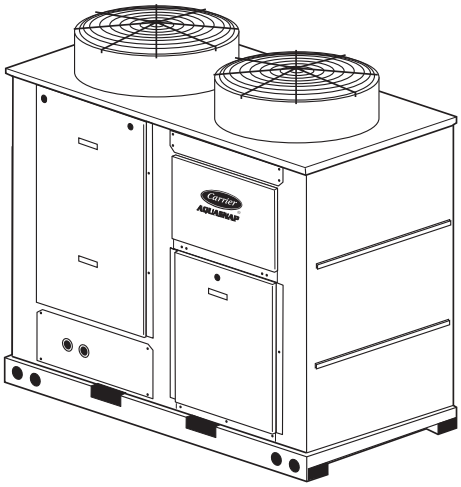
Carrier®

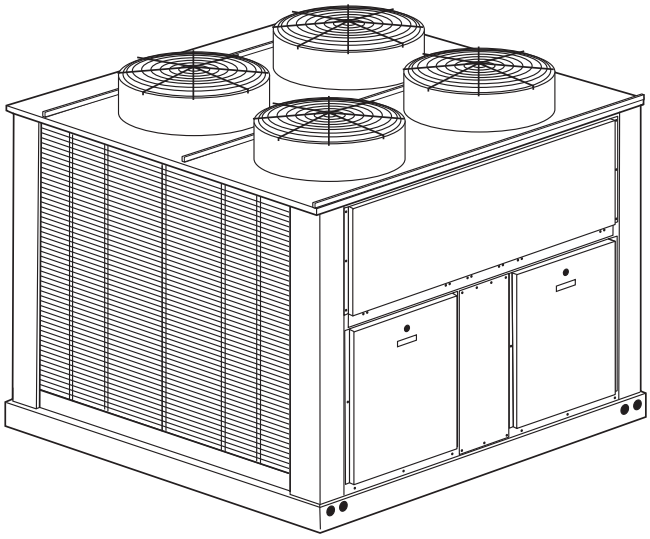
Advance Product Data

AQUASNAP® 30RAP010-060 Air-Cooled Chillers

10 to 60 Nominal Tons
(35 to 210 Nominal kW)

AQUASNAP®





Puron®
the environmentally sound refrigerant

ASHRAE 90.1 COMPLIANT

The AquaSnap chiller is an effective all-in-one package that is easy to install and easy to own. AquaSnap chillers operate quietly and efficiently. Value-added features include:

- Rotary scroll compression
- HFC Puron® refrigerant (R-410A)
- Quiet AeroAcoustic™ fan system
- Easy to use *Comfort*Link™ controls
- Optional integrated hydronic pump package
- Microchannel condenser coil technology
- Accessory fluid storage tank
- Optional digital scroll compressors

Features/Benefits

Carrier's superior chiller design provides savings at initial purchase, at installation, and for years afterward.

Costs less right from the start

Carrier's AquaSnap chillers feature a compact, all-in-one package design that installs quickly and easily on the ground or the rooftop. The optional pump and hydronic components are already built in; this costs less than buying and installing the components individually. The chiller's fully integrated and pre-assembled hydronic system installs in minutes. No other chiller in this class installs so easily and inexpensively. The preassembled and integrated hydronic module utilizes top-quality components and pumps to ensure years of reliable operation. Use of the optional fluid storage tank reduces installation costs and ensures sufficient fluid volume is available for close-coupled and process cooling applications. The AquaSnap unit's high efficiency keeps costs down.

Features/Benefits (cont)

AquaSnap® chillers make noise in the marketplace, not the workplace.

The AquaSnap chiller's AeroAcoustic™ fan produces up to half the sound level of propeller fans. Much of the noise reduction is in frequencies where noise is most annoying, which makes AquaSnap chillers ideal for sound-sensitive environments. When lower ambient temperatures allow part-load operation or during scheduled nighttime operation, the units operate with fewer fans and become even quieter. AquaSnap chillers are quiet during the day and even quieter at night.

The savings will continue to mount

Besides costing less to buy and install, AquaSnap chillers are also more affordable to operate. Carrier's Aqua Series chillers are our most efficient air-cooled models. The AquaSnap chiller provides full-load EER (Energy Efficiency Ratio) up to 10.5 and IPLV (integrated part-load value) up to 15.3. AquaSnap chillers use ultra-quiet, high-efficiency rotary scroll compressors, operated in single (sizes 010 and 015) and tandem (sizes 018 to 060) per independent circuit for greater efficiency at partial loads.

Electronic expansion valve (EXV) allows for precise control through all operating ranges, resulting in higher efficiency and improved reliability.

Proven reliability that's built in

Thousands of AquaSnap chillers are already in service around the world. This field-proven design is backed by a 12-month warranty that includes the hydronic system. The compressors are maintenance-free and protected by an auto-adaptive control that minimizes compressor wear. Unit sizes 035 and up have two independent refrigerant circuits. Year-round operation is standard, from –20 F (–29 C) (with optional cooler heater, low ambient control, and wind baffles) to 120 F (50 C).

Rotary scroll compressors provide smooth, quiet and reliable operation.

All-in-one package

AquaSnap chillers provide the most comprehensive chilled water circuit available for any air-cooled chiller. Included is a brazed plate direct expansion cooler that may be remote-mounted. The cooler is also completely drainable with factory-installed vents and drains.

Electronic thermal-dispersion flow switch is included with the cooler. The switch is factory installed and tested and contains no moving parts for high reliability.

Optional integrated hydronics package is more than just a pump, it is an entire chilled water system, including:

- Single/dual pumps up to 7.5 hp and 120 ft head
- Regular strainer
- Cleanout strainer
- Flow regulator
- Freeze protection to –20 F (–29 C) (with freeze protection option)
- Heaters
- Required piping
- Pressure/temperature taps
- Isolation valves for dual pump systems
- VFD compatibility

The factory-installed and tested hydronics package provides faster, simpler and less expensive installation.

Digital scroll compressors are available as a factory installed option. These allow for incremental unloading with capacity modulation to better match building load when compared to standard scroll compressors.

Environmentally sound

Carrier's Puron® refrigerant (R-410A) enables you to make a responsible decision in the protection of the earth's ozone layer. Puron refrigerant is an HFC refrigerant that does not contain chlorine that is damaging to the ozone layer. Puron refrigerant is unaffected by the Montreal Protocol. Puron refrigerant is a safe, non-toxic*, efficient and environmentally sound refrigerant for the future.

Durable construction

The 30RAP chillers have a structurally sound base that can be point-loaded, therefore, no perimeter base rail is required. All 30RAP units have weatherized cabinets constructed of heavy-duty galvanized steel with exterior panels painted with corrosion-resistant baked enamel. Inside and outside surfaces are protected to ensure long life and good appearance. The durable, galvanized steel, painted components exceed the requirements of the 500-hour salt spray test per ASTM (American Society for Testing and Materials) B117.

ComfortLink™ controls speak your language

The *Comfort*Link controls communicate in plain English, making it as easy as possible to monitor and control each AquaSnap chiller while accurately maintaining fluid temperatures. The large scrolling marquee display acts as a window into the unit's operation, providing easy-to-read information about chiller performance and over 15 diagnostic functions. Carrier 30 Series chillers' *Comfort*Link controls provide features such as chilled water temperature reset, demand limiting, compressor wear minimization and protection, temperature and pressure displays and diagnostic functions. These controls result in higher chiller reliability, simplified training and more productive service calls with correspondingly lower operational and maintenance costs.

Carrier's exclusive accessory handheld Navigator™ display provides convenience and powerful information in the palm of your hand. The Navigator display helps technicians to quickly diagnose problems and even prevent them from occurring.

All AquaSnap units are ready to be used with the Carrier Comfort Network® (CCN) system.

AquaSnap units minimize the impact on your footprint, as well as your bottom line

The integrated hydronics and the chilled fluid storage tank's placement under the chiller minimize the footprint, allowing easy installation almost anywhere.

Novation® heat exchanger technology

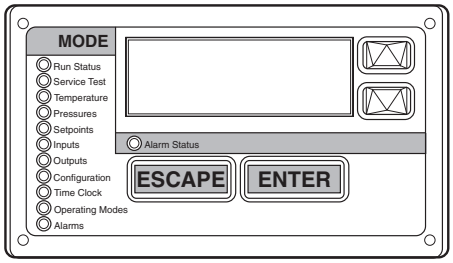
The Novation heat exchanger design with microchannel (MCHX) condenser coil is a robust, cost effective alternative to traditional coil design. These coils are offered coated or uncoated to match coil protection to site conditions. The Carrier Electronic Catalog (E-Cat) can be used to determine whether or not corrosion protection is recommended for particular applications in coastal/marine environments. Following the input of the requested

* Under ASHRAE Standard 34-1992, R-410A is classified as an A1 refrigerant.

data, the E-Cat program output will advise the appropriate coil to be used. Other factors described in "Selection Guide: Environmental Corrosion Protection, Novation Heat Exchanger with Microchannel Coil Technology" catalog number 04-581042-01 must also be considered to determine if corrosion protection is required.

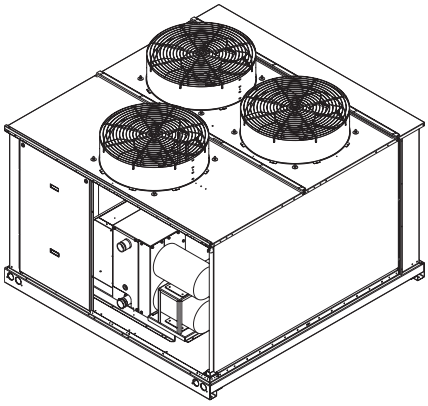
Microchannel coils are more robust than other coil types, making them easier to clean without causing damage to the coil.

Due to the compact all aluminum design, microchannel coils will reduce average unit operating weight by 25% compared to the previous 30RA units. The streamlined MCHX coil design also reduces refrigerant charge by an average of 60% compared to the previous 30RA units.

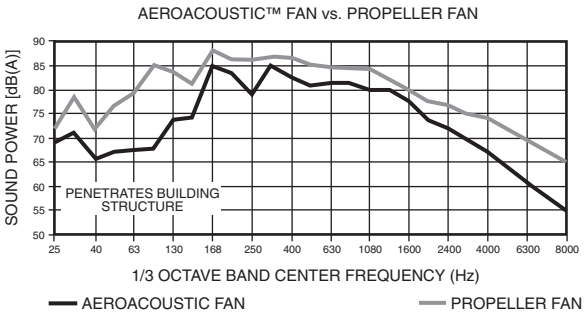


SCROLLING MARQUEE DISPLAY

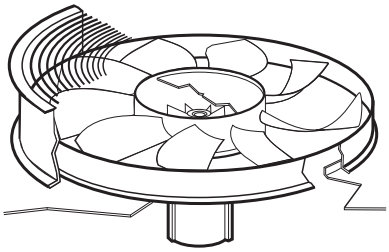
NAVIGATOR™ DISPLAY MODULE



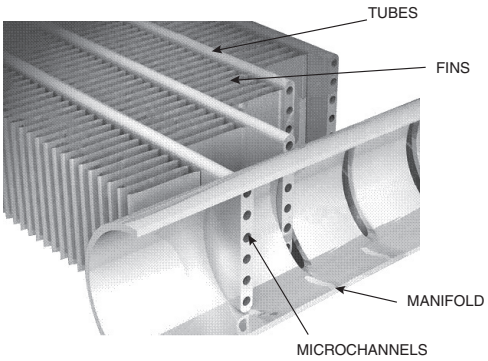
OPTIONAL HYDRONIC PACKAGE



AEROACOUSTIC FAN VS PROPELLER FAN



LOW-NOISE AEROACOUSTIC FAN WITH NIGHTTIME LOW SOUND



NOVATION® HEAT EXCHANGER TECHNOLOGY WITH MICROCHANNEL CONDENSER COILS

Model number nomenclature

AQUASNAP® CHILLER MODEL NUMBER DESIGNATION

30RA P 010 6 D A 0 6 0 0 0

30RA – Air-Cooled *AquaSnap* Chiller

Refrigerant Type
P – Puron

Unit Sizes
010 025 045
015 030 050
018 035 055
020 040 060

Voltage
1 – 575-3-60
2 – 380-3-60
5 – 208/230-3-60
6 – 460-3-60

Condenser Coil/Low Sound Options
5 – MCHX, Value Sound Fan
6 – MCHX, E-coat, Value Sound Fan
D – MCHX, Aero-Acoustic Fan
F – MCHX, E-coat, Aero-Acoustic Fan
J – MCHX, Aero-Acoustic Fan, Ultra-Low Sound
K – MCHX, E-coat, Aero-Acoustic Fan, Ultra-Low Sound

Revision Level
A – Current Revision Level

Hydronic System
0 – No Pump
1 – Single Pump, 1 Hp
2 – Single Pump, 1.5 Hp
3 – Single Pump, 2 Hp
4 – Single Pump, 2 Hp High Head
5 – Single Pump, 5 Hp
6 – Single Pump, 5 Hp High Head
7 – Single Pump, 7.5 Hp
8 – Dual Pump, 1 Hp
9 – Dual Pump, 1.5 Hp
B – Dual Pump, 2 Hp
C – Dual Pump, 2 Hp High Head
D – Dual Pump, 5 Hp
F – Dual Pump, 5 Hp High Head
G – Dual Pump, 7.5 Hp

Packaging/Security Options
0 – Std Packaging
4 – Security Grilles Only
8 – Skid Only
D – Skid, Security Grilles
J – Skid, Top Crate, Bag
N – Skid, Top Crate, Bag, Security Grilles

Controls/Communications Options
0 – Std
5 – EMM
B – EMM, GFI

Electrical Options
0 – No Disconnect, No Cooler Heater
1 – No Disconnect, Cooler Heater
D – Non-Fused Disconnect, No Cooler Heater
F – Non-Fused Disconnect, Cooler Heater

Ambient/Capacity Control/Interrupt Options
0 – Std Comp, Std Interrupt
1 – Hot Gas Bypass, Std Interrupt
2 – Digital Comp, Std Interrupt
3 – Std Comp, High SCCR
4 – Hot Gas Bypass, High SCCR
5 – Digital Comp, High SCCR
6 – Low Ambient, Std Comp, Std Interrupt
7 – Low Ambient, Hot Gas Bypass, Std Interrupt
8 – Low Ambient, Digital Comp, Std Interrupt
9 – Low Ambient, Std Comp, High SCCR
B – Low Ambient, Hot Gas Bypass, High SCCR
C – Low Ambient, Digital Comp, High SCCR

LEGEND
EMM — Energy Management Module
GFI — Ground Fault Interrupting
SCCR — Short Circuit Current Rating

Quality Assurance

Certified to ISO 9001: 2000

Table of contents

AHRI* capacity ratings

UNIT 30RAP	CAPACITY		COMPRESSOR POWER INPUT (kW)	FAN POWER (kW)	TOTAL POWER (kW)	FULL LOAD		IPLV		COOLER FLOW RATE		COOLER WATER PRESSURE DROP	
	Tons	kW				EER	COP	EER	COP	GPM	L/s	Ft wg	kPa
010	10.5	36.9	10.6	1.3	11.9	10.5	3.1	14.5	4.2	25.1	1.6	12.9	38.7
015	14.0	49.5	15.5	1.3	16.9	10.0	2.9	13.1	3.8	33.6	2.1	14.8	44.1
018	16.0	55.4	15.7	2.7	18.4	10.4	3.1	14.3	4.2	38.4	2.4	14.5	43.3
020	19.0	66.3	19.1	2.7	21.9	10.4	3.1	14.0	4.1	45.5	2.9	13.5	40.2
025	23.5	80.5	24.8	2.7	27.5	10.3	3.0	15.0	4.4	56.4	3.6	16.8	50.3
030	27.8	96.8	30.9	2.8	33.8	9.9	2.9	14.7	4.3	66.7	4.2	19.9	59.4
035	34.4	120.5	35.8	3.9	39.7	10.4	3.0	15.2	4.5	82.6	5.2	12.4	37.1
040	39.1	137.0	42.2	3.7	45.9	10.2	3.0	15.2	4.5	93.8	5.9	13.1	39.2
045	43.4	151.3	48.5	3.6	52.1	10.0	2.9	15.3	4.5	104.2	6.6	14.6	43.7
050	47.6	166.3	53.3	3.8	57.1	10.0	2.9	14.5	4.2	114.2	7.2	18.2	54.3
055	52.5	183.1	56.5	5.2	61.8	10.2	3.0	14.5	4.2	126.0	7.9	17.0	50.8
060	56.3	197.9	61.3	5.1	66.4	10.2	3.0	14.3	4.2	135.0	8.5	19.4	57.9

LEGEND

COP — Coefficient of Performance
EER — Energy Efficiency Ratio
IPLV — Integrated Part Load Value

* Air Conditioning, Heating, and Refrigeration Institute.
NOTE: Based on AHRI-550/590 standard rating conditions. Ratings are for standard chillers only. Ratings do not include options.

Physical data

ENGLISH

UNIT 30RAP	010	015	018	020	025	030	035	040	045	050	055	060
OPERATING WEIGHT (lb)												
MCHX Condenser Coil, No Pumps	704	718	1125	1133	1242	1283	2163	2185	2238	2263	2369	2375
MCHX Condenser Coil, Dual Pumps	1029	1043	1450	1458	1567	1608	2850	2872	2925	2950	3056	3062
REFRIGERANT TYPE	R-410A, EXV Controlled System											
Total Refrigerant Charge (lb)	8.6	9.6	14.6	15.2	16.7	17.6	29.2	29.9	33.5	33.7	34.3	34.5
Refrigerant Charge (lb) Ckt A/Ckt B	8.6/—	9.6/—	14.6/—	15.2/—	16.7/—	17.6/—	14.3/14.9	14.9/15.0	16.5/17.0	16.7/17.0	16.9/17.4	17.1/17.4
COMPRESSORS	Scroll, Hermetic											
Quantity	1	1	2	2	2	2	4	4	4	4	4	4
Speed (Rpm)	3500											
(Qty, Tons) Ckt A	(1) 11	(1) 15	(2) 9	(2) 10	(2) 13	(2) 15	(2) 10	(2) 10	(2) 11	(2) 13	(2) 13	(2) 15
(Qty, Tons) Ckt B	—	—	—	—	—	—	(2) 9	(2) 11	(2) 13	(2) 13	(2) 15	(2) 15
Oil Charge (Pt) Ckt A/Ckt B	6.9/—	6.9/—	13.8/—	13.8/—	13.8/—	13.8/—	13.8/13.8	13.8/13.8	13.8/13.8	13.8/13.8	13.8/13.8	13.8/13.8
No. Capacity Steps												
Standard	1	1	2	2	2	2	4	4	4	4	4	4
With Hot Gas Bypass	—	—	3	3	3	3	5	5	5	5	5	5
Digital Compressor Option	13	13	22	22	22	22	44	44	44	44	44	44
Minimum Capacity Step (%)												
Standard	100	100	50	50	50	50	23	23	24	25	23	25
With Hot Gas Bypass	—	—	20	24	29	32	10	12	14	14	15	16
Digital Compressor Option	20	20	15	15	15	15	8	8	8	8	8	8
Capacity (%)												
Circuit A	100	100	100	100	100	100	54	47	47	50	46	50
Circuit B	—	—	—	—	—	—	46	53	53	50	54	50
COOLER	Brazed, Direct-Expansion Plate Heat Exchanger											
Weight (lb) (empty)	22.4	27.5	31.8	40.3	46.3	80.6	99.4	117.9	125.3	137.5	160.4	160.4
Net Fluid Volume (gal)	4.9	6.4	7.6	10.1	11.7	16.5	21.8	27.5	29.3	34.3	41.8	41.8
Maximum Refrigerant Pressure (psig)	505	505	505	505	505	565	565	565	565	565	565	565
Maximum Water-Side Pressure Without Pump(s) (psig)	300	300	300	300	300	300	300	300	300	300	300	300
Maximum Water-Side Pressure With Pump(s) (psig)	150	150	150	150	150	150	150	150	150	150	150	150
COOLER WATER CONNECTIONS (in.)												
Inlet and Outlet, FPT	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
Drain (NPT)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
CONDENSER FANS												
Standard Aero-Acoustic Type	Plastic Type, Axial, Vertical Discharge											
Fan Speed (Rpm)	850	850	850	850	850	850	850	850	850	850	850	850
No. Blades...Diameter (in.)	9...30	9...30	9...30	9...30	9...30	9...30	9...30	9...30	9...30	9...30	9...30	9...30
No. Fans	1	1	2	2	2	2	3	3	3	3	4	4
Total Airflow (Cfm)	9400	9400	17,500	17,500	19,400	19,400	29,600	29,500	29,300	30,500	38,800	38,800
Optional Value Sound Type	Propeller Type, Axial, Vertical Discharge											
Fan Speed (Rpm)	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140
No. Blades...Diameter (in.)	4...30	4...30	4...30	4...30	4...30	4...30	4...30	4...30	4...30	4...30	4...30	4...30
No. Fans	1	1	2	2	2	2	3	3	3	3	4	4
Total Airflow (Cfm)	12,600	12,600	23,400	23,400	26,000	26,000	39,800	39,600	39,300	41,000	52,100	52,100
CONDENSER COILS	Novation® MCHX Aluminum Tube, Aluminum Fin											
Quantity (Ckt A/Ckt B)	1/—	1/—	1/—	1/—	1/—	1/—	1/1	1/1	1/1	1/1	1/1	1/1
Total Face Area (sq ft)	17	17	26	26	33	33	53	53	66	66	66	66
Maximum Refrigerant Pressure (psig)	656	656	656	656	656	656	656	656	656	656	656	656
HYDRONIC MODULE (Optional)*	Pump(s), Strainer with Blowdown Valve, Expansion Tank, Pressure Taps, Drain and Vent Plugs, Flow Switch, and Balance Valve											
Pump	Single or Dual, Centrifugal Monocell Pump(s), 3500 Rpm											
Expansion Tank Volume (gal)												
Total/Acceptance	5.0/2.9						10.0/5.5					
CHASSIS DIMENSIONS (ft - in.)												
Length	5-7	5-7	7-5	7-5	7-5	7-5	7-5	7-5	7-5	7-5	7-5	7-5
Width	3-5	3-5	3-5	3-5	3-5	3-5	7-9	7-9	7-9	7-9	7-9	7-9
Height	5-6	5-6	5-6	5-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6

LEGEND

EXV — Electronic Expansion Valve
MCHX — Microchannel Heat Exchanger

*Flow switch and strainer are standard on all units, with or without hydronic package.

SI

UNIT 30RAP	010	015	018	020	025	030	035	040	045	050	055	060
OPERATING WEIGHT (kg)												
MCHX Condenser Coil, No Pump	319	326	510	514	564	582	981	991	1015	1026	1075	1077
MCHX Condenser Coil, Dual Pump	467	473	658	661	711	729	1293	1303	1327	1338	1386	1389
REFRIGERANT TYPE	R-410A, EXV Controlled System											
Total Refrigerant Charge (kg)	3.9	4.4	6.6	7.1	7.6	8.0	13.4	13.6	15.6	15.7	16.0	16.1
Refrigerant Charge (kg) Ckt A/Ckt B	3.9/—	4.4/—	6.6/—	7.1/—	7.6/—	8.0/—	6.8/6.7	6.8/6.8	7.8/7.8	7.8/7.8	7.9/8.1	8.1/8.1
COMPRESSORS	Scroll, Hermetic											
Quantity	1	1	2	2	2	2	4	4	4	4	4	4
Speed (R/s)	58.3											
(Qty, kW) Ckt A	(1) 38	(1) 53	(2) 32	(2) 35	(2) 46	(2) 53	(2) 35	(2) 35	(2) 38	(2) 46	(2) 46	(2) 53
(Qty, kW) Ckt B	—	—	—	—	—	—	(2) 32	(2) 38	(2) 46	(2) 46	(2) 53	(2) 53
Oil Charge (L) Ckt A/Ckt B	3.3/—	3.3/—	6.5/—	6.5/—	6.5/—	6.5/—	6.5/6.5	6.5/6.5	6.5/6.5	6.5/6.5	6.5/6.5	6.5/6.5
No. Capacity Steps												
Standard	1	1	2	2	2	2	4	4	4	4	4	4
With Hot Gas Bypass	—	—	3	3	3	3	5	5	5	5	5	5
Digital Compressor Option	13	13	22	22	22	22	44	44	44	44	44	44
Minimum Capacity Step (%)												
Standard	100	100	50	50	50	50	23	23	24	25	23	25
With Hot Gas Bypass	—	—	20	24	29	32	10	12	14	14	15	16
Digital Compressor Option	20	20	15	15	15	15	8	8	8	8	8	8
Capacity (%)												
Circuit A	100	100	100	100	100	100	54	47	47	50	46	50
Circuit B	—	—	—	—	—	—	46	53	53	50	54	50
COOLER	Brazed, Direct-Expansion Plate Heat Exchanger											
Weight (kg) (empty)	10.1	12.5	14.4	18.3	21.0	36.6	45.1	53.5	56.8	62.4	72.8	72.8
Net Fluid Volume (L)	18.4	24.1	28.8	38.0	44.4	62.4	82.7	104.0	111.1	130.0	158.3	158.3
Maximum Refrigerant Pressure (kPa)	3482	3482	3482	3482	3482	3896	3896	3896	3896	3896	3896	3896
Maximum Water-Side Pressure Without Pump(s) (kPa)	2068	2068	2068	2068	2068	2068	2068	2068	2068	2068	2068	2068
Maximum Water-Side Pressure With Pump(s) (kPa)	1034	1034	1034	1034	1034	1034	1034	1034	1034	1034	1034	1034
COOLER WATER CONNECTIONS (in.)												
Inlet and Outlet, FPT	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
Drain (NPT)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
CONDENSER FANS												
Standard Aero-Acoustic Type	Plastic Type, Axial, Vertical Discharge											
Fan Speed (R/s)	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
No. Blades...Diameter (mm)	9...762	9...762	9...762	9...762	9...762	9...762	9...762	9...762	9...762	9...762	9...762	9...762
No. Fans	1	1	2	2	2	2	3	3	3	3	4	4
Total Airflow (L/s)	4400	4400	8300	8300	9200	9200	14,000	14,000	13,800	14,400	18,300	18,300
Optional Value Sound Type	Propeller Type, Axial, Vertical Discharge											
Fan Speed (R/s)	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
No. Blades...Diameter (mm)	4...762	4...762	4...762	4...762	4...762	4...762	4...762	4...762	4...762	4...762	4...762	4...762
No. Fans	1	1	2	2	2	2	3	3	3	3	4	4
Total Airflow (L/s)	5900	5900	11,000	11,000	12,300	12,300	18,800	18,700	18,500	19,400	24,600	24,600
CONDENSER COILS	Novation® MCHX Aluminum Tube, Aluminum Fin											
Quantity (Ckt A/Ckt B)	1/—	1/—	1/—	1/—	1/—	1/—	1/1	1/1	1/1	1/1	1/1	1/1
Total Face Area (sq m)	1.6	1.6	2.4	2.4	3.1	3.1	4.9	4.9	6.1	6.1	6.1	6.1
Maximum Refrigerant Pressure (kPa)	4523	4523	4523	4523	4523	4523	4523	4523	4523	4523	4523	4523
HYDRONIC MODULE (Optional)*	Pump(s), Strainer with Blowdown Valve, Expansion Tank, Pressure Taps, Drain and Vent Plugs, Flow Switch, and Balance Valve											
Pump	Single or Dual, Centrifugal Monocell Pump(s), 3500 Rpm											
Expansion Tank Volume (L) Total/Acceptance	18.9/11.0						37.9/20.8					
CHASSIS DIMENSIONS (mm)												
Length	1702	1702	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261
Width	1041	1041	1041	1041	1041	1041	2362	2362	2362	2362	2362	2362
Height	1676	1676	1676	1676	1981	1981	1981	1981	1981	1981	1981	1981

LEGEND

EXV — Electronic Expansion Valve
MCHX — Microchannel Heat Exchanger

*Flow switch and strainer are standard on all units, with or without hydronic package.

Physical data (cont)

UNIT WEIGHTS

STANDARD UNITS

30RAP SIZE	POUNDS				
	A	B	C	D	Total Weight
010	188	209	161	146	704
015	193	213	163	149	718
018	363	264	209	288	1125
020	365	266	211	290	1133
025	393	290	237	321	1242
030	405	301	246	331	1283
035	652	730	413	369	2163
040	704	697	390	394	2185
045	675	758	425	379	2238
050	732	724	401	405	2263
055	744	762	437	427	2369
060	746	762	438	429	2375

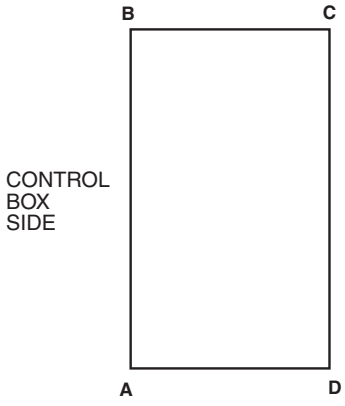
30RAP SIZE	KILOGRAMS				
	A	B	C	D	Total Weight
010	85.5	94.6	73.1	66.1	319.3
015	87.7	96.4	74.1	67.4	325.5
018	164.9	119.9	94.9	130.6	510.3
020	165.8	120.8	95.8	131.5	513.9
025	178.3	131.8	107.7	145.7	563.5
030	183.7	136.3	111.6	150.4	582.0
035	295.7	331.0	187.2	167.2	981.1
040	319.4	316.3	176.9	178.5	991.1
045	306.3	344.0	193.0	171.9	1015.1
050	332.2	3328.4	181.8	183.9	1026.3
055	337.4	345.5	198.2	193.5	1074.6
060	338.4	345.8	198.6	194.5	1077.3

DUAL PUMP UNITS

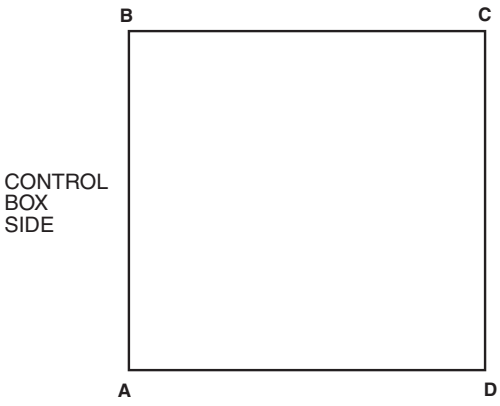
30RAP SIZE	POUNDS				
	A	B	C	D	Total Weight
010	242	319	266	202	1029
015	247	323	268	205	1043
018	445	347	288	370	1450
020	447	349	290	372	1458
025	475	373	316	403	1567
030	487	383	325	413	1608
035	828	899	585	538	2850
040	878	869	560	565	2872
045	851	928	598	548	2925
050	906	896	571	577	2950
055	918	933	607	598	3056
060	920	933	608	600	3062

30RAP SIZE	KILOGRAMS				
	A	B	C	D	Total Weight
010	109.9	144.8	120.5	91.5	466.7
015	112.1	146.6	121.4	92.8	473.0
018	202.0	157.4	130.7	167.7	657.7
020	202.9	158.3	131.6	168.6	661.3
025	215.5	169.2	143.5	182.7	710.9
030	220.8	173.8	147.4	187.3	729.4
035	375.5	407.9	265.3	244.2	1292.9
040	398.2	394.2	254.0	256.5	1302.9
045	386.2	420.8	271.1	248.8	1326.9
050	411.0	406.4	258.9	261.8	1338.1
055	416.4	423.2	275.6	271.2	1386.3
060	417.5	423.4	276.0	272.1	1389.1

30RAP010-030 UNITS



30RAP035-060 UNITS



Options and accessories

ITEM	FACTORY-INSTALLED OPTION	FIELD-INSTALLED ACCESSORY
Condenser Coil and Sound Options		
MCHX E-Coat	X	
Value Sound Fans	X	
Ultra-Low Sound	X	
Controls/Communication Options		
BACnet Translator Control		X
Chillervisor System Manager III Multi-Unit Control		X
Energy Management Module (EMM)	X	X
LON (Local Operating Network) Translator Control		X
Navigator™ Display		X
Remote Enhanced Display		X
Touch Pilot™ Display		X
Cooler Options		
Freeze Protection — Cooler Heaters	X	
Electrical Options		
Unit-Mounted Main Disconnect, Non-Fused	X	
GFI Convenience Outlet (115 v)	X	
High SCCR (Short Circuit Current Rating)	X	
Hydronics Option		
Hydronic Pump Package	X	
Fluid Storage Tank		X
Refrigeration Circuit Options		
Low Ambient Temperature Head Pressure Control	X	X
Hot Gas Bypass (not available on sizes 010 and 015)	X	X
Digital Compressor (not available on size 018)	X	
Security/Packaging Options		
Security Grilles/Hail Guards	X	
Vibration Isolation		X

Factory-installed options

Novation® heat exchanger technology microchannel coil (aluminum fin/aluminum tube) condenser is available for optimum durability. Novation heat exchangers with microchannel coil technology are offered coated or uncoated to match coil protection to site conditions. The Carrier Electronic Catalog (E-Cat) can be used to determine whether or not corrosion protection is recommended for particular applications in coastal/marine environments. Following the input of the requested data, the E-Cat program output will advise the appropriate coil to be used. Other factors described in "Selection Guide: Environmental Corrosion Protection, Novation Heat Exchanger with Microchannel Coil Technology" catalog number 04-581042-01 must also be considered to determine if corrosion protection is required.

Value sound fans provide a metal, propeller-type fan system which is cost-effective when compared to the aeroacoustic fan system. This factory-installed fan option is compatible with the Motormaster® V option.

Ultra-low sound provides a combination of low sound Aero-Acoustic fans with sound blankets.

Digital compressor control allows incremental unloading for a closer match to building load. This option is not available on the 018 size unit.

High short circuit current rating provides a short circuit current rating protection for the unit up to 65,000 A on 460-v, 380-v, and 208/230-v units or 25,000 A on 575-v units.

Motormaster® V low-ambient control provides control of fan motor operation to maintain head pressure at low outdoor ambient temperatures down to –20 F (–29 C) This option also requires field-installed wind baffles. This option is also available as an accessory. This option is a standard feature on all 30RAP010 and 015 chillers.

Non-fused disconnect includes factory-installed non-fused disconnect capability for power and control located at the unit.

Energy management module provides energy management capabilities to minimize chiller energy consumption. Several features are provided with this module including leaving fluid temperature reset, cooling set point reset or demand limit control from a 4 to 20 mA signal, 2-point demand limit control (from 0 to 100%) activated by a remote contact closure, and discrete input for “Ice Done” indication for ice storage system interface. The EMM is also available as an accessory.

Freeze protection with cooler heaters provides protection from cooler freeze-up to –20 F (–29 C).

GFI convenience outlet is a factory-installed convenience outlet that includes 4-amp GFI (ground fault interrupter) receptacle with independent fuse protection. Convenience outlet is 115-v female receptacle.

Hydronic pump package option adds circulating pumps, complete with controls, contactor, and insulated expansion tank. Available in single or dual (lead/lag controlled) cooler pump versions, with total dynamic head external to the chiller from approximately 15 to 120 feet.

Hot gas bypass option allows additional capacity reduction for unit operation down below the minimum standard step of capacity. Hot gas bypass is also available as a field-installed accessory. This option is not available on units with the digital compressor option or on the 30RAP010 and 015 units.

Options and accessories (cont)

Security grilles/hail guards consist of louvered, sheet metal panels which securely fasten to the chiller and provide condenser coil protection against hail and physical damage.

Field-installed accessories

BACnet translator control provides an interface between the unit and a BACnet Local Area Network (LAN, i.e., MS/TP EIA-485).

Chillervisor System Manager III multi-unit control accessory allows sequencing of between two and eight chillers in parallel. Pump control is also provided.

Energy management module provides energy management capabilities to minimize chiller energy consumption. Several features are provided with this module including leaving fluid temperature reset, cooling set point reset or demand limit control from a 4 to 20 mA signal, 2-point demand limit control (from 0 to 100%) activated by a remote contact closure, and discrete input for "Ice Done" indication for ice storage system interface. The EMM is also available as an option.

LON (local operating network) translator control provides an interface between the unit and a local operating network (i.e., LonWorks® FT-10A ANSI/EIA-709.1).

Navigator™ display module provides a portable, hand held display module for convenient access to unit status, operation, configuration and troubleshooting diagnostics capability. The 4-line, 80-character LCD (liquid crystal display) display provides clear language information in English, French, Spanish or Portuguese. The weatherproof enclosure and industrial grade extension cord make the Navigator module ideally suited for outdoor applications. Magnets located on the back of the module allow attachment of any sheet metal component for hands free operation.

Remote enhanced display accessory kit contains a remotely mounted 40-character per line, 16-line display panel for unit diagnostics.

Touch Pilot™ display is a cost-effective, touch-screen, remote-mount device that can be used in lieu of the remote enhanced display.

Motormaster® V low-ambient control provides control of outdoor-fan motor operation to maintain head pressure at low outdoor ambient temperatures down to –20 F (–29 C). This accessory also requires field-installed wind baffles. This accessory is also available as a factory-installed option. This accessory is standard on 30RAP010 and 015 units.

Hot gas bypass option allows additional capacity reduction for unit operation down below the minimum standard step of capacity. Hot gas bypass is also available as a factory-installed option. This accessory should not be used on units with the digital compressor option.

Chilled water storage tank provides a minimum of 4 gallons per ton loop storage capacity. Includes insulated steel shell tank, NPT pipe connections, electric tank heaters, vent, drain, and enclosure to allow tank to be installed under the chiller to protect to –20 F (–29 C). A separate 230 v power source is required for this accessory.

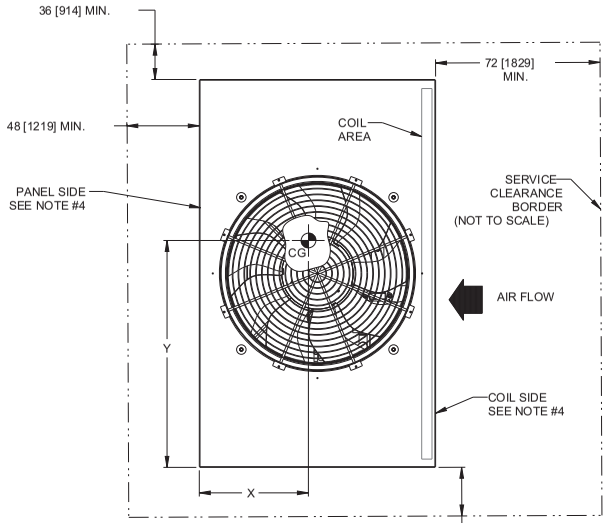
Vibration isolation consists of field-installed 1/4-in. neoprene isolator pads (24-in. x 3-in.) that reduce vibration transmission from the compressor through the floor and into the conditioned space.

Dimensions — 30RAP010,015

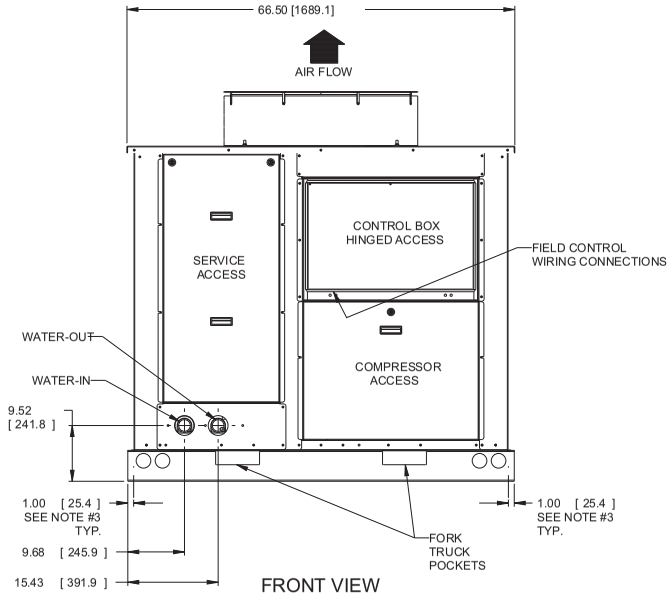
UNIT	CENTER OF GRAVITY		UNIT HEIGHT		VICTAULIC CONNECTIONS
	X	Y	H (STANDARD)	H (VALUE SOUND)	WATER IN/OUT
30RAP010	18.40 [467]	37.80 [960]	66.5 [1689]	61.0 [1549]	2"
30RAP015	18.35 [466]	37.69 [957]	66.5 [1689]	61.0 [1549]	2"

NOTES:

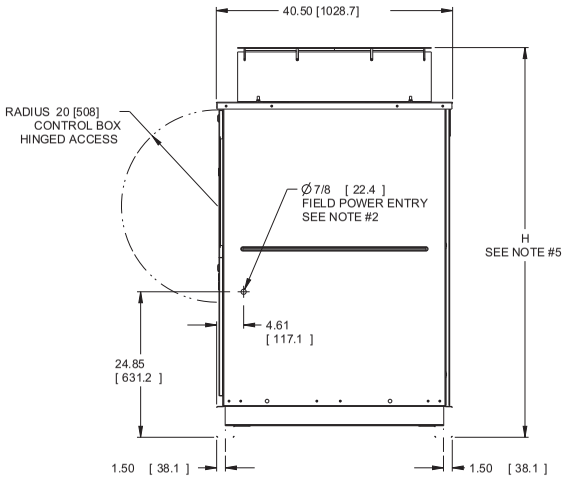
1. DO NOT CAP OR OTHERWISE OBSTRUCT THE LIQUID LINE TEMPERATURE RELIEF.
2. Ø 7/8 [22.4] PILOT HOLE PROVIDED FOR LOCATING FIELD POWER WIRING. ACTUAL HOLE REQUIRED DEPENDS ON FIELD WIRE SIZING.
3. Ø 0.437 [11.10] HOLE USED FOR MOUNTING UNIT.
4. UNIT MUST HAVE CLEARANCES AS FOLLOWS: TOP - DO NOT RESTRICT. COIL SIDE - 72 [1829] FROM SOLID SURFACE. PANEL SIDE - 48 [1219] PER NEC.
5. SEE TABLE COLUMN H; DIMENSION FOR STANDARD FAN OR VALUE SOUND FAN OPTION.
6. CARRIER DOES NOT RECOMMEND INSTALLATION IN A PIT.
7. UNIT CAN BE HANDLED USING THE FORK TRUCK LIFT POCKETS.
8. WATER CONNECTIONS RECESSED 2-3/8 INCHES INSIDE UNIT.
9. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [ ] ARE IN MILLIMETERS



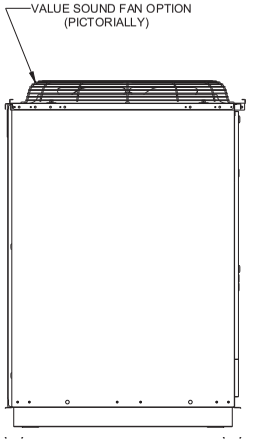
TOP VIEW



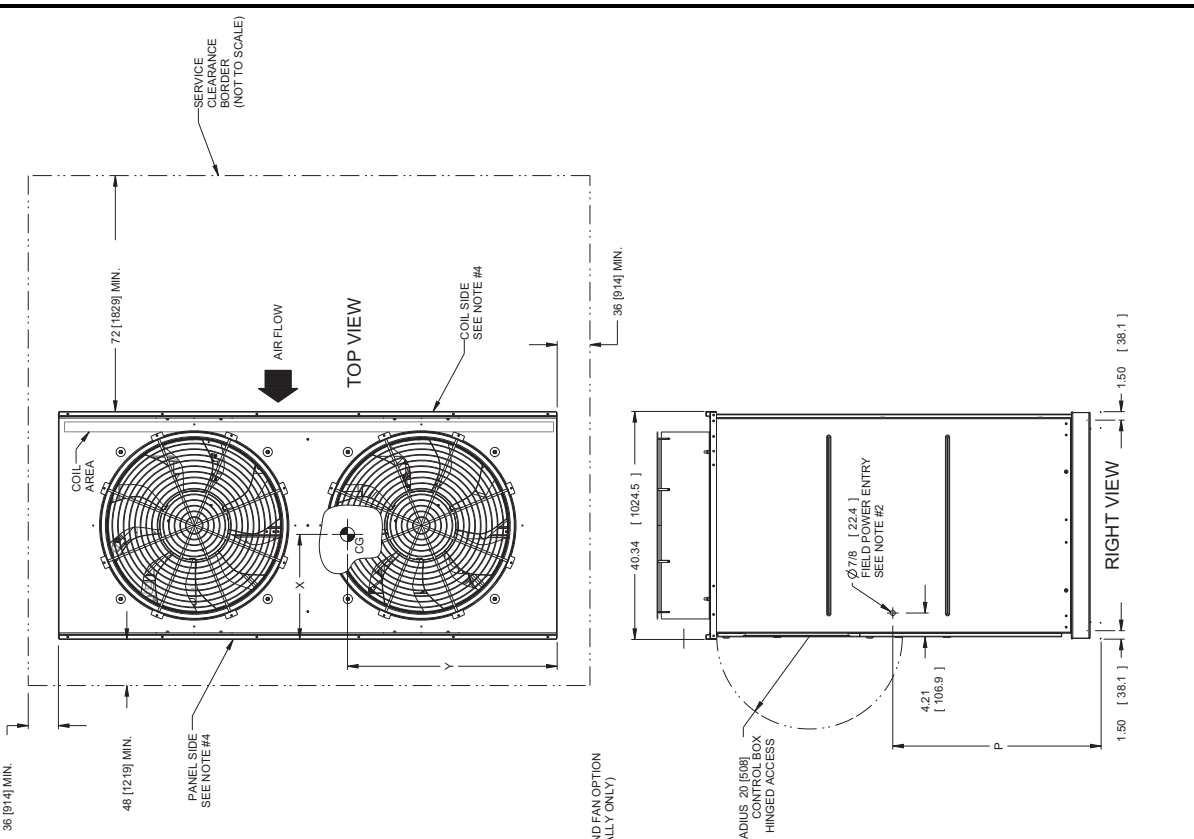
FRONT VIEW

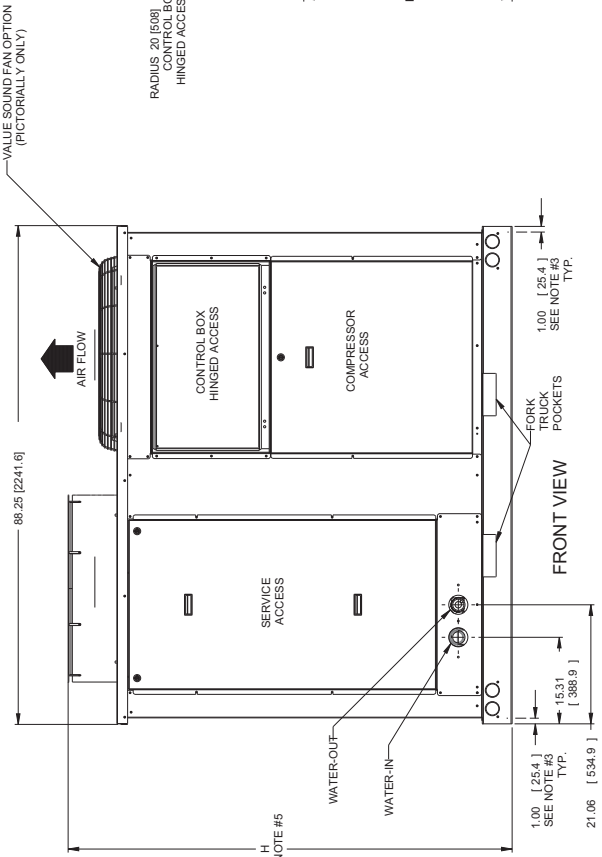


RIGHT SIDE VIEW



Dimensions — 30RAP018-030



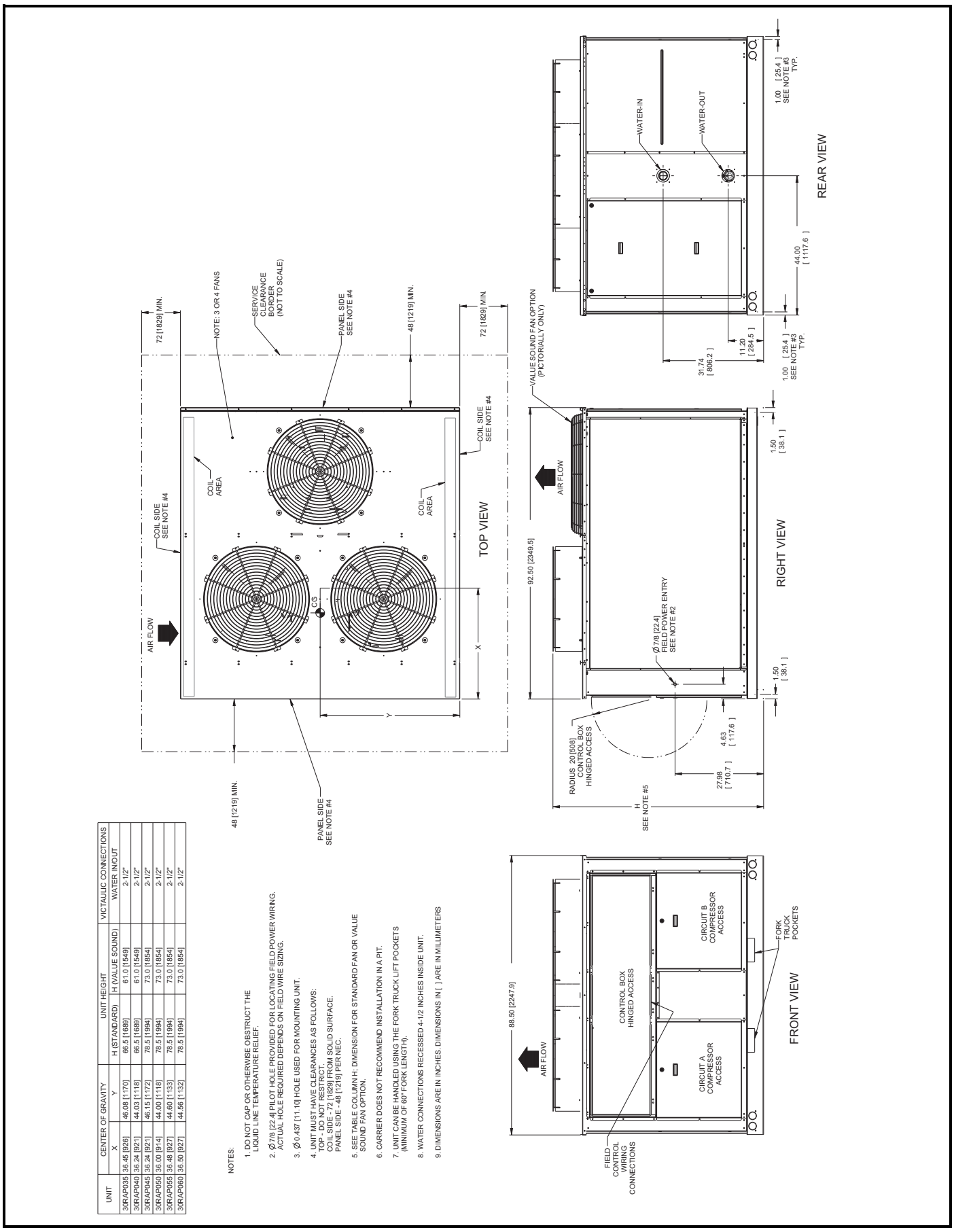


UNIT	STD. UNIT WT.		CENTER OF GRAVITY		UNIT HEIGHT		POWER ENTRY	VICTAULIC CONNECTIONS
	LBS.	KG.	X	Y	H (STANDARD)	H (VALUE SOUND)	P	WATER IN/OUT
30RA018	1150	522	18.37 [467]	38.77 [985]	66.5 [1689]	61.0 [1549]	24.9 [631]	2"
30RA020	1158	525	18.38 [467]	38.79 [985]	66.5 [1689]	61.0 [1549]	24.9 [631]	2"
30RA025	1267	575	18.58 [472]	38.93 [989]	78.5 [1994]	73.0 [1854]	36.9 [936]	2"
30RA030	1308	593	18.59 [472]	38.98 [990]	78.5 [1994]	73.0 [1854]	36.9 [936]	2"

NOTES:

1. DO NOT CAP OR OTHERWISE OBSTRUCT THE LIQUID LINE TEMPERATURE RELIEF.
2. Ø 7/8 [22.4] PILOT HOLE PROVIDED FOR LOCATING FIELD POWER WIRING. ACTUAL HOLE REQUIRED DEPENDS ON FIELD WIRE SIZING.
3. Ø 0.437 [11.10] HOLE USED FOR MOUNTING UNIT.
4. UNIT MUST HAVE CLEARANCES AS FOLLOWS:
   TOP - DO NOT RESTRICT.
   COIL SIDE - 72 [1829] FROM SOLID SURFACE.
   PANEL SIDE - 48 [1219] PER NEC.
5. SEE TABLE COLUMN H; DIMENSION FOR STANDARD FAN OR VALUE SOUND FAN OPTION.
6. CARRIER DOES NOT RECOMMEND INSTALLATION IN A PIT.
7. UNIT CAN BE HANDLED USING THE FORK TRUCK LIFT POCKETS.
8. WATER CONNECTIONS RECESSED 2-3/8 INCHES INSIDE UNIT.
9. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [ ] ARE IN MILLIMETERS.

Dimensions — 30RAP035-060



UNIT	CENTER OF GRAVITY		UNIT HEIGHT		VICTAULIC CONNECTIONS
	X	Y	H (STANDARD)	H (VALUE SOUND)	WATER IN/OUT
30RAP035	36.45 [926]	46.08 [1170]	66.5 [1689]	61.0 [1549]	2-1/2"
30RAP040	36.24 [921]	44.03 [1118]	66.5 [1689]	61.0 [1549]	2-1/2"
30RAP045	36.24 [921]	46.15 [1172]	78.5 [1994]	73.0 [1854]	2-1/2"
30RAP050	36.00 [914]	44.00 [1118]	78.5 [1994]	73.0 [1854]	2-1/2"
30RAP055	36.48 [927]	44.60 [1133]	78.5 [1994]	73.0 [1854]	2-1/2"
30RAP060	36.50 [927]	44.56 [1132]	78.5 [1994]	73.0 [1854]	2-1/2"

NOTES:

1. DO NOT CAP OR OTHERWISE OBSTRUCT THE LIQUID LINE TEMPERATURE RELIEF.
2. Ø 7/8 [22.4] PILOT HOLE PROVIDED FOR LOCATING FIELD POWER WIRING. ACTUAL HOLE REQUIRED DEPENDS ON FIELD WIRE SIZING.
3. Ø 0.437 [11.10] HOLE USED FOR MOUNTING UNIT.
4. UNIT MUST HAVE CLEARANCES AS FOLLOWS: TOP - DO NOT RESTRICT. COIL SIDE - 72 [1829] FROM SOLID SURFACE. PANEL SIDE - 48 [1219] PER NEC.
5. SEE TABLE COLUMN H; DIMENSION FOR STANDARD FAN OR VALUE SOUND FAN OPTION.
6. CARRIER DOES NOT RECOMMEND INSTALLATION IN A PIT.
7. UNIT CAN BE HANDLED USING THE FORK TRUCK LIFT POCKETS (MINIMUM OF 60" FORK LENGTH).
8. WATER CONNECTIONS RECESSED 4-1/2 INCHES INSIDE UNIT.
9. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [ ] ARE IN MILLIMETERS

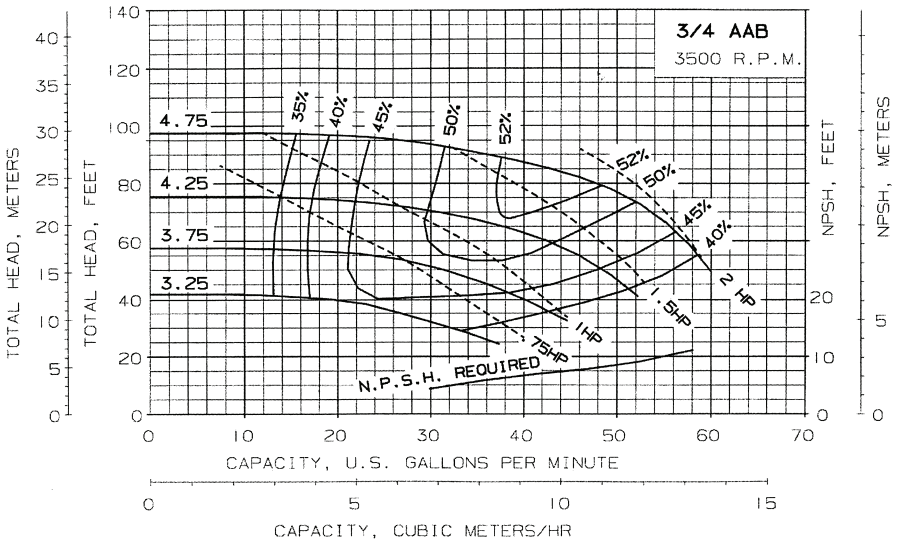
Selection procedure

Carrier's electronic catalog chiller selection program provides quick, easy selection of Carrier chillers. The program considers specific temperature, fluid, and flow requirements and other factors, such as fouling and altitude correction.

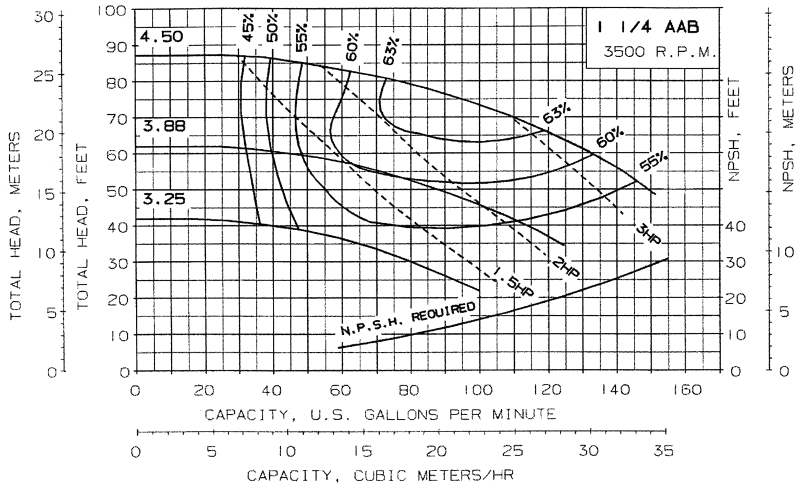
To select a 30RAP chiller, use the electronic catalog.

Performance data

PUMP CURVE FOR HYDRONIC PACKAGE — SINGLE PUMP 1 AND 1.5 Hp, SINGLE PUMP HIGH HEAD 2 Hp, DUAL PUMP 1 AND 1.5 Hp, AND DUAL PUMP HIGH HEAD 2 Hp



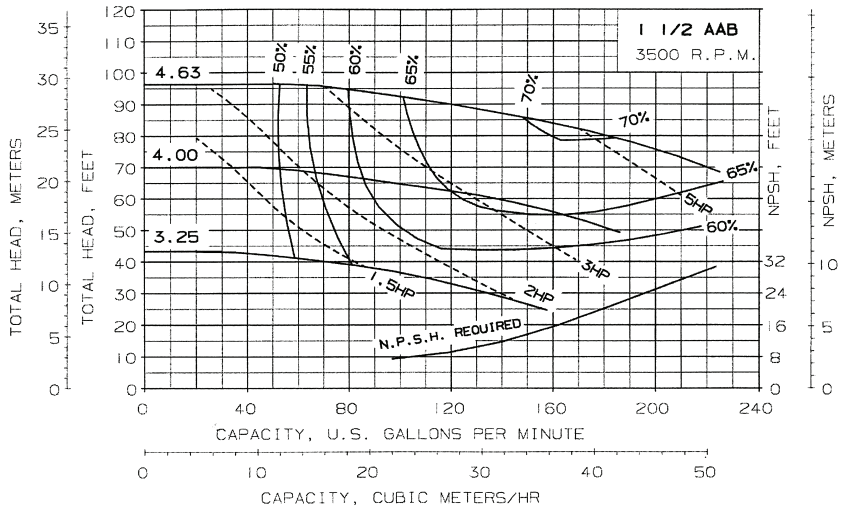
PUMP CURVE FOR HYDRONIC PACKAGE — SINGLE PUMP 2 Hp AND DUAL PUMP 2 Hp



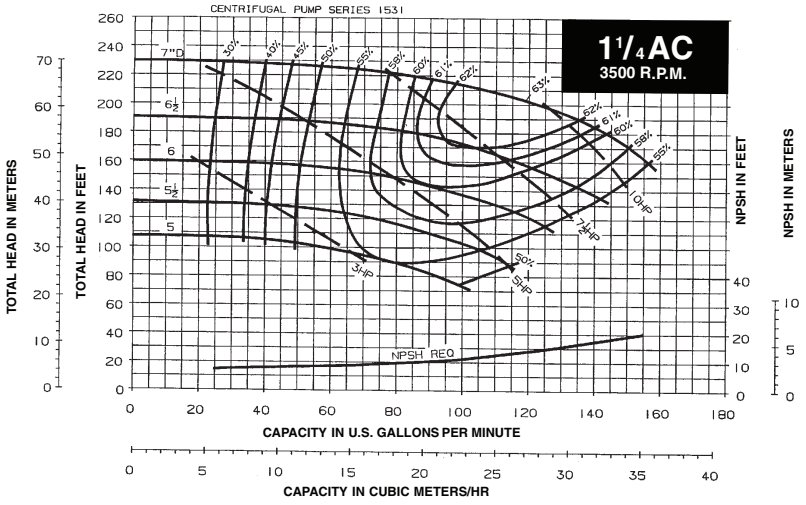
NPSH — Net Postive Suction Head

Performance data (cont)

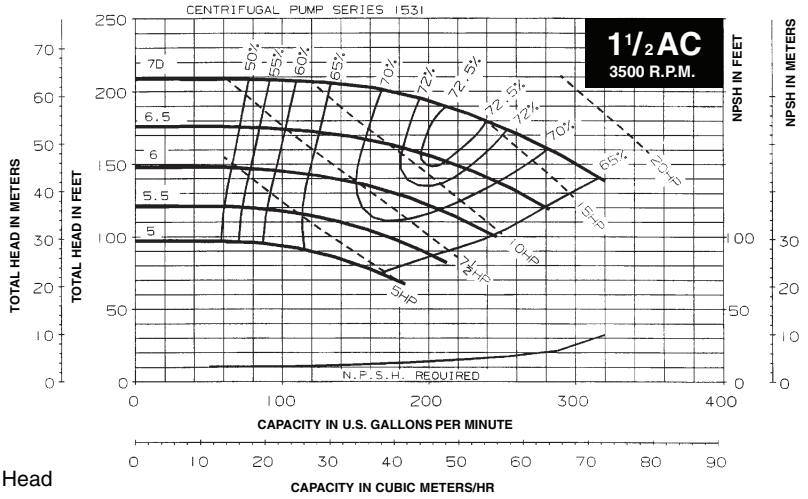
PUMP CURVE FOR HYDRONIC PACKAGE — SINGLE PUMP 5 Hp AND DUAL PUMP 5 Hp



PUMP CURVE FOR HYDRONIC PACKAGE — SINGLE PUMP HIGH HEAD 5 Hp AND DUAL PUMP HIGH HEAD 5 Hp



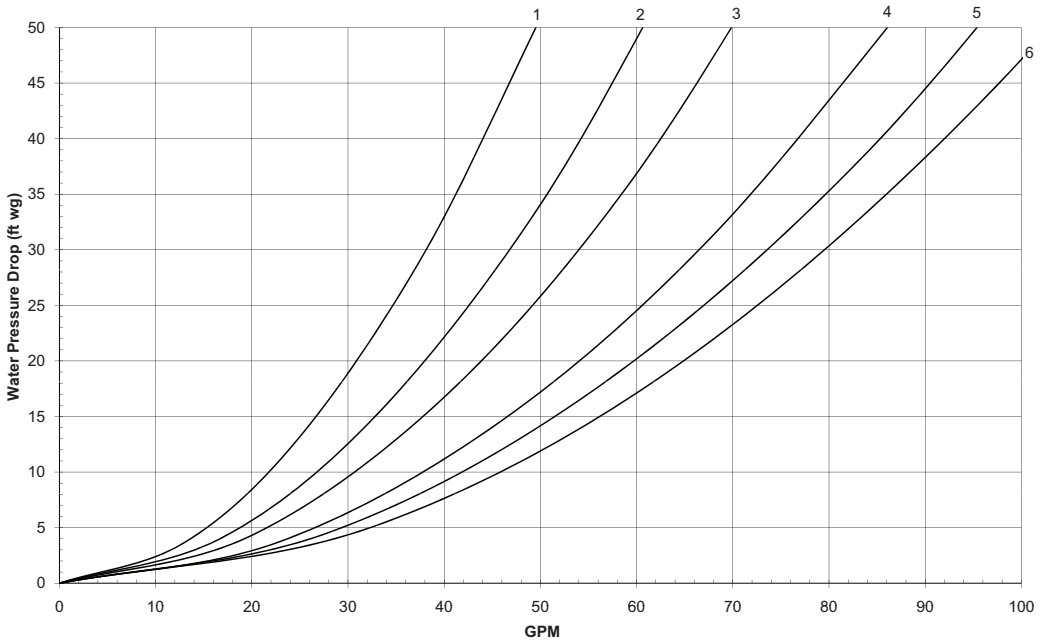
PUMP CURVE FOR HYDRONIC PACKAGE — SINGLE PUMP 7.5 Hp AND DUAL PUMP 7.5 Hp



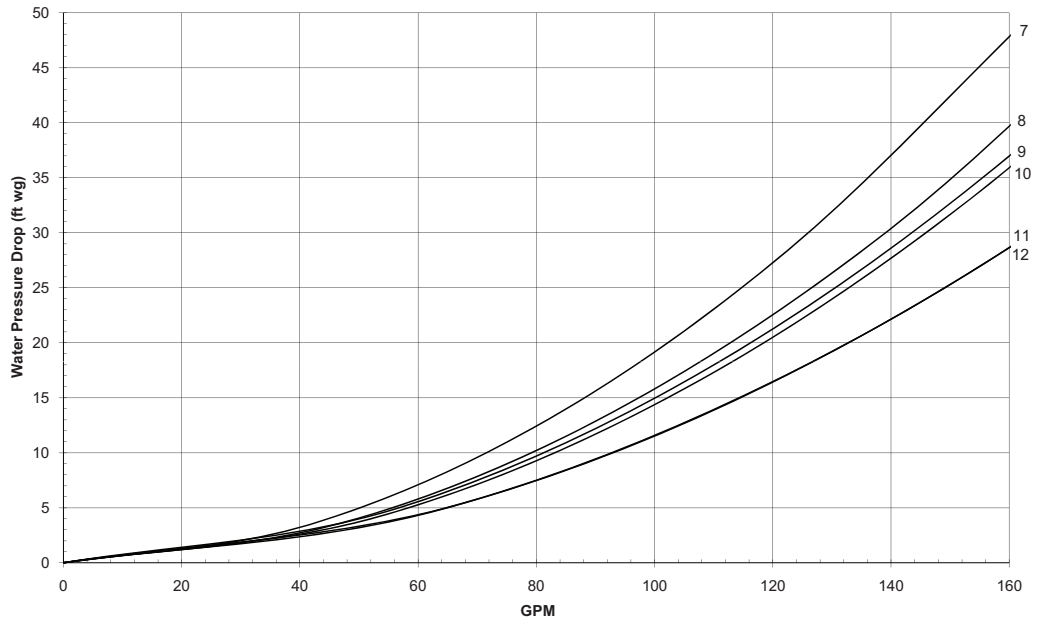
NPSH — Net Postive Suction Head

Performance data (cont)

PRESSURE DROP, WITHOUT PUMP UNITS, 30RAP010-030 (English)



PRESSURE DROP, WITHOUT PUMP UNITS, 30RAP035-060 (English)

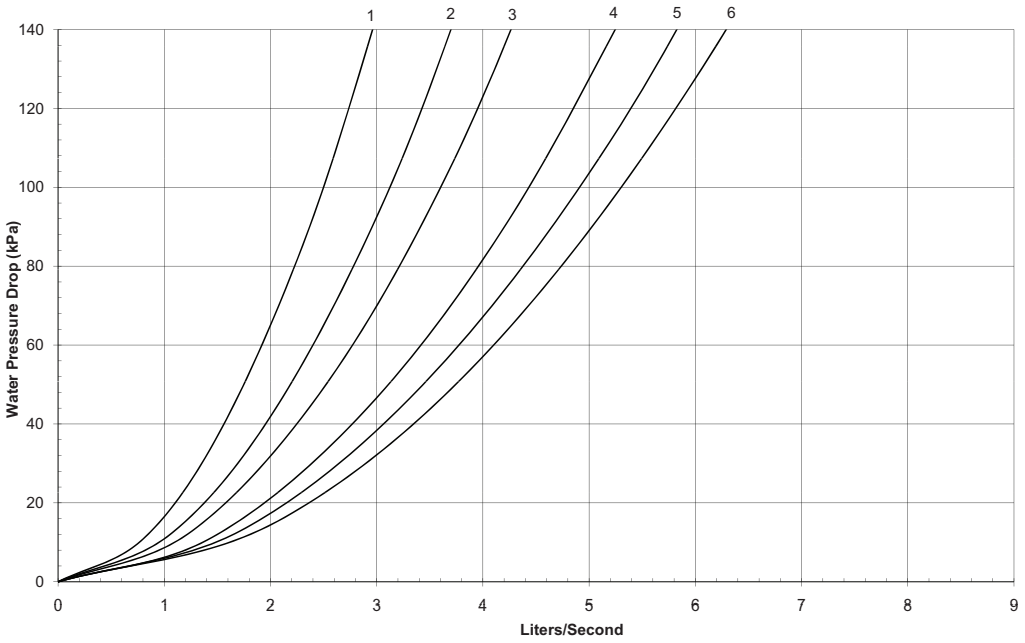


NOTES:
1. Use the following formula to convert feet of water to psig:
   ft of water (.4335) = psig
2. Use the following formula to convert psig to feet of water:
   psig (2.306) = ft of water

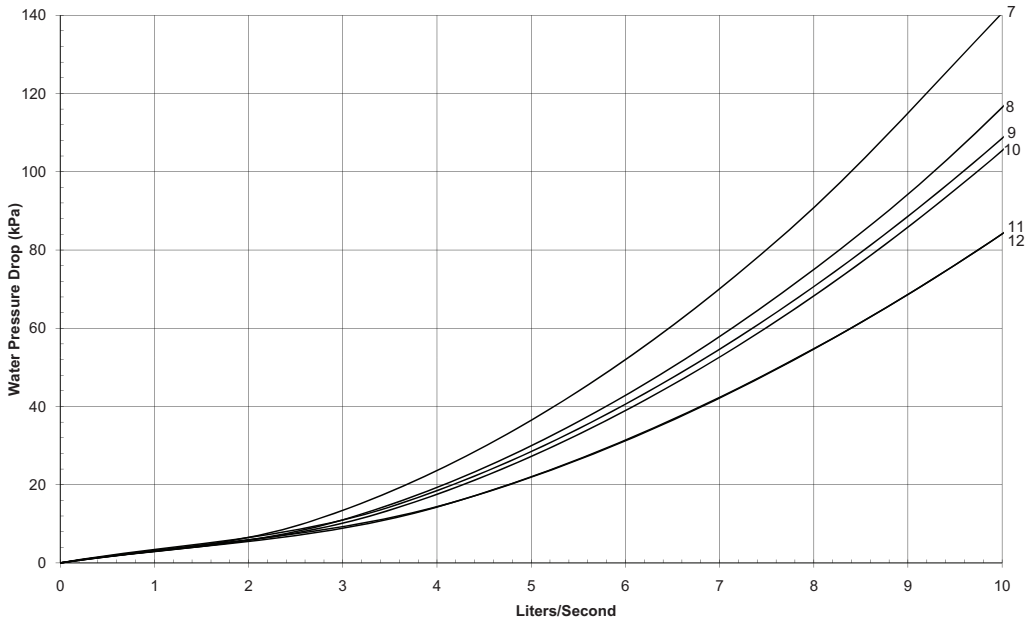
LEGEND

1 — 30RAP010	**3** — 30RAP018	**5** — 30RAP025	**7** — 30RAP035	**9** — 30RAP045	**11** — 30RAP055
2 — 30RAP015	**4** — 30RAP020	**6** — 30RAP030	**8** — 30RAP040	**10** — 30RAP050	**12** — 30RAP060

PRESSURE DROP, WITHOUT PUMP UNITS, 30RAP010-030 (SI)



PRESSURE DROP, WITHOUT PUMP UNITS, 30RAP035-060 (SI)



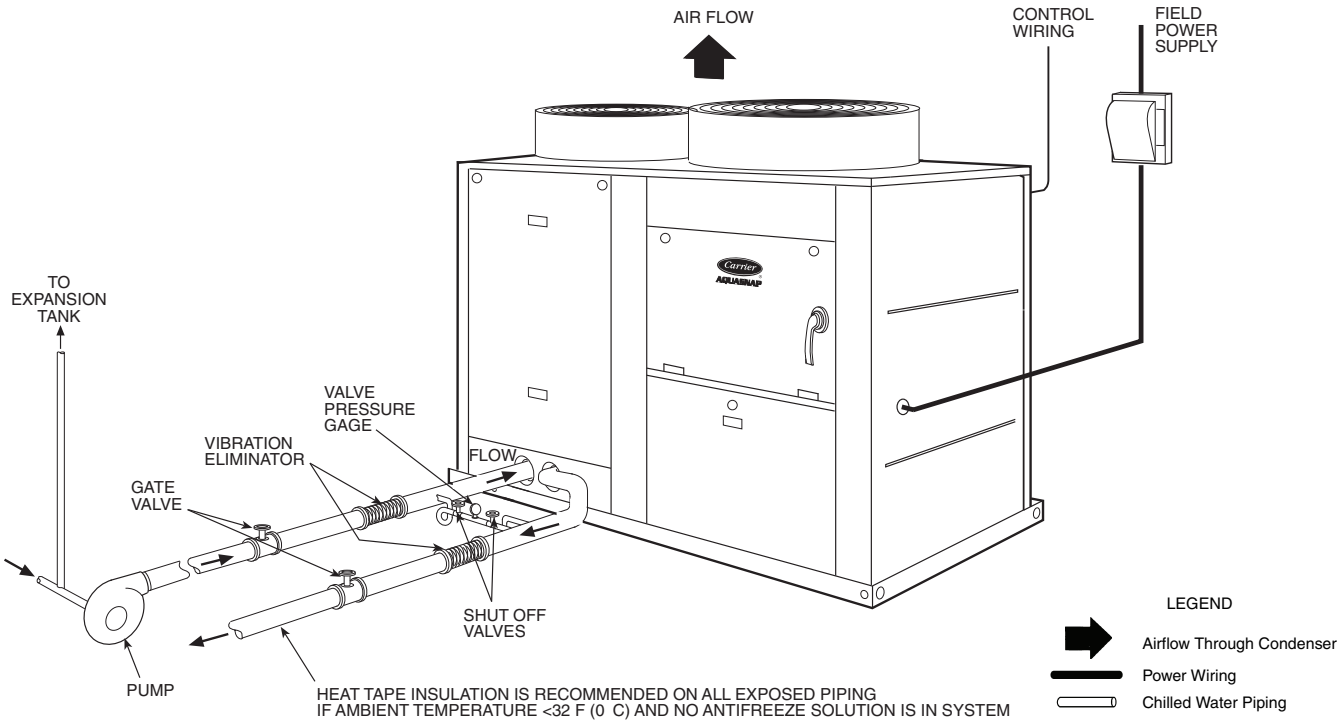
NOTES:
1. Use the following formula to convert feet of water to psig:
   ft of water (.4335) = psig
2. Use the following formula to convert psig to feet of water:
   psig (2.306) = ft of water

LEGEND

1 — 30RAP010	**3** — 30RAP018	**5** — 30RAP025	**7** — 30RAP035	**9** — 30RAP045	**11** — 30RAP055
2 — 30RAP015	**4** — 30RAP020	**6** — 30RAP030	**8** — 30RAP040	**10** — 30RAP050	**12** — 30RAP060

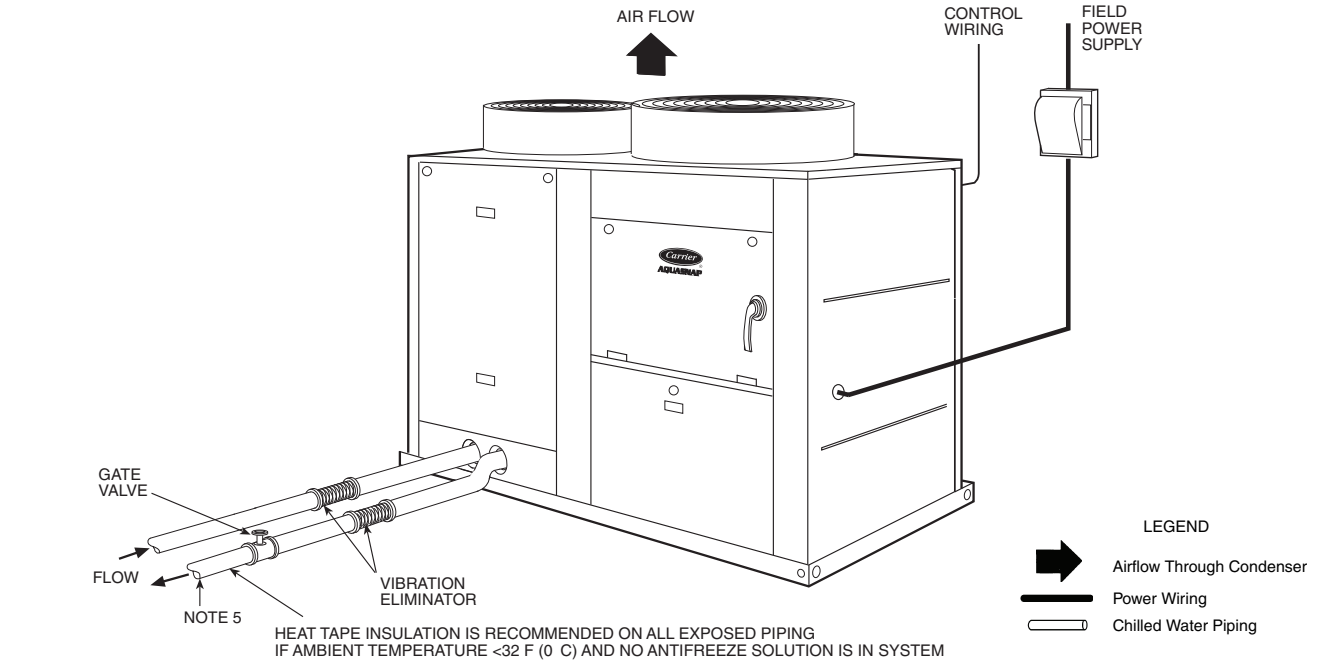
Typical piping and wiring

30RAP UNITS WITHOUT HYDRONIC PACKAGE (SIZE 030 SHOWN)



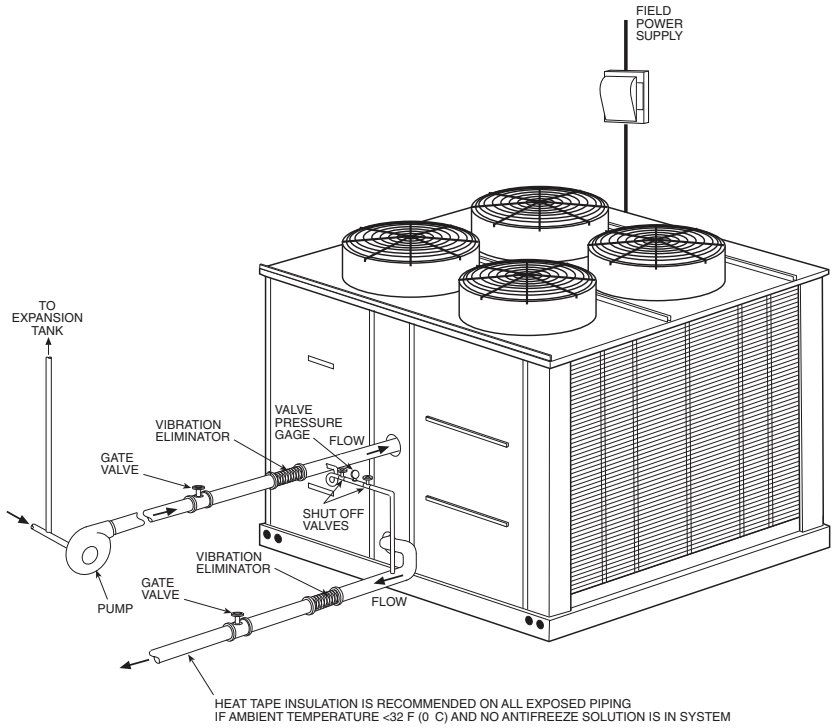
NOTES:
1. Chiller must be installed level to within 1/8 in. per foot (10.4 mm per meter) to maintain proper compressor oil return and hydraulics.
2. Wiring and piping shown are general points-of-connection guides only and are not intended for a specific installation. Wiring and piping shown are for a 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, Refrigerating, and Air Conditioning Engineers) handbook for details.

30RAP UNITS WITH HYDRONIC PACKAGE (SIZE 030 SHOWN)



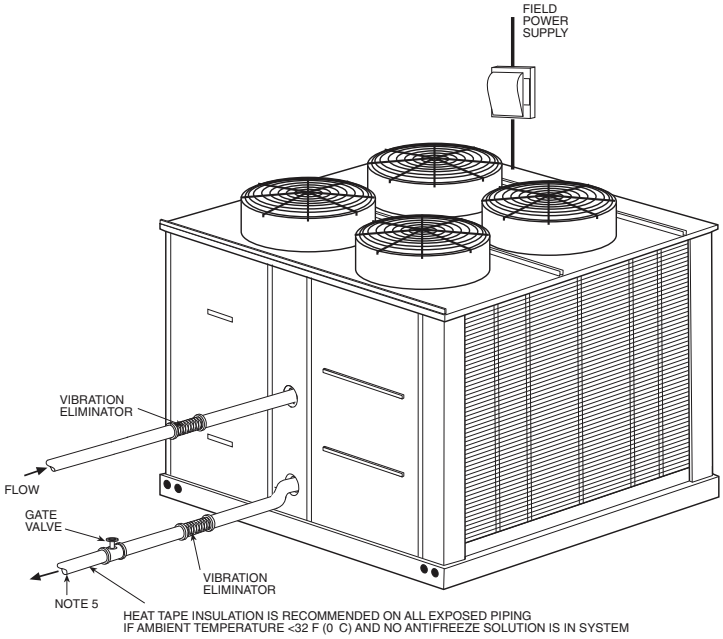
NOTES:
1. Chiller must be installed level to within 1/8 in. per foot (10.4 mm per meter) to maintain proper compressor oil return and hydraulics.
2. Wiring and piping shown are general points-of-connection guides only and are not intended for a specific installation. Wiring and piping shown are for a 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, Refrigerating, and Air Conditioning Engineers) handbook for details.
5. Air separator required as close to chiller as possible (except primary/secondary systems).

30RAP UNITS WITHOUT HYDRONIC PACKAGE (SIZE 060 SHOWN)



NOTES:
1. Chiller must be installed level to within 1/8 in. per foot (10.4 mm per meter) to maintain proper compressor oil return and hydraulics.
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, Refrigerating, and Air Conditioning Engineers) handbook for details.

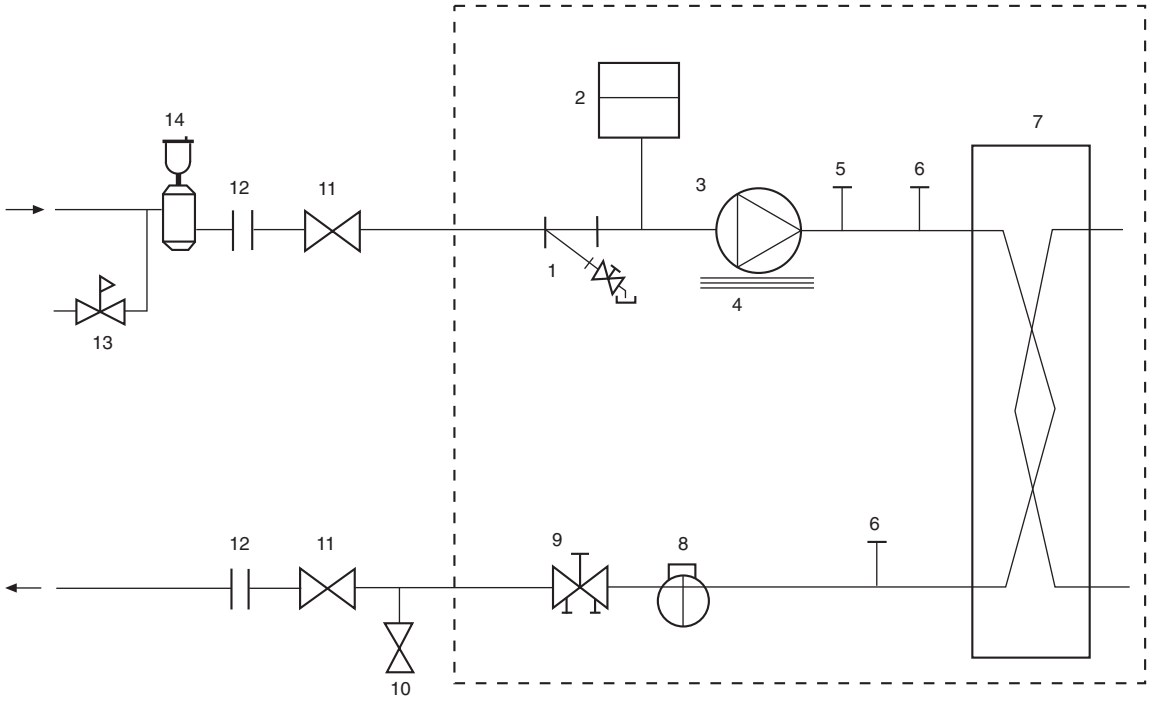
30RAP UNITS WITH HYDRONIC PACKAGE (SIZE 060 SHOWN)



NOTES:
1. Chiller must be installed level to within 1/8 in. per foot (10.4 mm per meter) to maintain proper compressor oil return and hydraulics.
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, Refrigerating, and Air Conditioning Engineers) handbook for details.
5. Air separator required as close to chiller as possible (except primary/secondary systems).

Typical piping and wiring (cont)

TYPICAL PIPING DIAGRAM ON 30RAP UNITS WITH HYDRONIC PACKAGE



LEGEND

1 — Strainer/Blow-Down Valve
2 — Expansion Tank
3 — Pump
4 — Electric Heater
5 — Air Vent Connection Port
6 — Pressure/Temperature Access Port
7 — Heat Exchanger
8 — Flow Switch
9 — Balance Valve/Drain Plug
10 — Pressure Relief
11 — Isolation Valves
12 — Flex Connections
13 — Pressure Reducing/Fill Valve
14 — Air Separator and Vent
--- Factory Supplied

Electrical data

30RAP ELECTRICAL DATA

UNIT 30RAP	UNIT VOLTAGE			POWER SUPPLY QTY REQD.	NO HYDRONIC PACKAGE STANDARD AEROACOUSTIC™ FAN				NO HYDRONIC PACKAGE OPTIONAL VALUE SOUND FANS			
	V-Hz (3 Ph)	Supplied			MCA	MOCP	ICF	Rec Fuse Size	MCA	MOCP	ICF	Rec Fuse Size
		Min	Max		XL	XL	XL		XL	XL	XL	
010	208/230-60	187	253	1	66.1	110	251.0	80	66.7	110	251.6	80
	460-60	414	506	1	26.2	40	127.9	35	26.6	45	128.3	35
	575-60	518	633	1	20.8	35	102.4	25	21.0	35	102.6	25
	380-60	342	418	1	33.5	50	148.9	40	33.5	50	148.9	40
015	208/230-60	187	253	1	75.8	125	346.0	90	76.4	125	346.6	100
	460-60	414	506	1	36.5	60	181.9	45	36.9	60	182.3	45
	575-60	518	633	1	32.0	50	134.4	40	32.2	50	134.6	40
	380-60	342	418	1	46.4	80	199.9	60	46.4	80	199.9	60
018	208/230-60	187	253	1	87.2	110	270.4	100	88.4	110	271.6	100
	460-60	414	506	1	43.4	60	136.5	50	44.2	60	137.3	50
	575-60	518	633	1	34.9	45	98.2	40	35.3	45	98.6	40
	380-60	342	418	1	51.1	70	167.0	60	51.1	70	167.0	60
020	208/230-60	187	253	1	92.6	125	286.8	110	93.8	125	288.0	110
	460-60	414	506	1	46.1	60	148.7	60	46.9	60	149.5	60
	575-60	518	633	1	37.0	50	99.1	45	37.4	50	99.5	45
	380-60	342	418	1	61.2	80	176.5	70	61.2	80	176.5	70
025	208/230-60	187	253	1	127.4	175	363.3	150	128.6	175	364.5	150
	460-60	414	506	1	57.8	80	178.9	70	58.6	80	179.7	70
	575-60	518	633	1	49.8	60	133.7	60	50.0	60	134.1	60
	380-60	342	418	1	68.3	90	173.7	80	68.3	90	173.7	80
030	208/230-60	187	253	1	137.6	175	407.8	175	138.8	175	409.0	175
	460-60	414	506	1	66.3	90	211.7	80	67.1	90	212.5	80
	575-60	518	633	1	58.1	80	160.5	70	58.5	80	160.9	70
	380-60	342	418	1	84.3	110	237.8	100	84.3	110	237.8	100
035	208/230-60	187	253	1	165.4	200	341.6	175	167.2	200	341.6	200
	460-60	414	506	1	82.4	100	176.3	90	83.6	100	176.3	90
	575-60	518	633	1	66.1	80	121.0	70	66.7	80	121.0	80
	380-60	342	418	1	103.5	125	207.2	110	103.5	125	207.2	110
040	208/230-60	187	253	1	194.8	225	377.0	225	196.6	225	377.0	225
	460-60	414	506	1	86.2	100	180.1	100	87.4	100	180.1	100
	575-60	518	633	1	68.8	80	143.7	80	69.4	80	143.7	80
	380-60	342	418	1	112.5	125	216.1	125	112.5	125	216.1	125
045	208/230-60	187	253	1	229.6	250	450.7	250	231.4	250	450.7	250
	460-60	414	506	1	97.9	110	214.8	110	99.1	110	214.8	110
	575-60	518	633	1	81.4	100	163.5	90	82.0	100	163.5	90
	380-60	342	418	1	119.6	125	216.5	125	119.6	125	216.5	125
050	208/230-60	187	253	1	236.0	250	453.9	250	237.8	250	453.9	250
	460-60	414	506	1	106.9	125	219.3	125	108.1	125	219.3	125
	575-60	518	633	1	91.8	110	168.7	100	92.4	110	168.7	100
	380-60	342	418	1	126.0	150	219.7	150	126.0	150	219.7	150
055	208/230-60	187	253	1	252.2	300	502.9	300	254.6	300	502.9	300
	460-60	414	506	1	118.3	125	255.9	125	119.9	125	255.9	125
	575-60	518	633	1	102.7	125	199.3	110	103.5	125	199.3	110
	380-60	342	418	1	145.9	175	290.9	175	145.9	175	290.9	175
060	208/230-60	187	253	1	261.2	317	507.4	300	263.6	320	507.4	300
	460-60	414	506	1	125.9	150	259.7	150	127.5	150	259.7	150
	575-60	518	633	1	110.3	125	203.1	125	111.1	125	203.1	125
	380-60	342	418	1	160.1	175	298.0	175	160.1	175	298.0	175

LEGEND

ICF — Instantaneous Current Flow
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
XL — Across-the-Line Start

NOTES:
1. 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%.
2. All units/modules have single point primary power connection. (Each unit/module requires its own power supply.) Main power must be supplied from a field-supplied disconnect.
3. Cooler heater is wired into the control circuit so it is always operable as long as the power supply disconnect is on, even if any safety device is open.
4. Power draw control circuits include cooler heaters (where used).

Electrical data (cont)

FAN ELECTRICAL DATA
(Standard AeroAcoustic™ Fans)

UNIT 30RAP	UNIT VOLTAGE V-Hz (3 Ph)	STANDARD CONDENSER FANS	
		Quantity	FLA (each)
010	208/230-60	1	6.0
	460-60	1	2.9
	575-60	1	2.4
	380-60	1	3.9
015	208/230-60	1	6.0
	460-60	1	2.9
	575-60	1	2.4
	380-60	1	3.9
018	208/230-60	2	6.0
	460-60	2	2.9
	575-60	2	2.4
	380-60	2	3.9
020	208/230-60	2	6.0
	460-60	2	2.9
	575-60	2	2.4
	380-60	2	3.9
025	208/230-60	2	6.0
	460-60	2	2.9
	575-60	2	2.4
	380-60	2	3.9
030	208/230-60	2	6.0
	460-60	2	2.9
	575-60	2	2.4
	380-60	2	3.9
035	208/230-60	3	6.0
	460-60	3	2.9
	575-60	3	2.4
	380-60	3	3.9
040	208/230-60	3	6.0
	460-60	3	2.9
	575-60	3	2.4
	380-60	3	3.9
045	208/230-60	3	6.0
	460-60	3	2.9
	575-60	3	2.4
	380-60	3	3.9
050	208/230-60	3	6.0
	460-60	3	2.9
	575-60	3	2.4
	380-60	3	3.9
055	208/230-60	4	6.0
	460-60	4	2.9
	575-60	4	2.4
	380-60	4	3.9
060	208/230-60	4	6.0
	460-60	4	2.9
	575-60	4	2.4
	380-60	4	3.9

FAN ELECTRICAL DATA
(Optional Value Sound Fans)

UNIT 30RAP	UNIT VOLTAGE V-Hz (3 Ph)	OPTIONAL CONDENSER FANS	
		Quantity	FLA (each)
010	208/230-60	1	6.6
	460-60	1	3.3
	575-60	1	2.6
	380-60	1	3.9
015	208/230-60	1	6.6
	460-60	1	3.3
	575-60	1	2.6
	380-60	1	3.9
018	208/230-60	2	6.6
	460-60	2	3.3
	575-60	2	2.6
	380-60	2	3.9
020	208/230-60	2	6.6
	460-60	2	3.3
	575-60	2	2.6
	380-60	2	3.9
025	208/230-60	2	6.6
	460-60	2	3.3
	575-60	2	2.6
	380-60	2	3.9
030	208/230-60	2	6.6
	460-60	2	3.3
	575-60	2	2.6
	380-60	2	3.9
035	208/230-60	3	6.6
	460-60	3	3.3
	575-60	3	2.6
	380-60	3	3.9
040	208/230-60	3	6.6
	460-60	3	3.3
	575-60	3	2.6
	380-60	3	3.9
045	208/230-60	3	6.6
	460-60	3	3.3
	575-60	3	2.6
	380-60	3	3.9
050	208/230-60	3	6.6
	460-60	3	3.3
	575-60	3	2.6
	380-60	3	3.9
055	208/230-60	4	6.6
	460-60	4	3.3
	575-60	4	2.6
	380-60	4	3.9
060	208/230-60	4	6.6
	460-60	4	3.3
	575-60	4	2.6
	380-60	4	3.9

LEGEND
FLA — Full Load Amps

PUMP ELECTRICAL DATA

PUMP OPTION	PUMP SIZE	PUMP RPM	UNIT VOLTAGE V-Hz (3 Ph)	FLA (each)	LRA (each)
1, 8	1.0 HP	3500	208/230-60	N/A	N/A
		3500	460-60	N/A	N/A
		3500	575-60	N/A	N/A
		3500	380-60	N/A	N/A
2, 9	1.5 HP	3500	208/230-60	N/A	N/A
		3500	460-60	N/A	N/A
		3500	575-60	N/A	N/A
		3500	380-60	N/A	N/A
3, 4, B, C	2.0 HP	3500	208/230-60	N/A	N/A
		3500	460-60	N/A	N/A
		3500	575-60	N/A	N/A
		3500	380-60	N/A	N/A
5, 6, D, F	5.0 HP	3500	208/230-60	N/A	N/A
		3500	460-60	N/A	N/A
		3500	575-60	N/A	N/A
		3500	380-60	N/A	N/A
7, G	7.5 HP	3500	208/230-60	N/A	N/A
		3500	460-60	N/A	N/A
		3500	575-60	N/A	N/A
		3500	380-60	N/A	N/A

LEGEND

FLA — Full Load Amps
LRA — Locked Rotor Amps
N/A — Data not available at this time

NOTES:
1. 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%.
2. All units/modules have single point primary power connection. (Each unit/module requires its own power supply.) Main power must be supplied from a field-supplied disconnect.
3. The unit control circuit power transformer (24 v, single-phase for all voltages) is factory supplied.
4. Cooler heaters are wired into the main power circuit so they are always operable as long as the disconnect is on, even if any safety device is open, and the unit ON/OFF switch is in the OFF position.
5. Incoming wire size ranges are shown below:
   a. Size 010-030 terminal block no. 8 - no. 2/0 AWG (American Wire Gage)
   b. Size 035-060 terminal block no. 6 - 350 kcmil
   c. 60 and 100 amp non-fused disconnect option no. 6 - no. 1 AWG
   d. 250 amp non-fused disconnect option no. 6 AWG - 350 kcmil

Electrical data (cont)

COMPRESSOR ELECTRICAL DATA

UNIT 30RAP	NUMBER OF COMPRESSORS PER CIRCUIT	UNIT VOLTAGE V-Hz (3 Ph)	CIRCUIT*			
			CIRCUIT A		CIRCUIT B	
			RLA	LRA	RLA	LRA
010	1	208/230-60 460-60 575-60 380-60	48.1 18.6 14.7 23.7	245 125 100 145	— — — —	— — — —
015	1	208/230-60 460-60 575-60 380-60	55.8 26.9 23.7 34.0	340 179 132 196	— — — —	— — — —
018	2	208/230-60 460-60 575-60 380-60	33.4 16.7 13.4 19.2	225 114 80 140	— — — —	— — — —
020	2	208/230-60 460-60 575-60 380-60	35.8 17.9 14.3 23.7	239 125 80 145	— — — —	— — — —
025	2	208/230-60 460-60 575-60 380-60	51.3 23.1 19.9 26.9	300 150 109 139	— — — —	— — — —
030	2	208/230-60 460-60 575-60 380-60	55.8 26.9 23.7 34.0	340 179 132 196	— — — —	— — — —
035	2	208/230-60 460-60 575-60 380-60	35.8 17.9 14.3 23.7	239 125 80 145	33.4 16.7 13.4 19.2	225 114 80 140
040	2	208/230-60 460-60 575-60 380-60	35.8 17.9 14.3 23.7	239 125 80 145	48.1 18.6 14.7 23.7	245 125 100 145
045	2	208/230-60 460-60 575-60 380-60	48.1 18.6 14.7 23.7	245 125 100 145	51.3 23.1 19.9 26.9	300 150 109 139
050	2	208/230-60 460-60 575-60 380-60	51.3 23.1 19.9 26.9	300 150 109 139	51.3 23.1 19.9 26.9	300 150 109 139
055	2	208/230-60 460-60 575-60 380-60	51.3 23.1 19.9 26.9	300 150 109 139	55.8 26.9 23.7 34.0	340 179 132 196
060	2	208/230-60 460-60 575-60 380-60	55.8 26.9 23.7 34.0	340 179 132 196	55.8 26.9 23.7 34.0	340 179 132 196

LEGEND

LRA — Locked Rotor Amps
RLA — Rated Load Amps

* All data is per individual compressor.

Controls

Microprocessor — The *Comfort*Link™ microprocessor controls overall unit operation. Its central executive routine controls a number of processes simultaneously. These include internal timers, reading inputs, analog to digital 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 the Emergency ON-OFF switch to ON position. Pump control of external pumps (where so configured) or optional internal pump, will energize the cooler pump to the internal (or CCN) time schedule (or input occupied signal from external system).

Where dual pumps are utilized, only one pump will be used at a time. The control will start the pump with the least number of operating hours. When the unit receives a call for cooling (based on a deviation from chilled water set point), the unit stages up in capacity to maintain the cooler fluid set point. The first compressor starts 1 to 3 minutes after the call for cooling. The *Comfort*Link microprocessor controls the capacity of the chiller by cycling compressors at a rate to satisfy actual dynamic load conditions. The control maintains leaving-fluid temperature set point shown on the scrolling marquee display board through intelligent cycling of compressors. Accuracy depends on loop volume, loop flow rate, load, outdoor-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-fluid temperature and leaving-fluid temperature. This is referred to as leaving-fluid temperature control with return-fluid temperature compensation.

The basic logic for determining when to add or remove a stage is a time band integration of deviation from set point plus rate of change of leaving-fluid temperature. When leaving-fluid temperature is close to set point and slowly moving closer, logic prevents addition of another stage.

If 1° F per minute (0.6° C per minute) pulldown control has been selected (adjustable setting), no additional steps of capacity are added as long as difference between leaving-fluid temperature and set point is greater than 4° F (2.2° C) and rate of change in leaving-fluid temperature is greater than the selected pulldown control rate. If it has been less than 90 seconds since the last capacity change, compressors will continue to run unless a safety device trips. This prevents rapid cycling and also helps return oil during short on periods.

Sensors — Thermistors are used for temperature-sensing inputs to microprocessor. Additional thermistor sensors may be used as remote temperature sensors for optional LCWT (leaving chilled fluid temperature) reset.

- Cooler leaving chilled fluid temperature
- Cooler entering fluid (return) temperature
- Outside air temperature
- Compressor suction temperature

Two refrigerant pressure transducers are used in each circuit for sensing suction and discharge pressure. The microprocessor uses these inputs to control capacity, the electronic expansion valve, and fan cycling.

- Saturated condensing temperature
- Cooler saturation temperature

Control sequence

Off cycle — If ambient temperature is below 36 F (2 C), cooler heaters (if equipped) are also energized.

Start-up — After control circuit switches on, the prestart process takes place, then microprocessor checks itself, starts pump (if configured) and waits for temperature to stabilize. The controlled pulldown feature limits compressor loading on start-up to reduce demand on start-up and unnecessary compressor usage. The microprocessor limits supply-fluid 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.

As additional cooling is required, additional compressors are energized.

Speed at which capacity is added or reduced is controlled by temperature deviation from set point and rate of temperature change of chilled fluid.

The Main Base Board (MBB) responds to temperature of supply chilled water to cycle the compressor(s) and to control compressor unloading and loading to match cooling load requirements.

Hot gas bypass valve is energized by the MBB. Valve allows hot gas to pass directly into the cooler circuit on the final step of unloading, maintaining constant suction pressure and permitting the unit to operate at lower loads with less compressor cycling.

On units equipped with the digital compressor option, the control will intigrate the modulation of the digital compressor into the capacity routine to match cooling load requirements. The digital compressor will modulate in 13 steps for sizes 010 and 015, 22 steps (11 per compressor) for sizes 020-030, and 44 steps (11 per compressor) for sizes 035-060.

The digital scroll option provides better capacity control by incrementally modulating capacity effectively, increasing the number of compression stages compared to chillers that are not equipped with this option. The digital scroll compressor is not a variable speed device, it modulates the capacity output by allowing the scroll sets to separate during operation, alternating between full capacity and zero capacity. Utilizing a fixed timeframe ratio, the percentage of time that the scroll set is engaged is the percentage capacity of that compressor.

There are 2 major advantages of this type of capacity control. First, there is closer capacity control operation with all the available capacity steps compared to the on/off cycling control of conventional scrolls. Second, there is much less wear factor on digital scrolls compared to standard scroll compressors because the digital scrolls are not subject to as many of the shutdown/restart cycles as conventional scrolls. Digital scrolls, rather than shutting off, tend to remain on as they vary to deliver the correct capacity step.

Controls (cont)

STANDARD CAPACITY CONTROL STEPS

UNIT 30RAP	STANDARD CAPACITY STEPS (%)
010	0, 100
015	0, 100
018	0, 50, 100
020	0, 50, 100
025	0, 50, 100
030	0, 50, 100
035	0, 23, 46, 73, 100
040	0, 23, 46, 73, 100
045	0, 24, 48, 74, 100
050	0, 25, 50, 75, 100
055	0, 23, 46, 73, 100
060	0, 25, 50, 75, 100

Additional information — Detailed information on controls and operation is available in the Controls, Operation, and Troubleshooting literature included with each unit. Packaged service training programs are also available. Contact your Carrier representative for more information.

Dual chiller control — The *Comfort*Link controller allows 2 chillers (piped in parallel) to operate as a single chilled water plant with standard control functions coordinated through the master chiller controller. This standard *Comfort*Link feature requires a communication link between the 2 chillers and an additional thermistor and well in the common supply line.

Dynamic *Comfort*Link controls — Dynamic *Comfort*Link controls keep the chiller on line during periods of extreme operating conditions. If the entering fluid temperature is 85 F (29 C) or higher and the saturated suction temperature is 60 F (16 C) or higher the maximum operating pressure (MOP) feature limits the suction to keep the chiller online. The control automatically starts the chiller in the unloaded state to eliminate the potential of compressor overload due to high head pressure or low suction pressure. The controller will equalize run time on each circuit through the lead/lag feature. If a circuit becomes disabled, the control will automatically set the active circuit to lead, keeping the chiller online at a reduced capacity.

Standard *Comfort*Link™ controls with scrolling marquee display module — A four-digit alphanumeric display shows all of the *Comfort*Link control codes (with 60-character expandable clear language), plus set points, time of day, temperatures, pressures, and superheat. Additional information can be displayed all at once with the accessory Navigator™ display.

Navigator display module — An optional 4-line, 20-character per line display an also available as a field-installed accessory.

Low-temperature override — This feature prevents LCWT (leaving chilled fluid temperature) from overshooting the set point and possibly causing a nuisance trip-out by the freeze protection.

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

Abnormal conditions — All control safeties in chiller operate through compressor sensor board and the microprocessor.

Loss of feedback signal to the MBB will cause the compressor(s) to shut down. For other safeties, microprocessor makes appropriate decision to shut down a compressor due to a safety trip or bad sensor reading and displays appropriate failure code on the display. Chiller holds in safety mode until reset. It then reverts to normal control when unit is reset.

Low-pressure safety — Safety cuts out if system pressure drops below minimum.

High-pressure cutout — Switch shuts down compressors if compressor discharge pressure increases to 650 psig (4482 kPa).

Compressor anti-cycling — This feature limits compressor cycling.

Loss of flow protection — Proof of flow switches are standard and installed on all 30RAP chillers.

Sensor failures — Failures are detected by the microprocessor.

Temperature reset

The energy management module (EMM) is required for 4 to 20 mA reset of LCWT in constant fluid systems. Reset by return fluid, outdoor-air temperature, or space temperature does not require this option. 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, based on the following:

Return-fluid temperature — Increases LCWT set point as return (or entering) fluid temperature decreases (indicating load decrease). Option may be used in any application where return fluid provides accurate load indication. Limitation of return fluid reset is that LCWT may only be reset to value of design return fluid temperature.

Outdoor-air temperature — Increases LCWT as outdoor ambient temperature decreases (indicating load decrease). This reset should be applied only where outdoor ambient temperature is an accurate indication of load.

Space temperature — Increases LCWT as space temperature decreases (indicating load decrease). This reset should be applied only where space temperature is an accurate indication of load. An accessory thermistor and the energy management module accessory is required.

For details on applying a reset option, refer to unit Controls, operation, and Troubleshooting literature. Obtain ordering part numbers for reset option from the Packaged Chiller Builder program or contact your local Carrier representative.

Accessory controls — Demand can be limited by controlling the chiller capacity through the demand limit control (the energy management module is required for this function). This FIOP/accessory interfaces with microprocessor to control unit so that chiller's kW demand does not exceed its setting. It is activated from an external switch or a 4 to 20 mA signal.

The standard *Comfort*Link control is programmed to accept various accessory temperature reset options (based on outdoor-air temperature [std], return-fluid temperature,

or space temperature), that reset the LCWT. An accessory thermistor for space temperature reset is required. The energy management module (EMM) is only required for temperature reset that is initiated by a 4 to 20 mA signal.

Demand limit — If applied, the demand limit function limits the total power draw of unit to selected point by controlling number of operational compressors during periods of peak electrical demand.

The energy management module is required for either 2-stage or 4 to 20 mA demand limit.

Electronic expansion valve (EXV) — The EXV controls refrigerant flow to the cooler for different operating conditions by moving an orifice to increase or decrease the flow area through the valve based on microprocessor input. The orifice is positioned by a stepper motor and is monitored every 3 seconds. The EXV maintains approximately 9° F (5° C) refrigerant superheat entering the compressor.

Diagnostics — The microprocessor may be put through a service test (see Controls, Operation, and Troubleshooting literature). Service test confirms microprocessor is functional, informs observer through display the condition of each sensor and switch in chiller, and allows observer to check for proper operation of fans and compressors.

Default settings — To facilitate quick start-ups, 30RAP chillers with *Comfort*Link controls are pre-configured with a default setting that assumes stand-alone operation supplying 44 F (6.7 C) chilled water.

Configuration settings will be based on any options or accessories included with the unit at the time of manufacturing.

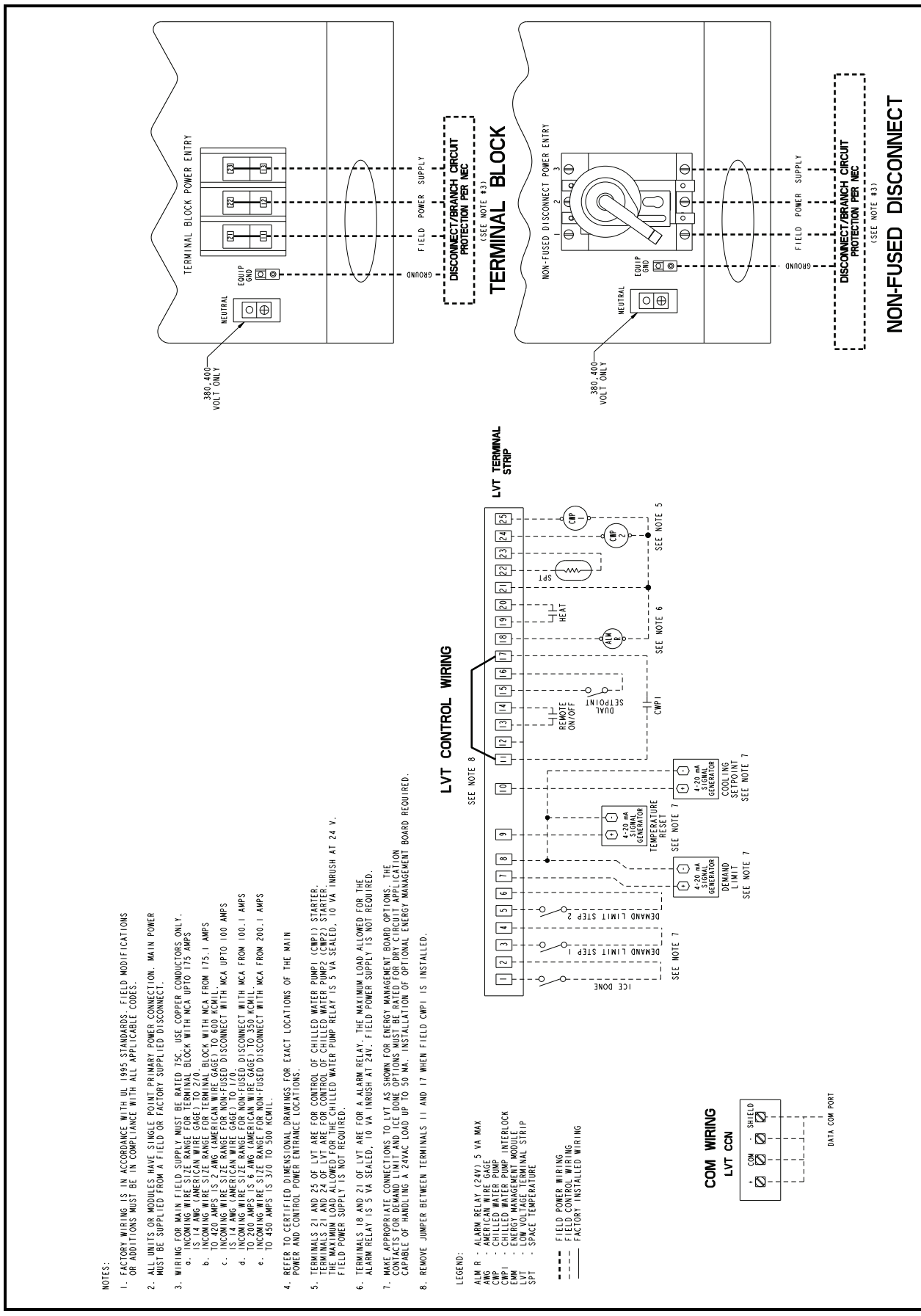
Date and time are set to U.S.A. Eastern Time zone and will need reconfiguring based on location and local time zone. If operation based on occupancy scheduling is desired, this will also need to be set during installation.

Ice duty — *Comfort*Link controls have the capability of reduced leaving fluid temperature operation for thermal storage, or ice duty. The optional energy management module includes input contacts for the "ice done" signal generated by the thermal storage control system. The ice duty feature may be configured to start on an external input command or by the *Comfort*Link standard internal scheduling function. Ice duty may be used in combination with any other standard features offered by the energy management module and *Comfort*Link controls.

The production of ice, which is stored for peak cooling demands, can significantly decrease energy costs. The unit produces ice (normally at night) by supplying ice storage tanks with low temperature cooling fluid. The chiller takes advantage of reduced ambient conditions at night for ice-making mode, so the capacity suffers a lower penalty for the low leaving fluid temperatures.

At peak cooling demands the chiller and the stored ice may share the cooling load to reduce operating costs. The thermal storage system may potentially reduce the size of the chiller plant required to meet demand loads.

Typical controls wiring diagram



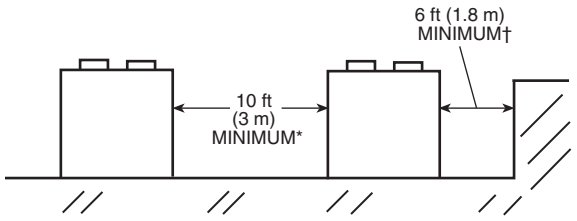
Application data

Chiller location and clearances

Do not locate near sound sensitive areas without proper acoustic consideration. For applications requiring mounting a chiller on a building rooftop, consideration should be given to using rubber-in-shear or spring isolators to minimize structure-borne transmission. Unit must be level when installed to ensure proper oil return to the compressors. Clearances must be provided around chillers for airflow, service and local code requirements. See dimensional drawings for specific unit clearance requirements. Ensure adequate clearance between adjacent chillers is maintained.

When parallel chillers are aligned such that coils face each other, a minimum of 10 feet (3048 mm) is recommended. When the parallel arrangement has only one coil drawing air from the space between chillers, a minimum of 6 feet (1829 mm) is recommended. When parallel chillers have no coils facing each other (a back-to-back arrangement), be sure to maintain the larger of the recommended service clearances associated with each chiller (see the certified drawings). Due to NEC (National Electric Code) regulations, a minimum clearance of 4 feet (1219 mm) must be maintained on the side of the chiller than has an electrical box. Chiller fan discharge must be at least as high as adjacent solid walls. Installation in pits is not recommended.

MULTIPLE UNIT SEPARATION



* Minimum for when coils face each other. Less clearance is required in other configurations.
† Clearance of 6 feet is required when a coil faces the wall. When there is no coil facing the wall, see the certified drawing for the required service clearance.

Oversizing chillers

Oversizing chillers by more than 15% at design conditions must be avoided as the system operating efficiency is adversely affected (resulting in greater or excessive electrical demand). When future expansion of equipment is anticipated, install a single chiller to meet present load requirements and add a second chiller to meet the additional load demand. It is also recommended that 2 smaller chillers be installed where operation at minimum load is critical. The operation of a smaller chiller loaded to a greater percentage over 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 can be supplied by a single 30RAP chiller are required, or where stand-by capability is desired, chillers may be installed in parallel. Units may be of the same or different sizes. However, cooler flow rates must be balanced to ensure proper flow to each chiller.

Where applied in parallel with optional hydronic package, the expansion tanks must be disconnected and a single expansion tank must be installed in the common header.

Unit software is capable of controlling two units as a single plant. Refer to the Controls, Start-up, Operation, Service, and Troubleshooting guide for further details. The accessory Chillervisor System Manager can be used to ensure proper staging sequence of up to 8 chillers. Isolation valves on individual chiller pumps are recommended for parallel chiller arrangements. Refer to the accessory Chillervisor System Manager installation instructions for further details. Hydronic pump package may not be applied in series applications.

Series chillers

Where a large temperature drop (greater than 20 F [11.1 C]) is desired or where chiller capacities greater than can be supplied by a single 30RAP chiller are required or where standby capability is required, chillers may be installed in series. The leaving fluid temperature sensors need not be relocated. However, the cooler minimum entering fluid temperature limitations should be considered for the chillers located downstream of other chillers. When chillers are operated in a series arrangement, the use of a Chillervisor System Manager is recommended.

Cooler water temperature

1. Maximum leaving chilled water temperature (LCWT) for the unit is 60 F (15.6 C). Unit can start and pull down with up to 95 F (35 C) entering-water temperature. It is recommended that entering-water temperature not exceed 70 F (21.1 C).
2. Minimum LCWT for fresh water applications is 40 F (3.3 C). For leaving-fluid temperatures between 15 and 39.9 F (–9.4 C and 3.3 C) an inhibited antifreeze solution is required.

NOTE: Water flowing through cooler should not exceed 100 F (38 C).

Strainers

A 40 mesh strainer is installed in the cooler fluid inlet line, just ahead of to the cooler.

Cooler flow/range

Ratings and performance data in this publication are for a cooling temperature rise of 10° F (6° C). The 30RAP chillers may be operated at a different temperature rise, providing flow limits are not exceeded and corrections to system guidelines are made. For minimum and maximum cooler flow rates, see the Minimum and Maximum Cooler Flow Rates table. A high flow rate is generally limited by the maximum pressure drop that can be tolerated by the unit. The 30RAP chillers are designed for a full load temperature rise of 5° to 20° F (2.8° to 11. 1° C). Use the Packaged Chiller Builder Program to obtain the rating if a temperature rise other than 10° F (6° C) is used.

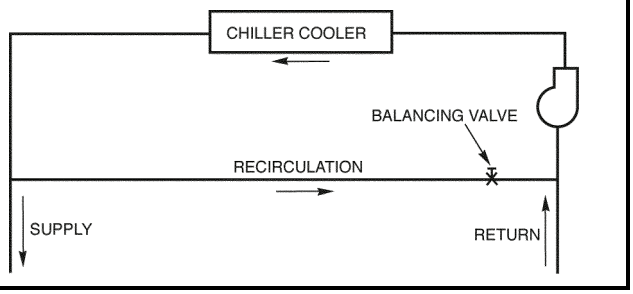
Application data (cont)

Minimum cooler flow (maximum cooler temperature rise) — The minimum cooler flow for standard units is shown in Minimum and Maximum Cooler Fluid Flow Rates table. When system design conditions require a lower flow (or higher rise) than the minimum allowable cooler flow, follow the recommendations below.

- Multiple smaller chillers may be applied in series, each providing a portion of the design temperature rise.
- Cooler fluid may be recirculated to raise the flow rate to the chiller. The mixed temperature entering the cooler must be maintained to a minimum of at least 5° F (2.8° C) above the LCWT and to a maximum of no more than 20° F (11.1° C) above the LCWT.

NOTE: Recirculation flow is shown below.

RECIRCULATION FLOW

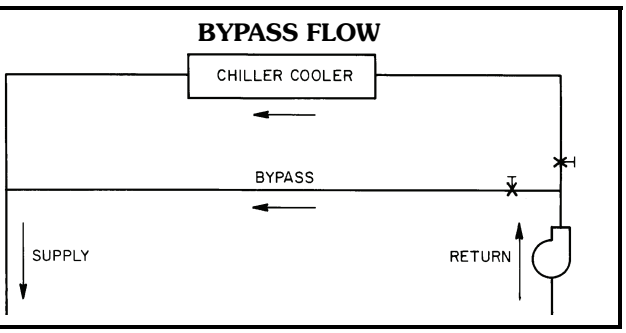


Maximum cooler flow — The maximum cooler flow (approximately 5° F [2.8° C] rise) results in a practical maximum pressure drop through cooler.

Return fluid may bypass the cooler to keep the pressure drop through the cooler within acceptable limits. This permits a higher delta T with lower fluid flow through cooler and mixing after the cooler. The mixed temperature entering the cooler must be maintained to a minimum of at least 5° F (2.8° C) above the LCWT and to a maximum of no more than 20° F (11.1° C) above the LCWT.

NOTE: Bypass flow is shown below.

BYPASS FLOW



Variable cooler flow rates

Variable rates may be applied to a standard chiller. The 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 the Minimum and Maximum Cooler Fluid Flow Rates table on the next page, and minimum fluid volume in circulation must be in excess of those values shown for normal air-conditioning applications in the Minimum Fluid Volume in Circulation table. Flow rate must change in steps of less than 10% per minute. Apply 6 gal. or more per ton (6.5 L per kW) water loop volume minimum if flow rate changes more rapidly.

Fluid loop volume

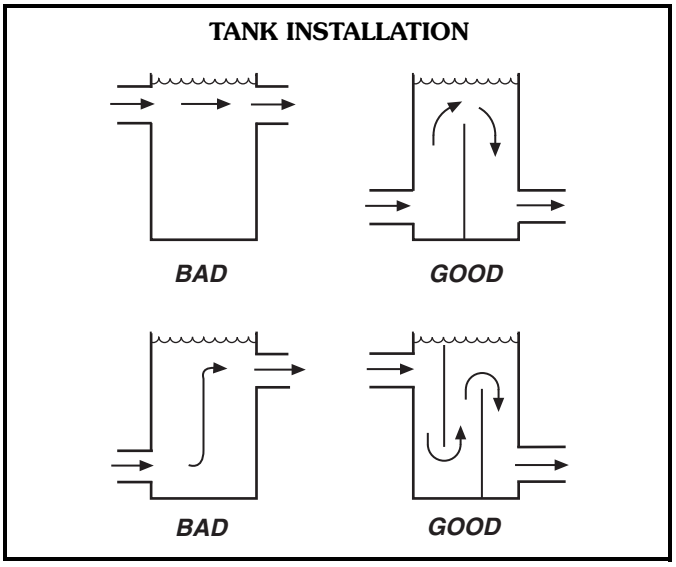
The minimum volume of fluid required to be in circulation is a function of the number of compressors in the chiller and the type of application. The minimum fluid in circulation must equal or exceed the values in the following table. Note that in process cooling applications, or for operation at ambient temperatures below 32 F (0° C) with low loading conditions, there should be more volume than is required for normal air-conditioning applications.

MINIMUM FLUID VOLUME IN CIRCULATION

UNIT	NORMAL AIR CONDITIONING APPLICATION	PROCESS COOLING OR LOW AMBIENT OPERATION APPLICATION
30RAP010-015	12 gal/ton (13 L per kW)	12 gal/ton (13 L per kW)
30RAP018-030	6 gal/ton (6.5 L per kW)	10 gal/ton (11 L per kW)
30RAP035-060	3 gal/ton (3.3 L per kW)	6 gal/ton (6.5 L per kW)

To achieve this fluid volume, it is often necessary to install a tank in the loop. The tank should be baffled to ensure there is no stratification and that water (or brine) entering the tank is adequately mixed with liquid in the tank. Afluid storage tank is available as an accessory.

TANK INSTALLATION



Tank volume

A properly baffled storage tank is available as an accessory. These tanks are designed to physically fit beneath the corresponding 30RAP unit, taking up the same footprint. Available volume is as follows:

30RAP010-018 85 gallons (322 liters)
30RAP022-030 130 gallons (492 liters)
30RAP035-060 265 gallons (1003 liters)

NOTE: This tank will obtain power from the main unit.

MINIMUM AND MAXIMUM COOLER FLOW RATES

30RAP SIZE	MINIMUM COOLER FLOW RATE (gpm)	MAXIMUM COOLER FLOW RATE (gpm)	MINIMUM COOLER FLOW RATE (l/s)	MAXIMUM COOLER FLOW RATE (l/s)
010	13	50	0.8	3.2
015	17	66	1.1	4.2
018	20	78	1.3	4.9
020	23	91	1.5	5.7
025	28	112	1.8	7.1
030	33	133	2.1	8.4
035	41	164	2.6	10.3
040	47	186	3.0	11.7
045	53	209	3.3	13.2
050	57	228	3.6	14.4
055	63	251	4.0	15.8
060	68	270	4.3	17.0

Cooler fouling factor

The fouling factor used to calculate tabulated ratings is 0.00010 $ft^2 \cdot hr \cdot °F/Btu$ (0.000018 $m^2 \cdot °C/W$). As fouling factor is increased, unit capacity decreases and compressor power increases. Use the NACO (North American Commercial Operation) Packaged Chiller Builder for corrections to published ratings.

Cooler and hydronic system freeze protection

Freeze protection for down to –20 F (–28.9 C) for the cooler and hydronic package is available as a factory-installed option. Since power is sometimes lost for extended periods during winter storms, freeze protection provided by heater tapes will be effective only if a back-up power supply can be assured for the unit's control circuit, heater and cooler pump. If not protected with an antifreeze solution, draining the cooler and outdoor piping is recommended if the system will not be used during freezing weather conditions.

Two conditions that must be considered when determining antifreeze concentration are leaving water set point and ambient freeze conditions. Both of these parameters can help determine the recommended concentration level. Higher concentration must be used to adequately protect the machine.

NOTE: Use only antifreeze solutions approved for heat exchanger duty.

For applications in which the leaving water temperature set point is less than 40 F (4.4 C), a suitable inhibited antifreeze solution must be used. The solution concentration must be sufficient to protect the chilled water loop to a freeze protection (first crystals) concentration of at least 15° F (8.3° C) below the leaving water temperature set point.

If the chiller refrigerant or fluid lines are in an area where ambient conditions fall below 34 F (1° C), it is required that an antifreeze solution be added to protect the unit and fluid piping to a temperature of 15° F (8.3° C) below the lowest anticipated ambient temperature.

Select concentration based on either burst or freeze protection as dictated by the application. If the chiller does not operate during the winter, nor is a start-up expected, a burst protection concentration is recommended. This concentration may not be high enough to pump the fluid through the unit. Burst protection is typically a lower concentration that will provide better performance from the machine. If the chiller does operate during winter, a freeze protection concentration is recommended. This concentration will be high enough to keep the fluid in a condition that it can be pumped at low ambient conditions.

IMPORTANT: Glycol anti-freeze solutions are highly recommended since heater tapes provide no protection in the event of a power failure.

Consult glycol fluid manufacturers for burst protection recommendations and fluid specifications.

High ambient temperature operation

High outdoor ambient chiller start-up and operation is possible for standard 30RAP chillers at ambient temperatures up to 120 F (50 C) at nominal voltage. The unit will additionally be able to stay running at reduced capacity up to 125 F (52 C).

Low ambient temperature operation

Units will operate down to –20 F (–29 C) on size 010 and 015 units, 45 F (7 C) on size 018-030 units, and 32 F (0° C) on size 035-060 units as standard.

Operation to –20 F (–29 C) for size 018-060 units requires optional Motormaster® V condenser head pressure control (included as standard on size 010 and 015 units) as well as wind baffles and hot gas bypass or digital compressor option. Inhibited propylene glycol or other suitable corrosion-resistant anti-freeze solution must be field supplied and installed in all units for unit operation below 32 F (0° C). Solution must be added to fluid loop to protect loop down to 15° F (8° C) below minimum operating ambient temperature. Concentration should be based on expected minimum temperature and either "Burst" or "Freeze" protection levels. At least 6 gal. per ton (6.5 L per kW) of fluid volume is the recommended minimum for a moderate system load.

NOTE: In order for a chiller to operate at –20 F (–29 C) ambient temperature, the minimum load on the chiller must be above the minimum step of unloading.

NOTE: As an alternative to requiring a glycol solution, the cooler may be remotely located. Burying refrigerant lines is never permitted.

Altitude correction factors

Correction factors must be applied to standard ratings at altitudes above 2000 ft (610 m). Use the NACO Packaged Chiller Builder to determine the altitude effect on peformance.

Water system overview (closed loop systems only)

The 30RAP chillers are designed for use with closed systems, meaning that there is no more than one water-air interface in the water loop. Cooling tower loops, for example, have two water-air interfaces (sump and nozzles) and would thus be classified as open, whereas a correctly designed chilled water loop with the only water-air interface being in the expansion tank is closed. Since closed and open water systems behave very differently, the following assumes that the chilled water loop is closed. A system installed incorrectly such that air is not handled properly — pipe leaks, vent leaks, air in pipes, etc. — may behave as an open system and thus have unsatisfactory operation. Pump seal wear can also cause leaks that cause poor system operation.

Proper closed system design and installation procedures should be followed closely. The system must be constructed with pressure tight components and thoroughly tested for installation leaks. Factory-supplied hydronic systems are available with single or dual (for back-up) pumps. The factory-installed system includes all of the components within the dashed lines shown in the figure on page 18.

Installation of water systems should follow sound engineering practice as well as applicable local and industry standards. Improperly designed or installed systems may cause unsatisfactory operation and/or system failure. Consult a water treatment specialist or appropriate literature for information regarding filtration, water treatment, and control devices. A typical installation with components that might be installed with the hydronic package of the 30RAP unit is shown on pages 16 and 17.

It is recommended that isolation (shutoff) valves be placed exterior to the unit to allow removal and service of the entire pump assembly, if necessary. Also, if the unit is isolated with valves, a properly sized pressure relief valve should be installed in the piping between the unit and the valves, following all applicable state and local codes.

Water system cleaning

Proper water system cleaning is of vital importance. Excessive particulates in the water system can cause excessive pump seal wear, reduce or stop flow, and cause damage of other components. Water quality should be maintained within the limits indicated in the Water Quality Characteristics and Limitations Table.

1. Install a temporary bypass around the chiller to avoid circulating dirty water and particulates into the pump package and chiller during the flush. Use a temporary circulating pump during the cleaning process. Also, be sure that there is capability to fully drain the system after cleaning.
2. Be sure to use a cleaning agent that is compatible with all system materials. Be especially careful if the system contains any galvanized or aluminum components. Both detergent-dispersant and alkaline-dispersant cleaning agents are available.
3. It is a good idea to fill the system through a water meter. This provides a reference point for the future for loop volume readings, but it also establishes the correct quantity of cleaner needed in order to get the required concentration.
4. Use a feeder/transfer pump to mix the solution and fill the system. Circulate the cleaning system for the length of time recommended by the cleaning agent manufacturer.
   a. After cleaning, drain the cleaning fluid and flush the system with fresh water.
   b. A slight amount of cleaning residue in the system can help keep the desired, slightly alkaline, water pH of 8 to 9. Avoid a pH greater than 10, since this will adversely affect pump seal components.
   c. A side stream filter is recommended during the cleaning process. Filter side flow rate should be enough to filter the entire water volume every 3 to 4 hours. Change filters as often as necessary during the cleaning process.
   d. Remove temporary bypass when cleaning is complete.

A strainer with a blow-down valve is standard on all 30RA units, both with and without hydronic packages. The blow-down valve allows removal of particulates caught in the strainer without complete removal of the screen. A female NPT connection is provided on the valve, allowing hose connection for drainage outside the unit.

The *Comfort*Link™ controls provided have a built-in feature to remind building owners or operators to clean the strainer by discharging the blow-down valve at a pre-set time interval. Properly installed and cleaned systems will rarely need the strainer cleaned after the initial fill. This time interval is user-configurable.

WATER QUALITY CHARACTERISTICS AND LIMITATIONS

WATER CHARACTERISTIC	QUALITY LIMITATION
Alkalinity (HCO_3^-)	70 – 300 ppm
Sulfate (SO_4^{2-})	Less than 70 ppm
HCO_3^-/SO_4^{2-}	Greater than 1.0
Electrical Conductivity	10 – 500 μS/cm
pH	7.5 – 9.0
Ammonium (NH_3)	Less than 2 ppm
Chorides (Cl^-)	Less than 300 ppm
Free chlorine (Cl_2)	Less than 1 ppm
Hydrogen Sulfide (H_2S)*	Less than 0.05 ppm
Free (aggressive) Carbon Dioxide (CO_2)†	Less than 5 ppm
Total Hardness (dH)	4.0 – 8.5
Nitrate (NO_3)	Less than 100 ppm
Iron (Fe)	Less than 0.2 ppm
Aluminum (Al)	Less than 0.2 ppm
Manganese (Mn)	Less than 0.1 ppm

*Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within the ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water contains a pH of 7.0.

†Dissolved carbon dioxide can either be calculated from the pH and total alkalinity values, shown below, or measured on the site using a test kit. Dissolved Carbon Dioxide, PPM = TA x $2^{[(6.3-pH)/0.3]}$ where TA = Total Alkalinity, PPM as $CaCO_3$.

Condenser coil protection (*Enviro-Shield*™)

Refer to the environmental selection guides for more information. If the standard Novation® (microchannel) coil does not meet the corrosion requirements for a given application, an e-coated Novation coil option is available. For specific geographical recommendations, please refer to the NACO Packaged Chiller Builder program.

E-coated Novation® coils have an extremely flexible and durable epoxy coating uniformly applied to all coil surfaces. Unlike brittle phenolic dip and bake coatings, e-coat provides superior protection with unmatched flexibility, edge coverage, metal adhesion, thermal performance and most importantly, corrosion resistance. E-coated coils provide this protection since all coil surfaces are completely encapsulated from environmental contamination.

Electrical/utility interests

Energy management — Use of energy management practices can significantly reduce operating costs, especially during off-peak modes of operation. Demand limiting and temperature reset are 2 techniques for accomplishing efficient energy management. See Demand Limiting (also called load shedding) section on this page for further details.

Demand limiting (load shedding)

When a utility's 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. The energy management module (EMM) can be added to accomplish this reduction. Demand may be limited on unit by resetting fluid temperature, or by unloading the chiller to a given predetermined percentage of the load. Demand limit may also be driven by an external 4 to 20 mA signal. These features require a 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 the 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 will suffer from constant cycling.

Remote on-off control

Remote on-off control may be applied by hard-wired connection (see Controls and Troubleshooting literature) or by connection to a Carrier Comfort Network® (CCN) system.

Optional hydronic system selection

Select pump gpm from resulting chiller selection and total pressure loss in the system plus the chiller internal pressure loss.

NOTE: Maximum gpm (L/s), pressure and pump hp must not exceed maximum on pump curve.

Pump flow can be reduced by using the factory-supplied triple-duty valve up to 10%. Beyond that, impeller trimming is recommended to reduce energy consumption. Follow local codes or ASHRAE 90.1 recommendations. Contact your Carrier representative for specific amount of trim required.

Expansion tank supplied will allow loop expansion due to ambient fluctuations for loop volumes of up to the values in the table below. If loop volume exceeds the maximum loop volume, a larger expansion tank must be field supplied.

The supplied expansion tanks have the following specifications: 30RAP010-030 — 5.0 total gal., 2.4 gal. acceptance volume, 30RAP035-060 — 10.0 total gal., 5.5 gal. acceptance volume.

MAXIMUM LOOP VOLUME

CONCENTRATION	30RAP010-030		30RAP035-060	
	GAL.	L	GAL.	L
PURE WATER	310	1173	725	2744
10% EG	180	681	425	1609
20% EG	175	662	410	1552
30% EG	155	587	370	1401
40% EG	150	568	350	1325
10% PG	175	662	410	1552
20% PG	150	568	350	1325
30% PG	128	485	300	1136
40% PG	118	447	275	1041

LEGEND

EG — Ethlyene Glycol
PG — Propylene Glycol

Maximum loop volume is based on typical system pressure of 12 psig (83 kPa) and 30 psig (207 kPa) of minimum and maximum pressures, and 100 F (37.8 C) mean temperature.

Parallel chillers with hydronic packages require that pump inlets be equalized to prevent pump cavitation. Pump expansion tanks must be removed and located

together in the common pump suction header. All materials needed for expansion tank relocation are field supplied. Appropriate measures must be taken for freeze protection.

Air separation

For proper system operation, it is essential that water loops be installed with proper means to manage air in the system. This is typically done by the installing contractor. Free air in the system can cause noise, reduce terminal output, stop flow, or even cause pump failure due to pump cavitation. For closed systems, equipment should be provided to eliminate all air from the system.

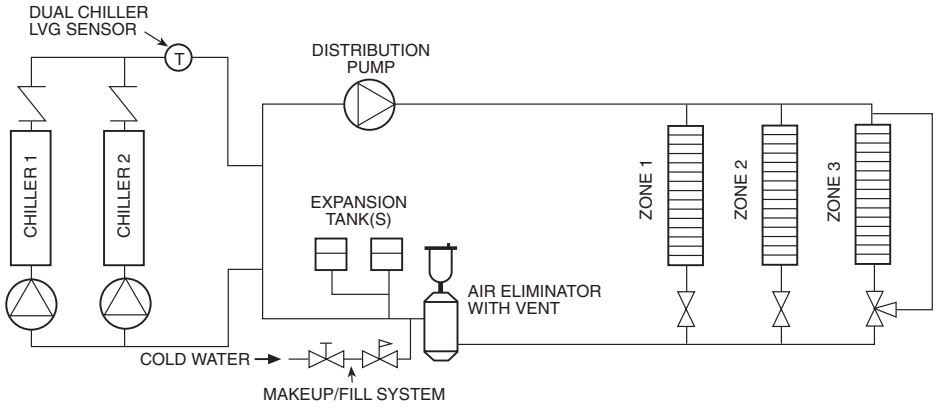
The amount of air that water can hold in solution depends on the pressure and temperature of the water/air mixture. Air is less soluble at higher temperatures and at lower pressures. Therefore, separation can best be done at the point of highest water temperature and lowest pressure. Typically, this point would be on the suction side of the pump as the water is returning from the system or terminals. Generally speaking, this is the best place to install an air separator, if possible.

1. Install automatic air vents at all high points in the system. (If the 30RAP unit is located at the high point of the system, a vent can be installed on the piping entering the heat exchanger on the ¼-in. NPT female port.)
2. Install an air separator in the water loop, at the place where the water is at higher temperatures and lower pressures — usually in the chilled water return piping. On a primary-secondary system, the highest temperature water is normally in the secondary loop, close to the decoupler. Preference should be given to that point on the system. In-line or centrifugal air separators are readily available in the field.

It may not be possible to install air separators at the place of lowest pressure and highest temperature. In such cases, preference should be given to the points of highest temperature. It is important that pipe be sized correctly so that free air can be moved to the point of separation. Generally, a water velocity of at least 2 ft per second (0.6 m per second) will keep free air entrained and prevent it from forming air pockets.

Automatic vents should be installed at all physically elevated points in the system so that air can be eliminated during system operation. Provision should also be made for manual venting during the water loop fill. It is important that the automatic vents be located in accessible locations for maintenance purposes, and that they be located where they can be prevented from freezing.

TYPICAL MULTIPLE CHILLER CONFIGURATION WITH AIR ELIMINATOR AND EXPANSION TANK LOCATION



Guide specifications

Air-Cooled Liquid Chiller

HVAC Guide Specifications

Size Range: **10 to 60 Nominal Tons (35 to 210 Nominal kW)**

Carrier Model Number: **30RAP**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Microprocessor controlled, air-cooled liquid chiller utilizing scroll compressors, low sound fans, electronic expansion valve, optional hydronic pump system, and fluid storage tank.

1.02 QUALITY ASSURANCE

A. Unit shall be rated in accordance with AHRI Standard 550/590, latest edition (U.S.A.) and all units shall be ASHRAE 90.1 compliant.

B. Unit construction shall comply with ASHRAE 15 Safety Code, UL latest edition, and ASME applicable codes (U.S.A. codes).

C. Unit shall be manufactured in a facility registered to ISO 9001:2000 Manufacturing Quality Standard.

D. Unit shall be full load run tested at the factory.

1.03 DELIVERY, STORAGE AND HANDLING

A. Unit controls shall be capable of withstanding 150 F (66 C) storage temperatures in the control compartment.

B. Unit shall be stored and handled per unit manufacturer's recommendations.

Part 2 — Products

2.01 EQUIPMENT

A. General:

Factory assembled, single-piece chassis, air-cooled liquid chiller. Contained within the unit cabinet shall be all factory wiring, piping, controls, refrigerant charge (R-410A), and special features required prior to field start-up.

B. Unit Cabinet:

1. Frame shall be of heavy-gage, galvanized steel.
2. Exterior panels shall be galvanized steel with a baked enamel powder or pre-painted finish.
3. Cabinet shall be capable of withstanding 500-hour salt spray test in accordance with the ASTM (U.S.A.) B-117 standard.

C. Fans:

1. Condenser fans shall be direct-driven, 9-blade airfoil cross-section, reinforced polymer construction, shrouded-axial type, and shall be statically and dynamically balanced with inherent corrosion resistance.
2. Fan operation shall allow reduced sound levels during scheduled unoccupied operating periods. Manufacturers without unoccupied reduced sound capability shall submit 1/3 octave band data and sound power data as measured according to ARI 370 as confirmation of unit sound characteristics.
3. Air shall be discharged vertically upward.
4. Fans shall be protected by coated steel wire safety guards.

D. Compressor/Compressor Assembly:

1. Fully hermetic, direct-drive, scroll type compressors.
2. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have either internal line break thermal and current overload protection or external current overload modules with compressor temperature sensors.
3. Compressors shall be mounted on rubber in shear vibration isolators.
4. Staging of compressors shall provide unloading capability. Digital compressor unloading control shall be available as an option.

E. Cooler:

1. Cooler shall be rated for a refrigerant working-side pressure of 505 psig (3482 kPa) on sizes 010-025 and 565 psig (3896 kPa) on sizes 030-060 and shall be tested for a maximum water-side pressure of 300 psig (2068 kPa) or 150 psig (1034 kPa) when optional hydronic package is installed.
2. Shall be single-pass, ANSI type 316 stainless steel, brazed plate construction.
3. Shell shall be insulated with 3/4-in. (19 mm) closed-cell, polyvinyl-chloride foam with a maximum K factor of 0.28.
4. Shall incorporate 2 independent refrigerant circuits on sizes 035 to 060; sizes 010 to 030 shall have one independent refrigerant circuit.
5. Cooler shall have an optional factory-installed heater, to protect cooler from ambient temperature freeze down to –20 F (–29 C).
6. Unit shall be provided with a factory-installed flow switch.
7. Shall be equipped with Victaulic-type water connections.

F. Condenser:

1. Coil shall be air-cooled Novation® heat exchanger technology with microchannel (MCHX) coils and shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered between the refrigerant manifolds. Coils shall consist of a two-pass arrangement. Coil construction shall consist of aluminum alloys for fins, tubes, and manifolds in combination with a corrosion-resistant coating.
2. Tubes shall be cleaned, dehydrated, and sealed.
3. Assembled condenser coils shall be leak tested and pressure tested at 656 psig (4522 kPa).

Guide specifications (cont)

G. Refrigeration Components:

Refrigerant circuit components shall include filter drier, moisture indicating sight glass, electronic expansion device, and complete operating charge of both refrigerant R-410A and compressor oil.

H. Controls, Safeties, and Diagnostics:

1. Unit controls shall include the following minimum components:
   a. Microprocessor with non-volatile memory. Battery backup system shall not be accepted.
   b. Single terminal block for power and controls.
   c. Control transformer to serve all controllers, relays, and control components.
   d. ON/OFF control switch.
   e. Replaceable solid-state controllers.
   f. Pressure sensors shall be installed to measure suction and discharge pressure for each circuit. Thermistors shall be installed to measure cooler entering and leaving fluid temperatures, outdoor ambient temperature, and suction temperature. Provision for field installation of accessory sensor to measure compressor return gas temperature.
2. Unit controls shall include the following functions:
   a. Automatic circuit lead/lag for dual circuit chillers.
   b. Hermetic scroll compressors are maintenance free and protected by an auto-adaptive control that minimizes compressor wear.
   c. Capacity control based on leaving chilled fluid temperature and compensated by rate of change of return-fluid temperature with temperature set point accuracy to 0.1° F (0.06° C).
   d. Limiting the chilled fluid temperature pull-down rate at start-up to an adjustable range of 0.2° F to 2° F (0.11° C to 1.1° C) per minute to prevent excessive demand spikes at start-up.
   e. Seven-day time schedule.
   f. Leaving chilled fluid temperature reset from return fluid and outside air temperature.
   g. Chilled water pump start/stop control and primary/standby sequencing to ensure equal pump run time.
   h. Dual chiller control for parallel chiller applications without addition of hardware modules and control panels (additional thermistors and wells are required).
   i. Timed maintenance scheduling to signal maintenance activities for pumps, condenser coil cleanings, strainer maintenance and user-defined maintenance activities.
   j. Boiler enable signal to initiate system heating mode.
   k. Low ambient protection to energize cooler and hydronic system heaters.
   l. Periodic pump start to ensure pump seals are properly maintained during off-season periods.
   m. Single step demand limit control activated by remote contact closure.
   n. Nighttime sound mode to reduce the sound of the machine by a user-defined schedule.
3. Diagnostics:
   a. The control panel shall include, as standard, a scrolling marquee display capable of indicating the safety lockout condition by displaying a code for which an explanation may be scrolled at the display.
   b. Information included for display shall be:
      1) Compressor lockout.
      2) Loss of charge.
      3) Low fluid flow.
      4) Cooler freeze protection.
      5) Cooler set point.
      6) Chilled water reset parameters.
      7) Thermistor and transducer malfunction.
      8) Entering and leaving-fluid temperature.
      9) Compressor suction temperature.
      10) Evaporator and condenser pressure.
      11) System refrigerant temperatures.
      12) Chiller run hours.
      13) Compressor run hours.
      14) Compressor number of starts.
      15) Low superheat.
      16) Time of day:
         a) Display module, in conjunction with the microprocessor, must also be capable of displaying the output (results) of a service test. Service test shall verify operation of every switch, thermistor, fan, and compressor before chiller is started.
         b) Diagnostics shall include the ability to review a list of the 20 most recent alarms with clear language descriptions of the alarm event. Display of alarm codes without the ability for clear language descriptions shall be prohibited.
         c) An alarm history buffer shall allow the user to store no less than 20 alarm events with clear language descriptions, time and date stamp event entry.
         d) The chiller controller shall include multiple connection ports for communicating with the local equipment network, the Carrier Comfort Network® (CCN) system and access to

chiller control functions from any point on the chiller.

e) The control system shall allow software upgrade without the need for new hardware modules.

4. Safeties:
   a. Unit shall be equipped with thermistors and all necessary components in conjunction with the control system to provide the unit with the following protections:
      1) Loss of refrigerant charge.
      2) Reverse rotation.
      3) Low chilled fluid temperature.
      4) Thermal overload.
      5) High pressure.
      6) Electrical overload.
      7) Loss of phase.
   b. Factory pump motors shall have external overcurrent protection.

I. Operating Characteristics:
   1. Unit shall be capable of operating down to –20 F (–29 C) on size 010 and 015 units, 45 F (7 C) on size 018-030 units, and 32 F (0° C) on size 035-060 units as standard.
   2. Unit shall be capable of starting and running at outdoor ambient temperatures up to 120 F (50 C) for all sizes. Unit shall additionally be able to stay online when running with a 125 F (52 C) ambient temperature.
   3. Unit shall be capable of starting up with 95 F (35 C) entering fluid temperature to the cooler.

J. Motors:

Condenser-fan motors shall be totally enclosed single-speed, 3-phase type with permanently lubricated bearings and Class F insulation (except Motormaster® V control motors which shall be open type and shall have Class B insulation).

K. Electrical Requirements:
   1. Unit/module primary electrical power supply shall enter the unit at a single location.
   2. Unit shall operate on 3-phase power at the voltage shown in the equipment schedule.
   3. Control points shall be accessed through terminal block.
   4. Unit shall be shipped with factory control and power wiring installed.

L. Chilled Water Circuit:
   1. Chilled water circuit shall be rated for 300 psig (2068 kPa). Units with optional pump package are rated for 150 psig (1034 kPa) working pressure.
   2. Solid-state flow monitor with integral relay shall be factory installed and wired.
   3. Brass body strainer with 40 mesh screen and ball type blow down.
   4. Optional hydronic package:
      a. Field pipe connections shall be copper Victualic type.
      b. Optional single or primary/stand-by operation pump systems. Dual pump systems shall have a pump discharge check valve.
      c. Pumps shall be single stage design, capable of being serviced without disturbing piping connections.
         1) Pump casing shall be of class 30 cast iron.
         2) The impeller shall be of cast bronze, closed type, dynamically balanced, keyed to the shaft and secured by locking cap screw.
         3) The hydronic kit will be provided with a flush line connection to ensure lubrication at the seal face and allow for positive venting of the seal chamber.
         4) Pump shall be rated for 150 psig (1034 kPa) working pressure.
         5) The pump case shall have gage tappings at the suction and discharge nozzles and include drain ports.
         6) Motors shall totally enclosed 3-phase type with grease lubricated ball bearings.
         7) Each pump shall be factory tested per Hydraulic Institute Standards.
         8) Pump motors shall be VFD (variable frequency drive) compatible.
      d. Fluid expansion tank shall be factory installed within the chiller cabinet insulates, pre-charged and rated for a maximum working pressure of 150 psig (1034 kPa).
      e. Water pressure taps (2) shall be factory installed across the cooler and rated for 150 psig (1034 kPa).
      f. Balancing valve shall be factory installed to set flow gage ports shall be factory installed and rated for 300 psig (2068 kPa).
      g. Hydronic assembly shall have factory supplied electric freeze protection to –20 F (–29 C) when optional heaters are used.
      h. Piping shall be type-L seamless copper tubing.

M. Special Features:

Certain standard features are not applicable when the features designated by * are specified. For assistance in amending the specifications, contact your Carrier representative.

* 1. Low-Ambient Operation:

Unit shall be capable of operating down to –20 F (–29 C) with the addition of the field or factory-installed solid-state Motormaster® V control with condenser coil temperature sensor. In addition, adequate field-supplied antifreeze with suitable corrosion inhibitor protection shall be field-installed in the evaporator circuit.

Additional components shall be required and used in conjunction with the low ambient device. Components include field-installed wind baffles and hot gas bypass. Motormaster® V control is standard on sizes 010 and 015.

2. Unit-Mounted Non-Fused Disconnect:

   Unit shall be supplied with factory-installed, non-fused electrical disconnect for main power supply.

3. Optional E-Coated MCHX Condenser Coil:

   E-coated aluminum microchannel coils shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers. Coating process shall ensure complete coil encapsulation, including all exposed fin edges. E-coat thickness of 0.8 to 1.2 mil with top coat having a uniform dry film thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided. E-coated coils shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross-hatch adhesion of 4B-5B per ASTM D3359-02. E-coated products shall have superior impact resistance with no cracking, chipping or peeling per NSF/ANSI 51-2002 Method 10.2 (U.S.A. Standards).

4. Remote Enhanced Display:

   Unit shall be supplied with indoor-mounted, remote, 40-character per line, 16-line display panel for field installation.

5. Chillervisor System Manager III Multi-Unit Control:

   Field-installed control shall sequence between 2 and 8 chillers in parallel in a single system. System shall control chilled water pumps.

6. Hot Gas Bypass:

   Unit shall be equipped with factory (or field) installed, microprocessor-controlled, hot gas bypass that shall permit unit operation down below the minimum step of capacity.

7. Energy Management Module:

   A factory or field-installed module shall provide the following energy management capabilities: 4 to 20 mA signals for leaving fluid temperature reset, cooling set point or demand limit control; 2-point demand limit control (from 15% to 100%) activated by a remote contact closure; and discrete input for "Ice Done" indication for ice storage system interface.

8. Security Grilles/Hail Guards:

   Unit shall be supplied with factory-installed, louvered, sheet metal panels which securely fasten to the chiller and provide condenser coil protection against hail and other physical damage.

9. Vibration Isolation:

   Vibration isolation pads shall be supplied for field installation at unit mounting points. Pads shall help to reduce vibration transmission into the occupied space.

10. Chilled Water Storage Tank:
    a. Fluid storage tank shall be rated for a maximum of 150 psig (1034 kPa).
    b. Shall provide a minimum 4 gallon per ton (3.7 L per kW) fluid storage capacity.
    c. Shall fit under the chiller to minimize system footprint requirements. Tanks fitted outside of the chiller footprint shall not be acceptable.
    d. Tank shall be constructed a cold rolled carbon steel shell.
    e. Tank shall be insulated with $^3/_4$-in. (19 mm) closed-cell, polyvinyl-chloride foam with a maximum K factor of 0.28.
    f. Tank shall be baffled to prevent temperature stratification.
    g. Tank shall have victaulic threaded connections.
    h. Tank shall have vent and drain plugs accessible from outside tank enclosure.
    i. Internal heaters shall provide freeze protection to –20 F (–29 C).

11. BACnet Translator Control:

    Unit shall be supplied with field-installed interface between the chiller and a BACnet Local Area Network (LAN, i.e., MS/TP EIA-485).

12. LON Translator control:

    Unit shall be supplied with field-installed interface between the chiller and a Local Operating Network (LON, i.e., LonWorks FT-10A ANSI/EIA-709.1).

13. Navigator™ Hand Held Display:
    a. Portable hand held display module with a minimum of 4 lines and 20 characters per line, of clear English, Spanish, Portuguese or French language.
    b. Display menus shall provide clear language descriptions of all menu items, operating modes, configuration points and alarm diagnostics. Reference to factory codes shall not be accepted.
    c. RJ-14 connection plug shall allow display module to be connected to factory-installed receptacle.
    d. Industrial grade coiled extension cord shall allow the display module to be moved around the chiller.

e. Magnets shall hold the display module to any sheet metal panel to allow hands-free operation.

f. Display module shall have NEMA 4x housing suitable for use in outdoor environments.

g. Display shall have back light and contrast adjustment for easy viewing in bright sunlight or night conditions.

h. Raised surface buttons with positive tactile response.

14. Touch Pilot™ Display:

    Unit shall be supplied with a remote mount touch screen display for network attachment to the chiller.

15. GFI Convenience Outlet:

    Shall be factory installed to provide the chiller with a 4 amp GFI receptacle. The receptacle shall have independent fuse protection. The convenience outlet is a 115-v female receptacle.

16. Freeze Protection Cooler Heaters:

    Cooler heaters shall provide protection from cooler freeze-up to –20 F (–29 C).

17. Value Sound Fans:

    Shall provide propeller-type fans for applications that are not highly sound-sensitive.

18. Ultra-Low Sound:

    Shall provide an acoustic enclosure around each compressor in conjunction with low-sound aero-acoustic fans to provide significant chiller sound reduction.

19. High SCCR (Short Circuit Current Rating):

    The optional high SCCR (short circuit current rating) device shall allow the chiller to tolerate a 65 kA (208/230, 380 and 460-v units) or 25 kA (575-v units) short circuit current for a brief period of time while protecting downstream components. The high SCCR option shall provide a higher level of protection than the standard unit.

20. Digital Compressor Option:

    Shall provide a factory-installed digital compressor to provide incremental steps for tighter temperature control (not available on size 018 units).