
AIR COOLED

Product Data Catalog



MODELS

ASR20C4_A

ASR30C4_A

ASR30C5_A

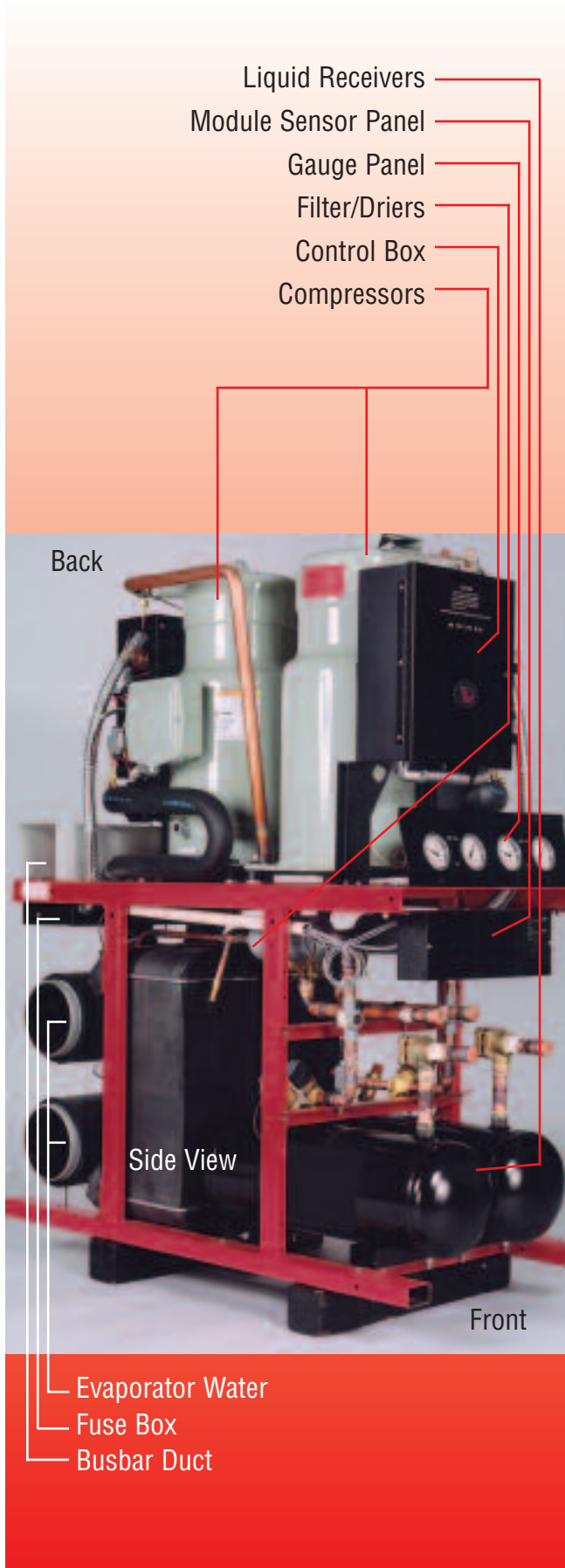
ASR50B4_A

ASR50Z6_A



The Leader in Modular Chillers

AIRSTACK AIR COOLED CHILLER MODULES



Highly Dependable

- Multiple independent systems for built-in standby
- Comprehensive computer monitoring of operations
- Automatic diagnostic recording of fault conditions
- Rotates lead compressor every 24 hours

Simple To Operate

- Large LCD screen displays information in plain English
- Simple keypad provides control of unit operations

Easy To Install

- Compact modules fit through standard doorways and into elevators
- Modules interconnect easily and quickly
- All refrigeration systems are evacuated and shipped with a holding charge of nitrogen
- Each compressor is charged with oil. (Additional oil may be required at the time of start-up to accommodate the air cooled condenser and interconnecting lines.)

Computer Control System

- Operates only the capacity required by the load
- Provides local and remote monitoring control of the chiller
- Operates at peak efficiency at any given load
- Provides operating load profile

Design Flexibility

- Wide array of module combinations
- Install only the capacity required at the time

Simple To Service

- Does not require unique proprietary training
- Service can often be performed on a convenient, non-emergency basis
- Most components are standard, off the shelf design

Optional

- Vertical discharge and liquid connections available upon request.

AIRSTACK AIR COOLED PERFORMANCE TABLES

SINGLE MODULE ASR20C4_A			SATURATED DISCHARGE TEMPERATURE						
Leaving Chilled Water°F	115°F			125°F			135°F		
	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
42	17.4	18.0	11.6	16.0	20.3	9.4	15.3	21.5	8.5
44	18.3	18.0	12.2	16.9	20.3	10.0	16.2	21.5	9.1
45	18.8	18.0	12.5	17.2	20.3	10.2	16.5	21.5	9.2
46	19.2	18.0	12.8	17.7	20.3	10.4	16.9	21.5	9.4
48	20.1	17.9	13.5	18.5	20.4	10.9	17.7	21.6	9.9
50	21.0	17.9	14.1	19.5	20.4	11.5	18.7	21.6	10.4

SINGLE MODULE ASR30C4_A			SATURATED DISCHARGE TEMPERATURE						
Leaving Chilled Water°F	115°F			125°F			135°F		
	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
42	26.0	27.1	11.5	24.2	29.6	9.8	22.6	31.2	8.7
44	27.1	26.8	12.1	25.2	29.8	10.1	23.4	31.4	8.9
45	27.5	26.9	12.3	25.6	29.9	10.3	23.8	31.5	9.1
46	28.0	27.0	12.4	26.1	29.9	10.5	24.1	31.5	9.2
48	28.9	26.9	12.9	26.8	30.0	10.7	24.6	31.6	9.3
50	29.8	27.0	13.2	27.4	30.1	10.9	25.0	31.7	9.5

SINGLE MODULE ASR30C5_A			SATURATED DISCHARGE TEMPERATURE						
Leaving Chilled Water°F	115°F			125°F			135°F		
	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
42	26.8	26.2	12.3	25.2	29.2	10.4	23.8	31.0	9.2
44	27.9	26.2	12.8	26.2	29.3	10.7	24.6	31.3	9.4
45	28.4	26.3	13.0	26.7	29.4	10.9	25.0	31.4	9.6
46	28.9	26.3	13.2	27.2	29.5	11.1	25.4	31.4	9.7
48	29.8	26.4	13.5	27.9	29.5	11.3	25.9	31.5	9.9
50	30.7	26.5	13.9	28.5	29.6	11.6	26.3	31.6	10.0

SINGLE MODULE ASR50B4_A			SATURATED DISCHARGE TEMPERATURE						
Leaving Chilled Water°F	115°F			125°F			135°F		
	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
42	40.4	48.7	10.0	37.6	50.8	8.9	35.0	52.4	8.0
44	41.8	49.5	10.1	39.2	51.7	9.1	36.4	53.9	8.1
45	42.6	49.9	10.2	39.9	52.2	9.2	37.1	54.5	8.2
46	43.5	50.3	10.4	40.6	52.6	9.3	37.8	55.0	8.3
48	45.2	51.1	10.6	42.1	53.5	9.4	39.2	55.7	8.4
50	47.0	51.9	10.9	43.8	54.2	9.7	40.5	56.5	8.6

SINGLE MODULE ASR50Z6_A			SATURATED DISCHARGE TEMPERATURE						
Leaving Chilled Water°F	115°F			125°F			135°F		
	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
40	44.3	42.6	12.5	41.9	47.2	10.7	39.5	52.3	9.1
42	46.2	42.7	13.0	43.7	47.3	11.1	41.2	52.5	9.4
44	48.1	42.9	13.5	45.5	47.5	11.5	42.9	52.6	9.8
45	49.0	43.0	13.7	46.4	47.5	11.7	43.8	52.7	10.0
46	50.0	43.0	13.7	47.3	47.6	11.9	44.7	52.8	10.2
48	52.0	43.2	14.4	49.3	47.8	12.4	46.5	53.0	10.5
50	54.1	43.4	14.9	51.2	47.9	12.8	48.4	53.1	10.9

All performance data is based on a 10°F chilled water temperature drop through the evaporator. For total chiller performance, multiply above outputs (TONS) and input (KW) by the number of modules. For selection procedure see selection example. Note: With sufficient notice, 1/2 modules are available when used with one or more full modules. (These modules are physically identical to full modules but with only one refrigerant circuit.)

AIRSTACK AIR COOLED CAPACITY TABLES

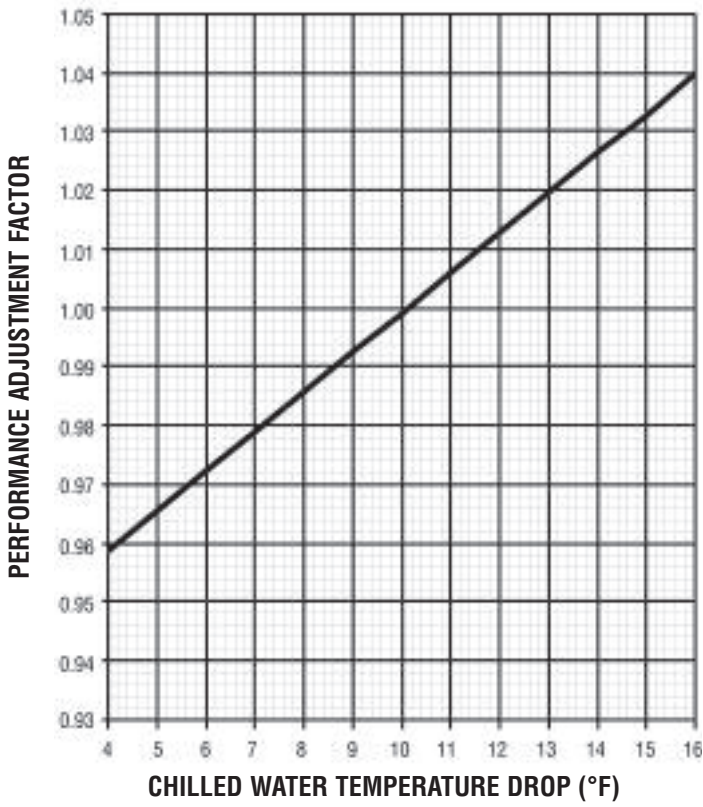


Figure 1. Performance Adjustment Factor

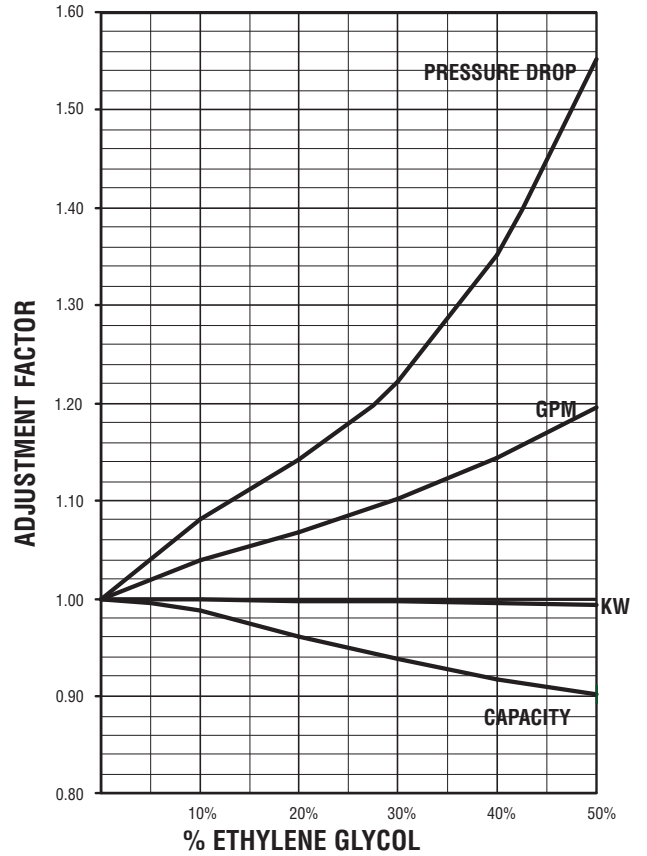


Figure 3. Ethylene Glycol Adjustment Factors

Use Curve	For
A	ASR20C_A; ASR30C4_A
B	ASR30C5_A
C	ASR50B4_A
D	ASR50Z6_A

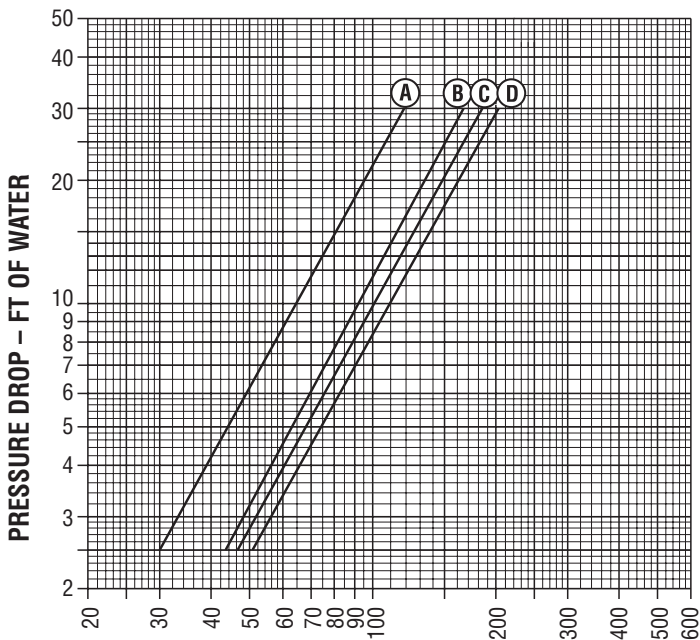


Figure 2. Water Pressure Drop

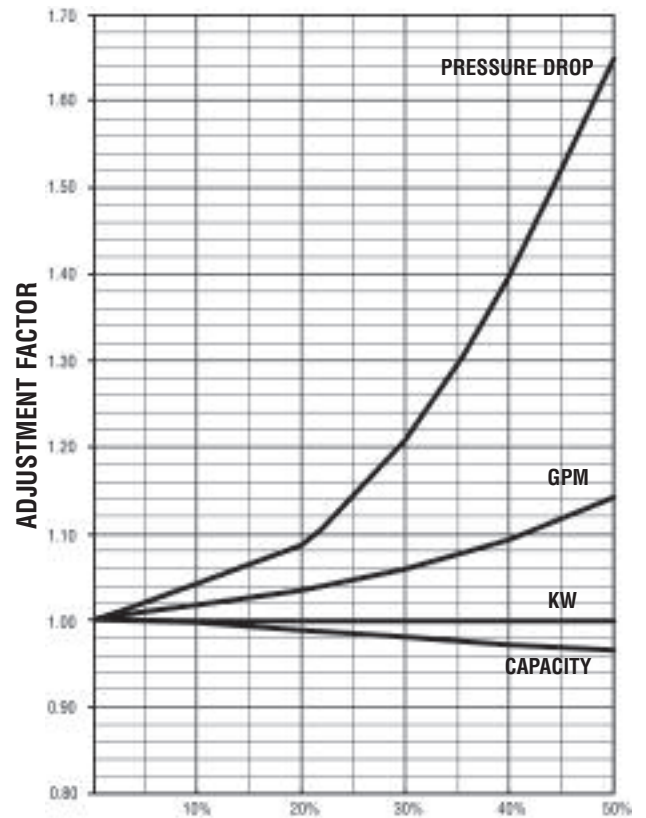


Figure 4. Propylene Glycol Adjustment Factors

AIRSTACK AIR COOLED SELECTION GUIDE

Selection

To select an AIRSTACK Air Cooled chiller, the following information is required:

1. Load in tons of refrigeration.
2. Chilled water temperature drop.
3. Leaving chilled water temperature.
4. Saturated refrigerant discharge temperature.

Capacity Tables

Capacity tables are based on a 10°F temperature drop through the evaporator. For other than 10°F temperature drop, apply the respective performance adjustment factors from **Figure 1**.

Evaporator Water Flow Rate

Evaporator water flow is determined as follows:

$$\text{GPM} = (24) (\text{TONS}) / \text{TEMPERATURE DROP}$$

Saturated Refrigerant Discharge Temperature (Tc)

$$T_c = T_a + TD$$

Ta = Design ambient air temperature
TD = Temperature difference at which air cooled condenser is selected

Note: When the equivalent length of connecting lines between module and condenser is less than 100 feet and properly sized, the affect on line losses on Tc can be considered negligible.

Waterside Pressure Drop

Evaporator waterside pressure drops are provided in **Figure 2**. To use **Figure 2**, divide the total chilled water GPM by the number of modules in the chiller.

Chiller Water Selection Example (Assumes ASR30C5 Modules)

System load = 55 TONS. Chilled water drop of 12°F. Leaving chilled water temperature of 45°F. Design ambient air temp. of 95°F. TD for condenser selection of 30°F.

1. Use **Figure 1** adjustment factor to convert tons at 12°F to equivalent tons of 10°F for use with capacity tables.
TONS = $55 / 1.012 = 54.2$ TONS
2. Determine saturated discharge temperature:
 $T_c = T_a + TD$
 $T_c = 95^\circ\text{F} + 30^\circ\text{F} = 125^\circ\text{F}$
3. Select the appropriate performance table based on module to be used (ASR30C5). Read the CAPACITY and KW of a single module at the water temperature specified (45°F) and determined saturated discharge temperature (125°F). Capacity = 26.7 Tons, Kw = 29.4
4. Divide equivalent tons required at 10°F temperature drop by single module capacity from tables.
MODULES REQUIRED = $54.2 / 26.7 = 2$ MODULES
CHILLER CAPACITY = $(26.7) (2) = 53.4$ TONS
POWER INPUT = $(29.4) (2) = 58.8$ KW
At 12°F temperature drop, applying **Figure 1** performance adjustment factor results in:
TONS = $(53.4) (1.015) = 54.2$ vs. system load of 55 TONS

5. To determine evaporator water flow and pressure drop, first determine GPM.

$$\text{GPM} = (24) (54.2) / 12 = 108.4$$

$$\text{GPM/Module} = 108.4 / 2 = 54.2$$

From **Figure 2**, read pressure drop from curve B.

$$\text{Pressure drop} = 3.7 \text{ ft. of water}$$

Low Temperature Operation With Glycol

(Assumes ASR30C5 Modules)

Ethylene Glycol adjustment factors (**Figure 3**) should be used to adjust performance depending on the percent of glycol used in the evaporator circuit. The factors in Table 3 are based on a 10°F change in fluid temperature through the evaporators.

Capacity and KW should be obtained by extrapolating no more than 10°F from the lowest leaving chilled water temperature shown in the capacity tables.

MULTISTACK should be contacted if leaving glycol temperatures below 32°F are required.

Adjustment factors for Propylene Glycol are shown in **Figure 4**, and are used in the same way given in the following example.

Ethylene Glycol Selection Example

(Assumes ASR30C5 Modules)

Determine CAPACITY, GPM, Pressure Drop and KW for an ASR30C5 module cooling 30% Ethylene Glycol from 45°F to 35°F, with a saturated discharge temperature of 125°F.

1. By extrapolating from the Performance Tables:
CAPACITY: 22.3 tons; KW: 28.9
2. Evaporator water flow and pressure drop is determined for water as in the previous example.
 $\text{GPM} = \frac{(24) (22.3)}{10} = 54 \text{ GPM}$

From **Figure 2**, read pressure drop from Curve B

Pressure drop = 5 ft. of water

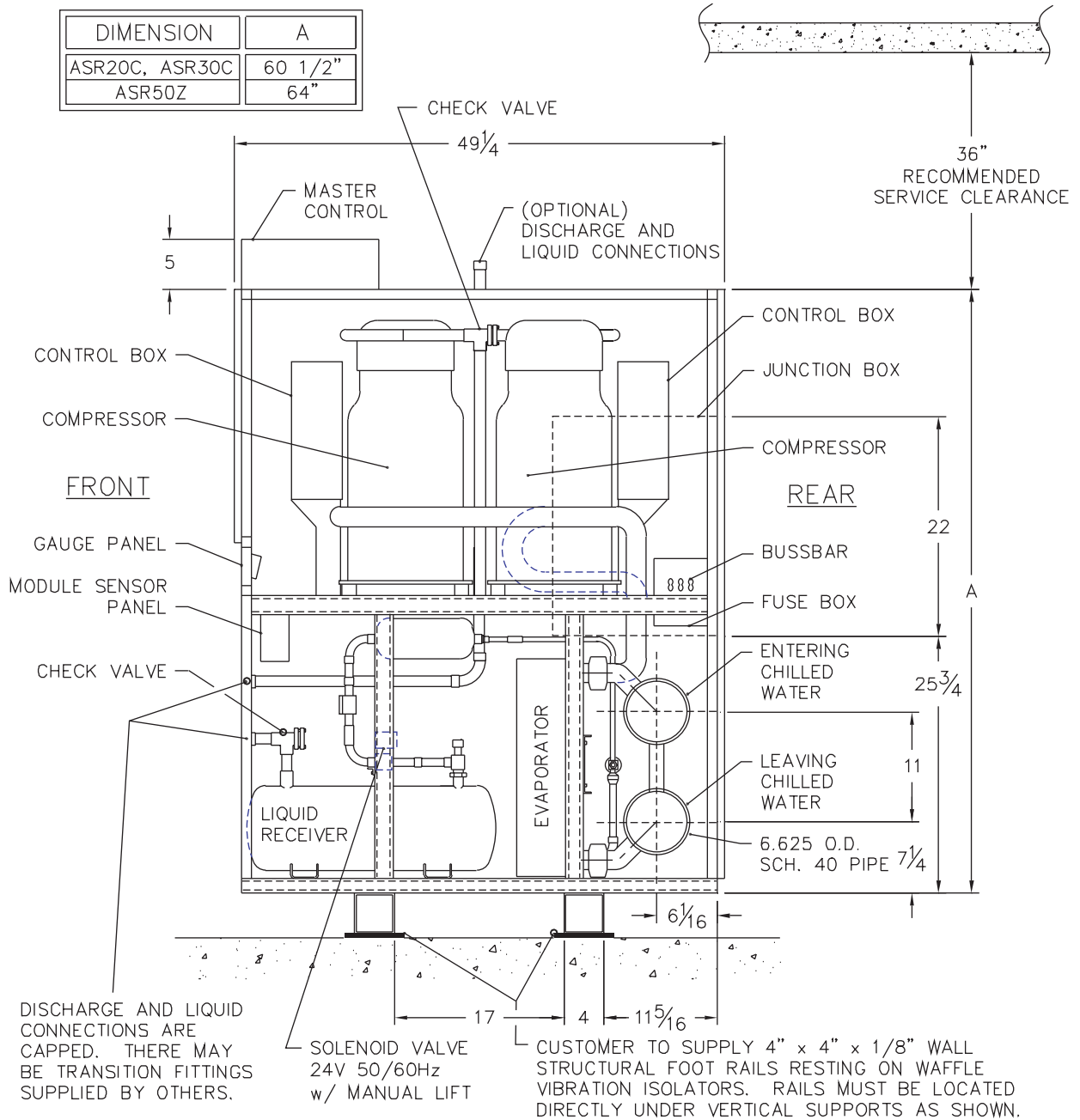
3. To convert performance for water to performance with Ethylene Glycol, read adjustment factors from **Figure 3** at 30% Glycol.

CAPACITY Adjustment:	0.94
KW Adjustment:	0.99
GPM Adjustment:	1.10
Pressure Drop Adjustment:	1.22
4. Calculate performance with 30% Ethylene Glycol by multiplying performance for water by adjustment factors.

CAPACITY:	$22.3 \times 0.94 = 20.9$ TONS
KW:	$28.9 \times 0.99 = 28.6$ KW
GPM:	$54.0 \times 1.10 = 59.4$ GPM
Pressure Drop:	$3.7 \times 1.22 = 4.5$ ft. of water

If a water temperature drop greater or less than 10°F is required, begin by first multiplying the CAPACITY using the performance adjustment factor from **Figure 1**.

AIRSTACK AIR COOLED SCHEMATICS



AIRSTACK AIR COOLED COMPONENTS

Refrigeration Components Installed in Standard Unit

The following components, normally required in an air cooled split system, are factory installed and shipped as part of the standard AIRSTACK module.

- Liquid line solenoid valves
- Check valves
- Liquid line filter/driers
- Liquid line sight glass
- Refrigerant receiver tanks with pressure relief valves and manual shut-off valves. Standard receiver size 50 lbs. (Charge depends on size and application. Alternate receivers with pressure relief valves may be required after consulting AIRSTACK.)

Air Cooled Condenser

The air cooled condenser can be purchased directly from a manufacturer by the customer, or as a convenience, AIRSTACK will purchase and supply the condenser. AIRSTACK recommends that the air cooled condenser include:

- Separate condenser circuit for each compressor*
- Condenser fans are controlled by pressure switches with monitor condenser pressure.
- Flooded condenser head pressure control on each circuit for operation at ambient temperatures below 45°F.
- 3 ph/60 Hz power voltage compatible with chiller and 24 vac control voltage
- Additional oil may have to be added to the system at time of start-up to accommodate the air cooled condenser and interconnecting lines.
- To determine the total HEAT OF REJECTION (THR) for selecting the condenser, use:
 $HR/Module (MBH) = 12 [TONS + 0.285 (KW)]$
 $THR (MBH) = (No. of Modules) (HR/Module)$

*CAUTION: Each Module has two independent refrigeration circuits. A separate condenser circuit is required for each refrigeration circuit.

Interconnecting Refrigerant Piping Between Chiller and Condenser

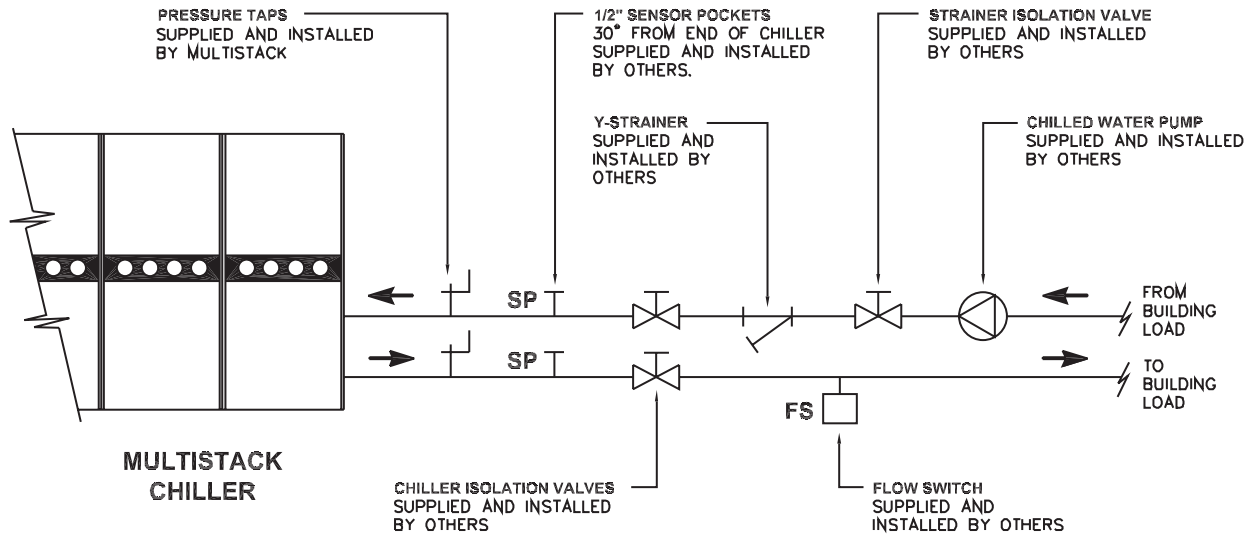
The interconnecting piping is supplied by others and good engineering practices should be used in sloping and trapping the lines. Recommend line sizes for use with specific AIRSTACK modules are:

LIQUID LINE SIZES AIR COOLED						
MODEL	Liquid 50'	Liquid 75'	Liquid 100'	Liquid 125'	Liquid 150'	PSI drop
ASR20C	3/4"	3/4"	3/4"	3/4"	3/4"	.5 - 3.5
ASR30C	7/8"	7/8"	7/8"	7/8"	7/8"	.5 - 3.0
ASR50Z & ASR50B	1 1/8"	1 1/8"	1 1/8"	1 1/8"	1 1/8"	.5 - 2.5
DISCHARGE LINE SIZES AIR COOLED						
MODEL	Disch 50'	Disch 75'	Disch 100'	Disch 125'	Disch 150'	PSI drop
ASR20C	1 1/8"	1 1/8"	1 1/8"	1 3/8"	1 3/8"	2.0 - 4.0
ASR30C	1 1/8"	1 3/8"	1 3/8"	1 3/8"	1 3/8"	2.0 - 4.5
ASR50Z & ASR50B	1 3/8"	1 5/8"	1 5/8"	1 5/8"	1 5/8"	3.5 - 5.0

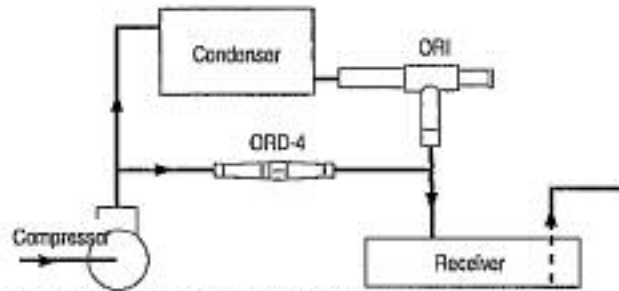
MODEL	ASR20C4_A	ASR30C4_A	ASR30C5_A	ASR50B4_A	ASR50Z6_A
Compressor Type	Scroll	Scroll	Scroll	Reciprocating	Scroll
Weight (lbs each)	160	227	227	268	407
Normal Capacity (each)	10	15	15	25	25
Quantity	2	2	2	2	2
Oil Change (pints)	7	11.5	11.5	14	12.5
Evaporator	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate
Weight (lbs each)	51.7	51.7	75.5	90.25	205
Water Storage (gallons each)	2.42	2.42	1.867	2.164	5.20
Quantity	2	2	2	2	1
Header System (gallons)	5.5	5.5	5.5	5.5	7
Refrigerant Type	R22	R22	R22	R22	R22
Refrigerant Charge (lbs/circuit)	8	10	12	13	20
Number of Circuits	2	2	2	2	2
Operating Weight (lbs)	1150	1300	1400	1500	2050
Shipping Weight (lbs)	1100	1250	1375	1475	1750

AIRSTACK AIR COOLED SCHEMATICS

REQUIRED CHILLED WATER PIPING



CONDENSER SCHEMATIC WITH HEAD PRESSURE CONTROL



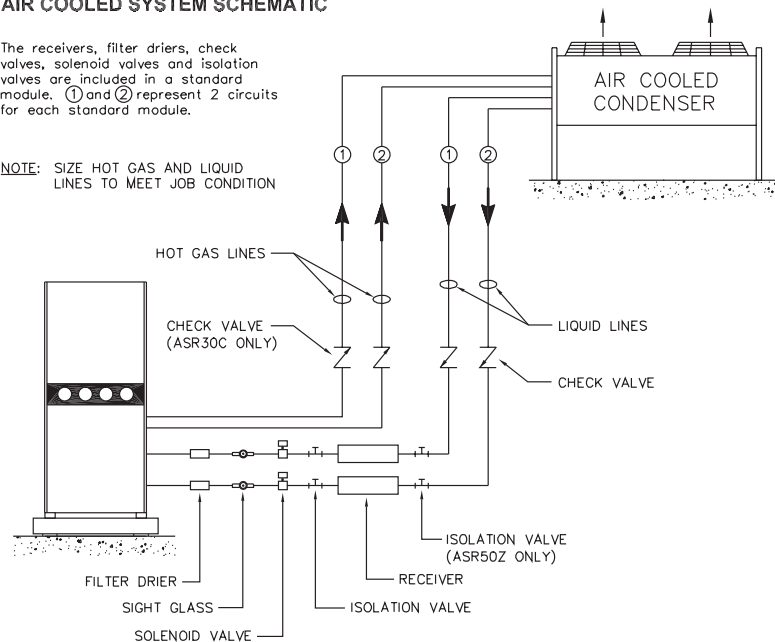
LOCATE ORI OUTSIDE AT CONDENSER OUTLET
 LOCATE ORD INSIDE AT COMPRESSOR OUTLET AND RECEIVER INLET.

OPTIONAL FLOODED CONDENSER HEAD PRESSURE CONTROL FOR LOW AMBIENT (<45°F) OPERATION. REQUIRED ON ALL CIRCUITS.

AIR COOLED SYSTEM SCHEMATIC

The receivers, filter driers, check valves, solenoid valves and isolation valves are included in a standard module. ① and ② represent 2 circuits for each standard module.

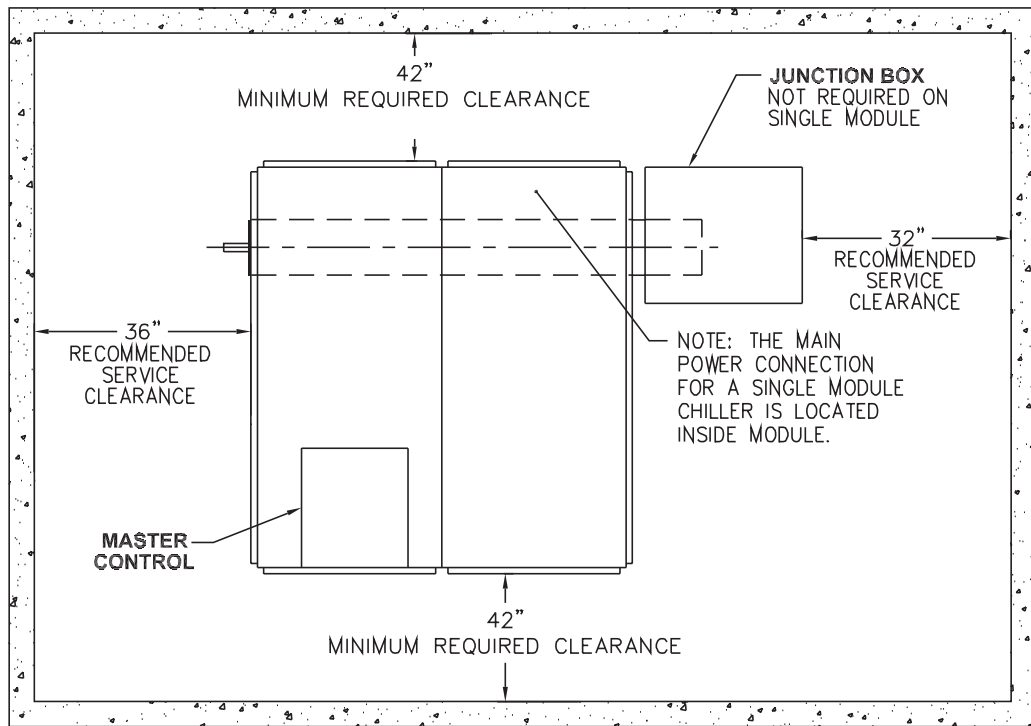
NOTE: SIZE HOT GAS AND LIQUID LINES TO MEET JOB CONDITION



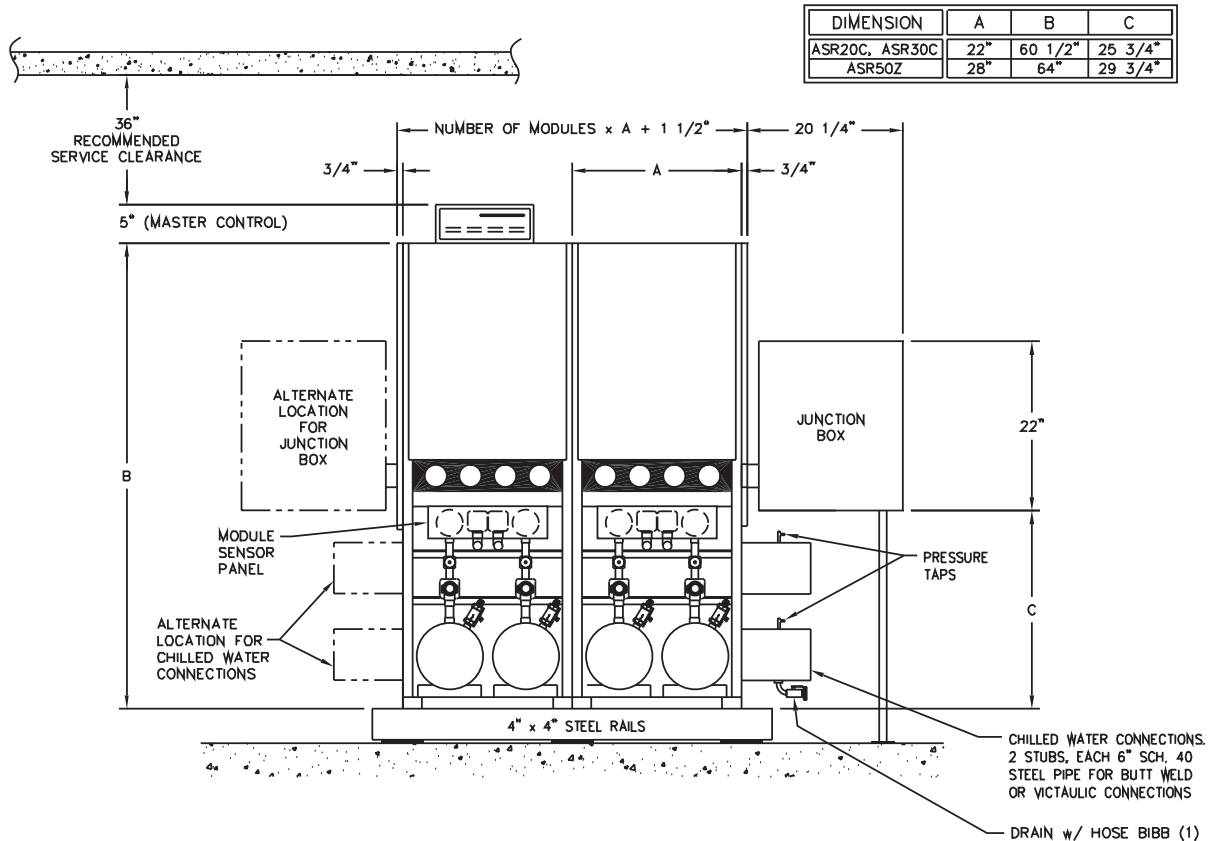
AIRSTACK AIR COOLED

SCHEMATICS

PLAN VIEW



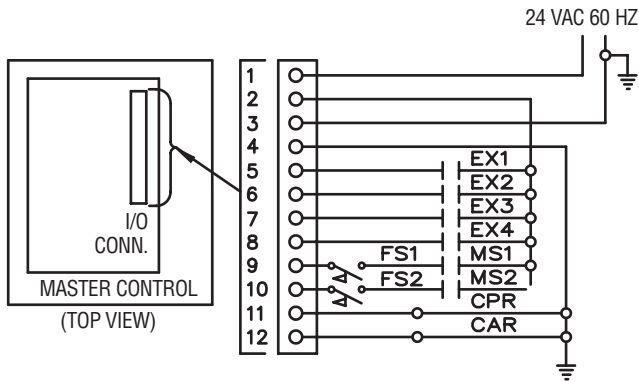
FRONT ELEVATION VIEW



AIRSTACK AIR COOLED

ELECTRICAL DATA

External Input/Output Connections



Note: For additional information, see Installation Manual
– Air Cooled Supplement and Master Control User Manual.

Inputs

- EX1 Close Circuit To Operate: Open To Stop. Manual Reset Required.
- EX2 Close Circuit To Operate: Open To Stop. Auto Reset. Remote Start/Stop
- EX3 Close Circuit To Operate: Open To Stop. Manual Reset Required.
- EX4 Close Circuit To Operate: Open To Stop. Auto Reset.
- CF Condenser Fan Starter Interlock.
- FS2 Chilled Water Flow Switch. (Or Optional Pressure Differential Switch)
- MS2 Chilled Water Pump Starter Interlock.
- TC1 Ambient Temperature Thermostat. (Required for condenser without low ambient provisions.)

Outputs

- CFR Condenser Fan Relay. (24 VAC, 5 VA)
- CAR Customer Alarm Relay (24 VAC, 5 VA)

Note: Interlock wiring to be 16 AWG minimum and field supplied by others. External relays, contractors and flow switches supplied by others.

System Wire & Fuse Sizing Specifications (Applicable codes may require different wire sizing)

- Compressor Rated Load Amps (RLA) and Locked Rotor Amps (LRA)
Data: RLA/LRA

VOLTAGE	208	230	460	575
25T Scroll	84/500	76/500	38/250	31/198
25T Bristol	86/400	78/400	39/200	32/160
15T Scroll	46/337	48/376	21/178	17/143
10T Scroll	30/222	30/251	15/117	12/94

- Wiring Sizing: Minimum Circuit Ampacity (MCA)
 $MCA = (1.25 \times RLA1^*) + RLA2 + RLA3.....$

MCA	3 Conductors	6 Conductors
	1 Conduit	2 Conduit
50	8	—
65	6	—
85	4	—
100	3	—
115	2	—
130	1	—
150	1/0	—
175	2/0	—
200	3/0	—
230	4/0	—
255	250 MCM	—
285	300 MCM	1/0
300	—	2/0
350	—	3/0
400	—	4/0
460	—	4/0
500	—	250 MCM

- Fuse Sizing: Maximum Fuse (MF), Type RK5 Fuse
 $MF = (2.25 \times RLA1^*) + RLA2 + RLA3.....$

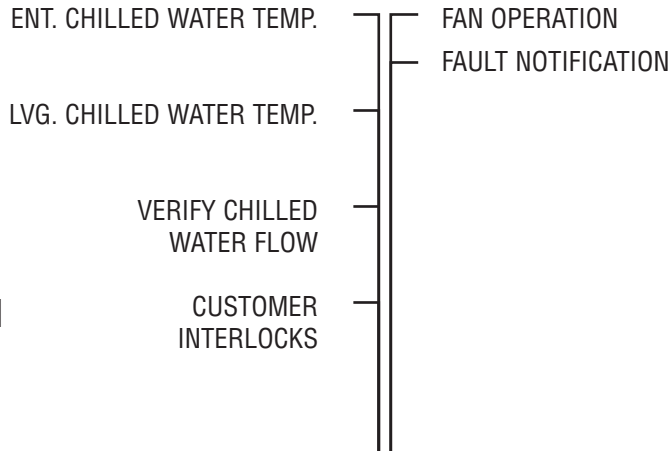
Where the MF does not equal a standard size fuse, the next larger size should be used.

4. NOTES:

- Compressor Related Load Amps (RLA) and Locked Rotor Amps (LRA) are based on 125°F Saturated Condensing Temperature.
- *RLA1 = RLA of the largest compressor in the system. RLA2 & RLA3 = RLA of the other compressors in the system.
- The total system Minimum Circuit Ampacity (MCA) shall not exceed 500A.
- Wire sizing is based on the Nat. Elect. Code (NEC) rating for 75°C copper wire, with 3 wires per conduit.
- Wiring distance from branch circuit shall not exceed 100 ft.

AIRSTACK AIR COOLED CONTROL SCHEMATICS

Chiller Data

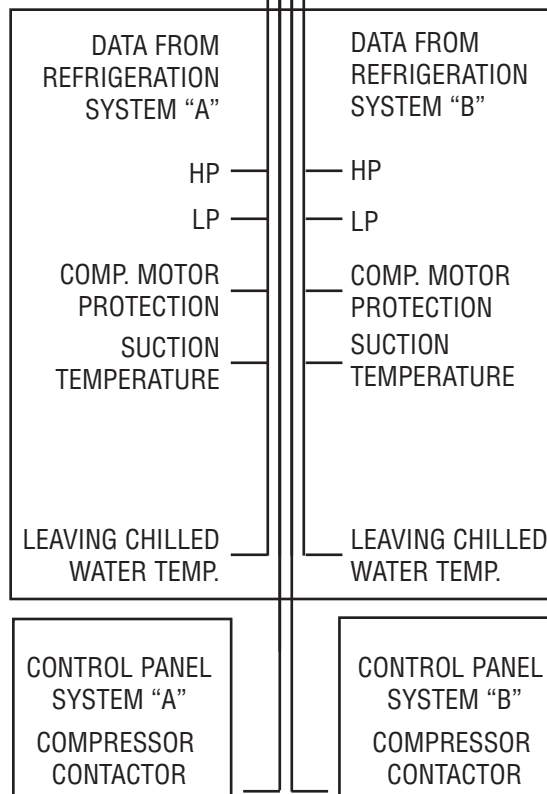


Master Control and Display
(Can stage a maximum of 12 modules)



Module Data

MODULE SENSOR PANEL



Remote PC



OPTIONAL RS-232 SERIAL PORT CONNECTION TO REMOTE PC, MODEM, BUILDING MANAGEMENT SYSTEMS, OR BACnet® PORTAL.

IDENTICAL SENSOR PANELS MODULE IN CHILLER

AIRSTACK AIR COOLED

MECHANICAL SPECIFICATIONS

General

Modules are ETL listed in accordance with UL standard 1995, CSA certified per standard C22.2 #236, and bear the ASME UM stamp on all heat exchangers.

Modules ship wired, charged with oil, and contain a holding charge of dry nitrogen.

Compressors, heat exchangers, piping and controls are mounted on a heavy gauge steel frame. Electrical controls, contactors, and relays for each module, are mounted within that module.

Factory Mounted Refrigerant Components

Refrigerant receiver tanks with pressure relief valves and shut-off valves, liquid line solenoid valves, check valves, liquid line filter driers and liquid line sight glasses are factory mounted in each module.

Chilled Water Mains

Each module includes supply and return mains for the chilled water. Grooved end connections are provided for interconnection to 6" US standard (6.625" outside diameter) customer piping with victaulic type couplings. Standard units include 30 mesh in-line strainers in the evaporator supply headers.

Evaporators

Each evaporator is a brazed plate heat exchanger constructed of 316 stainless steel; designed, tested and stamped in accordance with ASME code for a 360 psig working pressure.

Air Cooled Condensers

Condensers may be supplied by others, or special ordered by AIRSTACK. AIRSTACK's special ordered condensers come factory assembled. The condenser coil is divided into individual refrigerant circuits, each sized for its own specific application. Each circuit comes with its own inlet and outlet connections, individually labeled.

Compressors

Each module contains two separate refrigeration systems. The hermetic compressor in each system is mounted to the frame with rubber-in-shear isolators. Each system also includes high discharge pressure and low suction pressure cutouts.

Central Control System

Scheduling of the various compressors is performed by the microprocessor control. Compressors operating schedules are sequenced every 24 hours to assure distribution of run time. This microprocessor monitors the following on each refrigeration system:

- Discharge pressure cut-out
- Suction pressure cut-out
- Compressor motor protector
- Suction temperature
- Evaporator entering and leaving chilled water temperature

A fault condition from these controls or sensors will cause a shutdown of that compressor with the transfer of load requirements to another available compressor. When a fault occurs, the microprocessor records the reading of conditions at the time and stores the data for recall by operating personnel. This information can be recalled using the keys and displayed on the LCD screen. A running history of the fault occurrence conditions is maintained (up to the last 20 occurrences) should it be required for trouble shooting.

Individual monitoring of leaving chilled water temperature from each refrigeration system is designed to protect against freeze-up.

The control system monitors entering and leaving chilled water temperatures to determine system load and selects the number of compressors required. Response time and set points are adjustable.

Options

Options are available upon request.



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The Leader in Modular Chillers

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