

MULTISTACK[®]

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Standard and Total Access Design Units

Quad Scroll Water Cooled Chillers

Product Data Catalog

**MS105XC, MS135XC, MS145XC, MS165XC
R-410A Refrigerant**



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Multistack Quad Scroll Chillers 105, 135, 145, 165 Tons Capacity

Highly Dependable

- Four compressors, two refrigeration circuits
- Combine up to eight modules to create a chiller array up to 1,320 tons
- Also available as DHRC chillers using R-134a refrigerant for hot water up to 180 F Multiple independent systems for redundancy

Simple To Operate

- Semi-graphical LCD screen displays information
- Simple keypad provides control of unit operations

Easy To Install

- Modules interconnect using conduit and a Hoffman J-Box easily and quickly
- All refrigeration systems are factory charged and run tested

Programmable Logic Controller (PLC) System

- Comprehensive computer monitoring
- Automatic diagnostic recording of fault conditions
- Rotates lead compressor every 24 hours
- Manual switch allows redundancy control as each module has a processor allowing it to run even if master controller fails
- Optional Fail-To-Run software
- Display at each module; remote display optional

Total Access™ Configuration

- Heat exchangers located for easy service or replacement
- Ability to replace heat exchangers with other modules running makes Total Access ideal for mission-critical applications

Design Flexibility

- Wide array of module combinations available
- Install only the capacity required as needed, when needed

Simple To Service

- Service can often be performed on a convenient, non-emergency basis
- Most components are standard, off the shelf design

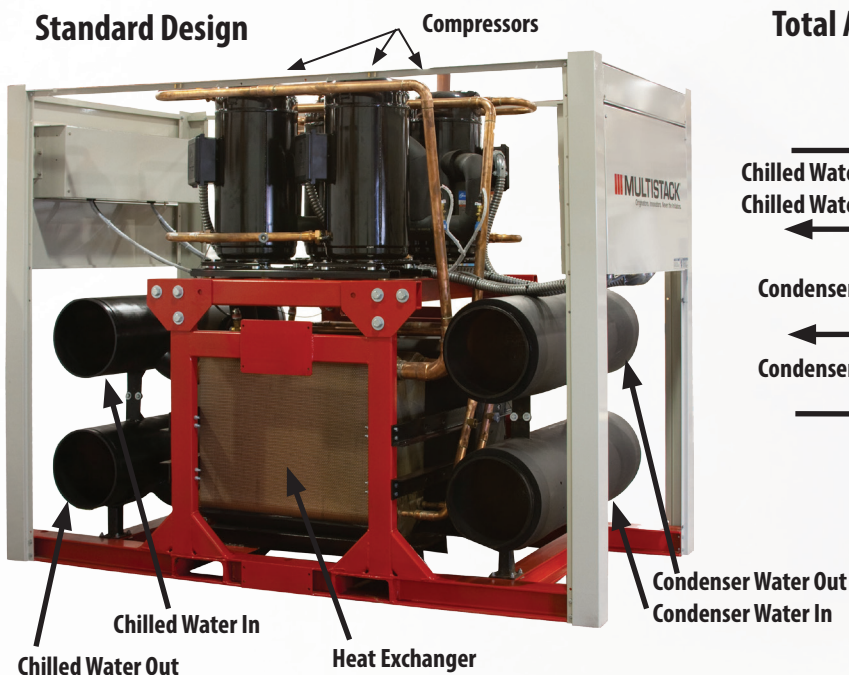
AHRI Certified

- All Multistack certifiable production modules are AHRI Certified providing performance assurance when comparisons are done in that category.

Environmental Focus

- Refrigerant R-410A is widely available, safe, and environmentally friendly refrigerants. R-134a is also available for heat recovery applications making hot water up to 180°F.
- In addition to delivering reliable comfort and low operating cost, Multistack products can reduce environmental footprint.

Standard Design



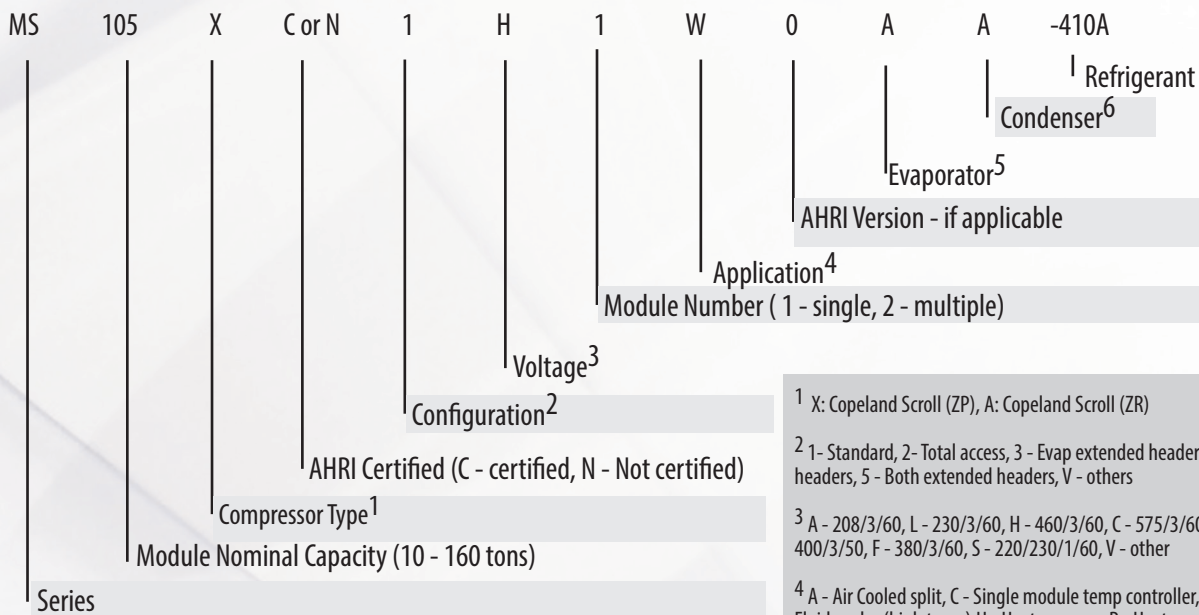
Total Access Design



Product Information

	MS105X	MS135X	MS145X	MS165X
Compressor Type	Scroll	Scroll	Scroll	Scroll
Dry Weight (lbs. each)	353	390	397	441
Nominal Capacity (total)	105	135	145	165
Quantity	4	4	4	4
Oil Charge (pints)	14.4	13.3	13.3	13.3
Evaporator	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate
Weight (lbs. each)	332	403	534	534
Water Storage (gallons each)	11.0	13.7	18.6	18.6
Circuit Configuration	Dual	Dual	Dual	Dual
Quantity	1	1	1	1
Header System (gallons)	50	50	50	50
Condenser	Brazed Plate	Brazed Plate	Brazed Plate	Brazed Plate
Weight (lbs. each)	403	435	534	534
Water Storage (gallons each)	13.7	16.8	18.6	18.6
Circuit Configuration	Dual	Dual	Dual	Dual
Quantity	1	1	1	1
Header System (gallons)	50	50	50	50
Refrigerant	R-410A	R-410A	R-410A	R-410A
Charge (lbs./circuit)	40	45	50	51
Number of Circuits	2	2	2	2

Model Number Description



¹ X: Copeland Scroll (ZP), A: Copeland Scroll (ZR)

² 1 - Standard, 2 - Total access, 3 - Evap extended headers, 4 - Cond extended headers, 5 - Both extended headers, V - others

³ A - 208/3/60, L - 230/3/60, H - 460/3/60, C - 575/3/60, D - 200/3/50, E - 400/3/50, F - 380/3/60, S - 220/230/1/60, V - other

⁴ A - Air Cooled split, C - Single module temp controller, D - Cond unit, F - Fluid cooler (high temp), H - Heat recovery, R - Heat pump, W - Water cooled

⁵ A - Brazed SS, B - Brazed SMO, C - S&T copper, D - S&T cu-Ni, V - Other

⁶ A - Brazed SS, B - Brazed SMO, C - S&T copper, D - S&T cu-Ni, E - Double wall brazed, R - Remote, V - Other

Operating, Shipping Weights

Operating and Shipping Weights without Enclosure Panels.

	MS105X	MS135X	MS135A	MS145X	MS165X
Operating Weight - Lbs. No Enclosure Panels Std. (Total Access Module)	4,710 (5,190)	5,290 (5,750)	5,430 (5,900)	5,660 (6,140)	5,765 (6,245)
Shipping Weight - Lbs. No Enclosure Panels Std. (Total Access Module)	3,840 (4,165)	4,375 (4,700)	4,455 (4,780)	4,685 (5,010)	4,795 (5,115)

Operating and Shipping Weights with Enclosure Panels.

	MS105X	MS135X	MS135A	MS145X	MS165X
Operating Weight - Lbs. With Enclosure Panels Std. (Total Access Module)	4,925 (5,545)	5,505 (6,110)	5,645 (6,250)	5,870 (6,495)	5,975 (6,600)
Shipping Weight - Lbs. With Enclosure Panels Std. (Total Access Module)	4,055 (4,520)	4,590 (5,055)	4,670 (5,135)	4,895 (5,365)	5,000 (5,470)

Single Quad Scroll VME (Virtual Movable Endcap) Module Operating and Shipping Weights with Enclosure Panels

Operating Weight - Lbs. Std. (Total Access Module)	1,450 (1,515)
Shipping Weight - Lbs. Std. (Total Access Module)	1,180 (1,240)

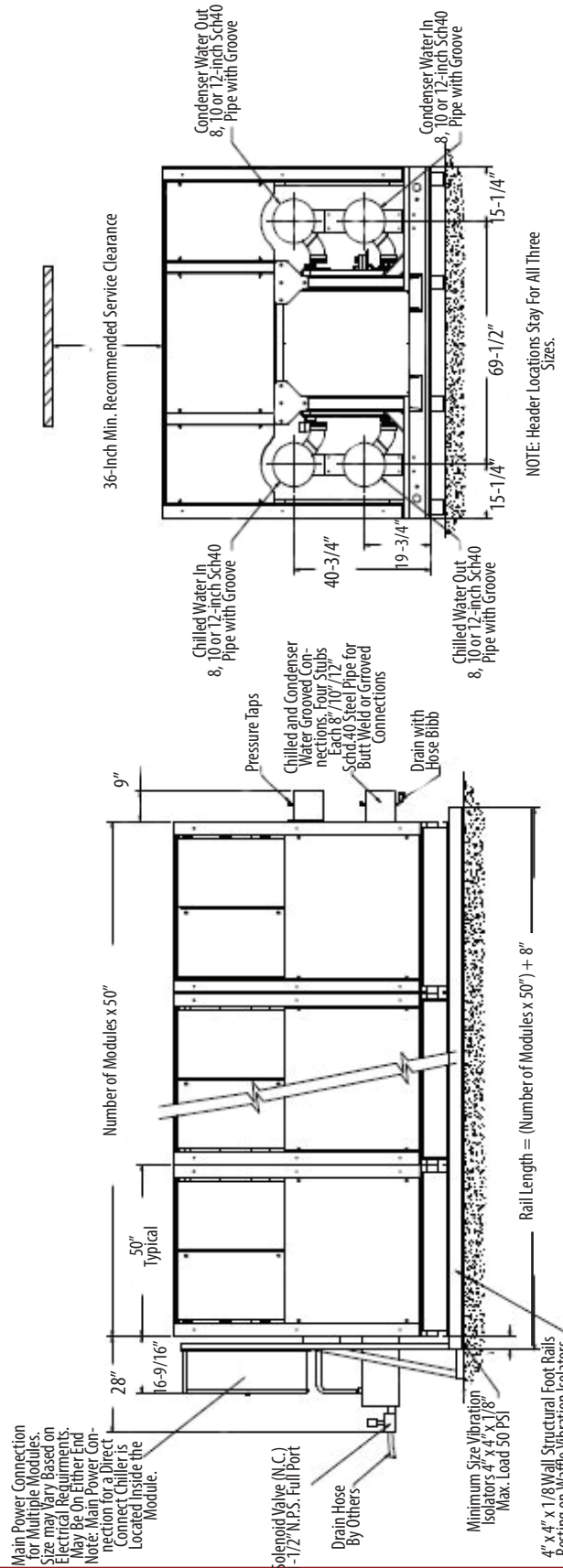
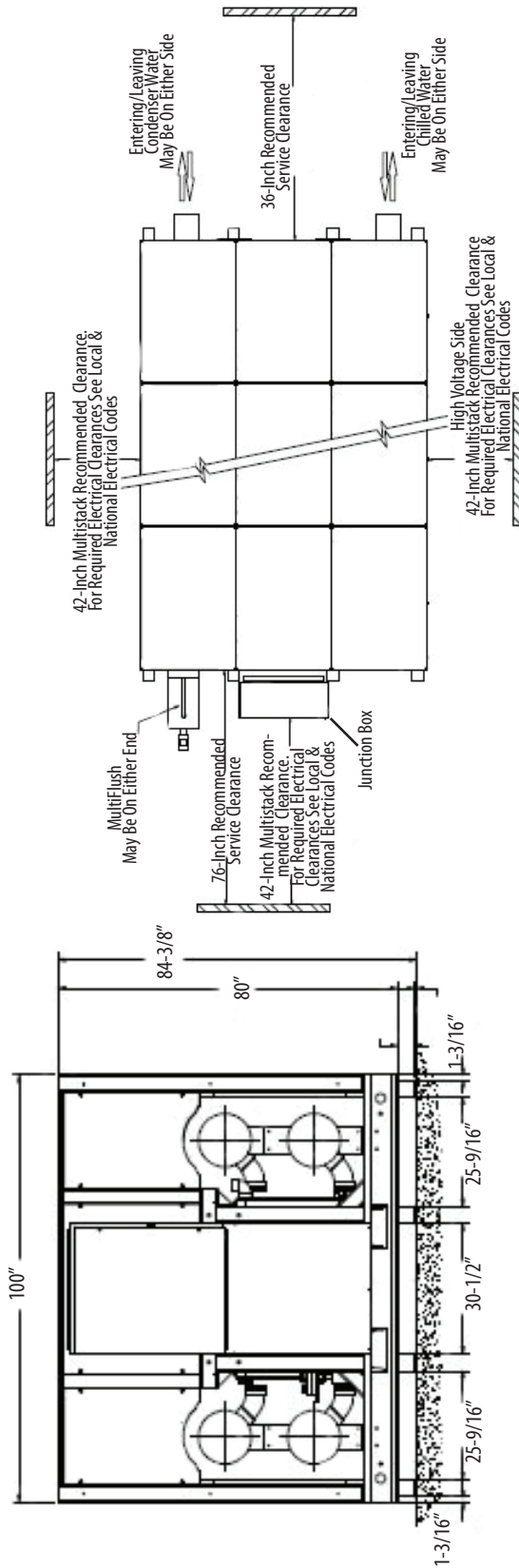
Single Quad Scroll VME (Virtual Movable Endcap) Module Operating and Shipping Weights without Enclosure Panels

Operating Weight - Lbs. Std. (Total Access Module)	1,290 (1,250)
Shipping Weight - Lbs. Std. (Total Access Module)	1,015 (975)

Notes

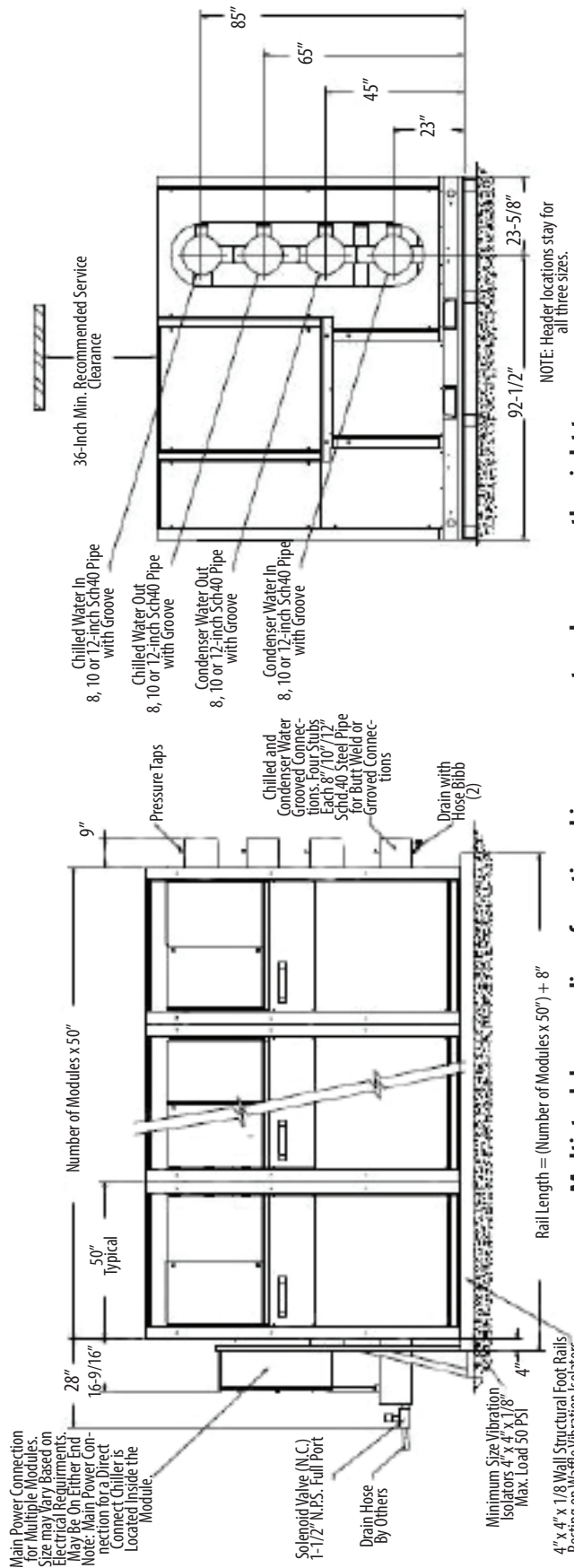
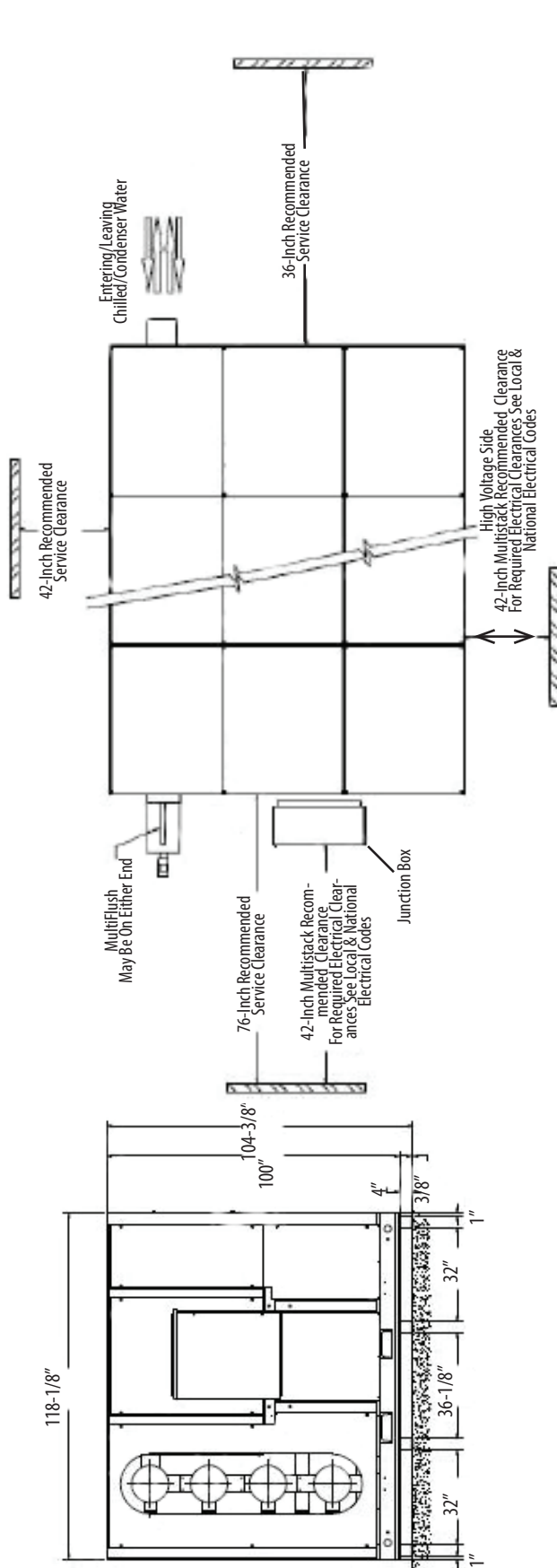
- *Weights shown are for Multistack Quad Scroll units built after December, 2017. For earlier units, consult your Multistack sales representative.*
- *Tables indicate operating and shipping weights for dual-quad chillers with 10-inch diameter water headers. If larger headers are used, weights will increase. Consult with your Multistack sales representative.*
- *X = Copeland ZP scroll compressors*
- *A = Copeland ZR scroll compressors.*

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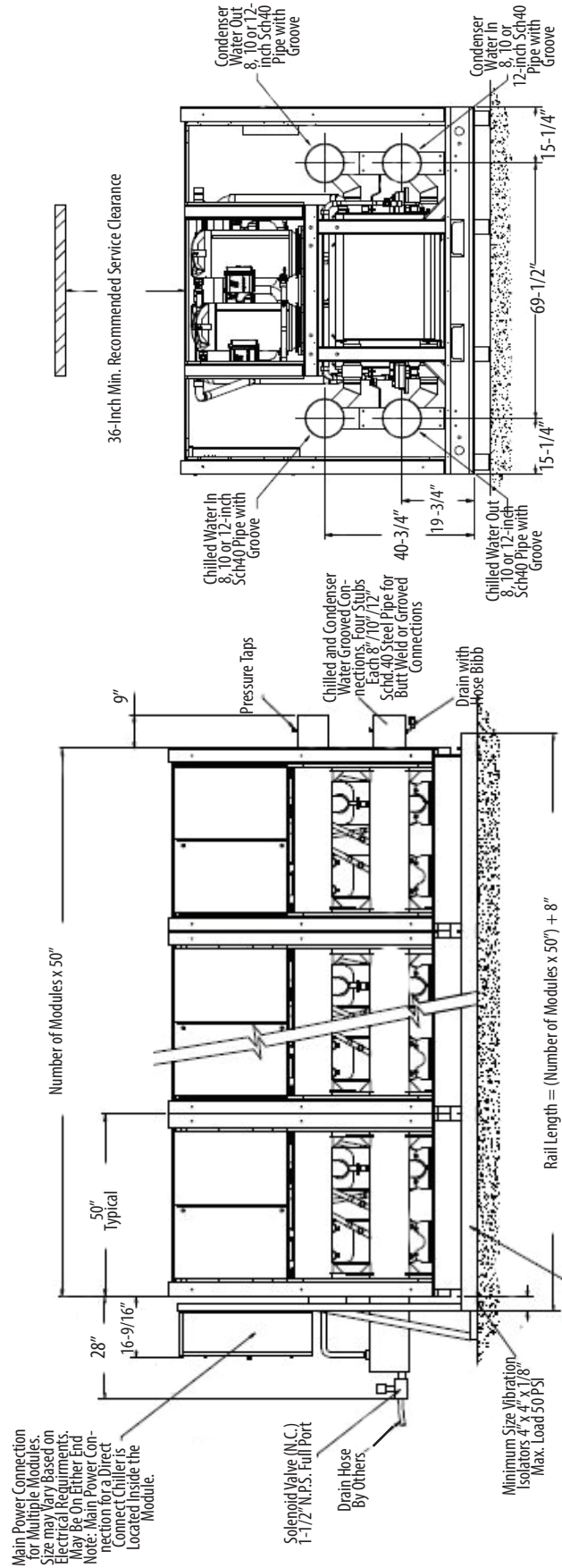
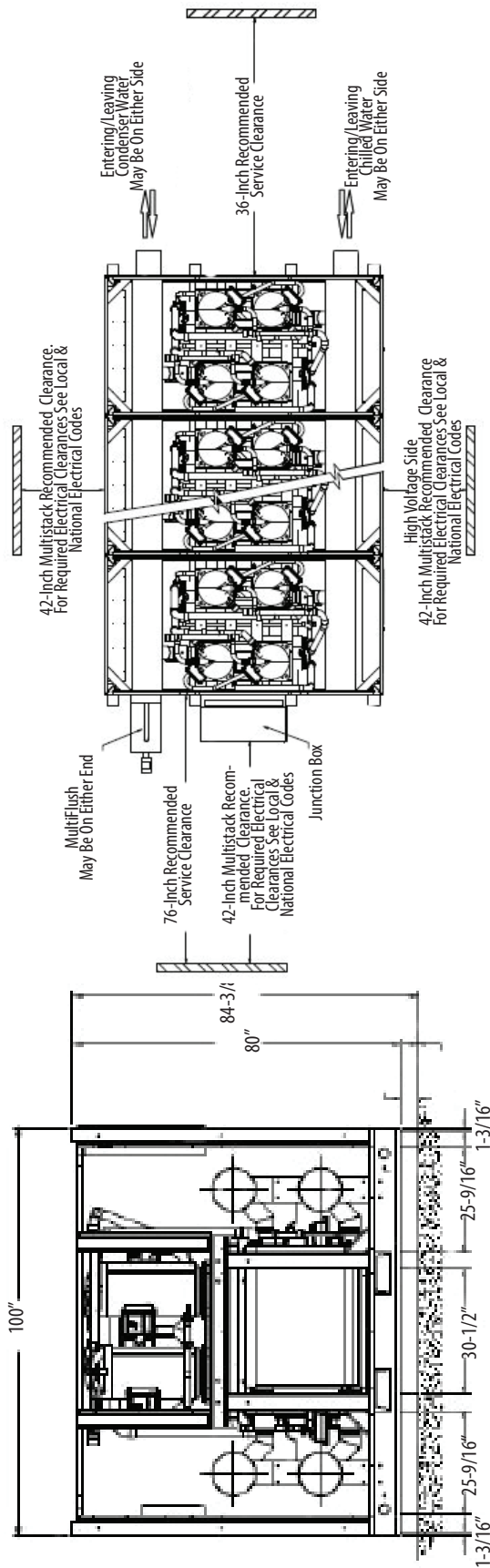


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Dimensions and Clearances



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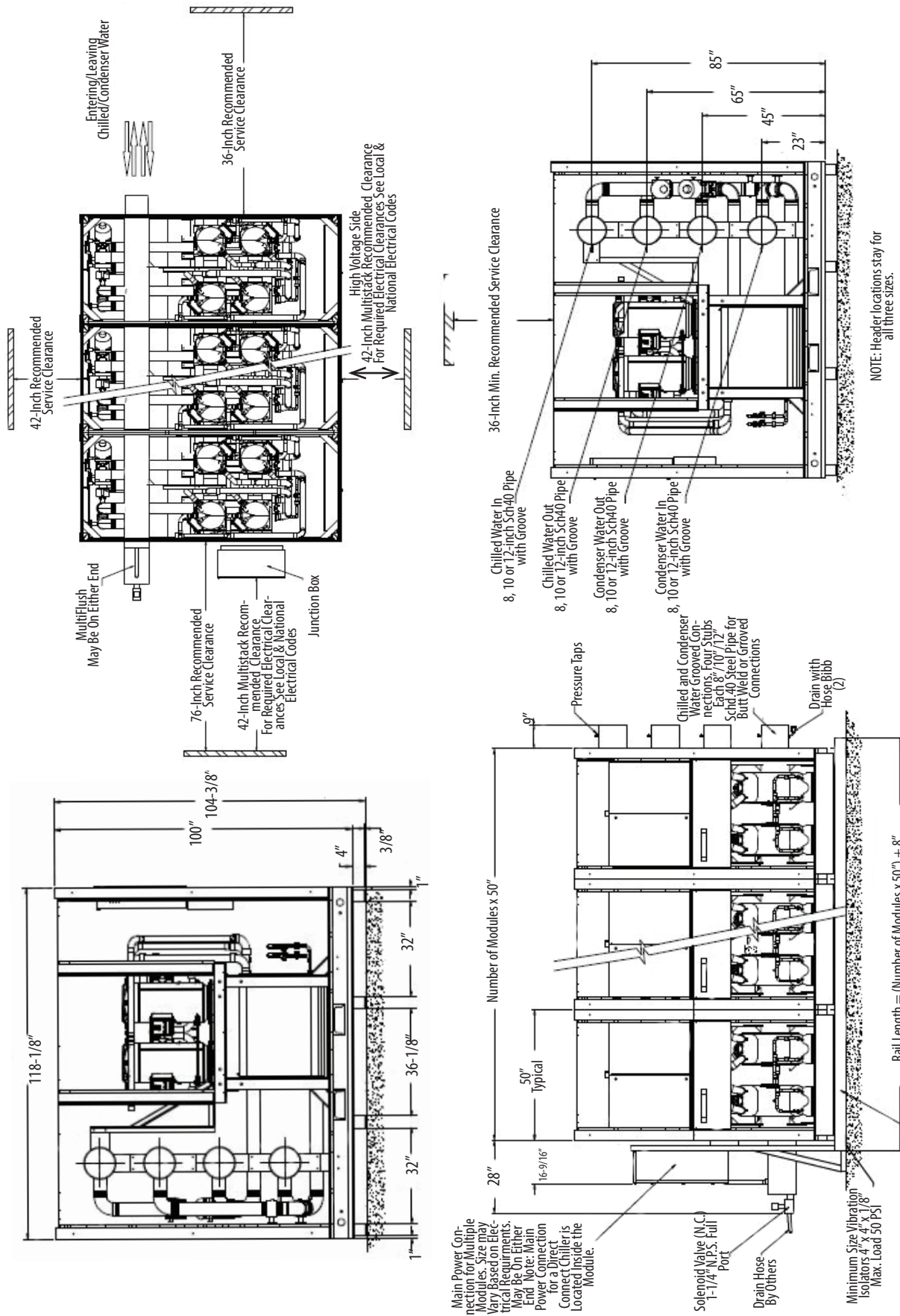
NOTE: Header Locations Stay For All Three Sizes.

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4" x 4" x 1/8" Wall Structural Foot Rails Resting on Warble Vibration Isolators. 50 Ctr/Ctr, Supplied by Others.

Quad Scroll, Total Access Design, No Enclosure Panels MS105, 135, 145, 165

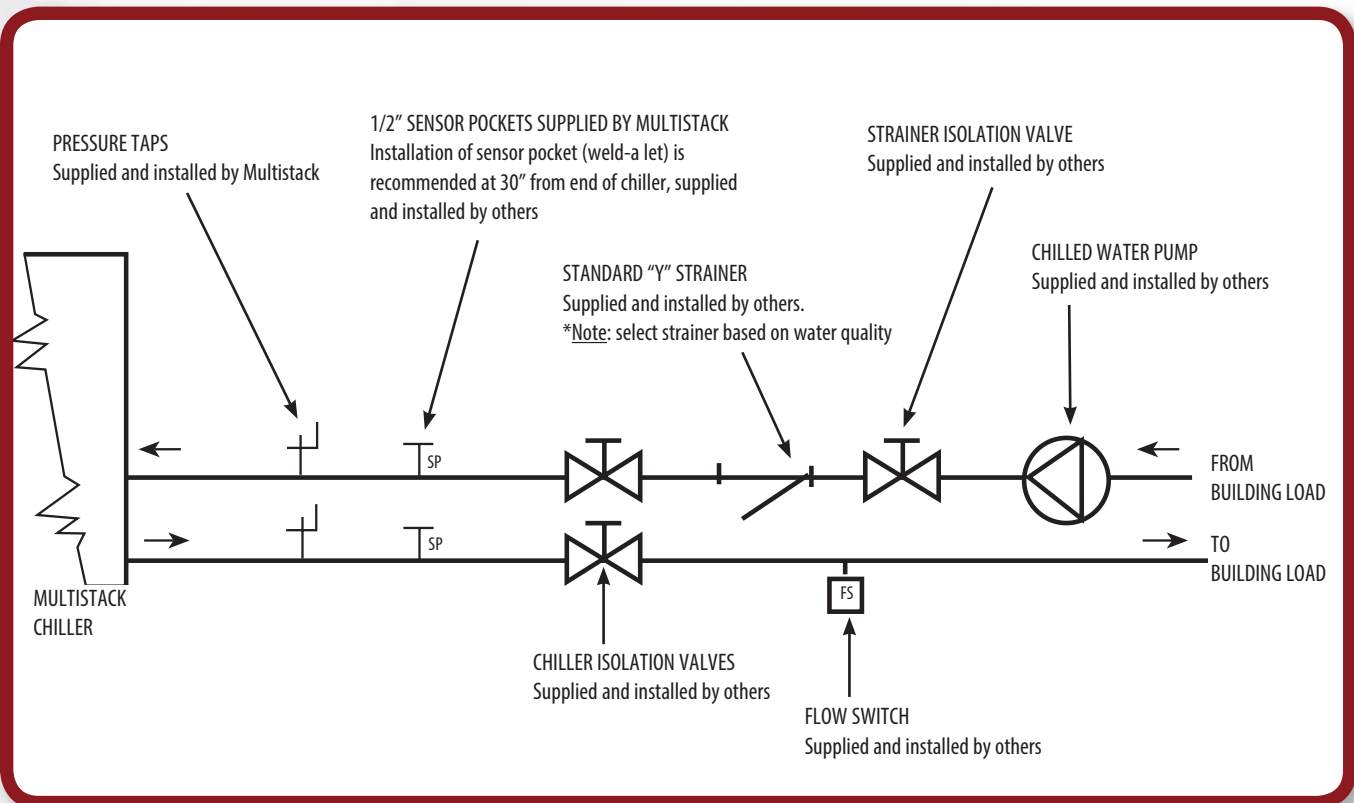
Dimensions and Clearances



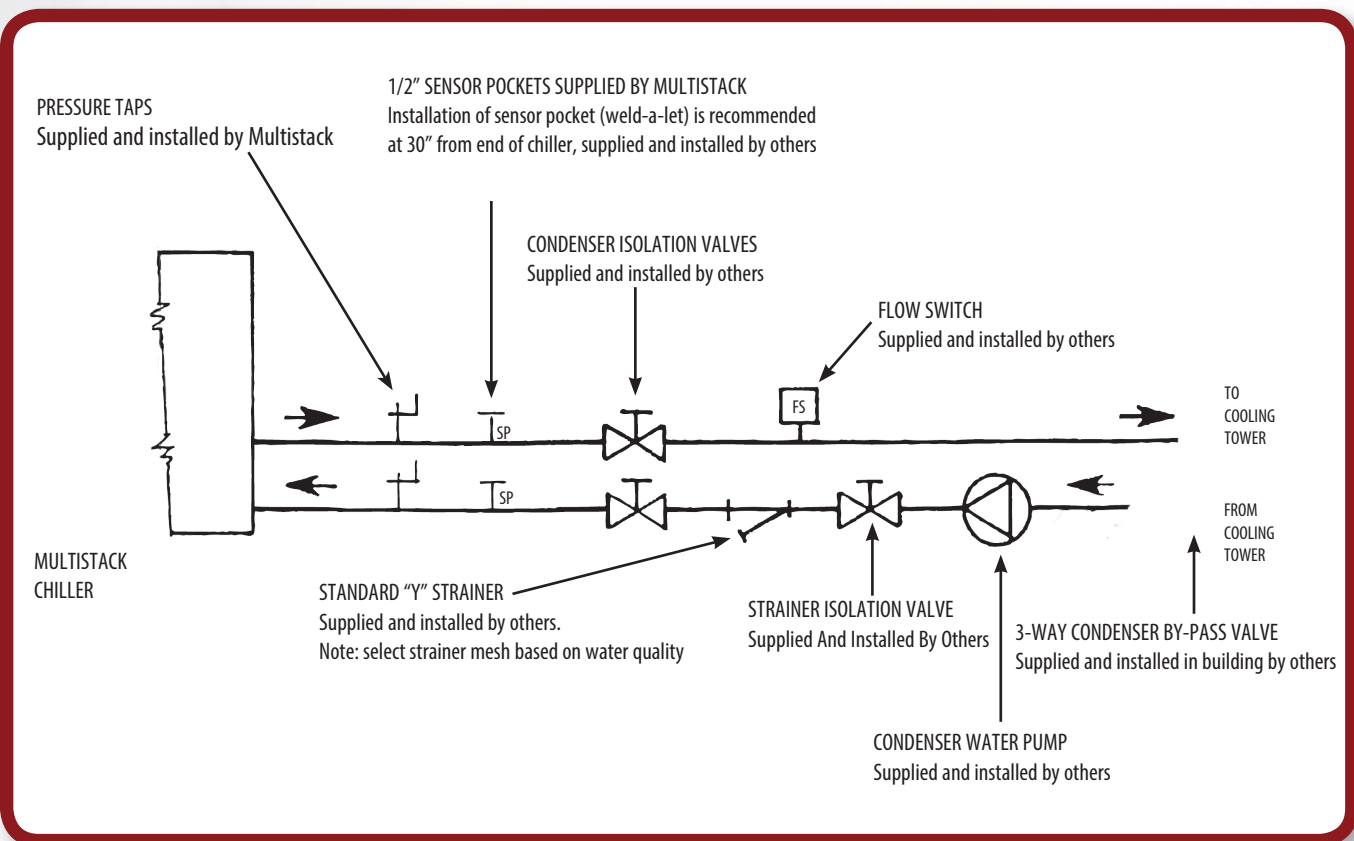
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Piping Schematics

Required Field Chilled Water Piping



Condenser Schematic with Head Pressure Control



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 (Per compressor, 4 compressors per module)				
Model	208	230	460	575
MS105X	67/605	60/605	30/272	24/215
MS135X	89/599	80/599	40/310	32/239
MS145X: Set 1	N/A	N/A	40/310	32/239
MS145X: Set 2*	N/A	N/A	51/408	37.6/375
MS165X	N/A	N/A	51/408	37.6/375

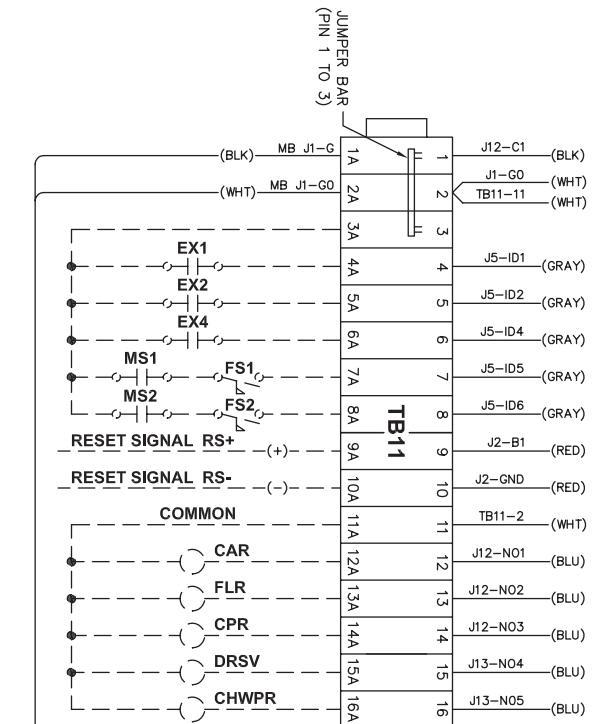
*Uses ZP485KCE Compressor

2. Wiring Sizing: Minimum Circuit Ampacity (MCA)

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

MCA	3 CONDUCTORS 1 CONDUIT	6 CONDUCTORS 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	--
310	350 MCM	2/0
335	400 MCM	2/0
380	500 MCM	3/0
420	600 MCM	4/0
460	--	4/0
510	--	250 MCM
570	--	300 MCM
620	--	350 MCM
670	--	400 MCM
760	--	500 MCM
800	--	600 MCM

External Input/Output Connections



LEGEND	
1. --- COMPONENTS & WIRING BY OTHERS. (18 AWG MIN. WIRE)	
2. INPUTS TO TERMINALS 4 THRU 8 OF TB11 MUST BE WIRED CLOSED IF NOT USED.	
3. EXTERNAL INPUTS: (CLOSED TO OPERATE)	
EX1 -	REQUIRES MANUAL RESET TO RESUME OPERATION
EX2 -	AUTO RESET (REMOTE START/STOP)
EX4 -	AUTO RESET (POWER PHASE MONITOR INPUT)
FS1 -	FLOW SWITCH (CHILLED WATER)
FS2 -	FLOW SWITCH (CONDENSER WATER)
MS1 -	AUX. INTERLOCK (CHILLED WATER PUMP STARTER)
MS2 -	AUX. INTERLOCK (CONDENSER WATER PUMP STARTER)
RS+ -	RESET SIGNAL (SOFTWARE SELECTABLE 0-10VDC, 4-20mA)
RS- -	RESET SIGNAL (SOFTWARE SELECTABLE 0-10VDC, 4-20mA)
4. EXTERNAL OUTPUTS:	
CAR -	CUSTOMER ALARM RELAY (24VAC, 5VA MAX.)
FLR -	FULL LOAD RELAY (24VAC, 5VA MAX.)
CHWPR -	CHILLED WATER PUMP RELAY (24VAC, 5VA MAX)
CPR -	CONDENSER PUMP RELAY (24VAC, 5VA MAX.)
DRSV -	DEBRIS REMOVAL SOLENOID VALVE (24VAC, 6W, 16VA) MAX. OF (2) DRSV IN THIS CIRCUIT
5. SENSOR INPUTS:	
ECW -	ENTERING CONDENSER WATER
LCW -	LEAVING CONDENSER WATER
ECHW -	ENTERING CHILLED WATER
LCHW -	LEAVING CHILLED WATER

3. Fuse Sizing: Maximum Overcurrent Protection (MOP), Type RK5 Fuse, or HACR Time Delayed Circuit Breaker

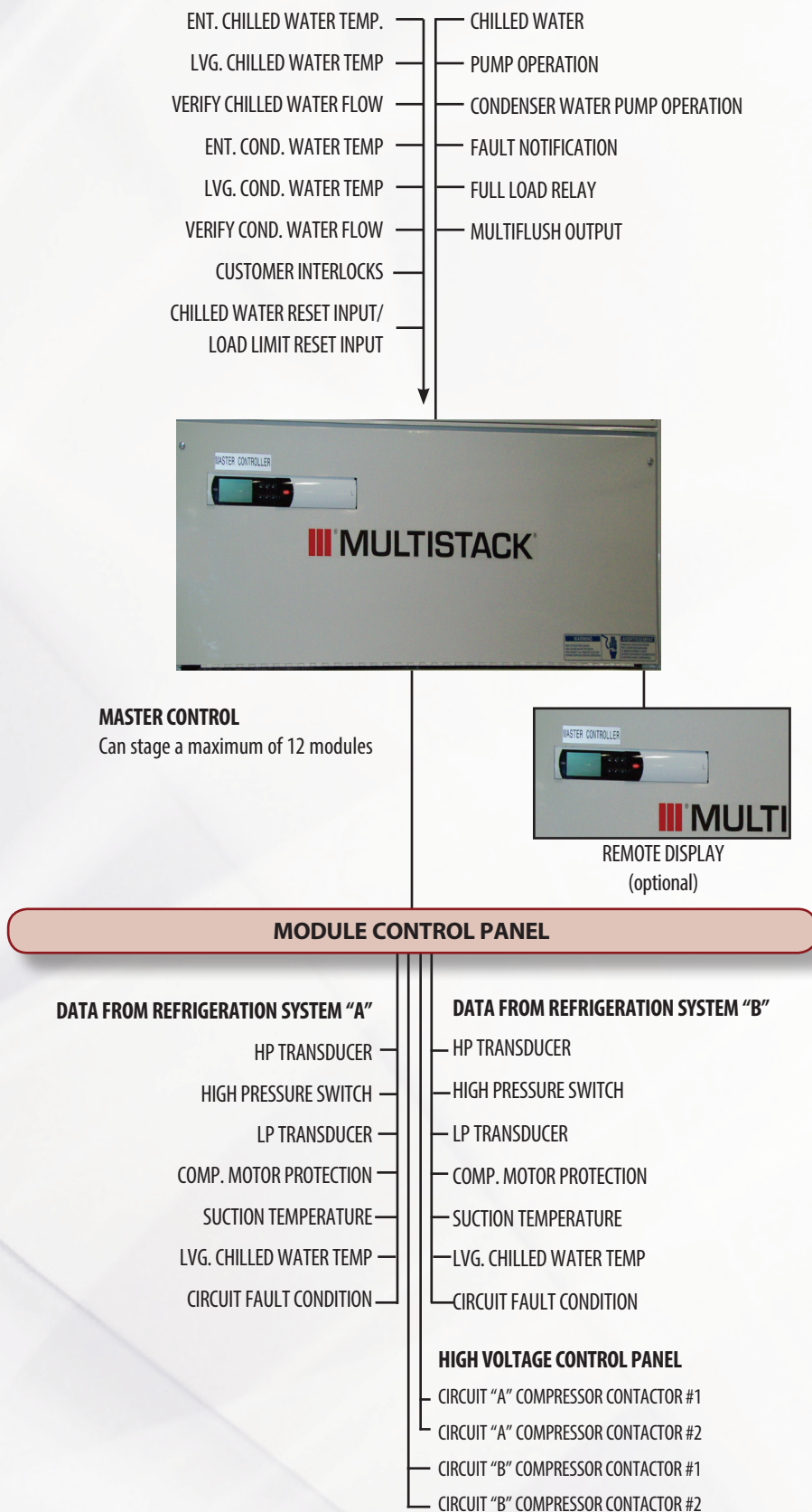
$$MOP = (2.25 \times RLA1^*) + RLA2 + RLA3$$

Where the MOP does not equal a standard size rating, the next larger size should be used. The MOP should not exceed 800 ampr.

4. NOTES:

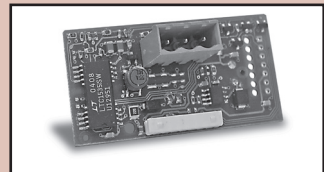
- *RLA1 = RLA of the largest compressor in the system; RLA2 & RLA3 = RLA of the other compressors in the system.
- The total system Minimum Circuit Ampacity (MCA) shall not exceed 760A.
- Wire sizing is based on the Nat. Electr. Code (NEC) rating for 75°C copper wire, with 3 wires per conduit.
- Wiring Distance from branch circuit shall not exceed 100ft.

Controller Schematics



BUILDING AUTOMATION SOLUTIONS

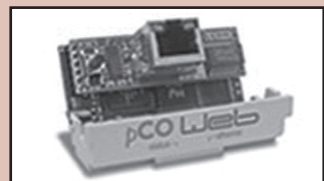
INTEROPERABILITY PORTALS



RS485 Serial Card



PCO Net RS485 Interface Board



PCO Web Ethernet Interface Board

BACNET™

- MSTP
- ETHERNET
- TCP/IP

MODBUS™ (RTU)

SNMP PROTOCOL

LONMARK™

PART 2 PRODUCTS

2.01 Operating Conditions

- A. Provide water-cooled liquid chiller with the capacity as scheduled on drawings at job site elevation listed in Section 15050.
- B. Chiller shall be designed to operate using R-410A Refrigerant.
- C. Chiller shall be designed for parallel evaporator water flow.
- D. The liquid to be chilled will be water containing corrosion inhibitors.
- E. Chiller shall be designed to operate using _____ volt, 3 phase, 60 Hz electrical power supply. (Refer to voltage options on Page 10.)

2.02 Water-Cooled Packaged Chiller

- A. Approved manufacturer is MULTISTACK.
- B. System Description: Chiller shall incorporate Scroll-type compressors and consist of multiple (105, 135, 145, 165)-ton refrigerant circuits. Each refrigerant circuit shall consist of an individual manifolded compressor set, condenser, evaporator, thermal expansion valve, and control system. Each circuit shall be constructed to be independent of other circuits from a refrigeration and electrical stand-point. The multi-circuit chiller must be able to produce chilled water even in the event of a failure of one or more refrigerant circuits. For refrigerant limits per circuit, refer to General Data on Page 4.
- C. General
 - 1. Chiller modules shall be ETL listed in accordance with UL Standard 1995 Third Edition, CSA C22.2 No. 236-05-Third Edition.
 - 2. Chiller modules shall be AHRI certified.
 - 3. Modules shall ship wired and charged with refrigerant. All modules shall be factory run tested before shipment on an AHRI-certified or third party verified test stand.
 - 4. Compressors, heat exchangers, piping and controls shall be mounted on a heavy gauge steel frame. Electrical controls, contactors, and relays for each module shall be mounted within that module.
- D. Chilled and Condenser Water Mains: Each module shall include supply and return mains for both chilled and condenser water. Cut grooved end connections are provided for interconnection to 12-inch standard (12.625" outside diameter) piping with grooved couplings. Rolled grooved shall be unacceptable. Water mains shall be installed such that they are beneath any power or control wiring to ensure safe operation in the event of condensation or minor piping leaks.
- E. Evaporators and condensers: Each evaporator and condenser shall be brazed plate heat exchangers constructed of 316 stainless steel; designed, tested, and stamped in accordance with UL 1995 code for 650 psig working pressure on the evaporator and 650 psig working pressure on the condenser. Both condenser and evaporator heat exchangers shall be mounted below the compressor, to eliminate refrigerant migration to the cold evaporator with consequent liquid slugging on start-up.
- F. OPTIONAL— Variable Flow Operation:
Chilled and/or condenser water butterfly type isolation valves shall incorporate appropriate accessories and controls to allow the chiller to operate efficiently in a variable primary flow system. Valves shall modulate via a motorized actuator for return water temperature control, chiller minimum flow bypass, chiller no-load bypass, or head pressure control.
- G. Compressor: Each module shall contain two compressor sets, each set containing two compressors with the compressors in the set manifolded together and mounted to the module with rubber-in-shear isolators. Each system also includes high discharge pressure and low suction pressure safety cut-outs.
- H. Central Control System.
 - 1. Compressor scheduling shall be performed by a microprocessor based control system (Master Controller). A new lead compressor is selected every 24 hours to assure even distribution of compressor run time.
 - 2. The Master Controller shall monitor and report the following on each refrigeration system:
 - a. Discharge Pressure Fault
 - b. Suction Pressure Fault
 - c. Compressor Winding Temperature
 - d. Suction Temperature
 - e. Evaporator Leaving Chilled Water Temp.
 - 3. The Master Controller shall be powered by the chiller's single point power connection and shall monitor and report these system parameters:
 - a. Chilled Water Entering and Leaving Temperature
 - b. Condenser Water Entering and Leaving Temperature
 - c. Chilled Water and Condenser Water Flow
 - 4. An out of tolerance indication from these controls or sensors shall cause a "fault" indication at the Master Controller and shutdown of that compressor, transferring load requirements to the next available compressor. In the case of a system fault the entire chiller will be shut down. When a fault occurs, the Master Controller shall record conditions at the time of fault and store the data for recall. This information shall be capable of being recalled through the keypad of the Master Controller and displayed on the Master Controller's semi graphical display. A history of faults shall be maintained including date and time of each fault (up to the last 20 occurrences).
 - 5. Individual monitoring of leaving chilled water temperatures from each refrigeration system shall be programmed to protect against freeze-up.
 - 6. The control system shall monitor entering and leaving chilled water temperatures to determine system load and select the number of compressor circuits required to operate. Response times and set points shall be adjustable. The system shall provide for variable time between compressor sequencing and temperature sensing, so as to fine tune the chiller to different existing building conditions.
- I. OPTIONAL – INTEROPERABILITY:
The Chiller shall be capable of interfacing to a building automation system. Interface shall be accomplished using an Interoperability Web Portal and shall be capable of communication over BACnet, Modbus or LON.

Mechanical Specifications

8. OPTIONAL – Fail to Run Mode (FRM): Chiller shall be capable of operation in the event that the Master Controller has lost communication.
- I. Chiller shall have a single-point power connection and external inputs and outputs compatible with the building management system. Inputs/Outputs include:
 1. Remote Start/Stop
 2. Customer Alarm Relay
 3. Customer Chilled/Load Limit Reset Signal
 4. ECW to Mechanical Cooling Module
 5. LCW from Mechanical Cooling Module
 6. ECHW to Mechanical Cooling Module
 7. LCHW from Mechanical Cooling Module
 8. Power Phase Monitor
 9. Chilled Water Flow Switch Input
 10. Condenser Water Flow Switch Input
 11. Full Load Indicator Relay
 12. Condenser Pump Relay
 13. Condenser Multiflush Relay
 14. Chilled Water Pump Relay
- J. Each inlet water header shall incorporate a built-in 30-mesh (minimum) in-line strainer system to prevent heat exchanger fouling and accommodate 100 percent flow filtration with a minimum surface area of 475 sq. inches per module. Condenser-side strainer system shall incorporate an automatic debris blow-down system for self-cleaning of the strainer system that is controlled and powered by the chiller.
- K. Single-Point Power: Chiller shall be equipped with a pre-engineered genuine buss bar electrical system for single-point power. Where equipment size exceeds amp rating of the buss bar, multiple power connections may be applied. Pre-engineered system shall also incorporate individual module isolation circuit breakers for full redundancy and ability of a module to be taken off-line for repair while remaining modules continue to operate. Individual power feeds to each module shall be unacceptable

2.03 SAFETIES, CONTROLS AND OPERATION

- A. Chiller safety controls system shall be provided with the unit (minimum) as follows:
 1. Low evaporator refrigerant pressure
 2. Loss of flow through the evaporator
 3. Loss of flow through the condenser
 4. High condenser refrigerant pressure
 5. High compressor motor temperature
 6. Low suction gas temperature
 7. Low leaving evaporator water temperature
- B. Failure of chiller to start or chiller shutdown due to any of the above safety cutouts shall be enunciated by display of the appropriate diagnostic description at the unit control panel in plain English. Alphanumeric codes unacceptable.
- C. The chiller shall be furnished with a Master Controller as an integral portion of the chiller control circuitry to provide the following functions:
 1. Provide automatic chiller shutdown during periods when the load level decreases below the chiller normal operating requirements. Upon an increase in load, the chiller shall automatically restart.
 2. Provisions for connection to automatically enable the chiller from a remote energy management system.
 3. The control panel shall provide alphanumeric display showing all system parameters in the English language with numeric data in English units.
 4. Each module shall contain a slave controller that will allow any module to run in the event of a master controller failure or loss of communication with the master controller via an on/off/manual toggle switch.
- D. Normal Chiller Operation
 1. When chiller is enabled, the factory supplied Master Controller modulates the chiller capacity from minimum to maximum as required by building load.
 2. The chiller control system shall respond to Entering Water Temperature and will have an integral reset based on entering water temperature to provide for efficient operation at part-load conditions.
- E. Power Phase Monitor
 1. Provide a Power Phase Monitor on the incoming power supply to the chiller. This device shall prevent the chiller from operating during periods when the incoming power is unsuitable for proper operation.
 2. The Power Phase Monitor shall provide protection against the following conditions:
 - a. Low Voltage (Brown-Out)
 - b. Phase Rotation
 - c. Loss of Phase
 - d. Phase Imbalance

Cont'd on next page...

PART 3 INSTALLATION

3.01 Piping System Flushing Procedure

- A. Before connecting the chiller to the condenser and chilled water loop, piping loops shall be flushed with a detergent and hot water (110-130° F) mixture to remove previously accumulated dirt and other organic materials. In old piping systems with heavy encrustation of inorganic materials consult a water treatment specialist for proper filtration and/or removal of these contaminants.
- B. While flushing 30 mesh (min.) Y-strainers (or acceptable Equivalent) shall be in place in the system piping and examined periodically as necessary to remove collected residue. The flushing process shall take no less than 6 hours or until the strainers when examined after each flushing are clean. Old systems with heavy encrustation shall be flushed for a minimum of 24 hours and may take as long as 48 hours before the filters run clean. Detergent and acid concentrations shall be used in strict accordance with the respective chemical manufacturer's instructions. After flushing with the detergent and/or dilute acid concentrations the system loop shall be purged with clean water for at least one hour to ensure that all residual cleaning chemicals have been flushed out.
- C. Before supplying water to the chiller the Water Treatment Specification (below) shall be consulted for water quality requirements during chiller operation. The appropriate chiller manufacturer's service literature shall be available to the operator and/or service contractor and consulted for guidelines concerning preventative maintenance and off-season shutdown procedures.

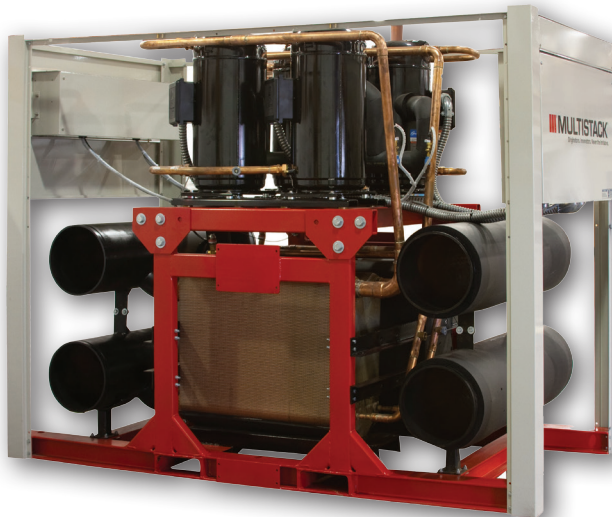
3.02 Water Treatment Requirements

- A. Supply water for both the chilled water and condenser water circuits shall be analyzed and treated by a professional water treatment specialist who is familiar with the operating conditions and materials of construction specified for the chiller's heat exchangers, headers and associated piping. Cycles of concentration shall be controlled such that recirculated water quality for modular chillers using 316 stainless steel brazed plate heat exchangers and carbon steel headers is maintained within the following parameters:
 - 1. pH Greater than 7 and less than 9
 - 2. Total Dissolved Solids (TDS) Less than 1000 ppm
 - 3. Hardness as CaCO₃ 30 to 500 ppm
 - 4. Alkalinity as CaCO₃ 30 to 500 ppm
 - 5. Chlorides Less than 200 ppm
 - 6. Sulfates Less than 200 ppm

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Multistack LLC supports and complies with the Buy American Act and the American Recovery and Reinvestment Act of 2009. Multistack air- and water-cooled chillers are manufactured in Sparta, Wisconsin, USA, with primary focus on American made components.



MULTISTACK®

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www.multistack.com



QUAD-CAT-001_0417
Supersedes F149-0613

FWB