



RESIDENTIAL

MARS 24 (MZ) VERSATILE TWO-STAGE SERIES

INSTALLATION, OPERATION & MAINTENANCE MANUAL

Part#: 97B0075N37 | Revised: May 16, 2025

Models: MZ 024-060

60Hz - R-454B



Models:
MZ
024-060

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Model Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
M	Z	L	0	2	4	A	G	D	R	0	R	0	V	S

MODEL
M = R-454B Refrigerant

MODEL TYPE
Z = Versatile Two-Stage Series

SUPPLY & RETURN CONFIGURATIONS

Horizontal Configuration		
	Left	Right
Straight	L	R
Back	B	P

Vertical Configuration		
	Left	Right
Top	T	K

SIZE

024	042
030	048
036	060 ¹

REVISION
A = Current

VOLTAGE¹
G = 208/230-1-60 J = 208/230-1-60 Refrigerant Detection System

CONTROLS

Control	Standard	Soft Start
DXM2.5	D	4
DXM2.5 with Disconnect	B	-

STANDARD
S = MARS

BLOWER MOTOR
V = Constant Volume (CV) EC

EXTENDED OPTIONS
O = Standard
P = HWG and Pump

DRAIN PAN/HEAT EXCHANGER OPTIONS
R = Stainless Steel Drain Pan, Tin-Coated Air Coil

WATER/HEAT EXCHANGER OPTIONS²

Water Option	Standard	Cupro-Nickel
None	0	Z
MOD Valve, Low System Pressure Drop ²	C	-
MOD Valve, High System Pressure Drop	-	P
Internal Flow Controller High Head with Check Valve	2	
Internal Flow Controller High Head w/o Check Valve	H	

CABINET
R = Residential

NOTES:

- MZ size 060 requires Refrigerant Detection System
- All Open-Loop Variable Water Flow Water Circuit Options require a Cupro-Nickel Heat Exchanger.

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Attentions, Cautions, and Warnings

SAFETY

Warnings, cautions, and notices appear throughout this manual. Read these items carefully before attempting any installation, service, or troubleshooting of the equipment.

DANGER: Indicates an immediate hazardous situation, which if not avoided will result in death or serious injury. DANGER labels on unit access panels must be observed.

WARNING: Indicates a potentially hazardous situation, which if not avoided could result in death or serious injury.

CAUTION: Indicates a potentially hazardous situation or an unsafe practice, which if not avoided could result in minor or moderate injury or product or property damage.

NOTICE: Notification of installation, operation, or maintenance information, which is important, but which is not hazard-related.

WARNING



Disconnect power supply(ies) before servicing. Refer servicing to qualified service personnel. Electric shock hazard. May result in injury or death!

WARNING

To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state, and federal proficiency requirements.

WARNING

The installation of water-source heat pumps and all associated components, parts, and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

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).

WARNING

If unit connected via an air duct system to one or more rooms with R-454B is installed in a room with an area less than A_{min} or has an Effective Dispersal Volume less than minimum, that room shall be without continuously operating open flames or other POTENTIAL IGNITION SOURCES. A flame-producing device may be installed in the same space if the device is provided with an effective flame arrest.

WARNING

All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

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

An unventilated area where the appliance using FLAMMABLE REFRIGERANTS is installed shall be so constructed that should any refrigerant leak, it will not stagnate so as to create a fire or explosion hazard.

WARNING

Auxiliary devices which may be a POTENTIAL IGNITION SOURCE shall not be installed in the duct work. Examples of such POTENTIAL IGNITION SOURCES are hot surfaces with a temperature exceeding 1,292°F (700°C)

WARNING

An unventilated area where a water-source heat pump is installed and surpasses a R-454B refrigerant charge of 62 oz (1.76 kg), shall be without continuously operating open flames (for example an operating gas appliance) or other POTENTIAL IGNITION SOURCES (for example, an operating electric heater, hot surfaces).

WARNING

Only auxiliary electric heaters approved by the manufacturer shall be installed in connecting ductwork. The installation of any other auxiliary devices is beyond manufacturer's responsibility.

WARNING

For mechanical ventilation, the lower edge of the air extraction opening where air is exhausted from the room shall not be more than 3.94 inches (100 mm) above the floor. The location where the mechanical ventilation air extracted from the space is discharged shall be separated by a sufficient distance, but not less than 9.84 feet (3 m), from mechanical ventilation air intake openings, to prevent recirculation to the space.

WARNING

Children being supervised are NOT to play with the appliance.

WARNING

Do not pierce or burn.

WARNING

Be aware that refrigerants may not contain odor.

Attentions, Cautions, and Warnings

CAUTION

DO NOT store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life. Always move and store units in an upright position. Tilting units on their sides will cause equipment damage.

CAUTION

CUT HAZARD - Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing heat pumps.

CAUTION

To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. The mechanical components and filters can quickly become clogged with construction dirt and debris, which may cause system damage and void product warranty.

CAUTION

All three phase scroll compressors must have direction of rotation verified at startup. Verification is achieved by checking compressor Amp draw. Amp draw will be substantially lower compared to nameplate values. Additionally, reverse rotation results in an elevated sound level compared to correct rotation. Reverse rotation will result in compressor internal overload trip within several minutes. Verify compressor type before proceeding.

CAUTION

Maximum allowed inlet water temperature 150°F for HWG applications.

NOTICE

Servicing shall be performed only as recommended by the manufacturer.

NOTICE

REFRIGERANT SENSORS for REFRIGERANT DETECTION SYSTEMS shall only be replaced with sensors specified by the appliance manufacturer.

NOTICE

An unconditioned attic is not considered natural ventilation.

NOTICE

Maximum external statics must be adhered to in order to maintain minimum CFM.

NOTICE

This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.

NOTICE

For Installation Only in Locations Not Accessible to the General Public.

NOTICE

LEAK DETECTION SYSTEM installed. Unit must be powered except for service.

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General Information

INSPECTION

Upon receipt of the equipment, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the packaging of each unit, and inspect each unit for damage. Ensure that the carrier makes proper notation of any shortages or damage on all copies of the freight bill and completes a common carrier inspection report. Concealed damage not discovered during unloading must be reported to the carrier within 15 days of receipt of shipment. If not filed within 15 days, the freight company can deny the claim without recourse.

NOTE: It is the responsibility of the purchaser to file all necessary claims with the carrier. Notify your equipment supplier of all damage within 15 days of shipment.

STORAGE

Equipment should be stored in its original packaging in a clean, dry area. Store units in an upright position at all times. You may stack vertical configurations a maximum of two units high and horizontal configurations a maximum of three units high.

UNIT PROTECTION

Cover units on the job site with either the original packaging or an equivalent protective covering. Cap the open ends of pipes stored on the job site. In areas where painting, plastering, and/or spraying has not been completed, all due precautions must be taken to avoid physical damage to the units and contamination by foreign material. Physical damage and contamination may prevent proper startup and may result in costly equipment cleanup.

Examine all pipes, fittings, and valves before installing any of the system components. Remove any dirt or debris found in or on these components.

PRE-INSTALLATION

Installation, Operation, and Maintenance instructions are provided with each unit. Horizontal equipment is designed for installation above false ceiling or in a ceiling plenum. Other unit configurations are typically installed in a mechanical room. The installation site chosen should include adequate service clearance around the unit. Before unit startup, read all manuals and become familiar with the unit and its operation. Thoroughly check the system before operation.

PREPARE UNITS FOR INSTALLATION AS FOLLOWS:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Keep the cabinet covered with the original packaging until installation is complete and all plastering, painting, etc. is finished.
3. Verify refrigerant tubing is free of kinks or dents and that it does not touch other unit components.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.
5. Remove any blower support packaging (water-to-air units only).
6. Some airflow patterns are field convertible (horizontal units only). Locate the airflow conversion section of this IOM.
7. Locate and verify any hot water generator (HWG) hanger, or other accessory kit located in the compressor section or blower section.

CHECKS TO THE AREA

Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized. For repair to the REFRIGERATING SYSTEM, these steps shall be completed prior to conducting work on the system.

General Information

Work Procedure

Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.

General Work Area

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.

Checking for Presence of Refrigerant

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.

Presence of Fire Extinguisher

If any hot work is to be conducted on the refrigeration 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 Ignition Sources

No person carrying out work in relation to a REFRIGERATION 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.

Ventilated Area

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.

Checks to the Refrigeration Equipment

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;
- Refrigerant piping 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.

Checks to Electrical Devices

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:

- 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.

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General Information

REPAIR TO INTRINSICALLY SAFE COMPONENTS

Intrinsically safe components must be replaced.

CABLING

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.

REQUIRED AREA FOR INSTALLATION

The minimum room area of the space (A_{min}) or a minimum room area of conditioned space (TA_{min}) shall be corrected for unit's location altitude by multiplying A_{min} or TA_{min} by the applicable altitude adjustment factor (AF) for building ground-level altitude (H_{alt}) in feet or meters, as shown in Table 1.

NOTE:

- You can use Imperial or Metric measurements to calculate A_{min} or TA_{min} .
- The maximum allowable altitude of installation for this product is 6,561 ft (2,000 m).

Table 1: Altitude Adjustment

H_{alt} ft (m)	AF
0 (0)	1.00
656 (200)	1.00
1,312 (400)	1.00
1,968 (600)	1.00
2,624 (800)	1.02
3,280 (1,000)	1.05
3,937 (1,200)	1.07
4,593 (1,400)	1.10
5,249 (1,600)	1.12
5,905 (1,800)	1.15
6,561 (2,000)	1.18

Minimum Installation Area

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 ft ² (m ²) [A _{min}]			
			Floor	Window	Wall	Ceiling
MZ060	69	Vertical	237 (22.0)	132 (12.2)	76 (7.0)	63 (5.9)
		Horizontal	237 (22.0)	141 (13.1)	79 (7.3)	65 (6.0)

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} (ft ²)	Q _{min} (ft ³ /min)
MZ060	69	3.54	117

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)	Anv _{min} in ² (cm ²)
MZ060	69	111.57 (719.80)

Anv _{min} =	Minimum natural ventilation area opening
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When the openings for connected rooms or natural ventilation are required, the following conditions shall be applied:

- 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.

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Refrigerant System Servicing

REFRIGERANT SYSTEM

Verify that air- and water-flow rates are at proper levels before servicing the refrigerant circuit. To maintain sealed-circuit integrity, do not install service gauges unless unit operation appears abnormal. Reference the operating charts for pressures and temperatures.

Removal and Evacuation

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:

- Safely remove refrigerant following local and national regulations
- Evacuate
- Purge the circuit with Nitrogen
- Evacuate
- Continuously flush or purge with Nitrogen when using flame to open circuit
- Open the circuit

The refrigerant charge shall be recovered into the correct recovery cylinders as 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, refrigerant 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 FLAMMABLE REFRIGERANT). This process shall be repeated until no refrigerant remains in the system (optional for FLAMMABLE REFRIGERANT). 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.

Charging Procedures

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 minimize the amount of refrigerant contained in them
- Cylinders shall be kept in an appropriate position according to the instructions to ensure charging with liquid refrigerant
- Ensure that the REFRIGERATION SYSTEM is grounded prior to charging the system with refrigerant
- Label the system when charging is complete (if not already):
 - For packaged units, the data plate dictates the charge level
 - For split systems, write the charge level on the data plate
- Extreme care shall be taken not to overfill the REFRIGERATION 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.

Leak Detection

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.

A2L-Compliant 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.

Refrigerant System Servicing

Leak-detection equipment shall be set at a percentage of the lower flammability limit 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 refrigerant leak that requires brazing is identified, all of the refrigerant shall be recovered from the system, or isolated (by means of shutoff valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to Removal and Evacuation section.

DECOMMISSIONING

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is a 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.

1. Become familiar with the equipment and its operation
2. Isolate system electrically

3. 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
4. Pump down refrigerant system, if possible
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system
6. Ensure that cylinder is situated on the scales before recovery takes place
7. Start the recovery machine and operate in accordance with instructions
8. Do not overfill cylinders (no more than 80% volume liquid charge)
9. Do not exceed the maximum working pressure of the cylinder, even temporarily
10. When the cylinders have been filled correctly and the process completed, ensure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off
11. Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked

Labeling - Upon decommissioning, equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed.

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Refrigerant System Servicing

RECOVERY

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 shutoff 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.

Physical Data

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MARS (MZ) Series

Unit Size	024	030	036	042	048	060
Compressor (1 Each)	Scroll					
Number of refrigerant circuits	1	1	1	1	1	1
Factory Charge R-454B (oz)	40	36	46	56	56	69
Refrigerant Leak Detection System	O	O	O	O	O	R
Number of Sensors	2	2	2	2	2	2
Water Connection Size						
Swivel	1"	1"	1"	1"	1"	1"
System Water Volume (gal) ¹	0.323	0.323	0.738	0.890	0.890	0.939
Vertical						
Filter Standard - 1" Throwaway (inch)	20x20	20x20	24x24	24x24	28x28	28x28
Weight - Operating (lbs.)	216	224	245	260	315	330
Weight - Packaged (lbs.)	221	229	251	266	322	337
Horizontal						
Filter Standard - 1" Throwaway	18x24	18x24	2-14x20	2-14x20	1-20x24 1-14x20	1-20x24 1-14x20
Weight - Operating (lbs.)	208	208	233	244	299	314
Weight - Packaged (lbs.)	213	213	239	250	306	321
Hot Water Generator						
Swivel - Residential Class	1"	1"	1"	1"	1"	1"
Weight - HWG Adder (lbs.)	+15	+15	+15	+15	+15	+15

Notes:

- All dimensions displayed above are in inches unless otherwise marked.
- The standard Condensate Drain Connection is rubber coupling that couples to ¾-inch schedule 40/80 PVC.
- The optional Stainless Steel Condensate Drain Connection is ¾-inch FPT.
- FPT = Female Pipe Thread.
- O = Optional, R = Required

1. Volume without water options.

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Horizontal Installation

HORIZONTAL UNIT LOCATION

Units are not designed for outdoor installation. Locate the unit in an INDOOR area that allows enough space for service personnel to perform typical maintenance or repairs without removing unit from the ceiling. Horizontal units are typically installed above a false ceiling or in a ceiling plenum. Never install units in areas subject to freezing or where humidity levels could cause cabinet condensation (such as unconditioned spaces subject to 100% outside air). Consideration should be given to access for easy removal of the filter and access panels. Provide sufficient room to make water, electrical, and duct connection(s).

If the unit is located in a confined space, such as a closet, provisions must be made for return air to freely enter the space by means of a louvered door, etc. Any access panel screws that would be difficult to remove after the unit is installed should be removed prior to setting the unit. Refer to Figure 3 for an illustration of a typical installation. Refer to unit submittal data or engineering design guide for dimensional data.

Conform to the following guidelines when selecting unit location:

1. Provide a hinged access door in concealed-spline or plaster ceilings. Provide removable ceiling tiles in T-bar or lay-in ceilings. Refer to horizontal unit dimensions for specific series and model in unit submittal data. Size the access opening to accommodate the service technician during the removal or replacement of the compressor, control, or blower assembly.
2. Provide access to hanger brackets, water valves and fittings. Provide screwdriver clearance to access panels, discharge collars and all electrical connections.
3. DO NOT obstruct the space beneath the unit with piping, electrical cables and other items that prohibit future removal of components or the unit itself.
4. Use a manual portable jack/lift to lift and support the weight of the unit during installation and servicing.

The installation of water-source heat pump units and all associated components, parts and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

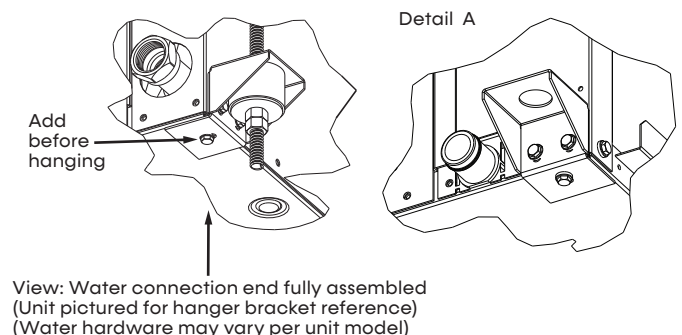
NOTE: Minimum clearances for installation are the same as the minimum required service clearances. Consult the service clearances or reference of installation clearances for more information.

MOUNTING HORIZONTAL UNITS

Horizontal units have four hanger brackets partially attached at the factory, one at each corner. Enclosed within the unit there is a hanger kit hardware bag containing vibration isolation grommets, washers, screws and a hanger installation instruction page. One additional screw from the hardware bag must be added to each hanger bracket before unit installation. Tighten each screw to 75 in-lbs (8.5 Nm). See Figure 1 for more information. Refer to the hanger installation instruction page contained in the hardware bag for details of final hanger bracket attachment and unit suspension.

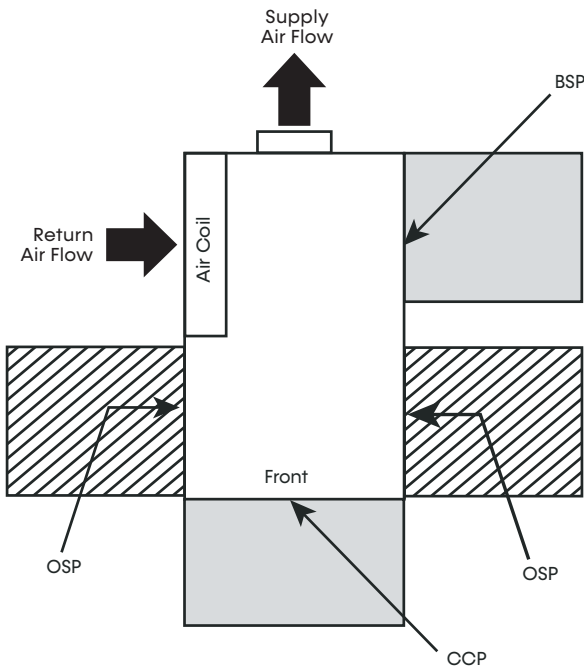
Use four field-supplied threaded rods and factory provided vibration isolators to suspend the unit. Safely lift the unit into position supporting the bottom of the unit. Ensure the top of the unit is not in contact with any external objects. Connect the top end of the four all-thread rods, slide rods through the brackets and grommet then assemble washers and double nuts at each rod. Ensure that the unit is approximately level and that the threaded rod extends past the nuts.

Figure 1: Hanger Bracket

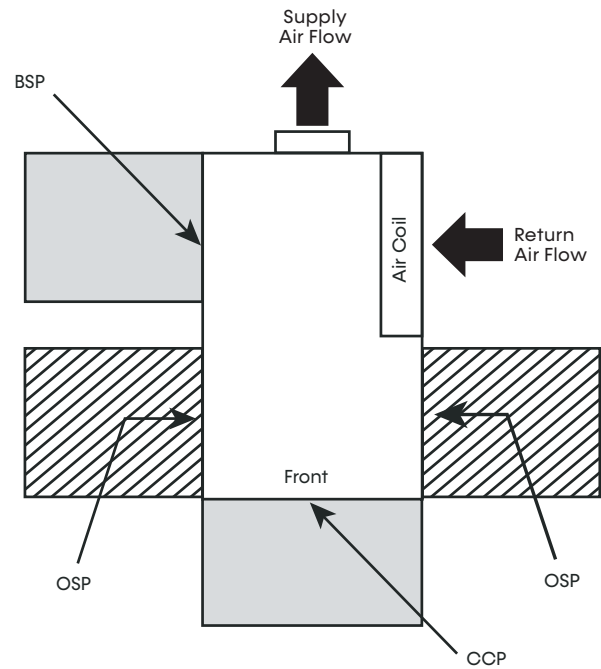


Horizontal Installation: Service Access

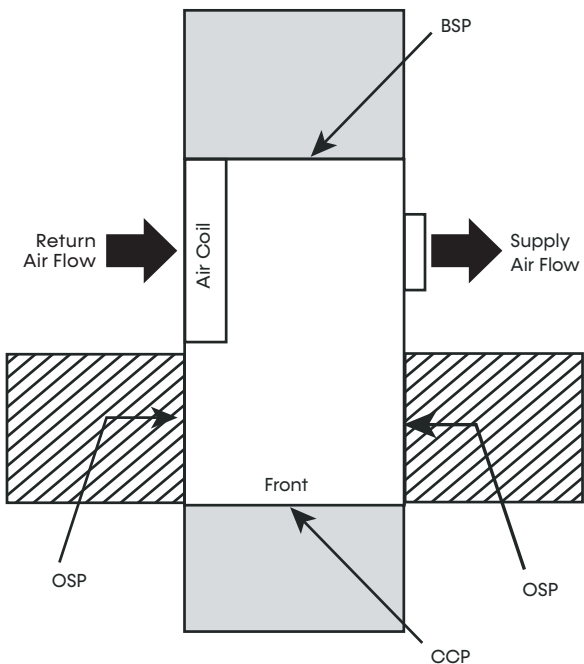
LEFT RETURN BACK DISCHARGE



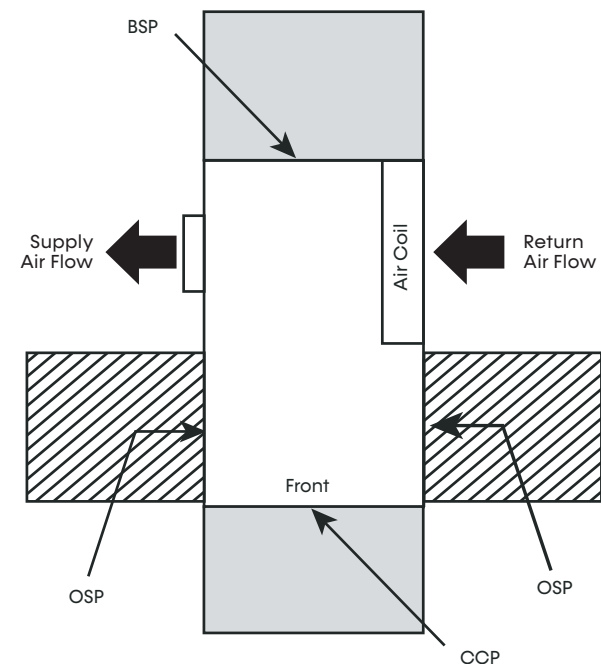
RIGHT RETURN BACK DISCHARGE



LEFT RETURN STRAIGHT DISCHARGE



RIGHT RETURN STRAIGHT DISCHARGE



Notes:

- While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
- CCP and BSP requires 2-feet of service access.
- Blower service access is through back panel on straight discharge units or through panel opposite air coil on back discharge units.
- OSP are removable panels that provide additional access to the units interior. Clear access to OSP panels is not required and they are not to be used in place of the mandatory CCP and BSP panels.

 = Mandatory Service Access 2-foot (61 cm)

 = Optional Service Access 2-foot (61 cm)

Legend:

CCP = Control/Compressor Access

BSP = Blower Service Panel

OSP = Optional Service Panel (not required)

Models:
MZ
024-060

Horizontal Installation

Figure 2: Horizontal Unit Pitch

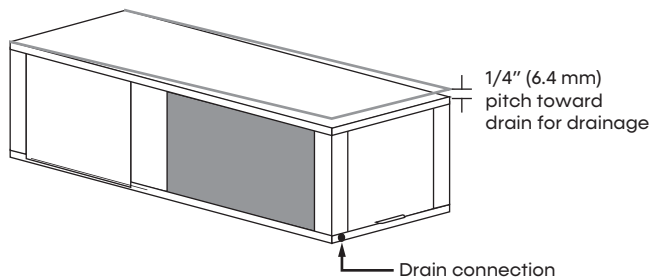
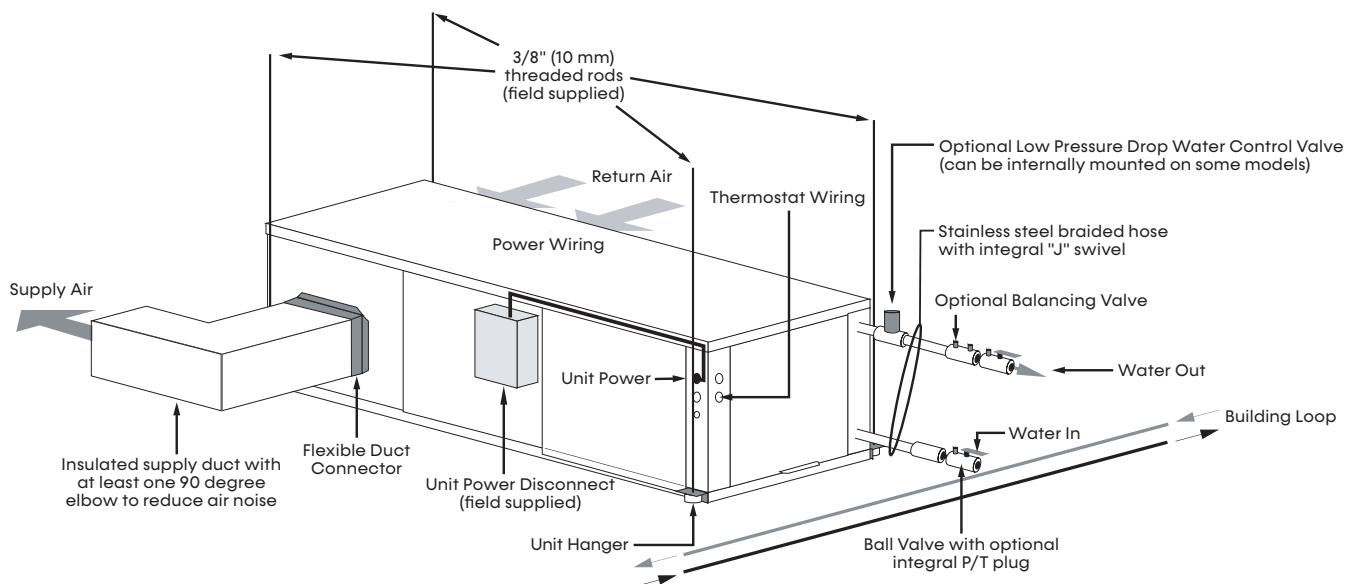


Figure 3: Typical Unit Installation



AIR COIL

To obtain maximum performance, the air coil should be cleaned before startup. A 10% solution of dishwasher detergent and water is recommended for both sides of the coil. A thorough water rinse should follow. **Do not use Ultraviolet-based anti-bacterial systems.**

NOTICE

Installation Note - Ducted Return: Many horizontal WSHPs are installed in a return air ceiling plenum application (above ceiling). Vertical WSHPs are commonly installed in a mechanical room with free return (e.g. louvered door). Filter rails are the industry standard and are included on commercial heat pumps only for holding the filter. For ducted return applications, the filter rail must be removed and replaced with a duct flange or filter frame. Canvas or flexible connectors should also be used to minimize vibration between the unit and ductwork.

Horizontal Installation

CONDENSATE PIPING

A condensate drain line must be installed and pitched away for the unit to allow for proper drainage. This connection must meet all local plumbing/building codes.

Pitch the unit toward the drain as shown in Figure 2 to improve the condensate drainage. On small units (less than 2.5 tons/8.8 kW), ensure that unit pitch does not cause condensate leaks inside the cabinet.

Install condensate trap at each unit with the top of the trap positioned below the unit condensate drain connection as shown in Figure 4. Design the depth of the trap (water-seal) based upon the amount of ESP capability of the blower (where 2-inches [51 mm] of ESP capability requires 2-inches [51 mm] of trap depth). As a general rule, 1 ½ inch [38 mm] trap depth is the minimum.

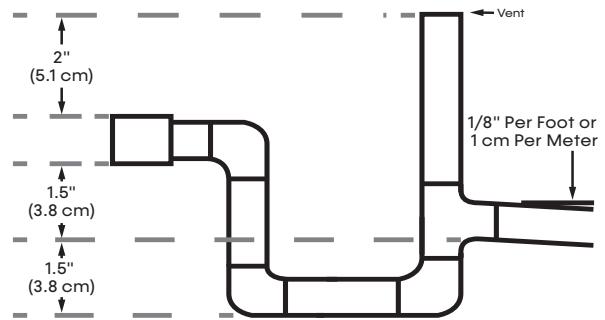
Each unit must be installed with its own individual trap and connection to the condensate line (main) or riser. Provide a means to flush or blow out the condensate line. DO NOT install units with a common trap and/or vent.

Always vent the condensate line when dirt or air can collect in the line or a long horizontal drain line is required. Also vent when large units are working against higher external static pressure than other units connected to the same condensate main since this may cause poor drainage for all units on the line. **WHEN A VENT IS INSTALLED IN THE DRAIN LINE, IT MUST BE LOCATED AFTER THE TRAP IN THE DIRECTION OF THE CONDENSATE FLOW.**

STAINLESS STEEL DRAIN PANS

The condensate connection is ¾-inch male pipe thread. Field-provided female adapter required for condensate drain connection.

Figure 4: Horizontal Condensate Connection



CAUTION

Ensure condensate line is pitched toward drain 1/8 inch per foot [11 mm per m] of run.

Models:
MZ
024-060

Duct System Installation

DUCT SYSTEM INSTALLATION

Proper duct sizing and design is critical to the performance of the unit. The duct system should be designed to allow adequate and even airflow through the unit during operation. Air flow through the unit **MUST** be at or above the minimum rated airflow for a given unit size to avoid equipment damage. Duct systems should be designed for quiet operation. Refer to Figure 3 for horizontal duct system details or Figure 7 for vertical duct system details. A flexible connector is recommended for both discharge and return air duct connections on metal duct systems to eliminate the transfer of vibration to the duct system. To maximize sound attenuation of the unit blower, the supply and return plenums should include internal fiberglass duct liner or be constructed from ductboard for the first few feet. Application of the unit to uninsulated ductwork in an unconditioned space is not recommended, as the unit's performance may be adversely affected.

At least one 90-degree elbow should be included in the supply duct to reduce air noise. If air noise or excessive air flow is a problem, the blower speed can be changed. For airflow charts, consult submittal data for the series and model of the specific unit.

If the unit is connected to existing ductwork, a previous check should have been made to ensure that the ductwork has the capacity to handle the airflow required for the unit. If ducting is too small, as in the replacement of a heating only system, larger ductwork should be installed. All existing ductwork should be checked for leaks and repaired as necessary.

An unventilated area where water-source heat pump is installed and surpasses a R-454B refrigerant charge of 62 oz (1.76 kg), shall be without continuously operating open flames (for example an operating gas appliance) or other **POTENTIAL IGNITION SOURCES** (for example an operating electric heater, hot surfaces).

Only auxiliary electric heaters approved by MARS shall be installed in connecting ductwork. The installation of any other auxiliary devices is beyond MARS's responsibility.

For duct-connected units, false ceilings or drop ceilings may be used as a return air plenum as long as the MARS RDS is installed as shown in Figure 40.

WARNING

Ducts connected to an appliance shall not contain a **POTENTIAL IGNITION SOURCE**.

WARNING

Keep any required ventilation openings clear of obstruction.

WARNING

For mechanical ventilation, the lower edge of the air extraction opening where air is exhausted from the room shall not be more than 3.94 inches (100 mm) above the floor. The location where the mechanical ventilation air extracted from the space is discharged shall be separated by a sufficient distance, but not less than 9.84 feet (3 m), from mechanical ventilation air intake openings, to prevent recirculation to the space.

Field Conversion of Air Discharge

OVERVIEW

Horizontal unit blower assembly can be field converted between side (straight) and back (end) discharge using the instructions below.

NOTE: It is not possible to field convert return air between left or right return models due to the necessity of refrigeration copper piping changes.

PREPARATION

It is best to field convert the unit discharge configuration on the ground before hanging. If the unit is already hung, take it down for field conversion. If the unit to be converted includes a factory-installed RDS, see Move the RDS Sensor After Field Conversion.

SIDE-TO-BACK DISCHARGE CONVERSION

1. Place unit in well lit area. Remove the screws as shown in Figure 5 to free top panel and discharge panel.
2. Lift out the access panel and set aside. Lift and rotate the discharge panel to the other position as shown, being careful with the blower wiring.
3. Check blower wire routing and connections for tension or contact with sheet metal edges. Re-route if necessary.
4. Check refrigerant tubing for contact with other components.
5. Reinstall the top panel and screws noting that the location for some screws have changed.
6. Manually spin the fan wheel to ensure that the wheel is not rubbing or obstructed.
7. Replace access panels.

BACK-TO-SIDE DISCHARGE CONVERSION

If the discharge is changed from back to side, use above instruction noting that illustrations are reversed.

LEFT VERSUS RIGHT RETURN

The conversion process of side-to-back or back-to-side discharge for either right or left return configuration is the same. In some cases, it may be possible to rotate the entire unit 180 degrees if the return air connection needs to be on the opposite side. **NOTE: rotating the unit moves the piping to the other end of the unit.**

Figure 5: Left Return – Side-to-Back

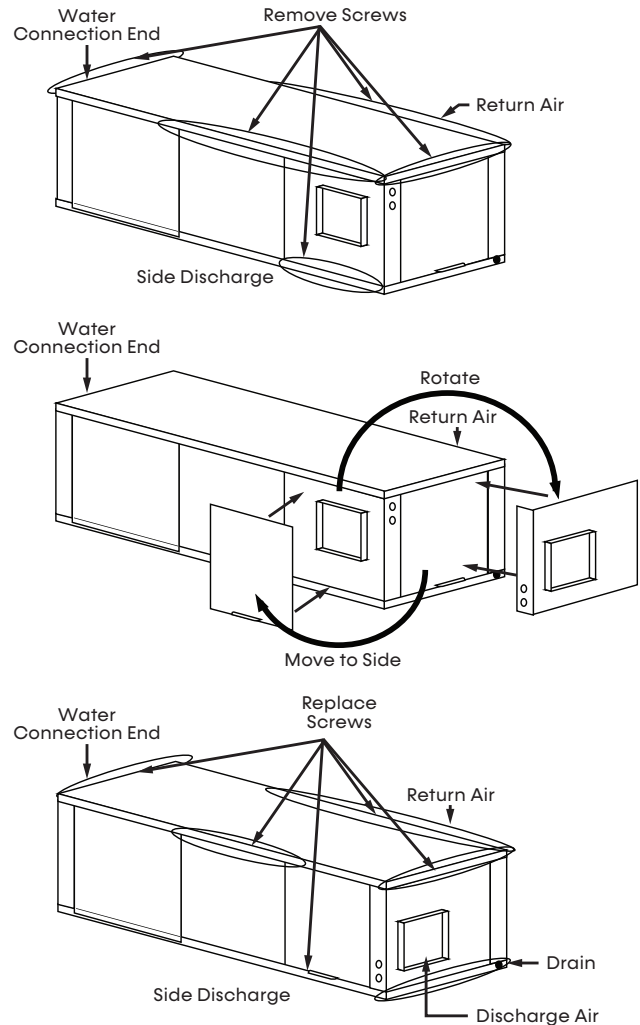
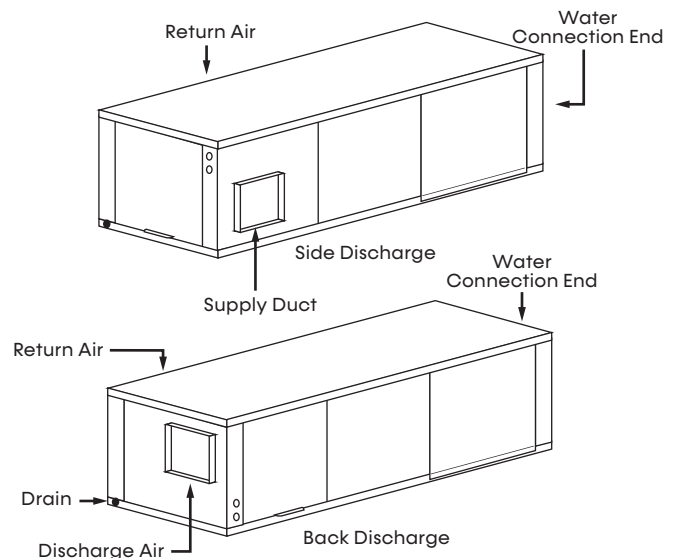


Figure 6: Right Return – Side-to-Back



Models:
MZ
024-060

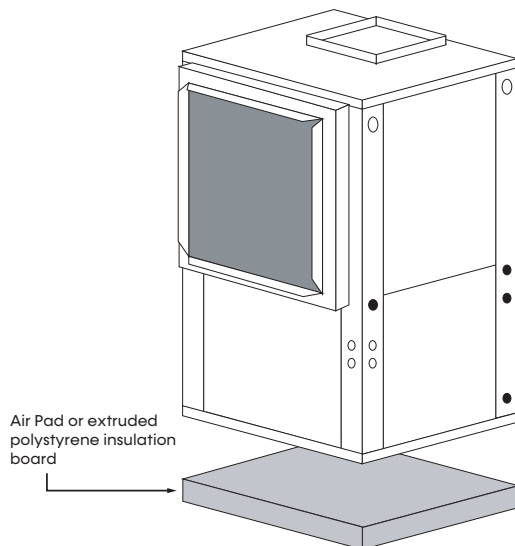
Vertical Installation

VERTICAL UNIT LOCATION

Units are not designed for outdoor installation. Locate the unit in an INDOOR area that allows enough space for service personnel to perform typical maintenance or repairs without removing unit from the mechanical room/closet. Never install units in areas subject to freezing or where humidity levels could cause cabinet condensation (such as unconditioned spaces subject to 100% outside air). Consideration should be given to access for easy removal of the filter and access panels. Provide sufficient room to make water, electrical, and duct connection(s). **NOTE: Minimum clearances for installation are the same as the minimum required service clearances. Consult the service clearances on for reference of installation clearances.**

If the unit is located in a confined space, such as a closet, provisions must be made for return air to freely enter the space by means of a louvered door, etc. Any access panel screws that would be difficult to remove after the unit is installed should be removed prior to setting the unit. Refer to the figures to the right for typical installation illustrations. Refer to submittal data or the engineering design guide for dimensional data.

Figure 7: Vertical Unit Mounting

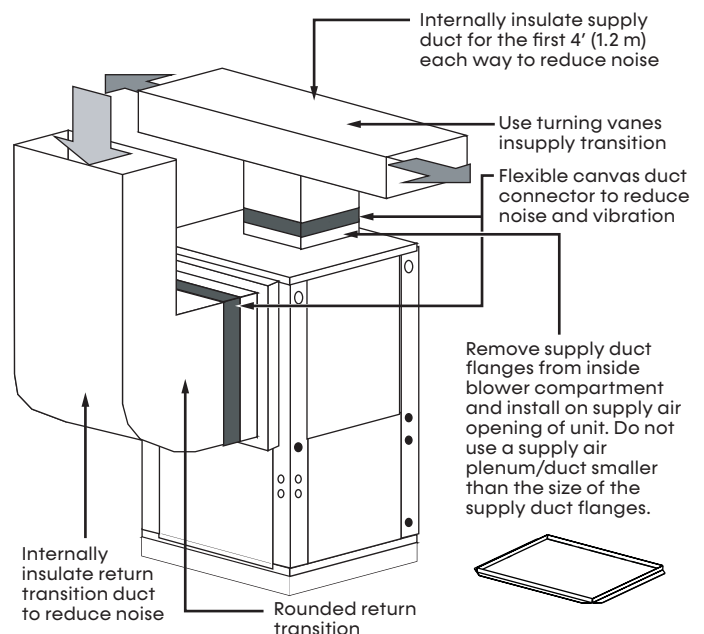


NOTICE

Installation Note - Ducted Return: Many horizontal WSHPs are installed in a return air ceiling plenum application (above ceiling). Vertical WSHPs are commonly installed in a mechanical room with free return (e.g. louvered door). Filter rails are the industry standard and are included on commercial heat pumps only for holding the filter. For ducted return applications, the filter rail must be removed and replaced with a duct flange or filter frame. Canvas or flexible connectors should also be used to minimize vibration between the unit and ductwork.

1. For optimal sound performance, install the unit on a piece of rubber, neoprene, or other mounting pad material for sound isolation. The pad should be at least $\frac{3}{8}$ -inch (10 mm) to $\frac{1}{2}$ -inch (13 mm) in thickness. The vibration isolation pad should cover the entire base of the unit and slightly extend past all four edges of the base.
2. Provide adequate clearance for filter replacement and drain pan cleaning. Do not block filter access with piping, conduit, or other materials. Refer to unit submittal data or engineering design guide for dimensional data.
3. Provide access for fan and fan motor maintenance and for servicing the compressor and coils without removing the unit.
4. Provide an unobstructed path to the unit within the closet or mechanical room. Space should be sufficient to allow removal of the unit, if necessary.
5. In limited side access installations, pre-removal of the control box side mounting screws will allow control box removal for future servicing.
6. Provide access to water valves and fittings and screwdriver access to the unit side panels, discharge collar and all electrical connections.

Figure 8: Typical Vertical Unit Installation Using Ducted Return Air



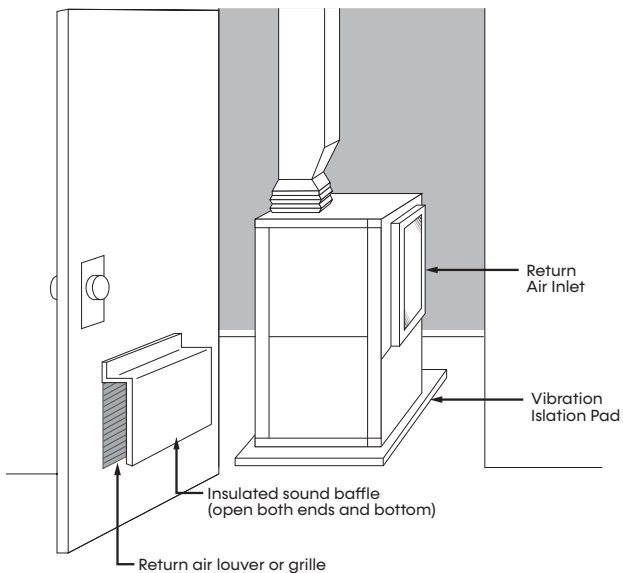
Vertical Installation

SOUND ATTENUATION FOR VERTICAL UNITS

Sound attenuation is achieved by enclosing the unit within a small mechanical room or a closet. Additional measures for sound control include the following:

1. Mount the unit so that the return air inlet is 90 degrees to the return air grille. Refer to the figure below. Install a sound baffle as illustrated to reduce line-of-sight sound transmitted through return air grilles.
2. Mount the unit on a rubber or neoprene isolation pad to minimize vibration transmission to the building structure.

Figure 9: Vertical Sound Attenuation



CONDENSATE PIPING FOR VERTICAL UNITS

A condensate line must be installed and pitched away from the unit to allow for proper drainage. This connection must meet all local plumbing and building codes.

Install condensate trap at each unit with the top of the trap positioned below the unit condensate drain connection. Design the depth of the trap (water-seal) based upon the amount of ESP capability of the blower (where 2-inches [51 mm] of ESP capability requires 2-inches [51 mm] of trap depth). As a general rule, 1-½ inches [38 mm] of trap depth is the minimum.

Always vent the condensate line when dirt or air can collect in the line or a long horizontal drain line is required. Also vent when large units are working against higher external static pressure than other units connected to the same condensate main since this may cause poor drainage for all units on the line. **WHEN A VENT IS INSTALLED IN THE DRAIN LINE, IT MUST BE LOCATED AFTER THE TRAP IN THE DIRECTION OF THE CONDENSATE FLOW.**

Each unit must be installed with its own individual vent (where necessary) and a means to flush or blow out the condensate drain line. Do not install units with a common trap and/or vent.

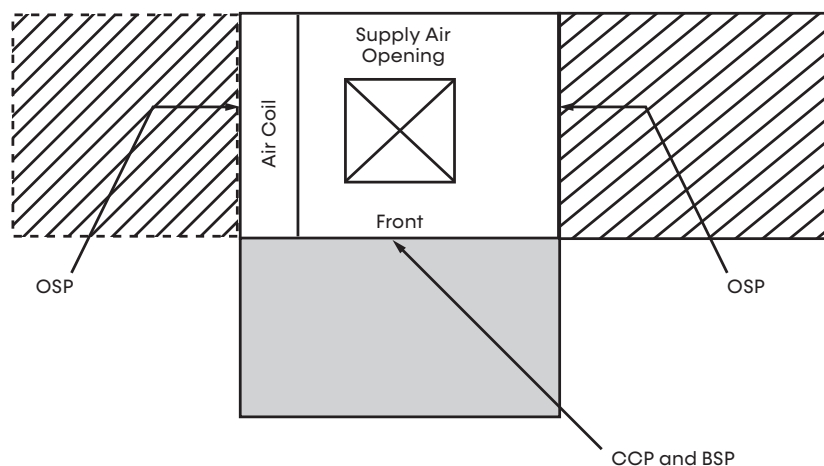
Condensate drain connection is a ¾-inch MPT that couples to ¾-inch FPT schedule 40/80 PVC. If the connection is not secure, the connection may leak.

Models:
MZ
024-060

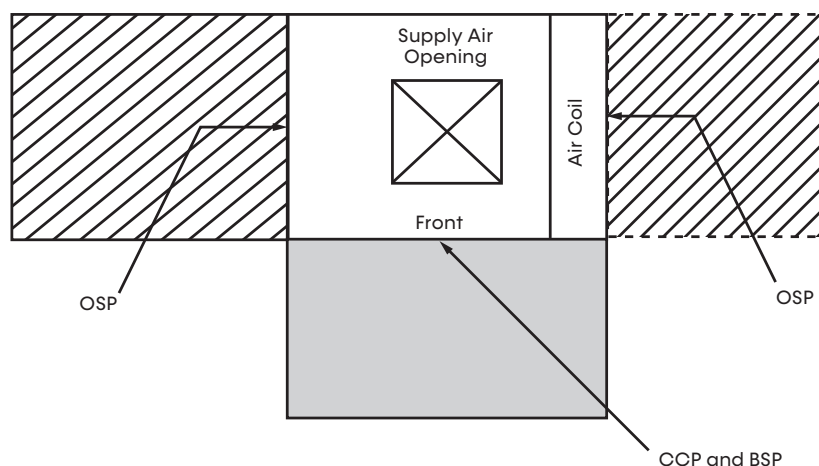
Vertical Installation: Service Access

VERTICAL UNITS

LEFT RETURN



RIGHT RETURN



Notes:

1. While clear access to all removable panels is not required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Front and side access is preferred for service access. However, all components may be serviced from the front access panel if side access is not available.
3. OSP are removable panels that provide additional access to the units interior. Clear access to OSP panels is not required and they are not to be used in place of the mandatory CCP and BSP panels.
4. Top supply air is shown, the same clearances apply to bottom supply air units.

 = Mandatory Service Access 2-foot (61 cm)

 = Optional Service Access 2-foot (61 cm)

Legend:

CCP = Control/Compressor Access

BSP = Blower Service Panel

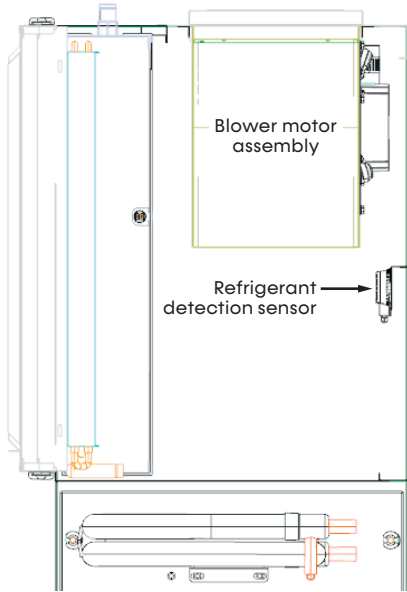
OSP = Optional Service Panel (not required)

Relocation of RDS After Field Conversion

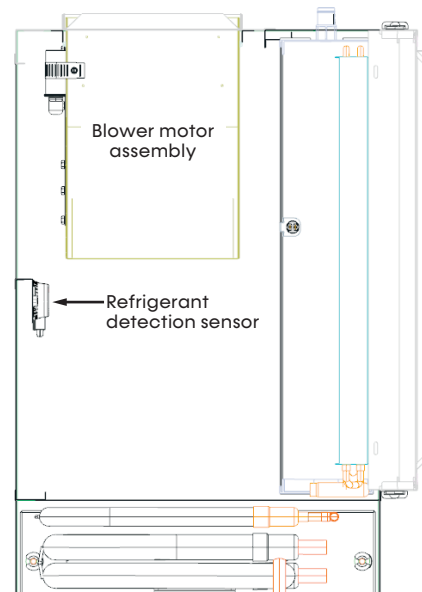
REFRIGERANT DETECTION SYSTEM SENSOR LOCATIONS

After field converting air discharge on units with a factory-installed Refrigerant Detection System (RDS), move the RDS sensor to the location the unit configuration requires. The following examples detail RDS sensor location per return and discharge configuration.

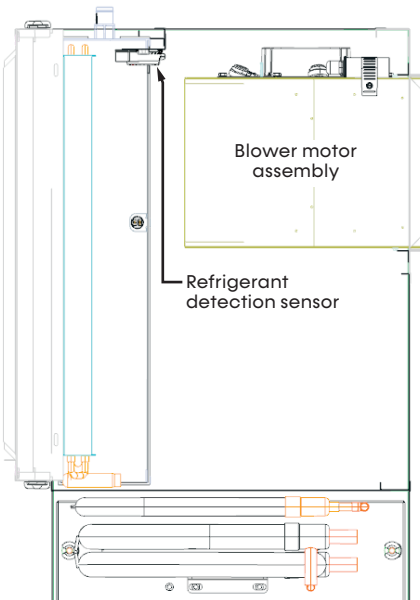
**Left Return Back Discharge
Sensor on the Right Side of the Unit**



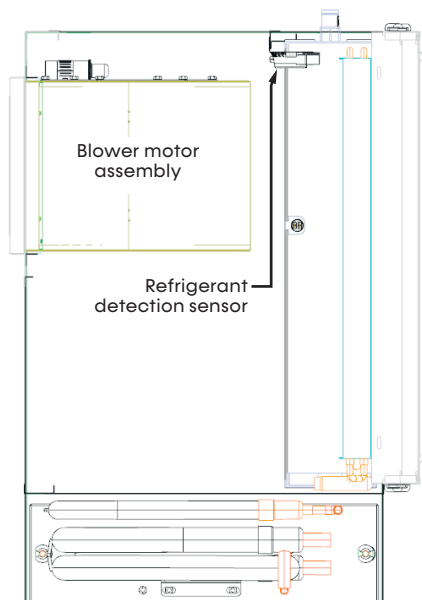
**Right Return Back Discharge
Sensor on the Left Side of the Unit**



**Left Return Straight Discharge
Sensor on the Back Side of the Unit**



**Right Return Straight Discharge
Sensor on the Back Side of the Unit**



Models:
MZ
024-060

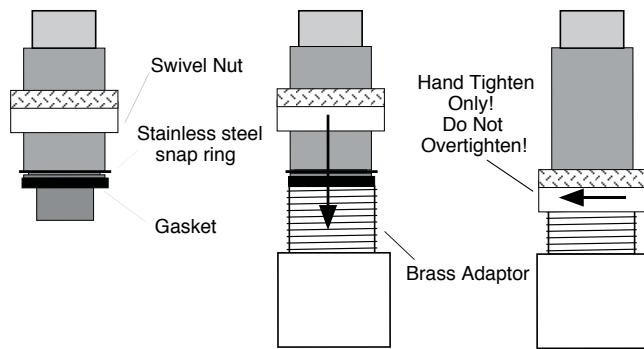
Piping Installation

WATER CONNECTIONS

Swivel piping fittings are used for water connections that are rated for 300 psi (2,068 kPa) operating pressure. The connections have a rubber gasket seal similar to a garden hose gasket, which when mated to the flush end of most 1-inch threaded male pipe fittings provides a leak-free seal without the need for thread sealing tape or joint compound. Check for burrs and ensure that the rubber seal is in the swivel connector prior to attempting any connection (rubber seals are shipped attached to the swivel connector). **DO NOT OVERTIGHTEN** or leaks may occur.

The female locking ring is threaded onto the pipe threads which holds the male pipe end against the rubber gasket, and seals the joint. **HAND TIGHTEN ONLY! DO NOT OVERTIGHTEN!**

Figure 10: Water Connection



Variable Water Flow Heat Pump Applications Overview

Models:
MZ
024-060

Variable Water Flow is a revolutionary new, intelligent, and efficient way to circulate water (or water plus antifreeze) using internal, variable speed water flow control. The factory installed high efficiency variable speed pumps uses almost half the wattage of traditional fixed speed pump. Variable Water Flow technology improves the life expectancy of the unit by reducing the amount of energy required to optimize the flow of water throughout the system and also reduces the space, cost, and labor required to install external water flow control mechanisms (flow controllers, solenoid and flow control valves).

VARIABLE WATER FLOW CONFIGURATIONS

1. Low System Pressure Drop Modulating Motorized Valve – Typical for External Central Pumping.

Primarily for use on multi-unit applications with central pumping. With this option the unit includes a low pressure drop, high CV modulating motorized water valve that is controlled by the DXM2.5 based on the difference in the entering and leaving water temperature ΔT . This valve is a factory installed feature for the MARS MZ.

2. High System Pressure Drop Modulating Motorized Valve – Typical for High Pressure Water System such as Open Loop Systems.

With this option the unit includes a high pressure drop modulating water valve that is controlled by the DXM2.5 based on the difference in the entering and leaving water temperature delta T. A low Cv valve is used to provide more precise control against high system pressure differential type of loops. This valve is a factory installed option for the MARS MZ.

3. Internal Flow Controller – For Closed Loop Applications

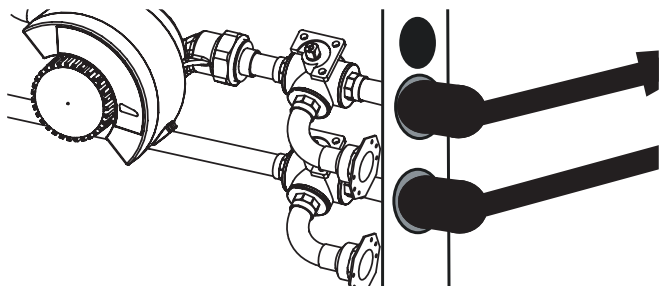
This is the most common configuration for closed loops. With this factory-installed option, the unit is built with an Internal Variable Speed Pump and other components to flush and operate the unit correctly (including an expansion tank, flush ports and flushing valves). The pump speed is controlled by the DXM2.5 based on the difference in entering and leaving water temperatures (ΔT). The Internal Flow Controller pump includes an internal check valve for multiple unit installations. A copper water coil is standard with this option.

Note: Internal Flow Controllers are also very suitable for multiple unit installations depending on pump performance requirements.

Variable speed pump or motorized modulating valve delivers variable water flow, controlled by DXM2.5, based on loop water ΔT .



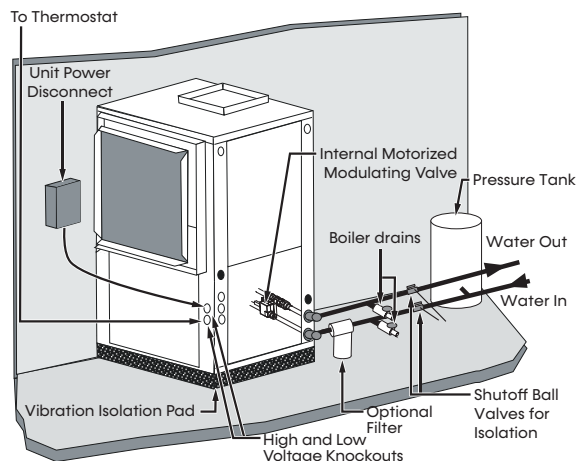
Figure 11: Internal Flow Controller



Models:
MZ
024-060

Variable Water Flow Heat Pump Applications Overview

Typical Open Loop Application (Shown with Internal Modulating Motorized Valve)



For use on applications using external source for flow.

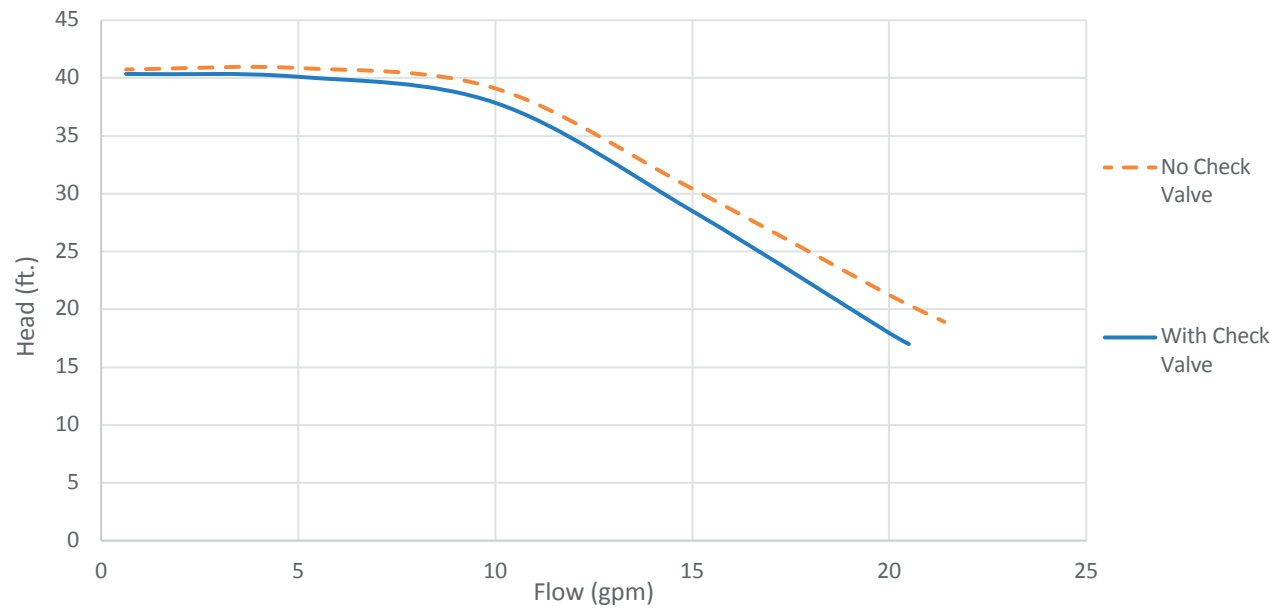
WATER PRESSURE SCHRADER PORTS

The pressure ports built in to the unit are provided as a means of measuring pressure drop through the water-to-refrigerant heat exchanger. The water pressure ports are schrader ports smaller than refrigerant schrader ports. They are the same size as tire schrader ports. A digital pressure gauge is recommended for taking pressure readings through these ports. The water flow through the unit can be determined by measuring the water pressure at the "water pressure out" port and subtracting it from the water pressure at the "water pressure in" port. Comparing the pressure differential to the pressure drop table (wpd)/flow rate in Table 9 in this manual will determine the flow rate through the unit.

Variable Water Flow Heat Pump Applications Overview

Models:
MZ
024-060

High Head Variable Pump Performance



Models:
MZ
024-060

Ground-Loop Heat Pump Applications

CAUTION

The following instructions represent industry accepted installation practices for closedloop earth-coupled heat-pump systems. Instructions are provided to assist the contractor in installing trouble-free ground loops. These instructions are recommendations only. State/provincial and local codes MUST be followed and installation MUST conform to ALL applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

CAUTION

Ground-loop applications require extended-range equipment and optional refrigerant/water circuit insulation.

PRE-INSTALLATION

Prior to installation, locate and mark all existing underground utilities, piping, etc. Install loops for new construction before sidewalks, patios, driveways, and other construction has begun. During construction, accurately mark all ground-loop piping on the plot plan as an aid in avoiding potential future damage to the installation.

PIPING INSTALLATION

Limit all ground-loop piping materials to polyethylene fusion only for in-ground sections of the loop. Do not use galvanized or steel fittings at any time due to their tendency to corrode. Do not use any plastic-to-metal threaded fittings due to their potential to leak in earth-coupled applications. Use flanged fittings as a substitute. Use P/T plugs for easy flow measurement using the pressure drop of the unit heat exchanger.

Ground-loop temperatures can range between 25 and 110°F (-4 to 43°C). Flow rates between 2.25 and 3 GPM (2.41 to 3.23 l/m per kW) of cooling capacity is recommended in these applications.

Test individual horizontal loop circuits before backfilling. Test vertical U-bends and pond loop assemblies prior to installation. Use pressures of at least 100 psi (689 kPa) when testing. Do not exceed the pipe pressure rating. Test the entire system when all loops are assembled.

FLUSHING THE GROUND LOOP

After system installation and testing is complete, flush the system to remove all foreign objects and purge to remove all air. For more information, see Ground-Loop Cleaning and Flushing section.

ANTIFREEZE

In areas where minimum entering loop temperatures drop below 40°F (5°C) or where piping is routed through areas subject to freezing, antifreeze is required. Alcohols and glycols are commonly used as antifreeze. Consult your local sales office to determine the antifreeze best suited to your area. Maintain freeze protection to 15°F (9°C) below the lowest expected entering loop temperature. For example, if 30°F (-1°C) is the minimum expected entering loop temperature, the leaving loop temperature is 22 to 25°F (-6 to -4°C) and freeze protection is at 15°F (-10°C).

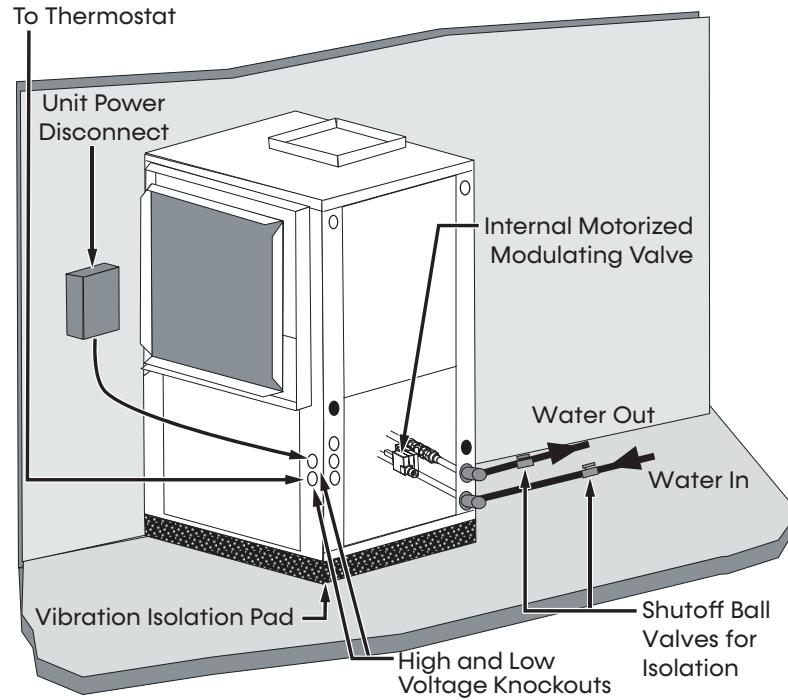
Calculation is as follows:

$$30^{\circ}\text{F} - 15^{\circ}\text{F} = 15^{\circ}\text{F} \quad [-1^{\circ}\text{C} - 9^{\circ}\text{C} = -10^{\circ}\text{C}]$$

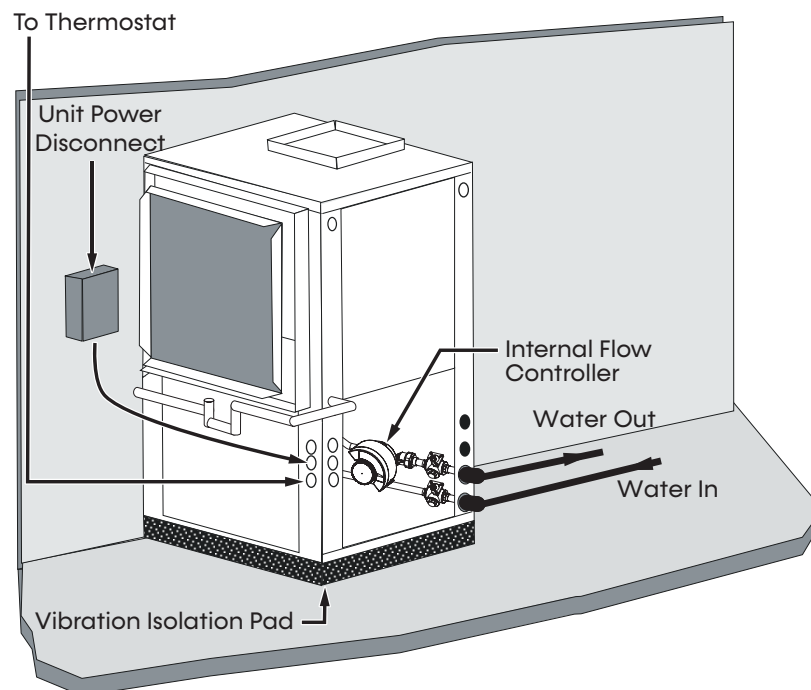
Premix and pump all alcohols from a reservoir outside of the building when possible. If an outside reservoir is not available, introduce alcohol under the water level to prevent fumes. Calculate the total volume of fluid in the piping system, then use the percentage by volume shown in the Antifreeze Percentages by Volume table for the amount of antifreeze needed. Check antifreeze concentration from a well mixed sample using a hydrometer or refractometer to measure specific gravity.

Ground-Loop Heat Pump Applications

**Figure 12: Typical Closed Loop with Central Pumping
(Shown with internal modulating water valve)**



**Figure 13: Typical Closed-Loop Application
(Shown with internal flow controller)**



Models:
MZ
024-060

Ground-Loop Cleaning and Flushing

Once piping is completed between the unit and the ground loop, final purging and charging of the loop is needed.

A flush cart (at least a 1.5 hp [1.1 kW] pump) is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop itself. Antifreeze solution is used in most areas to prevent freezing. All air and debris must be removed from the earth loop piping system before operation. Flush the loop with a high volume of water at a high velocity (2 fps [0.6 m/s] in all piping), using a filter in the loop return line, of the flush cart to eliminate debris from the loop system. See Table 2 for flow rate required to attain 2 fps (0.6 m/s). The steps below must be followed for proper flushing.

Table 2: Minimum Flow Required to Achieve 2 ft/sec velocity

PE Pipe Size	Flow (GPM)
3/4"	4 [4.3 L/M per KW]
1"	6 [6.5 L/M per KW]
1 1/4"	10 [10.8 L/M per KW]
1 1/2"	13 [14.0 L/M per KW]
2"	21 [22.6 L/M per KW]

Units with internal variable speed pumps also include a check valve internal to the pump. It is not possible to flush backwards through this pump. Care must be taken to connect the flush cart hoses so that the flush cart discharge is connected to the "water in" flushing valve of the heat pump.

LOOP FILL

Fill loop (valve position A, see Figure 16) with water from a garden hose through flush cart before using flush cart pump to ensure an even fill and increase flushing speed. When water consistently returns back to the flush reservoir, switch to valve position B (see Figure 17).

Isolate expansion tank for flushing procedure using the ball valve. During dead heading of flush cart pump, isolation will prevent compression of bladder in the expansion tank and flush cart fluid level dropping below available capacity.

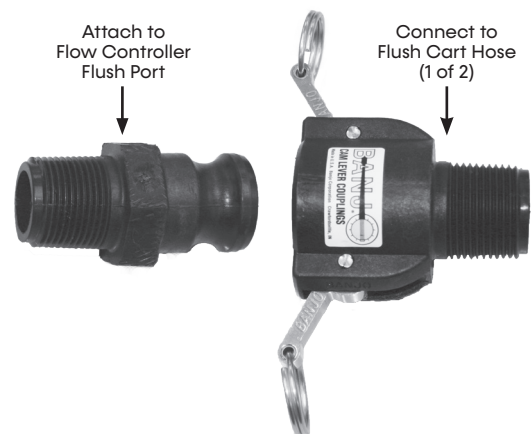
⚠ WARNING

DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK.

Figure 14: Typical Cleanable Flush Cart Strainer (100 mesh [0.149 mm])



Figure 15: Cam Fittings for Flush Cart Hoses



⚠ NOTICE

A hydrostatic pressure test is required on ALL piping, especially underground piping before final backfill per IGSHPA and the pipe manufacturers recommendations.

Ground Loop Cleaning and Flushing

Figure 16: Valve Position A – Loop Fill/Flush

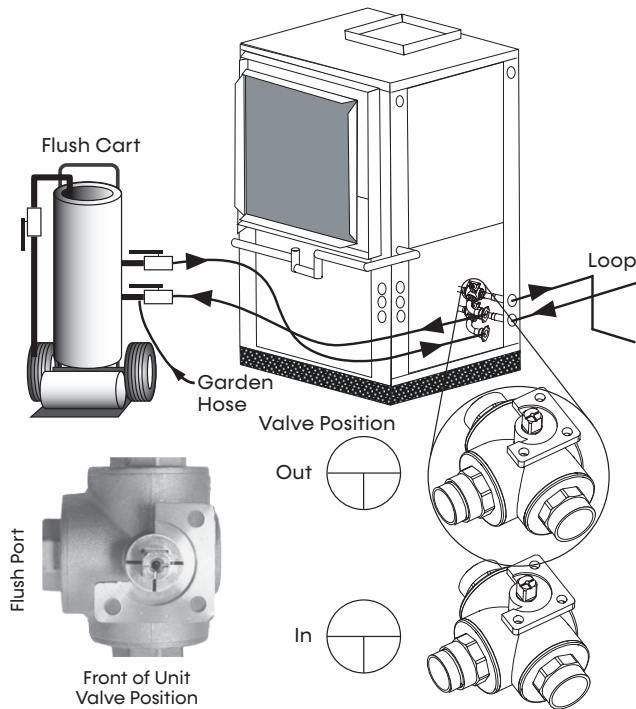
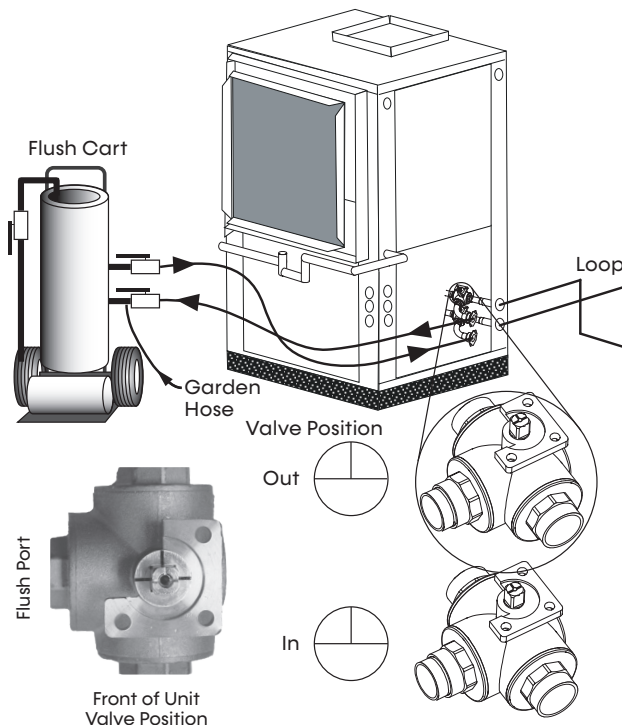


Figure 17: Valve Position B – Unit Fill/Flush



UNIT FILL

Unit fill valves should be switched to Position B while flush cart is pumping to fill the unit heat exchanger (see Figure 17). The valves position should be maintained until water is consistently returned into the flush reservoir.

LOOP FLUSH

Switch to valve Position A. The supply water may be shut off and the flush cart turned on to begin flushing. Once the flush reservoir is full, do not allow the water level in the flush cart tank to drop below the pump inlet line or air can be pumped back out to the earth loop. Try to maintain a fluid level in the tank above the return tee so that air can not be continuously mixed back into the fluid. Surges of 50 psi (345 kPa) can be used to help purge air pockets by simply shutting off the flush cart return valve going into the flush cart reservoir. This process 'dead heads' the pump to 50 psi (345 kPa). To dead head the pump until maximum pumping pressure is reached, open the valve back up and a pressure surge will be sent through the loop to help purge air pockets from the piping system. Notice the drop in fluid level in the flush cart tank. If all air is purged from the system, the level will drop only $\frac{3}{8}$ inches in a 10 inches (25.4 cm) diameter PVC flush tank (about a half gallon [1.9 liters]) since liquids are incompressible. If the level drops more than this level, flushing should continue since air is still being compressed in the loop fluid. Do this a number of times.

NOTICE

Actual flushing time require will vary for each installation due to piping length, configuration, and flush cart pump capacity. 3/8 inches or less fluid level drop is the ONLY indication that flushing is complete.

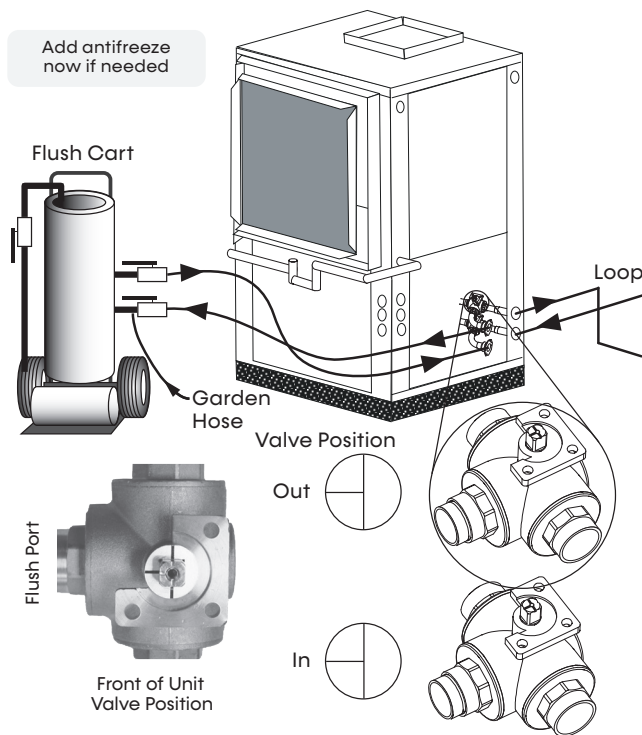
Switch valves to Position B to flush the unit. Flush through the unit until all air pockets have been removed.

Move valves to position C. By switching both valves to this position, water will flow through the loop and the unit heat exchanger. Finally, the dead head test should be checked again for an indication of air in the loop. Fluid level drop is your only indication of air in the loop.

Models:
MZ
024-060

Ground Loop Cleaning and Flushing

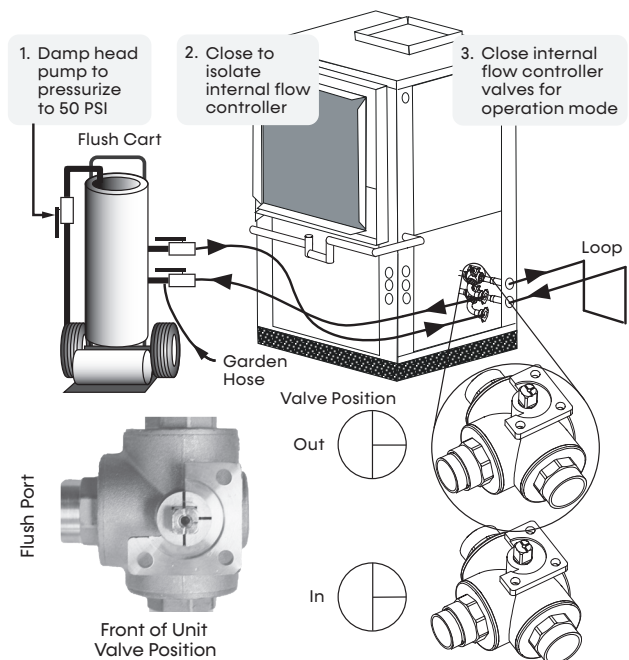
Figure 18: Valve Position C – Full Flush



Loop static pressure will fluctuate with the seasons and pressures will be higher in the winter months than during the cooling season. This fluctuation is normal and should be considered when charging the system initially. Unhook the flush cart from the Internal Flow Controller. Install Flow Controller caps to ensure that any condensation/leakage remains contained within the Flow Controller package.

If the loop pressure is between 50 and 75 psi (345 to 517 kPa) upon completion of flushing, pressures should be sufficient for all seasons.

Figure 19: Valve Position D – Pressurize and Operation



PRESSURIZE AND OPERATE

As shown in Figure 19, close the flush cart return valve to pressurize the loop to at least 50 psi (345 kPa), not to exceed 75 psi (517 kPa). Open the isolation valve to the expansion tank and bleed air from the expansion tank piping using the schrader valve located in front of the expansion tank. This will allow loop pressure to compress the expansion tank bladder, thus charging the expansion tank with liquid. After pressurizing, close the flush cart supply valve to isolate the flush cart. Move the Flow Controller valves to Position D.

NOTICE

It is recommended to run the unit in the cooling, then heating mode for 15-20 minutes each to 'temper' the fluid temperature and prepare it for pressurization. This procedure helps prevent the periodic "flat" loop condition of no pressure.

Ground-Loop Antifreeze Charging

GROUND-LOOP ANTIFREEZE CHARGING

It is highly recommended to utilize premixed antifreeze fluid where possible to ensure proper concentration levels.

The following procedure is based upon pure antifreeze and can be implemented during the Full Flush procedure with three way valves in Figure 18 - Valve Position C. If a premixed mixture of 15°F (-9.4°C) freeze protection is used, the system can be filled and flushed with the premix directly to prevent handling pure antifreeze during the installation.

WARNING

Always use properly marked vehicles (D.O.T. placards), and clean/suitable/properly identified containers for handling flammable antifreeze mixtures. Post and advise those on the job site of chemical use and potential dangers of handling and storage

NOTICE

DO NOT use automotive windshield washer fluid as antifreeze. Washer fluid contains chemicals that will cause foaming.

CAUTION

Always obtain MSDS safety sheets for all chemicals used in ground loop applications including chemicals used as antifreeze.

1. Flush loop until all air has been purged from system and pressurize to check for leaks before adding any antifreeze.
2. Run discharge line to a drain and hook up antifreeze drum to suction side of pump (if not adding below water level through approved container). Drain flush cart reservoir down to pump suction inlet so reservoir can accept the volume of antifreeze to be added.
3. Calculate the amount of antifreeze required by first calculating the total fluid volume of the loop from Table 3. Then calculate the amount of antifreeze needed using Table 4 for the appropriate freeze protection level. Many southern applications require freeze protection because of exposed piping to ambient conditions.
4. Isolate unit and prepare to flush only through loop (see Figure 16). Start flush cart, and gradually introduce the required amount of liquid to the flush cart tank (always introduce alcohols under water or use suction of pump to draw in directly to prevent fuming) until attaining the proper antifreeze protection. The rise in flush reservoir level indicates amount of antifreeze added (some carts are marked with measurements in gallons or liters). A ten-inch-diameter (25.4 cm) cylinder, three feet (91.4 cm) tall holds approximately 8 gallons (30.3 liters) of fluid plus the hoses (approx. two gallons, [7.6 liters], which equals about ten gallons [37.9 liters] total). If more than one tank-full is required, the tank should be drained immediately by opening the waste valve of the flush cart noting the color of the discharge fluid. Adding food coloring to the antifreeze can help indicate where the antifreeze is in the circuit and prevents the dumping of antifreeze out the waste port. Repeat if necessary.
5. Be careful when handling methanol (or any alcohol). Always wear eye protection and rubber gloves. The fumes are flammable, and care should be taken with all flammable liquids. Open flush valves to flush through both the unit and the loop and flush until fluid is homogenous and mixed. It is recommended to run the unit in the heating and cooling mode for 15-20 minutes each to 'temper' the fluid temperature and prepare it for pressurization. Devoting this time to clean up can be useful. This procedure helps prevent the periodic "flat" loop condition.

Table 3: Antifreeze Percentages by Volume

Type	Minimum Temperature for Low Temperature Protection			
	10°F [-12.2°C]	15°F [-9.4°C]	20°F [-6.7°C]	25°F [-3.9°C]
Methanol	21%	17%	13%	8%
100% USP food grade Propylene Glycol	29%	24%	18%	12%
Ethanol ¹	23%	20%	16%	11%

1. Must not be denatured with any petroleum based product

WARNING

Always dilute alcohols with water (at least 50% solution) before using. Alcohol fumes are flammable and can cause serious injury or death if not handled properly.

When handling methanol (or any alcohol), always wear eye protection and rubber gloves as alcohols are easily absorbed through the skin.

Models:
MZ
024-060

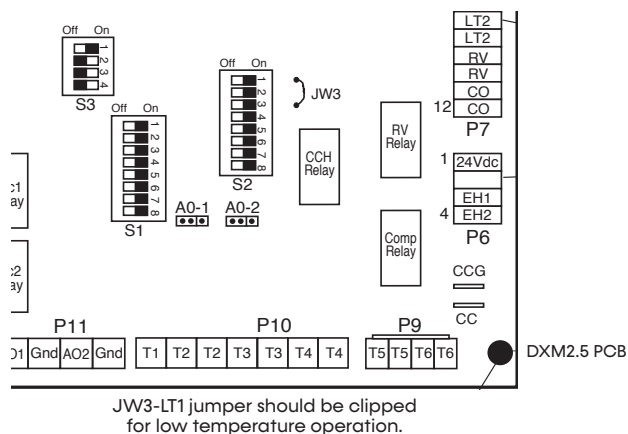
Ground-Loop Antifreeze Charging

6. Close the flush cart return valve; and immediately thereafter, close the flush cart supply valve, leaving a positive pressure in the loop of approximately 50 psi (345 kPa). This is a good time to pressure check the system as well. Check the freeze protection of the fluid with the proper hydrometer to ensure that the correct amount of antifreeze has been added to the system. The hydrometer can be dropped into the flush reservoir and the reading compared to Figure 21 for Methanol, Figure 22 for Propylene Glycol, and Figure 23 for Ethanol to indicate the level of freeze protection. Do not antifreeze more than a +10°F (-12.2°C) freeze point. Specific gravity hydrometers are available in the residential price list. Repeat after reopening and flushing for a minute to ensure good second sample of fluid. Inadequate antifreeze protection can cause nuisance low temperature lockouts during cold weather.
7. Close the flush cart return valve; immediately thereafter, close the flush cart supply valve, shut off the flush cart leaving a positive pressure in the loop of approximately 50-75 psi (345-517 kPa). Refer to Figure 19 for more details.

LOW WATER TEMPERATURE CUTOFF SETTING – DXM2.5

When antifreeze is selected, the LT1 jumper (JW3) should be clipped to select the low temperature (antifreeze 10°F [-12.2°C]) set point and avoid nuisance faults (see “Low Water Temperature Cutout Selection” in this manual).

Figure 20: Low Temperature Cutoff Selection



Multiple-Unit Piping and Flushing

Often projects require more than one heat pump. Where possible, it makes sense for multiple units to share a common ground loop. Common ground loops with multiple units bring new challenges including the need to avoid backward flow through inactive units, increased pumping requirements, and more complex flushing needs. Three types of multiple unit systems are described below along with guidelines for installation of each type.

Variable Water Flow® internal variable flow technology is a great assist for systems with multiple units. Variable Water Flow is available in three different configurations:

1. Internal variable-speed pump
2. Internal modulating valve for closed loops
3. Internal modulating valve for open loops

The high-head internal modulating valve for open loops should never be used on closed loop systems.

The internal variable speed pump version of Variable Water Flow includes an internal variable speed circulator controlled by the DXM2.5, internal 3-way flushing valves, an internal bladder type expansion tank, and front-mounted pressure ports that allow access to the pressure drop across the coaxial heat exchanger only. The internal expansion tank will operate as a pressure battery for the geothermal system. It will absorb fluid from the loop when loop pressure rises and inject fluid into the loop when loop pressure falls. In this way the expansion tank will help to maintain a more constant loop pressure and avoid flat loops due to seasonal pressure changes in the loop.

When using the internal variable speed pump as the loop pump in multiple unit installations it is important to ensure that the variable speed pump can provide adequate flow through the heat pump against the loop head when all units are operating.

Units with the standard head pump should not be combined with units with high head pumps on the same loop. Standard head pumps are best suited for small applications with a single unit.

It may be possible to flush a multiple unit system through the unit's flushing valves. Flushing pressure drop of the valve may be calculated to determine if it is acceptable. Engineering data for the three-way flushing valves can be found in Table 4.

Table 4: Internal Three-Way Flushing Valve Data

Model	Flushing Connection	Straight Flow Cv	90° Flow Cv
MZ024 - 042	3/4" FPT	25	10.3
MZ048 - 060	1" FPT	58	14.5

For example, if a system includes two two-ton units and four ¾-loop circuits we can calculate the flushing pressure drop as follows: From Table 2 we know that it will take 4 gpm to flush each ¾-inch circuit. If there is no provision to isolate the circuits for flushing, we will have to flush with a minimum of 4 circuits x 4 gpm/circuit = 16 gpm total. A check of other piping sizes used must be done to ensure tat 16 gpm total flow will flush all piping.

Pressure drop through the flushing valve can be calculated using the following formula.

$$\Delta P = (\text{GPM}/\text{Cv})^2 \text{ where,}$$

$$\Delta P = \text{pressure drop in psi through the valve while flushing}$$

$$\text{GPM} = \text{flushing flow in gallons per minute}$$

$$\text{Cv} = \text{valve Cv in flushing mode}$$

We know from Table 4 that the Cv for the flushing valve in a MZ024 is 10.3 in the flushing mode (90° flow). Therefore, $\Delta P = (\text{GPM}/\text{Cv})^2 = (16/10.3)^2 = 2.4$ psi (5.54 ft hd) per valve (there are two flushing valves). So long as the flushing pump is able to provide 16 gpm at the flushing pressure drop of the loop plus the 2.4 x 2 valves = 4.8 psi (11.09 ft hd) of the flushing valves, the internal flushing valves may be used. If the flushing pump is not able to overcome the pressure drop of the internal flushing valves, then larger external flushing valves must be used.

Models:
MZ
024-060

Multiple-Unit Piping and Flushing

UNIT CONFIGURATION

Multiple Variable Water Flow units with internal variable-speed flow controller and check valve, piped in parallel sharing a common loop MUST be configured for 'VS PUMP PARALLEL' in Installer Settings Menu.

UNIT CONFIGURATION	
CURRENT CONFIG	MZ024
HEAT PUMP FAMILY	MZ
HEAT PUMP SIZE	024
BLOWER TYPE	ECM
LOOP CONFIG	VS PUMP PARALLEL
SELECT OPTION ▲ ▼	
◀ PREVIOUS	SAVE ▶

Installer Settings ➡ System Config ➡ Unit Config
➡ Loop Config

MULTIPLE UNITS WITH INTERNAL FLOW CONTROLLERS

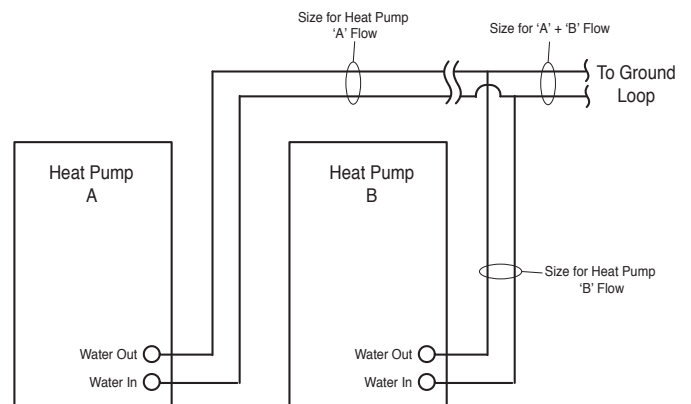
The simplest multiple unit systems consist of internal Flow Controllers with no external pumps or external flushing valves. The units are piped in parallel and use the internal flushing valves to flush the system. The variable speed pump includes an internal check valve to prevent back (short circuiting) flow through the units.

In this case, flush the loop through the internal flushing valves in the unit farthest from the loop first. Once the loop is flushed, then change the internal flushing valves to flush the heat pump. Next, move the flushing cart to the next closest unit to the loop.

Again, flush the loop through the internal flushing valves. This is important as there may be air and debris in the lines from this unit to the common piping. Once flushing begins the air moved into the loop and will need to be flushed out. After the loop is flushed through the second unit, change the flushing valves to flush the second unit. This process should be repeated for additional units. Always start with the unit farthest from the loop and end with the unit closest to the loop.

This type of application can generally be employed for systems up to 12 tons depending on loop design. However, it is important to perform appropriate calculations to confirm that the variable speed pump can provide adequate flow through all heat pumps.

Figure 24: Multiple Units with Internal Flow Controllers



MULTIPLE UNITS WITH INTERNAL FLOW CONTROLLERS AND EXTERNAL FLUSHING VALVES

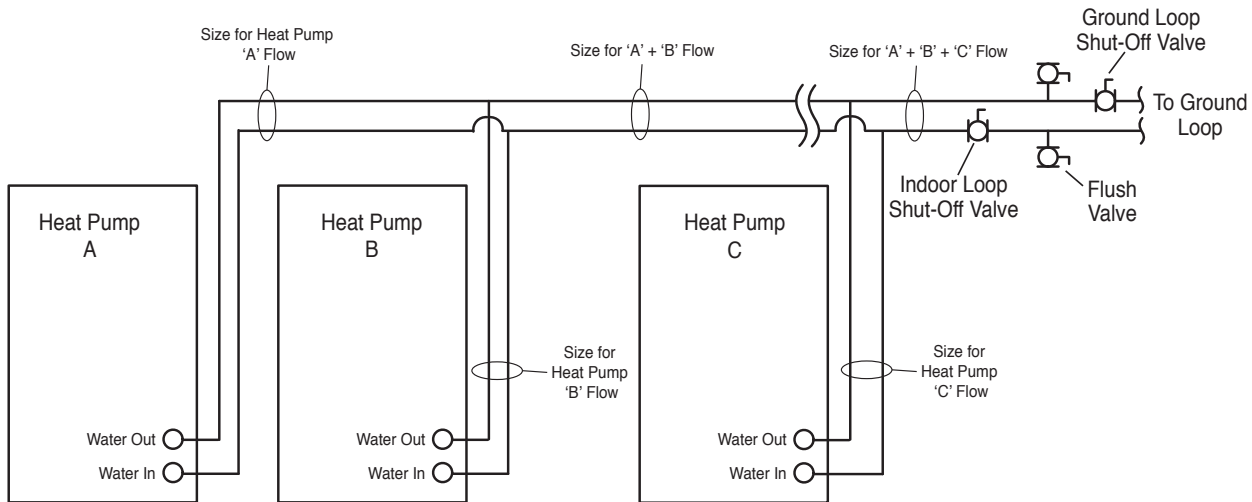
When the number of units or flushing requirements reaches a point where it is no longer feasible to flush through the internal valves external flushing valves should be installed. In this case, three-way flushing valves should be used or additional isolation valves must be installed to isolate the loop during flushing.

First, flush the ground loop. The installer should close the indoor loop shut-off valve (or the internal flushing valves in all units) and open the ground loop shut-off valve to prevent flow through the indoor loop while flushing the ground loop.

Once the ground loop is flushed, close the ground loop shut-off valve and open the indoor loop valve(s) to flush the units and indoor piping. Remember that there is an internal check valve in the variable speed pump and that backward flow the unit is not possible.

Multiple-Unit Piping and Flushing

Figure 25: Multiple Units with Internal Flow Controllers and External Flushing Valves



MULTIPLE UNITS WITH INTERNAL MODULATING VALVES AND CENTRAL PUMP

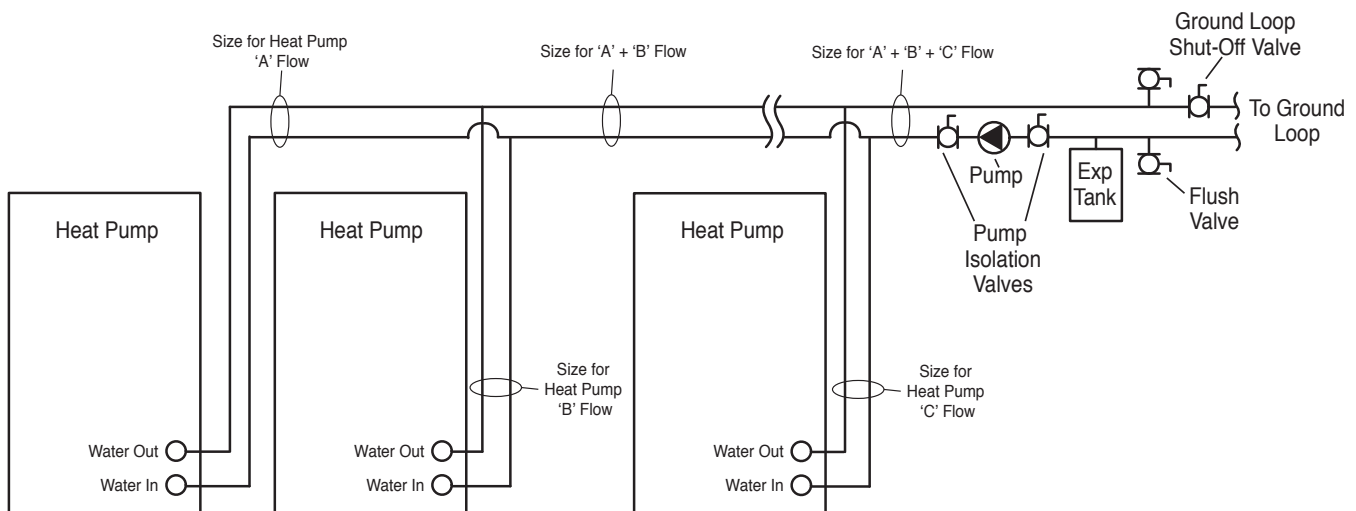
This is an application where multiple units are used in conjunction with a central, variable speed pump. In this case, units with closed loop modulating valves are used (do not use open loop modulating valves on a closed loop system). External flushing valves are required. This application is for larger systems, including commercial.

Before flushing, the installer should manually open all modulating valves as detailed in Closed Loop – External Central Pumping section of this manual.

Next, flush the ground loop. The installer should close a pump isolation valve and open the ground loop shut-off valve to prevent flow through the indoor loop while flushing the ground loop.

Once the ground loop is flushed, close the ground loop shut-off valve and open the pump isolation valve to flush the units and indoor piping. Once the system is flushed remember to return the modulating valves to their normal operating position.

Figure 26: Multiple Units with Internal Modulating Valves and Central Pump



Models:
MZ
024-060

Ground-Water Heat Pump Applications

OPEN LOOP: GROUND WATER SYSTEMS

Typical open loop piping is shown in accompanying illustration. Shut off valves should be included for ease of servicing. Boiler drains or other valves should be “tee’d” into the lines to allow acid flushing of the heat exchanger. Shut off valves should be positioned to allow flow through the coax via the boiler drains without allowing flow into the piping system. P/T plugs should be used with units that do not include Variable Water Flow so that flow can be measured using the pressure drop of the unit heat exchanger. Units equipped with any of the four Variable Water Flow configurations have built in Schrader ports. Water temperature may be viewed with myUplink. Supply and return water piping should be limited to copper, HPDE, or other acceptable high temperature material. **Note: PVC or CPVC material is not recommended as they are not compatible with the polyolester oil used in R-454B products.**

Water quantity should be plentiful and of good quality. Consult Table 5 for water quality guidelines. The unit can be ordered with either a copper or cupro-nickel water heat exchanger. Consult Table 5 for recommendations. Copper is recommended for closed loop systems and open loop ground water systems that are not high in mineral content or corrosiveness. In conditions anticipating heavy scale formation or in brackish water, a cupro-nickel heat exchanger is recommended. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, an open loop system is not recommended. Heat exchanger coils may lose heat-exchange capabilities over time due to build up of mineral deposits. Heat exchangers must only be serviced by a qualified technician, as special cleaning solutions and pumping equipment are required. Desuperheater coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional flushing using an appropriate cleaning solution. In some cases, the desuperheater option should not be recommended due to hard water conditions and additional maintenance required.

WARNING

Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with R-454B refrigerant. POE oil, if it ever comes in contact with PVC or CPVC piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water-source heat pump products containing R-454B as system failures and property damage may result.

WATER QUALITY REQUIREMENTS

Table 5 should be consulted for water quality requirements. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH <7.5 and the calcium hardness is less than 100 ppm, scaling potential is low. If this method yields numbers out of range of those listed, the Ryznar Stability and Langelier Saturation indices should be calculated. Use the appropriate scaling surface temperature for the application, 150°F [66°C] for direct use (well water/open loop) and DHW (desuperheater); 90°F [32°F] for indirect use. A monitoring plan should be implemented in these probable scaling situations. Other water quality issues such as iron fouling, corrosion prevention and erosion and clogging should be referenced in Table 5.

EXPANSION TANK AND PUMP

Use a closed, bladder-type expansion tank to minimize mineral formation due to air exposure. The expansion tank should be sized to provide at least one minute continuous run time of the pump using its drawdown capacity rating to prevent pump short cycling. Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways, depending on local building codes (e.g. recharge well, storm sewer, drain field, adjacent stream or pond, etc.). Most local codes forbid the use of sanitary sewer for disposal. Consult your local building and zoning department to assure compliance in your area.

The pump should be sized to handle the home's domestic water load (typically 5-9 gpm [23-41 l/m]) plus the flow rate required for the heat pump. Pump sizing and expansion tank must be chosen as complimentary items. For example, an expansion tank that is too small can cause premature pump failure due to short cycling. Variable speed pumping applications should be considered for the inherent energy savings and smaller pressure tank requirements.

Ground-Water Heat Pump Applications

FLOW REGULATION: UNITS WITHOUT VARIABLE WATER FLOW

Flow regulation can be accomplished by two methods. One method of flow regulation involves simply adjusting the ball valve or water control valve on the discharge line. Measure the pressure drop through the unit heat exchanger, and determine flow rate from Table 9. Since the pressure is constantly varying, two pressure gauges may be needed. Adjust the valve until the desired flow of 1.5 to 2 gpm per ton [2.0 to 2.6 l/m per kW] is achieved. A second method of flow control requires a flow control device mounted on the outlet of the water control valve. The device is typically a brass fitting with an orifice of rubber or plastic material that is designed to allow a specified flow rate. On occasion, flow control devices may produce velocity noise that can be reduced by applying some back pressure from the ball valve located on the discharge line. Slightly closing the valve will spread the pressure drop over both devices, lessening the velocity noise.

NOTE: When EWT is below 50°F [10°C], 2 gpm per ton (2.6 l/m per kW) is required.

Figure 27: Typical Open Loop/Well (shown with internal modulating water valve)

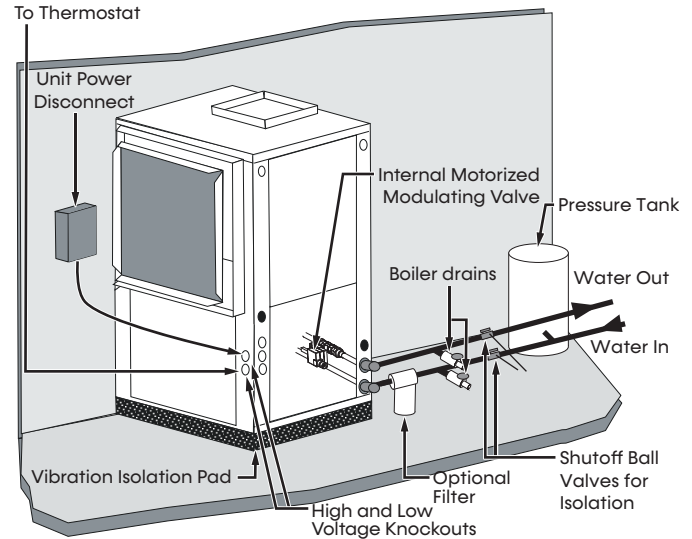
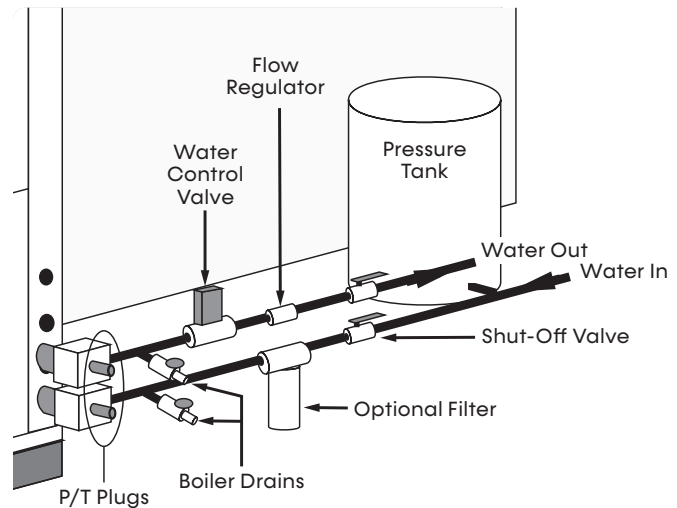


Figure 28: Typical Open Loop/Well Application without Variable Water Flow



Models:
MZ
024-060

Water Quality Requirements

Table 5: Water Quality Requirements

Clean water is essential to the performance and life span of water-source heat pumps. Contaminants, chemicals, and minerals all have the potential to cause damage to the water heat exchanger if not treated properly. All closed water loop systems should undergo water quality testing and be maintained to the water quality standards listed in this table.

Water Quality Requirements For Closed-Loop and Open-Loop Systems							
	Description	Symbol	Units	Heat Exchanger Type			
				Closed Loop Recirculating		Open Loop, Tower, Ground Source Well	
				All Heat Exchanger Types	Coaxial HX Copper Tube in Tube	Coaxial HX Cupronickel	Brazed- Plate HX 316 SS
Scaling Potential	pH - Chilled Water <85°F			7.0 to 9.0	7.0 to 9.0	7.0 to 9.0	7.0 to 9.0
	pH - Chilled Water >85°F			8.0 to 10.0	8.0 to 10.0	8.0 to 10.0	8.0 to 10.0
	Alkalinity	(HCO3 ⁻)	ppm - CaCO ₃ equivalent	50 to 500	50 to 500	50 to 500	50 to 500
	Calcium	(Ca)	ppm	<100	<100	<100	<100
	Magnesium	(Mg)	ppm	<100	<100	<100	<100
	Total Hardness	(CaCO3)	ppm - CaCO ₃ equivalent	30 to 150	150 to 450	150 to 450	150 to 450
	Langelier Saturation Index	LSI		-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5
	Ryznar Stability Index	RSI		6.5 to 8.0	6.5 to 8.0	6.5 to 8.0	6.5 to 8.0
Corrosion Prevention	Total Dissolved Solids	(TDS)	ppm - CaCO ₃ equivalent	<1000	<1000	<1000	<1000
	Sulfate	(SO ₄ ²⁻)	ppm	<200	<200	<200	<200
	Nitrate	(NO ₃ ⁻)	ppm	<100	<100	<100	<100
	Chlorine (free)	(Cl)	ppm	<0.5	<0.5	<0.5	<0.5
	Chloride (water < 80°F)	(Cl ⁻)	ppm	<20	<20	<150	<150
	Chloride (water > 120°F)	(Cl ⁻)	ppm	<20	<20	<125	<125
	Hydrogen Sulfide ^a	(H ₂ S)	ppb	<0.5	<0.5	<0.5	<0.5
	Carbon Dioxide	(CO ₂)	ppm	0	<50	10 to 50	10 to 50
	Iron Oxide	(Fe)	ppm	<1.0	<1.0	<1.0	<0.2
	Manganese	(Mn)	ppm	<0.4	<0.4	<0.4	<0.4
	Ammonia	(NH ₃)	ppm	<0.05	<0.1	<0.1	<0.1
	Chloramine	(NH ₂ CL)	ppm	0	0	0	0
Fouling & Biological	Iron bacteria		cells/mL	0	0	0	0
	Slime-forming bacteria		cells/mL	0	0	0	0
	Sulfate-reducing bacteria		cells/mL	0	0	0	0
	Suspended Solids ^b	(TSS)	ppm	<10	<10	<10	<10
Electrolysis All HX types	Earth Ground Resistance ^x		Ohms		Consult NEC and local electrical codes for grounding requirements		
	Electrolysis Voltage ^d		mV		Measure voltage and internal water loop to HP ground		
	Leakage Current ^d		mA		Measure current in water loop pipe		
	Building Primary Electrical Ground to unit, must meet local diameter and penetration length requirements. Do not connect heat pump to steel pipe unless dissimilar materials are separated by using Di-electric unions. Galvanic corrosion of heat pump water pipe will occur						

Water Quality Requirements

1. The Water Quality table provides water quality requirements for coaxial and brazed-plate heat exchangers.
2. The water must be evaluated by an independent testing facility comparing site samples against this table. When water properties are outside of these parameters, the water must either be treated by a professional water treatment specialist to bring the water quality within the boundaries of this specification, or an external secondary heat exchanger must be used to isolate the heat pump water system from the unsuitable water. Failure to do so will void the warranty of the heat pump system and will limit liability for damage caused by leaks or system failure.
3. Regular sampling, testing and treatment of the water is necessary to assure that the water quality remains within acceptable levels thereby allowing the heat pump to operate at optimum levels.
4. If closed-loop systems are turned off for extended periods, water samples must be tested prior to operating the system.
5. For optimal performance, it is recommended that the closed-loop piping systems are initially filled with de-ionized water.
6. Well water with chemistry outside of these boundaries, and salt water or brackish water requires an external secondary heat exchanger. Surface/Pond water should not be used.
7. If water temperature is expected to fall below 40°F (4.4°C), antifreeze is required. Refer to the heat pump IOM for the correct solution ratios to prevent freezing.
 - α Hydrogen sulfide has an odor of rotten eggs. If one detects this smell, a test for H₂S must be performed. If H₂S is detected above the limit indicated, remediation is necessary. Consult with your water testing/treatment professional. If a secondary heat exchanger is required, use appropriate materials as recommended by the heat exchanger supplier.
 - β Suspended solids and particulates must be filtered to prevent fouling and failure of heat exchangers. Strainers or particulate filters must be installed to provide a maximum particle size of 600 micron (0.60 mm, 0.023 inch) using a 20 to 30 mesh screen size. When a loop is installed in areas with fine material such as sand or clay, further filtration is required to a maximum of 100 micron. Refer to the Strainer / Filter Sizing Chart to capture the particle sizes encountered on the site.
 - χ The WSHP piping system or other plumbing pipes must not be used as the building ground. An electrical grounding system using a dedicated ground rod meeting NEC and local electrical codes must be installed.
 - δ Refer to the Antifreeze Percentages by Volume table for instructions on measuring resistance and leakage currents within water loops.

Strainer / Filter Sizing

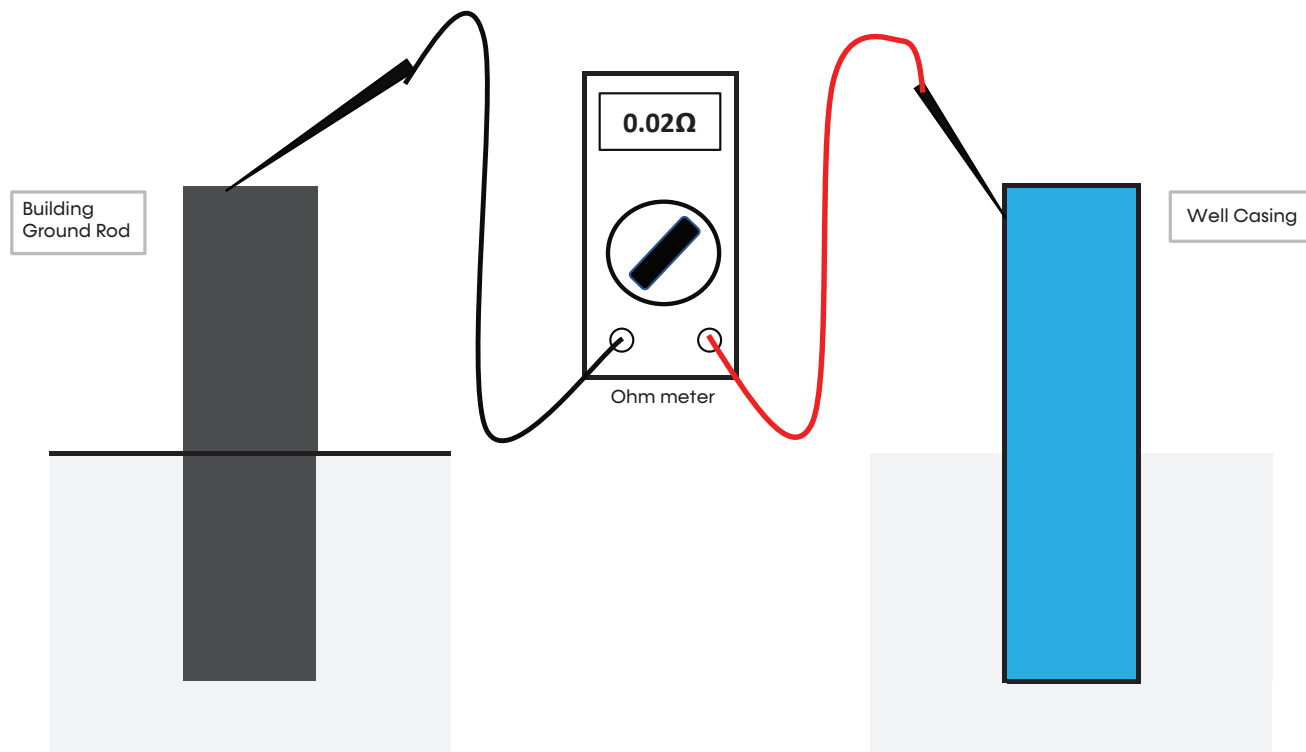
Mesh Size	Particle Size		
	Microns	Millimeter	Inch
20	840	0.840	0.0340
30	533	0.533	0.0210
60	250	0.250	0.0100
100	149	0.149	0.0060
150	100	0.100	0.0040
200	74	0.074	0.0029

- ppm = parts per million
- ppb = parts per billion

Models:
MZ
024-060

Water Quality Requirements

Measuring Earth Ground Resistance for Ground-Water Applications



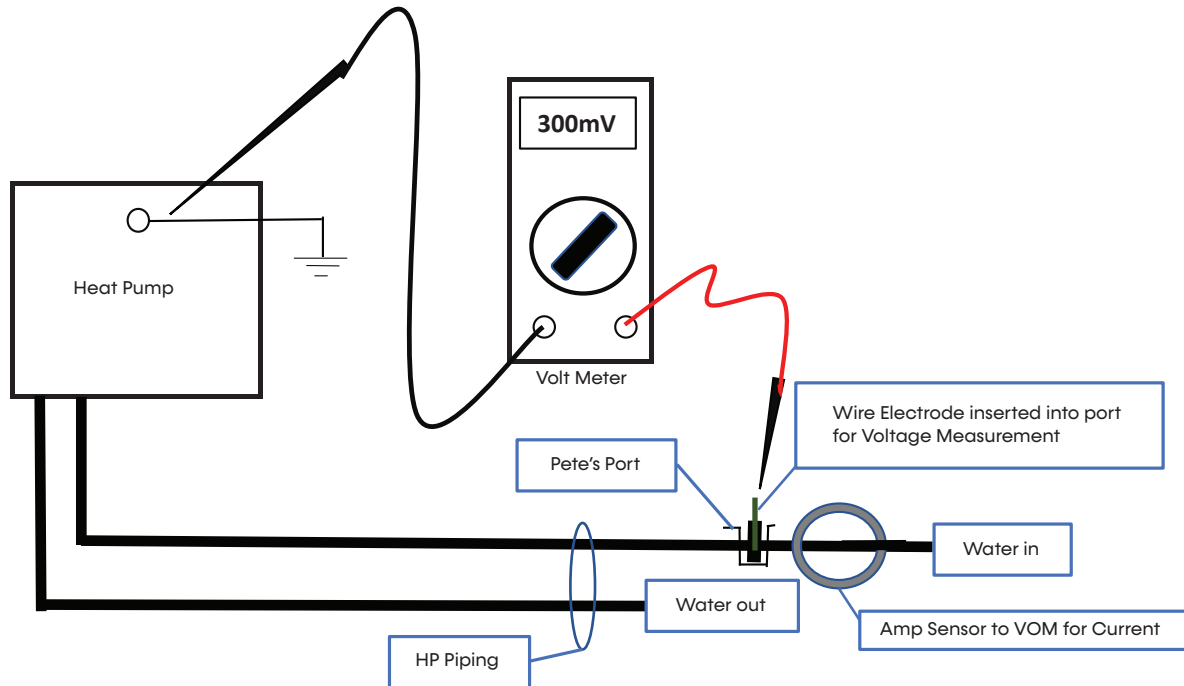
Measure the earth ground bond using an Ohm meter between the building's ground rod and the steel well casing.

The resistance measured should be zero Ohms. The NEC allows a resistance to ground up to 20 Ohms. Any resistance above zero indicates a poor earth ground, which may be the result of a hot neutral line or that conductive water is present. Both of these may lead to electrolysis and corrosion of the heat pump piping. A check for both should be performed and resolved.

NOTE: If the well casing is plastic, a conductive path can be achieved by inserting a #6 AWG bare copper wire into the well water. Remove the temporary conductor when finished.

Water Quality Requirements

Measuring Electrolysis, Voltage, and Current for Ground-Water Applications



Measure the electrolysis voltage using a volt meter between the heat pump ground and a #14 AWG solid copper wire electrode inserted into the water using a Pete's style access port.

The heat pump must be operating and the water stream flowing.

The voltage measured should be less than 300mV (0.300V). If the voltage is higher than 500mV, electrolysis will occur and corrosion will result.

If voltage is measured, the cause is a high-resistance earth ground or current on the neutral conductor. Remedial measures should be performed.

Measure the current flowing through the piping system by using an amp clamp probe on the water-in line. The heat pump must be operating and the water stream flowing.

Models:
MZ
024-060

Hot Water Generator

The Hot Water Generator (HWG) or desuperheater option provides considerable operating-cost savings by utilizing heat energy from the compressor discharge line to help satisfy domestic hot water requirements. The HWG is active throughout the year, providing virtually free hot water when the heat pump operates in the cooling mode or hot water at the COP of the heat pump during operation in the heating mode. Actual HWG water-heating capacities are provided in the appropriate heat pump performance data.

Heat pumps equipped with the HWG option include a built-in water-to-refrigerant heat exchanger that eliminates the need to tie into the heat pump's refrigerant circuit in the field. The control circuit and pump are also built in for residential equipment. Figure 29 shows a typical example of HWG water piping connections on a unit with built-in circulating pump. This piping layout prevents sludge/debris from the bottom of the tank being pulled into the HWG pump. **Due to high water temperature and potable water pressure, only copper piping should be used.**

The temperature setpoint of the HWG is field selectable to 125°F or 150°F. The 150°F setpoint allows more heat storage from the HWG. For example, consider the amount of heat that can be stored by the HWG when using the 125°F setpoint, versus the amount of heat that can be generated by the HWG when using the 150°F setpoint.

In a typical 50-gallon two-element electric water heater, the lower element is turned down to 100°F, or the lowest setting, to get the most from the HWG. The tank eventually stratifies so that the lower 80% of the tank, or 40 gallons, becomes 100°F (controlled by the lower element). The upper 20% of the tank, or 10 gallons, is maintained at 125°F (controlled by the upper element).

WARNING

A 150°F setpoint may lead to scalding or burns. The 150°F setpoint must only be used on systems that employ an approved anti-scald valve.

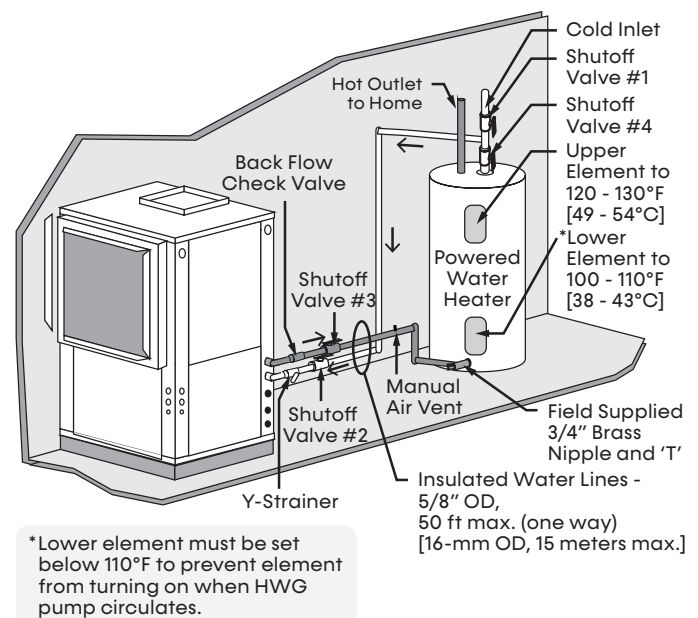
Using a 125°F setpoint, the HWG heats the lower 40 gallons of water from 100°F to 125°F, providing up to 8,330 btu's of heat. Using the 150°F setpoint, the HWG heats the same 40 gallons of water from 100°F to 150°F and the remaining 10 gallons of water from 125°F to 150°F, providing a total of up to 18,743 Btu's of heat, or more than twice as much heat as when using the 125°F setpoint.

Electric water heaters are recommended. If a gas, propane, or oil water heater is used, a second preheat tank is required (Figure 30). If the electric water heater has only a single center element, the dual-tank system is recommended to ensure a usable entering water temperature for the HWG.

Typically a single tank of at least 50 gallons (189 liters) is used to limit installation costs and space. However, a dual tank, as shown in Figure 30, is the preferred system, as it provides the maximum storage and temperate source water to the HWG.

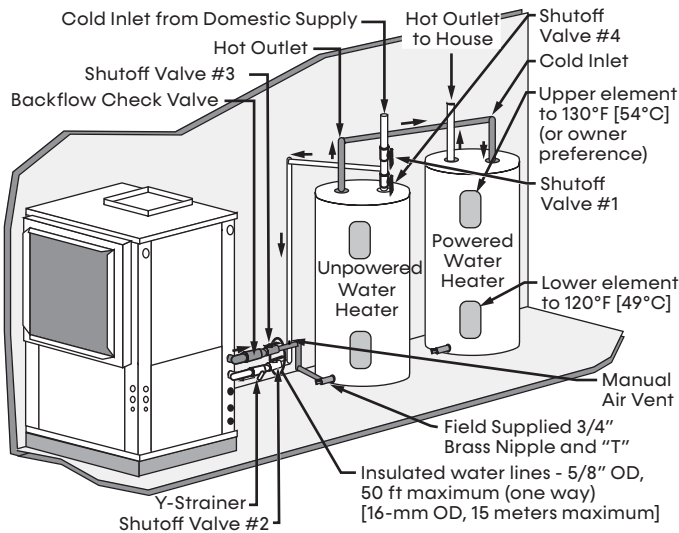
It is always advisable to use water-softening equipment on domestic-water systems to reduce the scaling potential and lengthen equipment life. In extreme water conditions, it may be necessary to avoid the use of the HWG option since the potential cost of frequent maintenance may offset or exceed any savings. Consult Table 6 for scaling potential tests.

Figure 29: Typical HWG Installation



Hot Water Generator

Figure 30: Two-tank HWG Installation



INSTALLATION

The HWG is controlled by two sensors and the DXM2.5. One sensor is located on the compressor discharge line to sense the discharge refrigerant temperature. The other sensor is located on the HWG heat exchanger's "Water In" line to sense the potable water temperature.

DXM2.5 Advanced Communicating Controls monitors the refrigerant and water temperatures to determine when to operate the HWG. The HWG operates any time the refrigerant temperature is sufficiently above the water temperature. Once the HWG has satisfied the water heating demand during a heat pump run cycle, the controller cycles the pump at regular intervals to determine if an additional HWG cycle can be utilized.

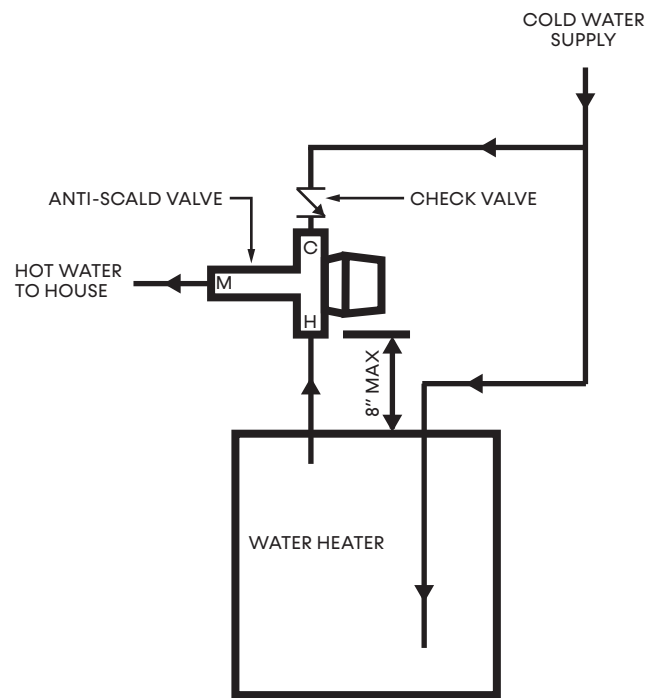
When the control is powered and the HWG pump output is active for water temperature sampling or HWG operation, the DXM2.5 status LED slowly flashes (On 1 second, Off 1 second).

If the control detects a HWG fault, the DXM2.5 status LED flashes a numeric fault code as follows:

- High Water Temperature (> 160°F) (five flashes)
- Hot Water Sensor Fault (six flashes)
- Compressor Discharge Sensor Fault (six flashes)

Fault code flashes have a duration of 0.3 seconds with a 10-second pause between fault codes. For example, a Compressor Discharge Sensor Fault is six flashes 0.3 seconds long, then a 10 second pause, then six flashes again, etc.

Figure 31: Anti-scald Valve-Piping Connection



WARNING

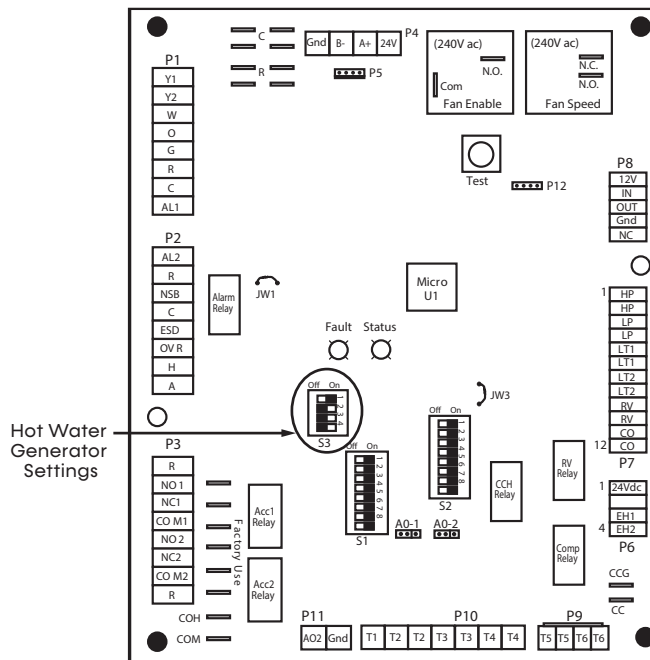
Using 150°F setpoint on the HWG results in water temperatures sufficient to cause severe physical injury in the form of scalding or burns, even when the hot water tank temperature setting is visibly set below 150°F. The 150°F HWG setpoint must only be used on systems that employ an approved anti-scald valve (part number (AVAS4) at the hot water storage tank with such valve properly set to control water temperatures distributed to all hot water outlets at a temperature level that prevents scalding or burns.

Models:
MZ
024-060

Hot Water Generator

- Hot Water Generator settings are determined by DIP switches 3-2, 3-3, and 3-4.
- DIP 3-2 controls the HWG Test Mode and provides for forced operation of the HWG output, activating the HWG pump for up to five minutes.
- ON = HWG test mode, OFF = normal HWG operation.
- The control reverts to standard operation after five minutes regardless of switch position.
- DIP 3-3 determines HWG setpoint temperature and provides for selection of the HWG operating setpoint.
- ON = 150°F (66°C), OFF = 125°F (52°C)
- DIP 3-4 is for the HWG status and provides HWG operation control
- ON = HWG mode enabled, OFF = HWG mode disabled
- Units are shipped from the factory with this switch in the OFF position.

Figure 32: Hot Water Generator Settings



The heat pump, water piping, pump, and hot water tank should be located where the ambient temperature does not fall below 50°F (10°C). Keep water piping lengths at a minimum. DO NOT use a one-way length greater than 50 ft. (15 m). See Table 6 for recommended piping sizes and maximum lengths.

All installations must be in accordance with local codes. The installer is responsible for knowing the local requirements, and for performing the installation accordingly. DO NOT activate the HWG (turn DIP 3-4 to the ON position) until Initial Startup section is completed. Powering the pump before all installation steps are completed will damage the pump.

WATER TANK PREPARATION

- Turn off power or fuel supply to the hot water tank.
- Connect a hose to the drain valve on the water tank.
- Shut off the cold water supply to the water tank.
- Open the drain valve and open the pressure relief valve or a hot water faucet to drain tank.
- When using an existing tank, it should be flushed with cold water after it is drained until the water leaving the drain hose is clear and free of sediment.
- Close all valves and remove the drain hose.
- Install HWG water piping.

HWG WATER PIPING

- Using at least ½-inch (12.7-mm) I.D. copper, route and install the water piping and valves. Install an approved anti-scald valve if the 150°F HWG setpoint is or will be selected. An appropriate method must be employed to purge air from the HWG piping. This may be accomplished by flushing water through the HWG or by installing an air vent at the high point of the HWG piping system.
- Insulate all HWG water piping with no less than ¾-inch (10-mm) wall closed-cell insulation.
- Open both shutoff valves and make sure the tank drain valve is closed.

WATER TANK REFILL

Hot Water Generator

1. Close valve #4. Ensure that the HWG valves (valves #2 and #3) are open. Open the cold water supply (valve #1) to fill the tank through the HWG piping. This will force water flow through the HWG and purge air from the HWG piping.
 2. Open a hot-water faucet to vent air from the system until water flows from faucet; turn off faucet. Open valve #4.
 3. Depress the hot water tank pressure relief valve handle to ensure that there is no air remaining in the tank.
 4. Inspect all work for leaks.
 5. Before restoring power or fuel supply to the water heater, adjust the temperature setting on the tank thermostat(s) to insure maximum utilization of the heat available from the refrigeration system and conserve the most energy. On tanks with both upper and lower elements and thermostats, the lower element should be turned down to 100°F (38°C) or the lowest setting; the upper element should be adjusted to 120-130°F (49-54°C). Depending upon the specific needs of the customer, you may want to adjust the upper element differently. On tanks with a single thermostat, a preheat tank should be used (Figure 5).
 6. Replace access cover(s) and restore power or fuel supply.
1. Make sure all valves in the HWG water circuit are fully open.
 2. Turn on the heat pump and allow it to run for 10-15 minutes.
 3. Set S3-4 to the "ON" position (enabled) to engage the HWG. See Figure 31.
 4. The HWG pump should not run if the compressor is not running.
 5. The temperature difference between the water entering and leaving the HWG coil should be approximately 5-10°F (3-6°C).
 6. Allow the unit to operate for 20 to 30 minutes to ensure that it is functioning properly.

Table 6: HWG Water Piping Sizes and Length

Unit Nominal Tonnage	Nominal HWG Flow (gpm)	1/2" Copper (max length')	3/4" Copper (max length')
2.0	0.8	50	-
2.5	1.0	50	-
3.0	1.2	50	-
3.5	1.4	50	-
4.0	1.6	45	50
5.0	2.0	25	50
6.0	2.4	10	50

1. Maximum length is equivalent length (in feet) one way of type L copper.

INITIAL STARTUP

⚠ WARNING

Use only copper piping for HWG piping due to the potential of high water temperatures for water that has been in the HWG heat exchanger during periods of no-flow conditions (HWG pump not energized). Piping other than copper may rupture due to high water temperature and potable water pressure. CPVC, PEX, or other plastic pipe should not be used HWG piping

Models:
MZ
024-060**Electrical Data: CV EC Blower Motor****Units with HWG and Pump (no Internal Flow Controller)**

Model	Voltage Code	Voltage	Voltage Min/Max	Compressor				Fan Motor FLA	Pump	Total Unit FLA	Min Circ Amp	Fuse HACR
				MCC	RLA	LRA	Qty		HWG FLA			
MZ*024	G.J.	208/230-1-60	187/252	16.0	10.3	62.0	1	4.2	0.28	14.7	17.3	25
MZ*030	G.J.	208/230-1-60	187/252	22.7	14.6	82.0	1	4.2	0.28	19.0	22.7	35
MZ*036	G.J.	208/230-1-60	187/252	22.7	14.6	76.0	1	5.9	0.28	20.7	24.4	35
MZ*042	G.J.	208/230-1-60	187/252	28.4	18.2	106.0	1	5.9	0.28	24.4	28.9	45
MZ*048	G.J.	208/230-1-60	187/252	28.6	18.3	138.0	1	5.9	0.28	24.5	29.1	45
MZ*060	J.	208/230-1-60	187/252	34.8	22.3	149.0	1	7.5	0.28	30.1	35.7	50

Units with Internal Flow Controller and HWG with Pump - High Head Variable Pump

Model	Voltage Code	Voltage	Voltage Min/Max	Compressor				Fan Motor FLA	Pump		Total Unit FLA	Min Circ Amp	Fuse HACR
				MCC	RLA	LRA	Qty		Motor FLA	HWG FLA			
MZ*024	G.J.	208/230-1-60	187/252	16.0	10.3	62.0	1	4.2	1.44	0.28	16.2	18.7	25
MZ*030	G.J.	208/230-1-60	187/252	22.7	14.6	82.0	1	4.2	1.44	0.28	20.5	24.1	35
MZ*036	G.J.	208/230-1-60	187/252	22.7	14.6	76.0	1	5.9	1.44	0.28	22.2	25.8	40
MZ*042	G.J.	208/230-1-60	187/252	28.4	18.2	106.0	1	5.9	1.44	0.28	25.8	30.4	45
MZ*048	G.J.	208/230-1-60	187/252	28.6	18.3	138.0	1	5.9	1.44	0.28	26.0	30.5	45
MZ*060	J.	208/230-1-60	187/252	34.8	22.3	149.0	1	7.5	1.44	0.28	31.5	37.1	50

Electrical: Power Wiring

⚠ WARNING

Disconnect electrical power source to prevent injury or death from electrical shock.

⚠ CAUTION

Use only copper conductors for field installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

ELECTRICAL

Line Voltage - All field installed wiring, including electrical ground, must comply with NFPA 70: National Electrical Code (NEC), CSA C22.1: Canadian Electrical Code (CE Code), as well as applicable local codes. Refer to the unit electrical data for fuse sizes. Consult wiring diagram for field connections that must be made by the installing (or electrical) contractor. All final electrical connections must be made with a length of flexible conduit to minimize vibration and sound transmission to the building.

Disconnects - Units with a factory-installed disconnect switch will provide full separation of **all poles** and disconnection from main line voltage. For units where factory disconnect is not selected as an option, the installer must incorporate the means to fully disconnect the line voltage in the fixed wiring in accordance with wiring rules and local electrical codes.

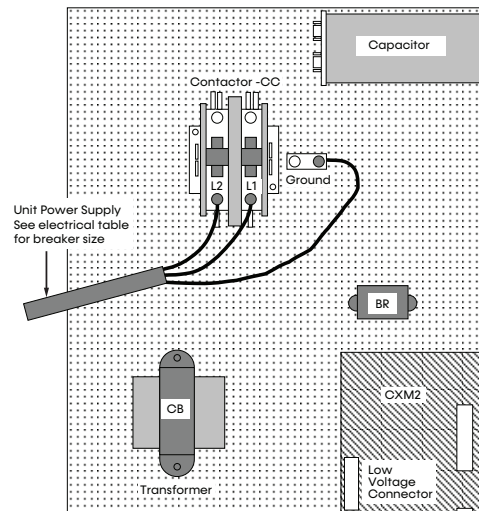
POWER CONNECTION

Line voltage connection is made by connecting the incoming line voltage wires to the "L" side of the contactor. Consult electrical data tables for maximum fuse size.

GENERAL LINE VOLTAGE WIRING

Ensure the available power is the same voltage and phase shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever is applicable.

Figure 33: Single Phase Line Voltage Field Wiring



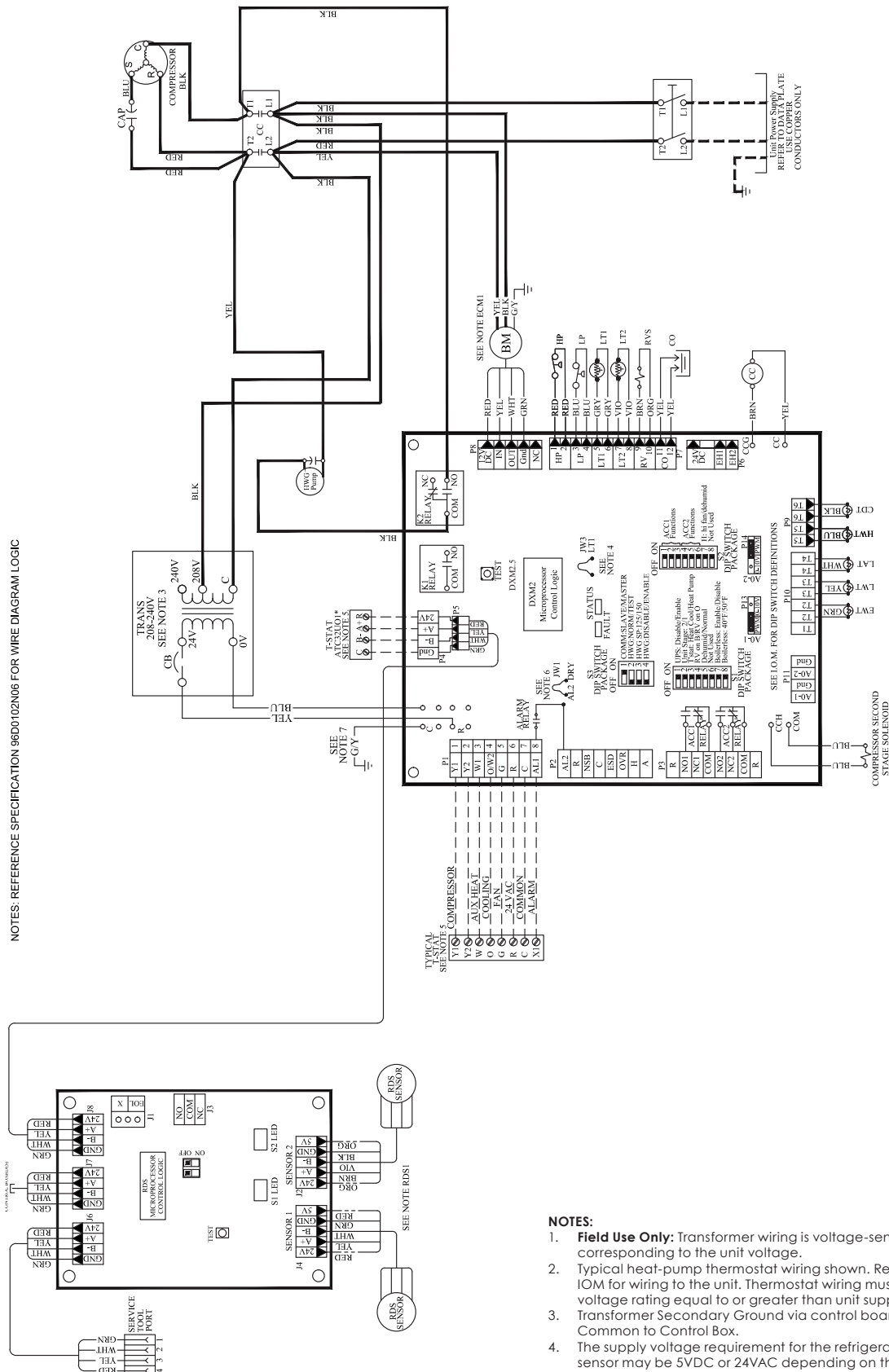
NOTE: 460V units with a CV EC motor or Internal Secondary Pump require a neutral wire. Three-phase wiring is similar except that all three power wires are directly connected to the contactor.

TRANSFORMER

All 208/230V units are factory wired for 208V. If supply voltage is 230V, installer must rewire transformer. See wire diagram for connections.

Models:
MZ
024-060

Electrical: DXM2.5 Example Wiring Diagram



Electrical: Low-Voltage Wiring

THERMOSTAT CONNECTIONS

The thermostat should be wired directly to the DXM2.5. See Electrical: Thermostat Wiring for specific terminal connections.

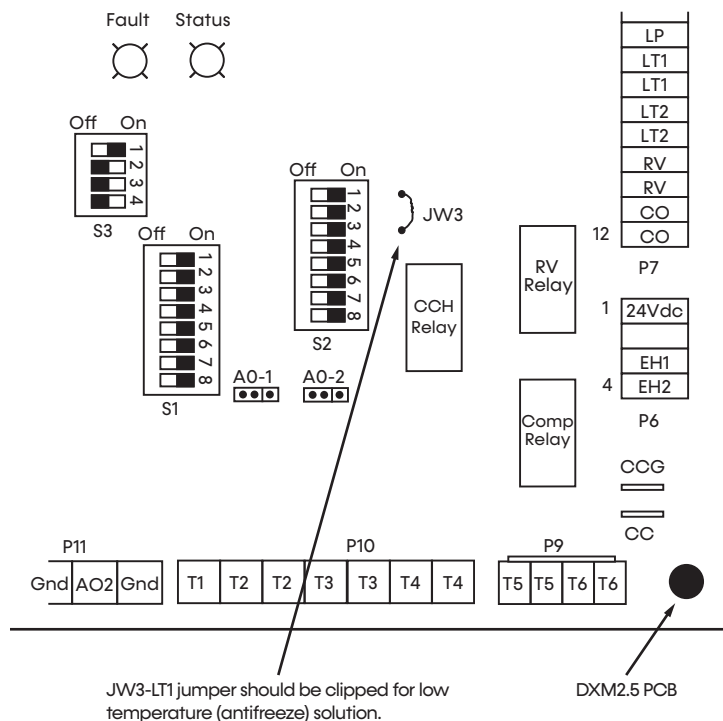
LOW WATER TEMPERATURE CUTOUT SELECTION

The DXM2.5 allows the field selection of low water (or water-antifreeze solution) temperature limit by clipping jumper JW3 (see the figure below), which changes the sensing temperature associated with thermistor LT1. Note that the LT1 thermistor is located on the refrigerant line between the coaxial heat exchanger and expansion device (TXV). Therefore,

LT1 is sensing refrigerant temperature, not water temperature, which is a better indication of how water flow rate/temperature is affecting the refrigeration circuit.

The factory setting for LT1 is for systems using water (30°F [-1.1°C] refrigerant temperature). In low water temperature (extended range) applications with antifreeze (most ground loops), jumper JW3 should be clipped as shown in the figure below to change the setting to 10°F [-12.2°C] refrigerant temperature, a more suitable temperature when using an antifreeze solution.

Figure 35: LT1 Limit Setting



Models:
MZ
024-060

Electrical: Low-Voltage Wiring

ACCESSORY CONNECTIONS

A terminal paralleling the compressor contactor coil is provided on the DXM2.5. Terminal “A” is designed to control accessory devices. **NOTE: Use this terminal only with 24V signals and not line voltage. Terminal “A” is energized with the compressor contactor.**

The DXM2.5 includes two accessory relays ACC1 and ACC2. Each relay includes a normally open (NO) and a normally closed (NC) contact. Accessory relays may be configured to operate as shown in the table below.

Accessory Relay 1 Connection

DIP 2.1	DIP 2.2	DIP 2.3	ACC1 Relay Option
ON	ON	ON	Cycle with fan
OFF	ON	ON	N/A for Residential Applications
ON	OFF	ON	Water valve – Slow opening
ON	ON	OFF	Outside air damper
OFF	OFF	ON	N/A for Residential Applications
ON	OFF	OFF	N/A for Residential Applications

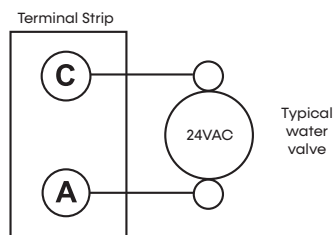
- All other DIP combinations are invalid

Accessory Relay 2 Connection

DIP 2.4	DIP 2.5	DIP 2.6	ACC2 Relay Option
ON	ON	ON	Cycle with compressor
OFF	ON	ON	N/A for Residential Applications
ON	OFF	ON	Water valve – Slow opening
OFF	OFF	ON	Humidifier
ON	ON	OFF	Outside air damper

- All other DIP combinations are invalid

Figure 36: Accessory Wiring



WATER SOLENOID VALVES

Use external solenoid valve(s) with ground water installations to shut off flow to the unit when the compressor is not operating. A slow-closing valve may be required to help reduce water hammer. The Accessory Wiring figure shows typical wiring for a 24VAC external solenoid valve. Accessory Motorized Water Valve – Typical Wiring Example #1 and Example #2 illustrate a slow-closing water control valve wiring for two styles of typical accessory water valves. Slow-closing valves take approximately 60 seconds to open (very little water flows before 45 seconds). Once fully open, an end switch allows the compressor to be energized. Only use relay or triac-based electronic thermostats with slow-closing valves. When wired as shown, the slow-closing valve operates properly with the following notations:

1. The valve remains open during a unit lockout.
2. The valve draws approximately 25-35VA through the “Y” signal of the thermostat.

NOTE: This valve can overheat the anticipator of an electromechanical thermostat. Therefore, only use relay or triac-based thermostats.

Low-Voltage Wiring for non-Variable Water Flow Units Using External Motorized Water Valve

Models:
MZ
024-060

Figure 37: Accessory Motorized Water Valve – Typical Wiring Example #1

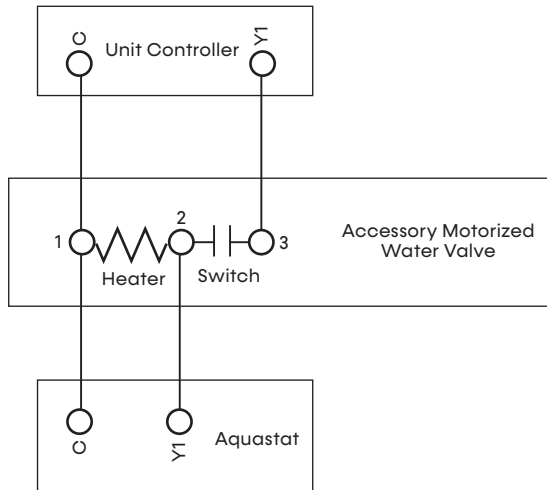


Figure 38: Accessory Motorized Water Valve - Typical Wiring Example #2

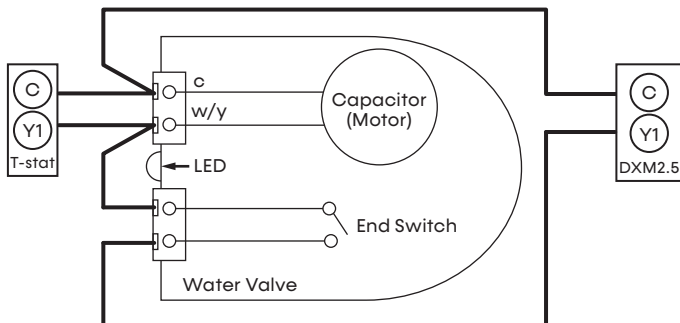
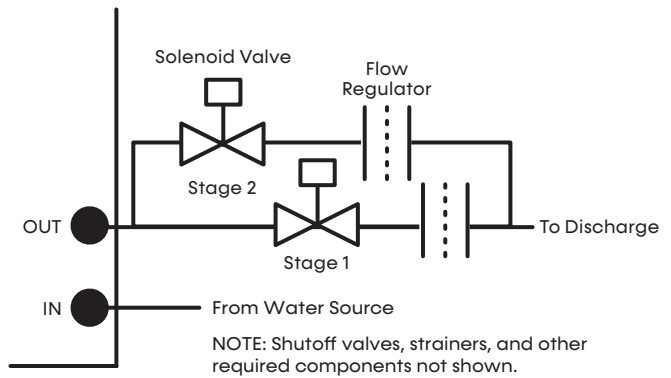


Figure 39: Two-Stage Piping



Models:
MZ
024-060

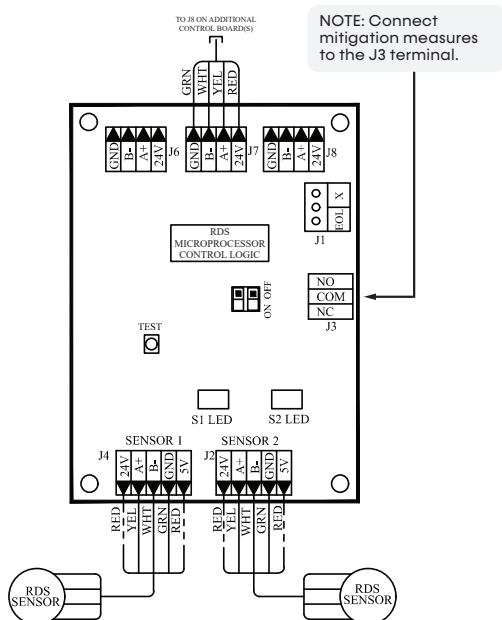
Electrical: Low-Voltage Wiring

REFRIGERANT DETECTION SYSTEM (RDS)

The function, operation, and required servicing measures for the RDS include the following:

- The RDS monitors the status of the refrigerant sensor(s) in the unit. If refrigerant is detected above the maximum threshold, the control enables the unit blower, disables the compressor(s), and enables the pilot relay on the RDS control board. You can use this relay to open external zoning dampers and/or activate external mechanical ventilation. The relay is normally closed (NC) and can control a signal with a maximum of 28VA @ 24VAC.
- A fault is enabled if the RDS control board loses communication with a refrigerant sensor, or if the main control board loses communication with the RDS board. See Functional Troubleshooting for steps to troubleshoot the RDS.
- The End of Line (EoL) termination is used to prevent signal reflection issues in the communication network. When the EoL termination is enabled, it places a resistor at the end of the communication line, ensuring proper signal integrity and reducing potential communication errors. Add the EoL termination resistor when the RDS board is the end of a daisy-chain, and the total length of the wire is greater than 50 feet.

Figure 40: RDS Board



FIELD-INSTALLED RDS SYSTEM

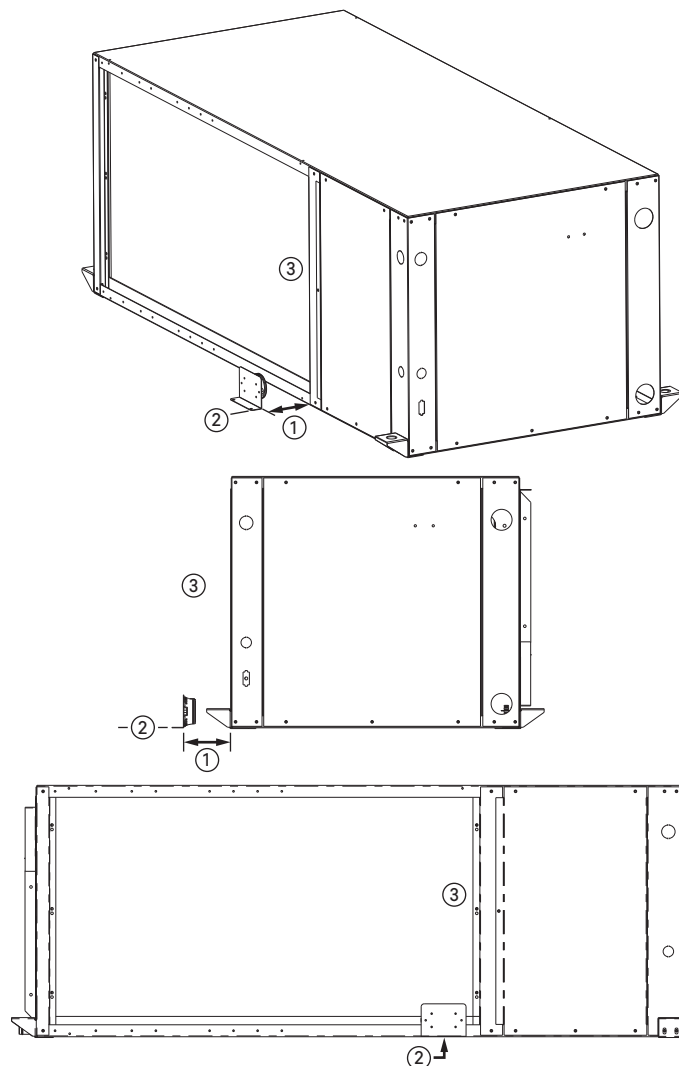
If an RDS is optionally being field-installed on non-ducted horizontal units in sizes 024-048, use the following guidelines to install the refrigerant detection sensor upstream of the unit's return air inlet:

1. The sensor must be located within 3 inches of the unit
2. The sensor must be on the same plane or lower than the unit
3. The sensor must be on the same side of the coil as the feeder tubes (feeder tubes are located near the electrical components)

NOTICE

The sensor cannot be installed in a way that exposes it to water and must be installed using the orientation displayed in the figure below.

Figure 41: RDS Installation



Electrical: Thermostat Wiring

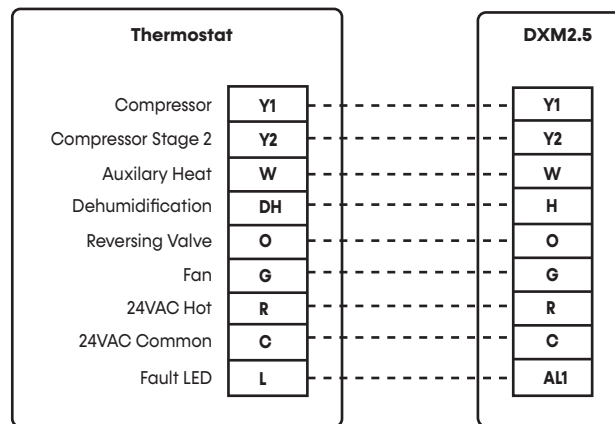
THERMOSTAT INSTALLATION

The thermostat should be located on an interior wall in a larger room, away from supply duct drafts. DO NOT locate the thermostat in areas subject to sunlight, drafts or on external walls. The wire access hole behind the thermostat may, in certain cases, need to be sealed to prevent erroneous temperature measurement.

Position the thermostat back plate against the wall so that it appears level and so the thermostat wires protrude through the middle of the back plate.

Mark the position of the back plate mounting holes and drill holes with a $\frac{3}{16}$ -inch (5 mm) bit. Install supplied anchors and secure plate to the wall. Thermostat wire must be 18 AWG wire. Representative thermostat wiring is shown in the figures below however, actual wiring connections should be determined from the thermostat IOM and or unit wiring diagram. Practically any heat pump thermostat will work with MARS units, provided it has the correct number of heating and cooling stages.

Figure 42: Conventional 3 Heat/2 Cool Thermostat Connection to DXM2.5



NOTES:

1. EC automatic dehumidification mode operates with dehumidification airflows in the cooling mode when the dehumidification output from thermostat is active. Normal heating and cooling airflows are not affected.
2. The DXM2.5 DIP switch S2-7 must be in the auto dehumidification mode for automatic dehumidification.
3. DH connection not possible with units with internal variable speed pump.

Models:
MZ
024-060

Blower Performance Data

CV EC MOTOR ADVANTAGE

A major benefit of the CV EC motor over other blower motor types is its ability to adjust airflow remotely through the iGate 2 web portal/mobile app or directly at the unit with the Wireless Service Tool. Airflow levels can be adjusted in increments of 25 CFM from the unit's minimum and maximum CFM range (see the Blower Performance: CV EC Blower Motor Standard Unit table for details).

Blower Performance: CV EC Blower Motor Standard Unit

Model	Max ESP (in wg)	Fan Motor (hp)	Range	Cooling Mode		Heating Mode		Dehumid Mode		Fan Only Mode	Aux Emergency Mode
				Stage 2	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1		
MZ024	0.75	1/2	Minimum	600	450	600	450	600	450	300	600
			Default	750	600	750	600	650	500	350	750
			Maximum	850	650	850	650	800	600	850	850
MZ030	0.5	1/2	Minimum	750	550	750	550	750	550	375	750
			Default	925	750	925	750	800	625	425	925
			Maximum	1,050	800	1,050	800	1,000	750	1,050	1,050
MZ036	0.6	3/4	Minimum	900	675	900	675	900	675	450	900
			Default	1,125	900	1,125	900	975	750	525	1,125
			Maximum	1,275	975	1,275	975	1,200	900	1,275	1,275
MZ042	0.6	3/4	Minimum	1,050	775	1,050	775	1,050	775	525	1,050
			Default	1,300	1,050	1,300	1,050	1,125	875	600	1,300
			Maximum	1,475	1,125	1,475	1,125	1,400	1,050	1,475	1,475
MZ048	0.6	3/4	Minimum	1,200	900	1,200	900	1,200	900	600	1,200
			Default	1,500	1,200	1,500	1,200	1,300	1,000	700	1,500
			Maximum	1,700	1,300	1,700	1,300	1,600	1,200	1,700	1,700
MZ060	0.75	1	Minimum	1,500	1,125	1,500	1,125	1,500	1,125	750	1,500
			Default	1,875	1,500	1,875	1,500	1,625	1,250	875	1,875
			Maximum	2,125	1,625	2,125	1,625	2,000	1,500	2,125	2,125

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- The maximum allowable altitude of installation for this product is 6,561 ft (2,000 m).

Controls: DXM2.5

Models:
MZ
024-060



DXM2.5 Advanced Communicating Controls

For detailed controller information, see the DXM2.5 Application, Operation, and Maintenance (AOM) manual (part # 97B0142N01). To confirm the controller type of your particular unit, refer to digit 9 on the unit model number and the unit nomenclature diagram found on page 3 of this manual.

Models:
MZ
024-060

Operating and Commissioning Limits

OPERATING LIMITS

Environment – Units are designed for indoor installation only. Never install units in areas subject to freezing or where humidity levels could cause cabinet condensation (such as unconditioned spaces subject to 100% outside air).

Power Supply – Voltage utilization shall comply with AHRI Standard 110 or values provided in the electrical data tables.

Three factors determine the operating limits of water source heat pumps: return air temperature, water temperature, and ambient temperature. When any one of these factors is at minimum or maximum levels, the other two factors should be at normal levels to ensure proper unit operation. Extreme variations in temperature and humidity and/or corrosive water or air will adversely affect unit performance, reliability, and service life.

Table 7: Operating Limits

Operating Limits	Cooling	Heating
Air Limits		
Min. ambient air, DB	10°F [-12°C] ¹	10°F [-12°C] ¹
Max. ambient air, DB	130°F [54.4°C]	130°F [54.4°C]
Min. entering air, DB/WB	65/45°F [18/7°C]	50°F [10°C]
Max. entering air, DB/WB	90/72°F [32/22°C]	80°F [27°C]
Min/Max Airflow (CFM/Ton)	300 to 500 CFM/Ton ²	
Water Limits		
Min. entering water	30°F [-1°C] ³	20°F [-6.7°C]
Max. entering water	120°F [49°C]	90°F [32°C]
Water Flow Range	1.5 to 3.0 gpm/ton [1.6 to 3.2 l/m per kW] ⁴	

Notes:

1. To prevent unit damage, the water loop should contain antifreeze to prevent freezing when not in operation.
2. Refer to specific blower tables for each model size
3. With unit flow-control automation.
4. Unless specified different on performance table for any model size

Unit Maximum Water Working Pressure

Options	Max Pressure PSIG [kPa]
Base Unit	300 [2,068]
Internal Modulating Valve	300 [2,068]

COMMISSIONING CONDITIONS

Starting conditions vary depending upon model and are based upon the following notes:

NOTES:

1. Commissioning Conditions are not normal or continuous operating conditions. Minimum/maximum limits are startup conditions to bring the building space up to occupancy temperatures. Units are not designed to operate under these conditions on a regular basis.
2. Voltage utilization range complies with AHRI Standard 110.

Table 8: Commissioning Conditions

Commissioning Conditions	Cooling	Heating
Air Limits		
Min. ambient air, DB	10°F [-12°C] ¹	10°F [-12°C] ¹
Max. ambient air, DB	130°F [54.4°C]	130°F [54.4°C]
Min. entering air, DB/WB	65/45°F [18/7°C]	40°F [4.4°C] ⁶
Max. entering air, DB/WB	100/75°F [38/24°C] ⁵	80°F [27°C]
Min/Max Airflow (CFM/Ton)	300 to 500 CFM/Ton ²	
Water Limits		
Min. entering water	20°F [-6.7°C] ³	20°F [-6.7°C]
Max. entering water	120°F [49°C]	90°F [32°C]
Water Flow Range	1.5 to 3.0 gpm/ton [1.6 to 3.2 l/m per kW] ⁴	

Notes:

1. To prevent unit damage, the water loop should contain antifreeze to prevent freezing when not in operation.
2. Refer to specific blower tables for each model size
3. With unit flow-control automation.
4. Unless specified different on performance table for any model size
5. Commission units for cooling at entering air temperatures of 100/75°F (38/24°C) only at rated water flow or 3 gpm/ton.
6. Commission units for heating at entering air temperature of 40°F (4.4°C) only at rated water flow or 3 gpm/ton.

Unit System Checkout

WARNING

Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with R-454B refrigerant. POE oil, if it ever comes in contact with PVC or CPVC piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water-source heat pump products containing R-454B as system failures and property damage may result.

UNIT AND SYSTEM CHECKOUT

BEFORE POWERING SYSTEM, please check the following:

UNIT FEATURES

- ☐ **Balancing/shutoff valves:** Ensure all isolation valves are open and water control valves are wired.
- ☐ **Line voltage and wiring:** Verify that voltage is within an acceptable range for the unit and wiring and fuses/breakers are properly sized. Verify that low voltage wiring is complete.
- ☐ **Unit control transformer:** Ensure transformer has the properly selected voltage tap. Residential 208-230V units are factory wired for 230V operation unless specified otherwise.
- ☐ **Loop/water piping:** Ensure loop or water piping is complete and purged of air. Water/piping is clean.
- ☐ **Antifreeze:** Has been added if necessary.
- ☐ **Entering water and air:** Ensure entering water and air temperatures are within operating limits of Table 7 and Table 8.
- ☐ **Low water temperature cutout:** Verify that low water temperature cut-out on the DXM2.5 is properly set.
- ☐ **Unit fan:** Manually rotate fan to verify free rotation and ensure blower wheel is secured to the motor shaft. Be sure to remove any shipping supports if needed. DO NOT oil motors upon startup. Fan motors are pre-oiled at the factory. Check unit fan CFM selection and compare to design requirements.
- ☐ **Condensate line:** Verify condensate line is open and properly pitched toward drain.
- ☐ **Water flow balancing:** Record inlet and outlet water temperatures for each heat pump upon startup. This check can eliminate nuisance trip outs and high velocity water flow that could erode heat exchangers.
- ☐ **Hot Water Generator:** Ensure HWG is switched off at SW 3-4 unless piping is completed and air has been purged from the system.

- ☐ **Unit air coil and filters:** Ensure filter is clean and accessible. Clean air coil of all manufacturing oils.
- ☐ **Unit controls:** Verify DXM2.5 field selection options are properly set. Low-voltage wiring is complete.
- ☐ Blower CFM and Water ΔT is set on the Wireless Service Tool.
- ☐ Service/access panels are in place.

SYSTEM CHECKOUT

- ☐ **System water temperature:** Check water temperature for proper range. Verify heating and cooling set points for proper operation.
- ☐ **System pH:** Check and adjust water pH if necessary to maintain a level between 6 and 8.5. Proper pH promotes longevity of hoses and fittings (see Table 5).
- ☐ **System flushing:** Verify all hoses are connected end-to-end when flushing to ensure that debris bypasses the unit heat exchanger, water valves and other components. Water used in the system must be potable quality initially and clean of dirt, piping slag, and strong chemical cleaning agents. Verify all air is purged from the system. Air in the system can cause poor operation or system corrosion.
- ☐ **System controls:** Verify system controls function and operate in the proper sequence.
- ☐ **Low water temperature cutout:** Verify low water temperature cut-out controls are provided for the outdoor portion of the loop. (LT1 - JW3)
- ☐ **Miscellaneous:** Note any questionable aspects of the installation.

CAUTION

Verify that ALL water control valves are open and allow water flow prior to engaging the compressor. Freezing of the coax or water lines can permanently damage the heat pump.

CAUTION

To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless antifreeze is added to the water loop. Heat exchangers never fully drain by themselves and will freeze unless winterized with antifreeze.

Models:
MZ
024-060

Unit Startup Procedure

UNIT STARTUP PROCEDURE

1. Turn the thermostat fan position to "ON". The blower should start.
2. Balance air flow at diffusers.
3. Adjust all valves to their full open positions. Turn on the line power to all heat pumps.
4. Room temperature should be within the minimum-maximum ranges of the Operating Limits and Commissioning Condition tables during startup checks, loop water temperature entering the heat pump should be between 60°F (16°C) and 95°F (35°C).
5. Two factors determine the operating limits of water-source heat pumps, (a) return air temperature, and (b) water temperature. When any one of these factors is at a minimum or maximum level, the other factor must be at normal level to ensure proper unit operation.
 - a. Adjust the unit thermostat to the warmest setting. Place the thermostat mode switch in the "COOL" position. Slowly reduce thermostat setting until the compressor activates.
 - b. Check for cool air delivery at the unit grille within a few minutes after the unit has begun to operate.

NOTE: Units have a five minute time delay in the control circuit that can be eliminated on the CXM2/DXM2.5 as shown in the Test Mode button figure. See controls description for details.
 - c. Run the unit for 15 minutes before recording performance data in the Startup Log Sheet.
 - d. Verify that the compressor is on and that the water flow rate is correct by measuring pressure drop through the heat exchanger using the P/T plugs and comparing to the Coax Water Pressure Drop table.
 - e. Check the elevation and cleanliness of the condensate lines. Dripping may be a sign of a blocked line. Check that the condensate trap is filled to provide a water seal.
- f. Refer to the Typical Unit Operating Pressures and Temperatures tables. Check the temperature of both entering and leaving water. If temperature is within range, proceed with the test. Heat of rejection (HR) can be calculated and compared to submittal data capacity pages. The formula for HR for systems with water is as follows:

$$\text{HR (Btuh)} = \text{TD} \times \text{GPM} \times 500$$

where TD is the temperature difference between the entering and leaving water, and GPM is the flow rate in U.S. GPM, determined by comparing the pressure drop across the heat exchanger to the Coax Water Pressure Drop table. In S-I units, the formula is as follows:

$$\text{HR (kW)} = \text{TD} \times \text{l/s} \times 4.18.$$
- g. Check air temperature drop across the air coil when compressor is operating. Air temperature drop should be between 15°F and 25°F (8°C and 14°C).
- h. Turn thermostat to "OFF" position. A hissing noise indicates proper functioning of the reversing valve.
6. Allow five (5) minutes between tests for pressure to equalize before beginning heating test.
 - a. Adjust the thermostat to the lowest setting. Place the thermostat mode switch in the "HEAT" position.
 - b. Slowly raise the thermostat to a higher temperature until the compressor activates.
 - c. Check for warm air delivery within a few minutes after the unit begins to operate.

Unit Startup Procedure

- d. Run the unit for 15 minutes before recording performance data in the Startup Log Sheet.
- e. Refer to the Typical Unit Operating Pressures and Temperatures tables. Check the temperature of both entering and leaving water. If temperature is within range, proceed with the test. If temperature is outside of the operating range, check refrigerant pressures. Heat of extraction (HE) can be calculated and compared to submittal data capacity pages. The formula for HE for systems with water is as follows:

$$\text{HE (kW)} = \text{TD} \times \text{GPM} \times 500$$

where TD is the temperature difference between the entering and leaving water, and l/s is the flow rate in U.S. GPM, determined by comparing the pressure drop across the heat exchanger to the Coax Water Pressure Drop table. In S-I units, the formula is as follows:

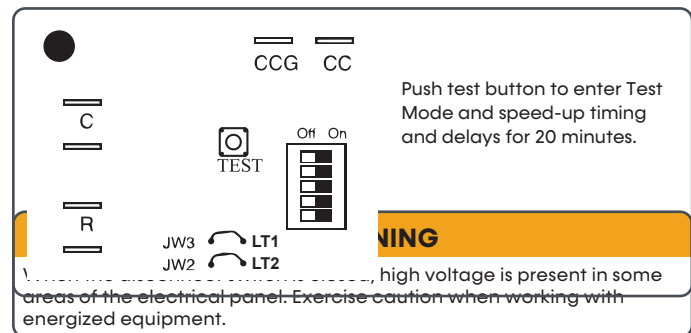
$$\text{HE (kW)} = \text{TD} \times \text{l/s} \times 4.18$$

- f. Check air temperature rise across the air coil when compressor is operating. Air temperature rise should be between 20°F and 30°F (11°C and 17°C).
 - g. Check for vibration, noise, and water leaks.
7. If the unit fails to operate, perform troubleshooting analysis (see Functional Troubleshooting). If the check procedure described fails to reveal the problem, and the unit still does not operate, contact a trained service technician to ensure proper diagnosis and repair of the equipment.

8. When testing is complete, set the system to maintain the desired comfort level.

NOTE: If performance during any mode appears abnormal, refer to the CXM2/DXM2.5 section or troubleshooting section of this manual. To obtain maximum performance, the air coil should be cleaned before startup. A 10% solution of dishwasher detergent and water is recommended.

Figure 43: Test Mode Button



CAUTION

Verify that ALL water control valves are open and allow water flow prior to engaging the compressor. Freezing of the coax or water lines can permanently damage the heat pump.

CAUTION

Many units are installed with a factory or field supplied manual or electric shut-off valve. DAMAGE WILL OCCUR if shut-off valve is closed during unit operation. A high pressure switch must be installed on the heat pump side of any field provided shut-off valves and connected to the heat pump controls in series with the built-in refrigerant circuit high pressure switch to disable compressor operation if water pressure exceeds pressure switch setting. The field installed high pressure switch shall have a cut-out pressure of 300 psig and a cut-in pressure of 250 psig.

Models:
MZ
024-060

Unit Operating Conditions

Operating Pressure/Temperature tables include the following notes:

- Airflow is at nominal (rated) conditions
- Entering air is based upon 70°F (21°C) DB in heating and 80/67°F (27/19°C) in cooling
- Subcooling is based upon head pressure at compressor service port
- Cooling air and water values can vary greatly with changes in humidity level

Table 9: MZ Series Typical Unit Operating Pressures and Temperatures

MZ024		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
EWT °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise °F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Drop °F	Air Temp Rise °F DB
30'	6	140-160	111-121	22-26	11-15	10-12	18-24	277-297	66-76	8-12	5-9	4-6	17-23
	4.5	147-167	114-124	18-22	11-15	13-15	19-25	274-294	64-74	8-12	5-9	5-7	17-23
	3	161-181	117-127	16-20	14-18	21-23	19-25	270-290	60-70	8-12	5-9	7-9	16-22
50	6	193-213	117-127	14-18	12-16	10-12	19-25	310-330	95-105	9-13	5-9	5-7	23-29
	4.5	202-222	119-129	13-17	14-18	13-15	19-25	307-327	92-102	9-13	6-10	7-9	23-29
	3	221-241	120-130	11-15	16-20	20-22	19-25	301-321	87-97	8-12	6-10	10-12	22-28
70	6	261-281	123-133	9-13	14-18	9-11	18-24	346-366	129-139	10-14	5-9	7-9	30-36
	4.5	273-293	124-134	8-12	16-20	13-15	18-24	342-362	124-134	10-14	5-9	10-12	29-35
	3	296-316	125-135	7-11	19-23	19-21	18-24	333-353	117-127	9-13	6-10	14-16	28-34
90	6	346-366	129-139	6-10	16-20	9-11	18-24	385-405	166-176	12-16	4-8	9-11	37-43
	4.5	359-379	129-139	6-10	17-21	12-14	17-23	379-399	160-170	12-16	4-8	12-14	35-41
	3	385-405	130-140	5-9	21-25	19-21	17-23	367-387	149-159	10-14	5-9	17-19	34-40
120	6	503-523	136-146	6-10	19-23	8-10	15-21						
	4.5	518-538	137-147	5-9	20-24	11-13	15-21						
	3	546-566	138-148	4-8	23-27	18-20	15-21						

1. Based on 20% Methanol antifreeze solution

MZ030		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
EWT °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise °F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Drop °F	Air Temp Rise °F DB
30'	7.5	145-165	108-118	11-15	7-11	10-12	21-27	302-322	64-74	8-12	7-11	4-6	22-28
	5.6	148-168	110-120	8-12	6-10	13-15	21-27	298-318	61-71	9-13	7-11	5-7	21-27
	3.8	160-180	111-121	6-10	6-10	20-22	21-27	293-313	57-67	8-12	7-11	8-10	20-26
50	7.5	197-217	112-122	7-11	7-11	9-11	20-26	341-361	94-104	8-12	5-9	5-7	28-34
	5.6	205-225	113-123	6-10	7-11	13-15	20-26	337-357	90-100	8-12	5-9	7-9	27-33
	3.8	222-242	113-123	5-9	9-13	19-21	20-26	333-353	85-95	8-12	6-10	10-12	27-33
70	7.5	265-285	116-126	5-9	8-12	9-11	19-25	380-400	126-136	10-14	3-7	6-8	34-40
	5.6	277-297	116-126	5-9	9-13	12-14	19-25	375-395	122-132	10-14	3-7	9-11	33-39
	3.8	298-318	117-127	4-8	11-15	19-21	19-25	369-389	115-125	9-13	4-8	13-15	32-38
90	7.5	349-369	120-130	4-8	8-12	8-10	18-24	417-437	161-171	14-18	2-6	8-10	40-46
	5.6	363-383	120-130	3-7	10-14	12-14	18-24	411-431	155-165	14-18	2-6	10-12	39-45
	3.8	388-408	121-131	3-7	12-16	18-20	18-24	401-421	145-155	13-17	2-6	15-17	37-43
120	7.5	506-526	127-137	3-7	10-14	8-10	16-22						
	5.6	521-541	128-138	2-6	10-14	12-14	16-22						
	3.8	547-567	130-140	1-5	13-17	17-19	16-22						

1. Based on 20% Methanol antifreeze solution

Models:
MZ
024-060

Unit Operating Conditions

MZ036		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
EWT °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise °F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Drop °F	Air Temp Rise °F DB
30'	9	133-153	111-121	9-13	5-9	10-12	19-25	302-322	64-74	10-14	12-16	4-6	20-26
	6.75	140-160	111-121	7-11	5-9	13-15	19-25	298-318	62-72	10-14	12-16	5-7	19-25
	4.5	155-175	110-120	6-10	12-16	20-22	19-25	293-313	58-68	10-14	12-16	8-10	18-24
50	9	187-207	114-124	7-11	6-10	9-11	19-25	339-359	94-104	9-13	13-17	5-7	26-32
	6.75	196-216	114-124	5-9	7-11	13-15	18-24	335-355	91-101	9-13	13-17	7-9	25-31
	4.5	215-235	114-124	4-8	12-16	20-22	18-24	329-349	85-95	8-12	14-18	11-13	24-30
70	9	254-274	117-127	5-9	7-11	9-11	18-24	382-402	129-139	9-13	12-16	7-9	33-39
	6.75	266-286	118-128	4-8	9-13	12-14	18-24	377-397	124-134	9-13	13-17	10-12	32-38
	4.5	288-308	119-129	3-7	11-15	19-21	18-24	367-387	116-126	8-12	13-17	14-16	30-36
90	9	336-356	122-132	3-7	8-12	9-11	17-23	430-450	168-178	11-15	9-13	9-11	40-46
	6.75	349-369	123-133	3-7	10-14	12-14	17-23	422-442	161-171	11-15	10-14	12-14	39-45
	4.5	374-394	124-134	2-6	11-15	18-20	17-23	409-429	150-160	9-13	11-15	18-20	37-43
120	9	486-506	131-141	3-7	7-11	8-10	15-21						
	6.75	500-520	131-141	2-6	9-13	11-13	15-21						
	4.5	527-547	133-143	1-5	10-14	18-20	16-22						

1. Based on 20% Methanol antifreeze solution

MZ042		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
EWT °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise °F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Drop °F	Air Temp Rise °F DB
30'	10.5	136-156	93-103	36-40	19-23	9-11	18-24	292-312	62-72	9-13	7-11	3-5	20-26
	7.9	148-168	99-109	34-38	19-23	12-14	18-24	290-310	59-69	9-13	7-11	5-7	19-25
	5.25	163-183	106-116	25-29	19-23	20-22	19-25	285-305	55-65	9-13	7-11	7-9	18-24
50	10.5	186-206	105-115	23-27	16-20	9-11	19-25	322-342	91-101	10-14	7-11	5-7	26-32
	7.9	198-218	108-118	21-25	17-21	13-15	19-25	319-339	88-98	9-13	7-11	7-9	25-31
	5.25	218-238	112-122	16-20	19-23	20-22	19-25	312-332	82-92	9-13	7-11	10-12	24-30
70	10.5	253-273	114-124	13-17	15-19	9-11	19-25	355-375	123-133	12-16	6-10	7-9	32-38
	7.9	266-286	116-126	12-16	17-21	13-15	19-25	351-371	119-129	11-15	6-10	9-11	31-37
	5.25	291-311	117-127	10-14	20-24	20-22	19-25	343-363	111-121	10-14	7-11	13-15	29-35
90	10.5	337-357	121-131	8-12	15-19	10-12	18-24	392-412	157-167	16-20	4-8	8-10	38-44
	7.9	351-371	121-131	7-11	17-21	13-15	19-25	387-407	152-162	15-19	5-9	11-13	38-44
	5.25	380-400	122-132	7-11	21-25	20-22	18-24	376-396	141-151	13-17	5-9	16-18	35-41
120	10.5	496-516	126-136	7-11	18-22	9-11	16-22						
	7.9	513-533	127-137	7-11	21-25	13-15	16-22						
	5.25	545-565	129-139	6-10	25-29	18-20	15-21						

1. Based on 20% Methanol antifreeze solution

Models:
MZ
024-060

Unit Operating Conditions

MZ048		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
EWT °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise °F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Drop °F	Air Temp Rise °F DB
30'	12	145-165	109-119	18-22	13-17	10-12	19-25	312-332	61-71	1-5	20-24	4-6	18-24
	9	156-176	111-121	15-19	14-18	14-16	19-25	308-328	59-69	2-6	20-24	5-7	18-24
	6	192-212	115-125	13-17	19-23	21-23	19-25	302-322	55-65	2-4	20-24	8-10	17-23
50	12	193-213	113-123	13-17	14-18	10-12	19-25	347-367	89-99	4-8	19-23	5-7	25-31
	9	205-225	114-124	11-15	16-20	13-15	19-25	342-362	86-96	4-8	19-23	7-9	24-30
	6	231-251	116-126	10-14	19-23	20-22	19-25	340-360	78-88	3-7	20-24	11-13	23-29
70	12	260-280	117-127	10-14	15-19	9-11	18-24	387-407	124-134	7-11	16-20	7-9	31-37
	9	273-293	117-127	9-13	18-22	13-15	19-25	381-401	119-129	6-10	17-21	10-12	30-36
	6	296-316	118-128	9-13	21-25	20-22	19-25	366-386	110-120	6-10	18-22	14-16	28-34
90	12	344-364	121-131	8-12	17-21	9-11	18-24	432-452	164-174	10-14	12-16	9-11	38-44
	9	358-378	121-131	8-12	20-24	13-15	18-24	424-444	157-167	10-14	12-16	12-14	37-43
	6	386-406	121-131	8-12	23-27	19-21	18-24	382-402	152-162	9-13	12-16	15-17	30-36
120	12	503-523	127-137	9-13	19-23	9-11	16-22						
	9	521-541	128-138	9-13	23-27	12-14	16-22						
	6	570-590	131-141	7-11	28-32	18-20	16-22						

1. Based on 20% Methanol antifreeze solution

MZ060		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
EWT °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise °F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Drop °F	Air Temp Rise °F DB
30'	15	140-160	105-115	25-29	12-16	9-11	19-25	283-303	61-71	4-8	5-9	5-7	11-17
	11.25	148-168	106-116	20-24	14-18	13-15	19-25	286-306	64-74	4-8	5-9	3-5	20-26
	7.5	161-181	108-118	17-21	15-19	20-22	19-25	279-299	57-67	4-8	9-13	7-9	18-24
50	15	188-208	113-123	16-20	12-16	9-11	19-25	315-335	89-99	4-8	4-8	7-9	12-18
	11.25	198-218	114-124	13-17	14-18	13-15	19-25	318-338	93-103	5-9	4-8	5-7	26-32
	7.5	217-237	115-125	11-15	18-22	20-22	19-25	309-329	84-94	4-8	11-15	10-12	24-30
70	15	253-273	120-130	9-13	13-17	9-11	18-24	349-369	122-132	7-11	3-7	9-11	13-19
	11.25	265-285	120-130	9-13	15-19	13-15	18-24	353-373	126-136	8-12	3-7	7-9	32-38
	7.5	289-309	121-131	7-11	20-24	19-21	18-24	341-361	114-124	6-10	13-17	13-15	30-36
90	15	335-355	126-136	6-10	14-18	9-11	17-23	386-406	157-167	13-17	2-6	11-13	13-19
	11.25	348-368	126-136	6-10	16-20	13-15	18-24	391-411	163-173	14-18	2-6	8-10	39-45
	7.5	376-396	127-137	5-9	21-25	19-21	18-24	376-396	148-158	10-14	15-19	16-18	36-42
120	15	490-510	132-142	6-10	15-19	8-10	15-21						
	11.25	506-526	132-142	6-10	18-22	12-14	16-22						
	7.5	535-555	133-143	6-10	21-25	18-20	16-22						

1. Based on 20% Methanol antifreeze solution

Unit Operating Conditions

WARNING

When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with energized equipment.

CAUTION

Verify that ALL water control valves are open and allow water flow prior to engaging the compressor. Freezing of the coax or water lines can permanently damage the heat pump.

CAUTION

Many units are installed with a factory or field supplied manual or electric shut-off valve. DAMAGE WILL OCCUR if shut-off valve is closed during unit operation. A high pressure switch must be installed on the heat pump side of any field provided shut-off valves and connected to the heat pump controls in series with the built-in refrigerant circuit high pressure switch to disable compressor operation if water pressure exceeds pressure switch setting. The field installed high pressure switch shall have a cut-out pressure of 300 psig and a cut-in pressure of 250 psig.

Table 10: MZ Coax Water Pressure Drop

Model	GPM	Pressure Drop (psi)				
		30°F*	50°F	70°F	90°F	110°F
MZ024	2.20	0.8	0.5	0.4	0.3	0.3
	3.00	1.3	0.8	0.6	0.6	0.5
	4.50	2.4	1.6	1.3	1.2	1.1
	6.00	3.5	2.5	2.1	2.0	1.8
MZ030	2.80	1.1	0.6	0.4	0.4	0.3
	3.80	1.8	1.0	0.8	0.7	0.7
	5.60	3.3	2.1	1.7	1.6	1.4
	7.50	4.8	3.3	2.8	2.7	2.5
MZ036	3.40	1.0	0.7	0.6	0.6	0.6
	4.50	1.6	1.1	1.0	0.9	0.9
	6.80	3.0	2.0	1.7	1.7	1.6
	9.00	4.4	3.3	2.8	2.7	2.6
MZ042	4.25	0.9	0.8	0.8	0.8	0.7
	5.25	1.4	1.2	1.1	1.1	1.0
	7.90	2.7	2.3	2.1	2.1	1.9
	10.50	4.3	3.7	3.5	3.3	3.1
MZ048	4.20	0.6	0.6	0.7	0.7	0.5
	6.00	1.4	1.2	1.1	1.0	1.0
	9.00	3.0	2.6	2.3	2.1	2.0
	12.00	4.9	4.4	4.0	3.6	3.3
MZ060	5.25	1.6	1.3	1.1	1.0	1.0
	7.50	2.6	2.3	2.0	1.9	1.7
	11.25	5.1	4.4	4.0	3.7	3.4
	15.00	8.2	7.2	6.5	6.1	5.6

Models:
MZ
024-060

Performance Data

MZ*024 EC Blower Motor (Full Load)

800 CFM Rated Airflow

EWT °F	GPM	WPD		COOLING - EAT 80/67°F							GPM	WPD		HEATING - EAT 70°F						
		PSI	FT	TC	SC	kW	HR	EER	LWT	HWG Cap		PSI	FT	HC	kW	HE	COP	LWT	HWG Cap	
20	Operation Not Recommended										6.0	4.4	10.1	15.7	1.45	10.5	3.2	16.5	1.9	
30	2.1	0.7	1.7	28.1	20.1	1.16	32.1	24.2	60.0	1.2	3.0	1.3	3.1	17.4	1.48	12.1	3.4	21.9	2.0	
											4.5	2.4	5.6	18.2	1.49	12.9	3.6	24.3	2.1	
											6.0	3.5	8.1	18.6	1.50	13.3	3.6	25.6	2.1	
40	3.2	1.1	2.6	27.6	19.7	1.17	31.5	23.6	60.0	1.2	3.0	1.0	2.4	20.1	1.53	14.7	3.9	30.2	2.3	
											4.5	1.9	4.5	21.0	1.54	15.5	4.0	33.1	2.3	
											6.0	2.9	6.6	21.5	1.55	16.0	4.1	34.7	2.4	
50	3.0	0.8	1.9	26.8	19.4	1.23	31.2	21.8	70.8	1.5	3.0	0.8	1.9	22.8	1.58	17.2	4.2	38.6	2.5	
	4.5	1.6	3.7	27.3	19.7	1.16	31.5	23.6	64.0	1.3	4.5	1.6	3.7	23.9	1.60	18.2	4.4	41.9	2.6	
	6.0	2.5	5.7	27.5	19.7	1.12	31.5	24.5	60.5	1.2	6.0	2.5	5.7	24.4	1.61	18.7	4.4	43.8	2.7	
60	3.0	0.7	1.6	25.8	19.0	1.34	30.6	19.2	80.4	1.9	3.0	0.7	1.6	25.5	1.63	19.7	4.6	46.9	2.8	
	4.5	1.4	3.2	26.5	19.3	1.26	31.0	21.0	73.8	1.7	4.5	1.4	3.2	26.7	1.66	20.8	4.7	50.8	2.9	
	6.0	2.2	5.1	26.8	19.5	1.22	31.2	21.9	70.4	1.6	6.0	2.2	5.1	27.4	1.67	21.4	4.8	52.9	3.0	
70	3.0	0.6	1.5	24.5	18.3	1.49	29.8	16.5	89.9	2.4	3.0	0.6	1.5	28.1	1.69	22.1	4.9	55.3	3.1	
	4.5	1.3	3.0	25.4	18.8	1.39	30.3	18.3	83.5	2.2	4.5	1.3	3.0	29.5	1.72	23.4	5.0	59.6	3.2	
	6.0	2.1	4.8	25.8	19.0	1.34	30.6	19.2	80.2	2.0	6.0	2.1	4.8	30.3	1.74	24.1	5.1	62.0	3.3	
80	3.0	0.6	1.4	23.2	17.6	1.66	29.1	14.0	99.4	3.1	3.0	0.6	1.4	30.8	1.75	24.6	5.2	63.6	3.5	
	4.5	1.2	2.9	24.1	18.1	1.54	29.6	15.6	93.1	2.9	4.5	1.2	2.9	32.3	1.78	25.9	5.3	68.5	3.6	
	6.0	2.0	4.6	24.5	18.3	1.49	29.8	16.5	89.9	2.6	6.0	2.0	4.6	33.1	1.80	26.7	5.4	71.1	3.7	
90	3.0	0.6	1.4	21.8	17.0	1.87	28.5	11.7	109.0	3.9	2.6	0.4	0.9	32.8	1.87	26.4	5.1	70.0	3.8	
	4.5	1.2	2.8	22.7	17.4	1.73	28.9	13.1	102.8	3.6										
	6.0	2.0	4.6	23.1	17.6	1.66	29.1	13.9	99.7	3.3										
100	3.0	0.6	1.3	20.6	16.4	2.14	28.2	9.6	118.8	4.8	1.8	0.1	0.2	32.8	1.87	26.4	5.1	70.0	3.8	
	4.5	1.2	2.7	21.3	16.7	1.97	28.3	10.9	112.6	4.4										
	6.0	1.9	4.5	21.8	16.9	1.89	28.5	11.5	109.5	4.0										
110	3.0	0.5	1.2	19.5	16.0	2.47	28.3	7.9	128.8	5.8	1.3	0.1	0.2	32.8	1.87	26.4	5.1	70.0	3.8	
	4.5	1.1	2.6	20.1	16.2	2.26	28.1	8.9	122.5	5.3										
	6.0	1.8	4.2	20.5	16.4	2.16	28.2	9.5	119.4	4.9										
120	3.0	0.4	1.0	18.8	16.0	2.89	29.0	6.5	139.4	7.0	1.1	0.1	0.2	32.8	1.87	26.4	5.1	70.0	3.8	
	4.5	0.9	2.2	19.2	16.0	2.61	28.5	7.3	132.6	6.4										
	6.0	1.6	3.8	19.4	16.0	2.49	28.3	7.8	129.4	5.8										

- Interpolation is permissible; extrapolation is not.
- All entering air conditions are 80°F (26.6°C) DB and 67°F (19.4°C) WB in cooling, and 70°F (21°C) DB in heating.
- AHRI/ISO certified conditions are 80.6°F (27°C) DB and 66.2°F (19°C) WB in cooling and 68°F (20°C) DB in heating.
- Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
- All performance is based upon the lower voltage of dual voltage rated units.
- Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
- Operation below 40°F (10.0°C) EWT is based upon 20% methanol antifreeze solution.
- Operation below 60°F (15.5°C) EWT requires optional insulated water/refrigerant circuit.
- See performance correction tables for operating conditions other than those listed above.
- See Performance Data Selection Notes for operation in the shaded areas.
- Regular Cooling operation with an EWT of less than 50°F (10.0°C) is not recommended unless variable water flow is available.
- Regular Heating operation with an EWT of more than 90°F (32°C) is not recommended unless variable water flow is available.
- For quiet operation and long term reliability, it is recommended that systems be designed to avoid continuous operation in the outlined areas.
- Performance capacities shown in thousands of Btuh
- Hot Water Generator Capacity is based on 90°F entering water and 0.5 GPM/Ton.

Performance Data

MZ*030 EC Blower Motor (Full Load)

Models:
MZ
024-060

900 CFM Rated Airflow

EWT °F	GPM	WPD		COOLING - EAT 80/67°F							GPM	WPD		HEATING - EAT 70°F						
		PSI	FT	TC	SC	kW	HR	EER	LWT	HWG Cap		PSI	FT	HC	kW	HE	COP	LWT	HWG Cap	
20	Operation Not Recommended										7.5	6.0	13.8	20.9	1.93	14.0	3.2	16.3	1.9	
30	2.6	0.8	1.9	33.8	22.9	1.49	38.8	22.7	60.0	1.0	3.8	1.8	4.1	22.8	1.98	15.8	3.4	21.7	2.0	
											5.6	3.3	7.5	23.6	2.01	16.5	3.5	24.1	2.0	
											7.5	4.8	11.0	24.1	2.02	16.9	3.5	25.5	2.1	
40	3.9	1.4	3.2	33.6	22.8	1.51	38.7	22.2	60.0	1.0	3.8	1.3	3.1	25.8	2.07	18.5	3.7	30.3	2.2	
											5.6	2.6	5.9	26.8	2.10	19.3	3.7	33.1	2.3	
											7.5	3.9	9.0	27.4	2.11	19.8	3.8	34.7	2.3	
50	3.8	1.0	2.4	32.6	22.4	1.60	38.3	20.4	70.2	1.5	3.8	1.0	2.4	28.8	2.15	21.2	3.9	38.9	2.5	
											5.6	2.1	4.8	29.9	2.19	22.2	4.0	42.1	2.6	
											7.5	3.3	7.6	33.6	2.28	22.8	4.1	43.9	2.6	
60	3.8	0.9	2.0	31.5	22.0	1.77	37.8	17.8	79.9	2.1	3.8	0.9	2.0	31.8	2.24	23.9	4.2	47.4	2.9	
											5.6	1.8	4.2	32.2	2.23	25.0	4.3	51.1	3.0	
											7.5	3.0	6.8	32.6	2.24	25.6	4.3	53.2	3.0	
70	3.8	0.8	1.8	30.3	21.5	1.97	37.3	15.4	89.6	2.9	3.8	0.8	1.8	34.8	2.32	26.5	4.4	56.0	3.3	
											5.6	1.7	3.8	31.1	2.18	27.7	4.5	60.1	3.4	
											7.5	2.8	6.4	31.5	2.20	28.5	4.5	62.4	3.5	
80	3.8	0.7	1.7	28.9	20.9	2.20	36.8	13.1	99.3	3.7	3.8	0.7	1.7	37.7	2.40	29.1	4.6	64.7	3.8	
											5.6	1.6	3.7	29.8	21.3	30.4	4.7	69.1	3.9	
											7.5	2.7	6.3	30.2	21.4	31.2	4.7	71.7	4.0	
90	3.8	0.7	1.7	27.5	20.3	2.46	36.2	11.2	109.1	4.6	3.1	0.3	0.7	39.5	2.56	30.7	4.5	70.0	4.4	
100	3.8	0.7	1.7	25.9	19.6	2.76	35.7	9.4	118.8	5.6	2.0	0.1	0.2	39.5	2.56	30.7	4.5	70.0	4.4	
110	3.8	0.7	1.5	24.3	18.8	3.10	35.3	7.8	128.6	6.8	1.5	0.1	0.2	39.5	2.56	30.7	4.5	70.0	4.4	
120	3.8	0.5	1.2	22.6	17.9	3.48	34.9	6.5	138.4	8.0	1.2	0.1	0.2	39.5	2.56	30.7	4.5	70.0	4.4	

- Interpolation is permissible; extrapolation is not.
- All entering air conditions are 80°F (26.6°C) DB and 67°F (19.4°C) WB in cooling, and 70°F (21°C) DB in heating.
- AHRI/ISO certified conditions are 80.6°F (27°C) DB and 66.2°F (19°C) WB in cooling and 68°F (20°C) DB in heating.
- Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
- All performance is based upon the lower voltage of dual voltage rated units.
- Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
- Operation below 40°F (10.0°C) EWT is based upon 20% methanol antifreeze solution.
- Operation below 60°F (15.5°C) EWT requires optional insulated water/refrigerant circuit.
- See performance correction tables for operating conditions other than those listed above.
- See Performance Data Selection Notes for operation in the shaded areas.
- Regular Cooling operation with an EWT of less than 50°F (10.0°C) is not recommended unless variable water flow is available.
- Regular Heating operation with an EWT of more than 90°F (32°C) is not recommended unless variable water flow is available.
- For quiet operation and long term reliability, it is recommended that systems be designed to avoid continuous operation in the outlined areas.
- Performance capacities shown in thousands of Btuh
- Hot Water Generator Capacity is based on 90°F entering water and 0.5 GPM/Ton.

Models:
MZ
024-060

Performance Data

MZ*036 EC Blower Motor (Full Load)

1150 CFM Rated Airflow

EWT °F	GPM	WPD		COOLING - EAT 80/67°F							GPM	WPD		HEATING - EAT 70°F						
		PSI	FT	TC	SC	kW	HR	EER	LWT	HWG Cap		PSI	FT	HC	kW	HE	COP	LWT	HWG Cap	
20	Operation Not Recommended										9.0	5.2	12.1	25.1	2.26	17.0	3.3	16.2	2.4	
30	3.1	0.7	1.5	40.0	28.3	1.87	46.3	21.4	60.0	1.2	4.5	1.6	3.6	27.4	2.32	19.2	3.5	21.5	2.4	
											6.8	3.0	6.8	28.6	2.35	20.3	3.6	24.0	2.5	
											9.0	4.4	10.1	29.2	2.36	20.8	3.6	25.4	2.6	
40	4.6	1.3	3.1	39.8	28.2	1.90	46.3	20.9	60.0	1.2	4.5	1.3	3.0	31.4	2.42	22.8	3.8	29.9	2.7	
											6.8	2.4	5.5	32.9	2.46	24.1	3.9	32.9	2.8	
											9.0	3.7	8.6	33.7	2.48	24.8	4.0	34.5	2.8	
50	4.5	1.1	2.6	38.6	27.4	1.96	45.6	19.7	70.3	1.8	4.5	1.1	2.6	35.5	2.53	26.5	4.1	38.2	3.0	
	6.8	2.0	4.7	39.4	27.9	1.87	46.0	21.1	63.5	1.6	6.8	2.0	4.7	37.3	2.58	28.1	4.2	41.7	3.1	
	9.0	3.3	7.6	39.7	28.2	1.83	46.3	21.7	60.3	1.5	9.0	3.3	7.6	38.2	2.60	29.0	4.3	43.6	3.2	
60	4.5	1.0	2.4	37.4	26.7	2.13	45.0	17.5	80.0	2.5	4.5	1.0	2.4	39.7	2.64	30.4	4.4	46.5	3.5	
	6.8	1.8	4.2	38.2	27.2	2.01	45.4	19.0	73.4	2.3	6.8	1.8	4.2	41.8	2.70	32.2	4.5	50.5	3.6	
	9.0	3.0	6.9	38.6	27.4	1.96	45.6	19.7	70.1	2.1	9.0	3.0	6.9	42.9	2.73	33.2	4.6	52.6	3.7	
70	4.5	1.0	2.2	35.9	26.0	2.34	44.3	15.4	89.7	3.4	4.5	1.0	2.2	44.0	2.77	34.2	4.7	54.8	4.1	
	6.8	1.7	4.0	36.9	26.4	2.20	44.7	16.8	83.2	3.1	6.8	1.7	4.0	46.3	2.84	36.3	4.8	59.3	4.2	
	9.0	2.8	6.5	37.4	26.7	2.13	45.0	17.5	80.0	2.9	9.0	2.8	6.5	47.6	2.88	37.3	4.8	61.7	4.3	
80	4.5	0.9	2.1	34.4	25.3	2.58	43.6	13.3	99.4	4.4	4.5	0.9	2.1	48.3	2.90	38.0	4.9	63.1	4.7	
	6.8	1.7	4.0	35.4	25.7	2.42	44.0	14.7	92.9	4.1	6.8	1.7	4.0	50.8	2.99	40.2	5.0	68.2	4.8	
	9.0	2.7	6.3	35.9	25.9	2.34	44.2	15.3	89.8	3.7	9.0	2.7	6.3	52.1	3.04	41.3	5.0	70.8	5.0	
90	4.5	0.9	2.1	32.7	24.6	2.86	42.8	11.4	109.0	5.6	4.1	0.7	1.6	51.8	3.15	41.0	4.8	70.0	5.4	
	6.8	1.7	3.9	33.8	25.0	2.67	43.3	12.6	102.7	5.1										
	9.0	2.7	6.2	34.3	25.2	2.59	43.5	13.3	99.7	4.7										
100	4.5	0.9	2.1	30.8	24.0	3.18	42.1	9.7	118.7	6.9	2.7	0.1	0.2	51.8	3.15	41.0	4.8	70.0	5.4	
	6.8	1.7	3.9	32.0	24.4	2.97	42.6	10.8	112.5	6.3										
	9.0	2.7	6.1	32.6	24.6	2.88	42.8	11.3	109.5	5.7										
110	4.5	0.9	2.0	28.9	23.3	3.53	41.4	8.2	128.4	8.3	2.1	0.1	0.2	51.8	3.15	41.0	4.8	70.0	5.4	
	6.8	1.6	3.6	30.1	23.7	3.30	41.8	9.1	122.3	7.6										
	9.0	2.6	5.9	30.7	23.9	3.20	42.1	9.6	119.3	6.9										
120	4.5	0.8	1.8	26.8	22.7	3.91	40.7	6.8	138.1	9.9	1.6	0.1	0.2	51.8	3.15	41.0	4.8	70.0	5.4	
	6.8	1.4	3.1	28.1	23.1	3.67	41.1	7.6	132.1	9.0										
	9.0	2.4	5.6	28.7	23.3	3.56	41.3	8.1	129.2	8.2										

- Interpolation is permissible; extrapolation is not.
- All entering air conditions are 80°F (26.6°C) DB and 67°F (19.4°C) WB in cooling, and 70°F (21°C) DB in heating.
- AHRI/ISO certified conditions are 80.6°F (27°C) DB and 66.2°F (19°C) WB in cooling and 68°F (20°C) DB in heating.
- Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
- All performance is based upon the lower voltage of dual voltage rated units.
- Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
- Operation below 40°F (10.0°C) EWT is based upon 20% methanol antifreeze solution.
- Operation below 60°F (15.5°C) EWT requires optional insulated water/refrigerant circuit.
- See performance correction tables for operating conditions other than those listed above.
- See Performance Data Selection Notes for operation in the shaded areas.
- Regular Cooling operation with an EWT of less than 50°F (10.0°C) is not recommended unless variable water flow is available.
- Regular Heating operation with an EWT of more than 90°F (32°C) is not recommended unless variable water flow is available.
- For quiet operation and long term reliability, it is recommended that systems be designed to avoid continuous operation in the outlined areas.
- Performance capacities shown in thousands of Btuh
- Hot Water Generator Capacity is based on 90°F entering water and 0.5 GPM/Ton.

Performance Data

MZ*042 EC Blower Motor (Full Load)

Models:
MZ
024-060

1350 CFM Rated Airflow

EWT °F	GPM	WPD		COOLING - EAT 80/67°F							GPM	WPD		HEATING - EAT 70°F						
		PSI	FT	TC	SC	kW	HR	EER	LWT	HWG Cap		PSI	FT	HC	kW	HE	COP	LWT	HWG Cap	
20	Operation Not Recommended										10.5	4.9	11.2	27.7	2.78	17.8	2.9	16.6	3.3	
30	3.6	0.4	0.9	47.2	32.7	2.14	54.5	22.0	60.0	2.3	5.3	1.4	3.1	30.1	2.85	19.9	3.1	22.4	3.3	
											7.9	2.7	6.3	31.1	2.87	20.9	3.2	24.7	3.4	
											10.5	4.3	10.0	31.7	2.88	21.5	3.2	25.9	3.5	
40	5.3	1.2	2.8	45.9	31.6	2.15	53.2	21.3	60.0	2.3	5.3	1.2	2.9	34.3	2.93	23.9	3.4	30.9	3.6	
											7.9	2.5	5.7	35.8	2.96	25.3	3.6	33.6	3.7	
											10.5	4.0	9.2	36.7	2.97	26.1	3.6	35.0	3.8	
50	5.3	1.2	2.7	46.5	32.5	2.27	54.6	20.5	70.8	2.7	5.3	1.2	2.7	39.1	3.01	28.4	3.8	39.2	4.0	
	7.9	2.3	5.3	46.2	32.0	2.13	53.8	21.7	63.6	2.5	7.9	2.3	5.3	41.0	3.04	30.2	4.0	42.4	4.1	
	10.5	3.7	8.6	45.9	31.6	2.07	53.2	22.2	60.1	2.3	10.5	3.7	8.6	42.1	3.06	31.2	4.0	44.1	4.2	
60	5.3	1.1	2.6	46.2	32.6	2.50	55.1	18.5	81.0	3.2	5.3	1.1	2.6	44.1	3.09	33.1	4.2	47.4	4.3	
	7.9	2.2	5.1	46.5	32.6	2.34	54.8	19.9	73.9	3.0	7.9	2.2	5.1	46.4	3.13	35.3	4.4	51.1	4.5	
	10.5	3.6	8.2	46.5	32.5	2.26	54.6	20.5	70.4	2.7	10.5	3.6	8.2	47.7	3.15	36.5	4.4	53.1	4.6	
70	5.3	1.1	2.6	45.1	32.1	2.77	54.9	16.3	90.9	3.9	5.3	1.1	2.6	49.2	3.17	37.9	4.5	55.6	4.8	
	7.9	2.1	4.9	45.9	32.5	2.58	55.1	17.8	83.9	3.6	7.9	2.1	4.9	51.7	3.22	40.3	4.7	59.8	4.9	
	10.5	3.5	8.0	46.2	32.6	2.49	55.1	18.6	80.5	3.3	10.5	3.5	8.0	53.1	3.25	41.5	4.8	62.1	5.1	
80	5.3	1.1	2.6	43.5	31.2	3.08	54.4	14.1	100.7	4.8	5.3	1.1	2.6	54.1	3.27	42.4	4.8	63.8	5.3	
	7.9	2.1	4.9	44.7	31.9	2.85	54.8	15.7	93.9	4.5	7.9	2.1	4.9	56.7	3.33	44.8	5.0	68.7	5.4	
	10.5	3.4	7.8	45.2	32.1	2.75	55.0	16.4	90.5	4.0	10.5	3.4	7.8	58.0	3.36	46.0	5.1	71.2	5.6	
90	5.3	1.1	2.6	41.4	30.2	3.45	53.6	12.0	110.4	6.0	4.6	0.8	1.8	57.5	3.48	45.6	4.8	70.0	5.9	
	7.9	2.1	4.8	42.9	30.9	3.18	54.2	13.5	103.7	5.5										
	10.5	3.3	7.7	43.5	31.3	3.07	54.4	14.2	100.4	5.0										
100	5.3	1.1	2.5	38.9	28.9	3.88	52.7	10.0	120.1	7.4	3.0	0.1	0.2	57.5	3.48	45.6	4.8	70.0	5.9	
	7.9	2.0	4.6	40.6	29.8	3.58	53.3	11.4	113.5	6.8										
	10.5	3.2	7.5	41.4	30.2	3.44	53.6	12.0	110.2	6.1										
110	5.3	1.0	2.3	36.3	27.7	4.40	51.9	8.2	129.8	8.9	2.3	0.1	0.2	57.5	3.48	45.6	4.8	70.0	5.9	
	7.9	1.9	4.4	38.1	28.5	4.05	52.5	9.4	123.3	8.2										
	10.5	3.1	7.1	39.0	28.9	3.88	52.7	10.0	120.0	7.5										
120	5.3	0.8	1.9	33.5	26.5	5.01	51.3	6.7	139.6	10.8	1.8	0.1	0.2	57.5	3.48	45.6	4.8	70.0	5.9	
	7.9	1.7	3.9	35.4	27.3	4.60	51.7	7.7	133.1	9.9										
	10.5	2.9	6.6	36.3	27.7	4.41	51.9	8.2	129.9	9.0										

- Interpolation is permissible; extrapolation is not.
- All entering air conditions are 80°F (26.6°C) DB and 67°F (19.4°C) WB in cooling, and 70°F (21°C) DB in heating.
- AHRI/ISO certified conditions are 80.6°F (27°C) DB and 66.2°F (19°C) WB in cooling and 68°F (20°C) DB in heating.
- Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
- All performance is based upon the lower voltage of dual voltage rated units.
- Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
- Operation below 40°F (10.0°C) EWT is based upon 20% methanol antifreeze solution.
- Operation below 60°F (15.5°C) EWT requires optional insulated water/refrigerant circuit.
- See performance correction tables for operating conditions other than those listed above.
- See Performance Data Selection Notes for operation in the shaded areas.
- Regular Cooling operation with an EWT of less than 50°F (10.0°C) is not recommended unless variable water flow is available.
- Regular Heating operation with an EWT of more than 90°F (32°C) is not recommended unless variable water flow is available.
- For quiet operation and long term reliability, it is recommended that systems be designed to avoid continuous operation in the outlined areas.
- Performance capacities shown in thousands of Btuh
- Hot Water Generator Capacity is based on 90°F entering water and 0.5 GPM/Ton.

Models:
MZ
024-060

Performance Data

MZ*048 EC Blower Motor (Full Load)

1550 CFM Rated Airflow

EWT °F	GPM	WPD		COOLING - EAT 80/67°F							GPM	WPD		HEATING - EAT 70°F						
		PSI	FT	TC	SC	kW	HR	EER	LWT	HWG Cap		PSI	FT	HC	kW	HE	COP	LWT	HWG Cap	
20	Operation Not Recommended										12.0	5.2	12.1	33.3	3.03	22.5	3.2	16.2	3.4	
30	4.1	0.2	0.6	53.3	38.3	2.45	61.6	21.7	60.0	1.8	6.0	1.4	3.2	36.5	3.13	25.4	3.4	21.5	3.4	
											9.0	3.0	6.8	37.9	3.17	26.7	3.5	24.1	3.5	
											12.0	4.9	11.3	38.7	3.19	27.4	3.6	25.4	3.6	
40	6.1	1.3	3.0	52.6	38.3	2.38	60.7	22.1	60.0	1.8	6.0	1.3	3.0	41.3	3.26	29.8	3.7	30.1	3.6	
											9.0	2.8	6.4	43.0	3.30	31.3	3.8	33.1	3.7	
											12.0	4.6	10.6	43.9	3.32	32.0	3.9	34.7	3.8	
50	6.0	1.2	2.9	51.6	37.8	2.54	60.6	20.3	70.2	2.4	6.0	1.2	2.9	46.0	3.37	34.0	4.0	38.7	3.9	
	9.0	2.6	6.0	52.3	38.1	2.38	60.7	22.0	63.5	2.2	9.0	2.6	6.0	47.8	3.42	35.7	4.1	42.1	4.0	
	12.0	4.4	10.1	52.6	38.3	2.29	60.7	22.9	60.1	2.0	12.0	4.4	10.1	48.8	3.44	36.6	4.2	43.9	4.1	
60	6.0	1.2	2.7	50.1	37.3	2.77	60.0	18.1	80.0	3.0	6.0	1.2	2.7	50.5	3.48	38.2	4.3	47.3	4.2	
	9.0	2.4	5.6	51.2	37.7	2.61	60.4	19.6	73.4	2.8	9.0	2.4	5.6	52.5	3.52	40.0	4.4	51.1	4.3	
	12.0	4.2	9.6	51.6	37.9	2.53	60.6	20.4	70.1	2.5	12.0	4.2	9.6	53.6	3.55	41.0	4.4	53.2	4.5	
70	6.0	1.1	2.6	48.3	36.7	3.01	59.0	16.0	89.7	3.8	6.0	1.1	2.6	55.0	3.58	42.3	4.5	55.9	4.6	
	9.0	2.3	5.4	49.6	37.1	2.85	59.7	17.4	83.3	3.5	9.0	2.3	5.4	57.3	3.63	44.4	4.6	60.1	4.7	
	12.0	4.0	9.2	50.1	37.3	2.77	60.0	18.1	80.0	3.2	12.0	4.0	9.2	58.5	3.66	45.5	4.7	62.4	4.8	
80	6.0	1.1	2.5	46.2	35.9	3.30	57.9	14.0	99.3	4.8	6.0	1.1	2.4	59.6	3.69	46.5	4.7	64.5	5.0	
	9.0	2.2	5.2	47.6	36.5	3.11	58.6	15.3	93.0	4.4	9.0	2.2	5.2	62.1	3.75	48.8	4.9	69.2	5.1	
	12.0	3.8	8.8	48.3	36.7	3.02	59.0	16.0	89.8	4.0	12.0	3.8	8.8	63.5	3.79	50.1	4.9	71.7	5.2	
90	6.0	1.0	2.4	43.8	35.0	3.66	56.8	12.0	108.9	6.0	4.9	0.5	1.1	62.5	3.91	49.2	4.7	70.0	5.5	
	9.0	2.1	5.0	45.4	35.6	3.42	57.5	13.3	102.8	5.5										
	12.0	3.6	8.4	46.1	35.9	3.31	57.9	13.9	99.6	5.0										
100	6.0	1.0	2.3	41.3	33.8	4.11	55.9	10.1	118.6	7.3	3.3	0.1	0.2	62.5	3.91	49.2	4.7	70.0	5.5	
	9.0	2.1	4.8	42.9	34.5	3.81	56.5	11.3	112.5	6.7										
	12.0	3.5	8.0	43.7	34.9	3.68	56.8	11.9	109.5	6.1										
110	6.0	1.0	2.3	38.7	32.4	4.69	55.4	8.3	128.5	8.8	2.5	0.1	0.2	62.5	3.91	49.2	4.7	70.0	5.5	
	9.0	2.0	4.5	40.3	33.3	4.31	55.7	9.4	122.4	8.1										
	12.0	3.3	7.6	41.2	33.7	4.14	55.9	9.9	119.3	7.4										
120	6.0	1.0	2.3	36.1	30.7	5.43	55.4	6.6	138.5	10.5	2.0	0.1	0.2	62.5	3.91	49.2	4.7	70.0	5.5	
	9.0	1.9	4.3	37.7	31.8	4.95	55.3	7.6	132.3	9.7										
	12.0	3.1	7.1	38.5	32.2	4.74	55.4	8.1	129.2	8.8										

- Interpolation is permissible; extrapolation is not.
- All entering air conditions are 80°F (26.6°C) DB and 67°F (19.4°C) WB in cooling, and 70°F (21°C) DB in heating.
- AHRI/ISO certified conditions are 80.6°F (27°C) DB and 66.2°F (19°C) WB in cooling and 68°F (20°C) DB in heating.
- Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
- All performance is based upon the lower voltage of dual voltage rated units.
- Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
- Operation below 40°F (10.0°C) EWT is based upon 20% methanol antifreeze solution.
- Operation below 60°F (15.5°C) EWT requires optional insulated water/refrigerant circuit.
- See performance correction tables for operating conditions other than those listed above.
- See Performance Data Selection Notes for operation in the shaded areas.
- Regular Cooling operation with an EWT of less than 50°F (10.0°C) is not recommended unless variable water flow is available.
- Regular Heating operation with an EWT of more than 90°F (32°C) is not recommended unless variable water flow is available.
- For quiet operation and long term reliability, it is recommended that systems be designed to avoid continuous operation in the outlined areas.
- Performance capacities shown in thousands of Btuh
- Hot Water Generator Capacity is based on 90°F entering water and 0.5 GPM/Ton.

Performance Data

MZ*060 EC Blower Motor (Full Load)

Models:
MZ
024-060

1900 CFM Rated Airflow

EWT °F	GPM	WPD		COOLING - EAT 80/67°F							GPM	WPD		HEATING - EAT 70°F						
		PSI	FT	TC	SC	kW	HR	EER	LWT	HWG Cap		PSI	FT	HC	kW	HE	COP	LWT	HWG Cap	
20	Operation Not Recommended										15.0	9.0	20.7	38.8	3.58	26.1	3.2	16.5	4.1	
30	5.0	0.7	1.6	65.3	44.8	2.97	75.4	22.0	60.0	2.5	7.5	2.6	6.1	42.3	3.65	29.3	3.4	22.2	4.2	
											11.3	5.1	11.8	43.8	3.69	30.7	3.5	24.5	4.3	
											15.0	8.2	19.0	44.6	3.70	31.5	3.5	25.8	4.4	
40	7.5	2.3	5.3	64.3	44.4	2.99	74.5	21.5	60.0	2.5	7.5	2.4	5.6	47.9	3.77	34.5	3.7	30.8	4.5	
											11.3	4.8	11.0	49.8	3.81	36.3	3.8	33.6	4.6	
											15.0	7.6	17.6	50.8	3.84	37.2	3.9	35.0	4.7	
50	7.5	2.3	5.2	63.6	44.0	3.11	74.7	20.5	69.9	3.4	7.5	2.3	5.2	53.8	3.90	39.9	4.0	39.3	4.8	
	11.3	4.4	10.3	64.2	44.3	2.94	74.6	21.8	63.3	3.1	11.3	4.4	10.3	56.0	3.95	42.0	4.2	42.5	4.9	
	15.0	7.2	16.5	64.3	44.4	2.87	74.5	22.4	59.9	2.8	15.0	7.2	16.5	57.2	3.98	43.1	4.2	44.3	5.1	
60	7.5	2.1	4.9	62.3	43.5	3.39	74.3	18.4	79.8	4.0	7.5	2.1	4.9	59.8	4.03	45.5	4.3	47.9	5.2	
	11.3	4.2	9.7	63.3	43.9	3.20	74.6	19.8	73.3	3.7	11.3	4.2	9.7	62.4	4.09	47.8	4.5	51.5	5.4	
	15.0	6.8	15.7	63.6	44.0	3.11	74.7	20.5	70.0	3.4	15.0	6.8	15.7	63.7	4.12	49.1	4.5	53.5	5.5	
70	7.5	2.0	4.7	60.3	42.6	3.71	73.5	16.3	89.6	4.9	7.5	2.0	4.7	65.8	4.17	51.0	4.6	56.4	5.7	
	11.3	4.0	9.2	61.7	43.2	3.49	74.1	17.7	83.2	4.5	11.3	4.0	9.2	68.7	4.24	53.6	4.7	60.5	5.8	
	15.0	6.5	15.0	62.3	43.4	3.39	74.3	18.4	79.9	4.1	15.0	6.5	15.0	70.2	4.28	55.0	4.8	62.7	6.0	
80	7.5	2.0	4.5	57.8	41.6	4.08	72.4	14.2	99.3	5.9	7.5	2.0	4.5	71.8	4.32	56.5	4.9	64.9	6.2	
	11.3	3.8	8.8	59.5	42.3	3.83	73.1	15.5	93.0	5.5	11.3	3.8	8.8	74.9	4.40	59.3	5.0	69.5	6.4	
	15.0	6.3	14.5	60.3	42.6	3.72	73.5	16.2	89.8	5.0	15.0	6.3	14.4	76.5	4.44	60.8	5.1	71.9	6.6	
90	7.5	1.9	4.3	55.0	40.4	4.51	71.0	12.2	108.9	7.2	6.0	0.9	2.2	75.3	4.59	59.7	4.8	70.0	7.0	
	11.3	3.7	8.5	56.9	41.2	4.23	71.9	13.4	102.8	6.6										
	15.0	6.1	14.0	57.8	41.6	4.10	72.3	14.1	99.6	6.0										
100	7.5	1.8	4.2	51.8	39.1	5.01	69.6	10.3	118.6	8.8	4.0	0.1	0.2	75.3	4.59	59.7	4.8	70.0	7.0	
	11.3	3.6	8.2	53.8	39.9	4.69	70.5	11.5	112.5	8.0										
	15.0	5.9	13.5	54.8	40.3	4.54	71.0	12.1	109.5	7.3										
110	7.5	1.7	4.0	48.4	37.6	5.59	68.3	8.7	128.2	10.5	3.0	0.1	0.2	75.3	4.59	59.7	4.8	70.0	7.0	
	11.3	3.4	7.9	50.5	38.5	5.22	69.1	9.7	122.3	9.6										
	15.0	5.6	13.0	51.6	39.0	5.05	69.5	10.2	119.3	8.8										
120	7.5	1.6	3.8	44.9	35.9	6.25	67.1	7.2	137.9	12.5	2.4	0.1	0.2	75.3	4.59	59.7	4.8	70.0	7.0	
	11.3	3.3	7.5	47.0	36.9	5.84	67.8	8.1	132.1	11.5										
	15.0	5.4	12.5	48.1	37.4	5.64	68.2	8.5	129.1	10.4										

- Interpolation is permissible; extrapolation is not.
- All entering air conditions are 80°F (26.6°C) DB and 67°F (19.4°C) WB in cooling, and 70°F (21°C) DB in heating.
- AHRI/ISO certified conditions are 80.6°F (27°C) DB and 66.2°F (19°C) WB in cooling and 68°F (20°C) DB in heating.
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- All performance is based upon the lower voltage of dual voltage rated units.
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- See performance correction tables for operating conditions other than those listed above.
- See Performance Data Selection Notes for operation in the shaded areas.
- Regular Cooling operation with an EWT of less than 50°F (10.0°C) is not recommended unless variable water flow is available.
- Regular Heating operation with an EWT of more than 90°F (32°C) is not recommended unless variable water flow is available.
- For quiet operation and long term reliability, it is recommended that systems be designed to avoid continuous operation in the outlined areas.
- Performance capacities shown in thousands of Btuh
- Hot Water Generator Capacity is based on 90°F entering water and 0.5 GPM/Ton.

Models:
MZ
024-060

Full Load Performance: Correction Tables

Cooling Correction

Entering Air WB °F	Total Capacity	Sensible Cooling Capacity Multipliers - Entering DB °F						Power	Heat of Rejection
		65	70	75	80	85	90		
50	0.730	1.137	*	*	*	*	*	0.944	0.786
55	0.809	0.913	1.117	*	*	*	*	0.960	0.849
60	0.889	0.689	0.894	*	*	*	*	0.977	0.912
65	0.968		0.672	0.877	1.087	1.287	*	0.993	0.975
67	1.000		0.583	0.788	1.000	1.199	1.404	1.000	1.000
70	1.048			0.655	0.869	1.067	1.272	1.010	1.038
75	1.127				0.650	0.847	1.053	1.027	1.101

Notes:

- AHRI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling - 80.6°F (27°C) DB/ 66.2°F (19°C) WB, and Heating 68°F (20°C) DB/ 59°F (15°C) WB entering air temperature.
- Asterisks indicate that no correction factor is needed, Total Capacity equals Sensible capacity.
- Entering DB temperature range is based on operating limits, not on commission limits.
- Cooling and heating air corrections based on rated airflow.

Entering Air Heating Correction

Entering Air WB °F	Heating Capacity	Power	Heat of Rejection
50	1.026	0.807	1.103
55	1.019	0.855	1.077
60	1.013	0.904	1.052
65	1.006	0.952	1.026
70	1.000	1.000	1.000
75	0.994	1.048	0.974
80	0.987	1.096	0.948

Airflow Correction

% of Rated	Heating			Cooling				
	Heating Capacity	Power	Heat of Extraction	Total Capacity	Sensible Capacity	S/T	Power	Heat of Rejection
80	0.963	1.008	0.965	0.975	0.913	0.936	0.937	0.974
85	0.972	1.006	0.974	0.981	0.935	0.952	0.952	0.980
90	0.981	1.004	0.983	0.988	0.956	0.968	0.968	0.987
95	0.991	1.002	0.991	0.994	0.978	0.984	0.984	0.993
100	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
105	1.009	0.998	1.009	1.006	1.022	1.015	1.016	1.007
110	1.019	0.996	1.017	1.012	1.044	1.031	1.032	1.013

Preventative Maintenance

WATER COIL MAINTENANCE (WATER LOOP APPLICATIONS)

Generally water coil maintenance is not needed for closed loop systems. However, if the piping is known to have high dirt or debris content, it is best to establish a periodic maintenance schedule with the owner so the water coil can be checked regularly. Dirty installations are typically the result of deterioration of iron or galvanized piping or components in the system. Open cooling towers requiring heavy chemical treatment and mineral buildup through water use can also contribute to higher maintenance. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with both the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. However, flow rates over 3 GPM per ton (3.9 l/m per kW) can produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

HOT WATER GENERATOR COILS

See water coil maintenance for ground water units. If the potable water is hard or not chemically softened, the high temperatures of the desuperheater will tend to scale even quicker than the water coil and may need more frequent inspections. In areas with extremely hard water, a HWG is not recommended.

FILTERS

Filters must be clean to obtain maximum performance. Filters should be inspected every month under normal operating conditions and be replaced when necessary. Units should never be operated without a filter.

CONDENSATE DRAIN

In areas where airborne bacteria may produce a slimy substance in the drain pan, it may be necessary to treat the drain pan chemically with an algicide approximately every three months to minimize the problem. The condensate pan may also need to be cleaned periodically to ensure indoor air quality. The condensate drain can pick up lint and dirt, especially with dirty filters. Inspect the drain twice a year to avoid the possibility of plugging and eventual overflow.

COMPRESSOR

Conduct annual amperage checks to ensure that amp draw is no more than 10% greater than indicated on the serial dataplate.

AIR COIL

The air coil must be cleaned to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum clean. Care must be taken not to damage the aluminum fins while cleaning.

CAUTION

Fin edges are sharp and may cause injury.

CABINET

Do not allow water to stay in contact with the cabinet for long periods of time to prevent corrosion of the cabinet sheet metal. Generally, vertical cabinets are set up from the floor a few inches (7 - 8 cm) to prevent water from entering the cabinet. The cabinet can be cleaned using a mild detergent.

REPAIRS TO SEALED COMPONENTS

Sealed electrical components shall be replaced.

Troubleshooting

GENERAL

If operational difficulties are encountered, perform the preliminary checks below before referring to the troubleshooting charts.

- Verify that the unit is receiving electrical supply power
- Make sure the fuses in the fused disconnect switches are intact

After completing the preliminary checks described above, inspect for other obvious problems such as leaking connections, broken or disconnected wires, etc. If everything appears to be in order, but the unit still fails to operate properly, refer to the “DXM2.5 Troubleshooting Process Flowchart” or “Functional Troubleshooting Chart.”

DXM2.5

DXM2.5 troubleshooting in general is best summarized as verifying inputs and outputs. After inputs and outputs have been verified, board operation is confirmed and the problem must be elsewhere. Below are some general guidelines for troubleshooting the DXM2.5.

FIELD INPUTS

Conventional thermostat inputs are 24VAC from the thermostat and can be verified using a voltmeter between C and Y1, Y2, W, O, G. 24VAC will be present at the terminal (for example, between “Y1” and “C”) if the thermostat is sending an input to the DXM2.5.

Proper communications with a thermostat can be verified using the Fault LED on the DXM2.5. If the control is NOT in the Test mode and is NOT currently locked out or in a retry delay, the Fault LED on the DXM2.5 will flash very slowly (1 second on, 5 seconds off), if the DXM2.5 is properly communicating with the thermostat.

SENSOR INPUTS

All sensor inputs are ‘paired wires’ connecting each component to the board. Therefore, continuity on pressure switches, for example can be checked at the board connector. The thermistor resistance should be measured with the connector removed so that only the impedance of the thermistor is measured.

OUTPUTS

The compressor and reversing valve relays are 24VAC and can be verified using a voltmeter. For units with EC blower motors, the DXM2.5 controls the motor using serial communications, and troubleshooting should be done with the Wireless Service Tool. The alarm relay can either be 24VAC as shipped or dry contacts for use with DDC controls by clipping the JW1 jumper. Electric heat outputs are 24VDC “ground sinking” and require a voltmeter set for DC to verify operation. The terminal marked “24VDC” is the 24VDC supply to the electric heat board; terminal “EH1” is stage 1 electric heat; terminal “EH2” is stage 2 electric heat. When electric heat is energized (thermostat is sending a “W” input to the DXM2.5), there will be 24VDC between terminal “24VDC” and “EH1” (stage 1 electric heat) and/or “EH2” (stage 2 electric heat). A reading of 0VDC between “24VDC” and “EH1” or “EH2” will indicate that the DXM2.5 board is NOT sending an output signal to the electric heat board.

TEST MODE

Test mode can be entered for 20 minutes by pressing the Test pushbutton. The DXM2.5 automatically exits test mode after 20 minutes.

WARNING

HAZARDOUS VOLTAGE! DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.

Failure to disconnect power before servicing can cause severe personal injury or death.

Troubleshooting

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ADVANCED DIAGNOSTICS

If the Wireless Service Tool (AWST) is connected to the DXM2.5, additional diagnostic information and troubleshooting capabilities are available. The current status of all DXM2.5 inputs can be verified, including the current temperature readings of all temperature inputs. In the manual operating mode, most DXM2.5 outputs can be directly controlled for system troubleshooting. For more detailed information on the advanced diagnostics of the DXM2.5, see the DXM2.5 Application, Operation and Maintenance (AOM) manual (part #97B0142N01).

DXM2.5 TROUBLESHOOTING PROCESS FLOWCHART/FUNCTIONAL TROUBLESHOOTING CHART

The DXM2.5 Functional Troubleshooting Process Flowchart is a quick overview of how to start diagnosing a suspected problem using the fault recognition features of the DXM2.5. The Functional Troubleshooting Chart on the following page is a more comprehensive method for identifying a number of malfunctions that may occur and is not limited to just the DXM2.5. Within the chart are five columns:

- The Fault column describes the symptoms.
- Columns 2 and 3 identify in which mode the fault is likely to occur, heating or cooling.
- The “Possible Cause column” identifies the most likely sources of the problem.
- The “Solution” column describes what should be done to correct the problem.

Models:
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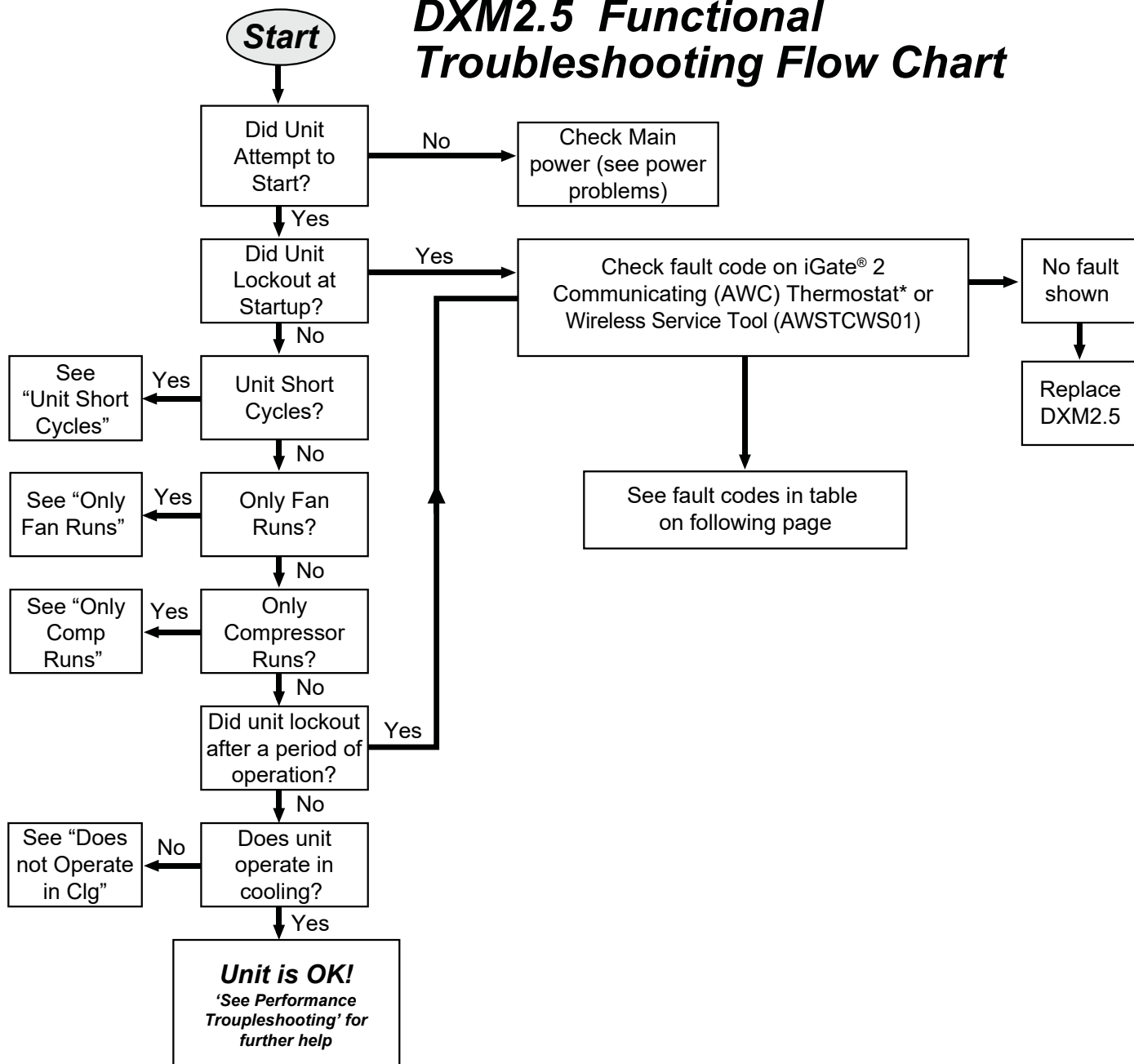
DXM2.5 Functional Troubleshooting Flow Chart

⚠ WARNING

HAZARDOUS VOLTAGE! DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.

Failure to disconnect power before servicing can cause severe personal injury or death.

DXM2.5 Functional Troubleshooting Flow Chart



Functional Troubleshooting

Models:
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Fault	Htg	Cig	Possible Cause	Solution
Main power problems	X	X	Green Status LED Off	Check line voltage circuit breaker and disconnect.
				Check for line voltage between L1 and L2 on the contactor.
				Check for 24VAC between R and C on CXM2/DXM2.5.
				Check primary/secondary voltage on transformer.
HP Fault Code 2 High Pressure		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting. Check water flow adjust to proper flow rate.
		X	Water Temperature out of range in cooling	Bring water temp within design parameters.
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Dirty Air Coil - construction dust etc.
				Too high of external static? Check static vs blower table.
	X		Air temperature out of range in heating	Bring return air temp within design parameters.
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table.
LP/LOC Fault Code 3 Low Pressure / Loss of Charge	X	X	Bad HP Switch	Check switch continuity and operation. Replace.
	X	X	Insufficient charge	Check for refrigerant leaks.
	X		Compressor pump down at startup	Check charge and startup water flow.
LT1 Fault Code 4 Water coil low- temperature limit	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting. Plugged strainer or filter? Clean or replace. Check water flow. Adjust to proper flow rate.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X		Improper temperature limit setting (30°F vs 10°F [-1°C vs -2°C])	Clip JW3 jumper for antifreeze (10°F [-12°C]) use.
	X		Water Temperature out of range	Bring water temp within design parameters.
LT2 Fault Code 5 Air coil low-temperature limit	X	X	Bad thermistor	Check temp and impedance correlation per chart.
		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. Too high of external static? Check static vs blower table.
		X	Air Temperature out of range	Too much cold vent air? Bring entering air temp within design parameters.
	X	X	Improper temperature limit setting (30°F vs 10°F [-1°C vs -12°C])	Normal air-side applications will require 30°F (-1°C) only.
Condensate Fault Code 6	X	X	Blocked drain	Check temp and impedance correlation per chart.
	X	X	Improper trap	Check for blockage and clean drain.
		X	Poor drainage	Check trap dimensions and location ahead of vent. Check for piping slope away from unit. Check slope of unit toward outlet. Poor venting? Check vent location.
		X	Moisture on sensor	Check for moisture shorting to air coil.
	X	X	Plugged air filter	Replace air filter.
Over/Under Voltage Code 7 (Auto resetting)	X	X	Under Voltage	Find and eliminate restriction. Increase return duct and/or grille size.
				Check power supply and 24VAC voltage before and during operation.
				Check power supply wire size.
				Check compressor starting. Need hard start kit?
	X	X	Over Voltage	Check 24VAC and unit transformer. Tap for correct power supply voltage.
				Check power supply voltage and 24VAC before and during operation. Check 24VAC and unit transformer. Tap for correct power supply voltage.

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Functional Troubleshooting

Table continued from previous page

Fault	Htg	Clg	Possible Cause	Solution
Unit Performance Sentinel Code 8	X		Heating mode LT2>125°F (52°C)	Check for poor airflow or overcharged unit.
		X	Cooling Mode LT1>125°F (52°C) OR LT2< 40°F (4°C)	Check for poor water flow or airflow.
Swapped Thermistor Code 9	X	X	LT1 and LT2 swapped	Reverse position of thermistors
Low Water Flow Code 13	X	X	Reduced or no water flow	Check pump or valve operation setting.
				Check water flow and adjust to proper flow rate.
				Clogged Y strainer, replace mesh.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X	X	Bad flow switch	Confirm applied flow to looks vs minimum flow switch setpoint on label.
Leaving Water Temperature Low Code 14	X		Reduced or no water flow in heating	Check pump or valve operation setting.
				Check water flow and adjust to proper flow rate.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X		Improper temperature limit setting (30°F vs 15°F [-1°C vs -9°C])	Clip JW3 jumper for antifreeze (15°F [-9°C]) use.
	X		Water temperature out of range	Bring water temperature within design parameters.
	X	X	Bad thermistor	Check temperature impedance correlation per chart.
Refrigerant and RDS Code 15	X	X	Refrigerant Leak	Check refrigerant charge. If the charge is low, identify and repair the leak.
			Faulty RDS sensor	Check refrigerant charge. If the charge is not low, replace the RDS sensor.
No Fault Code Shown	X	X	No compressor operation	See "Only Fan Runs".
	X	X	Compressor overload	Check and replace, if necessary.
	X	X	Control board	Reset power and check operation.
Unit Short Cycles	X	X	Dirty air filter	Check and clean air filter.
	X	X	Unit in "test mode"	Reset power or wait 30 minutes for auto exit.
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.
	X	X	Compressor overload	Check and replace, if necessary.
Only Fan Runs	X	X	Thermostat position	Ensure thermostat set for heating or cooling operation.
	X	X	Unit locked out	Check for lockout codes. Reset power.
	X	X	Compressor Overload	Check compressor overload. Replace if necessary.
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode.
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation.
	X	X		Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode.
	X	X	Fan motor relay	Jumper G and R for fan operation.
	X	X		Check for line voltage across BR contacts.
	X	X	Fan motor	Check fan power enable relay operation (if present).
Unit Doesn't Operate in Cooling		X	Reversing valve	Set for cooling demand and check 24VAC on RV coil and at CXM2/DXM2.5.
		X		If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	Check for 'O' RV setup not 'B'.
		X	Thermostat wiring	Check O wiring at heat pump. Jumper O and R for RV coil 'click'.
		X		Put thermostat in cooling mode. Check 24VAC on O (check between C and O); check for 24VAC on W (check between W and C). There should be voltage on O, but not on W. If voltage is present on W, thermostat may be bad or wired incorrectly.

Performance Troubleshooting

Models:
MZ
024-060

Symptom	Htg	Clg	Possible Cause	Solution
Insufficient capacity/ Not cooling or heating properly	X	X	Dirty filter	Replace or clean.
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static? Check static vs. blower table.
		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static? Check static vs. blower table.
	X	X	Leaky duct work	Check supply and return air temperatures at the unit and at distant duct registers. If significantly different, duct leaks are present.
	X	X	Low refrigerant charge	Check superheat and subcooling per chart.
	X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.
		X	Defective reversing valve	Perform RV touch test.
	X	X	Thermostat improperly located	Check location and for air drafts behind stat.
High Head Pressure	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static? Check static vs. blower table.
		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow. Adjust to proper flow rate.
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture.
	X		Air temperature out of range in heating	Bring return air temperature within design parameters.
		X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Unit overcharged	Check superheat and subcooling. Re-weigh in charge.
	X	X	Non-condensables in system	Vacuum system and re-weigh in charge.
Low Suction Pressure			Reduced water flow in heating	Check pump operation or water valve operation/setting.
				Plugged strainer or filter? Clean or replace.
				Check water flow. Adjust to proper flow rate.
	X		Water temperature out of range	Bring water temperature within design parameters.
		X	Reduced airflow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static? Check static vs. blower table.
		X	Air temperature out of range	Too much cold vent air? Bring entering air temperature within design parameters.
	X	X	Insufficient charge	Check for refrigerant leaks.

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Performance Troubleshooting

Table continued from previous page

Symptom	Htg	Clg	Possible Cause	Solution
Low Discharge Air Temperature in Heating	X		Too high of airflow	Check fan motor speed selection and airflow chart.
	X		Poor performance	See 'Insufficient Capacity'
High humidity		X	Too high of airflow	Check fan motor speed selection and airflow chart.
		X	Unit oversized	Recheck loads & sizing. Check sensible cooling load and heat-pump capacity.
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation.
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for line voltage across blower relay contacts.
	X	X	Fan motor	Check fan power. Enable relay operation (if present).
	X	X	Thermostat wiring	Check for line voltage at motor. Check capacitor.
Unit Doesn't Operate in Cooling		X	Reversing valve	Check thermostat wiring at DXM2.5. Put in Test Mode and then jumper Y1 and W1 to R to give call for fan, compressor and electric heat.
		X	Thermostat setup	Set for cooling demand and check 24VAC on RV coil.
		X	Thermostat wiring	If RV is stuck, run high pressure up by reducing water flow and, while operating, engage and disengage RV coil voltage to push valve.
Modulating Valve Troubleshooting	X	X	Improper output setting	For DXM2.5, check for "O" RV setup, not "B".
	X	X	No valve output signal	Check O wiring at heat pump. DXM2.5 requires call for compressor. To get RV coil, "Click".
	X	X	No valve operation	Check O wiring at heat pump. DXM2.5 requires call for compressor. To get RV coil, "Click".

Startup Log Sheet

Models:
MZ
024-060

Installer: Complete *Unit and System Checkout* and follow *Unit Startup Procedures* in the IOM. Use this form to record unit information, temperatures, and pressures during startup. Keep this form for reference.

Job Name: _____

Street Address: _____

Model Number: _____

Serial Number: _____

Unit Location in Building: _____

Date: _____

Sales Order Number: _____

In order to minimize troubleshooting and costly system failures, complete the following checks and data entries before the system is put into full operation.

Fan Motor	Description	Value
CV EC	CFM Setting	

 Temperatures (check one): ☐ °F ☐ °C Antifreeze: _____ %

 Pressures (check one): ☐ PSIG ☐ kPa Type: _____

	Cooling Mode		Heating Mode
Entering Fluid Temperature			
Leaving Fluid Temperature			
Fluid Temperature Differential			
Return-Air Temperature	DB	WB	DB
Supply-Air Temperature	DB	WB	DB
Air Temperature Differential			
Water Coil Heat Exchanger (Water Pressure IN)			
Water Coil Heat Exchanger (Water Pressure OUT)			
Pressure Differential			
Flow Rate GPM (l/s)			
Compressor			
Amps			
Volts			
Discharge Line Temperature			
Motor			
Amps			
Volts			

NOTES:

1. Allow unit to run 15 minutes in each mode before taking data.
2. Never connect refrigerant gauges during startup procedures.
3. Conduct water-side analysis using P/T ports to determine water flow and temperature difference.
4. If water-side analysis shows poor performance, refrigerant troubleshooting may be required.
5. Connect refrigerant gauges as a last resort.

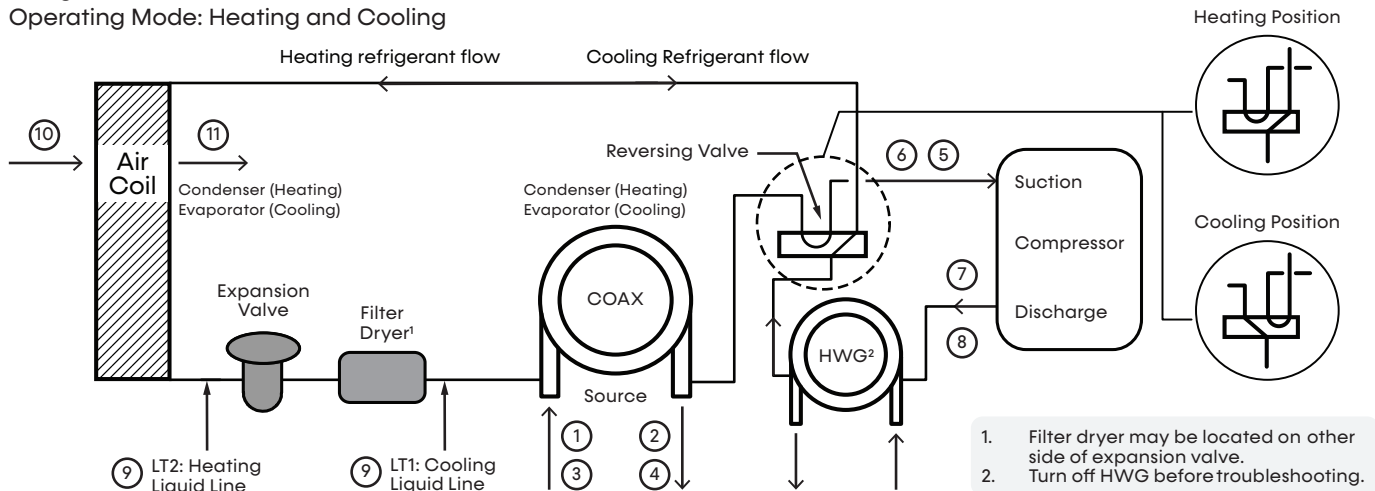
Models:
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Functional Troubleshooting Form

Customer:	Loop Type:	Startup Date:
Model #:	Serial #:	Antifreeze Type: %
Complaint:		

Refrigerant: R-454B

Operating Mode: Heating and Cooling



Description	Heating	Cooling	Notes
Water Side Analysis			
1 Water In Temp.			
2 Water Out Temp.			$\Delta T =$
3 Water In Pressure			
4 Water Out Pressure			
4a Pressure Drop			
4b GPM			

Heat of Extraction (Absorption) or Heat of Rejection:

HE (Btuh) = _____ or HR (Btuh) = _____
 _____ Flow Rate (GPM) x _____ ΔT (°F) x _____ Fluid Factor

Fluid Factor:

500 (Water) 485 (Antifreeze)

Refrigerant Analysis			
5	Suction Temp.		
6	Suction Pressure		
6a	Saturation Temp.		
6b	Superheat		
7	Discharge Temp.		
8	Discharge Pressure		
8a	Saturation Temp.		
8b	Subcooling		
9	Liquid Line Temp		
10	Return Air Temp.		
11	Supply Air Temp.		$\Delta T =$
	Voltage		
	Compress Amps		

Warranty

Models:
MZ
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LIMITED EXPRESS WARRANTY

Congratulations on purchasing your new HVAC equipment. It's been designed for long life and reliable service, and is backed by one of the strongest warranties in the industry. Your unit automatically qualifies for the warranty coverage listed below, providing you keep your proof of purchase (receipt) for the equipment and meet the warranty conditions.

LIMITED TEN (10) YEAR EXPRESS WARRANTY

MARS warrants all parts of the MZ Series residential geothermal heat pump including the compressor to be free from defects in workmanship and materials for normal use and maintenance for ten (10) years from the date of purchase by the original consumer for the original installation. This Express Limited Warranty applies only when the geothermal heat pump is installed as a complete matched system, and only when the system is installed per MARS installation instructions and in accordance with all local, state and national codes for normal use. Thermostats, auxiliary electric heaters, and geothermal pump flow centers purchased through MARS and installed with an MZ geothermal heat pump will be covered by the same ten (10) year express warranty. All other accessories will have one (1) year.

LIMITED FIVE (5) YEAR LABOR ALLOWANCE

Labor is allowed for warranty service for a period of five (5) years from the date of purchase when the unit is properly registered and commissioned according to the start-up procedure specified in the Installation/Operation Manual, and when the Geothermal Start-Up Certification Form is completed and submitted to MARS.

EXCEPTIONS

The Limited Express Warranty does not cover normal maintenance—MARS recommends that regular inspection/maintenance be performed at least once a season and proof of maintenance be kept. Additionally, labor charges, transportation charges for replacement parts, replacement of refrigerant or filters, any other service calls/repairs are not covered by this Limited Warranty. It also does not cover any portion or component of the system that is not supplied by MARS, regardless of the cause of failure of such portion or component.

CONDITIONS FOR WARRANTY COVERAGE

- Unit must be operated according to MARS operating instructions included with the unit and cannot have been subjected to accident, alteration, improper repair, neglect or misuse, or an act of God (such as a flood)
- Installation was done by a trained, licensed or otherwise qualified HVAC dealer/contractor
- Performance cannot be impaired by use of any product not authorized by MARS, or by any adjustments or adaptations to components
- Serial numbers and/or rating plate have not been altered or removed
- Damage has not been a result of inadequate wiring or voltage conditions, use during brown-out conditions, or circuit interruptions
- Air flow around any section of the unit has not been restricted
- Unit remains in the original installation
- Unit was not purchased over the internet

Please visit www.marsdelivers.com
to register your new product



DURATION OF WARRANTY & REGISTRATION

The warranty begins on the date of purchase by the original consumer. The consumer must retain a receipted bill of sale as proof of warranty period. Without this proof, the express warranty begins on the date of shipment from the factory.

REMEDY PROVIDED BY THE LIMITED EXPRESS WARRANTY

The sole remedy under the Limited Warranty is replacement of the defective part. If replacement parts are required within the period of this warranty, MARS replacement parts shall be used; any warranty on the replacement part(s) shall not affect the applicable original unit warranty. Ready access to the unit for service is the owner's responsibility. Labor to diagnose and replace the defective part is not covered by this Limited Express Warranty. If for any reason the replacement part/product is no longer available during the warranty period, MARS shall have the right to allow a credit in the amount of the current suggested retail price of the part/product instead of providing repair or replacement.

LIMITATION OF LIABILITY

- There are no other express or implied warranties. MARS makes no warranty of merchantability. We do not warrant that the unit is suitable for any particular purpose or can be used in buildings or rooms of any particular size or condition except as specifically provided in this document. There are no other warranties, express or implied, which extend beyond the description in this document.
- All warranties implied by law are limited in duration to the seven-year term of the parts warranty. Your exclusive remedy is limited to the replacement of defective parts. **We will not be liable for any consequential or incidental damages caused by any defect in this unit.**
- This warranty gives you specific legal rights and you may also have other rights which vary from state to state. Some states do not allow limitation on how long an implied warranty lasts or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.
- No warranties are made for units sold outside the continental United States and Canada. Your distributor or final seller may provide a warranty on units sold outside these areas.
- MARS will not be liable for damages if our performance regarding warranty resolution is delayed by events beyond our control including accident, alteration, abuse, war, government restrictions, strikes, fire, flood, or other acts of God.

HOW TO OBTAIN WARRANTY SERVICE OR PARTS

If you have a warranty claim, notify your installer promptly. If the installer does not remedy your claim, write to MARS, 1900 Wellworth Ave., Jackson MI 49203. Enclose a report of inspection by your installer or service person. Include model number, serial number, and date of purchase.

Owner responsibilities are set forth in the
instruction manual—read it carefully.

KEEP THIS INFORMATION AS A RECORD OF YOUR PURCHASE

GEOTHERMAL HEAT PUMP

INSTALLATION

Model Number

Installer Name

Serial Number

Phone Number/Contact Information

Date of Purchase

Date Installation Completed

☐ Component of new HVAC system☐ Replacement heat pump only

Remember to retain your bill of sale as proof of warranty period.

Models:
MZ
024-060

Revision History

Date	Section	Description
05/16/25	Move RDS Sensors After Field Conversion	Added new section
05/02/25	Model Nomenclature	Updated Notes
	Electrical Data	Updated LRA for size 042
	Unit Operating Conditions	Updated Total unit FLA and Minimum Circuit Amp for all sizes
02/26/25	Unit Operating Conditions	Updated data for size 036
	Warranty	Corrected headers
02/21/25	Electrical Data: CV EC Blower Motor	Added section
	Performance Data	Updated Voltage Code for size 060
	Full Load Performance: Correction Tables	Added a note concerning Hot Water Generator Capacity calculation
	Unit Operating Conditions	Updated correction data for Cooling, Entering Air Heating, and Airflow
	All	Updated data for size 048
01/28/25	All	Added the Wireless Service Tool
	Minimum Installation Area	Updated metric data
	Physical Data	Updated representation of HWG weight
	Horizontal Installation	Clarified condensate drain connections
	Electrical Data: CV EC Blower Motor	Updated data and notes
	Unit Operating Conditions	Relocated Operating Pressures and Temperatures tables
12/04/24	Functional Troubleshooting Form	Updated form
	All	Updated naming conventions for DXM2.5, AWC Thermostat, and grounded
	Model Nomenclature	Added Notes
	Blower Performance Data	Updated Full-Load data for size 030 and 036
	Blower Performance CV EC Standard Unit	Added note concerning maximum altitude limitations.
09/27/24	Electrical: Low Voltage Wiring	Updated RDS Board arrangement graphic
	All	First Published



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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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