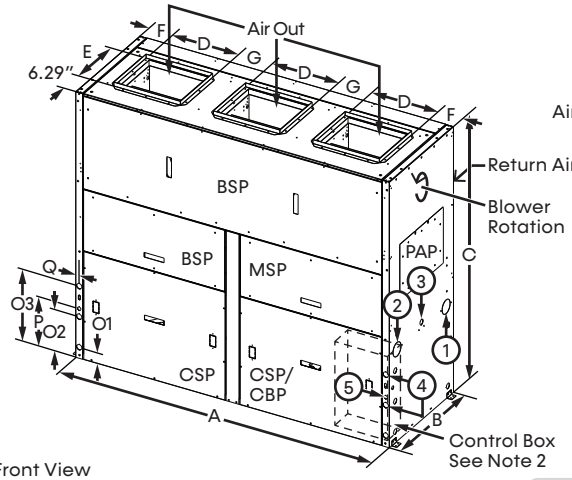
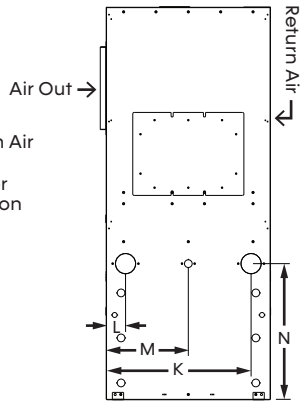
Dimensional Data
MB300 Vertical

Unit Size		Overall Cabinet			Discharge Connections Duct Flange			Water Connections				Electrical Knockouts					Return Air Connections Using Return Air Opening			
		A	B	C	D	E	F	K	L	M	N	O			P	Q	S	T	U	V
								1	2	3		1	2	3						
		Width	Depth	Height	Supply Width	Supply Height	Side Offset	Water In	Water Out	Condensate	Connection Height	1-3/8" (3.5cm)			7/8" (2.2 cm)		Return Width	Return Height		
300	inch	82.3	29.2	69.8	46.5	14.7	17.9	25.8	3.4	14.6	24.2	3.0	11.0	19.0	13.0	0.9	77.2	35.0	31.0	2.6
	cm	209.0	74.2	177.3	118.1	37.3	45.5	65.5	8.6	37.1	61.5	7.6	27.7	48.3	33.0	2.3	196.1	88.9	78.7	6.6

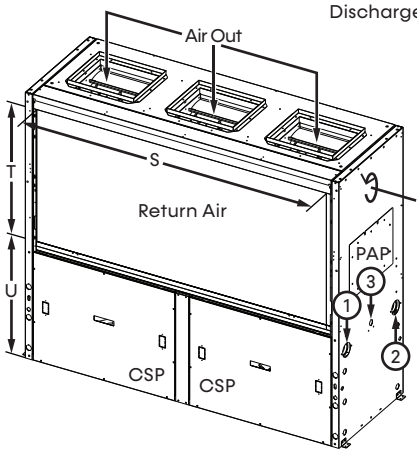
Front View
Top Discharge



Right Side View
Straight Discharge



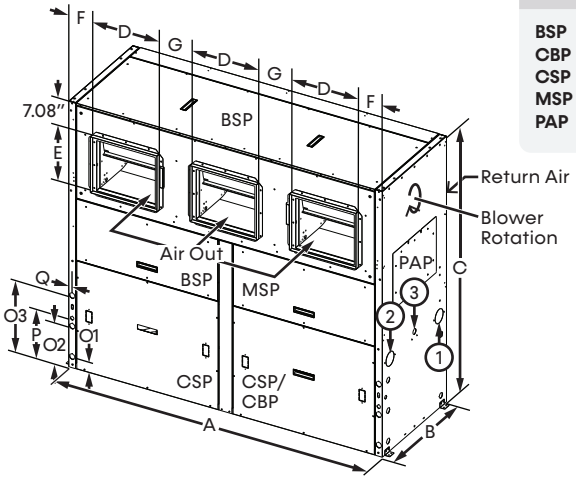
Rear Return
Top Discharge



Blower to Air Coil relationship for Top Discharge size 300



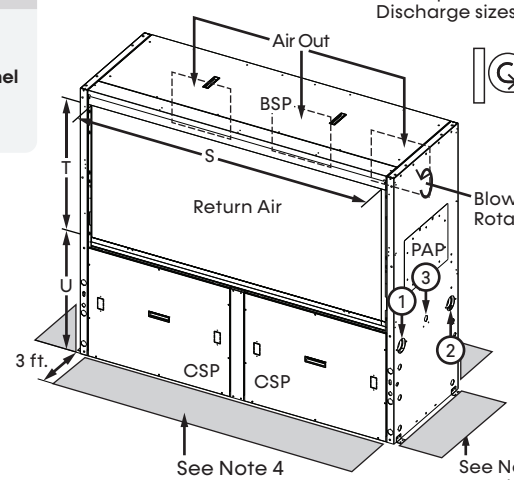
Front View
Straight Discharge



LEGEND

BSP = Blower Service Panel
CBP = Control Box Panel
CSP = Compressor Service Panel
MSP = Motor Service Panel
PAP = Pulley Access Panel

Rear View
Straight Discharge



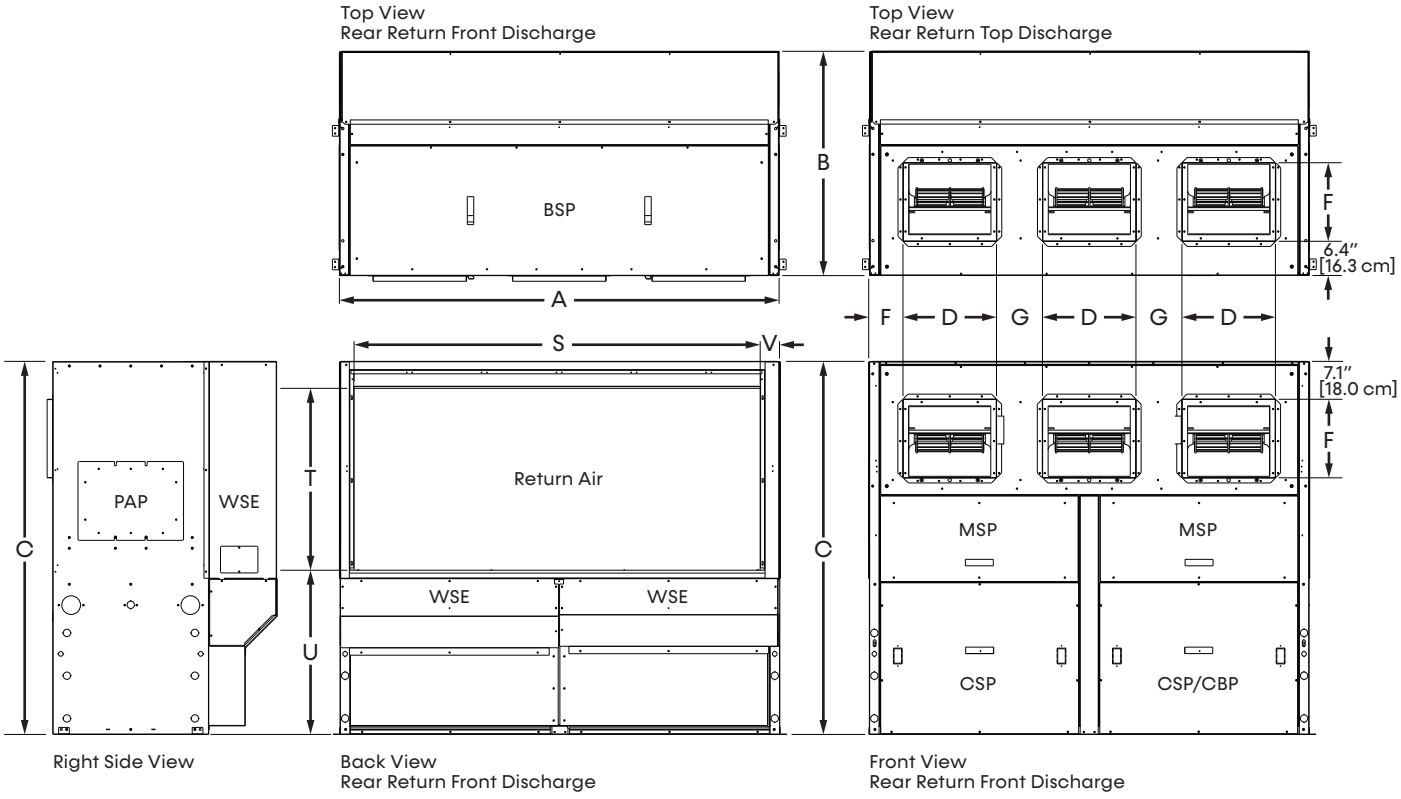
Blower to Air Coil relationship for Straight Discharge sizes 300

NOTES

1. Condensate drain is available on either side (left or right) of unit. Drain hose and drain connection are tied inside the unit. The installer will untie the drain hose, form trap, and connect to the condensate drain hole of installer's choice.
2. Electrical access is available on either side (left or right) of unit and is also available in the front on the left or right side of the unit.
3. Overall cabinet height and depth dimension does not include duct flange for or filter rails.
4. Units require 3 feet (91 cm) of clearance, CBP, CSP, MSP and BSP service access. While access to all removable panels may not be required, the installer should take care to comply with all building codes and allow adequate clearance for future field service.
5. Filter removal is from right or left side of filter frame, allow 3 feet (91 cm) of access for servicing.

Legend	MB300
① Water Inlet	2-1/2" FPT
② Water Outlet	2-1/2" FPT
③ Condensate Drain[1]	1" FPT
④ High Voltage Access[2]	1-3/8" (3.49 cm)
⑤ Low Voltage Access[2]	7/8" (2.2 cm)

Unit Size		Overall Cabinet			Discharge Connections Duct Flange			Water Connections				Electrical Knockouts					Return Air Connections Using Return Air Opening			
		A	B	C	D	E	F	K	L	M	N	O			P	Q	S	T	U	V
								1	2	3		1	2	3						
		Width	Depth	Height	Supply Width	Supply Height	Side Offset	Water In	Water Out	Condensate	Connection Height						Return Width	Return Height		Return Side Offset
300	inch	82.3	42.0	69.8	46.5	14.7	17.9	25.8	3.4	14.6	24.2	3.0	11.0	19.0	15.1	0.9	76.0	34.0	30.7	3.6
	cm	209.0	106.7	177.3	118.1	37.3	45.5	65.5	8.6	37.1	61.5	7.6	27.9	48.3	38.4	2.3	193.0	86.4	78.0	9.1



NOTES

See the standard configuration for water connection and electrical knockout dimensions.

1. While clear access to all removable panels may not be required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Units require 3 feet (91 cm) of clearance for water connections, WSE coil air bleed, CBP, CSP, BSP, PAP, and MSP.
3. Condensate drain is internally trapped, externally vented.
4. For top discharge units, BSP is on front. For front discharge units, BSP is on top. Allow 3 feet above unit for service.

LEGEND

BSP = Blower Service Panel
CSP = Compressor Service Panel
CBP = Control Box Panel
MSP = Motor Service Panel
PAP = Pulley Access Panel
WSE = Waterside Economizer

MINIMUM INSTALLATION AREA

Minimum area where a blower-equipped unit must be installed, and mechanical/natural ventilation is not required

Model	Charge (oz)	Configuration	Minimum Installation Area ft² (m²) [A_{min}]			
			Floor	Window	Wall	Ceiling
MB072	54	Vertical	186	70	46	40
		Horizontal	186	70	46	40
MB096	62	Vertical	213	80	53	46
		Horizontal	213	80	53	46
MB120	66	Vertical	227	85	57	49
		Horizontal	213	80	53	46
MB168	94	Vertical	323	121	81	69
MB192	103	Vertical	354	133	89	76
MB240	134	Vertical	461	173	115	99
MB300	184	Vertical	633	237	158	136

A_{min}	=	Minimum area where unit is installed where unit has incorporated airflow
h_{inst} (floor)	=	0.0 ft (0.0 m)
h_{inst} (window)	=	3.3 ft (1.0 m)
h_{inst} (wall)	=	5.9 ft (1.8 m)
h_{inst} (ceiling)	=	7.2 ft (2.2 m)

Minimum area and CFM requirements for the conditioned space

Model	Charge (oz)	Minimum CFM [Q_{min}]	
		TA_{min} (ft²)	Q_{min} (ft³/min)
MB072	54	2.77	91
MB096	62	3.18	105
MB120	66	3.38	112
MB168	94	4.82	159
MB192	103	5.28	174
MB240	134	6.87	227
MB300	184	9.43	311

TA_{min}	=	Minimum conditioned area for venting leaked refrigerant
Q_{min}	=	Minimum ventilation flow rate for conditioned space if space is less than TA_{min}

Minimum area of opening for natural ventilation

Model	Charge (oz)	A_{nv} (in²)
MB072	54	98.70
MB096	62	105.76
MB120	66	109.12
MB168	94	130.22
MB192	103	136.31
MB240	134	155.48
MB300	184	182.19

A_{nv}	=	Minimum natural ventilation area opening

When the openings for connected rooms or natural ventilation are required, apply the following conditions:

- The area of any openings above 11.8 inches (300 mm) from the floor shall not be considered in determining compliance with Anv_{min}.
- At least 50% of the required opening area Anv_{min} shall be below 7.8 inches (200 mm) from the floor.
- The bottom of the lowest openings shall not be higher than the point of release when the unit is installed and not more than 3.9 inches (100 mm) from the floor.
- Openings are permanent openings which cannot be closed.
- For openings extending to the floor, the height shall not be less than 0.78 inch (20 mm) above the surface of the floor covering.
- A second higher opening shall be provided. The total size of the second opening shall not be less than 50% of minimum opening area for Anv_{min} and shall be at least 3.3 ft (1.5 m) above the floor.

VFD BLOWER

Variable Frequency Drives are controllers that vary electrical frequency and voltage to the fan motor. Electrical frequency is directly related to a fan motor's speed (RPM's). The faster the frequency, the faster the motor will go and vice versa. VFD's allow the fan motor to ramp speed (CFM) up or down to match the load of the space they are satisfying. This allows the MC to deliver variable capacity, optimizing system efficiency and saving owners money.

VFD controllers come factory installed and tested to provide supply fan motor speed modulation. VFDs on the supply fan, are quieter, more efficient, and are eligible for utility rebates. These products are commonly used in single-zone, variable-air-volume (VAV) applications. When applied to single-zone VAV applications the system modulates the indoor fan and stages compressors as space temperature changes, for increased part-load efficiency and more precise temperature control with fan speed varying down to 37.5% of maximum air flow.
The VFD controls are paired with our intelligent CXM2 Communicating Controls to provide superior service and functionality.

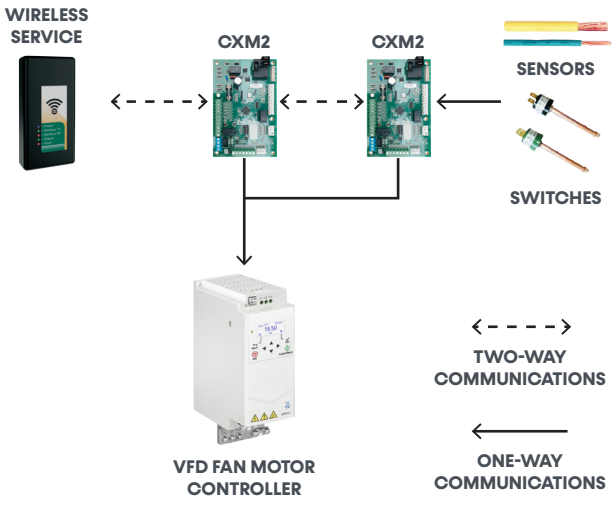
VFD BLOWER SEQUENCE OF OPERATION

The VFD blower option comes factory programmed with the standard CXM2. The CXM2 controls the VFD blower controller using a 0–10VDC control signal, and comes factory programmed for Leaving Air Temperature (LAT) control mode. The actual operating range for the VFD when the blower should be active will be 3.7–10.0VDC associated to the operating speeds of 37–100%. When the VFD is off, the output should be set to 0VDC. For each unit size, there is a maximum and minimum operating speed at which the VFD can operate at for any mode, defined in the **VFD Control Valves** table.

The VFD blower may be operated in LAT or discrete-speed control modes.

NOTE: At the end of a heating or cooling demand cycle, the VFD is set to 50% of the final demand value during the blower-off delay time.





LAT CONTROL VFD OPERATION

The CXM2 comes factory configured for LAT control operation. The VFD speed is controlled by the CXM2 to maintain the factory default LAT set point, 55°F for cooling and 105°F for heating. LAT can be adjusted in the field. See the **VFD Control Valves** table for full details.

When a compressor demand is recognized, the VFD output is set to the most recent demand operating speed of the VFD in the current operating mode (heating or cooling). If there is no value stored from a previous heating or cooling cycle, the VFD speed initially sets to 75% or 8.0 VDC. After the VFD speed is initially set, the VFD control signal is not adjusted until after 90 seconds of compressor operation, and then is periodically checked and adjusted every 10 seconds if needed to maintain the LAT.

If the control switches from the heating mode to cooling, or cooling to heating without de-activating the compressor, the VFD control voltage immediately switches to the last stored control voltage for the new operating mode, and is not adjusted for the first 90 seconds of operation in the new operating mode. The VFD control voltage is increased or decreased incrementally based on the magnitude of the differential between the current LAT and the target LAT defined in the **Operating Temperatures** table.

DISCRETE SPEED VFD OPERATION

When the CXM2 is configured for discrete-speed VFD operation, the VFD speed is set to the selected operating speed (A, B or C) for full-load heating or cooling. Full-load operation is defined as second stage enabled in either heating or cooling.

When the CXM2 is configured for discrete-speed VFD operation, the VFD operating speed may be increased or decreased by 10%. The speed offset option defaults to normal (no offset). To increase the VFD operating speed by 10%, set the speed offset option to Increase. To decrease the VFD operating speed by 10%, set the speed offset option to decrease.

When operating in first-stage heating or cooling, the VFD speed is set to the percentage of the selected full-load operating speed (A, B or C, plus or minus adjustment) listed for each unit size as defined in the **Operating Temperatures** table.

Table 1: VFD Control Valves

Model	Minimum VFD Speed	Maximum VFD Speed	VFD Fixed Speed A	VFD Fixed Speed B	VFD Fixed Speed C	Part Load Multiplier	Default Fan Speed
MB072	3.7	10.0	7.4	6.2	9.0	71%	5.2
MB096	3.8	10.0	7.0	6.0	9.0	75%	5.0
MB120	4.2	10.0	8.0	7.0	9.0	70%	6.0
MB160	4.1	10.0	7.9	6.4	9.0	76%	5.4
MB192	4.4	10.0	8.0	7.0	9.0	73%	6.0
MB240	4.2	10.0	8.0	7.0	9.0	70%	6.0
MB300	5.0	10.0	8.0	8.0	9.5	71%	7.0

Table 2: Operating Temperatures

Model	Minimum Heat LAT	Maximum Heat LAT	Default Heat LAT	Minimum Cool LAT	Maximum Cool LAT	Default Cool LAT
MB072	85°	125°	105°	45°	65°	55°
MB096	85°	125°	105°	45°	65°	55°
MB120	85°	125°	105°	45°	65°	55°
MB160	85°	125°	105°	45°	65°	55°
MB192	85°	125°	105°	45°	65°	55°
MB240	85°	125°	105°	45°	65°	55°
MB300	85°	125°	105°	45°	65°	55°

LAT differential |Actual – Target|	VFD adjust (VDC)
$\Delta T \leq 1.0°F$	0.0
$1.0 < \Delta T \leq 2.0°F$	0.1
$2.0 < \Delta T \leq 3.0°F$	0.2
$3.0 < \Delta T \leq 5.0°F$	0.3
$\Delta T > 5.0°F$	0.4

GENERAL

Furnish and install MB Compact High-Capacity Series units as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

Units shall be supplied completely factory built, capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 43.3°C) as standard. Equivalent units from other manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated and certified in accordance with Air-Conditioning, Heating and Refrigeration Institute / International Standards Organization (AHRI / ISO 13256-1). All equipment must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL 60335-2-40 4th Edition, UL 60335-1 6th Edition for the United States and Can/CSA C22.2 No. 60335-2-40:22, CAN/CSA C22.2 No 60335-1:16 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI / ISO and ETL-US-C labels

All units shall pass a factory acceptance test. The quality control system shall automatically perform factory acceptance test via computer. A detailed report card from the factory acceptance test shall be shipped with each unit. **NOTE: If a unit fails the factory acceptance test, it shall not be allowed to ship. The unit serial number shall be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.**

BASIC CONSTRUCTION

Horizontal units shall have one of the following air flow arrangements: Left Return/Back Discharge, Left Return/Straight Discharge, Right Return/Back Discharge, Right Return/Straight Discharge as shown on the plans. Unit sizes 072 to 120 can be field converted without requiring new panels or belts. **Unit sizes 072-120 that cannot be field converted shall not be acceptable.**

Vertical units shall have one of the following air flow arrangements: rear return/top discharge, front return/top discharge, rear return/front discharge, front return/rear discharge as shown on plans. Unit sizes 072-120 can be field converted without requiring new panels or belts. **Unit sizes 072-120 that cannot be field converted shall not be acceptable.**

If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades. All units must have a minimum of two access panels for serviceability of compressor compartment. **Units having only one access panel to compressor/heat exchangers/expansion device/ refrigerant piping shall not be acceptable.**

Compressor-section interior surfaces shall be lined with ½-inch-thick (12.7 mm), 1½ lb/ft³ (24 kg/m³), acoustic-type, glass-fiber insulation. Air-handling-section interior surfaces shall be lined with ½-inch-thick (12.7 mm), 1¾ lb/ft³ (28 kg/m³) foil-backed glass-fiber insulation for ease of cleaning. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream. **Units without foil-faced insulation in the air-handling section will not be accepted.**

Units shall be fabricated from heavy-gauge galvanized steel with powder-coat finish on front access panels.

Standard insulation must meet NFPA Fire Hazard Classification requirements 25/50 per ASTM E84, UL 723, CAN/ULC S102-M88 and NFPA 90A requirements; air erosion and mold growth limits of UL-181; stringent fungal resistance test per ASTM-C1071 and ASTM G21; and shall meet zero level bacteria growth per ASTM G22. **Unit insulation must meet these stringent requirements or unit(s) will not be accepted.**

Horizontal units to have discharge flange, 1-inch (25.4 mm), 2-inch (50.8 mm), or 4-inch (101.6 mm) return filter rails with filters factory installed, and factory-installed hanger brackets. Vertical units have discharge flange shipped loose and 1-inch (25.4 mm), 2-inch (50.8 mm), or 4-inch (101.6 mm) return full filter frame with filters factory installed. **If units with these factory installed provisions are not used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for their subcontractor to install these provisions.**

All units must have an insulated panel separating the fan compartment from the compressor compartment. Units with the compressor in the air stream are not acceptable.

Horizontal units shall have factory-installed filter rails with filter removal from either side. Vertical units shall have factory-installed full-filter frame with filter removal from bottom. **The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of startup.** Filters shall be standard sizes. **If units utilize non-standard filter sizes then the contractor shall provide 12 spare filter sets for each unit.**

Cabinets shall have separate knockouts on front and sides for entrance of line voltage and low-voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet-metal edges at openings by plastic ferrules. Supply and return water connections shall be copper FPT fittings, connections on either the left or right side and shall be securely mounted flush to the cabinet side allowing for connection of a flexible hose without the use of a backup wrench. **Water connections that protrude through the cabinet or require the use of a backup wrench shall not be allowed.** Water connections on only one side will not be accepted. All water connections and electrical knockouts must not interfere with the serviceability of unit. **Contractors shall be responsible for any extra costs involved in the installation of units that do not have this feature.** Contractors must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

Option: Dual-point power.

Option: Sound Attenuation package shall consist of high-technology sound-attenuating material that is strategically applied to the compressor and air-handling compartment casings and fan scroll in addition to the standard system design, to further dampen and attenuate sound transmissions. Compressor is mounted on specially engineered sound-tested isolators.

Option: The unit will be supplied with internal factory-mounted modulating water valve with delta T control. The factory built-in valve shall modulate water flow through unit based on a field-adjustable water temperature difference between the entering and leaving water. The valve shall automatically adjust for operating mode, source water temperature and variations in external head pressure. The valve will also act as a shutoff valve to prevent water flow through the unit when the unit is not activated and will have a minimum position capability. Externally mounted, modulating water valves will not be accepted.

Option: The unit will be supplied with internally factory-mounted two-way water valve for variable-speed pumping requirements. A factory-mounted (included with factory-mounted water valve) or field-installed high-pressure switch shall be installed in the water piping to disable compressor operation in the event water pressures build due to water freezing in the piping system.

FAN AND MOTOR ASSEMBLY

All units shall have a single belt-driven centrifugal fan. Fan motor shall be premium duty, VFD compatible, permanently lubricated with thermal-overload protection. Units supplied without permanently lubricated motors must provide external oilers for easy service. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule. Airflow/Static pressure rating of the unit shall be based on a wet coil and a clean filter in place. **Ratings based on a dry coil and/or no filter, or on an ESP less than 0.25 inches (6.35 mm w.g.) shall NOT be acceptable.**

Option: Various blower drive packages for selectable static pressure/airflow.

Option: Variable Frequency Drives (VFD). VFD controls shall be factory mounted, installed and programmed. VFD controls have the capability to reduce airflow down to 37.5%. Products not containing factory-mounted VFD controls shall not be acceptable.

REFRIGERANT CIRCUIT

All units shall contain an R-454B sealed refrigerant circuit including a high-efficiency scroll compressor designed for heat-pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated-aluminum lanced fin and rifled copper tube refrigerant-to-air heat exchanger, reversing valve, coaxial (tube-in-tube) refrigerant-to-water heat exchanger, and safety controls including a high-pressure switch, low-pressure switch (loss-of-charge), water coil low-temperature sensor, and air coil low-temperature sensor.

Access fittings shall be factory installed on high and low-pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. **Units that cannot be reset at the thermostat shall not be acceptable.**

The scroll compressors shall have a dual-level vibration isolation system. The compressor(s) will be mounted on specially engineered, sound-tested EPDM vibration-isolation grommets to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with EPDM grommets to minimize vibration and maximize vibration attenuation. Compressor shall have thermal-overload protection. Compressors shall be located in an insulated compartment isolated from air stream to minimize sound transmission.

Refrigerant-to-air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 625 PSIG (4,309 kPa) refrigerant working pressure. Refrigerant-to-water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4,309 kPa) working refrigerant pressure and 300 PSIG (2,068 kPa) working water pressure. The refrigerant-to-water heat exchanger shall be "electro-coated" with a low-cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black-colored coating shall provide a minimum of 1,000 hours of salt-spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).

The unit water circuit is protected by two high-pressure switches set at 300 PSI (2,068 kPa). Switches will reset automatically when pressure is reduced. Units that do not have auto-reset water high-pressure switches are not acceptable.

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual-port balanced type with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 20° to 120°F (-6.7° to 48.9°C). A reversing valve shall be a four-way solenoid-activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing-valve solenoid defaults to cooling mode, an additional low-temperature thermostat must be provided to prevent over-cooling an already cold room.

Individual refrigeration circuits charged with 62 ounces or greater of R-454B shall be supplied with a Refrigerant Detection System (RDS) with sensors to be strategically placed within the cabinet. In the event of a refrigerant leak, the RDS disables compressor operation, and the unit blower runs to disperse any concentration of leaked refrigerant in compliance with UL 60335-2-40 safety standards for flammable refrigerants. **Individual refrigeration circuits charged with 62 ounces or greater of R-454B that do not have an RDS shall not be acceptable.**

Option: The unit shall be supplied with extended range insulation option, which adds closed cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant-to-water heat exchanger.

Option: The refrigerant-to-air heat exchanger shall be coated.

Option: The unit shall be supplied with a WSE. The WSE will consist of hydronic coil, three-way valve, and aquastat. The aquastat will be adjustable type and factory set at 45°F (7.2°C).

Option: The unit will be supplied with a cupronickel coaxial water-to-refrigerant heat exchanger.

DRAIN PAN

The drain pan shall be constructed of galvanized steel and have a powder-coat paint application to further inhibit corrosion. This corrosion protection system shall meet the stringent 1,000-hour salt spray test per ASTM B117. If plastic-type material is used, it must be HDPE (High-Density Polyethylene) to avoid thermal-cycling shock-stress failure over the lifetime of the unit. Drain pans shall be fully insulated. Drain pan outlet shall be located to ensure positive unobstructed drainage of condensate. Drain outlet for horizontal units shall be connected from pan directly to ¾-inch FPT fitting. For vertical units, drain pan hose assembly can be connected to either side, drain outlet to be 1-inch FPT fitting. The unit as standard will be supplied with solid-state electronic condensate overflow protection. **Mechanical float switches will NOT be accepted.**

Option: The unit shall be supplied with stainless-steel drain pan.

ELECTRICAL

A control box shall be located within the unit compressor compartment and shall contain a 75 VA transformer with load side circuit breaker protection, 24V activated, two- or three-pole compressor contactor, terminal block for thermostat wiring, and solid-state controller for complete unit operation. Reversing valve and fan motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time-delay fuses or HACR circuit breakers. Unit controls shall be 24-volt and provide heating or cooling as required by the remote thermostat/sensor. Units shall have a solid-state time-delay relay and random start to prevent both compressors from starting simultaneously.

ENHANCED SOLID-STATE CONTROL SYSTEM (CXM2)

Units shall have a solid-state control system. **Units utilizing electro-mechanical control shall not be acceptable.** The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat-pump-type thermostat. The control system shall have the following features:

a. Anti-short cycle time delay on compressor operation.
b. Random start on power up mode.
c. Low-voltage protection.
d. High-voltage protection.
e. Unit shutdown on high- or low-refrigerant pressures.
f. Unit shutdown on low water temperature.
g. Condensate overflow electronic protection.
h. Option to reset unit at thermostat or disconnect.
i. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
j. Ability to defeat time delays for servicing.
k. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
l. 24V output to cycle a motorized water valve or other device with compressor contactor.
m. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
n. Water coil low-temperature sensing (selectable for water or anti-freeze).
o. Air coil low-temperature sensing.
p. Minimized reversing-valve operation (Unit control logic shall only switch the reversing valve when cooling is demanded for the first time. The reversing valve shall be held in this position until the first call for heating, ensuring quiet operation and increased valve life).

q. Emergency shutdown contacts.
r. Entering- and leaving-water temperature sensing.
s. Leaving-air temperature sensing.
t. Compressor-discharge temperature sensing.

NOTE: Units not providing the eight safety protections of anti-short cycle, low-voltage, high-voltage, high-refrigerant pressure, low-pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protections will not be accepted.

When CXM2 is connected to a Wireless Service Tool, the installer/service technician can; check DIP switch S2 settings; run operation modes manually; check all physical inputs from the Wireless Service Tool and refrigerant pressure switches status, (Y1, Y2, W, O, G, H, ESD, NSB, OR, HP switch, and LOC switch); current or at time of fault the following temperatures—water coil (LT1), air coil (LT2), compressor discharge, leaving air, leaving water, entering water and control voltage; record last five faults, list possible reasons, and clear faults.

DIGITAL NIGHT SETBACK WITH PUMP RESTART:

The unit will be provided with a digital night-setback feature using an accessory relay on the CXM2, an external, field-provided thermostat, and an external, field-provided time clock. The external time clock will initiate and terminate the night-setback period. The thermostat will have a night-setback override feature with a programmable override time period. An additional accessory relay on the unit CXM2 will energize the building-loop pump control for the duration of the override period.
NOTE: This feature requires additional low-voltage wiring. Consult Application Drawings for details.

REMOTE SERVICE SENTINEL

Solid-state control system shall communicate with a service tool to display (on the service tool) the unit status, fault status, and specific fault condition, as well as retrieve previously stored fault that caused unit shutdown. The Remote Service Sentinel allows building maintenance personnel or service personnel to diagnose units from the service tool. The control board shall provide a signal to the service tool fault light, indicating a lockout. Upon cycling the G (fan) input three times within a 60-second time period, the fault light shall display the specific code as indicated by a sequence of flashes. A detailed flashing code shall be provided at the service tool to display unit status and specific fault status such as over-/under-voltage fault, high-pressure fault, low-pressure fault, low-water-temperature fault, condensate-overflow fault, etc. **Units that do not provide this remote service sentinel shall not be acceptable.**

Option: MPC (Multiple Protocol Control) Interface System

Units shall have all the features listed above and the control board will be supplied with a Multiple Protocol interface board. Available protocols are BACnet MS/TP, Modbus, or Johnson Controls N2. The choice of protocol shall be field-selectable/changeable via the use of a simple selector switch. **Protocol selection shall not require any additional programming or special external hardware or software tools.** This enables all units to be daisy-chain connected by a two-wire twisted-pair shielded cable. The following points must be available at a central or remote computer location:

a. Space temperature
b. Leaving-water temperature
c. Discharge-air temperature
d. Command-of-space temperature setpoint
e. Cooling status
f. Heating status
g. Low-temperature sensor alarm
h. Low-pressure sensor alarm
i. High-pressure switch alarm
j. Condensate-overflow alarm
k. High-/low-voltage alarm
l. Fan "ON/AUTO" position of space thermostat as specified above

m. Unoccupied/occupied command
n. Cooling command
o. Heating command
p. Fan "ON/AUTO" command
q. Fault-reset command
r. Itemized fault code revealing reason for specific shutdown fault (any one of seven)

This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built-in circuit breaker.

FIELD-INSTALLED OPTIONS

Hose Kits:

All units 120,000 Btuh (35 kW) and below shall be connected with hoses. The hoses shall be 2-feet-long (61-cm), braided stainless steel; fire-rated hoses complete with adapters. **Only fire-rated hoses will be accepted.**

Valves:

The following valves are available and will be shipped loose:

a. Ball valve; bronze material, standard port full flow design, FPT connections.
b. Ball valve with memory stop and PT port.
c. "Y" strainer with blowdown valve; bronze material, FPT connections.
d. Motorized water valve; slow-acting, 24V, FPT connections.

Hose Kit Assemblies:

The following assemblies ship with the valves already assembled to the hose described:

a. Supply and return hoses having ball valve with PT port.
b. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.
c. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator with PT ports, and ball valve.
d. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

THERMOSTATS

The thermostat shall be a geothermal mechanical or electronic type thermostat.

NOTE: All units require a heat pump thermostat with two-stage cooling.

WIRELESS SERVICE TOOL

Allows installation and service personnel to access the configuration and service modes of the CXM2:

a. Configure the airflow, pump, or modulating valve operation etc.
b. Diagnose by viewing fault history and operating conditions at the time of fault and manually operating the unit.

DDC SENSORS

Wall-mounted DDC sensor to monitor room temperature and interfaces with optional interface system described above. Several types as described below:

a. Sensor only with no display (MPC).
b. Sensor with setpoint adjustment and override (MPC only).
c. Sensor with setpoint adjustment and override, LCD display, status/fault indication (MPC).

⚠ NOTICE

This product specification document is furnished as a means to copy and paste our product information into project specification. It is not intended to be a complete list of product requirements. This document is an excerpt from the product submittal and must not be used without consulting the complete product submittal. For complete product installation and application requirements, please consult the complete product submittal. Heat Controller is not responsible for misuse of this document or a failure to adequately review specific requirements in the product catalog.

Revision History

Date	Section	Description
03/25/26	Features, Options, and Accessories	Added the cupronickel heat exchanger option
	Model Nomenclature	Updated
	Dimensional Data MB072-120 Horizontal	Updated header column names
	Dimensional Data MB072-120 Horizontal with WSE	Updated header column names
	Engineering Specifications	Added the cupronickel heat exchanger option
10/01/25	Internal Variable Water Flow Control	Added section
	Model Nomenclature	Updated model nomenclature including product revision
	Performance Data: AHRI/ASHRAE/ISO 13256-1	Updated
	Performance Data	Updated
	Blower Performance	Added Standard MB300 performance
	Electrical Data	Updated the following for Standard and Dual Point Power units: • Min/max voltage columns • Added data for additional voltage options for size 240-300 models
	Physical Data	Added horsepower and kW values for Standard MB300 units
		Added weights for units with WSE (packaged and unpackaged)
		Updated MWV and MOD valve working water pressures
	Blower Motor Variable Frequency Drive (VFD) Controls (Optional)	Updated example VFD image
	Engineering Specifications	Added water options
06/16/25	All, Blower Motor Variable Frequency Drive (VFD) Controls	Updated ACDU01/Handheld Service tool to Wireless Service Tool

Due to ongoing product improvements, specifications, and dimensions are subject to change and correction without notice or incurring obligations. Determining the application and suitability for use of any product is the responsibility of the installer. Additionally, the installer is responsible for verifying dimensional data on the actual product prior to beginning any installation preparations.

Incentive and rebate programs have precise requirements as to product performance and certification. All products meet applicable regulations in effect on date of manufacture; however, certifications are not necessarily granted for the life of a product. Therefore, it is the responsibility of the applicant to determine whether a specific model qualifies for these incentive/rebate programs.

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