - 7) Thermistor or potentiometer malfunction
 - b. Module in conjunction with the microprocessor must also be capable of displaying the output (results) of a run test to verify operation of every switch, thermistor, potentiometer, fan, and compressor before chiller is started
- I. Operating Characteristics:
- 1. Unit shall be capable of starting and running at outdoor ambient temperatures from 35 to 115F (46.1 C) per criteria of ARI Standard 590.
 - 2. Unit shall be capable of starting up with 95 F (35 C) entering water temperature to the cooler.
- J. Motors:
- 1 Compressor motors shall be cooled by suction gas passing around motor windings.
 - 2. Condenser fan motors shall be 3-phase type with permanently lubricated bearings and class B insulation.
- K. Electrical Requirements:
- 1. Unit primary electrical power supply shall be connected to a single point.
 - 2 Unit shall operate on 3 phase, 60 cycle power at the voltage shown in the equipment schedule.
- L. Special Features:
- Certain standard features are not applicable when the features designated by * are specified.
- * Low Ambient Operation:
Unit shall be capable of starting and running at outdoor ambient temperatures down to -20 F (-29 C) with the addition of brine in the cooler circuit, wind baffles, and motormaster fan control.
 - * Unloaders:
Unit shall be equipped with electrically actuated suction cutoff type cylinder unloaders.
Demand Limit Control:
Unit shall be equipped with a 2 point demand limit control activated remotely by an electric signal.
 - * Condenser:
Coil shall be air cooled with integral subcooler constructed of 'copper' fins mechanically bonded to seamless copper tubes which are then cleaned, dehydrated and sealed
 - * Optional Controls and Diagnostics:
 - 1 Controls.
 - a. Unit controls shall include the following minimum components:
 - 1) Microprocessor.
 - 2) Power and control circuit terminal blocks.
 - 3) On/off control switch.
 - 4) Replaceable solid-state relay panel
 - 5) 8 digit alphanumeric diagnostic display/set point panel.
 - 6) Thermistors and/or pressure transducers.
 - b. Capable of performing the following functions:
 - 1) Automatic compressor lead-lag.
 - 2) Pumpout at beginning and end of every circuit cycle.
 - 3) Capacity control based on leaving chilled water temperature and compensated by rate of change of return water temperature.
 - 4) Limit the chilled water temperature pull-down rate at start-up to 1 degree F per minute to prevent excessive demand spikes (charges) at start-up
 - 5) Seven-day time schedule.
 - 6) Leaving chilled water temperature reset from return.

Guide specifications (cont)

2. Diagnostics:

a. Diagnostic display module shall be capable of indicating the safety lockout condition by displaying a code for which an explanation may be scrolled at the display. Protections included for display shall be:

- 1) Compressor lockout.
- 2) Loss of charge.
- 3) Low water flow.
- 4) Low oil pressure.
- 5) Cooler freeze protection.
- 6) High or low suction superheat.

- 7) Thermistor or potentiometer malfunction.
- 8) Entering and leaving water temperature.
- 9) Evaporator and condenser pressure.
- 10) EXV positions.
- 11) All set points.
- 12) Time of day.

b. Module in conjunction with the microprocessor must also be capable of displaying the output (results) of a run test to verify operation of every switch, thermistor, potentiometer, fan, and compressor before chiller is started.

