MULTISTACK®
CUSTOMER DRIVEN INNOVATION

Installation, Operation, Maintenance Manual

AIR COOLED PACKAGED MODULE

ASP010, ASP015, ASP020, ASP030, ASP060, PMP, FCP

multistack.com

TABLE OF CONTENTS

SAFETY INFORMATION

This manual includes warnings, cautions and notes.

DANGER conveys serious hazards for injury or death.

WARNING indicates risk of injury or death.

CAUTION warns of possible injury or damage.

NOTE calls out work practices that can result in optimal operations.

WARNINGS, CAUTIONS AND NOTES INCLUDE:

DANGER: To avoid the risk of electrical shock, personal injury or death, disconnect all electrical power to the unit before performing any maintenance or service. The unit may have more than one electrical power supply. Assume all electrical wires are live, energized wires. Use lockout/tag outs.

DANGER: Use extreme caution when working around electrical components, wiring and connections to avoid injury or death by electric shock.

DANGER: Never remove a lockout from equipment unless you placed it there. Each person shall place his/her own lock/tag when required to isolate an energy source. Do not start any adjustment, service or repair without verifying that the tag/lock out switch or control cannot be by-passed or over-ridden. Verify that the locked-out switch or control cannot be overridden. Test the equipment to be certain that the locked-out switch is de-energized and not malfunctioning. Press all start buttons to confirm that the equipment WILL NOT START. Confirm that the system being serviced or repaired is the system that has been locked out. Before restarting equipment, verify all tools and other items have been removed, all machine guards are in place, all electric systems are reconnected, and personnel are clear of equipment.

DANGER: During installation, testing, servicing and troubleshooting this product, it may be necessary to work with live electrical components. Only qualified licensed electricians or other properly trained persons may perform these tasks. Failure to follow all electrical safety precautions can result in death or serious injury. All HVAC equipment must be installed per National Electric Code (NEC) and all applicable state/local codes.

DANGER: Incorrect handling of HVAC equipment can result in explosions, electrical shock or fire, causing property damage, injury and/or fatality.

DANGER: HVAC liquids and chemicals can be dangerous if used incorrectly or if spills or accidents occur. Handle detergents and solvents with care to avoid spills and burns.

DANGER: Refrigerant cylinders can explode causing serious injury and/or death if not handled and stored properly.

WARNING: Failure to handle, install and operate this equipment according to the information and safety notices in this manual may result in damage to the equipment and/or personal injury or death. Failure to comply may void some or all Multistack warranty options.

WARNING: Working with HVAC (heating, ventilating and air conditioning) equipment can be hazardous due to electricity, moving parts, chemicals, combustion and other hazards. Use safe work habits including proper tools and personal protective equipment. Understand and heed all safety information, installation guidelines and operation and maintenance procedures Only trained, qualified personnel shall install and/or service Multistack equipment. Serious injury, death and property damage can result from improper installation and service of the Multistack equipment. High voltage electrical components and refrigerant under pressure are present. Personnel installing and servicing Multistack equipment shall have a minimum Class II EPA certification.

WARNING: Only qualified, licensed electricians with proper personal protection equipment should wire Multistack heat pumps. Injury or death my result if not properly wired due to electric shock hazard.

WARNING: Danger of electrical shock. Many types of HVAC equipment have switches and regulators with electrical current on even if other parts of the equipment appear to be turned off. Main circuit breakers must be turned off before servicing equipment to avoid injury or fatality.

WARNING: Use lifting slings with lifting capacity to safely handle unit weight. Consult the unit's as-built submittal drawings for unit weight data.

WARNING: If welding on heat pump water connections, use proper electrical grounding to avoid damaging the compressors or heat pump controls. Never weld directly on the heat exchanger shells. Only an authorized ASME-certified repair agency may weld directly on ASME-certified shells. After welding, an "R" stamp is required.

WARNING: The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater). Do not pierce or burn. Be aware that refrigerants may not contain an odor.

WARNING: RISK OF FIRE - Flammable refrigerant used. To be repaired only by trained service personnel. Do not puncture refrigerant tubing. Dispose of properly in accordance with federal or local regulations. Flammable refrigerant used.

WARNING: RISK OF FIRE - UNIT CONTAINS R-454B REFRIGERANT. Proper service equipment is required. Failure to use proper service tools may result in equipment damage or personal injury.

WARNING: This product can expose you to chemicals including lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

WARNING: This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

WARNING: Children should be supervised to ensure that they do not play with the appliance.

WARNING: APPLIANCE NOT ACCESSIBLE TO THE GENERAL PUBLIC.

CAUTION: Thermal dispersion flow sensors are factory calibrated. Special tools are needed to adjust calibration.

CAUTION: Pressurized application of cleaning substances or refrigerants must be done using correct procedures to ensure safety of personnel and avoid property damage.

ISO SAFETY SYMBOLS DEFINED

Read and understand safety precautions prior to installation and operation. Improper installation and operation due to negligence of instructions may result in significant property damage, severe injury, and / or death. The symbol graphics used within this manual are classified by the following general appearance shown below.

	Mandatory action required where ignoring mandatory action can result in property damage, significant injury, and / or death.
	General Hazard warning where if the corresponding precautions are not taken it could result in significant property damage, severe injury and / or death.
	Prohibited Action. You must never perform the action shown or described.
	Important additional information and advice for user.
	Before installation, start-up, and operation, read these instructions carefully to ensure correct use. Use this manual to work safely with and on the equipment. They contain safety instructions that must be complied with as well as information required for optimal performance of the equipment. Failure to follow instructions can result in significant property damage, severe injury and / or death.
	Before servicing equipment read these instructions carefully. They contain safety instructions and hazard warnings that must be complied with. Failure to follow instructions can result in significant property damage, severe injury and / or death.
	Lock Electrical Disconnect Switch or Circuit Breaker supplying the equipment when opening any access doors or covers. Follow Lock Out - Tag Out protocol when servicing equipment.
	Disconnect all incoming sources of power before opening any access doors or covers on the equipment.
	Equipment has High Leakage Current. Protective Earth connection essential before connecting mains supply. Minimum ground wire size: 8.4mm^2 Cu.
	Equipment operates with refrigerant which can be dangerous when servicing. Eye protection required.
	Wear protective gloves. Equipment can contain contaminated refrigerant and oil which can cause severe burns.

Never operate the equipment with doors or covers removed. Access to hazardous voltage and moving parts can result in significant property damage, severe injury, and / or death.

Warning, equipment contains hazardous voltage and live electrical parts. Coming in to contact with these parts can result in severe injury, and / or death. Take necessary precautions to avoid contact with live parts.

This unit contains an electronically commutated motor which retains hazardous voltage even after power is disconnected. Wait at least three minutes after you disconnect power before you attempt to service motors or electrical components within the unit. Sealed electrical components shall be replaced. Intrinsically safe components must be replaced.

Warning, equipment has potential arc flash hazard. Appropriate PPE and tools required when working on this equipment. Failure to comply may result in severe injury, and / or death.

Warning, equipment contains hazard due to contact with rotating fan blade. Coming into contact with rotating fan blade can result in significant property damage, severe injury, and / or death. Take necessary precautions.

Warning, equipment contains Flammable Gas. No smoking, no open flames, no sparks.

Inadequate pipe sizing & routing can cause performance issues. All piping must be properly and adequately supported at coupling connections and suitable intervals along the piping runs. Hanger design must provide for the weight of fluids in the piping system when the chiller is in operation.

DISPOSAL / RECYCLING

This equipment contains potentially hazardous materials. When disposing of this appliance, the law requires special collection and treatment. Do not dispose of this product as household waste or unsorted municipal waste. Follow the Equipment Decommissioning and Removal Sign Off Checklist.

Disposing of this appliance improperly, or in other natural surroundings, endangers your health and is bad for the environment. Hazardous substances may leak into the ground water and enter the food chain. Please follow the proper disposal protocol.

This Equipment contains refrigerants, oils and other harmful liquids. These liquids shall not be permitted to enter municipal wastewater or ground water sources. Dispose of liquids as required by local environmental law.

Equipment shall be labeled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing FLAMMABLE REFRIGERANTS, ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.

This equipment contains electronics, and other components/hazardous materials. Do not dispose as household waste or unsorted municipal waste. Dispose or recycle as required by local environmental law.

This Equipment contains metals and other recyclable materials which must be recycled as required by local environmental law.

ADDITIONAL SAFETY

Additional safety when Flammable Refrigerant is in use:
Prior to beginning work on systems containing **FLAMMABLE REFRIGERANTS**, safety checks are necessary to ensure that the risk of ignition is minimised. Work shall be undertaken under a controlled procedure so as to minimise the risk of a flammable gas or vapour being present while the work is being performed. All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe. If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

No person carrying out work in relation to a **REFRIGERATING SYSTEM** which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space.

Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed. Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Charging Process when Flammable Refrigerant is used:
In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the **REFRIGERATING SYSTEM** is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the **REFRIGERATING SYSTEM**.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Detection of Flammable Refrigerants:
Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. The following leak detection methods are deemed acceptable for all refrigerant systems. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of **FLAMMABLE REFRIGERANTS**, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

NOTE Examples of leak detection fluids are
– bubble method,
– fluorescent method agents.

If a leak is suspected, all naked flames shall be removed/ extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

Recovering:
When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant.

If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

ADDITIONAL SAFETY

Removal and Evacuation for Flammable Refrigerant:
When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

– evacuate;
– purge the circuit with inert gas (optional for A2L);
– evacuate (optional for A2L);
– continuously flush or purge with inert gas when using flame to open circuit; and
– open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Decommissioning:
Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely.

Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

a) Become familiar with the equipment and its operation

b) Isolate system electrically.

c) Before attempting the procedure, ensure that:

- mechanical handling equipment is available, if required, for handling refrigerant cylinders.
- all personal protective equipment is available and being used correctly;
- the recovery process is supervised at all times by a competent person;
- recovery equipment and cylinders conform to the appropriate standards.

d) Pump down the refrigerant system, if possible.

e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.

f) Make sure that cylinder is situated on the scales before recovery takes place.

g) Start the recovery machine and operate in accordance with instructions.

h) Do not overfill cylinders (no more than 80 % volume liquid charge).

i) Do not exceed the maximum working pressure of the cylinder, even temporarily.

j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.

k) Recovered refrigerant shall not be charged into another **REFRIGERATING SYSTEM** unless it has been cleaned and checked.

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.

The following checks shall be applied to installations using **FLAMMABLE REFRIGERANTS:**

– the actual **REFRIGERANT CHARGE** is in accordance with the room size within which the refrigerant containing parts are installed;

– the ventilation machinery and outlets are operating adequately and are not obstructed;

– if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;

– marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;

– refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised. Initial safety checks shall include:

- that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- that no live electrical components and wiring are exposed while charging, recovering or purging the system;
- that there is continuity of earth bonding.

MODEL NUMBER NOMENCLATURE

1,2,3	4,5,6	7	8	9	10
ASP	**015**	**A**	**C**	**H**	**A**

Series
ASP
Standard Air-Cooled

ASX
High Efficiency

ASA
Aux Condenser

ADX
Condensing Unit

AHA
High Ambient

Nominal Capacity

Compressor

A - Copeland ZR
E - Copeland ZH
I - Copeland YAI
K - Danfoss DSH
L - Danfoss PSH
X - Copeland ZP

AHRI Certification

C - Certified

N - NOT Certified

Voltage

A - 208/ 3 / 60
C - 575 / 3 / 60
H - 460 / 3 / 60
K- 400 / 3 / 60
L - 230 / 3 / 60
M - 208 / 1 / 60
S- 230 / 1 / 60

Compressor RLA

A - Low (not defined)
B - Medium (<110F)
C - High (>110F)

PROJECT SPECIFIC DATA AND LAYOUT DRAWING

MULTISTACK

Job Name	Test	Job Number	
Location	Test	Quote Number	QMCLATWORTHY08132024-1
Engineer		Representative	Mike Clatworthy
Contractor		Rep Office	Sparta

Mechanical Modules: (4) MSS030KCHA **Code:** GHAA--ABCBC-BAA-CA-X

Accessory Modules:

SUMMARY PERFORMANCE DATA													
							EVAPORATOR			CONDENSER			
Load	Capacity (tons)	Input kW	THR (MBtu/h)	kW/Ton	EER (Btu/Wh)	COP (kW/kW)	Flow Rate (GPM)	Leaving Temp. °F	ΔP (ft H2O)	Cond Flow (GPM)	Entering Temp. °F	Leaving Temp. °F	ΔP (ft H2O)
100%	123.4	89.48	1.779	0.7249	16.98	4.980	295.7	44.00	17.90	383.5	85.00	94.30	19.37
75%	92.58	58.03	1.288	0.6269	21.37	6.260	295.7	44.00	17.90	383.5	75.00	81.76	19.37
50%	61.72	30.71	0.8359	0.4976	26.53	7.770	295.7	44.00	17.90	383.5	65.00	69.39	19.37
25%	30.86	15.54	0.4165	0.5036	27.34	8.010	295.7	44.00	17.90	383.5	65.00	67.21	19.37

		kW/Ton	EER (Btu/Wh)	COP (kW/kW)
With Tower Relief (per AHRI 550/590)	IPLV.IP	0.5473	21.92	6.429

EVAPORATOR DESIGN DATA	(Based on Water)
Entering Temperature °F	54.00
Leaving Temperature °F	44.00
Design Flow (GPM)	295.7
Pressure Drop (PSI / Ft H2O)	7.748 PSI / 17.90 ft H2O
Chiller Minimum Flow (GPM)	73.90
Min. GPM For Sizing System Bypass	110.9
Heat Exchanger Style	Brazed Plate
Fouling Factor (h-ft2-°F/Btu)	.000100
Header Connection Size (in.)	6
Header Connection Type	Grooved Coupling

CONDENSER DESIGN DATA	(Based on Water)
Entering Temperature °F	85.00
Leaving Temperature °F	94.30
Design Flow (GPM)	383.5
Pressure Drop (PSI / Ft)	8.385 PSI / 19.37 ft H2O
Chiller Minimum Flow (GPM)	95.90
Min. GPM For Sizing System Bypass	143.8
Heat Exchanger Style	Brazed Plate
Fouling Factor (h-ft2-°F/Btu)	.000250
Header Connection Size (in.)	6
Header Connection Type	Grooved Coupling

PHYSICAL DATA	
Length (in.)	128
Width (in.)	56
Height (in.)	67
Estimated Dry Weight (lbs.)	6360
Estimated Operating Weight (lbs.)	6960
Refrigerant Type	R454B
Refrig. Charge (lbs/circuit)	9,

ELECTRICAL DATA	1	2	3	4
(4) MSS030K	4	0	0	0
MCA	*165			
MOP	200			
Voltage	460/60/3			

Dimensions are estimated and do not include frames, J-boxes, Multiflush, etc

*

CHILLER DATA	
Compressor Description	Water Cooled Modular Scroll
** Compressor RLA (per comp.) ** Rated Input Current (per comp.)	MSS030K=19.9 (fixed)*

MOUNTING/LIFTING FRAME	
Materials	Option Not Selected
I-Beam Size	Option Not Selected
Bolt together frame - # of pieces	Option Not Selected
End Type	Option Not Selected

Outside the scope of AHRI Water-Cooled Water-Chilling and Heat Pump Water-Heating Packages Certification Program, but is rated in accordance with AHRI Standard 550/590 (I-P) and AHRI Standard 551/591 (SI).
Combined units or modular chiller array rating is outside of the scope of the AHRI Water-Cooled Water-Chilling and Heat Pump Water-Heating Packages Certification Program. Individual unit ratings are subject to the governing documents of the AHRI Certification Program.

Software Version# : 1.0.4435.72000

MEMBER AHRI

Performance Run Date: 8/13/2024 11:17:08 AM

PROJECT SPECIFIC DATA AND LAYOUT DRAWING

MULTISTACK®

Variable Primary Flow Design Requirements

NOTE: Primary/Secondary requirements use decoupler as the bypass. Contact Multistack for additional design requirements.

Chilled Water System (Evaporator)

Ensure a chiller DP transmitter (DP1) is incorporated into the piping design and set to: 7.75 PSI
DP1 to be installed directly after the chiller with no pressure adding devices between the chiller and DP1. *(mechanical only ΔP)*

Ensure a system DP transmitter(s) (DP2) is incorporated into the piping design

Ensure a system bypass valve(s) (V1) is incorporated into the piping design

Design of system bypass (V1) must be a characterized ball or globe type valve and be pressure dependent

System bypass valve (V1) stroke time needs to be selected for less than 60 seconds

Chiller minimum flow is: 73.90 GPM

System bypass valve must be design for a minimum of: 110.9 GPM

Note: this is a minimum requirement for the chiller ONLY! Other system components such as pumps or air handling units may have higher minimum flow requirements and bypass sizing may be adjusted accordingly.

Bypass loop volume (Includes piping between V1 & chiller): 370.3 Gallons

Note: the bypass loop should be designed for a minimum of a 2 minute loop at all conditions. To obtain ensure the above volumes min

Refer to Multistack Variable Flow Engineering Bulletin for more details.

The pump or the bypass valve must control to maintain chiller DP setpoint. The opposite device (Pump or Bypass Valve) must maintain system DP setpoint.

When a pump module is supplied by Multistack it will be factory configured to control to DP across the chiller unless otherwise specified and noted on the chiller selection.

Pages 09-15 RESERVED
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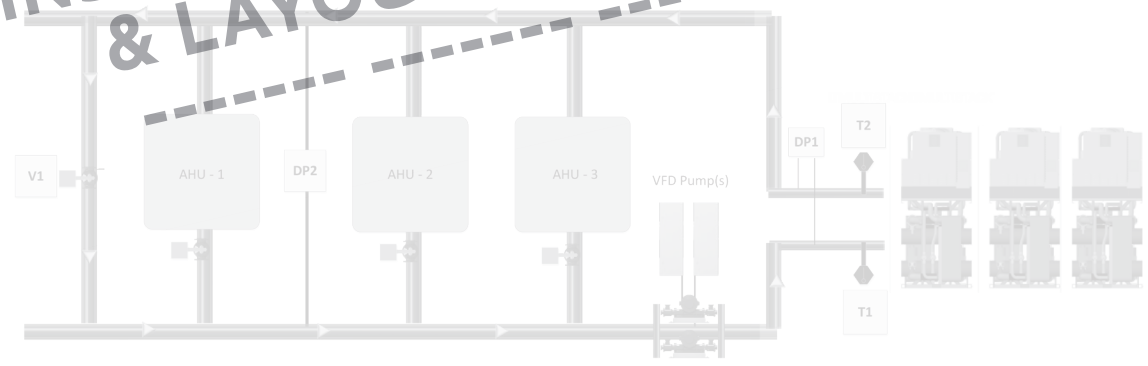


LEGEND

WIRED & CONTROLLED BY CONTROLS CONTRACTOR
V1 – SYSTEM BYPASS VALVE
DP1 – CHILLER DIFFERENTIAL PRESSURE
DP2 – SYSTEM DIFFERENTIAL PRESSURE
VFD Pump(s)

WIRED TO CHILLER MASTER CONTROLLER
T1 – CHW RETURN TEMP SENSOR
T2 – CHW SUPPLY TEMP SENSOR

PROJECT SPECIFIC DATA AND LAYOUT DRAWING

MULTISTACK®

Variable Primary/Secondary Flow Design Requirements

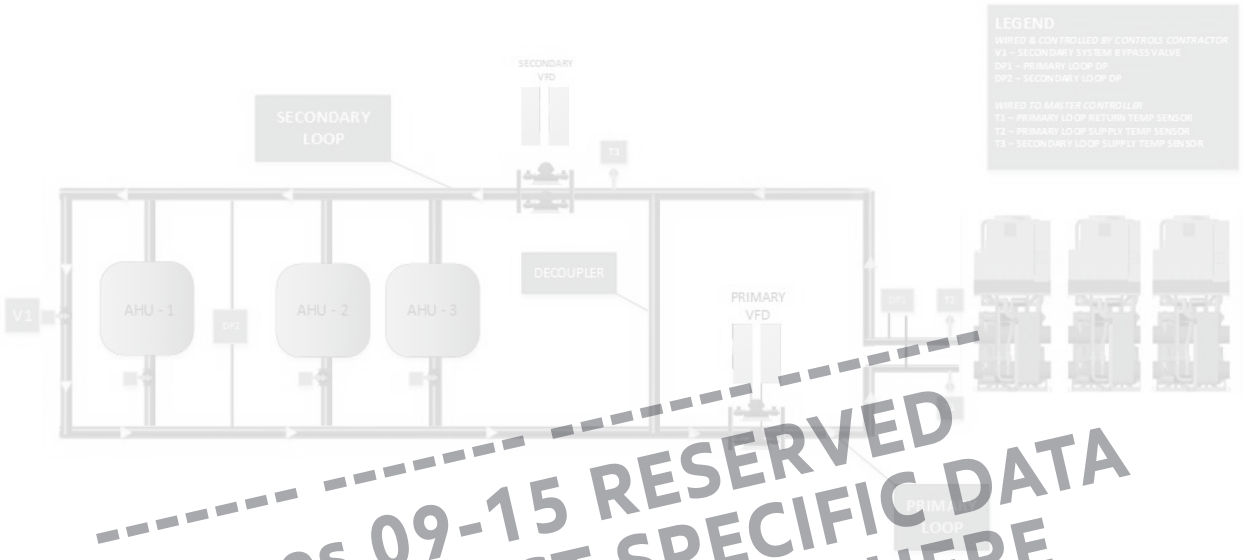
Chilled Water System (Evaporator)

Ensure a chiller DP Transmitter (SP1) is incorporated into the piping design and set to: 7.75 PSI

DP1 to be installed directly after the chiller with no pressure adding devices between the chiller and DP1. (mech. only *ΔP)*

Ensure a system DP Transmitter(s) (DP2) is incorporated into the piping design.

Chiller minimum Flow is: 73.90 GPM



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PROJECT SPECIFIC DATA AND LAYOUT DRAWING

MULTISTACK®

Variable Primary Flow Design Requirements

NOTE: Primary/Secondary requirements use decoupler as the bypass. Contact Multistack for additional design requirements.

Condenser Water System

Ensure a chiller DP transmitter (DP1) is incorporated into the piping design and set to: 8.385 PSI

DP1 to be installed directly after the chiller with no pressure adding devices between the chiller and DP1.

Chiller minimum flow is: 95.90 GPM

Refer to Multistack Variable Flow Engineering Bulletin for more details

The condenser side water valves may be left open at all times in a user seletable number of modules.
This would be to allow for the cooling tower's, fluid cooler's, pump's, etc. minimum flow.
When a pump module is supplied by Multistack it will be factory configured to control to DP across the chiller unless otherwise specified and noted on the chiller selection.

specified and noted on the chiller selection.

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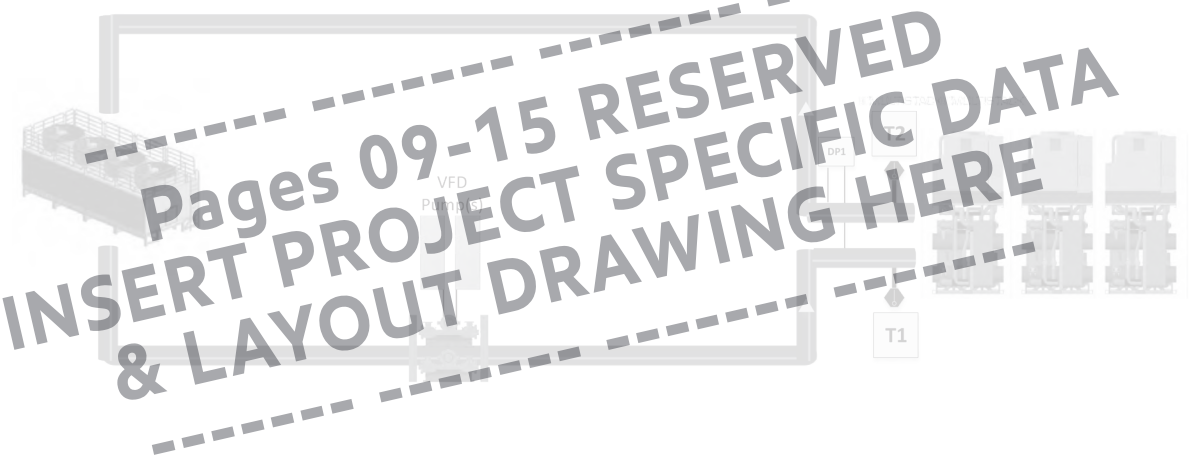

LEGEND

WIRED & CONTROLLED BY CONTROLS CONTRACTOR
DP1 – CHILLER DIFFERENTIAL PRESSURE
VFD Pump(s)

WIRED TO CHILLER MASTER CONTROLLER
T1 – CHW RETURN TEMP SENSOR
T2 – CHW SUPPLY TEMP SENSOR

PROJECT SPECIFIC DATA AND LAYOUT DRAWING

Services & Special Features:

- Chiller Waterside Maximum Working Pressure is 150 PSIG
- Heat exchanger maximum working pressure (refrigerant 650 PSI)
- Lead compressor sequencing (24hrs)
- Automatic internal rescheduling if fault occurs
- Multiple, independent refrigeration systems
- Automatic logging of any fault condition
- Electronic chilled water control
- Quick interconnect modular design
- Filters in evaporator and condenser supply headers
- Stainless steel evaporator and condenser inlet header
- Electrical design - Standard
- Electrical tier - Low - A
- R-454B Refrigerant
- 5kA SCCR
- Electrical Connection Type - Junction Box
- 5 Year Warranty: Compressor and Drive
- 1 Year Warranty: All Parts
- Evaporator Type - Standard
- Condenser Type - Standard
- Power Phase Monitor per module
- Total Access Design w/NEMA2 Var. Flow Actuator (Evap. & Cond.) (C-Steel Valves)
- Single Point Power Connection (Hoffman Style)
- Multiflush™ (Debris Removal System) - Cond
- ¾" Insulation (Evaporator)
- 6" Taller Modules with Conduit Raceway
- Evap Flow Switch-Thermal Dispersion Type (24 Volt Factory Powered & Installed On Each Module)
- Refrigerant Leak Det. Per Module
- UL 207 (CSA C22.2 NO. 140.3-15) Evaporator
- UL 207 (CSA C22.2 NO. 140.3-15) Condenser

Excluded By Multistack:

- Acoustical Panels - indoor use
- Interconnecting piping between sections if two sections exist.
- Multistack recommends a 2-3 minute minimum loop time. Contact Multistack if you have questions regarding system loop time design

- **REFRIGERANT MONITORING :** Multistack provides a contact closure at **EACH MODULE** that is tied directly to the refrigerant sensing device as well as a common output from our Master Control. The output at the Master Control depends upon communication between the module and Master Control and may or may not meet the local requirements for this monitoring. The customer will need to determine if they need to monitor at each individual module for this status, or if it will be acceptable to monitor the single output at the Master Control based on local codes.

Pages 09-15 RESERVED
INSERT PROJECT SPECIFIC DATA & LAYOUT DRAWING HERE

PROJECT SPECIFIC DATA AND LAYOUT DRAWING

There is no job specific drawing available for this configuration.
Please contact Multistack for a detailed drawing.

Project Specific Data and Layout Drawing are to be placed here.

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Pages 09-15 RESERVED
INSERT PROJECT SPECIFIC DATA
& LAYOUT DRAWING HERE
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PROJECT SPECIFIC DATA AND LAYOUT DRAWING

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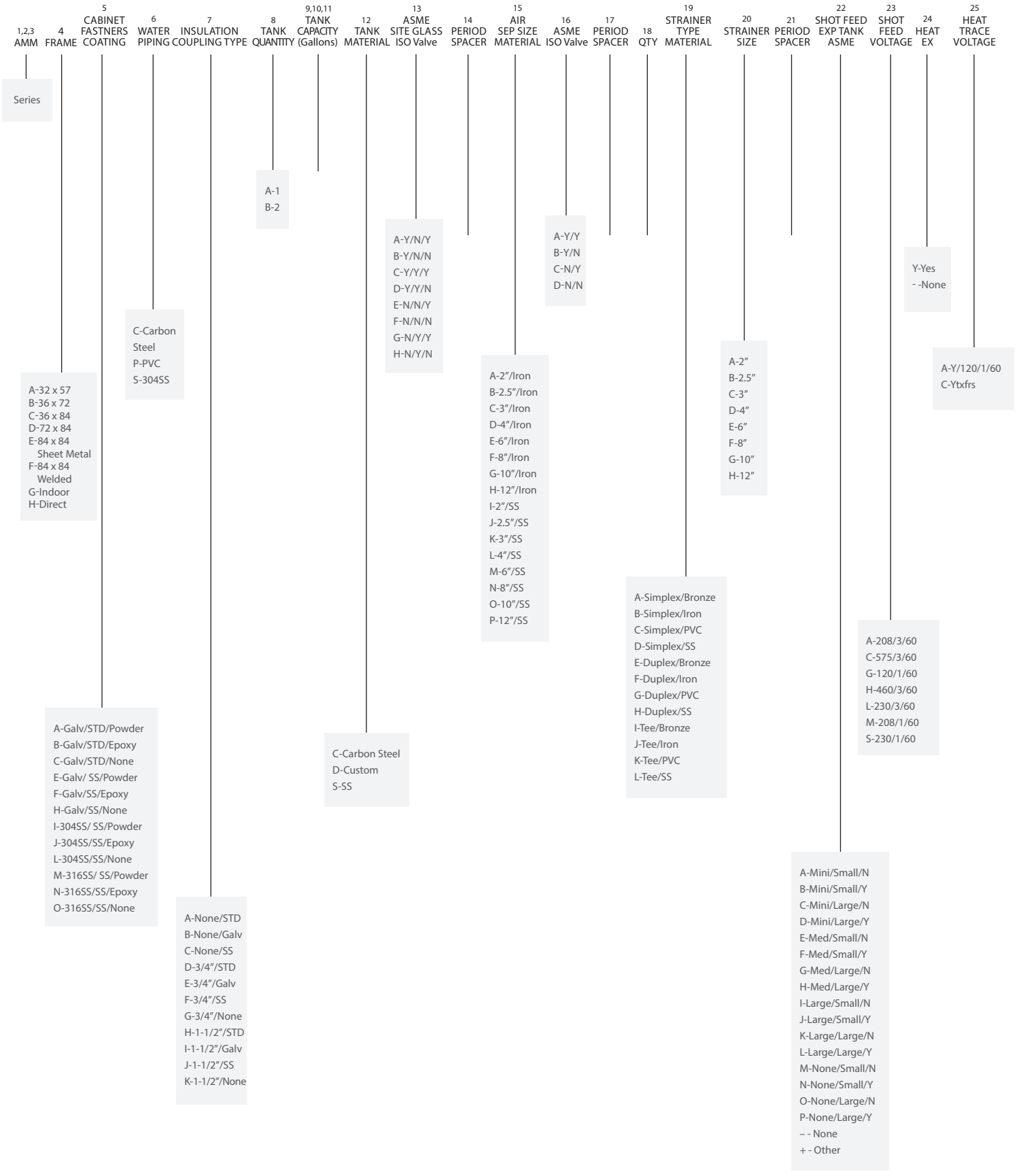
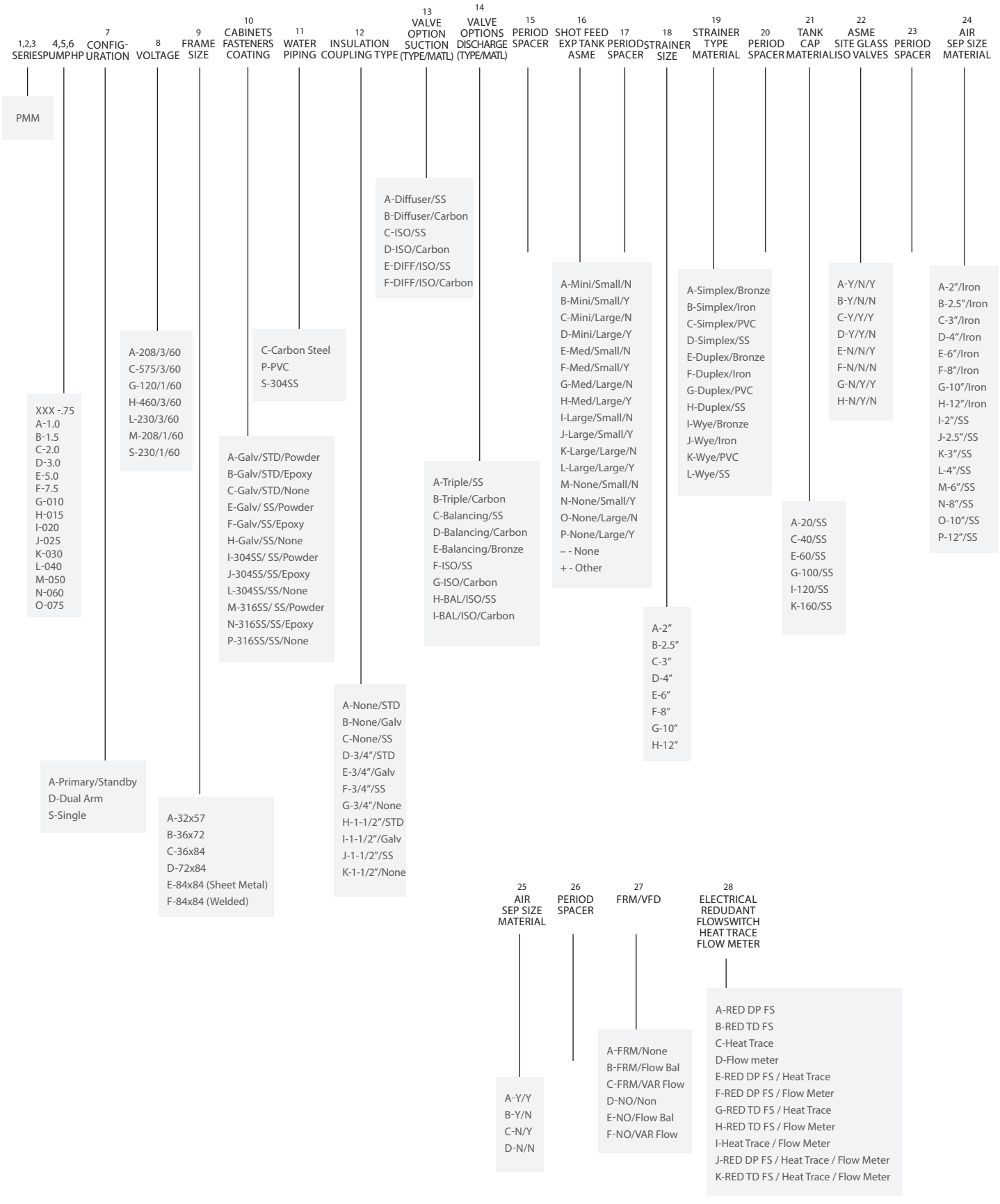
& LAYOUT DRAWING HERE

ACCESSORY MODULE NOMENCLATURE



PUMP MODULE NOMENCLATURE



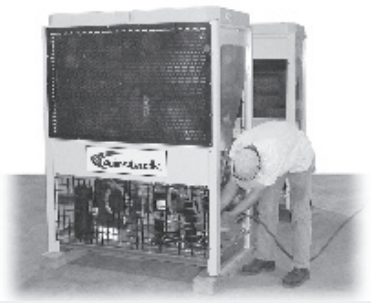
INTRODUCTION AIR COOLED PACKAGED MODULE

The **Multistack®** "ASP" is a modular air-cooled chiller system with a nominal capacity of 10, 15, 20, 30 and 60 tons per module. The chiller system could consist of a master module (front module with controller), front and rear modules, free cooling module, and a pump module. This system utilizes a fully hermetic scroll compressor, 316 stainless-steel-brazed plate heat exchanger, four or six row copper tube or microchannel, aluminum fin condenser coils and a microprocessor–based control. Operating capacity is based on the entering chilled liquid temperature. Precise control and system reliability is best served in this fashion. These modular air-cooled chiller systems are for use outdoor only.

This manual was created for the express purpose of assisting the owner or installing contractor of the Multistack ASP Packaged Air Cooled Product. Please review the material contained in this document carefully before installing and operating this equipment. Additional inquires regarding installation and operation should be directed to Multistack or its authorized agents. Failure to handle, install and operate this equipment in accordance with this manual may result in damage to the equipment and/or personal injury. Failure to comply may void some or all of the Multistack warranty options.

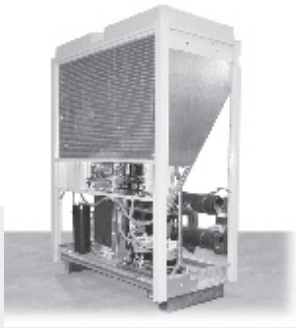
Any questions regarding the content of this Installation Manual, the handling or installation of the Multistack Chiller components, should be directed immediately to your authorized representative or to the **Service Department** at **(608) 366-2400 or FAX (608) 366-2450.**

INTRODUCTION



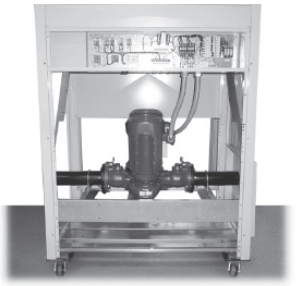
Multistack ASP
The chiller will consist of modules (one master, front or back), with an optional free cooling module (no compressors), an optional water pump module, optional water holding tank module (not pictured) and optional glycol feeder module (not pictured).

Master Module
The master module for each chiller is designated at the factory and is equipped with the master microprocessor display.



Front Module
Front Modules contain the (4", 6" or 8") water header distribution pipes and has a control board. This module will bolt together with the rear module. **Note:** ASP-020X, -030X and -060X uses 6" header.

Rear Module
This module will be attached to the front module by vertical frame bolts and the evaporator is connected by cross over pipes to the front modules water header pipes. It also has its own board. (There is no rear module on the ASP-060X)

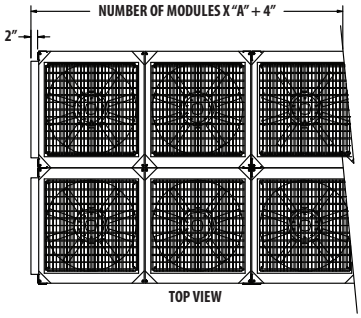


Pump Package Module
This module contains a centrifugal dual-arm pump and water distribution headers. This module is for installations where no pump is provided for the chilled water system or when additional pumping capacity is required. **Note:** Several configurations of pump modules are available. Typical pump is shown.

Free Cooling Modules
This module has fin and tube coils for free cooling operation and no mechanical refrigeration (no compressors). The module contains a three-way diverting valve for either enabling free cooling or bypass for mechanical cooling. **Note:** Free cool modules can come as fronts (with headers) or rears (without headers).

STANDARD ASP-010, -015, -020, -030 DIAGRAMS

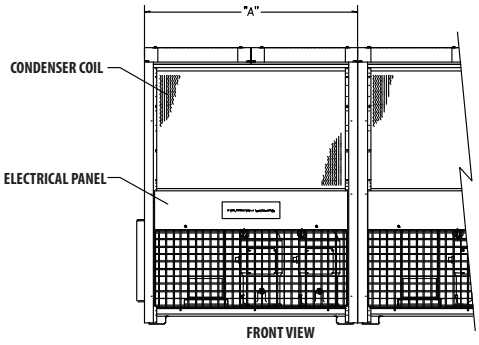
* The factory provided "As Built" drawing must be used in conjunction with this publication to determine the correct dimensional data applicable to your chiller.

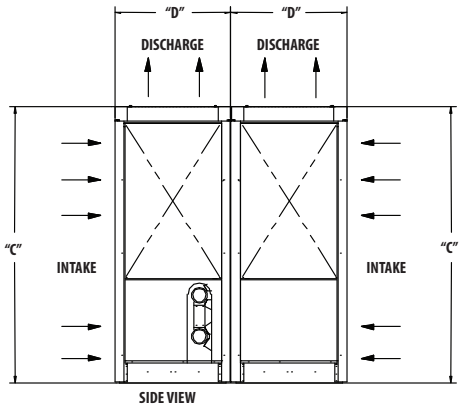


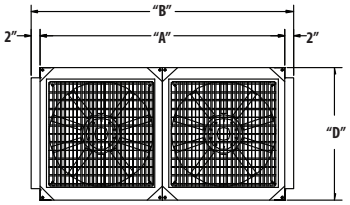
	ASP-010X, -015X	ASP-020X	ASP-030X
A	57 7/8"	72"	84"
B	——	——	——
C	74 7/8"	76 5/16"	89 5/16"
D	31 1/2"	36"	36"

MULTIPLE MODULES

NOTES:
1. NO OBSTRUCTIONS ALLOWED ABOVE CONDENSER FANS.
2. REQUIRED SERVICE CLEARANCE AT MODULE ENDS: 36".
3. REQUIRED CLEARANCE FROM ANY HIGH VOLTAGE PANEL: 42"



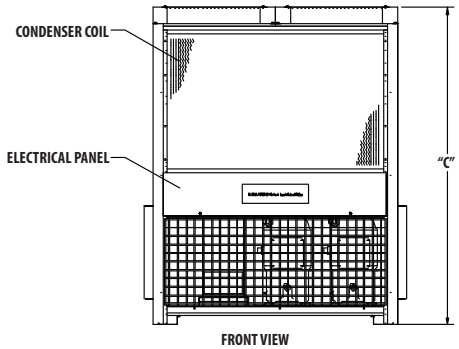


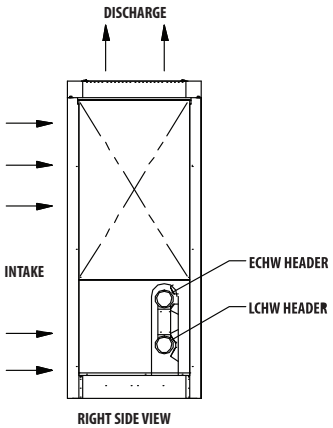


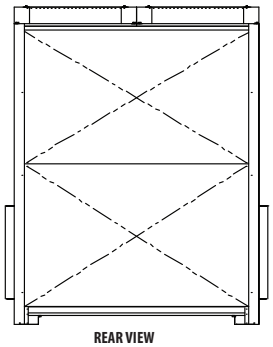
	ASP-010X, -015X	ASP-020X	ASP-030X
A	57 7/8"	72"	84"
B	61 7/8"	76"	88"
C	74 7/8"	76 1/2"	88 5/16"
D	31 1/2"	36"	36"

SINGLE MODULES

NOTES:
1. NO OBSTRUCTIONS ALLOWED ABOVE CONDENSER FANS.
2. REQUIRED SERVICE CLEARANCE AT MODULE ENDS: 36".
3. REQUIRED CLEARANCE FROM ANY HIGH VOLTAGE PANEL: 42".
4. REQUIRED CLEARANCE FROM ANY GROUNDED WALL: 36".
5. NO CLEARANCE REQUIRED FROM REAR.



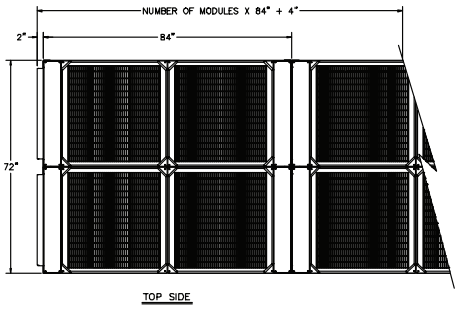


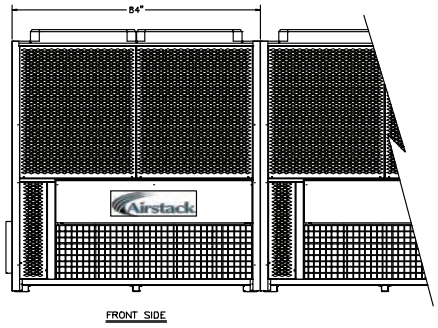


NOTE: If installation is in a pit or near walls that are taller than modules, please contact Multistack for clearances.

STANDARD ASP-060 DIAGRAMS*

* The factory provided "As Built" drawing must be used in conjunction with this publication to determine the correct dimensional data applicable to your chiller.



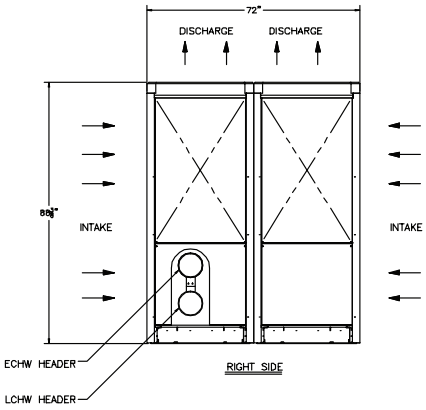


ASP-060X

MULTIPLE MODULES

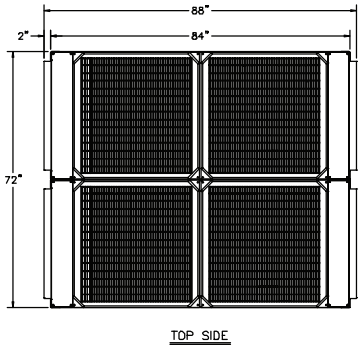
NOTES:

1. NO OBSTRUCTIONS ALLOWED ABOVE CONDENSER FANS.
2. REQUIRED SERVICE CLEARANCE AT MODULE ENDS: 42".
3. REQUIRED CLEARANCE FROM ANY HIGH VOLTAGE PANEL: 42".



STANDARD ASP-060 DIAGRAMS*

* The factory provided "As Built" drawing must be used in conjunction with this publication to determine the correct dimensional data applicable to your chiller.

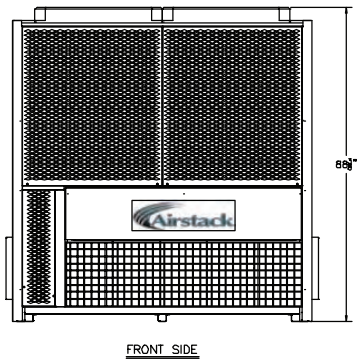


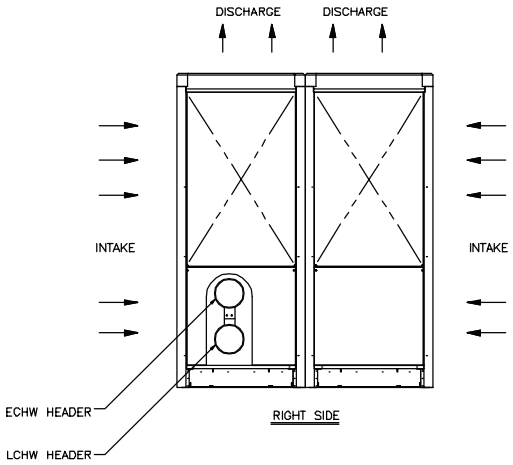
ASP-060X

SINGLE MODULES

NOTES:

1. NO OBSTRUCTIONS ALLOWED ABOVE CONDENSER FANS.
2. REQUIRED SERVICE CLEARANCE AT MODULE ENDS: 42".
3. REQUIRED CLEARANCE FROM ANY HIGH VOLTAGE PANEL: 42".
4. REQUIRED CLEARANCE FROM ANY GROUNDED WALL: 42", NON-GROUNDED WALL: 36".





NOTE: If installation is in a pit or near walls that are taller than modules, please contact Multistack for clearances.

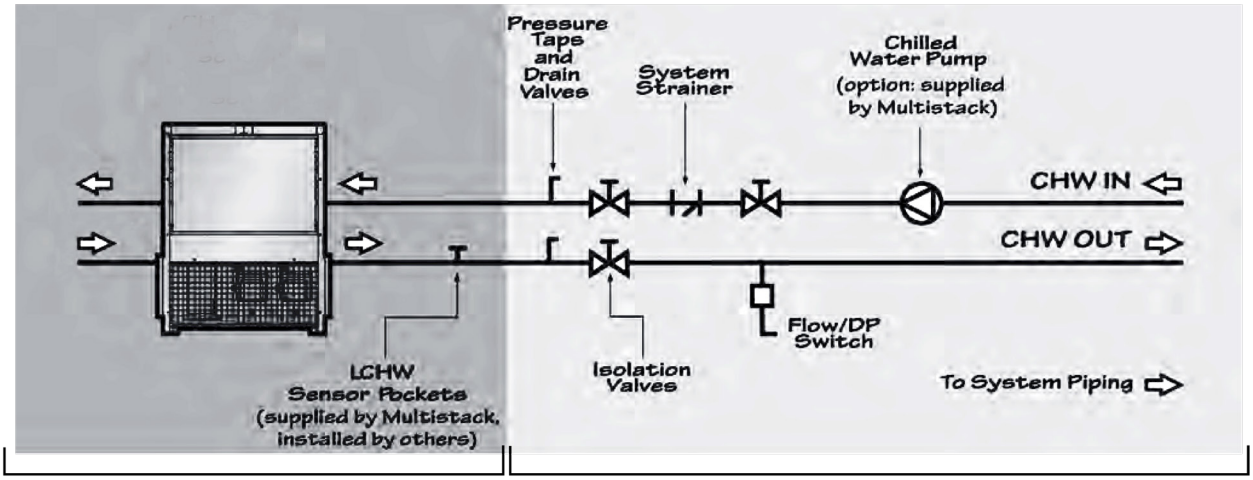
HANDLING OF MODULES

If the Multistack product is damaged in any way during shipping and handling by the transportation company or any of it's agents, the owner, or installing contractor should promptly file a claim with the transportation company and advise Multistack. It is very important to note any damage on the bill of lading when signing for the delivery of the chiller. Digital photos are also helpful.

Fork Lift or Pallet Jack
The modules can safely be lifted and maneuvered with a forklift or pallet jack. Forks can be positioned under the evaporator and between the tandem compressors.

Use of a Crane or Other Lifting Devices
If lifting modules by crane ensure the slings (do not use chains) do not damage the modules. The lift points are at the corners of the base of the chiller. The modules are shipped with the panels pre-fitted. The use of a spreader bar will prevent damage.

Site Preparation
Below components are required to ensure proper performance of the AIRSTACK® ASP chiller. All piping must be properly supported at coupling connections and suitable intervals. It is the responsibility of the installing contractor to ensure all water connections conform to local and national codes. The drawing shows piping exiting on right end. Depending on location of master module, exit can be on either end.



Supplied by Multistack. *Supplied and installed by others.*

PIPE SYSTEM FLUSHING PROCEDURE

Prior to connecting the Multistack chiller to the water/glycol-piping loop, the system piping should be flushed with a detergent and hot water (110-130º F) to remove previously accumulated dirt and/or other organic residue. After removal of organic residue, flushing should continue with a diluted phosphoric, sulfamic, or citric acid mixture if inorganic scale is present in system. (Note: Cleaning chemicals such as Nu-Calgon"Imperial Grade"Scale Remover part number 4360-84 or equivalent suitable for both organic residue and scale removal may be substituted). Any other detergents and acids shall not be combined unless approved by chemical manufacturers. Only chemicals compatible with 316 stainless steel, copper and carbon steel shall be used. (Any concentrations of hydrochloric or sulfuric acid or chloride containing chemicals shall not be allowed to come in contact with copper brazed 316 stainless steel evaporators.) Do not use means to accelerate the defrost process or to clean, other than those of the recommended by the manufacturer. Do not pierce or burn. Be aware that refrigerants may not contain an odour.

During the flushing, 30 mesh (max.) 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 manufacturers instructions. After flushing, the system loop shall be purged with clean water for at least one hour to ensure that all residual cleaning chemicals have been removed. Prior to supplying water to the Multistack chiller, the Water Treatment Specification shall be consulted for requirements regarding the water quality during chiller operation. The Multistack service literature shall be available to the operator and/or service contractor and consulted for guidelines concerning preventative maintenance.

Required Service Clearance at Module..... 36″

Required Air Intake Clearance..... ..... 42″

Required Clearance from Any High Voltage Panel..... 42″

Water Treatment/Specifications

Supply water for the evaporator 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 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:

Modular Chiller Water Quality

ph	>7 and <9
Total Dissolved Solids (TDS)	Less than 1000 ppm
Hardness as $CaCO_3$	30 to 500 ppm
Alkalinity as $CaCO_3$	0 to 500 ppm
Chlorides	Less than 200 ppm
Sulfates	Less than 200 ppm

INSTALLATION

Installing Single and Multiple Modules

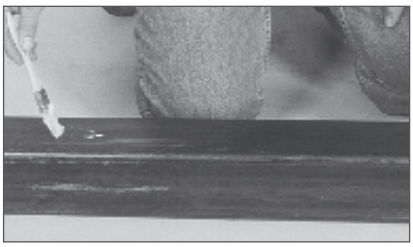
The modules should be mounted on a level surface with steel rails. This will ensure proper alignment of all fittings.

Rails should run parallel with module water flow (headers). For maximum stability three rails should be used, one rail for each outside edge and one rail to be shared in the center.

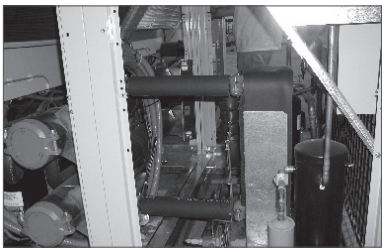
The outside rails should be placed flush with outside frame. Internal rail shares half the distance (2") with Rear and Front modules.

To ensure all warranties and a successful installation, a Factory Authorized Technician is required to perform start-up of the Multistack Chiller. If start-up is to be performed directly by Multistack,a minimum of two weeks notice is required. Please call the Multistack Service Department at **(608) 366-2400** to schedule.

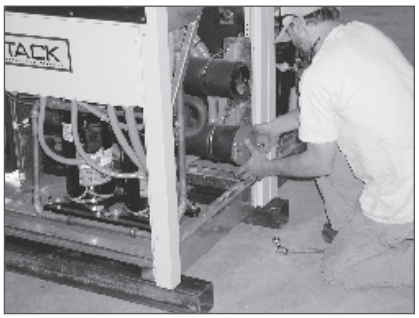
1. Starting with the master front modules, position on rails (27" center to center for 010X and 015X; 32.5" for 020X, 030X and 060X).



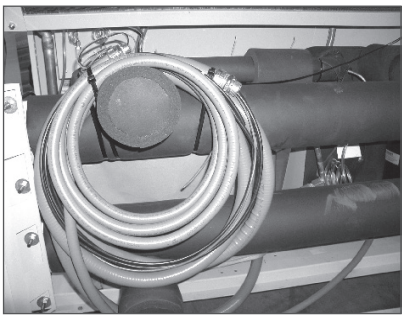
2. Lubricate rails with solid vegetable shortening (Crisco™) or other non-petroleum lubricant.



3. For rear modules, install the evaporator heat exchanger connecting pipes. Also install the provided CHW sensor into the leaving pipe. The 60 ton module consists of a front and rear portion for one module.

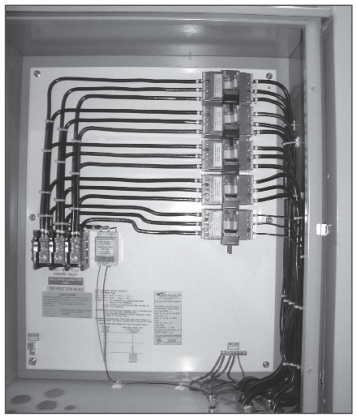


4. Lubricate gaskets with a vegetable-based lubricant and hand tighten only. Make sure the bottom connector pipe and the sensor pocket is positioned to accept the sensor for the rear module.



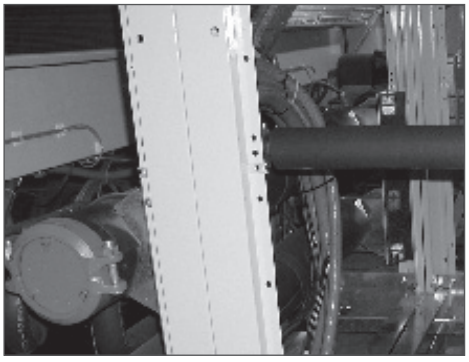
5. Note: If the chiller has a single point power box, the coiled wire and conduit should be run to the power box as the modules are installed. The conduit is marked.

INSTALLATION



6. Termination of each module to the power box should be done by the electrician.

7. Position the rear module on the rails. Align the rear module with the front module.



8. Fit the connector pipes from the front module to the rear module, lubricate the gasket, and tighten both front and rear couplings at this time. You may need to slide the evaporator mounting plate forward or backward to accomplish this.

9. By loosening the four bolts on the plate you can slide the evaporator to the correct distance. If further adjustments are needed, you can loosen the header pipes and front

10. To secure the front and rear modules, align the three holes on both ends and install the (six) 3/8" bolts provided.

The Next Step

For installation of subsequent modules, follow the same procedure as discussed previously, always begin with the front module. Before installing further rear modules, align the water header pipes, lubricate and install the gaskets and couplings connecting to the previous modules header pipe. When bolting the second full module to the first full module, align the three outer holes on each end and install the 3/8" bolts provided.

Once the chiller array is assembled the header and associated water piping shall be pressure tested by an industry accepted method to ensure that there are no water leaks. When modules are assembled at the factory, they receive a similar pressure test. Pressure testing shall be re-done in the field as well since piping that was leak free at the factory may develop leaks because of the vibration and movement inherent in motor transport and lifting.

IMPORTANT MODULE CONFIGURATION INFORMATION

PMP: ASP Pump Module

1. When present, a Pump Module is only allowed in the Front position.
2. Incoming water to the chiller system must enter at the Pump Module.
3. Leaving water from the chiller system may be from either end of the chiller.

FCP: Free Cool Module

1. When present, incoming system water must enter through the Free Cool Modules prior to entering an ASP-010X, 015X, 020X, 030X or 060X Chiller Module.
2. You may not attach a Rear Free Cool Module to a Front ASP-010X, 015X, 020X, 030X or 060X Chiller Module.

ACP: ASP Glycol Feeder Module

1. An ACP Glycol Feeder Module may be attached in any rear position.

ASP-010X, 015X, 020X, 030X or 060X Chiller Module

1. The maximum number of ASP-010X, 015X, 020X, 030X or 060X modules with a single Master Module is 14 (i.e., (1) Front-Master, (6) Front, and (7) Rear).
2. You may have more than one Master Module in a single chiller bank.
3. Piping sides of an ASP-010X, 015X, 020X, 030X or 060X chiller without Free Cool or Pump Modules attached are field selectable.

LEGEND

First Letter

M=	Master Chiller Module (ASP-010X, 015X, 020X, 030X or 060X)
S =	Chiller Module (ASP-010X, 015X, 020X, 030X or 060X)
P =	Pump Module (PMP)
F =	Free Cool Module (FCP)
G =	Glycol Feeder Module (ACP)

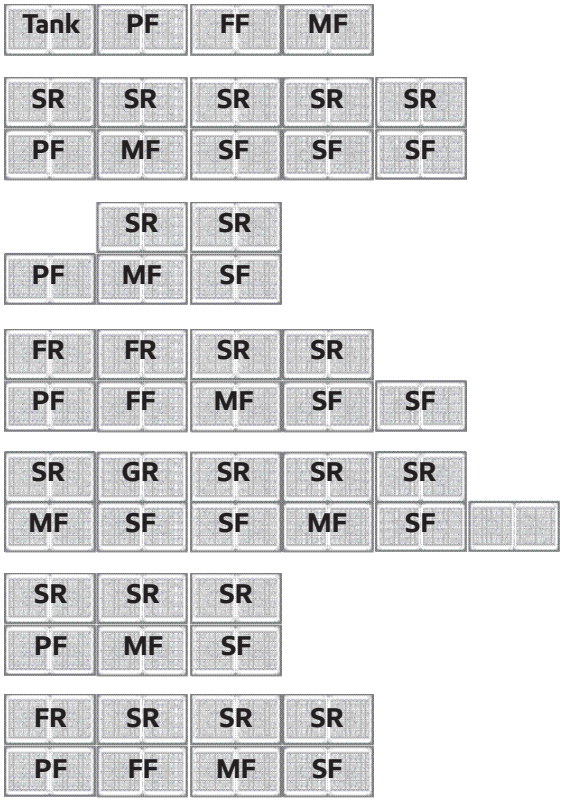
Second Letter

F =	Front Module
R =	Rear Module

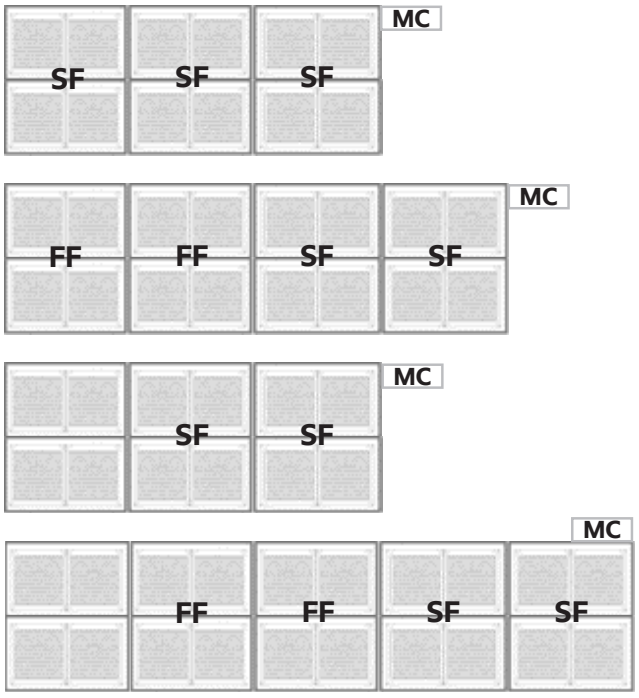
Front of Chiller Bank is Facing the Bottom of he Page
(Master Module location determines front of chiller)

For other configurations, contact your local Multistack® Representative.

ASP-010X, 015X, 020X OR 030X CONFIGURATIONS SAMPLES



ASP-060X CONFIGURATION SAMPLES*



*Rear modules are an invalid configuration for the ASP060X

FREE COOL AND PUMP MODULES

FREE COOL AND PUMP MODULES

Top Header: This header is for CHW water leaving the free cool coils. If return CHW enter on the free cool module this should be capped on the CHW inlet side.

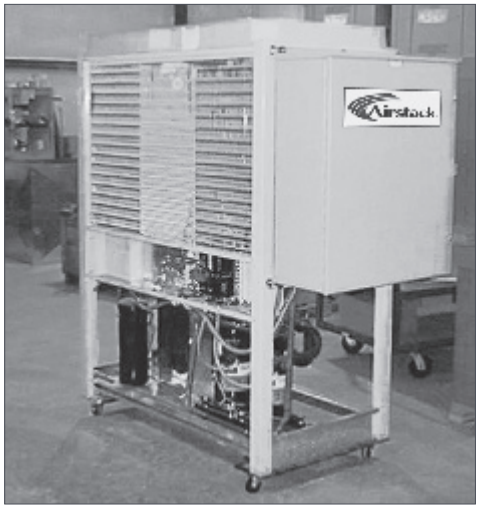
This header sends water from the free cool module to the mechanical modules for additional cooling.

Middle Header: This connection is for the inlet water to the free cool module. If the connection is to a mechanical module, the header end closest to the mechanical module should be capped.

Bottom Header: This header is for CHW going to the building. If the LCHW exits through a mechanical module on the opposite end, this header would not be used.

MAIN POWER

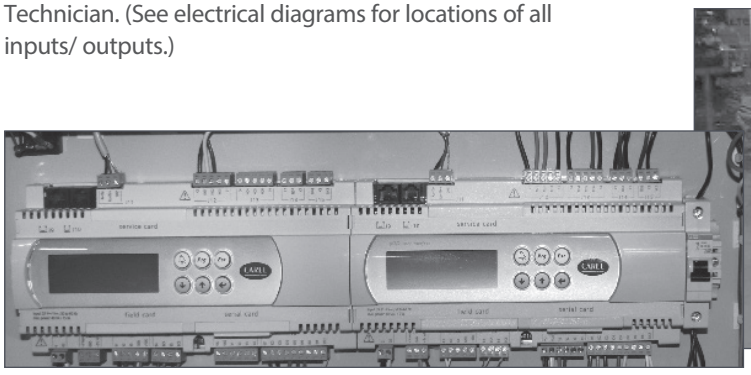
Locate the power distribution box on the specified end of the chiller. Wire and conduit will need to be run from the distribution box to each module of the chiller. The wire and conduit may be pre-sized and fabricated at the factory. It is the responsibility of the installer to connect main power to modules before start-up.

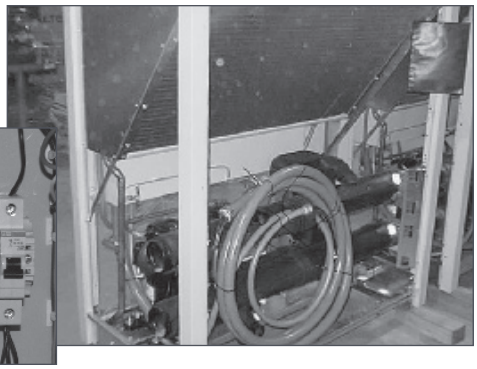


Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

FIELD WIRING

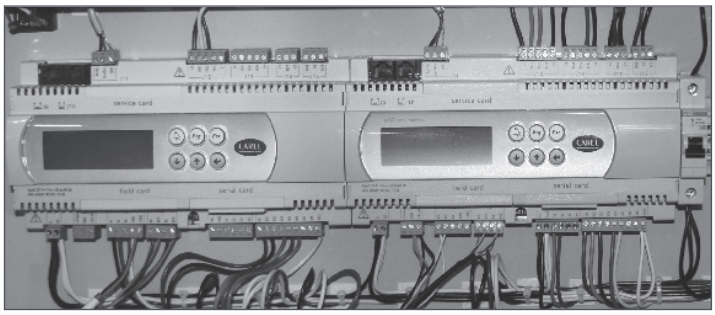
It is the responsibility of the contractor to supply and install a flow switch in the LCHW piping. The master module of the ASP chiller has inputs for the following options: remote start/ stop, run status, system alarm, 0-10V or 4-20ma input, and remote communication. Supply and return CHW sensors, module communication plugs, and communication interface cables are all provided with the chiller. The sensors and cables will be installed and tested by the Factory Authorized Start-Up Technician. (See electrical diagrams for locations of all inputs/ outputs.)



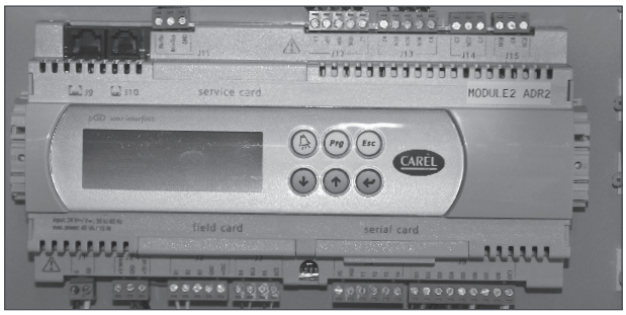


IMPORTANT MODULE CONFIGURATION INFORMATION

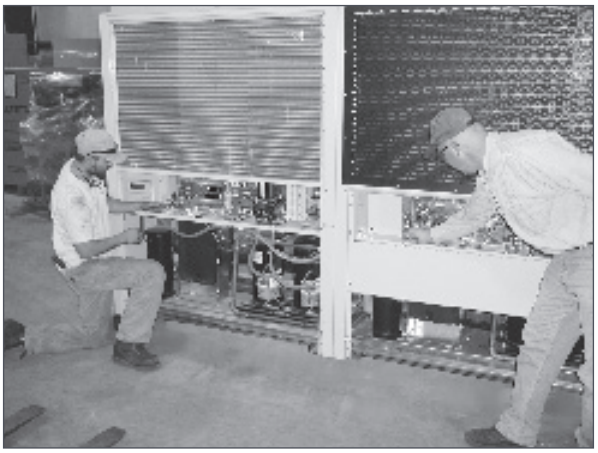
Master Controller Communication
This is the computer controller that is installed on the master module and controls all connected modules.



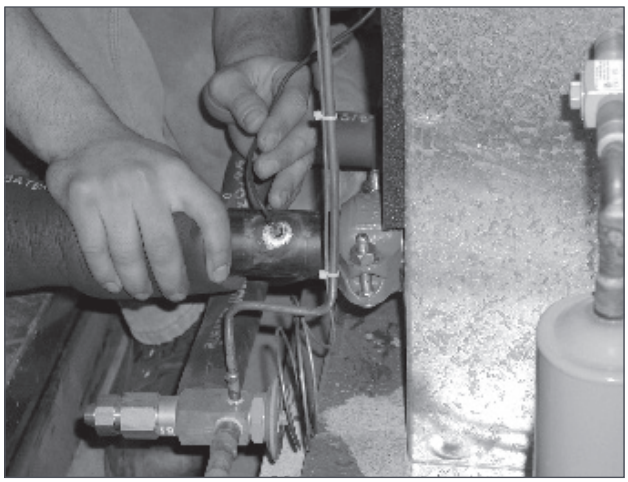
Module Board Communication
Each front and rear module has one of these. This board transfers communication from one module to the next.



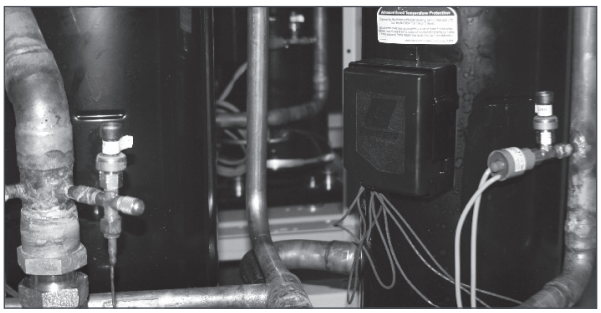
Module Communication
All modules are linked together through a communication cable. The communication port is J11 on the module board.



Chilled Water Temperature Sensors
These sensors are factory supplied and field installed on the leaving chilled water header stubs. The master module also has a return water sensor (top header stub). On Variable Flow applications, a return CHW sensor well must be supplied external and field installed as well.



Compressor Pressure Transducers
These are factory installed on the suction and discharge lines of each refrigeration circuit to monitor the suction and discharge pressures (circled).



Sensor Well
The factory supplied, and field installed, LCHW system sensor well should be installed near the master module. Sensor well is 1/2" pipe thread. The master modules LCHW System sensor will should be installed in this well. On Variable Flow applications, a system ECHW sensor well is also provided.

ASP PRESTART CHECKLIST

ASP Cooled Prestart Checklist

Job Name	
Job Number	
Jobsite Address	
Contact Name	
Contact Phone #	
Requested Startup Date	

The service of a Multistack authorized startup engineer is requested on the date above, and it is understood if the work checked below is not completed, the engineer's time and expense will be billed to us by Multistack. Terms net 30 days. Multistack is to be notified at least 14 working days in advance of the startup date. Technician availability may vary depending on current demand.

Chilled Water System

System Questions	Response
1. Piping complete and connected to the Multistack units?	
2. Does this application require glycol to be installed in the system? If so, what type and what percentage will be installed in the system at the time of the chiller startup?	
3. Water system filled and vented?	
4. Pump rotation checked?	
5. External strainers installed?	
6. The system has been flushed and all strainers are clear of debris? (Note: The system should never be flushed through the chiller)	
7. The startup screens have been removed from all pumps?	
8. All BAS controlled pumps and system valves will be automated at the time of startup?	
9. External flow switch installed?	
10. Pressure Gauges installed entering and leaving the chiller?	

ASP PRESTART CHECKLIST

Chilled Water System (cont'd)

System Questions	Response
11. Thermometers installed entering and leaving the chiller?	
12. A minimum system load of 50% is available for testing?	
13. Is this a constant or variable flow system? If constant flow skip to question 19.	
14. Does the pump control to chiller, or system differential pressure?	
15. Does the system bypass control to chiller, or system differential pressure?	
16. What is the total GPM in 3-way valves?	
17. What is the design GPM of the system bypass valve?	
18. What is the stroke time of the system bypass? (should be 30 seconds or faster)	
19. How much volume is in the shortest loop? (in gallons)	
Electrical Questions	Response
20. Is the power wiring complete and in accordance with the nameplate?	
21. Confirm clockwise of incoming power to chiller?	
22. If applicable is control wiring pulled into the chiller control panel? Please note controls wiring is not to be landed to the controller in the chiller control panel until the startup technician arrives on site.	

Note: No power is to be applied prior to inspection by the startup engineer

We understand that authorized representatives of the installing electrical, mechanical contractor, and controls contractor must be available during the startup period and that coordination is our responsibility. We understand that the service of the startup engineer will be furnished for a period of not more than 12 consecutive normal working hours. We agree that a charge for time and expenses will be made by Multistack if services are required longer.

Printed Name:	
Signature:	
Phone Number:	
Company:	

OPERATIONS

1. THEORY OF OPERATION

The Airstack ASP chiller provides chilled water to an external load based on the return water temperature as measured by the ASP master control. When the temperature of the returning water rises above the set point as calculated by the upper set point, the lower set point and the VSP the master controller starts compressors, one at a time, to produce chilled water. The number of compressors that will start is determined by the program in the master controller based on the temperature being returned.

When the return chill water approaches the correct set point the master controller starts to turn off compressors as needed. When the return chilled water reaches the set point or a little below, the master controller will have turned off all the compressors.

During operation of the compressors, the controller will cycle on one or both of the condenser fans in a module according to the refrigerant high pressure.

Some systems have a large heat exchanger which uses a main chiller to chill the return water/glycol. When the chilled water from the main system is cold enough, the heat exchanger valves open and chill the return water/glycol through the smaller chiller enough that the compressors will not run. If the Heat Exchanger does not chill the return water/glycol enough, the 3 heat exchanger valves close and the compressors will start and chill the discharge water to the set-point.

2. FAIL TO RUN

Airstack ASP systems designed for critical needs have a design that will allow individual modules to run in the event that the master module fails or goes offline or if certain System Faults occur that would otherwise disable the entire chiller. Each module must be in the Auto mode of operation in order for this OVERRIDE condition to occur. If the Master Control comes back online and all System Faults are cleared then the control of the compressors will automatically shift back to the master control.

3. PRESSURE READINGS

The operating suction and discharge pressures in the modules are directly related to the temperature of the water flow, condenser temperatures, the ambient temperature and the cleanliness of the system. If a module is faulting on a High Pressure (HP) fault, you should first check to see that the fans are operating. If both fans are working check the cleanliness of the condenser coil.

All ASP modules have both, a high pressure and low pressure (LP) cut out setting. Each module will cut out on HP or LP when the programmed limit in the master control is met. In addition a back up manual HP cut out switch is installed on each module.

A LP fault is an indication of low refrigerant charge in the system. If a module is going out on a LP fault, check the static pressure of the system while the module is in the off mode. It will be necessary to wait for the system to warm up before checking the pressures by the gauge. If pressures are low, check the circuit for possible leaks. Call the Multistack service department for leak testing procedures.

A further possible cause of a low suction temperature fault could be insufficient water flow. The strainers, filters and pump and valve settings should be checked.

4. STRAINER CLEANING

All ASP modules have a 30 mesh filter cartridge in the chilled water inlet header. The purpose of the filter cartridge is to keep debris from entering the heat exchanger. An external "Y" or basket type strainer should also be installed as a pre-filter to the factory supplied strainers.

There is no set time for cleaning the filter cartridges. The factory recommendation is that the internal filters be removed and cleaned once per year. Sometimes the filter must be removed more often if the water in the closed loop system has particulates. A good indicator that the strainers need to be cleaned is a "low leaving water temperature" fault in the module(s) near the discharge side of the chiller.

a. In order to remove the in-line strainers the following steps must be performed.

b. Shut down the chiller and stop the chill water pump

c. Close the inlet and outlet water valves to the chiller

d. Drain the water-glycol from the system and dispose properly. When the water/glycol level is below the top header the system can be safely opened.

e. Remove the 4"Victaulic end cap on the last module on the discharge side. On systems with 2 banks of modules, the upper crossover pipe will also have to be removed to access the strainer in the second bank of modules. Care should be taken to close the isolation valve for that header.

f. Remove the strainers and clean immediately. A hooked tool may be required to remove the strainers further in the system. This tool can be manufactured on site.

g. Slowly open the bottom water isolation valve and fill the unit from the bottom up to prevent air from being trapped in the headers. Care should be taken to check for leaks.

h. Restart the chill water pump and again check for possible leaks, bleed any trapped air from the system and start the chiller.

OPERATIONS

5. REFRIGERANT CHARGE / EVACUATION

All ASP modules come from the factory charged with the recommended refrigerant volume. Prior to charging, each unit is evacuated to a maximum of 150 microns and held 15 minutes. The proper refrigerant charge for each module can be found on the module data plate.

On air cooled machines the proper charging procedure is by a calculated weigh-in method. Charging to a full sight glass on air cooled machines will likely result in over charging as the elbows in the liquid line as well as the liquid line solenoid valve still produce some flashing even with the correct charge. As fans are cycling the sight glass will also display some bubbling.

6. SUPERHEAT / SUB COOLING

All ASP modules use an electric expansion valve controlled by a microprocessor controller.

Setting for the EEV are configured in the master control factory setup menu. Superheat should be set for 10-12° F. Sub cooling is necessary in the system to prevent flash gas as the refrigerant enters the expansion valve. ASP condensers are sized and charged so that sub cooling of the liquid refrigerant will take place with no separate sub-cooler being needed. The range of sub cooling is 8 - 12° F.

7. PRESSURE RELIEF VALVE

Each module has a 650 psig pressure relief valve installed. The relief valve is installed on the receiver of the module and has a 3/8" flare connection.

8. FILTER DRIERS

ASP modules are built with a factory installed liquid line filter drier. The filter driers are a solid core sweat fitting replaceable type. Some modules have a flare connection system for the filter drier. In the case of a compressor failure, heat exchanger failure or water contamination in the system, it is always required to replace the drier.

9. COMPRESSOR MOUNTING AND OIL LEVEL

It is very important that the compressors remain tightened on the rubber isolators and base plate in the same manner as shipped. This will prevent any damage to the refrigerant piping from excess vibration. If replacing a compressor make sure the isolators and mounting brackets get re-installed in the same manner.

The compressors used on ASP modules are oil charged by the compressor manufacturer. Most models have an oil sight glass. Correct oil level should be between 1/8 to 7/8 full on the glass. To ensure no liquid is present in the oil the crankcase heaters should be on a minimum of 24 hours before starting of the compressors. The factory oil charge volume for each compressor can be found in the Product Data Catalog. The oil used in R-410A compressors use an esther based oil, not a petroleum based oil. Please do not mix oils when adding oil to a system since they are not compatible and will cause damage

10. DAILY LOG SHEET

On the back page of this manual is a chiller information log sheet. The log sheet can be used daily, weekly or as desired to record operation characteristics of the chiller. The information recorded on the log sheet can also be very helpful for diagnosing potential problems in the system.

11. ANNUAL MAINTENANCE

Most of the annual maintenance requirements for ASP Chillers involve proper shut-down of the system and if needed cleaning of the heat exchangers. Preventive Maintenance bulletin #F125 and Heat Exchanger Cleaning Procedures bulletin #F130 describe the recommended procedures for both processes. Airstack has available the 151A Cleaning Kit to assist with this process. Please see the 151A Cleaning Kit bulletin #F126 for more details. All of these bulletins are part of the standard O&M manual package.

12. ANNUAL MAINTENANCE CHECKS

a. Electrical components
b. Check all external interlocks
c. Inspect compressor terminals
d. Check compressor crankcase heater operation
e. Tighten all electrical terminals, high voltage and low
f. Check and calibrate all compressor safety controls
g. Check and record voltages and amperages for compressors
h. Check and record amperages for pumps and condenser fans
i. Check and calibrate low ambient fan cycling controls
j. Inspect relay contacts for damage or pitting, replace if required

12.1 Refrigeration Circuits

a. Analyze refrigerant with tube type moisture/acid analyzer
b. Check and record refrigerant sub cooling and superheat
c. Check liquid solenoid valves
d. Check expansion valve and sensing bulb connections

12.2 Chilled Water System

a. Clean pump strainers and system strainers
b. Remove header caps and clean the ECHW strainers. Please see the 151A Cleaning Kit bulletin #F126 for more details.

OPERATIONS

12.3 Cabinet and Related Hardware

a. Dry clean electrical panels, remove debris
b. Apply protective coatings or wax if required
c. Remove rust and apply primer and paint if required

13. COMPRESSOR FAILURE

With any chiller system there is always the chance of a compressor failure. In the event of a failure, proper steps should be taken to determine the cause of the failure.

a. A motor burn out due to a fault in the motor insulation is quite rare. Most burnouts are actually caused by a mechanical condition or lubrication problems. In the event of a burnout, proper clean up procedures should be followed.
b. Check all electrical components of the circuit (contactors, fuses, wires, etc.)
c. If necessary perform a system clean up. Nu-Calgon RX-11 Flush or Sporlan System Cleaner work well. Follow the cleaning solutions manufacturers direction
d. Replace the liquid line filter drier with a burnout core.
e. Evacuate the system to a minimum of 500 microns and hold for 20 minutes
f. Charge the circuit with virgin refrigerant. Charge with liquid into the discharge side of the compressor. See refrigerant charge on nameplate data of unit for proper amount
g. Run the system 2-3 weeks with the burnout filter core. With the King Valve on the receiver closed, replace with standard core drier. Consideration should be given that the pipe loop will have refrigerant under pressure and consideration must be given to safety.

14. HEAT EXCHANGERS

Airstack® uses brazed plate stainless steel heat exchangers for all evaporators. Without proper water treatment or due to abuse, heat exchangers can corrode over time and eventually develop an internal leak. In such an event it would become necessary to replace the heat exchanger.

Following are steps for field replacement of a failed evaporator heat exchanger:

a. If the refrigerant has not been lost on the failed circuit, you should first do a standard refrigerant recovery
b. Begin by isolating the chiller and draining the water/glycol form the loop

Update Your Maintenance Log Book!

c. Remove the 4" round header pipes that attach to the evaporator (if you have a front module). If rear module remove the crossover pipes from the front module.
d. Cur the refrigerant lines below the elbows and sweat off remaining pipe
e. Remove old evaporator and replace with new one
f. Fit in copper connections and braze, using a minimum 45% silver solder. Purge with Nitrogen while brazing
g. After brazing first perform a pressure check with Nitrogen. Charge the system to 110 psig and hold for 20 minutes. If the system passes the pressure test, evacuate to a minimum of 500 microns and hold for 20 minutes. Charge the circuit according to the name plate charge.

If the evaporator heat exchanger has caused water to enter into the refrigerant side, the compressor and condenser should also be checked for possible contamination. If water has entered into the compressor it is recommended the compressor be replaced as removing all the moisture from the oil is very difficult. Replacement of the condenser, the expansion valve and installation of a liquid line filter drier with a water core cartridge is also recommended. Evacuate the circuit to a maximum of 500 microns and let stand for 20 minutes. Charge the circuit and run 2-3 weeks with the high water core cartridge and the replace with a standard core.

Standard condensers on the ASP module are copper coil with aluminum fin type, however other construction materials may be used. Periodic cleaning of the fins should be done to keep air-born debris from plugging up the fins and causing high pressure conditions. Confirm the specific material used in construction of the condenser before cleaning to avoid any possible damage. A coil cleaner suitable for copper and aluminum can be used for the standard condensers.

15. LOW AMBIENT OPTION

For applications requiring operation below 20° F, modules should be ordered with the "Low Ambient" option. "Low Ambient" modules can be operated down to-20° F. These modules will be equipped with additional refrigerant charge, a liquid receiver (standard modules do not use receivers), and head pressure control valves. The valves used to control head pressure are the adjustable electronic CDS Stepper Valve along with the fixed setting ORD valve. The CDS Valve holds refrigerant in the condenser to "flood" the coils by reducing surface area and therefore building the condenser head pressure. The ORD valve will open based on a differential between the compressor discharge pressure and the receiver liquid pressure. As the differential between pressures increases, the ORD valve will open, allowing hot gas into the liquid line increasing the liquid pressure. To set the chiller for low ambient operation and to set the CDS valves please see the ASPX Master Controller User Manual.

OPERATIONS

16. TROUBLE SHOOTING

AIR COOLED PACKAGED MODULES

ASP modules use the Carel master control. The user manual for the controller is located in the O&M package. The user manual details the different status screen and explanations of system or module faults.

WARNING: Most of the following repairs to the system should only be performed or attempted by a qualified service technician. Failure to adhere to proper safeguards and safety rules could cause damage to the system and serious injury to personnel.

FAULT	SOLUTION
No Display on Master Module	• Check main disconnect for power • Check circuit breakers in module and J-Box • Check transformer in modules • Check for 24v at J1 on board
EX 1, 2 interlock	• Check appropriate interlock component • Check jumpers on TS2 in master module
EX 4 interlock	• Check for proper rotation, phasing • Check PPM device
Waiting For Chilled Water Flow	• Check CHW pump • Check flow switch operation • Check filter strainers, Basket strainers and Y strainers • Check TS2 inputs #3 and #5
Low Chill Water Temp	• Check LCHW sensor • Check set points in system variables • Check for flow restrictions, system and module
No Demand	• Check entering CHW sensor • Check set points in system variables • Check sensor location
100% Demand all the time	• Check entering CHW sensor • Check set points in the system variables
100% Demand, chiller won't load	• Turn chiller on • Check sensors • Check load limit setting in system variables menu
Excessive Cycling	• Check VSP setting in system variables • Check entering CHW sensor location
High discharge Pressure (HP)	• Check fan operation • Check coil condition • Compare analog pressure reading with digital • Check fan settings in system variables
Low Suction Pressure (LP)	• Check refrigerant charge / leaks • Compare analog pressure reading to digital • Check expansion valve • Check solenoid valve
Low Suction Temperature	• Check suction sensor • Check set points in system variables • Check expansion valve • Check solenoid valve • Check for water flow restrictions
Communication Error/ pLan Error	• Check settings in system variables • Check cables at J11 communications ports
Circuit Fault	• Check components in control circuit • Check wire crimps in the control circuit

MULTISTACK®
CUSTOMER DRIVEN INNOVATION

MULTISTACK, LLC
1065 Maple Ave.
P.O. Box 510
Sparta, WI 54656

T: 608.366.2400
F: 608.366.2450

info@**multistack.com**

multistack.com