

Product availability and improved delivery leadtime is a direct result of the new 30GN,GT standardized design.

To better match your jobsite requirements, Carrier provides more product factory options: new sound reduction kit, part-wind start, Motor-master® III low ambient control, dual set point for ice storage, and adherence to Australian codes.

Flotronic™ control with 30GT offers superior system controls sophistication, with ultimate simplicity.

The widest application flexibility in the industry

- 40 to 70 F (4 to 21 C) leaving chilled water temperature range.
- Variable cooler waterflow capability
- Cooler water-loop pulldown from 95 F (35 C) entering water temperature.
- Choice between *demand limiting* or *fast* water-loop pulldown rate.
- Standard system application from 0 to 125 F (–18 to 52 C) outdoor ambient temperature, to simplify your engineering, unit selection, application and installation tasks.

Lowest electrical operating cost

- Precise year-round operation optimization of compressor, outdoor fan and expansion valve maintains cost efficiency.

Easy system start-up

- Single dial setting; leaving chilled water temperature is the only setting required. Lead/lag and range adjustment settings are automatic

- Exclusive Quick Test procedure permits the technician to thoroughly check chiller input and output signals of microprocessor control *before* chiller start-up
- Every chiller is factory run-tested under load conditions to assure total operational performance prior to delivery.
- Easy to operate 2-digit diagnostic display.

Flotronic™ II control with 30GN, compatible with CCN (Carrier Comfort Network)

Offers the same sophisticated control features as Carrier Flotronic control — plus:

- 8-character alphanumeric display with remote mounting capability.
- Remote access to 88 chiller control information points.
- Remote set point scheduling capability.
- Easy 3-wire hookup.

These features give Model 30GN the additional capability to provide advanced engineering and service strategies, for further economy, comfort and performance assurance.

Multiple 06E compressor design

- Provides only the compression required for the specific application.
- Reduces electrical operating costs at lighter load conditions.
- Minimizes inrush current, reducing stress on electrical service in older buildings.

- Saves refrigerant by retaining pumpout capability should No. 1 compressor become inactive.
- Exclusive Carrier ground current sensing prevents acid formation by sensing a compressor winding short before acid has had time to form. This avoids the need to replace the damaged refrigerant.

Carrier Electronic Expansion Valve (EXV)

- Features patented long-stroke design which minimizes operating cost, and provides most efficient refrigerant control.
- Provides a wide application envelope in both cooler loop and outdoor ambient temperatures.
- Offers superior chiller reliability. Normally closed design provides complete refrigerant control while low superheat control keeps compressor motor cooler.
- Low superheat design maximizes cooler performance.

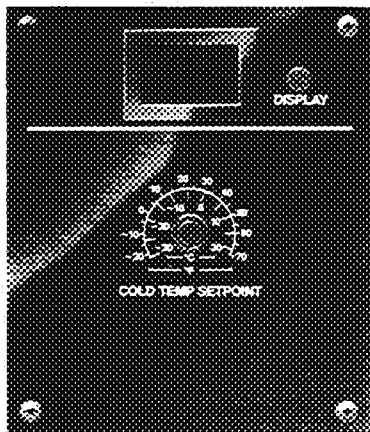
Time tested

Models 30GN,GT superiority is based on time-proven technology.

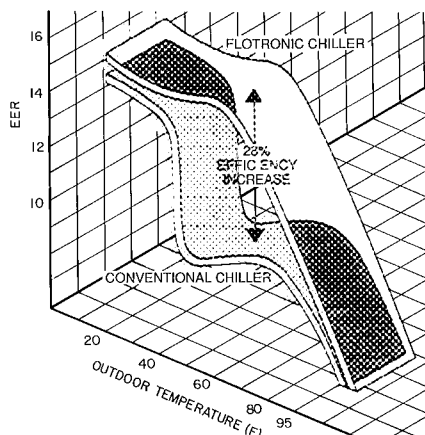
- Over 15,000 Carrier Flotronic chillers have been installed world-wide since 1984
- Over ½ million Carrier 06E compressors have been installed in the last 25 years.
- Every 30GN,GT model is factory tested under load prior to delivery.
- 30GN,GT units (U.S.A. voltages) are UL and CSA approved.

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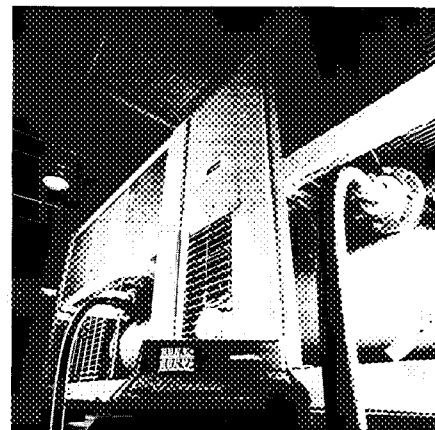
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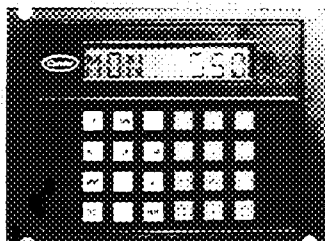
30GT 2-DIGIT DISPLAY



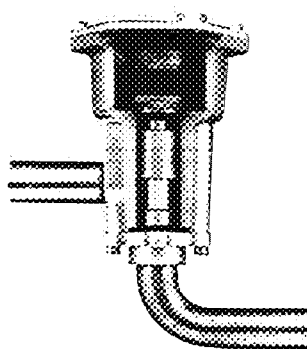
PART-LOAD EFFICIENCY 28% GAIN



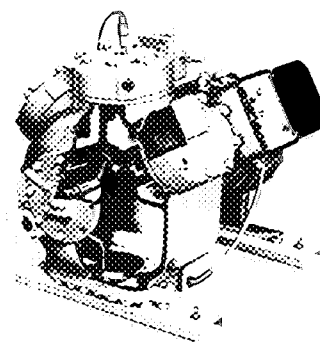
100% FACTORY RUN TEST



30GN 8-CHARACTER DISPLAY



ELECTRONIC EXPANSION VALVE (EXV)



06E COMPRESSOR

Model number nomenclature

	30GN	—	100	C	6	--	KA	
30GN — Air-Cooled Flotron TM II Outdoor Liquid Chiller (080-110)								
30GT — Air-Cooled Flotron TM Outdoor Liquid Chiller (080-110)								
P — Part Wind — — Across the Line								
Unit Sizes 080 090 100 110								
								Options KA — Standard EXV Unit GA — Motormaster III Control LA — Australian Code Unit SD — Brine Unit* Other Options: Contact Carrier Representative
								Packaging 1 — Domestic Packaging 3 — International Packaging
								V-Ph-Hz 5 — 208/230-3-60 6 — 460-3-60 1 — 575-3-60 2 — 380-3-60 3 — 346-3-50 9 — 380/415-3-50
								-- — Copper-Aluminum Condenser C — Copper-Copper Condenser

LEGEND

CCN — Carrier Comfort Network
PW — Part Winding

*For brine options, contact your Carrier representative.

Physical data — 60 Hz

ENGLISH

UNIT SIZE		080	090	100	110
APPROX OPER WT — lb	C-AL	6,630	7,015	8,610	8,660
	C-C	7,355	7,740	9,560	9,610
REFRIG CHG — 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*	(No.) Ckt A	(1) 275, (1) 250	(1) 265, (1) 250	(1) 265, (1) 275	(1) 265, (1) 299
	(No.) Ckt B	(1) 299	(1) 265, (1) 265	(1) 265, (1) 275	(1) 265, (1) 275
Capacity Control Steps		8	11	11	11
% 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			
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
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		One.. Direct Expansion, Shell and Tube			
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 — psig		Refrigerant Side — 278, Water Side — 300			
WATER CONNECTIONS — in.		Cooler Inlet and Outlet; Victaulic Type			
Inlet and Outlet		4	4	5	5
	Drain	¾ NPT			

SI

UNIT SIZE		080	090	100	110
APPROX OPER WT — kg	C-AL	3,013	3,189	3,914	3,935
	C-C	3,343	3,518	4,346	4,368
REFRIG CHG — 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
COMPRESSORS, Type...r/s		Reciprocating, Semi-Hermetic...29.2			
06E*	(No.) Ckt A	(1) 275, (1) 250	(1) 265, (1) 250	(1) 265, (1) 275	(1) 265, (1) 299
	(No.) Ckt B	(1) 299	(1) 265, (1) 265	(1) 265, (1) 275	(1) 265, (1) 275
Capacity Control Steps		8	11	11	11
% 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			
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
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	669	669	669
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		One.. Direct Expansion, Shell and Tube			
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 — kPa		Refrigerant Side — 1916, Water Side — 2068			
WATER CONNECTIONS — in.		Cooler Inlet and Outlet; Victaulic Type			
Inlet and Outlet		4	4	5	5
	Drain	¾ NPT			

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

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

LEGEND

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

Physical data — 50 Hz

ENGLISH

UNIT SIZE			080	090	100	110
APPROX OPER WT — lb	C-AL		6,720	7,135	8,710	8,840
	C-C		7,445	7,860	9,660	9,790
REFRIG CHG — lb						
R-22	Ckt A	Total/Over Clear Glass	78/15	78/15	98/20	98/20
	Ckt B		78/15	78/15	105/20	105/20
COMPRESSORS, Type...rpm			Reciprocating, Semi-Hermetic. 1450			
06E*	(No.) Ckt A		(1) 265, (1) 299	(1) 265, (1) 299	(1) 265, (1) 299	(1) 299, (1) 299
	(No.) Ckt B		(1) 299	(1) 265, (1) 275	(1) 265, (1) 299	(1) 299, (1) 299
Capacity Control Steps			8	11	11	11
% 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			
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
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			One.. Direct Expansion, Shell and Tube			
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 — psig			Refrigerant Side — 278, Water Side — 300			
WATER CONNECTIONS — in.			Cooler Inlet and Outlet; Victaulic Type			
Inlet and Outlet			4	4	5	5
Drain			¾ NPT			

SI

UNIT SIZE			080	090	100	110
APPROX OPER WT — kg	C-AL		3,055	3,243	3,960	4,018
	C-C		3,384	3,573	4,390	4,450
REFRIG CHG — 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 .24.2			
06E*	(No.) Ckt A		(1) 265, (1) 299	(1) 265, (1) 299	(1) 265, (1) 299	(1) 299, (1) 299
	(No.) Ckt B		(1) 299	(1) 265, (1) 275	(1) 265, (1) 299	(1) 299, (1) 299
Capacity Control Steps			8	11	11	11
% 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			
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
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	669	669	669
No. Rows — Ckt A or B			3	3	3	3
Face Area m ² — Ckt A and B Total			128.3	128 3	168	168
Max Working Pressure Refrigerant — kPa			3103			
COOLER — No. ...Type			One...Direct Expansion, Shell and Tube			
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 — kPa			Refrigerant Side — 1916, Water Side — 2068			
WATER CONNECTIONS — in.			Cooler Inlet and Outlet; Victaulic Type			
Inlet and Outlet			4	4	5	5
Drain			¾ NPT			

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

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

LEGEND

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

Factory-installed options

Part-wind start — Generally, PW start is not required where multiple 06E compressors are installed. The starting current is generally lower than a larger compressor using PW start. However, a part-wind start option is available (denoted by a **P** in the fifth position of the unit model number).

Copper/copper condenser coils — A **C** in the eleventh position of the unit model number indicates copper tubing and copper fins. The standard copper tube/aluminum fin condenser coil is replaced by internally enhanced copper tubing mechanically bonded to sine wave copper fin stock.

Motormaster® III low ambient control — The Motormaster III head pressure control device is available from the factory. This control permits operation of 30GN,GT units to -20 F (-29 C) ambient temperature. The control is prewired at the factory.

Australian code cooler — A shell-and-tube type cooler with removable heads, built and certified to the Australian cooler code is available. The cooler is stamped AS1210, and

is inspected in accordance with the Australian Code for a refrigerant-side working pressure of 207 psig (1430 kPa), and a minimum water-side pressure of 150 psig (1034 kPa).

Brine — The Brine option permits supply liquid temperatures to be set to a minimum of 15 F (-9.4 C). Refrigeration circuit components, such as the expansion device, are modified to correct for the lower refrigeration flow rates.

Cooler heater — A cooler heater may be factory installed. The package includes controls to energize the heater at 35 F (2 C) and below, and eight cooler tape heaters, 210 watts each.

→ **Thermostatic expansion valves (TXV)** — A TXV option (30GT only), instead of electronic expansion valves, permits unit to start and run fully loaded at outdoor temperatures from 35 to 125 F (1° to 52 C) without special control or field provision.

Field-installed accessories

Hot-gas bypass — The package includes control solenoid valves and the hot gas bypass valve along with installation instructions. Piping and electrical connections are made easy by factory-provided piping stubs and electrical terminal blocks. The accessory requires use of the accessory Control Option Board.

Gage panel — (for 30GT only) Accessory package includes one suction gage and one discharge gage mounted on the same panel, with a shutoff valve for each gage. Two gage panels are required for **each** circuit. For 30GN, all system pressures are monitored through the 8-character display.

Motormaster III control — This device permits unit operation down to -20 F (-29 C). The package includes sensor, control, and installation hardware. Factory-installed fan motors compatible with the Motormaster III require no field motor changes. A Motormaster III control is required for **each** circuit. In 575-v applications, 4 transformers must be field supplied.

Chilled water flow switch — Although low water flow detection is provided by the unit internal control devices, this accessory is available for field installation.

Additional unloaders — An additional unloader can be field-installed for the lead compressors of each circuit on Flotronic™ II (30GN) units only. The accessory requires use of the accessory Control Option Board.

Temperature reset — For Flotronic™ (30GT) units only, for leaving water temperature reset. The accessory lets the unit reset the leaving water temperature to a higher value during low load conditions. Temperature reset can be initiated from return water temperature, space temperature or outdoor temperature. The accessory requires use of the accessory Control Option Board.

Demand limit control module — The accessory has a 2-point adjustment (0-49% and 50-100%), activated by a remote signal, either 115 v or 230 v. This module is a prewired board for 30GT units. Model 30GN uses the Options Board Module for 2-step demand limit.

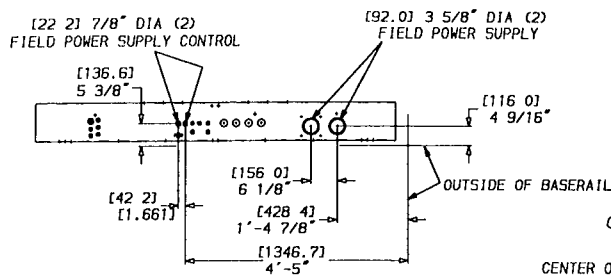
Control transformer — The transformer is sized to supply the needs of the control circuit, sourcing power from the main unit power connection.

Sound reduction kit — Kit consists of a specially-designed fan system of fans and orifices for reducing system noise without compromising unit performance. No fan motor change is required, and the fan system is compatible with Motormaster® III control. Accessory is packaged in sets of 2 per package.

Security package condenser grilles — These accessory grilles mount to the condenser coil shelf and to the base rail.

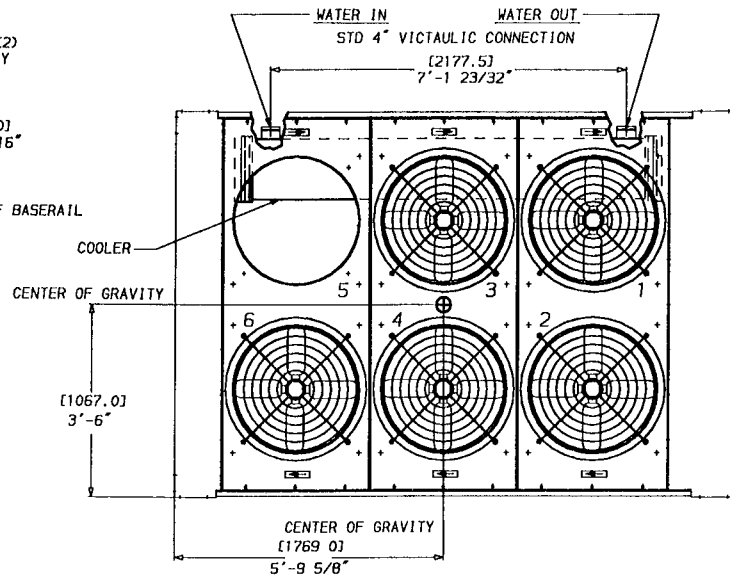
Condenser coil hail guard package — The package includes louvered condenser coil hail guards, and installation hardware.

Base unit dimensions — 30GN,GT080

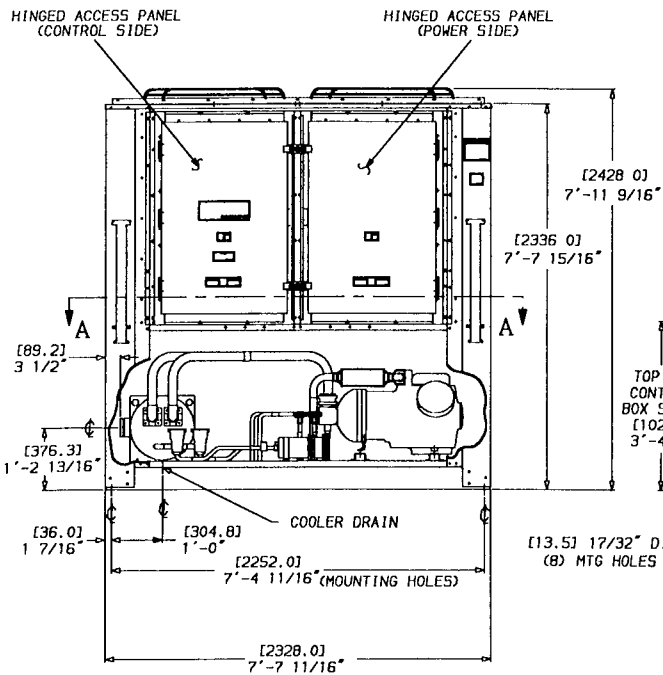


VIEW A-A

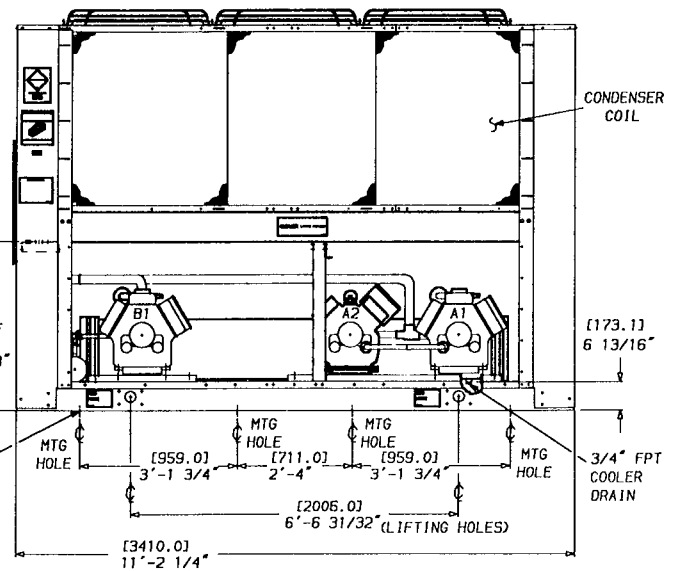
TOP VIEW OF CONTROL BOX SHELF
WITH FIELD POWER SUPPLY CONNECTIONS



TOP VIEW



END VIEW

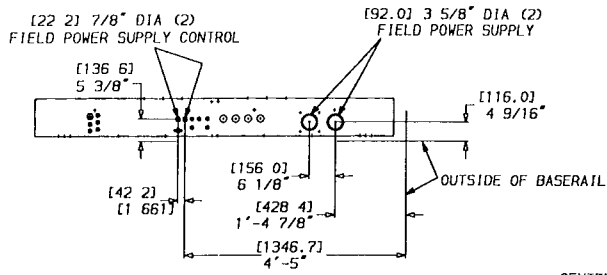


SIDE VIEW

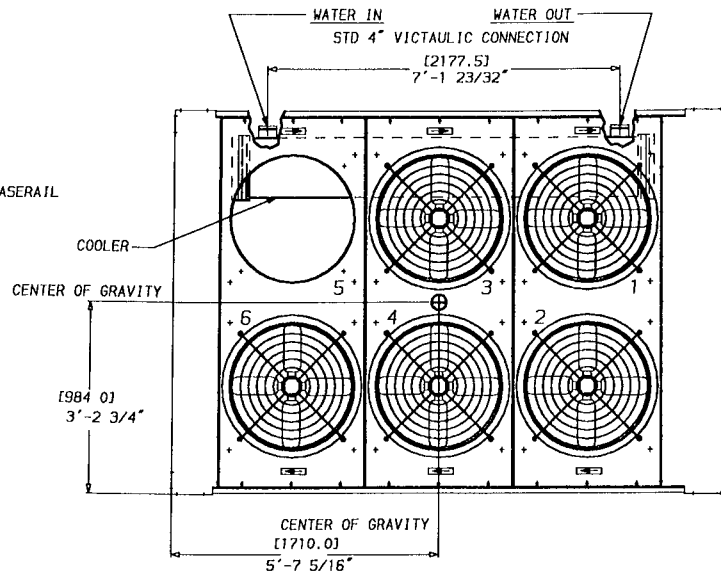
NOTES:

- Unit must have clearances for air flow as follows:
Top — Do not restrict in any way
Ends — 5 ft [1524 mm]
Sides — 6 ft [1829 mm]
- Dimensions in [] are in millimeters.

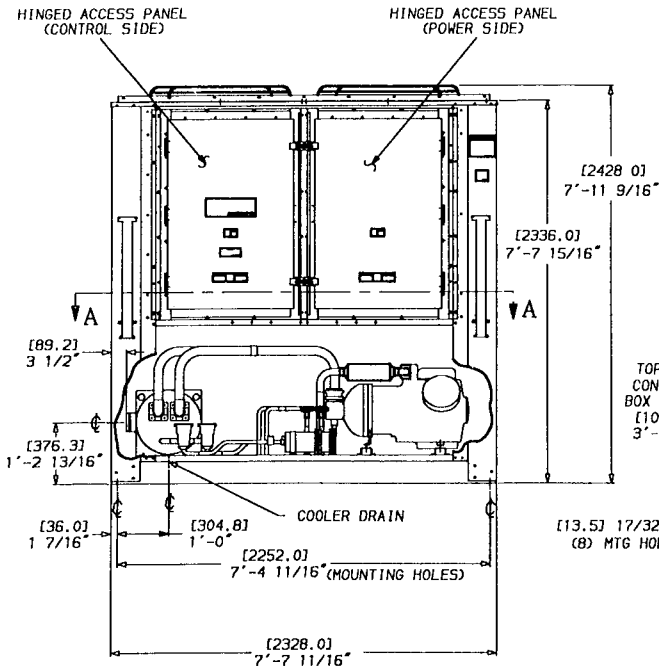
Base unit dimensions — 30GN,GT090



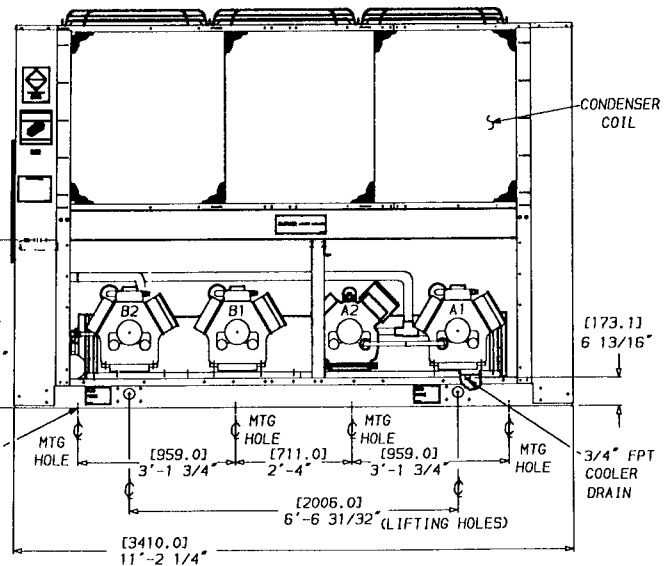
VIEW A-A
TOP VIEW OF CONTROL BOX SHELF
WITH FIELD POWER SUPPLY CONNECTIONS



TOP VIEW



END VIEW

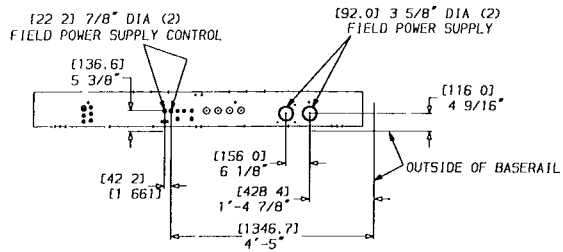


SIDE VIEW

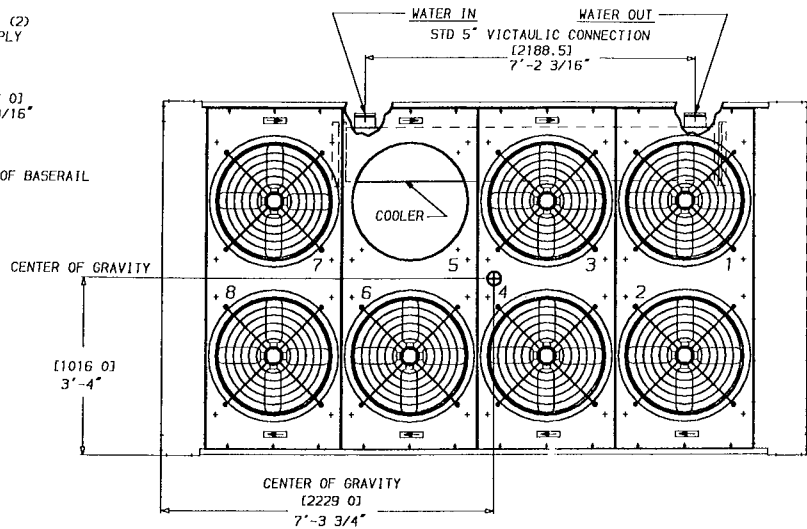
NOTES

- Unit must have clearances for air flow as follows:
Top — Do not restrict in any way
Ends — 5 ft [1524 mm]
Sides — 6 ft [1829 mm]
- Dimensions in [] are in millimeters.

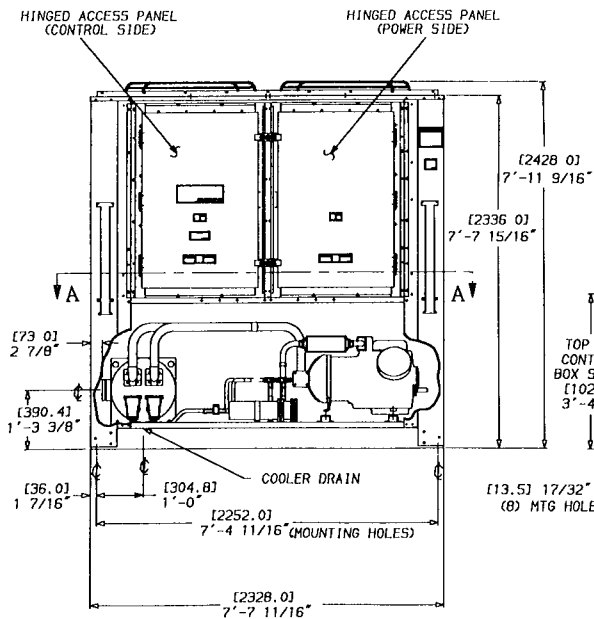
Base unit dimensions — 30GN,GT100, 110



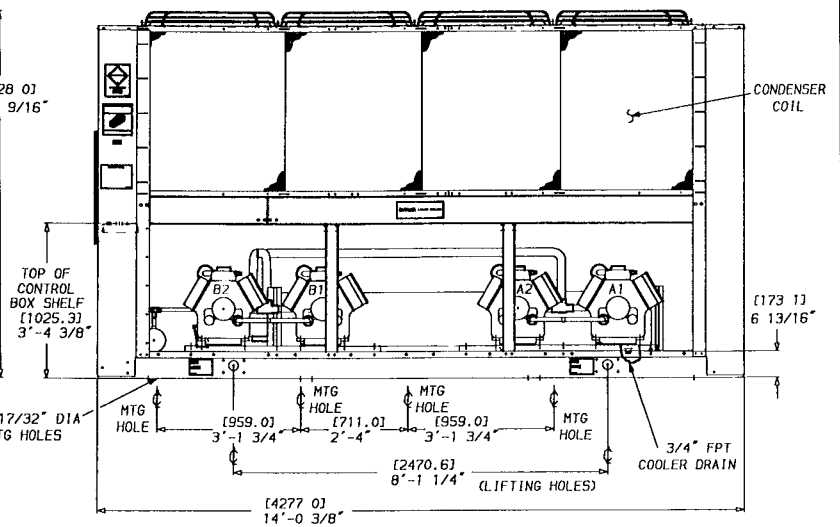
VIEW A-A
TOP VIEW OF CONTROL BOX SHELF
WITH FIELD POWER SUPPLY CONNECTIONS



TOP VIEW



END VIEW

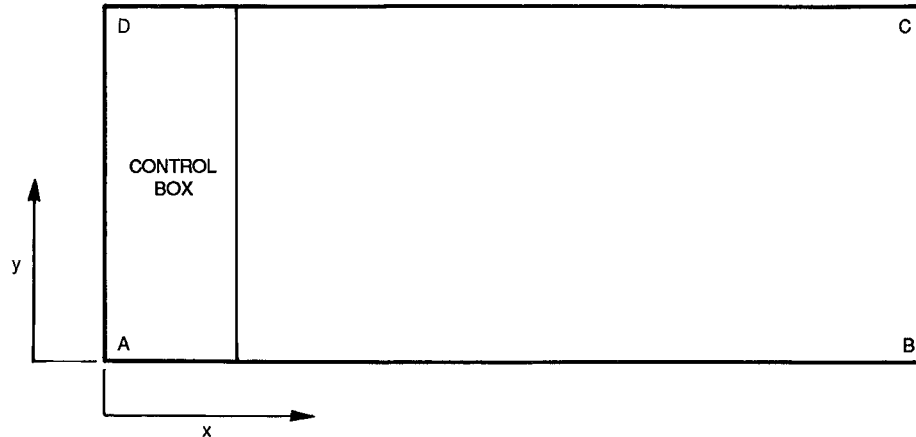


SIDE VIEW

NOTES:

- Unit must have clearances for air flow as follows:
Top — Do not restrict in any way
Ends — 5 ft [1524 mm]
Sides — 6 ft [1829 mm]
- Dimensions in [] are in millimeters

Base unit dimensions — mounting weights (approx.)



60 Hz

UNIT SIZE	CONDENSER COIL	lb				kg			
		A	B	C	D	A	B	C	D
080	C-AL	1,624	1,690	1,666	1,650	738	768	757	750
	C-C	1,797	1,880	1,847	1,831	817	854	840	832
090	C-AL	1,817	1,793	1,720	1,685	826	815	782	766
	C-C	1,997	1,970	1,893	1,880	908	895	860	855
100	C-AL	2,185	2,185	2,120	2,120	993	993	964	964
	C-C	2,420	2,420	2,360	2,360	1100	1100	1073	1073
110	C-AL	2,191	2,217	2,136	2,116	996	1007	970	962
	C-C	2,428	2,454	2,374	2,354	1104	1115	1079	1070

50 Hz

UNIT SIZE	CONDENSER COIL	lb				kg			
		A	B	C	D	A	B	C	D
080	C-AL	1,650	1,730	1,680	1,660	750	786	764	755
	C-C	1,830	1,910	1,863	1,842	832	868	847	837
090	C-AL	1,833	1,864	1,724	1,714	833	847	784	779
	C-C	2,014	2,040	1,907	1,899	915	927	867	863
100	C-AL	2,222	2,222	2,133	2,133	1010	1010	970	970
	C-C	2,460	2,460	2,370	2,370	1118	1118	1077	1077
110	C-AL	2,271	2,217	2,149	2,149	1032	1032	976	976
	C-C	2,508	2,508	2,387	2,387	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		110	
	in.	mm	in.	mm	in.	mm	in.	mm
X Dimension	69 ⁵ / ₁₆	1768	67 ⁵ / ₁₆	1710	87 ⁵ / ₁₆	2218	87 ³ / ₄	2229
Y Dimension	42	1067	38 ³ / ₄	984	40	1016	39 ¹ / ₂	1002

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 30GN,GT 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 unit 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 (29.4C).
2. **Minimum** LCWT for standard unit 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 to 39.9 F (1° to 4.4 C) only if a protective brine solution (20% antifreeze solution, or greater) is used and microprocessor DIP (Dual In-Line Package) switch is properly set (See Controls and Troubleshooting Instructions for further information.)

Medium temperature brine application

Application of chiller for brine duty within the 39.9 to 34 F (4.4 to 1° C) range is possible with proper field change of control configuration. Application in the range of 34 to 15 F (1° to -9.4 C) requires unit with factory modification. For ratings below 40 F (4.5 C) LCWT, contact your local Carrier representative.

Leaving water temperature reset

Accessory board* may be installed in chiller 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* — Increases 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 standard, and resets at the display panel.

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 thermostat is required.

*Obtain ordering part number from current price pages.

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

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

Cooler temperature rise

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

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

- a. Multiple smaller chillers may be applied in series, each providing a portion of the design temperature rise.
- b. Chilled water may be recirculated to raise flow rate. However, mixed temperature entering cooler must be maintained 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 9% for 080 and 090 sizes, 11% for 100 and 110 sizes.

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	59.5	3.75
090	216	13.62	59.5	3.75
100	240	15.14	72.7	4.59
110	264	16.65	72.7	4.59

LEGEND

ARI — Air Conditioning & Refrigeration Institute

NOTES:

1. Minimum flow based on 1.0 fps (0.30 m/s) velocity in cooler without special cooler baffling
2. Minimum Loop Volumes (based on Normal Air Conditioning — see below):
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

High ambient temperature operation

Standard 30GN,GT chillers can start and operate to 125 F (52 C) ambient temperature at nominal voltage

Application data (cont)

Low ambient temperature operation

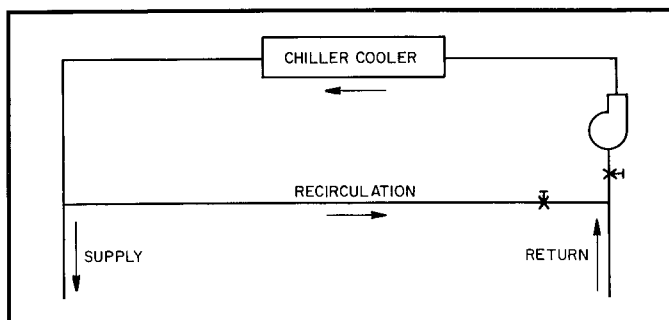
With certain field provisions as described below, 30GN,GT units will start and operate down to 0° F (–18 C) Model 30GT units with TXV option operate down to 35 F (1.7 C).

If operation is intended below 0° F (–18 C), the Carrier Motormaster® III condenser head pressure control (factory- or field-supplied) and its associated components must be added. Motormaster III control allows operation down to –20 F (–29 C). Consult your Carrier representative for details.

Wind baffles (field fabricated and installed) must be added to all units for operation below 32 F (0° C) if wind velocity is anticipated greater than 5 mph (8 km/h).

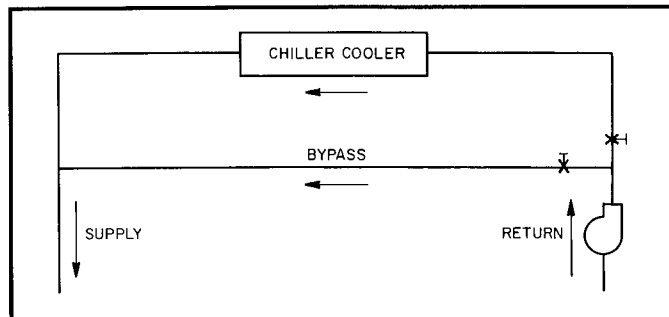
Antifreeze solution must be field-supplied and installed in all units for unit installation below 32 F (0° C) Antifreeze solution must be added to water loop to protect loop down to 15 F (–9 C) below minimum operating ambient temperature.

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



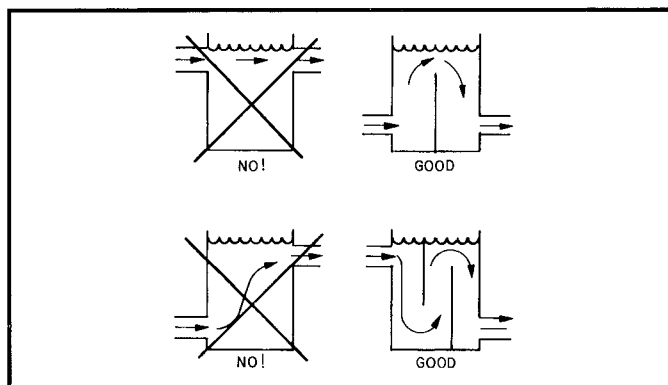
Maximum cooler flow > 5 gpm/ton or < 5° F rise (> [0.09 L/s · kW or < 2.7° C rise]) results in practical maximum pressure drop through cooler.

- 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.
- Special cooler baffling is available to permit a cooler flow rate increase of 12% for the 080 and 090 sizes, 15% for the 100 and 110 sizes.



Variable cooler flow rates may be applied to standard 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 Minimum Cooler Water Flow Rates 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 (3.25 liters per kW) per nominal ton of cooling for temperature stability and accuracy in normal air conditioning applications. For example, a size 100 would require 300 gallons (1135 liters). In process cooling applications, or for operation at ambient below 32 F (0° C) with low 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 ensure there is no stratification and that water (or brine) entering tank is adequately mixed with liquid in the tank.



→ **Cooler fouling factor** used to calculate tabulated ratings was .00025 ft² · hr · °F/Btu (.044 m² · kW). 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 · kW)		
.00025	.044	1.00	1.00
.00075	.132	0.97	0.98
.00175	.308	0.91	0.91

Cooler protection — When operating in areas that experience temperatures below 32 F (0° C), cooler protection in form of ethylene glycol (or other suitable brine) is required to protect cooler from low ambient freeze-up. Even though unit cooler is equipped with insulation and an electric heater that helps prevent freeze-up, 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 on low ambient temperature 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

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 in the Ethylene Glycol Performance Correction Factors chart.

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 that 40% concentration of ethylene glycol is required to prevent crystals from forming in solution.

Consider the 080 size from the Selection Procedure example (refer to correction curves at 40% solution).

Correct unit capacity — On Capacity Correction Curve, read 0.95.

$$\begin{aligned}\text{Corrected capacity} &= 0.95 \times \text{determined capacity} \\ &= 0.95 \times 82.3 \\ &= 78.2 \text{ tons.}\end{aligned}$$

Correct cooler water flow — On Cooler Flow Correction factor curve, read 1.15.

Cooler water flow (at corrected capacity)

$$\begin{aligned}&= \frac{24 \times \text{corrected capacity}}{\text{temperature rise}} = \text{U.S. gpm} \\ &= \frac{24 \times 78.2 \text{ tons}}{14 \text{ F}} = 134.0 \text{ U.S. gpm}\end{aligned}$$

$$\begin{aligned}\text{Cooler water flow (40\% solution)} &= 1.15 \times 134.0 \\ &= 154.1 \text{ U.S. gpm}\end{aligned}$$

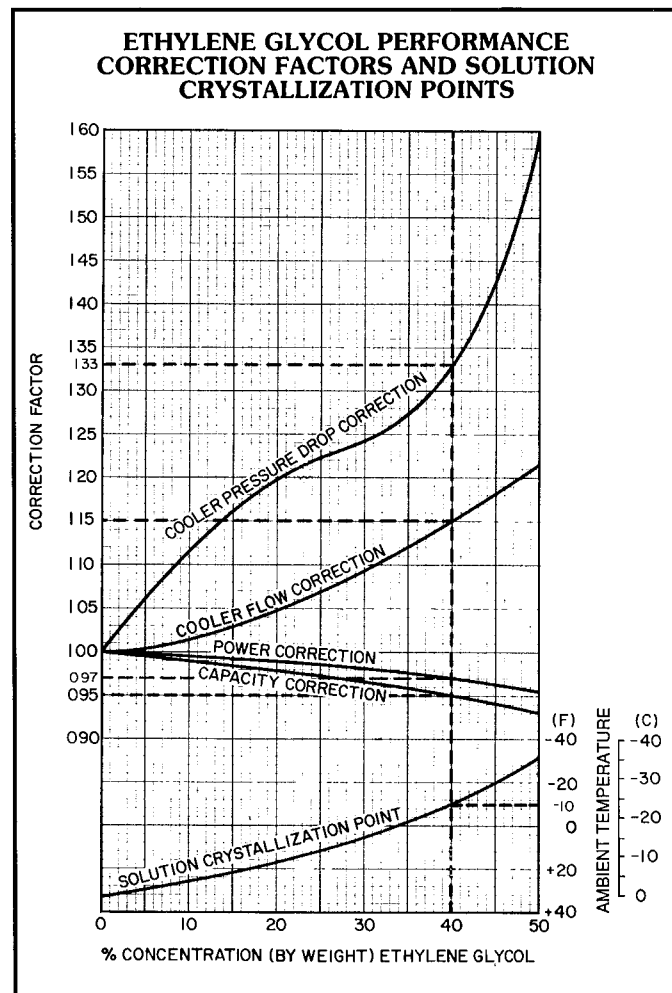
Correct cooler pressure drop — On Cooler Pressure Drop Correction curve below, read 1.33

On Cooler Pressure Drop curve (page 15), for 154.1 gpm, read pressure drop = 10 ft water. The pressure drop for 40% solution = $1.33 \times 10 = 13.3$ ft water.

Correct compressor power input (kW) — On Power Correction Curve, read 0.97 correction factor at 40% ethylene glycol concentration.

Power input from Selection Procedure example = 93.9 kW

$$\text{Corrected power input} = 0.97 \times 93.9 = 91.1 \text{ kW.}$$



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

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 the 080 size selected in the Selection Procedure (refer to correction curves at 40% solution).

Application data (cont)

Low ambient temperature operation

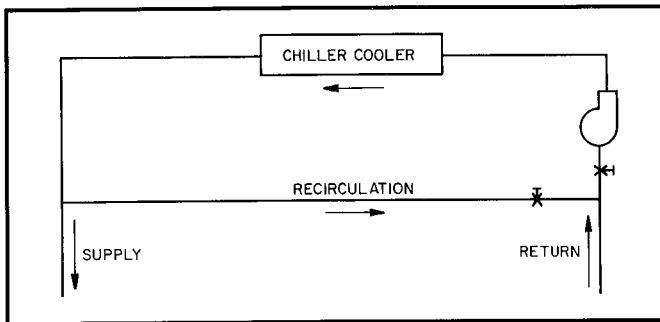
With certain field provisions as described below, 30GN,GT units will start and operate down to 0° F (–18 C). Model 30GT units with TXV option operate down to 35 F (1.7 C).

If operation is intended below 0° F (–18 C), the Carrier Motormaster® III condenser head pressure control (factory- or field-supplied) and its associated components must be added. Motormaster III control allows operation down to –20 F (–29 C). Consult your Carrier representative for details

Wind baffles (field fabricated and installed) must be added to all units for operation below 32 F (0° C) if wind velocity is anticipated greater than 5 mph (8 km/h)

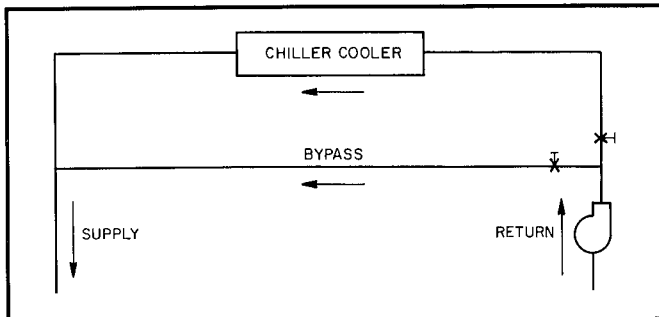
Antifreeze solution must be field-supplied and installed in all units for unit installation below 32 F (0° C). Antifreeze solution must be added to water loop to protect loop down to 15 F (–9 C) below minimum operating ambient temperature.

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



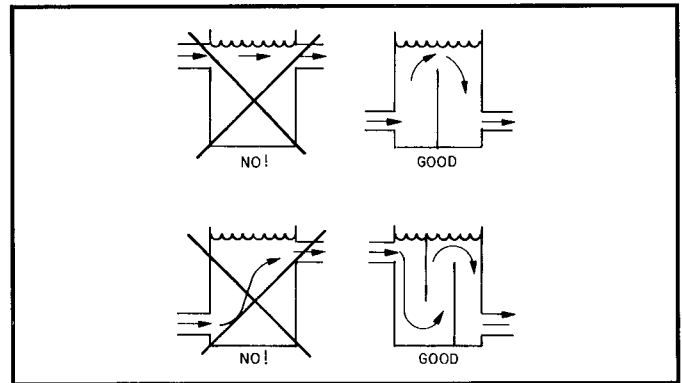
Maximum cooler flow > 5 gpm/ton or < 5° F rise (> [0.09 L/s · kW or < 2.7° C rise]) results in practical maximum pressure drop through cooler.

- 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.
- Special cooler baffling is available to permit a cooler flow rate increase of 12% for the 080 and 090 sizes, 15% for the 100 and 110 sizes.



Variable cooler flow rates may be applied to standard 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 Minimum Cooler Water Flow Rates 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 (3.25 liters per kW) per nominal ton of cooling for temperature stability and accuracy in normal air conditioning applications. For example, a size 100 would require 300 gallons (1135 liters). In process cooling applications, or for operation at ambient below 32 F (0° C) with low 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 ensure there is no stratification and that water (or brine) entering tank is adequately mixed with liquid in the tank.



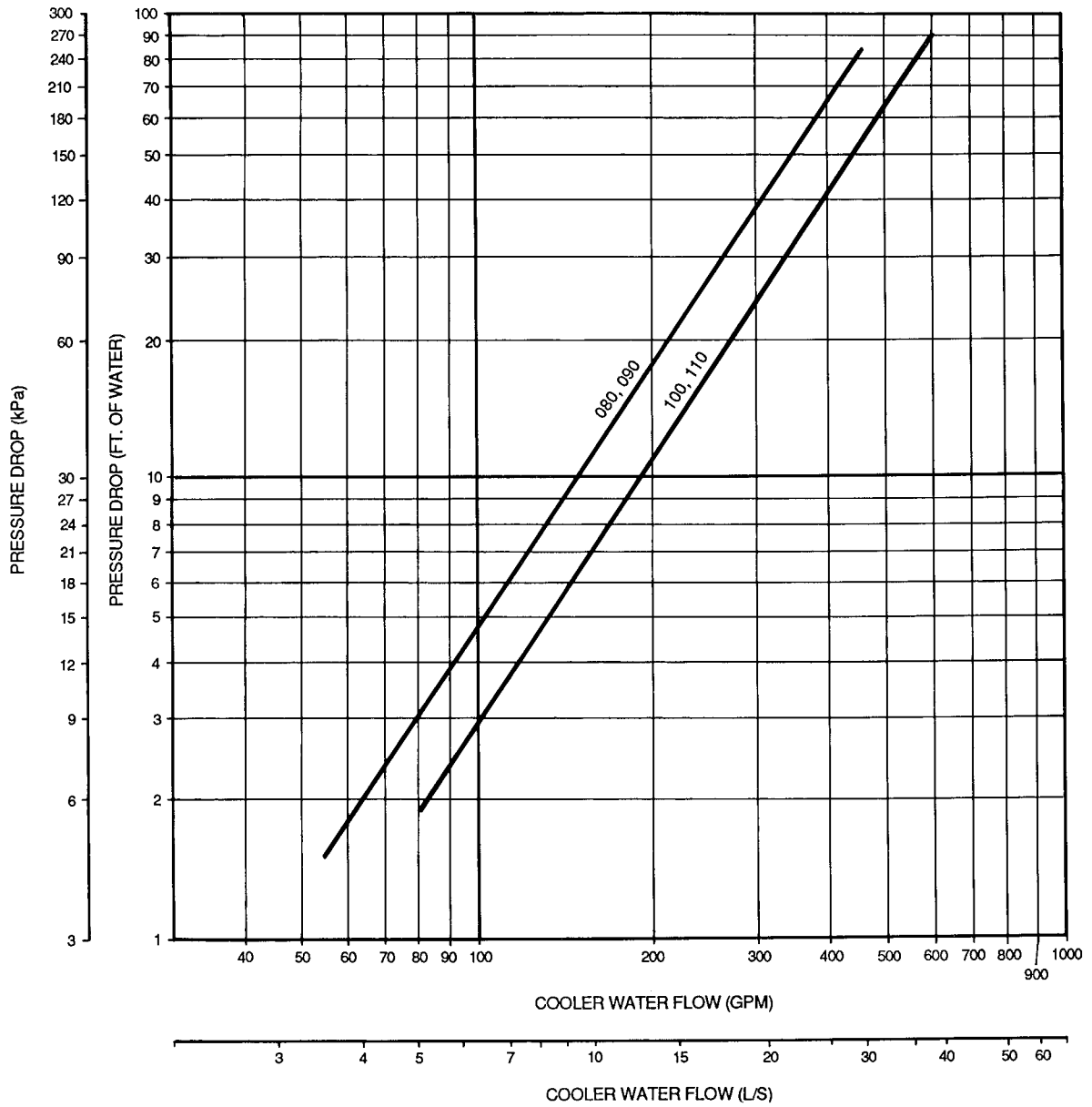
→ **Cooler fouling factor** used to calculate tabulated ratings was .00025 ft² · hr · °F/Btu (.044 m² · kW). As fouling factor is increased, both unit capacity and compressor power decrease. Standard ratings should be corrected using following multipliers:

FOULING FACTOR		CAPACITY MULTIPLIER	COMPRESSOR POWER MULTIPLIER
English (ft ² · hr · °F/Btu)	SI (m ² · kW)		
.00025	.044	1.00	1.00
.00075	.132	0.97	0.98
.00175	.308	0.91	0.91

Cooler protection — When operating in areas that experience temperatures below 32 F (0° C), cooler protection in form of ethylene glycol (or other suitable brine) is required to protect cooler from low ambient freeze-up. Even though unit cooler is equipped with insulation and an electric heater that helps prevent freeze-up, 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 on low ambient temperature operation

COOLER PRESSURE DROP (Water Side)



Application data (cont)

Correct unit capacity — On Capacity Correction Curve read 0.95

$$\begin{aligned}\text{Corrected capacity} &= 0.95 \times \text{determined capacity} \\ &= 0.95 \times 279.6 \\ &= 265.6 \text{ kW}\end{aligned}$$

Correct cooler water flow — On Cooler Flow Correction curve, read 1.15.

Cooler water flow (at corrected capacity)

$$\begin{aligned}&= \frac{0.239 \times \text{corr cap in kW}}{\text{temperature rise } ^\circ\text{C}} = \text{L/s} \\ &= \frac{0.239 \times 265.5}{7.8} = 8.1 \text{ L/s}\end{aligned}$$

$$\begin{aligned}\text{Cooler water flow (40\% solution)} &= 1.15 \times 8.1 \\ &= 9.3 \text{ L/s}\end{aligned}$$

Correct cooler pressure drop — On Cooler Pressure Drop Correction curve (page 13), read 1.33.

On Cooler Pressure Drop curve (page 15), for 9.3 L/s, read pressure drop = 45 kPa. The pressure drop for 40% solution = $1.33 \times 45 = 59.9$ kPa

Correct compressor power input (kW) — On Power Correction Curve, read 0.97 correction factor at 40% ethylene glycol concentration.

Power input from Selection Procedure example = 82.1 kW.

$$\text{Corrected power input} = 0.97 \times 82.1 = 79.6 \text{ kW}$$

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.

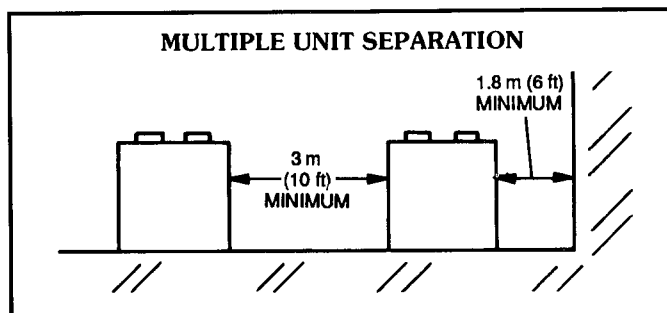
It is also recommended that the installation of 2 smaller chillers be considered where operation at minimum load is critical. The operation of a smaller chiller loaded to a greater percent of minimum is preferred to operating a single chiller at or near its minimum recommended value.

Hot gas bypass should not be used as a means to allow oversizing chillers. Hot gas bypass should be given consideration where substantial operating time is anticipated below the minimum unloading step.

Multiple chillers

Where chiller capacities greater than 250 tons (880 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° 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 Multiple Unit Separation figure below. See Base Unit Dimensions section for service clearances.



Electrical/utility interests

Energy management — See Controls and Troubleshooting Instructions 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.

Demand may be limited on unit 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 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

Remote ON-OFF control may be applied by hard-wired connection (see Controls and Troubleshooting Instructions) or by CCN with Flotronic™ II option.

Part-wind start

Part-wind start generally is not required 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 table) should be used in determining need.

Performance data — English

COOLING CAPACITIES — 60 Hz

LCWT	UNIT SIZE	CONDENSER ENTERING AIR TEMPERATURE (F)														
		85			95			105			115			125		
		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	080	80.7	85.1	193.2	76.1	89.9	182.1	71.4	94.2	170.9	66.7	98.0	159.7	61.9	101.3	148.3
	090	86.4	89.0	206.8	81.1	94.4	194.1	75.9	99.4	181.6	70.6	103.9	169.0	65.3	107.9	156.4
	100	97.9	97.5	234.4	92.2	103.6	220.7	86.3	109.1	206.7	80.5	114.0	192.7	74.5	118.4	178.4
	110	105.7	111.5	253.0	99.6	117.8	238.5	93.6	123.6	224.0	87.5	128.9	209.4	81.4	133.7	194.9
42	080	83.7	86.8	200.4	78.9	91.8	189.1	74.2	96.3	177.7	69.3	100.3	166.1	64.5	103.8	154.5
	090	89.6	90.8	214.6	84.2	96.4	201.8	78.9	101.6	188.9	73.5	106.3	176.0	68.1	110.5	163.1
	100	101.8	99.4	243.8	95.8	105.7	229.6	89.9	111.5	215.4	83.9	116.7	201.0	77.9	121.4	186.5
	110	109.8	113.8	263.0	103.6	120.4	248.2	97.4	126.4	233.2	91.1	132.0	218.3	84.9	137.0	203.4
44	080	86.7	88.5	207.8	81.9	93.6	196.3	77.0	98.3	184.6	72.1	102.6	172.7	67.1	106.3	160.8
	090	92.9	92.6	222.8	87.4	98.4	209.5	81.9	103.8	196.3	76.4	108.7	183.1	70.8	113.1	169.7
	100	105.7	101.3	253.5	99.6	107.9	238.8	93.5	113.9	224.1	87.4	119.4	209.5	81.2	124.3	194.6
	110	114.0	116.2	273.2	107.6	123.0	258.0	101.3	129.3	242.8	94.9	135.1	227.5	88.5	140.4	212.1
46	080	89.8	90.2	215.3	84.8	95.6	203.5	79.9	100.5	191.6	74.8	104.9	179.5	69.7	108.8	167.2
	090	96.3	94.5	230.9	90.6	100.5	217.4	85.0	106.0	203.9	79.3	111.1	190.2	73.6	115.8	176.7
	100	109.8	103.2	263.3	103.5	110.1	248.4	97.2	116.3	233.2	90.9	122.1	218.1	84.6	127.3	203.0
	110	118.3	118.5	283.7	111.8	125.6	268.2	105.3	132.2	252.5	98.7	138.3	236.8	92.1	143.9	221.0
48	080	92.9	91.9	222.9	87.9	97.5	210.9	82.8	102.6	198.7	77.7	107.2	186.4	72.4	111.4	173.8
	090	99.7	96.3	239.2	93.9	102.5	225.4	88.1	108.3	211.4	82.3	113.6	197.6	76.5	118.5	183.7
	100	113.8	105.2	273.2	107.5	112.2	258.0	101.1	118.8	242.6	94.6	124.8	227.0	88.1	130.3	211.5
	110	122.6	120.9	294.3	116.0	128.3	278.3	109.3	135.1	262.4	102.6	141.5	246.3	95.9	147.3	230.2
50	080	96.2	93.7	230.9	91.0	99.4	218.5	85.8	104.7	206.0	80.6	109.6	193.4	75.2	113.9	180.6
	090	103.1	98.1	247.7	97.2	104.5	233.4	91.3	110.5	219.3	85.4	116.1	205.1	79.5	121.2	190.9
	100	118.0	107.1	283.4	111.5	114.5	267.8	105.0	121.3	252.0	98.4	127.5	236.3	91.7	133.2	220.1
	110	127.1	123.3	305.1	120.3	130.9	288.8	113.5	138.1	272.4	106.6	144.7	255.9	99.7	150.8	239.4
55	080	104.5	98.2	251.1	99.0	104.4	238.0	93.3	110.0	224.3	—	—	—	—	—	—
	090	112.0	102.9	269.2	105.8	109.8	254.4	99.6	116.2	239.4	92.7	121.9	222.9	—	—	—
	100	128.9	112.1	309.7	122.0	120.0	293.2	115.1	127.5	276.7	108.1	134.5	259.8	101.0	140.8	242.7
	110	138.6	129.5	333.1	131.4	137.7	315.8	124.2	145.5	298.5	116.9	152.8	280.9	109.5	159.6	263.3
60	080	107.6	99.8	258.7	100.9	105.5	242.7	94.2	110.6	226.7	—	—	—	—	—	—
	090	118.3	106.1	284.6	110.3	112.4	265.4	102.5	118.1	246.5	94.7	123.3	227.8	—	—	—
	100	137.7	115.9	331.3	128.9	123.5	310.1	120.1	130.4	288.9	111.4	136.6	268.0	102.7	142.1	247.1
	110	150.2	135.5	361.4	141.6	143.6	340.6	132.1	150.6	317.8	122.8	157.0	295.4	113.5	162.7	273.1

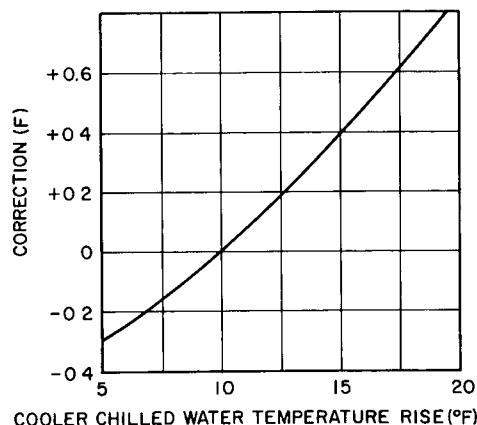
COOLING CAPACITIES — 50 Hz

LCWT	UNIT SIZE	CONDENSER ENTERING AIR TEMPERATURE (F)														
		85			95			105			115			125		
		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	080	79.7	75.4	190.8	75.2	79.6	180.1	70.9	83.4	169.6	66.5	87.0	159.2	62.1	90.3	148.7
	090	89.3	95.9	213.8	84.2	101.2	201.6	79.1	106.1	189.3	74.0	110.6	177.1	68.9	114.6	164.8
	100	98.3	102.4	235.3	92.8	108.1	222.2	87.3	113.3	208.9	81.8	118.2	195.8	76.3	122.7	182.8
	110	108.6	122.1	260.0	102.9	128.1	246.4	97.2	133.7	232.8	91.5	138.8	219.1	85.7	143.6	205.2
42	080	82.6	76.9	197.9	78.1	81.3	187.1	73.6	85.3	176.2	69.1	89.0	165.5	64.6	92.4	154.7
	090	92.6	97.9	221.9	87.3	103.4	209.2	82.1	108.5	196.7	76.9	113.1	184.1	71.6	117.4	171.5
	100	102.1	104.5	244.6	96.5	110.4	231.1	90.8	115.9	217.4	85.2	121.0	204.0	79.5	125.7	190.6
	110	112.8	124.8	270.2	106.9	131.0	256.0	101.0	136.9	242.1	95.1	142.2	227.9	89.2	147.2	213.8
44	080	85.5	78.4	205.1	81.0	82.9	194.2	76.4	87.1	183.1	71.7	91.0	171.9	67.1	94.6	160.9
	090	95.9	99.9	230.0	90.6	105.6	217.1	85.2	110.9	204.2	79.8	115.7	191.3	74.4	120.2	178.4
	100	106.0	106.7	254.2	100.2	112.8	240.2	94.4	118.5	226.2	88.6	123.9	212.4	82.8	128.8	198.6
	110	117.0	127.5	280.4	111.0	134.0	266.0	104.9	140.1	251.4	98.9	145.7	237.0	92.8	150.9	222.5
46	080	88.7	80.0	212.7	83.9	84.6	201.2	79.2	89.0	190.0	74.5	93.0	178.7	69.7	96.8	167.1
	090	99.3	101.9	238.2	93.8	107.8	225.1	88.4	113.3	211.9	82.8	118.4	198.6	77.3	123.0	185.4
	100	110.0	108.9	263.8	104.1	115.3	249.6	98.1	121.2	235.3	92.2	126.8	221.1	86.2	131.9	206.7
	110	121.2	130.3	290.7	115.1	137.0	276.0	108.9	143.3	261.2	102.7	149.2	246.2	96.4	154.6	231.3
48	080	91.8	81.5	220.2	86.9	86.4	208.6	82.0	90.8	196.9	77.2	95.1	185.4	72.4	99.0	173.7
	090	102.7	103.9	246.6	97.2	110.1	233.2	91.6	115.8	219.7	85.9	121.1	206.2	80.2	125.9	192.5
	100	114.1	111.1	273.8	107.9	117.7	259.0	101.9	123.9	244.5	95.7	129.7	229.8	89.6	135.0	215.1
	110	125.5	133.1	301.3	119.2	140.1	286.2	113.0	146.6	271.1	106.6	152.7	255.8	100.2	158.4	240.5
50	080	94.9	83.1	227.8	90.0	88.1	216.1	85.0	92.8	204.2	80.0	97.1	192.1	75.1	101.2	180.3
	090	106.3	106.0	255.2	100.6	112.3	241.5	94.8	118.3	227.7	89.1	123.8	213.8	83.3	128.8	199.9
	100	118.2	113.4	283.9	112.0	120.2	268.9	105.7	126.6	253.8	99.5	132.6	238.8	93.2	138.2	223.8
	110	130.0	136.0	312.2	123.5	143.2	296.6	117.1	150.0	281.1	110.6	156.3	265.5	104.0	162.2	249.7
55	080	102.6	86.9	246.5	97.0	92.1	233.0	91.4	96.9	219.6	85.7	101.4	206.1	80.1	105.5	192.6
	090	115.3	111.2	277.1	109.3	118.1	262.7	103.3	124.6	248.2	97.2	130.6	233.5	—	—	—
	100	129.0	119.1	310.0	122.3	126.5	293.9	115.7	133.5	278.1	109.1	140.1	262.2	102.4	146.3	246.1
	110	141.5	143.3	340.1	134.7	151.1	323.7	127.8	158.5	307.2	120.9	165.5	290.6	113.9	172.0	273.7
60	080	106.6	89.0	256.4	100.1	93.9	240.8	93.7	98.4	225.3	87.3	102.4	210.1	81.0	106.1	195.0
	090	122.0	114.8	293.5	114.2	121.1	274.8	106.6	126.7	256.3	98.9	131.8	238.0	—	—	—
	100	138.3	123.8	332.7	129.7	130.7	312.1	121.3	137.0	291.8	113.0	142.8	271.7	104.7	148.0	251.9
	110	153.6	150.9	369.5	145.6	158.7	350.3	136.4	165.1	328.0	127.4	171.0	306.5	118.6	176.4	285.2

Performance data — English and SI

ENGLISH

LCWT CORRECTION



NOTE: Above 10 F, ADD correction to design LCWT;
below 10 F, SUBTRACT.

LEGEND

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

NOTES:

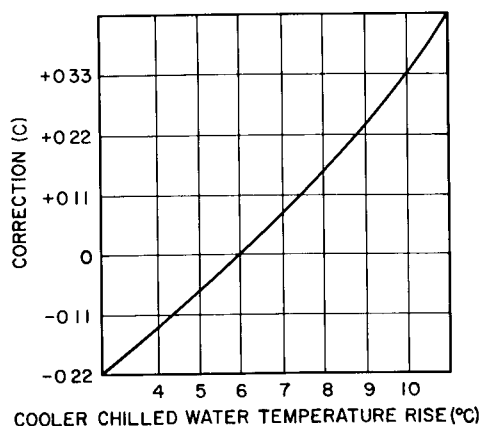
- Ratings apply to units with electronic or thermal expansion valves
- All ratings are based on:
 - A cooler water temperature rise of 10° F. When greater accuracy is desired, correct design LCWT, before entering rating tables, by reference to the LCWT correction curve.
 - A fouling factor of 0.00025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

$$= \frac{24 \times \text{capacity in tons}}{\text{temperature rise } ^\circ\text{F}} = \text{U.S. gpm}$$
 - On Cooler Pressure Drop chart (page 15), enter cooler pressure drop curve at corrected flow rate and read pressure drop
- When cooler 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.

Shaded area in table shows ratings in accordance with latest ARI (Air Conditioning & Refrigeration Institute) Standard 590.

SI

LCWT CORRECTION



NOTE: Above 6 C, ADD correction to design LCWT;
below 6 C, SUBTRACT.

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 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 .044 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 cooler:

$$= \frac{0.239 \times \text{capacity in kW}}{\text{temperature rise } ^\circ\text{C}} = \text{L/s}$$
 - On Cooler Pressure Drop chart (page 15), enter cooler pressure drop curve at corrected flow rate and read pressure drop
- When cooler 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 – SI

COOLING CAPACITIES – 60 Hz

LCWT	UNIT SIZE	CONDENSER ENTERING AIR TEMPERATURE (C)														
		30			35			40			45			50		
		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	080	278.1	84.9	11.9	263.6	89.1	11.3	248.9	92.9	10.7	234.2	96.4	10.1	219.3	99.4	9.4
	090	297.4	88.9	12.8	280.9	93.6	12.1	264.4	98.0	11.3	247.9	102.0	10.6	231.5	105.7	9.9
	100	337.1	97.4	14.5	318.8	102.7	13.7	300.7	107.6	12.9	282.4	112.1	12.1	263.8	116.0	11.3
	110	363.9	111.2	15.6	344.8	116.8	14.8	325.9	121.9	14.0	306.9	126.7	13.2	287.8	131.0	12.4
5.0	080	287.4	86.5	12.3	272.6	90.8	11.7	257.6	94.8	11.1	242.5	98.4	10.4	227.4	101.6	9.8
	090	307.5	90.5	13.2	290.6	95.4	12.5	273.9	100.0	11.8	257.0	104.2	11.0	240.2	108.0	10.3
	100	349.1	99.1	15.0	330.7	104.7	14.2	311.9	109.7	13.4	293.2	114.4	12.6	274.4	118.6	11.8
	110	376.7	113.3	16.2	357.3	119.1	15.4	337.8	124.5	14.5	318.4	129.4	13.7	298.9	133.9	12.8
6.0	080	296.7	88.0	12.8	281.7	92.5	12.1	266.5	96.6	11.5	251.1	100.4	10.8	235.7	103.8	10.1
	090	317.9	92.1	13.7	300.7	97.2	12.9	283.5	102.0	12.2	266.2	106.3	11.4	249.0	110.3	10.7
	100	361.4	100.9	15.5	342.4	106.6	14.7	323.3	111.9	13.9	304.2	116.8	13.1	284.9	121.2	12.2
	110	389.8	115.4	16.8	370.0	121.4	15.9	350.1	127.0	15.1	330.1	132.1	14.2	310.2	136.9	13.3
7.0	080	306.3	89.6	13.2	291.1	94.2	12.5	275.6	98.5	11.9	259.9	102.5	11.2	243.9	106.0	10.5
	090	328.4	93.8	14.1	310.8	99.0	13.4	293.2	103.9	12.6	275.6	108.5	11.9	257.9	112.6	11.1
	100	373.9	102.6	16.1	354.5	108.5	15.2	334.9	114.0	14.4	315.4	119.1	13.6	295.8	123.8	12.7
	110	403.2	117.6	17.3	382.9	123.8	16.5	362.6	129.6	15.6	342.2	134.9	14.7	321.7	139.9	13.8
8.0	080	316.1	91.1	13.6	300.5	95.9	12.9	284.8	100.4	12.3	268.8	104.5	11.6	252.5	108.2	10.9
	090	339.0	95.4	14.6	321.0	100.9	13.8	303.1	105.9	13.0	285.0	110.6	12.3	267.0	115.0	11.5
	100	386.7	104.3	16.6	366.9	110.5	15.8	346.9	116.2	14.9	327.0	121.5	14.1	306.7	126.3	13.2
	110	416.6	119.7	17.9	396.1	126.1	17.0	375.4	132.2	16.2	354.6	137.7	15.3	333.6	142.9	14.4
9.0	080	326.0	92.7	14.0	310.1	97.7	13.4	294.0	102.3	12.7	277.8	106.6	12.0	261.3	110.4	11.2
	090	349.7	97.1	15.1	331.5	102.7	14.3	313.0	107.9	13.5	294.7	112.8	12.7	276.3	117.3	11.9
	100	399.5	106.1	17.2	379.5	112.5	16.3	359.1	118.4	15.5	338.8	123.9	14.6	318.0	129.0	13.7
	110	430.4	121.9	18.5	409.4	128.5	17.6	388.2	134.7	16.7	367.1	140.6	15.8	345.7	146.0	14.9
10.0	080	336.4	94.3	14.5	320.0	99.4	13.8	303.5	104.2	13.1	286.9	108.6	12.4	270.2	112.7	11.6
	090	360.7	98.8	15.5	341.9	104.5	14.7	323.2	109.9	13.9	304.6	115.0	13.1	285.8	119.7	12.3
	100	412.9	107.9	17.8	392.3	114.5	16.9	371.5	120.6	16.0	350.8	126.3	15.1	329.4	131.6	14.2
	110	444.5	124.1	19.1	423.0	130.9	18.2	401.4	137.4	17.3	379.7	143.4	16.4	358.0	149.0	15.4
13.0	080	367.9	99.2	15.9	350.6	104.8	15.1	331.5	109.8	14.3	—	—	—	—	—	—
	090	394.3	104.0	17.0	374.7	110.2	16.2	353.8	115.8	15.3	332.1	121.0	14.3	310.8	125.9	13.4
	100	453.9	113.3	19.6	432.1	120.5	18.6	410.1	127.3	17.7	388.0	133.7	16.7	365.5	139.6	15.8
	110	488.1	130.8	21.0	465.3	138.3	20.1	442.4	145.4	19.1	419.1	152.0	18.1	395.9	158.3	17.1
16.0	080	376.2	100.4	16.2	355.1	105.5	15.3	334.0	110.1	14.4	—	—	—	—	—	—
	090	413.5	106.7	17.8	388.2	112.4	16.8	363.3	117.6	15.7	338.7	122.3	14.6	314.4	126.5	13.6
	110	481.5	116.7	20.8	453.5	123.5	19.6	425.7	129.8	18.4	398.1	135.4	17.2	370.6	140.5	16.0
	110	528.4	136.6	22.8	498.1	143.6	21.5	468.2	150.0	20.2	438.6	155.8	18.9	409.2	161.1	17.7

Performance data – SI (cont)

COOLING CAPACITIES – 50 Hz

LCWT	UNIT SIZE	CONDENSER ENTERING AIR TEMPERATURE (C)														
		30			35			40			45			50		
		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	080	274.7	75.2	11.8	260.7	78.9	11.2	247.0	82.3	10.6	233.3	85.5	10.0	219.6	88.5	9.4
	090	307.8	95.7	13.2	291.8	100.4	12.5	275.7	104.7	11.8	259.8	108.7	11.2	243.7	112.3	10.5
	100	338.4	102.1	14.5	321.3	107.1	13.8	304.0	111.8	13.0	286.9	116.2	12.3	269.8	120.2	11.6
	110	374.5	121.6	16.1	356.6	126.9	15.3	338.7	131.9	14.5	320.8	136.5	13.8	302.7	140.8	13.0
5.0	080	283.8	76.6	12.2	269.7	80.4	11.6	255.5	84.0	11.0	241.5	87.3	10.4	227.5	90.4	9.8
	090	318.1	97.5	13.7	301.6	102.3	13.0	285.2	106.8	12.3	268.8	111.0	11.5	252.5	114.8	10.8
	100	350.4	104.0	15.1	332.6	109.2	14.3	314.9	114.1	13.5	297.5	118.7	12.8	279.9	122.9	12.0
	110	387.4	124.1	16.6	369.0	129.6	15.9	350.6	134.7	15.1	332.3	139.5	14.3	313.9	144.0	13.5
6.0	080	292.9	78.0	12.6	278.7	81.9	12.0	264.3	85.6	11.4	249.8	89.0	10.7	235.5	92.3	10.1
	090	328.5	99.3	14.1	311.8	104.3	13.4	294.9	108.9	12.7	278.1	113.3	12.0	261.3	117.2	11.2
	100	362.5	106.0	15.6	344.5	111.4	14.8	326.4	116.4	14.0	308.3	121.2	13.3	290.3	125.6	12.5
	110	400.4	126.6	17.2	381.7	132.3	16.4	362.9	137.6	15.6	344.1	142.6	14.8	325.1	147.2	14.0
7.0	080	302.6	79.4	13.0	287.7	83.4	12.4	273.2	87.3	11.8	258.5	90.9	11.1	243.6	94.2	10.5
	090	339.0	101.1	14.6	322.0	106.3	13.8	304.9	111.1	13.1	287.6	115.6	12.4	270.4	119.7	11.6
	100	375.0	108.0	16.1	356.4	113.5	15.3	337.9	118.8	14.5	319.3	123.7	13.7	300.9	128.3	12.9
	110	413.7	129.0	17.8	394.6	134.9	17.0	375.4	140.5	16.1	356.1	145.6	15.3	336.6	150.5	14.5
8.0	080	312.3	80.8	13.4	297.1	85.0	12.8	282.1	88.9	12.1	267.2	92.7	11.5	251.9	96.1	10.8
	090	349.7	102.9	15.1	332.3	108.3	14.3	314.9	113.3	13.6	297.4	118.0	12.8	279.7	122.2	12.0
	100	387.4	110.0	16.7	368.7	115.7	15.9	349.7	121.2	15.0	330.8	126.2	14.2	311.8	131.0	13.4
	110	427.1	131.6	18.4	407.6	137.7	17.5	388.0	143.4	16.7	368.3	148.8	15.9	348.3	153.8	15.0
9.0	080	322.1	82.2	13.9	306.8	86.5	13.2	291.2	90.6	12.5	275.9	94.4	11.9	260.6	98.1	11.2
	090	360.6	104.8	15.5	342.9	110.3	14.8	325.1	115.5	14.0	307.3	120.3	13.2	298.4	124.8	12.5
	100	400.5	112.0	17.2	380.9	117.9	16.4	361.8	123.6	15.6	342.4	128.8	14.7	323.0	133.8	13.9
	110	440.8	134.1	19.0	420.9	140.4	18.1	400.8	146.3	17.3	380.8	151.9	16.4	360.4	157.1	15.5
10.0	080	332.0	83.6	14.3	316.5	88.1	13.6	300.8	92.3	13.0	284.9	96.3	12.3	269.3	100.0	11.6
	090	371.8	106.6	16.0	353.7	112.3	15.2	335.5	117.7	14.4	317.2	122.7	13.7	289.3	127.4	12.9
	100	413.6	114.1	17.8	393.8	120.2	17.0	373.9	126.0	16.1	354.2	131.4	15.3	334.4	136.6	14.4
	110	455.1	136.7	19.6	434.4	143.2	18.7	414.0	149.3	17.8	393.4	155.1	16.9	372.7	160.5	16.1
13.0	080	360.1	87.6	15.5	342.3	92.3	14.8	324.6	96.7	14.0	306.7	100.8	13.2	288.9	104.6	12.5
	090	405.9	112.4	17.5	386.9	118.6	16.7	367.7	124.4	15.9	348.4	130.0	15.0	328.1	134.9	14.1
	100	454.3	120.3	19.6	433.1	127.0	18.7	412.1	133.4	17.8	391.1	139.4	16.9	369.8	145.1	15.9
	110	498.6	144.7	21.5	476.9	151.8	20.6	455.1	158.5	19.6	433.1	164.9	18.7	410.7	170.9	17.7
16.0	080	372.8	89.5	16.1	352.2	93.9	15.2	331.8	97.9	14.3	311.7	101.6	13.5	291.8	105.0	12.6
	090	426.6	115.5	18.4	402.0	121.1	17.3	377.6	126.2	16.3	353.5	130.8	15.3	329.6	135.0	14.2
	100	483.7	124.5	20.9	456.6	130.7	19.7	429.8	136.4	18.5	403.3	141.7	17.4	377.1	146.5	16.3
	110	540.3	152.1	23.3	511.4	158.5	22.1	482.9	164.4	20.8	454.6	169.9	19.6	426.4	174.9	18.4

Electrical data

UNIT

UNIT SIZE	VOLTAGE			MCA		MOCP		ICF	
	Nameplate	Supplied*		XL	PW	XL	PW	XL	PW
		Min	Max						
080	208/230-3-60	187	253	391.3	391.3	500	500	896.9	620.9
	460-3-60	414	506	179.5	183.4	225	250	442.8	305.4
	575-3-60	518	633	160.9	149.2	200	200	365.6	246.9
	380-3-60	342	418	209.1	209.9	250	250	492.6	339.5
	346-3-50	325	380	250.1	250.1	300	300	—	379.8
	380/415-3-50	342	440	208.7	215.8	250	250	472.0	292.9
090	208/230-3-60	187	253	392.2	392.2	450	450	722.3	547.9
	460-3-60	414	506	192.7	195.6	225	225	361.2	273.5
	575-3-60	518	633	168.0	156.9	200	175	286.2	213.2
	380-3-60	342	418	205.9	202.6	250	225	396.0	294.5
	346-3-50	325	380	269.3	269.3	300	300	—	399.0
	380/415-3-50	342	440	233.7	241.4	250	300	497.0	363.5
100	208/230-3-60	187	253	462.3	462.3	500	500	835.2	633.2
	460-3-60	414	506	214.3	221.2	250	250	408.8	312.3
	575-3-60	518	633	191.1	168.9	225	200	289.4	233.1
	380-3-60	342	418	240.5	242.1	250	250	454.8	342.8
	346-3-50	325	380	303.8	303.8	350	350	—	433.5
	380/415-3-50	342	440	258.3	266.6	300	300	521.6	388.7
110	208/230-3-60	187	253	513.6	513.6	600	600	1019.2	743.2
	460-3-60	414	506	237.5	245.2	300	300	500.8	367.3
	575-3-60	518	633	212.0	194.5	250	225	416.6	292.1
	380-3-60	342	418	273.3	274.1	350	350	556.8	403.8
	346-3-50	325	380	373.0	373.0	450	450	—	502.7
	380/415-3-50	342	440	301.9	312.8	350	350	565.2	434.7

CONTROL CIRCUIT

UNIT POWER	CONTROL POWER			AMPS
	V-Ph-Hz	Min	Max	
208/230-3-60	115-1-60	104	127	30
460-3-60	115-1-60	104	127	30
575-3-60	115-1-60	104	127	30
380-3-60	230-1-60	207	254	15/5†
346-3-50	230-1-50	198	254	15/5†
380/415-3-50	230-1-50	198	254	15/5†



LEGEND AND NOTES FOR ELECTRICAL DATA ON PAGES 21-23

- FLA** — Full Load Amps (Fan Motors)
Maximum Instantaneous Current Flow during starting (the point in the starting sequence where the sum of the LRA for the
- ICF** — 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 Winding
- RLA** — Rated Load Amps (Compressors)
- XL** — Across-the-Line

*Units are suitable for use on electrical systems where voltage supplied to the unit terminals is not below or above the listed minimum and maximum limits. Maximum allowable phase imbalance is voltage, 2%, amps, 10%.

†First value is for chiller with cooler heater Second value (if applicable) is for chiller without cooler heater.

NOTES:

- All units have single point primary power connection. Main power must be supplied from a field-supplied disconnect.
- The unit control circuit power (115 v, 1-phase for 208/230-, 460-, and 575-v units; 230 v, 1-phase 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.
- 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.
- Units have the following power terminal blocks and parallel conductors:

UNIT SIZE	VOLTAGE	TERMINAL BLOCKS	PARALLEL CONDUCTORS
080 to 110	208/230	1	6
	460	1	3
	575	1	3
	380	1	3
	346	1	3
	380/415	1	3

- Maximum incoming wire size for each terminal block is 500 kcmil.
- 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 watts each

CONDENSER FAN

UNIT SIZE	NAMEPLATE VOLTAGE	CONDENSER FAN				
		No.	Hp	kW	FLA (ea)	LRA (ea)
080	208/230-3-60	6	1	.746	(4) 5.4, (2) 5.5	(4) 31.6, (2) 30.0
	460-3-60				(4) 2.7, (2) 2.8	(4) 31.6, (2) 30.0
	575-3-60				(6) 3.4	(6) 30.0
	380-3-60				(6) 3.9	(6) 20.9
	346-3-50				(6) 4.4	(6) 20.9
090	380/415-3-50	6	1	.746	(6) 3.0	(6) 30.0
	208/230-3-60				(4) 5.4, (2) 5.5	(4) 31.6, (2) 30.0
	460-3-60				(4) 2.7, (2) 2.8	(4) 31.6, (2) 30.0
	575-3-60				(6) 3.4	(6) 30.0
	380-3-60				(6) 3.9	(6) 20.9
100	346-3-50	8	1	.746	(6) 4.4	(6) 20.9
	380/415-3-50				(6) 3.0	(6) 30.0
	208/230-3-60				(6) 5.4, (2) 5.5	(6) 31.6, (2) 30.0
	460-3-60				(6) 2.7, (2) 2.8	(6) 31.6, (2) 30.0
	575-3-60				(8) 3.4	(8) 30.0
110	380-3-60	8	1	.746	(8) 3.9	(8) 20.9
	346-3-50				(8) 4.4	(8) 20.9
	380/415-3-50				(8) 3.0	(8) 30.0
	208/230-3-60				(6) 5.4, (2) 5.5	(6) 31.6, (2) 30.0
	460-3-60				(6) 2.7, (2) 2.8	(6) 31.6, (2) 30.0

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 switch to ON position. (This switch is also used to reset microprocessor should any safety trip, and also functions as ON-OFF switch for electronic processor and relay boards.) On Flotronic™ II, ON-OFF switch is replaced by the LOCAL/STOP/CCN switch.

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 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 to 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 (3.3° 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.

Where available, 2 sequences are used to obtain circuit lead/lag operation and even out compressor operating hours. This requires accessory unloaders on some units. 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 is to run the longest.

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.

Electrical data (cont)

COMPRESSORS

UNIT SIZE	NAMEPLATE VOLTAGE	COMPRESSOR NUMBERS							
		A1		A2		B1		B2	
		RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA
080	208/230-3-60	106.4	506	67.9	345	147.7	690	—	—
	460-3-60	46.8	253	34.6	173	65.4	345	—	—
	575-3-60	40.4	176	28.8	120	57.1	276	—	—
	380-3-60	52.6	280	34.6	191	78.8	382	—	—
	346-3-50	44.9	247	79.5	382	79.5	382	—	—
	380/415-3-50	43.6	223	65.4	345	65.4	345	—	—
080-PW	208/230-3-60	106.4	304	67.9	207	147.4	414	—	—
	460-3-60	48.7	152	33.3	104	67.9	207	—	—
	575-3-60	33.3	106	28.2	72	53.8	165	—	—
	380-3-60	53.8	168	33.3	115	79.5	229	—	—
	346-3-50	44.9	148	79.5	229	79.5	229	—	—
	380/415-3-50	44.9	134	67.9	207	67.9	207	—	—
090	208/230-3-60	89.7	446	67.9	345	89.7	446	89.7	446
	460-3-60	43.6	223	34.6	173	43.6	223	43.6	223
	575-3-60	36.5	164	28.8	120	36.5	164	36.5	164
	380-3-60	45.5	247	34.6	191	45.5	247	45.5	247
	346-3-50	44.9	247	79.5	382	44.9	247	53.8	280
	380/415-3-50	43.6	223	65.4	345	43.6	223	46.8	280
090-PW	208/230-3-60	89.7	268	67.9	207	89.7	268	89.7	268
	460-3-60	44.9	134	33.3	104	44.9	134	44.9	134
	575-3-60	33.3	98	28.2	72	33.3	98	33.3	98
	380-3-60	44.9	148	33.3	115	44.9	148	44.9	148
	346-3-50	44.9	148	79.5	229	44.9	148	53.8	168
	380/415-3-50	43.6	134	67.9	207	44.9	134	48.7	152
100	208/230-3-60	89.7	446	106.4	506	89.7	446	106.4	506
	460-3-60	43.6	223	46.8	253	43.6	223	46.8	253
	575-3-60	36.5	164	40.4	176	36.5	164	40.4	176
	380-3-60	45.5	247	52.6	280	45.5	247	52.6	280
	346-3-50	44.9	247	79.5	382	44.9	247	79.5	382
	380/415-3-50	43.6	223	65.4	345	43.6	223	65.4	345
100-PW	208/230-3-60	89.7	268	106.4	304	89.7	268	106.4	304
	460-3-60	44.9	134	48.7	152	44.9	134	48.7	152
	575-3-60	33.3	98	33.3	106	33.3	98	33.3	106
	380-3-60	44.9	148	53.8	168	44.9	148	53.3	168
	346-3-50	44.9	148	79.5	229	44.9	148	79.5	229
	380/415-3-50	44.9	134	67.9	207	44.9	134	67.9	207
110	208/230-3-60	89.7	446	147.4	690	89.7	446	106.4	506
	460-3-60	43.6	223	65.4	345	43.6	223	46.8	253
	575-3-60	36.5	164	57.1	276	36.5	164	40.4	176
	380-3-60	45.5	247	78.8	382	45.5	247	52.6	280
	346-3-50	79.5	382	79.5	229	79.5	382	79.5	382
	380/415-3-50	65.4	345	65.4	207	65.4	345	65.4	345
110-PW	208/230-3-60	89.7	268	147.4	414	89.7	268	106.4	304
	460-3-60	44.9	134	67.9	207	44.9	134	48.7	152
	575-3-60	33.3	98	53.8	165	33.3	98	33.3	106
	380-3-60	44.9	148	79.5	229	44.9	148	53.8	168
	346-3-50	79.5	229	79.5	229	79.5	229	79.5	229
	380/415-3-50	67.9	207	67.9	207	67.9	207	67.9	207

CONDENSER FAN

UNIT SIZE	NAMEPLATE VOLTAGE	CONDENSER FAN				
		No.	Hp	kW	FLA (ea)	LRA (ea)
080	208/230-3-60	6	1	746	(4) 5.4, (2) 5.5	(4) 31.6, (2) 30.0
	460-3-60				(4) 2.7, (2) 2.8	(4) 31.6, (2) 30.0
	575-3-60				(6) 3.4	(6) 30.0
	380-3-60				(6) 3.9	(6) 20.9
	346-3-50				(6) 4.4	(6) 20.9
	380/415-3-50				(6) 3.0	(6) 30.0
090	208/230-3-60	6	1	746	(4) 5.4, (2) 5.5	(4) 31.6, (2) 30.0
	460-3-60				(4) 2.7, (2) 2.8	(4) 31.6, (2) 30.0
	575-3-60				(6) 3.4	(6) 30.0
	380-3-60				(6) 3.9	(6) 20.9
	346-3-50				(6) 4.4	(6) 20.9
	380/415-3-50				(6) 3.0	(6) 30.0
100	208/230-3-60	8	1	746	(6) 5.4, (2) 5.5	(6) 31.6, (2) 30.0
	460-3-60				(6) 2.7, (2) 2.8	(6) 31.6, (2) 30.0
	575-3-60				(8) 3.4	(8) 30.0
	380-3-60				(8) 3.9	(8) 20.9
	346-3-50				(8) 4.4	(8) 20.9
	380/415-3-50				(8) 3.0	(8) 30.0
110	208/230-3-60	8	1	746	(6) 5.4, (2) 5.5	(6) 31.6, (2) 30.0
	460-3-60				(6) 2.7, (2) 2.8	(6) 31.6, (2) 30.0
	575-3-60				(8) 3.4	(8) 30.0
	380-3-60				(8) 3.9	(8) 20.9
	346-3-50				(8) 4.4	(8) 20.9
	380/415-3-50				(8) 3.0	(8) 30.0

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 switch to ON position. (This switch is also used to reset microprocessor should any safety trip, and also functions as ON-OFF switch for electronic processor and relay boards.) On Flotronic™ II, ON-OFF switch is replaced by the LOCAL/STOP/CCN switch.

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 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 to 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 (3.3° 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.

Where available, 2 sequences are used to obtain circuit lead/lag operation and even out compressor operating hours. This requires accessory unloaders on some units. 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 is to run the longest.

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.

Controls (cont)

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 Evaporator refrigerant temperature — Circuit A
- T6 Evaporator refrigerant 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 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 to 20° F (8.3° C to 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 EXV 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 an 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 compressor(s) if a 2 to 3 ampere ground current is sensed by a toroid around the compressor power leads.

The CPCS control system is standard on all sizes

Complete electronic control system contains several additional components.

Flotronic™ controls with 2-digit display/set point 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. 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 Instructions

Flotronic II (CCN) controls — Controls are factory-shipped in 30GN units, and include microprocessor controls and compatibility with Carrier Comfort Network (CCN) building comfort system. Control has a diagnostic display or Local Interface Device (LID) with 8-character display with capability to expand the output into full phrases. Also includes monitoring of system operational status, fault/overload conditions, key refrigeration temperatures, system pressures, and inputs to the processor at the unit or remotely.

Control Sequence

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

Start-up — After control circuit ON-OFF switch (LOCAL/STOP/CCN) switches 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 pulldown 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 EXV 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 deenergized 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), EXV closes, and compressor and fans continue to run while pumping down cooler. The liquid line solenoid valve on TXV units provides pumpdown.

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 (30GT only) 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

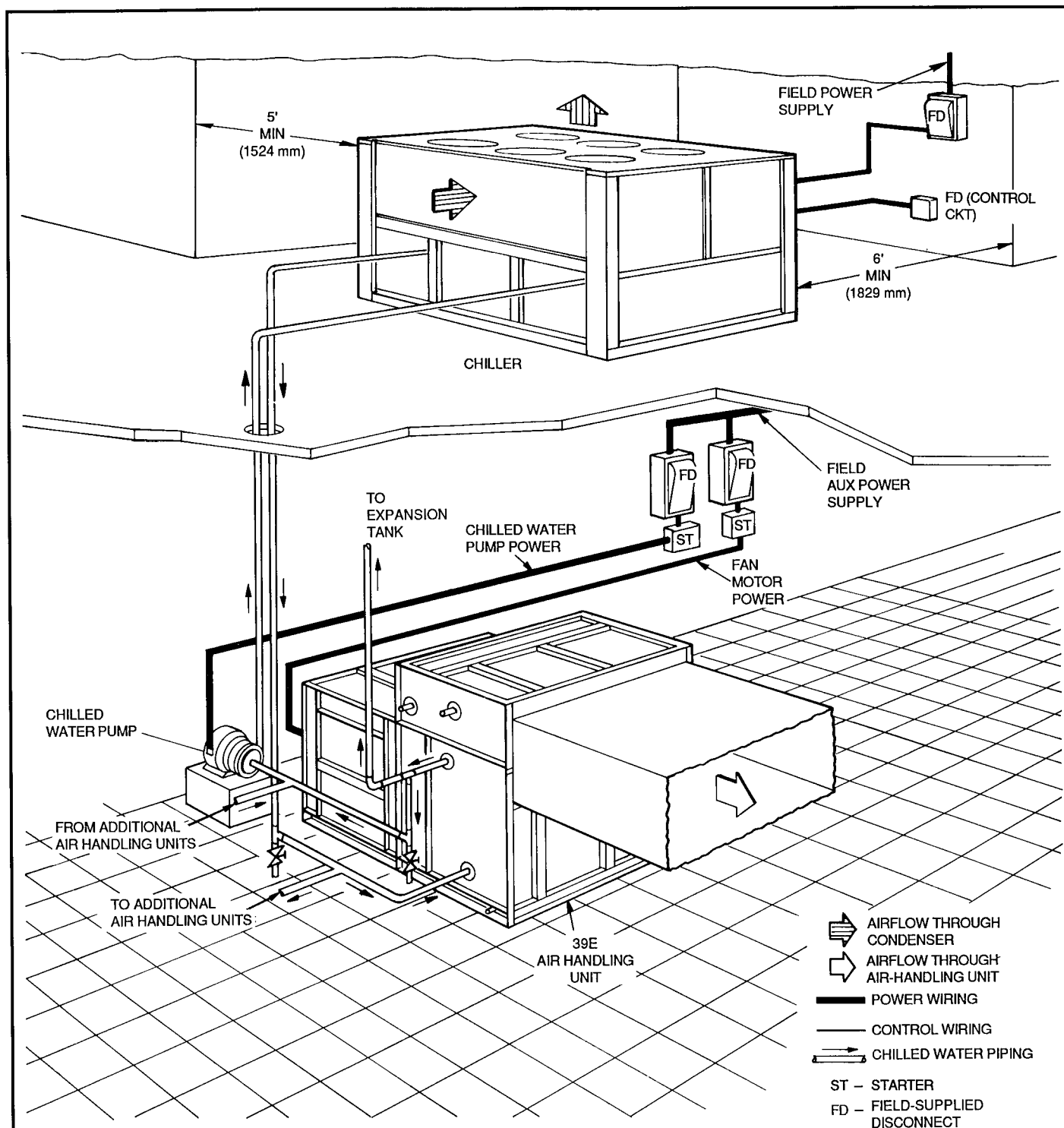
— Expansion valve opens and closes on signal from microprocessor to maintain an approximate 20° F (11° C) refrigerant superheat entering the compressor cylinders. (The compressor motor increases the refrigerant superheat from the approximate 5° F [3° C] leaving the cooler to that entering the cylinders.) 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 shut 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 in 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 cutout* shuts down 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* is provided by temperature differences between entering and leaving water temperature sensors 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 Instructions without additional equipment or tools). Quick Test confirms microprocessor is functional, informs observer through the display the condition of each sensor and switch in chiller, and allows observer to check for proper operation of fans, compressor(s), and expansion valves.

Typical piping and wiring



NOTES:

1. 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 are 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 (American Society of Heating, Refrigeration, and Air Conditioning Engineers) 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.

Guide specifications — 30GN080-110

Reciprocating Air-Cooled Liquid Chiller

HVAC Guide Specifications

Size Range **080 to 110 Tons (280 to 390 kW)**

Nominal

Carrier Model Number **30GN**

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
- B. Unit construction shall be designed to conform to ANSI/ASHRAE 15/latest revision safety standard, NEC (National Electrical Code, U S A) and ASME applicable codes.
- C. Unit operation shall be fully tested at the factory.

1.03 DELIVERY, STORAGE AND HANDLING

- A. 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

- 1. Frame shall be of heavy-gage galvanized steel members
- 2. Galvanized steel casing, zinc phosphatized, with an electrostatically applied baked-enamel finish with hinged access panels for compressor section.
- 3. Cabinet shall be capable of withstanding Federal Test Method Standard No 141 (Method 6061) 500-hour salt spray test.

C. Fans:

Condenser fans shall be direct-driven propeller type discharging air vertically upward and shall be equipped with the following features

- 1. Permanently lubricated bearings.
- 2. PVC coated steel wire safety guards.
- 3. Inherent corrosion resistance shafts
- 4. Statically and dynamically balanced fan wheels

D. Compressors:

- 1. Reciprocating semi-hermetic type only.
- 2. Each equipped with an automatically reversible oil pump, operating oil charge, suction and discharge

shutoff valves, and an insert-type factory-sized crank-case 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 r/s) for 60 Hz units, and 1450 rpm (24.2 r/s) for 50 Hz units
- 5. Cycles per hour per compressor shall not exceed 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 victaulic-type water connections.
- 4. Shell shall be insulated with 3/4-in (19-mm) PVC foam (closed-cell) of maximum K factor 0.28 with a protective steel jacket
- 5. Design shall incorporate 2 independent direct expansion refrigerant circuits.
- 6. 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)

F. Condenser

- 1. 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
- 2. Air-cooled condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa).

G. Refrigeration Components:

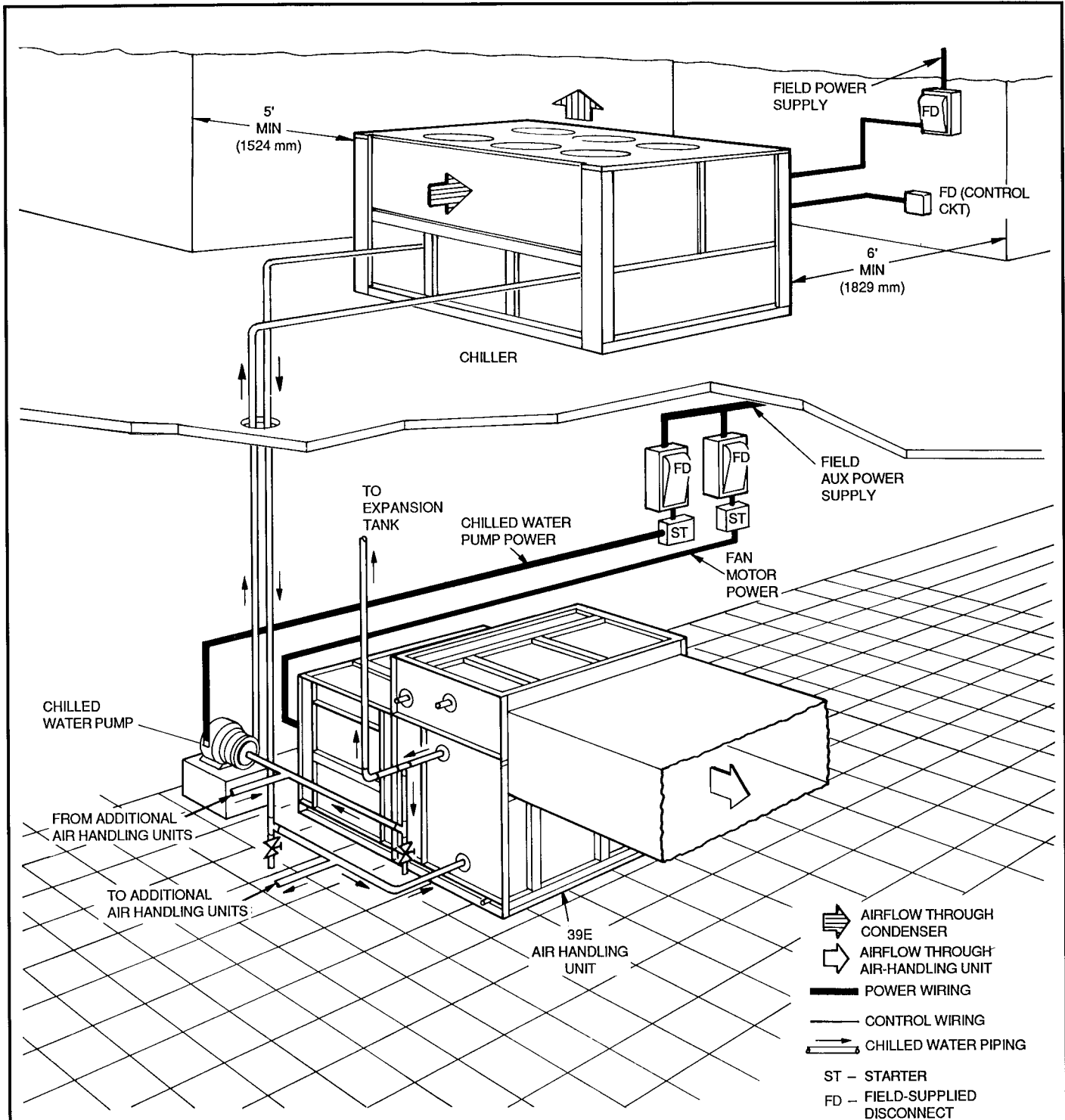
Refrigerant circuit components shall include hot gas muffler, high side pressure relief device, liquid line shut-off valves, suction and discharge shutoff valves, replaceable core filter drier, moisture-indicating sight glass, stepper motor actuated EXV, and complete operating charge of refrigerant R-22 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) Eight-character diagnostic display/set point panel
 - 6) Thermistors and/or pressure potentiometers.

Typical piping and wiring



NOTES:

- 1 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 are 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 (American Society of Heating, Refrigeration, and Air Conditioning Engineers) 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

Guide specifications — 30GN080-110 (cont)

- b. Capable of performing the following function.
 - 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) Limiting of the chilled water temperature pull-down rate at start-up to 1° F (.56° C) per minute to prevent excessive demand spikes (charges) at start-up.
 - 5) Seven-day time schedule.
 - 6) Leaving chilled water temperature reset from return.
 - 7) Demand limit control with 2-point control (0 to 100% each.)
 - c. Unit controls shall be capable of withstanding 185 F (85 C) storage temperature in the control compartment for an indefinite period of time.
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 control voltage (to unit) protection
 - 6) Visual alarm signal (alarm light).
 - 7) High-pressure switch.
 - 8) Ground current compressor protection.
 - 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 3 phases in the event of an overload in any one phase (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 by displaying a code for which an explanation may be scrolled at the display. Information 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, transducer or potentiometer malfunction.
 - 8) Entering and leaving water temperature.
 - 9) Evaporator and condenser pressure.
 - 10) Electronic expansion valve 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.
 - c. Provide serial output port.
- I. Operating Characteristics.
- 1. Unit shall be capable of starting and running fully loaded at outdoor ambient temperatures from 0° F to 125 F (–18 C to 52 C), without special controls.
 - 2. Unit shall be capable of starting up with 95 F (35 C) entering water temperature to the cooler.
 - 3. Multi-step cooling capacity control shall be accomplished through the use of unloaders and compressor staging.
 - 4. Two refrigerant circuits shall be provided to protect against loss of total capacity
 - 5. Unit shall have automatic lead/lag feature to automatically alternate the lead circuit to ensure even compressor wear.
- 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 (3 ph) shall be connected to a single location.
 - 2. Unit control power (1 ph) shall be connected to a separate entry point.
 - 3. Unit shall be shipped with factory control and power wiring installed.

L. Special Features:

Certain standard features are not applicable when the features designated by * are specified. For assistance in amending the specifications, your local Carrier Sales Office should be contacted.

- * 1 Low Ambient Temperature Operation:
 - a. Unit shall be capable of operating down to 0° F (–18 C) with the addition of antifreeze in the evaporator circuit, and with the addition of field-fabricated and field-installed wind baffles. The wind baffles shall be installed when wind velocity greater than 5 mph (8 km/h) is anticipated, and ambient temperature is below 32 F (0° C).
 - b. Unit shall be capable of operating down to –20 F (–29 C) with the addition of the field or factory-installed solid-state Motormaster® III control with condenser coil temperature sensor. In addition, adequate field-supplied anti-freeze protection shall be field-installed in the evaporator circuit — and where wind velocity greater than 5 mph (8 km/h) is anticipated, field-fabricated and installed wind baffles shall be required.
- * 2 Unloaders:

Electric suction cutoff unloaders shall be field-installed.
- * 3. Cooler Heater:

Optional factory-installed heater shall protect cooler to 30 F (16.6 C) below freeze point.
- * 4. Sound Reduction:

Outdoor fans and orifice extensions shall be field installed to reduce airborne sound level.
- * 5. Optional Condenser Coil Material:

Unit shall be factory equipped with a condenser coil made from copper tubes and copper fins.

6. Control Option Board:

Allows microprocessor control to control accessory unloaders, hot gas bypass, demand limit and temperature reset.

7. Hot Gas Bypass:

Shall be field installed to allow the unit to operate at lower capacity levels than standard.

8. Security Package Condenser Grilles:

A set of metal grilles complete with support retainers and fasteners shall be provided for the protection of the compressors and cooler.

9. Hail Guard:

Unit shall be field-equipped with louvered condenser coil hail guards and installation hardware.

10. Part Wind Start:

Shall be factory installed to reduce compressor inrush current.

11 Brine Units:

Units shall be factory equipped to operate down to 15 F (–9 C) leaving chilled water temperature.

12. Flow Switch:

A chilled water flow switch shall be field-installed for low water flow detection.

* 13. Control Transformer:

A transformer shall be field-installed to permit single-point power connection combining unit primary electrical power supply with control power supply (115 v for 60 Hz, 230 v for 50 Hz).

* 14. Australian Code:

A shell-and-tube type cooler, certified to the Australian cooler code, shall be available from the factory.

- b. Capable of performing the following functions:
 - 1) Pumpout at beginning and end of every circuit cycle.
 - 2) Capacity control based on leaving chilled water temperature and compensated by rate of change of return water temperature
 - 3) Limiting of the chilled water temperature pull-down rate at start-up to 1° F (.56° C) per minute to prevent excessive demand spikes (charges) at start-up.
 - c. Unit controls shall be capable of withstanding 185 F (85 C) storage temperature in the control compartment for an indefinite period of time.
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 control voltage (to unit) protection.
 - 6) Visual alarm signal (alarm light)
 - 7) High-pressure switch
 - 8) Ground current compressor protection.
 - 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 3 phases in the event of an overload in any one phase (single-phasing condition).
 - c. Fan motors shall have inherent overcurrent protection
3. Diagnostics:
- a. Diagnostic display module shall be capable of indicating the tripping of protections through display of a 2-digit code for which a legend shall be provided in control panel. Protections included for display shall be:
 - 1) Compressor lockout.
 - 2) Loss of charge.
 - 3) Low water flow.
 - 4) Cooler freeze protection.
 - 5) High or low suction superheat.
 - 6) Thermistor, or potentiometer malfunction.
 - b. Module must also be capable of performing a run test to verify operation of every switch, thermistor, potentiometer, fan, and compressor before chiller is started.
 - c. Provide serial output port.
- I. Operating Characteristics:
- 1. Unit shall be capable of starting and running fully loaded at outdoor ambient temperatures from 0° F to 125 F (-18 C to 52 C), without special controls.
 - 2. Unit shall be capable of starting up with 95 F (35 C) entering water temperature to the cooler.
 - 3. Multi-step cooling capacity control shall be accomplished through the use of unloaders and compressor staging.
 - 4. Two refrigerant circuits shall be provided to protect against loss of total capacity.
 - 5. Unit shall have automatic lead/lag feature to automatically alternate the lead circuit to ensure even compressor run time.
- 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 (3 ph) shall be connected to a single location.
 - 2. Unit control power (1 ph) shall be connected to a separate entry point
 - 3. Unit shall be shipped with factory control and power wiring installed

Guide specifications — 30GT080-110

Reciprocating Air-Cooled Liquid Chiller

HVAC Guide Specifications

Size Range: **080 to 110 Tons (280 to 390 kW)**

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.
- B Unit construction shall be designed to conform to ANSI/ASHRAE 15/latest revision safety standard, NEC (National Electrical Code, U S A.) and ASME applicable codes
- C. Unit operation shall be fully tested at the factory

1.03 DELIVERY, STORAGE AND HANDLING

- A 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

- 1. Frame shall be of heavy-gage galvanized steel members.
- 2 Galvanized steel casing, zinc phosphatized, with an electrostatically applied baked-enamel finish with hinged access panels for compressor section.
- 3. Cabinet shall be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500-hour salt spray test.

C Fans

Condenser fans shall be direct-driven propeller type discharging air vertically upward and shall be equipped with the following features:

- 1. Permanently lubricated bearings.
- 2 PVC coated steel wire safety guards
- 3 Inherent corrosion resistance shafts.
- 4 Statically and dynamically balanced fan wheels.

D. Compressors

- 1 Reciprocating semi-hermetic type only
- 2 Each equipped with an automatically reversible oil pump, operating oil charge, suction and discharge

shutoff valves, and an insert-type factory-sized crank-case 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 r/s) for 60 Hz units, and 1450 rpm (24 2 r/s) for 50 Hz units.
- 5 Cycles per hour per compressor shall not exceed 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 victaulic-type water connections.
- 4 Shell shall be insulated with ¾-in. (19-mm) PVC foam (closed-cell) of maximum K factor 0.28 with a protective steel jacket
- 5 Design shall incorporate 2 independent direct expansion refrigerant circuits.
- 6. 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)

F. Condenser:

- 1 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
- 2 Air-cooled condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa)

G. Refrigeration Components:

Refrigerant circuit components shall include hot gas muffler, high side pressure relief device, liquid line shutoff valves, suction and discharge shutoff valves, replaceable core filter drier, moisture-indicating sight glass, stepper motor actuated EXV, 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) Two-digit diagnostic display/set point panel.
 - 6) Thermistors and/or potentiometers

Guide specifications — 30GT080-110 (cont)

L. Special Features:

Certain standard features are not applicable when the features designated by * are specified. For assistance in amending the specifications, your local Carrier Sales Office should be contacted.

- * 1. Low Ambient Temperature Operation:
 - a. Unit shall be capable of operating down to 0° F (– 18 C) with the addition of antifreeze in the evaporator circuit, and with the addition of field-fabricated and installed wind baffles. The wind baffles shall be installed when wind velocity greater than 5 mph (8 km/h) is anticipated, and ambient temperature is below 32 F (0° C).
 - b. Unit shall be capable of operating down to – 20 F (– 29 C) with the addition of the field- or factory-installed solid-state Motormaster® III control with condenser coil temperature sensor. In addition, adequate field-supplied anti-freeze protection shall be field-installed in the evaporator circuit — and where wind velocity greater than 5 mph (8 km/h) is anticipated, field-fabricated and installed wind baffles shall be required.
- * 2. Unloader(s):

Electric suction cutoff unloader(s) shall be field-supplied.
- * 3. Demand Limit Control:

Unit shall be equipped with a 2-point demand limit control (0 to 49% and 50 to 100%) activated remotely by an electric signal.
- 4. Pressure Gages.

Unit shall be field-equipped with suction and discharge pressure gages with manual shutoff valves.
- * 5. Cooler Heater:

An optional factory-installed heater shall protect cooler to 30 F (16.6 C) below freeze point.
- * 6. Sound Reduction:

Outdoor fans and orifice extensions shall be field installed to reduce airborne sound level.
- * 7. Optional Condenser Coil Material:

Unit shall be factory equipped with a condenser coil made from copper tubes and copper fins.
- 8. Temperature Reset Board:

Allows microprocessor control to compare either return or outdoor temperature with the accessory board settings and adjust leaving-water temperature accordingly. Shall include necessary sensor. Standard on Flotronic™ II units.
- 9. Hot Gas Bypass:

Shall be field installed to allow the unit to operate at lower capacity levels than standard.
- 10. Security Package Condenser Grilles:

A set of metal grilles complete with support retainers and fasteners shall be provided for the protection of the compressors and cooler.
- 11. Hail Guard:

Unit shall be field-equipped with louvered condenser coil hail guards and installation hardware.
- 12. Part Wind Start:

Shall be factory installed to reduce compressor inrush current.
- 13. Brine Units:

Units shall be factory-equipped to operate down to 15 F (– 9 C) leaving chilled water temperature.
- 14. Flow Switch:

A chilled water flow switch shall be field-installed for low water flow detection.
- * 15. TXV Option:

Unit shall have factory-installed thermostatic expansion valves instead of electronic expansion valves. Unit shall be capable of starting and running fully loaded at outdoor temperatures from 35 F (1° C) to 125 F (52 C) without special control or field provisions.
- * 16. Control Transformer:

A transformer shall be field-installed to permit single-point power connection combining unit primary electrical power supply with control power supply (115 v for 60 Hz, 230 v for 50 Hz).
- * 17. Australian Code:

A shell-and-tube type cooler, certified to the Australian cooler code, shall be available from the factory.

