
WATER COOLED

Product Data Catalog



MULTISTACK

The Leader in Modular Chillers

MODELS

MS20C4_W

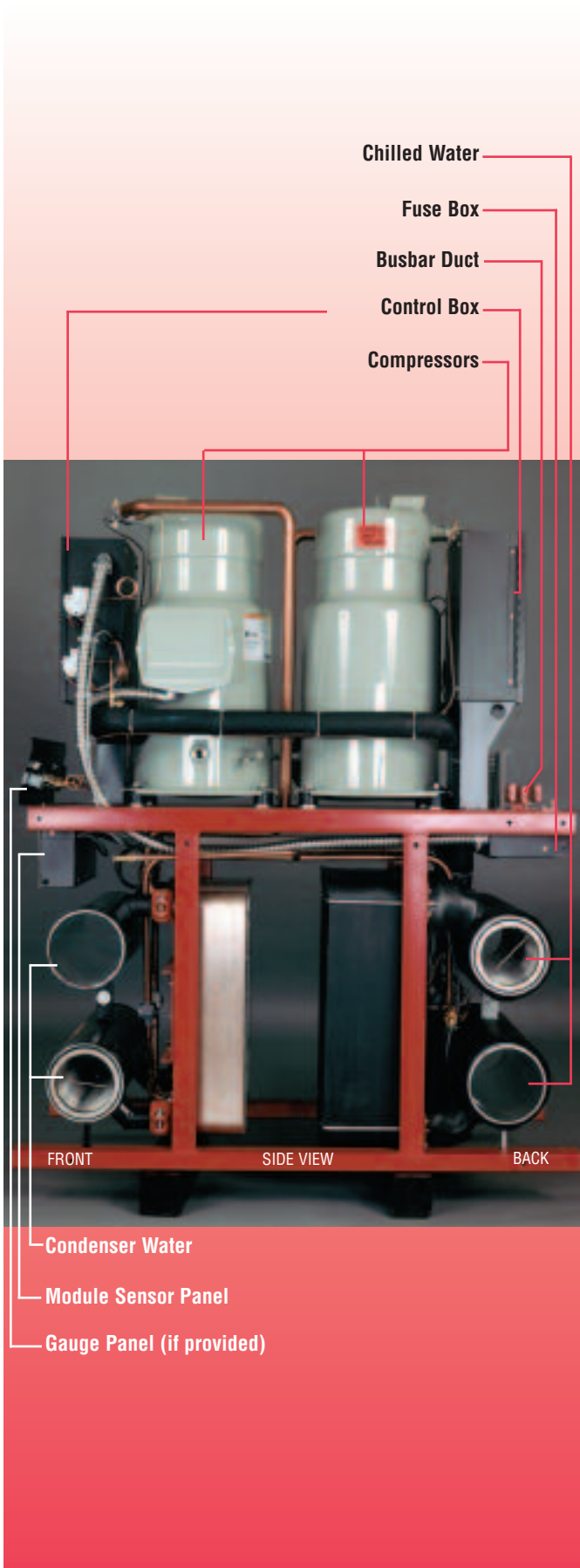
MS30C4_W

MS30C5_W

MS50B4_W

MS50Z6_W





HIGHLY DEPENDABLE

- Multiple independent systems for redundancy
- 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 factory charged and run tested

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

MULTISTACK WATER COOLED

PERFORMANCE TABLES

SINGLE MODULE	ENTERING CONDENSER WATER TEMPERATURE														
	75°F			80°F			85°F			90°F			95°F		
MS20C4_W	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
Leaving Chilled Water °F															
40°F	19.1	13.2	17.3	18.4	14.4	15.3	17.9	15.7	13.2	17.3	16.8	12.3	16.7	18.1	11.1
42°F	20.1	13.3	18.1	19.4	14.6	16.0	18.7	15.8	14.2	17.9	17.0	12.7	17.2	18.2	11.3
44°F	21.2	13.4	18.9	20.4	14.7	16.7	20.2	15.9	15.2	18.6	17.2	13.0	17.7	18.4	11.6
45°F	21.7	13.5	19.3	20.9	14.7	17.0	20.6	16.0	15.5	19.1	17.2	13.3	18.2	18.4	11.8
46°F	22.2	13.5	19.7	21.4	14.8	17.4	21.1	16.2	15.6	19.5	17.3	13.5	18.6	18.5	12.1
48°F	23.2	13.6	20.5	22.4	14.9	18.1	22.1	16.3	16.3	20.5	17.4	14.1	19.5	18.6	12.6
50°F	24.3	13.7	21.2	23.4	15.0	18.7	22.5	16.4	16.5	21.7	17.5	14.9	20.8	18.8	13.3

MS30C4_W	75°F			80°F			85°F			90°F			95°F		
	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
40°F	28.0	21.7	15.5	27.6	22.9	14.5	26.8	23.9	13.5	26.1	25.5	12.3	25.1	26.7	11.3
42°F	29.3	22.1	15.9	28.8	23.2	14.9	28.1	24.3	13.9	27.4	25.6	12.8	26.4	27.0	11.7
44°F	30.5	22.2	16.5	30.0	23.4	15.4	29.4	24.5	14.4	28.6	25.8	13.3	27.7	27.1	12.3
45°F	31.2	22.5	16.6	30.8	23.5	15.7	30.0	24.6	14.6	29.3	25.8	13.6	28.4	27.2	12.5
46°F	31.7	22.6	16.8	31.3	23.6	15.9	30.6	24.7	14.9	29.8	25.9	13.8	28.8	27.3	12.7
48°F	32.9	22.7	17.4	32.4	23.8	16.3	31.6	24.8	15.3	30.9	26.0	14.3	29.9	27.4	13.1
50°F	34.0	22.9	17.8	33.5	24.0	16.8	32.8	25.0	15.7	32.0	26.3	14.6	31.0	27.7	13.4

MS30C5_W	75°F			80°F			85°F			90°F			95°F		
	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
40°F	29.4	21.3	16.6	28.8	22.4	15.4	28.1	23.5	14.3	27.6	24.9	13.3	27.0	26.4	12.3
42°F	30.3	21.4	17.0	29.6	22.6	15.7	29.0	23.6	14.7	28.5	25.1	13.6	28.0	26.5	12.7
44°F	31.2	21.6	17.3	30.6	22.7	16.2	30.0	23.7	15.2	29.5	25.2	14.0	28.9	26.6	13.0
45°F	31.6	21.7	17.5	31.0	22.8	16.3	30.5	23.8	15.4	30.0	25.3	14.2	29.4	26.7	13.2
46°F	32.1	21.8	17.7	31.5	22.9	16.5	31.0	24.0	15.5	30.5	25.4	14.4	29.9	26.8	13.4
48°F	33.2	21.9	18.2	32.6	23.0	17.0	32.0	24.2	15.9	31.5	25.5	14.8	30.9	26.8	13.8
50°F	34.2	22.0	18.7	33.6	23.2	17.4	33.1	24.3	16.3	32.6	25.5	15.3	31.9	26.9	14.2

MS50B4_W	75°F			80°F			85°F			90°F			95°F		
	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
40°F	46.1	47.7	11.6	44.2	47.8	11.1	42.5	48.8	10.5	41.0	49.2	10.0	39.9	50.7	9.5
42°F	48.0	48.8	11.8	46.0	48.9	11.3	44.4	49.8	10.7	42.8	50.4	10.2	41.8	52.3	9.6
44°F	49.8	49.1	12.0	47.9	50.0	11.5	46.3	51.0	10.9	44.7	51.6	10.4	43.6	53.4	9.8
45°F	50.7	49.8	12.2	48.8	50.5	11.6	47.2	51.7	11.0	45.6	52.4	10.5	44.6	54.1	9.9
46°F	51.6	50.3	12.3	49.7	51.0	11.7	48.0	51.9	11.1	46.5	52.6	10.6	45.4	54.5	10.0
48°F	53.2	51.1	12.5	51.4	51.8	11.9	49.8	52.9	11.3	48.2	54.1	10.7	47.1	55.4	10.2
50°F	54.9	51.9	12.7	53.1	52.4	12.2	51.5	53.7	11.5	49.9	55.2	10.9	48.8	56.6	10.4

MS50Z6_W	75°F			80°F			85°F			90°F			95°F		
	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER	Output TONS	Input KW	EER
40°F	50.5	33.4	18.1	49.4	35.2	16.8	48.2	36.9	15.7	47.1	38.9	14.5	45.9	40.8	13.5
42°F	52.5	33.6	18.8	51.3	35.3	17.4	50.2	37.0	16.3	49.0	39.0	15.1	47.7	41.0	14.0
44°F	54.5	33.8	19.3	53.3	35.5	18.0	52.1	37.2	16.8	50.8	39.1	15.6	49.6	41.1	14.5
45°F	55.5	33.9	19.6	54.3	35.5	18.4	53.1	37.2	17.1	51.8	39.2	15.9	50.5	41.2	14.7
46°F	56.5	33.9	20.0	55.3	35.6	18.6	54.0	37.3	17.4	52.7	39.3	16.1	51.4	41.2	15.3
48°F	58.6	34.1	20.6	57.3	35.8	19.2	56.0	37.5	17.9	54.7	39.4	16.7	53.4	41.4	15.5
50°F	60.8	34.3	21.3	59.5	36.0	19.8	58.2	37.6	18.6	56.8	39.6	17.2	55.4	41.5	16.0

All performance data is based on a 10°F chilled water temperature drop through the evaporator and condenser. For total chiller performance multiply above output (TONS) and input (KW) by the number of modules. For selection procedures see selection example on page 5 of "Water Cooled Product Data Catalog".

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.)

MULTISTACK WATER COOLED CAPACITY TABLES

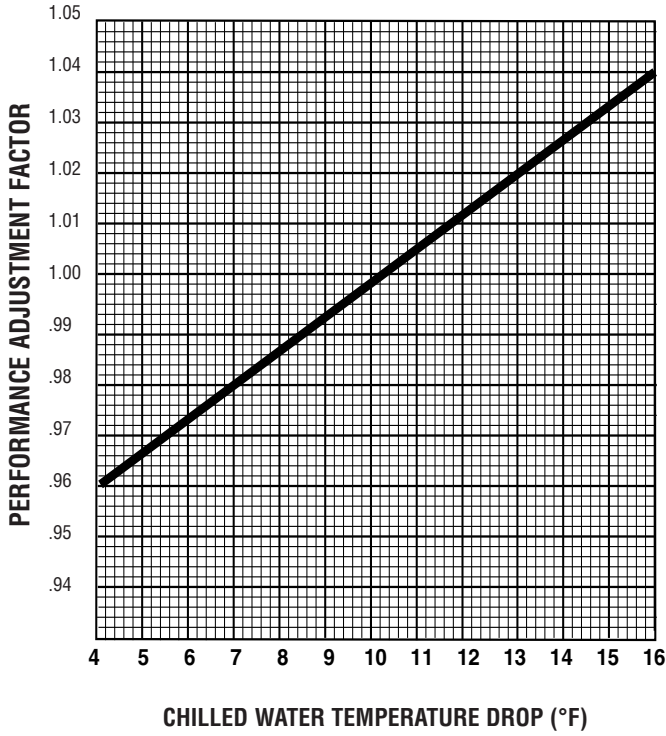


Figure 1. Performance Adjustment Factor

Use Curve For

- | | |
|------------------------|------------------------|
| A: MS20C4_W Condenser | C: MS30C5_W Evaporator |
| A: MS30C4_W Condenser | C: MS50B4_W Condenser |
| B: MS20C4_W Evaporator | D: MS50B4_W Evaporator |
| B: MS30C4_W Evaporator | E: MS50Z6_W Evaporator |
| C: MS30C5_W Condenser | F: MS50Z6_W Condenser |

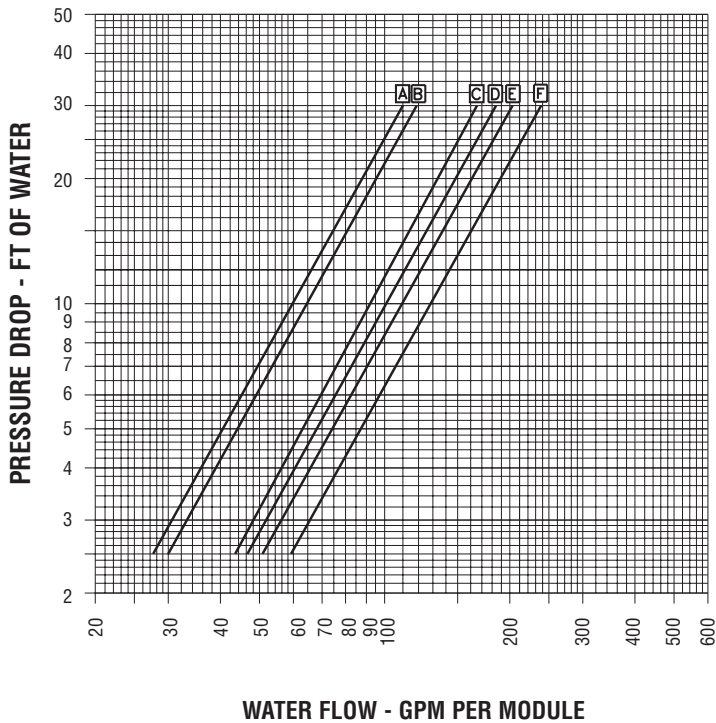


Figure 2. Water Cooled Units

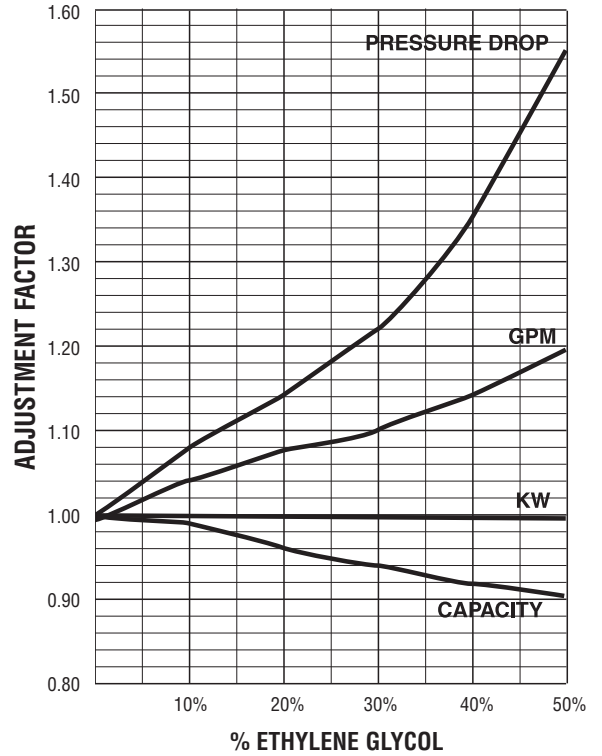


Figure 3. Ethylene Glycol Adjustment Factors

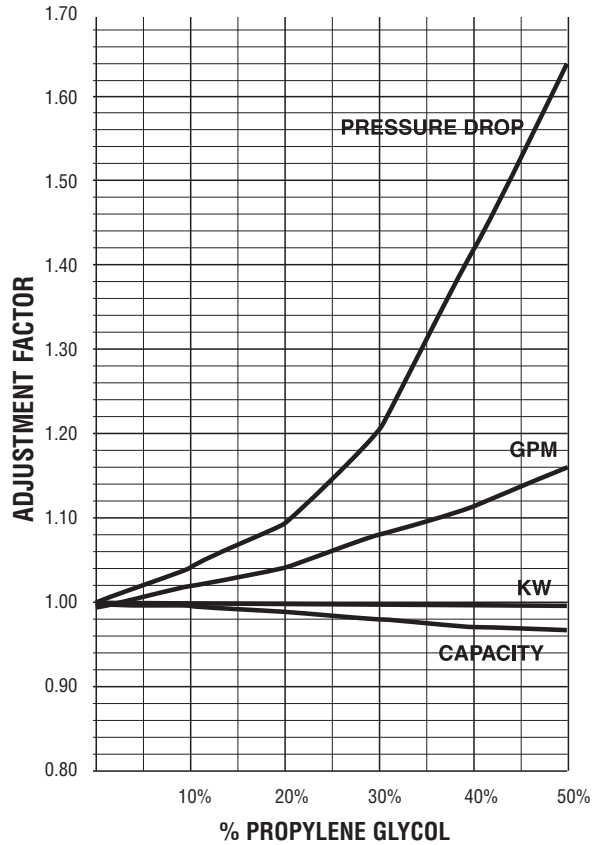


Figure 4. Propylene Glycol Adjustment Factors

Selection

To select a MULTISTACK Water Cooled chiller, the following information is required:

1. Load in tons of refrigeration.
2. Chilled water temperature drop.
3. Leaving chilled water temperature.
4. Entering condenser water 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**.

Water Flow Rates

Evaporator water flow can be determined as follows:

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

Condenser water flow should always be determined using a 10 °F temperature rise as follows:

$$\text{GPM} = 2.4 [\text{TONS} + (0.285)(\text{Compressor KW})]$$

Waterside Pressure Drop

Evaporator and condenser 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.

Chilled Water Selection

Example (Assumes MS50B4 Modules)

System load = 290 TONS. Chilled water drop of 12°F. Leaving chilled water temperature of 45°F. Entering condensed water temperature of 85°F.

1. Use **Figure 1** adjustment factor for tons to convert tons to 10°F at equivalent for use with capacity tables.
 $\text{TONS} = 290 / 1.008 = 287.7 \text{ TONS}$
2. Select the appropriate performance table based on module to be used. Read the CAPACITY and KW of a single module at the water temperature specified.
 $\text{CAPACITY} = 47.2 \text{ TONS}, \text{ KW} = 51.7$
3. To find the number of modules required, divide equivalent tons required at 10°F temperature drop by single module capacity from table:
 $\text{MODULES REQUIRED} = 287.7 / 47.2 = 6 \text{ modules}$
 $\text{CHILLER CAPACITY} = (47.2) (6) = 283.2 \text{ TONS}$
 $\text{POWER INPUT} = (51.7) (6) = 310.2 \text{ KW}$
4. At 12°F evaporator temperature drop, applying **Figure 1** performance adjustment factors result in:
 $\text{TONS} = (283.2) (1.008) = 285.5 \text{ tons vs. system load}$
5. To determine evaporator and condenser water pressure drops, first determine GPM
 $\text{Evaporator GPM} = (24) (285.5) / 12 = 571$
 $\text{Condenser GPM} = 2.4 [285.5 + (0.285) (310.2)] = 898 \text{ GPM}$
6. With a 6 module chiller, evaporator and condenser pressure drops are read from **Figure 2** as follows:
 $\text{Evaporator} = \text{GPM} / \text{modules} = 571 / 6 = 95.1$

Pressure Drop = 9 feet

Condenser = GPM/modules = 898/6 = 149.6

Pressure Drop = 25 feet

Low Temperature Operation with Glycol

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 MS30C5 Modules)

Determine CAPACITY, GPM, Pressure Drop and KW for a MS-30C5 module cooling 30% Ethylene Glycol from 45°F to 35°F, with a entering condensing temperature of 85°F and 100% water.

1. By extrapolating from the Performance Tables:
 $\text{CAPACITY: } 25.5 \text{ tons; KW: } 23.0$
2. Evaporator water flow and pressure drops are determined for water as in the previous example.
 $\text{Evaporator GPM} = (24)(25.5) / 10 = 61.2 \text{ GPM}$
 $\text{Evaporator Pressure Drop} = 4.6 \text{ feet}$
3. To convert performance for water to performance with Ethylene Glycol read adjustment factors from **Figure 3** at 30% Glycol.

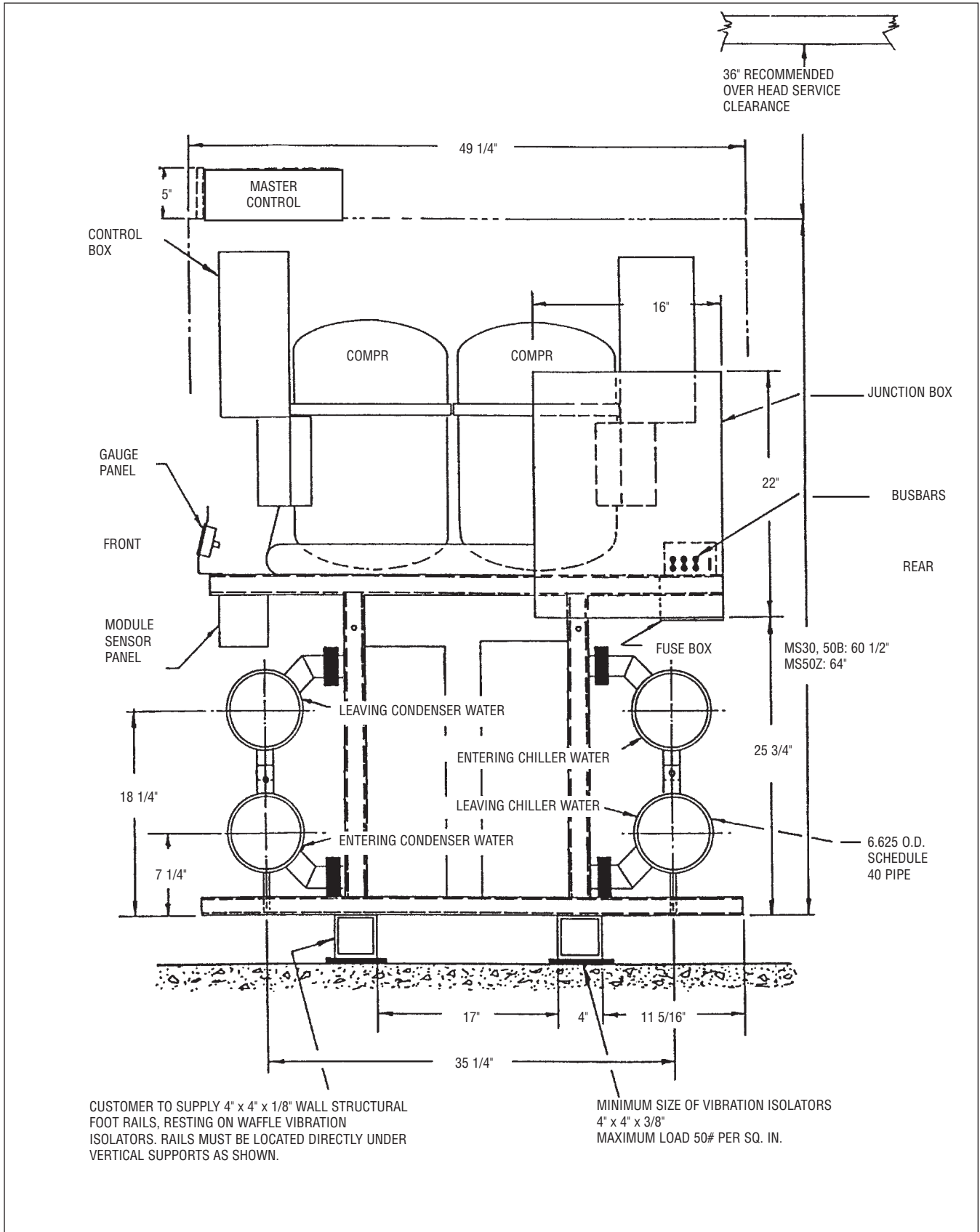
CAPACITY Adjustment:	0.94
KW Adjustment:	0.99
Evaporator GPM Adjustment:	1.10
Pressure Drop Adjustment:	1.22
4. Calculate performance with 30% Ethylene Glycol by multiplying performance for water by adjustment factors.

CAPACITY:	$25.5 \times 0.94 = 24.0 \text{ TONS}$
KW:	$23.0 \times 0.99 = 22.8 \text{ KW}$
GPM:	$61.2 \times 1.10 = 67.3 \text{ GPM}$
Pressure Drop:	$4.6 \times 1.22 = 5.6 \text{ ft of water}$
5. To determine condenser water pressure drops, first determine GPM.
 $\text{Condenser GPM} = 2.4 [24.0 + (0.285)(22.8)] = 73.2 \text{ GPM}$
6. Condenser pressure drops are read from **Figure 2** as follows:
 $\text{Condenser Pressure Drop} = 6.5 \text{ feet}$

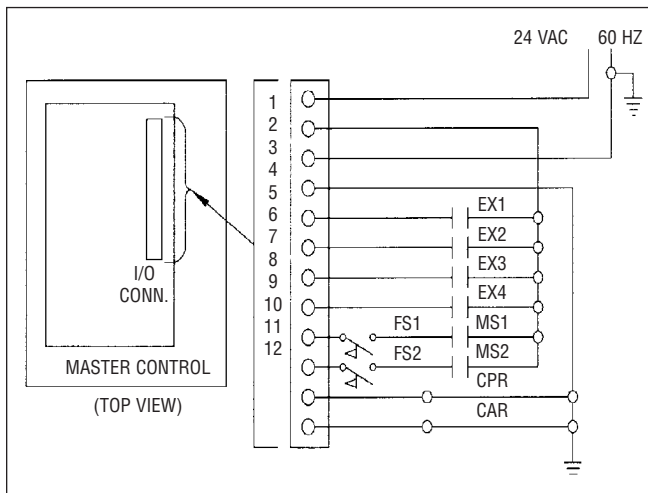
MULTISTACK WATER COOLED

CHILLER

End View



External Input/Output Connections



Note: For additional information, see *Installation Manual – Water Cooled Chiller and Master Control User Manual*.

Inputs

- EX1 Close Circuit To Operate: Open To Stop. Manual Reset Req'd
- EX2 Close Circuit To Operate: Open To Stop. Auto Reset. Remote Start/Stop
- EX3 Close Circuit To Operate: Open To Stop. Manual Reset Req'd
- EX4 Close Circuit To Operate: Open To Stop. Auto Reset.
- FS1 Condenser Water Flow Switch. (Or Optional Pressure Differential Switch)
- MS1 Condenser Water Pump Starter Interlock
- FS2 Chilled Water Flow Switch. (Or Optional Pressure Differential Switch)
- MS2 Chilled Water Pump Starter Interlock.

Outputs

- CPR Condenser Pump 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, contactors and flow switches supplied by others.*

System Wire & Fuse Sizing Specifications

(Applicable codes may require different wire sizing)

1. Compressor Rated Load Amps (RLA) and Locked Rotor Amps (LRA)

Data: RLA/LRA

VOLTAGE	208	230	460	575
25T Scroll	69/500	62/500	31/250	25/250
25T Recip	75/400	75/400	37/200	30/160
15T Scroll	42/337	44/376	21/178	17/143
10T Scroll	25/222	25/251	12/117	10/94

2. Wiring Sizing: Minimum Circuit Ampacity (MCA)

$$MCA = (1.25 \times RLA1^*) + RLA2 + RLA3 \dots$$

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

3. Fuse Sizing: Maximum Fuse (MF), Type RK5 Fuse

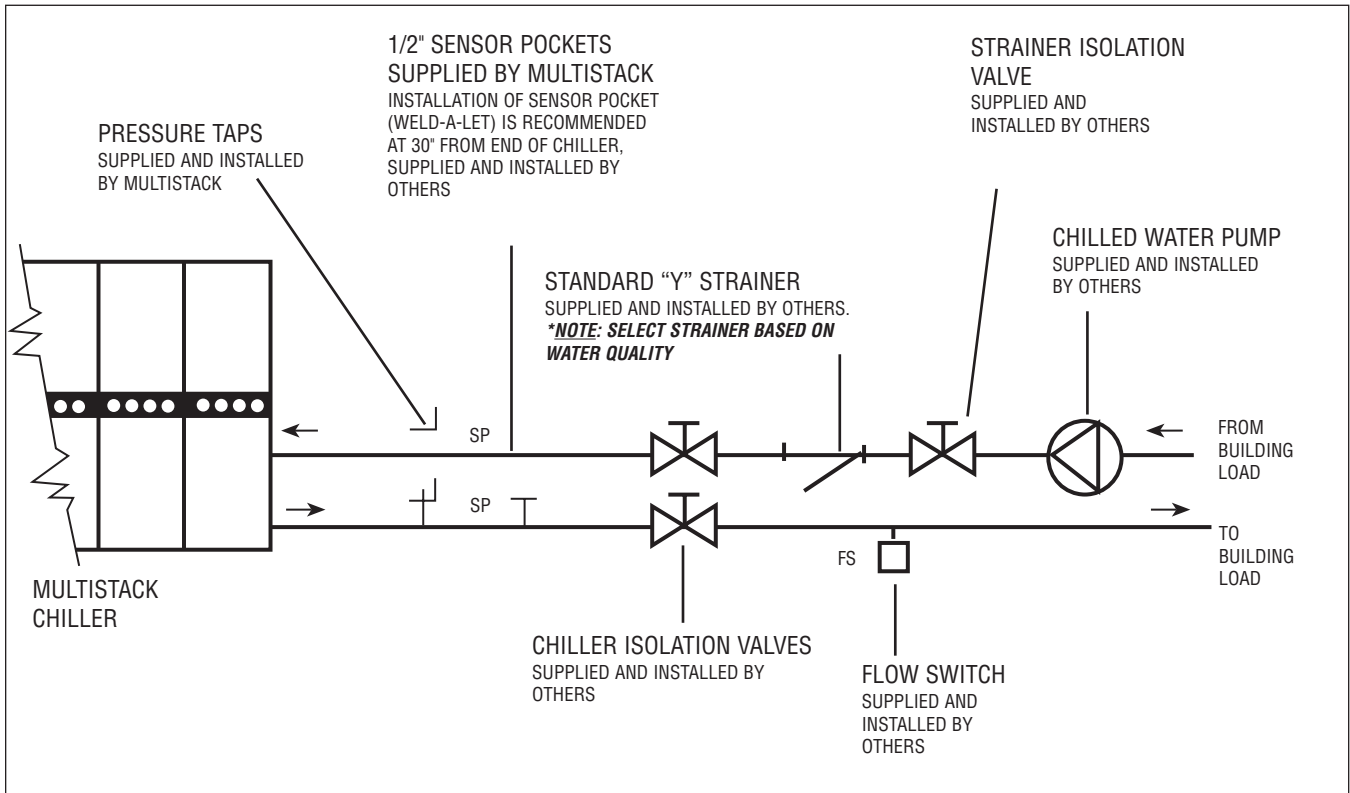
$$MF = (2.25 \times RLA1^*) + RLA2 + RLA3 \dots$$

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

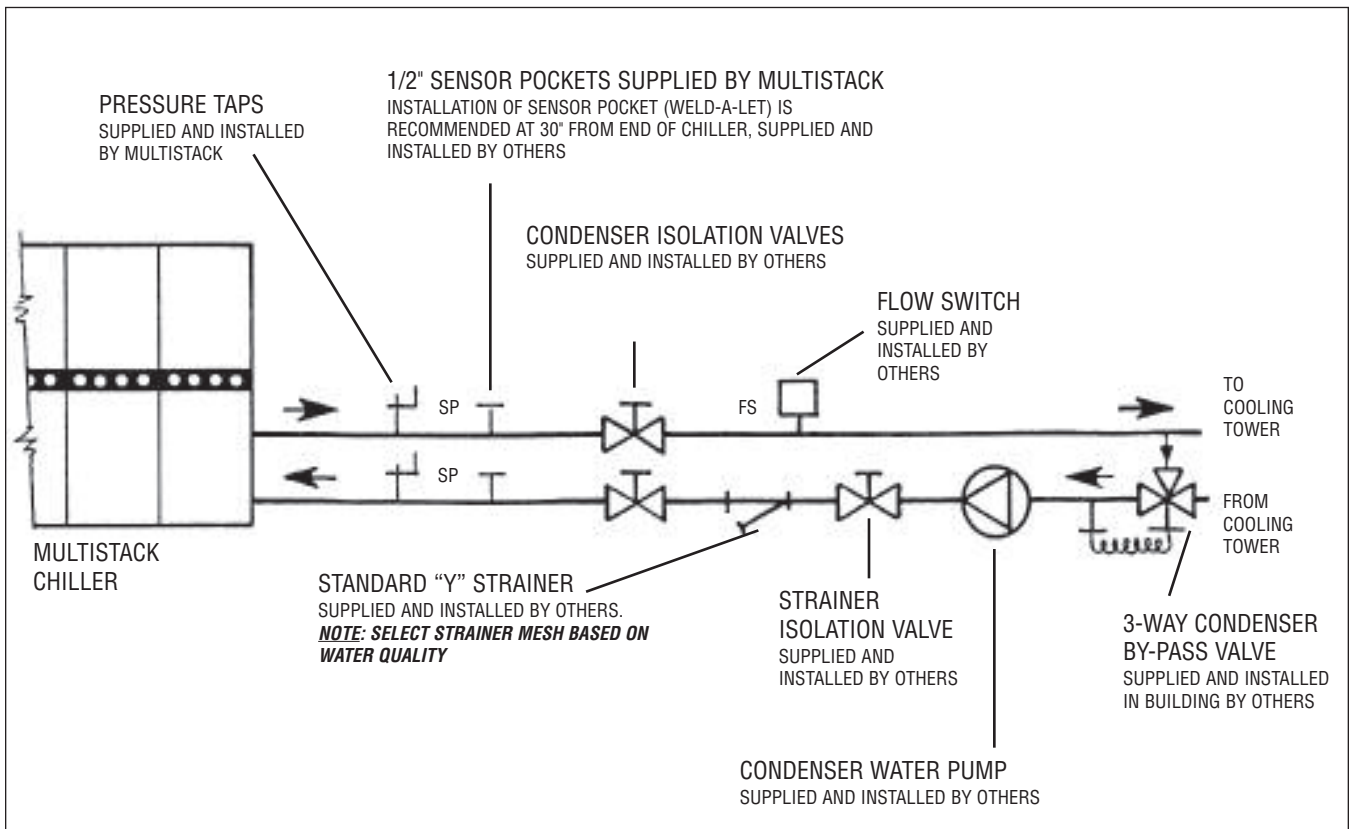
4. NOTES:

- A. *RLA1 = RLA of the largest compressor in the system.
RLA2 & RLA3 = RLA of the other compressors in the system.
- B. The total system Minimum Circuit Ampacity (MCA) shall not exceed 500A.
- C. Wire sizing is based on the Nat. Electr. Code (NEC) rating for 75°C copper wire, with 3 wires per conduit.
- D. Wiring Distance from branch circuit shall not exceed 100ft.

Required Chilled Water Piping



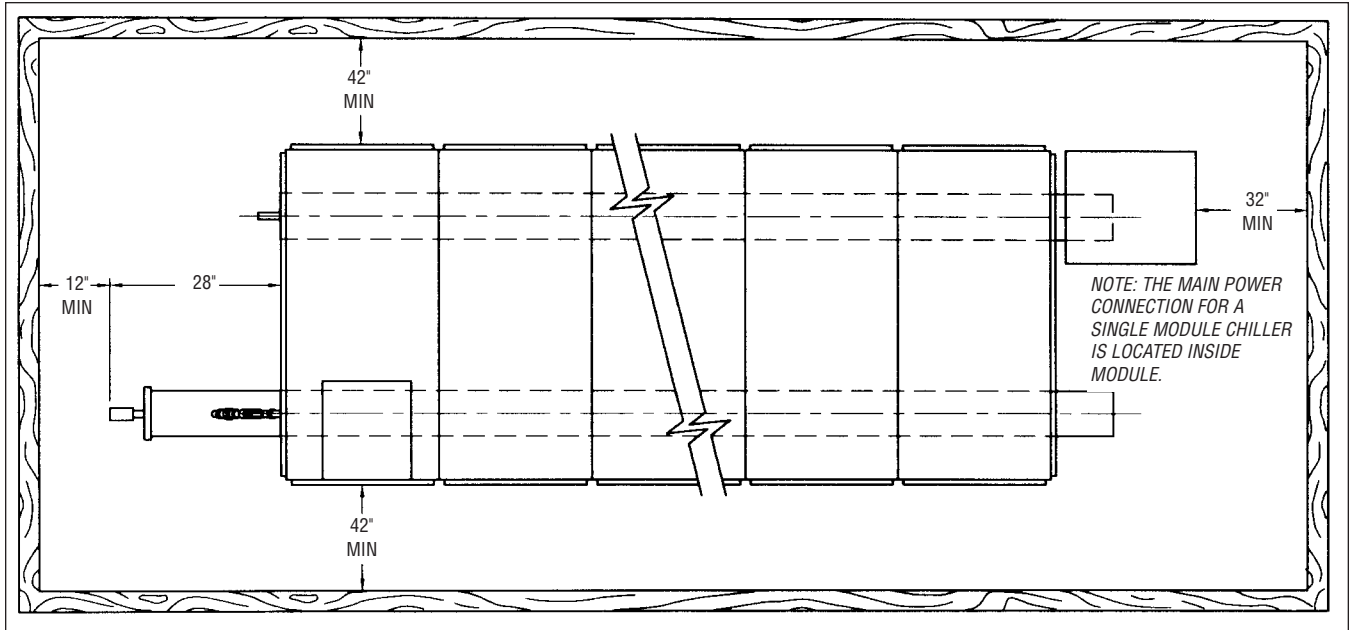
Condenser Schematic with Head Pressure Control



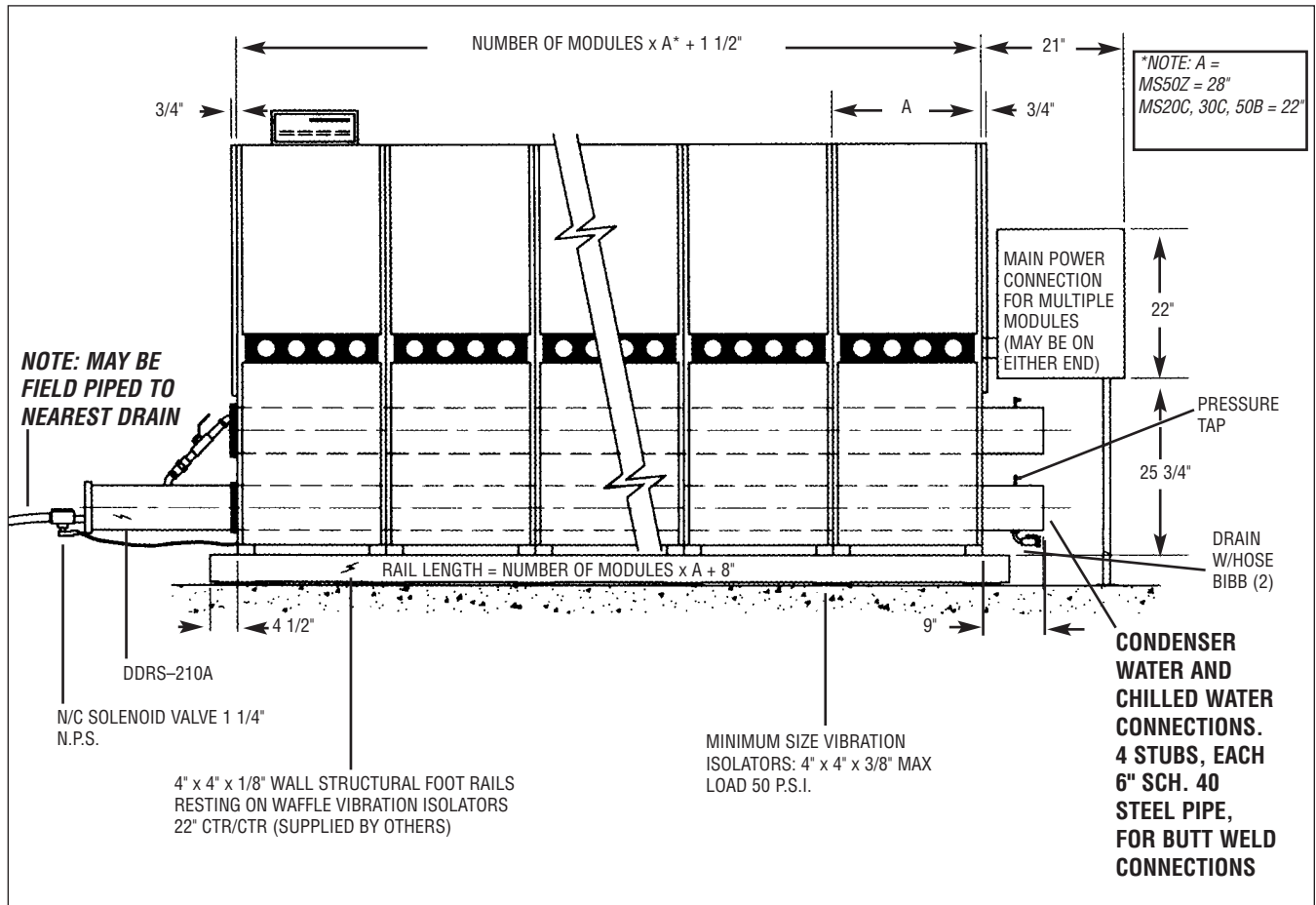
Chiller Installation Dimensions

Module Installation

Plan View



Front Elevation View - Chiller Length



MULTISTACK WATER COOLED

GENERAL DATA TABLE

Model	MS20C4_W		MS30C4_W		MS30C5_W		MS50B4_W		MS50Z6_W
Compressor Type	Scroll		Scroll		Scroll		Reciprocating		Scroll
Dry Weight (lbs each)	160		227		227		268		407
Normal Capacity (each)	10		15		15		25		25
Quantity	2		2		2		2		2
Oil Charge (pints)	8		14		14		14		12.5
Evaporator	Braze Plate		Braze Plate		Braze Plate		Braze Plate		Braze Plate
Weight (lbs each)	91.3	51.7	91.3	51.7	114.4	75.5	164.4	90.25	205
Water Storage (gallons each)	2.2	1.242	2.2	1.242	3.0	1.867	4.6	2.164	5.20
Circuit Configuration	Dual	Single	Dual	Single	Dual	Single	Dual	Single	Dual
Quantity	1	2	1	2	1	2	1	2	1
Header System (gallons)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	7
Condenser	Braze Plate		Braze Plate		Braze Plate		Braze Plate		Braze Plate
Weight (lbs each)	53		53		75.5		75.5		188
Water Storage (gallons each)	1.125		1.125		1.867		1.867		5.33
Circuit Configuration	Single		Single		Single		Single		Dual
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		8.5		10		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

NOTE: OTHER REFRIGERANTS ARE AVAILABLE PER REQUEST.

Chiller Data

- ENT. CHILLED WATER TEMP.
- LVG. CHILLED WATER TEMP
- VERIFY CHILLED WATER FLOW
- ENT. COND. WATER TEMP
- LVG. COND. WATER TEMP
- VERIFY COND. WATER FLOW
- CUSTOMER INTERLOCKS

MASTER CONTROL AND DISPLAY
(Can stage a maximum of 12 modules)



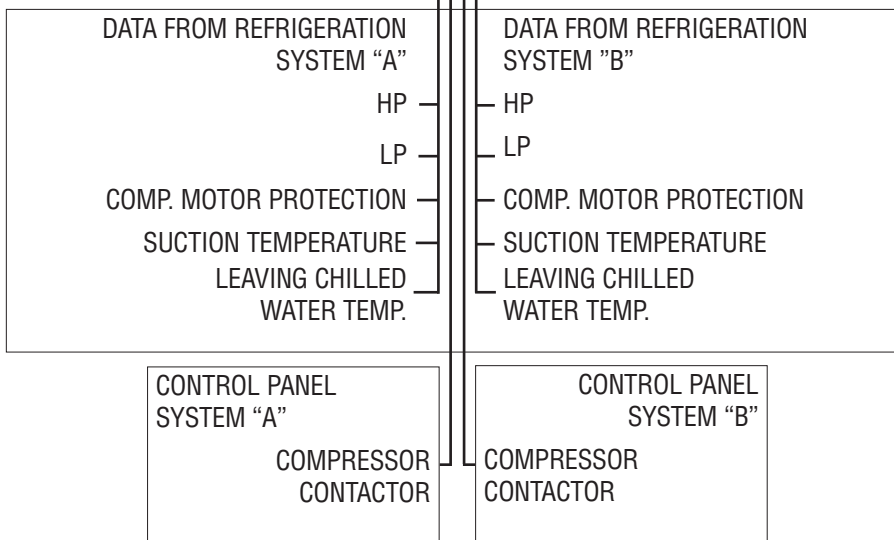
System Interface Portal



OPTIONAL
Connection to Building
Management Systems
through:
BACnet
Modbus
Lon

Module Data

MODULE SENSOR PANEL



IDENTICAL SENSOR PANELS
FOR EACH MODULE IN
CHILLER

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 and charged with refrigerant and oil, ready for installation. All modules are factory run tested prior to shipment.

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.

Chilled and Condensed Water Mains

Each module includes supply and return mains for both chilled and condensed 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. Also standard is the DDRS-210A automatic debris removal system.

Evaporators and Condensers

Each evaporator and condenser 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.

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.



MULTISTACK

The Leader in Modular Chillers

1065 Maple Avenue
P.O. Box 510
Sparta, WI 54656

Phone 608-366-2400
Fax 608-366-2450