

COMMERCIAL

MARS 24 (MW) WATER-TO-WATER SERIES

INSTALLATION, OPERATION & MAINTENANCE MANUAL

Part#: 97B0164N03 | Revised: June 26, 2025

Models: MW 036-120

60Hz – R-454B



Models:
MW
036-120

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MARS works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact MARS's Customer Service Department at 517-787-2100 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely MARS' opinion or commendation of its products.

Model Nomenclature

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| M | W | M | 0 | 3 | 6 | A | G | C | 0 | 0 | 0 | G | B | S |

PRODUCT NAME
M = R-454B Refrigerant

MODEL TYPE
W = Water-to-Water Series

APPLICATION
M = Medium Temperature

SIZE
036
060
120

REVISION
A = Current

VOLTAGE
G = 208/230-1-60 J = 208/230-1-60 Refrigerant Detection System
H = 208/230-3-60 K = 208/230-3-60 Refrigerant Detection System
E = 265-1-60 D = 265-1-60 Refrigerant Detection System
F = 460-3-60 L = 460-3-60 Refrigerant Detection System

CONTROLS

| Control | Standard | MPC |
|------------------------------------|----------|-----|
| CXM2 ¹ | C | N |
| DXM2.5 ² | D | P |
| CXM2with Disconnect ¹ | W | R |
| DXM2.5with Disconnect ² | B | S |

CABINET

| Cabinet | Sound Attenuation Package | Option |
|------------|---------------------------|--------|
| Commercial | No | 0 |
| | Yes | 5 |

STANDARD
S = Standard

RESERVED FOR FUTURE
0 = None

EXTENDED OPTIONS
0 = Standard
G = Hot Water Generator (HWG)

LOAD SIDE OPTIONS

| Description | Standard |
|-------------|----------|
| None | 0 |

SOURCE SIDE OPTIONS

| Description | Standard |
|------------------|----------|
| None | 0 |
| Modulating Valve | C |

1. Size 120 only

2. Sizes 036 and 060 only

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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 MARS shall be installed in connecting ductwork. The installation of any other auxiliary devices is beyond MARS' 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.

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

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

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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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.

Refrigerant System Servicing

REFRIGERANT SYSTEM

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

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 Inert gas
- Evacuate
- Continuously flush or purge with Inert gas when using flame to open circuit
- Open the circuit

The refrigerant charge shall be recovered into the correct recovery cylinders. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe. 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
- Ensure that the REFRIGERATION SYSTEM is earthed prior to charging the system with refrigerant
- Label the system when charging is complete (if not already)
- Extreme care shall be taken not to overfill the 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.

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.

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Refrigerant System Servicing

Ensure that the detector is not a potential source of Ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the 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 pipework.

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 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. Make sure 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.

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.

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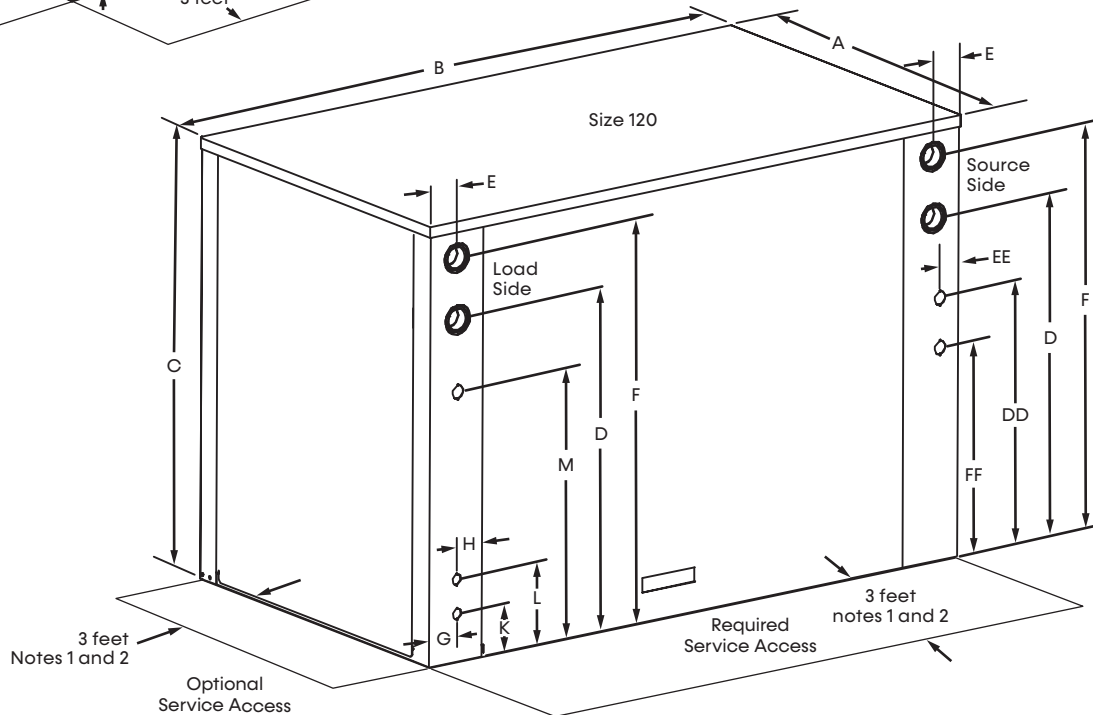
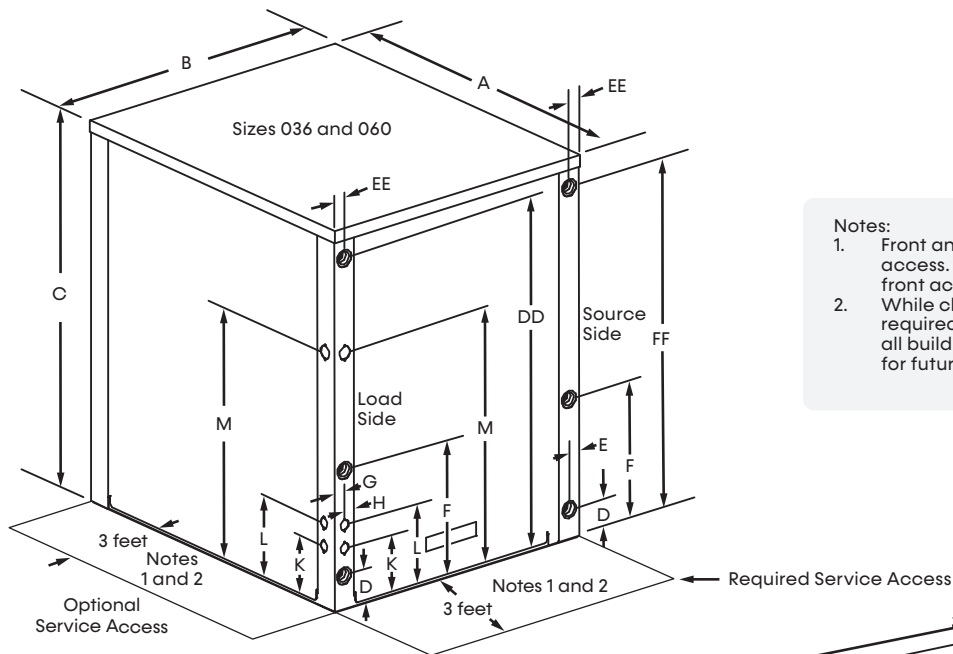
Physical Data

MW Series

| Unit Size | MW036 | MW060 | MW120 |
|---|-------------|------------|-------------|
| Compressor (qty) | 1 | | 2 |
| Number of refrigerant circuits | 1 | 1 | 2 |
| Factory Charge R-454B - (oz.) (per circuit) | 42 | 48 | 48 |
| Refrigerant Leak Detection System | O | O | O |
| Water Connection Size | | | |
| Source/Load - FPT | 1" | | 1-1/2" |
| HWG - FPT | | 1/2" | |
| Weight | | | |
| Weight - Operating (lbs) [kg] | 187 [85] | 239 [108] | 496 [224] |
| Weight - Shipping (lbs) [kg] | 212 [96] | 264 [120] | 520 [235] |
| Water Volume | | | |
| Gallons [Liters] | 0.56 [2.12] | 0.7 [2.65] | 1.40 [5.30] |

- O = Optional, R = Required

1. Front and side access is preferred for service access. All components may be serviced from the front access panel if side access is not available.
2. 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.



| Unit Size | | Overall Cabinet | | | Water Connections | | | | | | | | | | | | | | Electrical Knockouts | | | | | | | |
|-----------|------|------------------|-------|--------|----------------------|-----|-----------------------|-----|--------------------|-----|---------------------|-----|----------------------|--------|-----|---------|-----|--------------------|----------------------|------|-----------------|-----|-----|---------|---------|---|
| | | Depth/ Length | Width | Height | Water In (Source) | | Water Out (Source) | | Water In (Load) | | Water Out (Load) | | Water In/Out Φ | HWG In | | HWG Out | | HWG In/Out Φ | Low Voltage | | High Voltage | G | H | | | |
| | | | | | A | B | C | D | E | F | E | D | | E | F | E | DD | | EE | FF | EE | | | K | L | M |
| | | | | | | | | | | | | | | | | | | | | | | | | KO 1/2" | KO 3/4" | |
| 036-060 | inch | 27.5 | 25.4 | 27.0 | 4.0 | 2.2 | 10.6 | 2.2 | 4.0 | 2.2 | 10.6 | 2.2 | 1.0 | 25.4 | 2.2 | 25.4 | 2.2 | 0.5 | 6.0 | 7.6 | 20.6 | 2.1 | 1.1 | | | |
| | cm | 69.9 | 64.5 | 68.6 | 10.1 | 5.5 | 26.9 | 5.5 | 26.9 | 5.5 | 10.1 | 5.5 | 2.5 | 64.5 | 5.6 | 64.5 | 5.6 | 1.3 | 15.3 | 19.4 | 52.2 | 5.3 | 2.9 | | | |
| 120 | inch | 30.6 | 48.8 | 34.8 | 28.3 | 2.8 | 32.2 | 2.8 | 28.3 | 2.8 | 32.2 | 2.8 | 1.5 | 23.3 | 2.1 | 19.8 | 2.1 | 0.5 | 7.1 | 9.1 | 24.3 | 2.8 | 1.1 | | | |
| | cm | 77.7 | 124.0 | 88.4 | 71.8 | 7.2 | 81.9 | 7.2 | 81.8 | 7.2 | 71.8 | 7.2 | 3.8 | 59.2 | 5.4 | 50.3 | 5.3 | 1.3 | 18.1 | 23.2 | 61.6 | 7.0 | 2.9 | | | |

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Installation

LOCATION

These 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.

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.

Locate the unit in an indoor area that allows easy removal of access panels and has enough space for service personnel to perform maintenance or repair. Provide sufficient room to make water and electrical connections. Remove any access panel screws that would be difficult to remove after the unit is installed prior to setting the unit. These units are not approved for outdoor installation and must be installed inside the structure being conditioned. Do not locate in areas where ambient conditions are not maintained within 40-100°F (4-38°C).

PIPING INSTALLATION

Installation of Supply and Return Piping

Follow these piping guidelines:

1. Install a drain valve at the base of each supply and return riser to facilitate system flushing.
2. Install shutoff/balancing valves and unions at each unit to permit unit removal for servicing.
3. Place strainers at the inlet of each system circulating pump.
4. Select the proper hose length to allow slack between connection points. Hoses may vary in length by +2% to -4% under pressure.
5. Exceeding the minimum bend radius may cause the hose to collapse resulting in reduced water flow rate. Install an angle adapter to avoid sharp bends in the hose when the radius falls below the required minimum and causes a slight kink.

Insulation is not required on loop water piping except where the piping runs through unheated areas or outside the building or when the loop water temperature is below the minimum expected dew point of the pipe ambient temperature.

NOTE: Insulation is required if loop water temperature drops below the dew point.

Pipe-joint compound is not necessary when water-thread sealant tape is pre-applied to hose assemblies or when flared-end connections are used. If pipe-joint compound is preferred, use compound only in small amounts on the pipe threads of the fitting adapters. Prevent sealant from reaching the flared surfaces of the joint.

NOTE: When antifreeze is used in the loop, ensure that it is compatible with water-thread sealant tape or the pipe-joint compound that is used.

Maximum allowable torque for brass fittings is 30 ft-lbs (41 N-m). If a torque wrench is not available, tighten finger-tight plus one-quarter turn. Tighten steel fittings as necessary.

WARNING

Piping must comply with all applicable codes.

WARNING

Do not bend or kink supply lines

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Optional pressure-rated hose assemblies designed specifically for use with the manufacturer's units are available. You can purchase similar hoses from alternate suppliers. Supply and return hoses are fitted with swivel-joint fittings at one end to prevent kinking during installation.

Refer to Figure 1 for an illustration of a Supply/Return Hose Kit. Male adapters secure hose assemblies to the unit and risers. Install hose assemblies properly and check them regularly to avoid system failure and reduced service life.

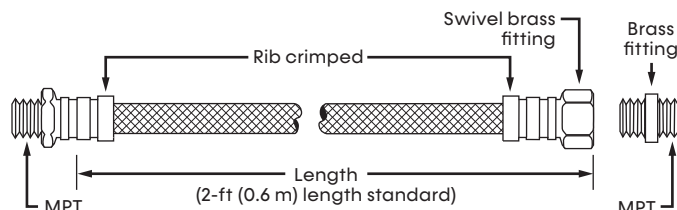
WARNING

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.

CAUTION

Corrosive system water requires corrosion-resistant fittings and hoses and may require water treatment.

Figure 1: Supply/Return Hose Kit



LOAD PLUMBING INSTALLATION

MW Unit Load Plumbing

Many load plumbing applications are not described in this document. This document presents some basic guidelines. Many principles of water-loop applications are valid for the load plumbing discussion as well. All plumbing must conform to local codes with the following considerations:

Wide temperature variation applications such as heating/cooling coils:

- Employ piping materials that are rated for the maximum temperature and pressure combination. This excludes PVC for most heating applications.
- Ensure that load water flow in high temperature heating applications is at least 3 GPM per ton (3.9 l/m per kW) to improve performance and reduce nuisance high pressure faults.
- DO NOT employ plastic to metal threaded joints
- Utilize a pressure tank and air separator vent system to equalize pressure and remove air.

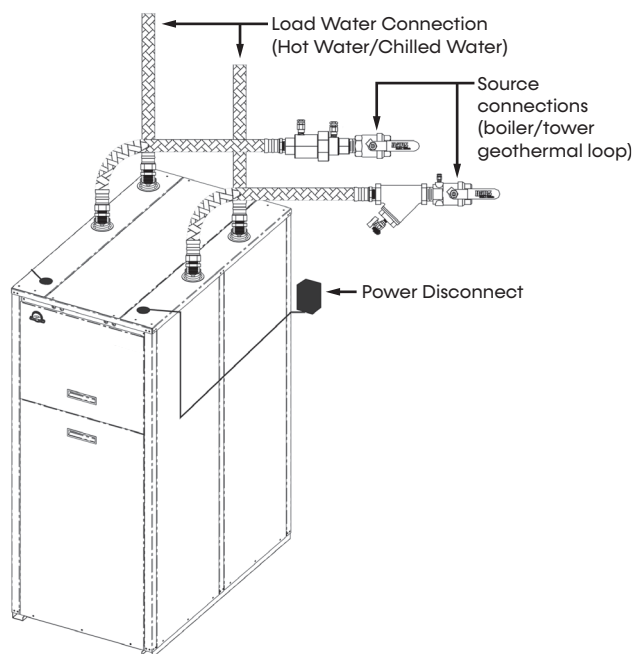
Swimming Pool Hot Tub Applications:

- Load brazed plate should be isolated with secondary heat exchanger constructed of anti-corrosion material in all chlorine/bromine fluid applications.

Potable Water Applications:

- Potable water systems require field-supplied external secondary heat exchanger.
- Ensure load water flow in high temperature heating applications is at least 3 GPM per ton to improve performance and reduce nuisance to high-pressure faults.

Figure 2: Typical Water-Loop Application



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Water Loop Heat-Pump Applications

COMMERCIAL WATER-LOOP APPLICATIONS

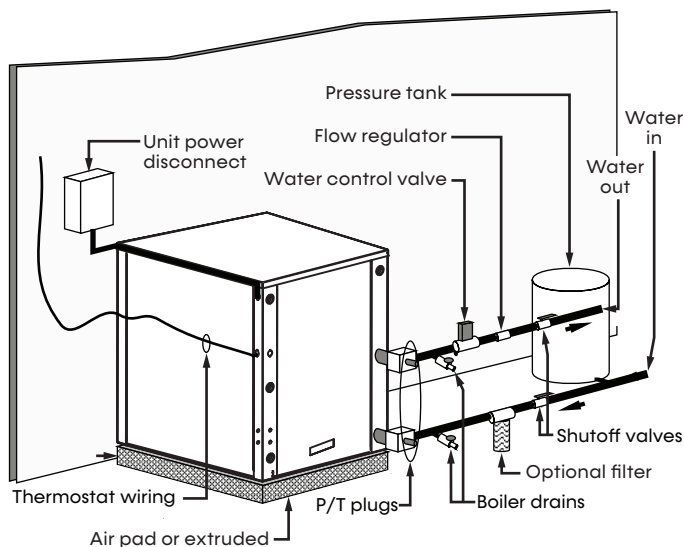
Commercial systems typically include a number of units connected to a common piping system. Any unit plumbing maintenance work can introduce air into the piping system; therefore air elimination equipment is a major portion of the mechanical room plumbing. To avoid condensation, consider insulating the piping surfaces. The manufacturer recommends piping insulation any time the water temperature is below 60°F (15.6°C). Do not use metal to plastic threaded joints due to their tendency to leak over time.

Water thread-sealant tape or thread sealant is recommended to minimize internal fouling of the heat exchanger. Do not over tighten connections and route piping so as not to interfere with service or maintenance access. Hose kits are available from the manufacturer in different configurations for connection between the unit and the piping system. Depending on selection, hose kits may include shutoff valves, P/T plugs for performance measurement, high pressure stainless-steel braided hose, "Y" type strainer with blow down valve, and/or with blow down valve, auto-flow valve and swivel connections.

Flush the piping system to remove dirt, piping chips, and other foreign material prior to operation (see Piping System Cleaning and Flushing in this manual). The flow rate is usually set between 2.25 and 3.5 GPM per ton (2.9 and 4.5 l/m per kW) of cooling capacity. The manufacturer recommends 3 GPM per ton (3.9 l/m per kW) for most water-loop heat pump applications. To ensure proper maintenance and servicing, P/T ports are imperative for temperature, flow verification, and performance checks.

Water-loop heat pump (cooling tower/boiler) systems typically utilize a common loop maintained between 60 - 90°F (16 - 32°C). The use of a closed-circuit evaporative cooling tower with a secondary heat exchanger between the tower and the water loop is recommended. If an open type cooling tower is used continuously, chemical treatment and filtering is necessary.

Figure 3: Typical Open-Loop/Well Applications



⚠ WARNING

Never jumper terminal "A" from CXM2 or DXM2.5 #1 to CXM2 or DXM2.5 #2 on multi-compressor/multi-control board units. For more information, see the motorized water valve wiring examples in electrical section of this document.

⚠ CAUTION

Many units are installed with a factory or field-supplied manual or electric shutoff valve. **DAMAGE WILL OCCUR** if shutoff valve is closed during unit operation. A high-pressure switch must be installed on the heat-pump side of any field-provided shutoff 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. This pressure switch can be ordered from MARS with a ¼-inch internal-flare connection as part number 39B0005N02.

Ground Water Heat-Pump Applications

Include shutoff valves for easy servicing. “Tee” boiler drains or other valves into the line to allow for acid flushing of the heat exchanger. Use pressure temperature plugs for easy flow and temperature measurement. Limit supply and return water piping materials to copper, PE, or similar material. Never use PVC or CPVC as they are incompatible with the POE oils used in R-454B products and piping-system failure and property damage may occur.

Ensure water quantity is plentiful and of good quality. See Water Quality Requirements for water quality guidelines. In conditions anticipating heavy scale formation or in brackish water, an intermediate heat exchanger is recommended.

In ground-water situations with heavy scaling or where biological growth such as iron bacteria is present, a closed-loop system is recommended. It is recommended to install an intermediate heat exchanger to isolate an open loop from the heat-pump loop on open-well systems. Over time heat exchangers may lose heat-exchange capabilities due to a build up of mineral deposits inside. Only qualified service mechanics can provide cleaning services as acid and special pumping equipment are required.

In areas with extremely hard water, inform the owner that the heat exchanger may require occasional acid flushing.

Expansion Tank and Pump

Use a closed, bladder-type expansion tank to minimize mineral formation due to air exposure. Size the expansion tank to handle at least one minute of pump runtime using its drawdown capacity rating to prevent premature pump failure. Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways depending on local building codes; i.e. 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.

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-Control Valve

Note the placement of the water-control valve. Always maintain water pressure in the heat exchanger by placing water-control valves at the outlet of the unit to prevent mineral precipitation. Pilot-operated or slow-closing solenoid valves are recommended to reduce water hammer. If water hammer persists, mount a mini expansion tank on the piping to help absorb the excess hammer shock. Ensure that the unit transformer accommodates the total VA draw of the valve. For example, the slow-closing valve draws up to 35VA. This can overload smaller 40 or 50 VA transformers depending on the other controls employed. A typical pilot-operated solenoid valve draws approximately 15VA.

Flow Regulation

You can accomplish flow regulation using two methods.

- Most water-control valves have a built-in flow adjustment. Determine flow rate by measuring the pressure drop through the unit heat exchanger then compare to Table 6. Since the pressure is constantly varying, two pressure gauges may be needed. Adjust the water-control valve until reaching the desired flow of 1.5-2 gpm per ton (2.0 to 2.6 l/m per kW).
- Install and mount a flow-control device 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. Flow-control devices may produce a velocity noise, but you can reduce this noise by applying some back pressure from the ball valve located on the discharge line. Slightly close the valve to spread the pressure drop over both devices, decreasing the velocity noise.

WARNING

Never jumper terminal “A” from CXM2 or DXM2.5 #1 to CXM2 or DXM2.5 #2 on multi-compressor/multi-control board units. For more information, see the motorized water valve wiring examples in electrical section of this document.

CAUTION

Many units are installed with a factory or field-supplied manual or electric shutoff valve. DAMAGE WILL OCCUR if shutoff valve is closed during unit operation. A high-pressure switch must be installed on the heat-pump side of any field-provided shutoff 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. This pressure switch can be ordered from MARS with a 1/4-inch internal-flare connection as part number 39B0005N02.

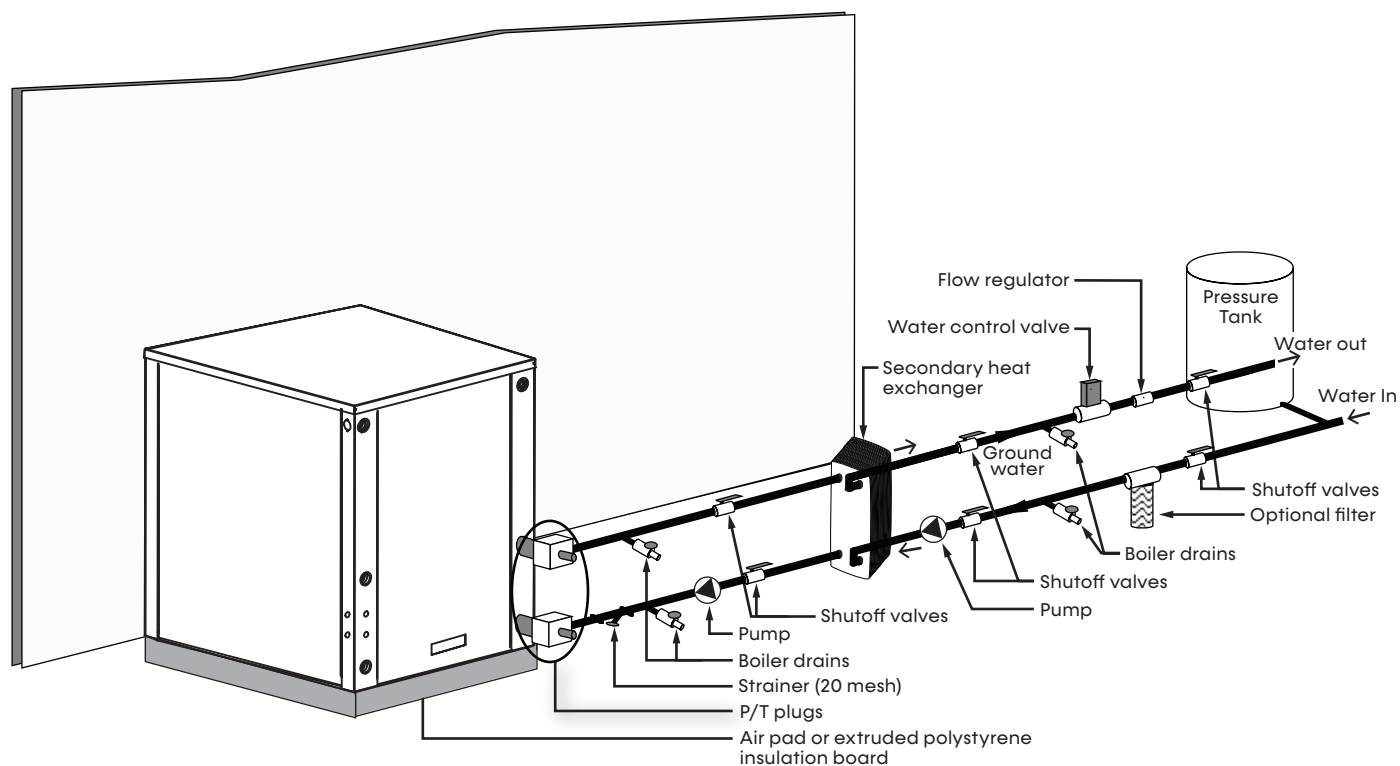
CAUTION

Low temperature limit systems do not allow leaving load water temperature (cooling mode) or leaving source water temperature (heating mode) to be below 42°F (5.6°C).

Models:
MW
036-120

Ground Water Heat-Pump Applications

Example Ground Water Heat-Pump Configuration



Ground Loop Heat-Pump Applications

CAUTION

The following instructions represent industry accepted installation practices for closed-loop earth-coupled heat pump systems. They are provided to assist the contractor in installing trouble-free ground loops. These instructions are recommendations only. State 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.

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 earth-loop piping materials only polyethylene fusion for inground sections of the loop. Do not use galvanized or steel fittings at any time due to their tendency to corrode. Avoid all plastic-to-metal threaded fittings due to their potential to leak in earth-coupled applications (use a flanged fitting instead). Use P/T plugs to enable flow measurement using the pressure drop of the unit heat exchanger in lieu of other flow measurement means. Earth loop temperatures range between 25–110°F (-4–43°C), and 2.25–3 GPM of flow per ton (2.9–3.9 l/m per kW) of cooling capacity is recommended in these applications. Upon completion of the ground loop piping, pressure test the loop to ensure a leak free system. For horizontal systems, test individual loops as installed. Test the entire system when all loops are assembled. Test Vertical U-Bends and Pond Loop Systems: Test Vertical U-bends and pond loop assemblies prior to installation with a test pressure of at least 100 psi (689 kPa).

FLUSHING THE EARTH LOOP

Upon completion of system installation and testing, flush the system to remove all foreign objects and purge to remove all air. Flush the loop first with the unit isolated to avoid flushing debris from the loop into the unit heat exchanger.

ANTIFREEZE

In areas where minimum entering loop temperatures drop below 40°F (5°C) or where piping is routed through areas subject to freezing, anti-freeze is required. Alcohols and glycols are commonly used as antifreezes. Consult your local sales manager to determine the antifreeze best suited to your area. Maintain low temperature 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 would be 25 to 22°F (-4 to -6°C) and low temperature protection should be at 15°F (-10°C) e.g. 30°F - 15°F = 15°F (-1°C - 9°C = -10°C). To prevent fuming, premix and pump all alcohols from a reservoir outside of the building when possible, or introduce alcohols under the water level. Initially calculate the total volume of fluid in the piping system. Then use the percentage by volume shown in Table 2 for the amount of antifreeze. Verify antifreeze concentration using a well-mixed sample and a hydrometer to measure specific gravity.

Table 2: Antifreeze Percentages by Volume

| Type | Minimum Antifreeze Concentration % 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% | 9% |
| 100% USP food grade Propylene Glycol | 29% | 24% | 19% | 12% |
| Ethanol ¹ | 28% | 24% | 18% | 12% |

1. Must not be denatured with any petroleum based product

Models:
MW
036-120

Ground Loop Heat-Pump Applications

Note the placement of the water control valve. Always maintain water pressure in the heat exchanger by installing water control valves at the source out of the unit to prevent mineral precipitation. Position water high pressure switch between the unit and valve. Pilot-operated or slow-closing valves are recommended to reduce water hammer. If water hammer persists, mount a mini expansion tank on the piping to help absorb the excess hammer shock. Ensure that the unit's transformer can accommodate the total 'VA' draw of the valve. For instance, some slow-closing valves can draw up to 35VA. This can overload smaller transformers depending on the other controls employed. A typical pilot-operated solenoid valve draws approximately 15VA.

WARNING

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CAUTION

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FLOW REGULATION

Install on source in of unit. Accomplish flow regulation by two methods.

1. Most water control valves have a built-in flow adjustment. Determine flow rate by measuring the pressure drop through the unit heat exchanger then compare to Table 6. Since the pressure is constantly varying, two pressure gauges might be needed. Adjust the water control valve until the desired flow of 2.5 to 3 GPM per ton (2.0 to 2.6 l/m per kW) is achieved.
2. Install a flow-control device. Flow-control devices are typically an orifice of plastic material that is designed to allow a specified flow rate. These are mounted on the outlet of the water control valve. Flow-control devices may produce a velocity noise, but you can reduce this noise by applying back pressure. Apply back pressure by slightly closing the leaving isolation valve of the well water system.

Water Quality Requirements

Models:
MW
036-120

Table 3: 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-loop water systems should undergo water quality testing and be maintained to the water quality standards listed in this table. All open-loop water systems shall be tested upon installation and periodically to ensure water quality standard in the table below are met.

| 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 | (CaCO ₃) | 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 |
| 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 ^h | | 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 | | | | | | |
| | | | | | | | |

Models:
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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

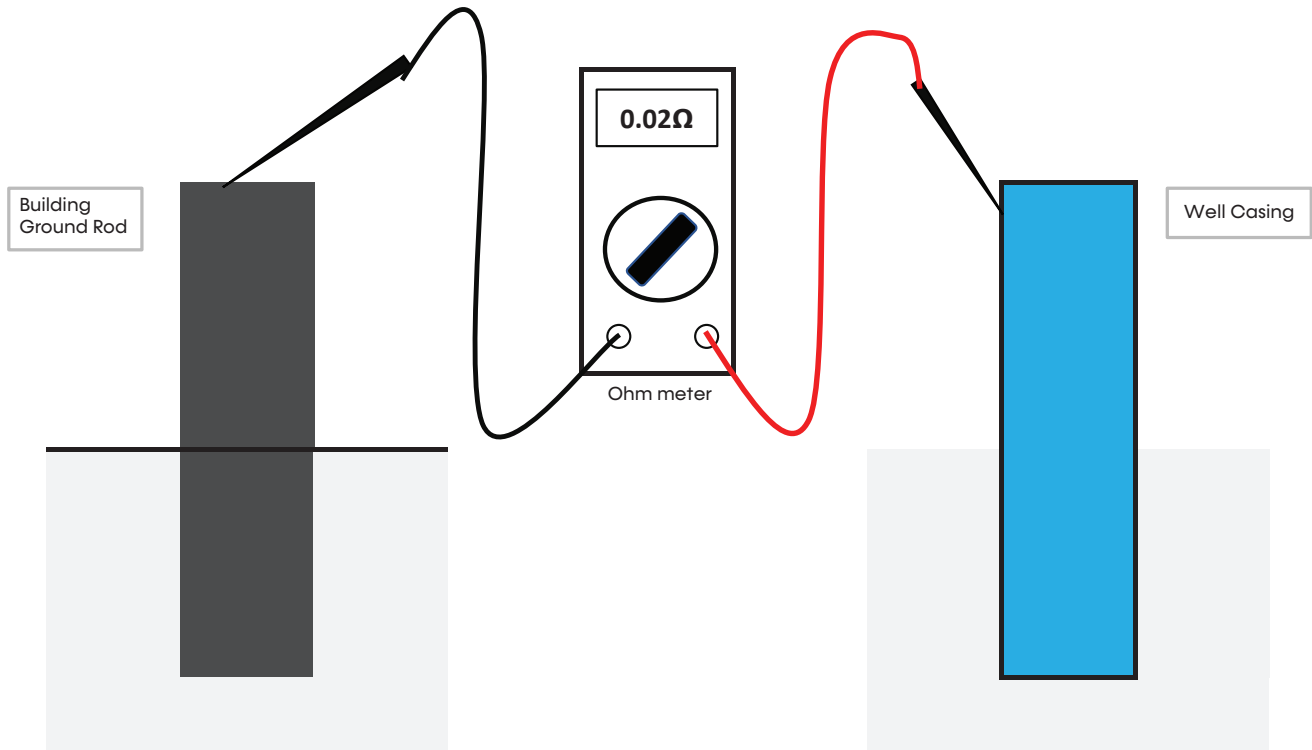
| Mesh Size | Particle Size | | |
|-----------|---------------|------------|--------|
| | Microns | Millimeter | Inch |
| 20 | 840 | 0.840 | 0.0340 |
| 30 | 533 | 0.533 | 0.0210 |
| 60 | 250 | 0.250 | 0.0100 |
| 100 | 149 | 0.149 | 0.0060 |
| 150 | 100 | 0.100 | 0.0040 |
| 200 | 74 | 0.074 | 0.0029 |

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

Water Quality Requirements

Models:
MW
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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.

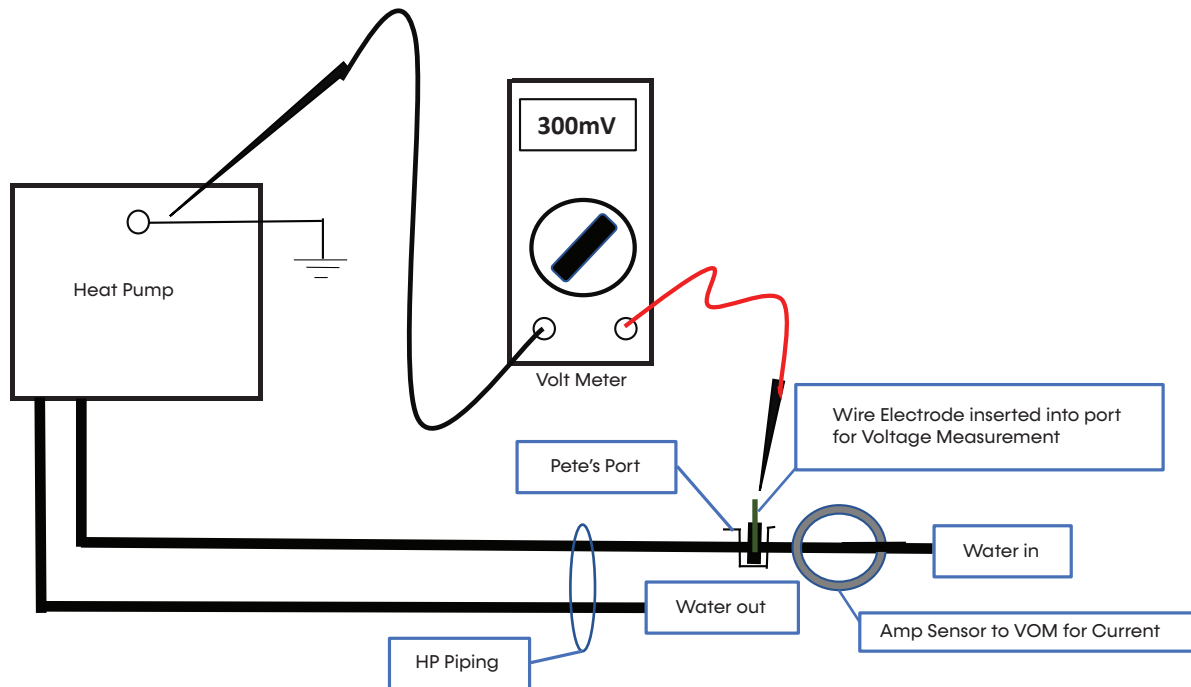
The resistance measured should be zero Ohms. The NEC allows a resistance to ground up to 20 Ohms. Any resistance above zero indicates a poor earth ground, which may be the result of a hot neutral line or that conductive water is present. Both of these may lead to electrolysis and corrosion of the heat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

Models:
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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.

There should be zero amps measured. If current is present, there is leakage current to the plumbing system and it must be rectified to prevent pipe corrosion.

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. The Typical HWG Installation figure shows an example of HWG water piping connections on a unit with built-in circulating pump. This piping layout prevents the HWG pump from pulling sludge/debris from the bottom of the tank.

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, turn down the lower element 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 can heat 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 can heat 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, install a second preheat tank. See the Two-tank HWG Installation figure. 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. For maximum storage and temperate source water to the HWG, use a dual tank system as shown in the Two-tank HWG Installation figure.

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 the HWG Water Piping Sizes and Length table for scaling potential tests.

Figure 4: Typical HWG Installation

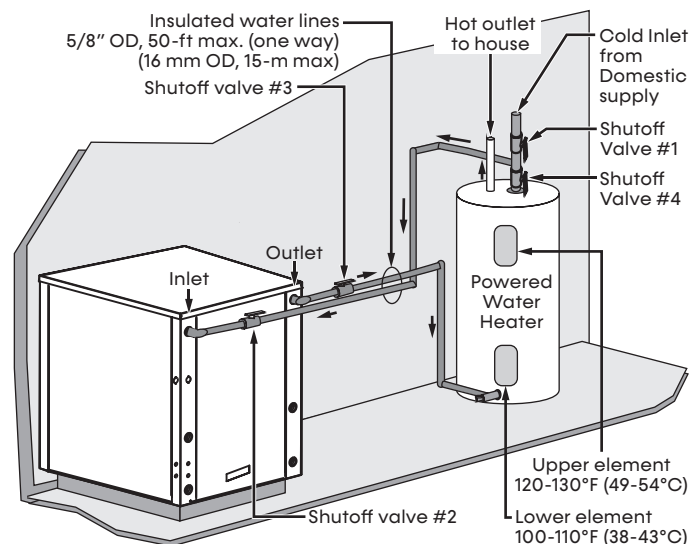
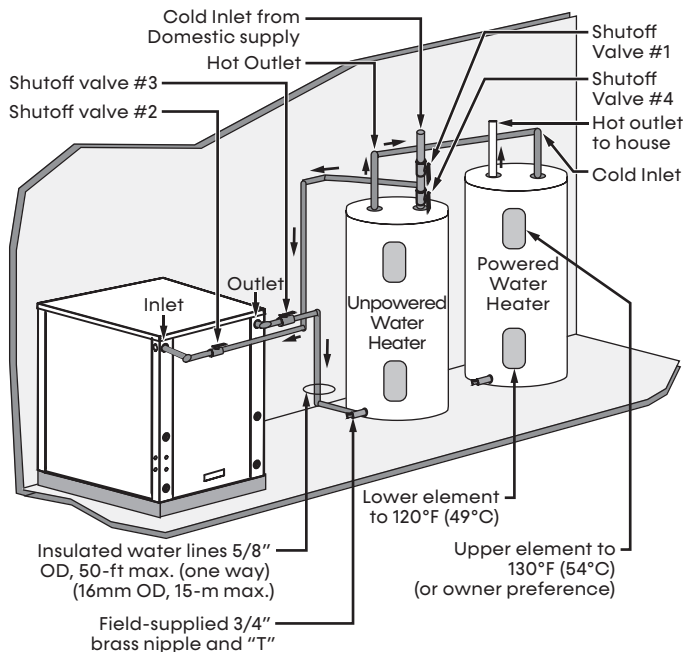


Figure 5: Two-tank HWG Installation

Models:
MW
036-120

Hot Water Generator



WARNING

Under no circumstances should the sensors be disconnected or removed. Full load conditions can drive hot water tank temperatures far above safe temperature levels if sensors are disconnected or removed.

INSTALLATION

The HWG is controlled by two sensors and the CXM2/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.

The CXM2/DXM2.5 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. After the HWG satisfies 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 CXM2/DXM2.5 status LED slowly flashes (On 1 second, Off 1 second).

If the control detects a HWG fault, the CXM2/DXM2.5 status LED flashes a numeric fault code as follows:

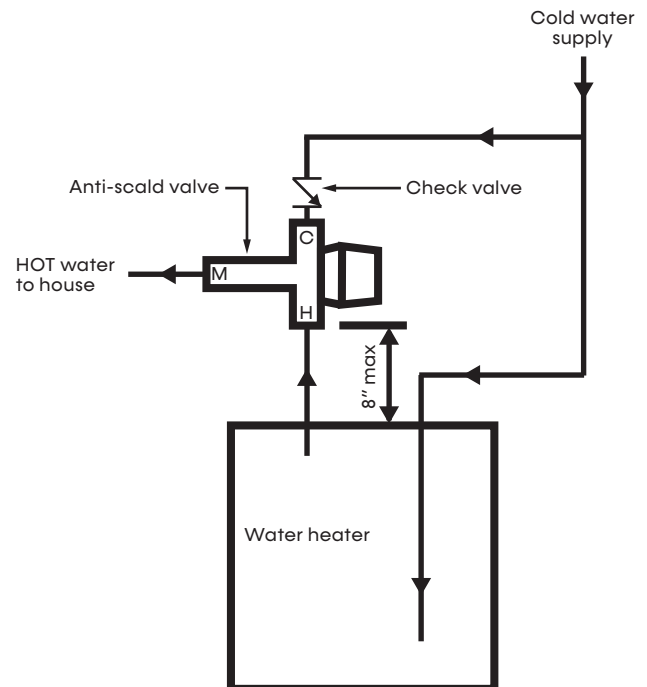
- High Water Temperature (> 160°F) (five flashes)
- Hot Water Sensor Fault (six flashes)
- Compressor Discharge Sensor Fault (six flashes)

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.

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.

Figure 6: Anti-scald Valve-Piping Connection



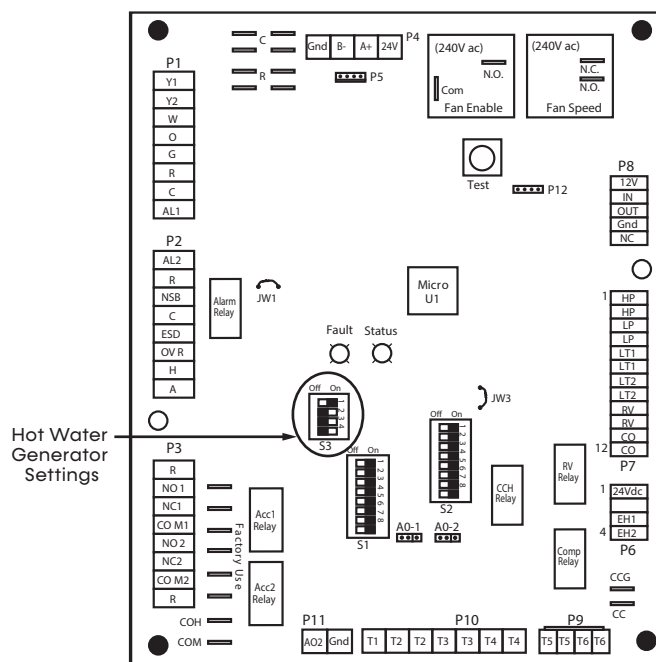
Hot Water Generator

- 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.

NOTE: The HWG pump is field provided on commercial units and is a factory-installed option on residential units.

- 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 7: Hot Water Generator Settings



⚠ WARNING

The HWG pump is fully wired from the factory. Use extreme caution when working around the microprocessor control as it contains line voltage connections that presents a shock hazard that can cause severe injury or death.

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 feet (one way) (15 m). See Table 4 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, below is completed. To avoid damaging the pump, do not power it before all installation steps are complete.

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 and pump.

Models:
MW
036-120

Hot Water Generator

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

- 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 forces water flow through the HWG and purge air from the HWG piping.
- Open a hot-water faucet to vent air from the system until water flows from faucet; turn off faucet. Open valve #4.
- Depress the hot water tank pressure relief valve handle to ensure that there is no air remaining in the tank.
- Inspect all work for leaks.
- Before restoring power or fuel supply to the water heater, adjust the temperature setting on the tank thermostat(s) to ensure 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, turn down the lower element to 100°F (38°C) or the lowest setting; adjust the upper element 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, use a preheat tank (Figure 5).
- Replace access cover(s) and restore power or fuel supply.

INITIAL STARTUP

- Make sure all valves in the HWG water circuit are fully open.
- Turn on the heat pump and allow it to run for 10-15 minutes.
- Set S3-4 to the "ON" position (enabled) to engage the HWG. See Figure 6.
- The HWG pump should not run if the compressor is not running.
- The temperature difference between the water entering and leaving the HWG coil should be approximately 5-10°F (3-6°C).
- Allow the unit to operate for 20 to 30 minutes to insure that it is functioning properly.

Table 4: HWG Water Piping Sizes and Length

| Unit Nominal Tonnage | Nominal HWG Flow (gpm) | 1/2" Copper (max length ¹) | 3/4" Copper (max length ¹) |
|----------------------|------------------------|--|--|
| 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. The maximum length is equivalent length (in feet) one way of type L copper.

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

Electrical Data

Models:
MW
036-120

Standard Unit

| Unit Size | Rated Voltage | Voltage Code | Voltage Min/Max | Compressor A | | | No Pump | | |
|-----------|---------------|--------------|-----------------|--------------|-------|-----|----------------|-----------------|-----------|
| | | | | RLA | LRA | Qty | Total Unit FLA | Min Circuit Amp | Fuse HACR |
| MW036 | 208/230-1-60 | G.J. | 187/252 | 14.6 | 76.0 | 1 | 14.6 | 18.3 | 30 |
| | 265/60/1 | E.D | 249/291 | 10.2 | 55.0 | 1 | 10.2 | 12.7 | 20 |
| | 208/230-3-60 | H.K. | 187/252 | 8.6 | 70.0 | 1 | 8.6 | 10.8 | 15 |
| | 460-3-60 | F.L. | 432/504 | 4.5 | 39.0 | 1 | 4.5 | 5.6 | 15 |
| MW060 | 208/230-1-60 | G.J. | 187/252 | 22.3 | 149.0 | 1 | 22.3 | 27.9 | 50 |
| | 208/230-3-60 | H.K. | 187/252 | 14.0 | 150.0 | 1 | 14.0 | 17.5 | 30 |
| | 460-3-60 | F.L. | 432/504 | 6.3 | 58.0 | 1 | 6.3 | 7.9 | 15 |
| MW120 | 208/230-1-60 | G.J. | 187/252 | 23.7 | 157.0 | 2 | 47.4 | 53.4 | 70 |
| | 208/230-3-60 | H.K. | 187/252 | 16.0 | 156.4 | 2 | 32.1 | 36.1 | 50 |
| | 460-3-60 | F.L. | 432/504 | 7.1 | 69.0 | 2 | 14.1 | 15.9 | 20 |

Models:
MW
036-120

Electrical: Power Wiring

⚠ WARNING

To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.

⚠ 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 8: Single Phase Line Voltage Field Wiring

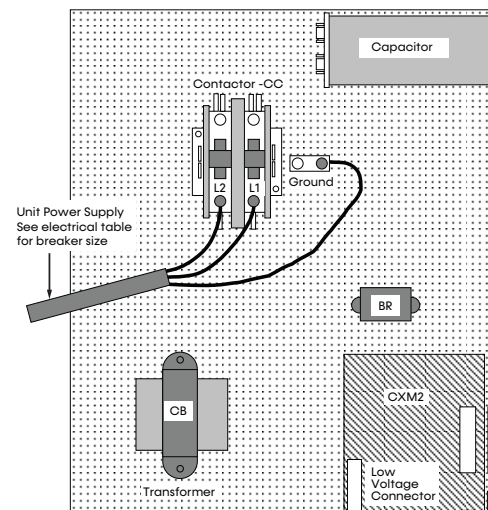
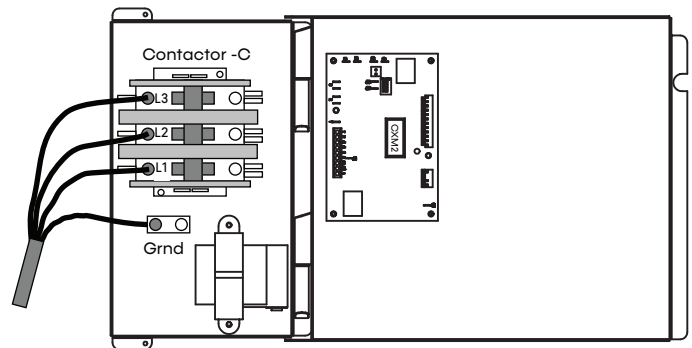


Figure 10: 036-060 Line Voltage Field Wiring Commercial Class (3-phase)



TRANSFORMER

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

NOTE: See the CXM2 AOM ([part #97B0003N12](#)), DXM2.5 AOM ([part #97B0003N13](#)), or MPC Controller AOM ([part #97B0031N01](#)).

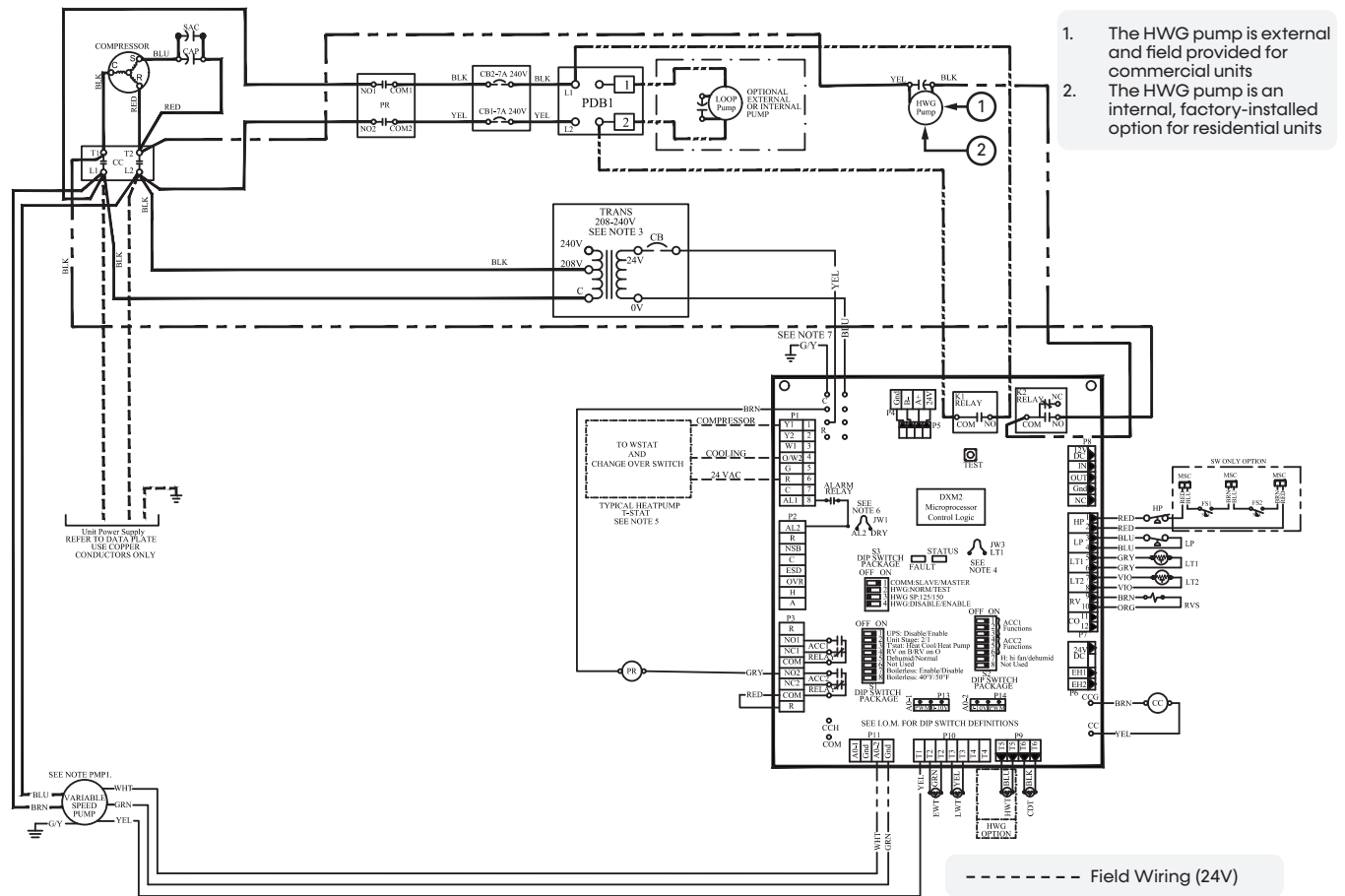
----- Field Wiring (24V)

-
- Wiring Diagram**
- 24V Unit**
- The diagram illustrates the electrical connections for a 24V unit with an external pump. Key components and connections include:
- Power Supply:** A 24V transformer (TRANS 208-240V) provides power to the unit. The primary is connected to a 240V source, and the secondary provides 24V and 0V lines.
 - Pump Motor:** The pump motor is connected to the 24V and 0V lines. It includes a pump relay (PDB1) and a pump switch (PDB2).
 - Control Circuitry:** The unit contains various relays (PDB1, PDB2, PDB3, PDB4) and switches (PDB1, PDB2, PDB3, PDB4) that control the pump and other functions.
 - Wiring Labels:** The diagram uses color-coded wiring labels: BLK (Black), WHT (White), GRN (Green), YEL (Yellow), VIO (Violet), GRY (Grey), LTN (Light Blue), and RED (Red).
 - Notes:** The diagram includes several notes, such as "SEE NOTE 7 G-V", "SEE NOTE 6", "SEE NOTE 5", and "SEE NOTE 4", which provide additional information about the wiring and components.

Models:
MW
036-120

Electrical: Power Wiring

Figure 12: Field Wiring of 24V Motorized Valve for MW036-060 (DXM2.5)



Electrical: Low-Voltage Wiring

THERMOSTAT CONNECTIONS

Wire the thermostat directly to the CXM2 or DXM2.5. See Electrical: Thermostat Wiring for specific terminal connections. Review the appropriate AOM (Application, Operation and Maintenance) manual for units with DDC controls.

LOW WATER TEMPERATURE CUTOUT SELECTION

The CXM2/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 brazed-plate heat exchanger and expansion device (TXV). LT1 senses 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), clip jumper JW3 as shown in the figure below to change the setting to 10°F (-12.2°C) refrigerant temperature, which is a more suitable temperature when using an antifreeze solution. All MARS units operating with entering water temperatures below 60°F (15.6°C) require the optional water/refrigerant circuit insulation package to prevent internal condensation.

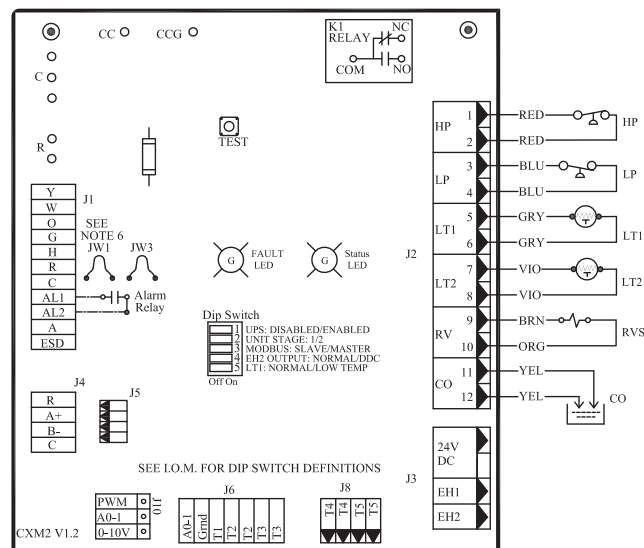
Variable Water Flow FREEZE PROTECTION

Variable Water Flow freeze protection logic is designed to safeguard the brazed-plate heat exchanger (BPHE) from freeze-related damage. The system monitors the source loop leaving water temperature (LWT) and initiates a lockout if it approaches a threshold where freezing could begin.

Due to localized conditions such as sensor tolerances, stratification, or reduced flow, portions of the heat exchanger can experience temperatures lower than the average LWT. These situations can lead to ice formation inside the BPHE, which can cause immediate and irreparable damage due to expansion forces.

To mitigate this risk, the control logic includes a freeze protection setpoint that triggers a lockout condition when necessary. While antifreeze is strongly recommended in low-temperature loop designs, the lockout feature acts as a critical backup to prevent slush or freezing water from entering the heat exchanger under fault or marginal conditions.

Figure 13: LT1 Limit Setting



Models:
MW
036-120

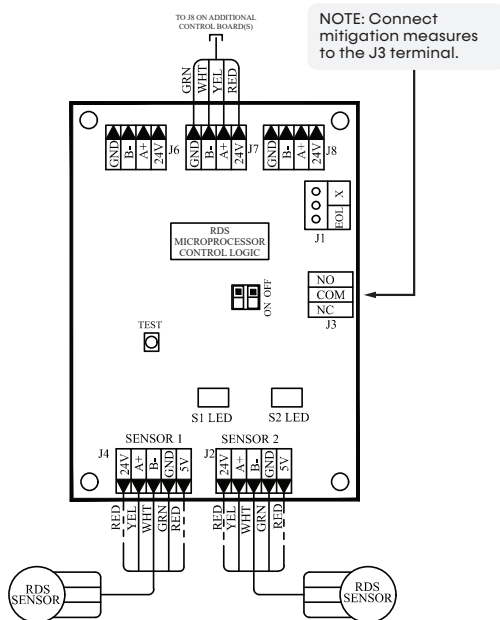
Electrical: Low-Voltage Wiring

REFRIGERANT DETECTION SYSTEM (RDS)

The function, operation, and required servicing measures for the Refrigerant Detection System (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 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.

Figure 15: RDS Board



FIELD-INSTALLED RDS SYSTEM

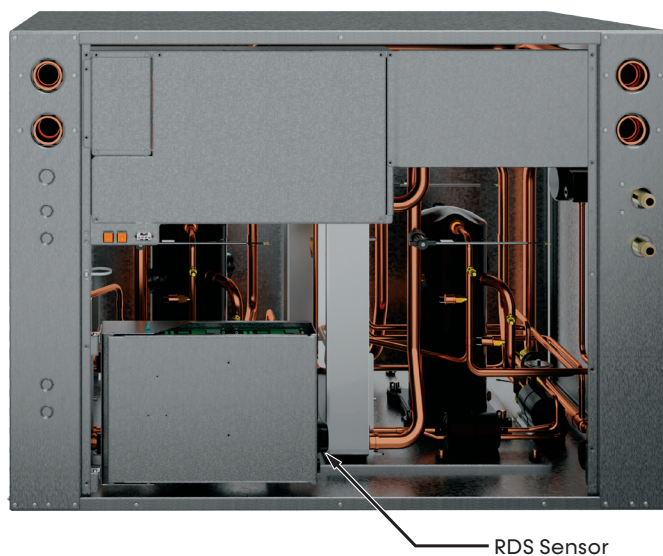
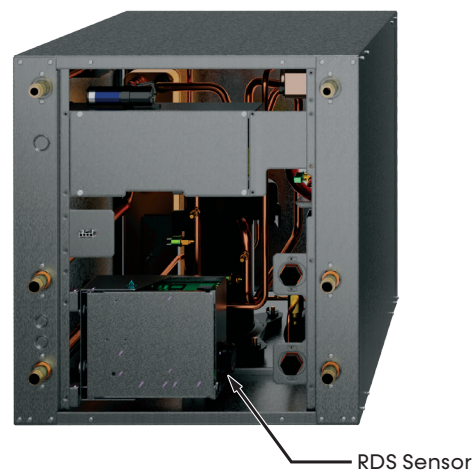
If the RDS was specified as a factory-installed option, but forgotten and not ordered, use the following guidelines to install a refrigerant detection sensor:

1. The sensor must be installed inside the cabinet
2. The ideal location for the sensor is on the exterior side panel of the controls enclosure as shown in Figure 14
3. Because the RDS is optional, an area within the controls enclosure can house the RDS control board

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 14: RDS Installation



Electrical: Low-Voltage Wiring

ACCESSORY CONNECTIONS

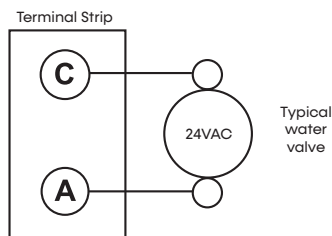
A terminal paralleling the compressor contactor coil is provided on the CXM2/DXM2.5. Terminal "A" is designed to control accessory devices, such as water valves. **NOTE: This terminal should be used only with 24V signals and not line voltage.** Terminal "A" is energized with the compressor contactor. See the Accessory Wiring figure or the specific unit wiring diagram for details.

Table 5: Low Voltage VA Ratings

| Component | VA |
|----------------------------------|---------|
| Typical Blower Relay | 6 - 7 |
| Typical Reversing Valve Solenoid | 4 - 6 |
| 30 A Compressor Contactor | 6 - 9 |
| Subtotal | 16 - 22 |
| + CXM2 (5 - 9VA) ¹ | 21 - 31 |
| Remaining VA for Accessories | 19 - 29 |
| + DXM2.5 (8 - 12VA) ² | 24 - 34 |
| Remaining VA for Accessories | 41 - 51 |

1. Standard transformer for CXM2 is 50VA.
2. Optional DXM2.5 and/or DDC controls include a 75VA transformer.

Figure 16: Accessory Wiring



WATER SOLENOID VALVES

Use an external solenoid valve(s) on 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. The Accessory Motorized Water Valve – Typical Wiring Example #1 and #2 figures 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 will operate properly with the following notations:

1. The valve will remain open during a unit lockout.
2. The valve will draw approximately 25-35VA through the "Y" signal of the thermostat.

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

Models:
MW
036-120

Electrical: Low-Voltage Wiring

Figure 17: Accessory Motorized Water Valve – Typical Wiring Example #1

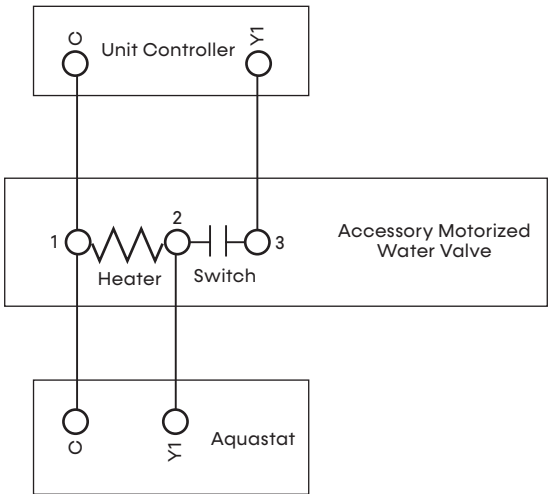


Figure 18: Accessory Motorized Water Valve - Typical Wiring Example #2

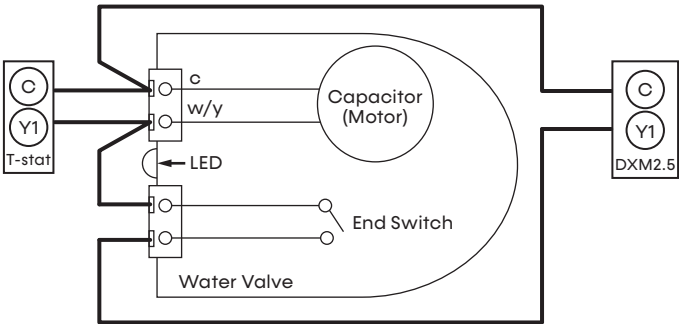
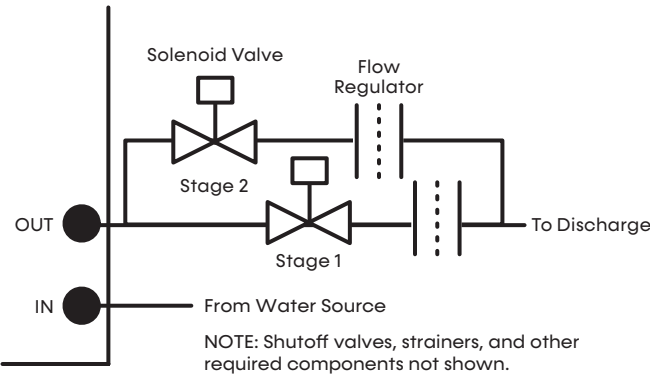


Figure 19: Two-Stage Piping



Controls: CXM2 and DXM2.5



CXM2 Communicating Controls

For detailed controller information, see the CXM2 Application, Operation, and Maintenance (AOM) manual (part # 97B0137N01). 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.



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:
MW
036-120

Piping System Cleaning and Flushing

Cleaning and flushing the WLHP piping system is the single most important step to ensure proper startup and continued efficient operation of the system.

Follow the instructions below to properly clean and flush the system:

1. Verify electrical power to the unit is disconnected.
2. Install the system with the supply hose connected directly to the return riser valve. Use a single length of flexible hose.
3. Open all air vents. Fill the system with the water. DO NOT allow system to overflow. Bleed all air from the system. Pressurize and check the system for leaks and repair appropriately.
4. Verify all strainers are in place. Start the pumps, and systematically check each vent to ensure all air is bled from the system.
5. Verify make-up water is available. Adjust make-up water appropriately to replace the air which was bled from the system. Check and adjust the water/air level in the expansion tank.
6. Set the boiler to raise the loop temperature to approximately 85°F (29°C). Open the a drain at the lowest point in the system. Adjust the make-up water replacement rate to equal the rate of bleed.
7. Refill the system and add trisodium phosphate in a proportion of approximately one pound per 150 gallons (½ kg per 750 L) of water (or other equivalent approved cleaning agent). Reset the boiler to raise the loop temperature to about 100°F (38°C). Circulate the solution for a minimum of 8 to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if desired.
8. When the cleaning process is complete, remove the short-circuited hoses. Reconnect the hoses to the proper supply, and return connections to each of the units. Refill the system and bleed off all air.
9. Test the system pH with litmus paper. The system water should be slightly alkaline (pH 7.5-8.5). Add chemicals, as appropriate, to maintain acidity levels.
10. When the system is successfully cleaned, flushed, refilled and bled, check the main system panels, safety cutouts and alarms. Set the controls to properly maintain loop temperatures.

CAUTION

DO NOT use 'stop leak' or any similar chemical agent in this system. Addition of these chemicals to the loop water will foul the system and inhibit unit operation.

CAUTION

To avoid possible damage to a plastic (PVC) piping system, do not allow temperatures to exceed 110°F (43°C).

Unit and System Checkout

⚠ WARNING

Verify ALL water controls are open and allow water flow prior to engaging the compressor. Freezing of the brazed plate or water lines can permanently damage the heat pump.

⚠ WARNING

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

NOTE: The manufacturer strongly recommends all piping connections, both internal and external to the unit, be pressure tested by an appropriate method prior to any finishing of the interior space or before access to all connections is limited. Test pressure may not exceed the maximum allowable pressure for the unit and all components within the water system. The manufacturer will not be responsible or liable for damages from water leaks due to inadequate or lack of a pressurized leak test, or damages caused by exceeding the maximum pressure rating during installation.

BEFORE POWERING THE SYSTEM,
please check the following:

UNIT CHECKOUT

- ❑ **Balancing/Shutoff Valves:** Ensure all isolation valves are open, water control valves wired and open or brazed plate may freeze and burst.
- ❑ **Line Voltage and Wiring:** Ensure Voltage is within an acceptable range for the unit and wiring and fuses/breakers are properly sized. Low voltage wiring is complete.
- ❑ **Unit Control Transformer:** Ensure transformer has properly selected control voltage tap. 208-230V units are factory wired for 208V operation unless specified otherwise.
- ❑ **Entering Water:** Ensure entering water temperatures are within the operating limits of Table 7.
- ❑ **Low Water Temperature Cutout:** Verify low water temperature cut-out on CXM2/DXM2.5 is properly set.
- ❑ **Water Flow Balancing:** Verify inlet and outlet water temperatures on both Load and source are recorded for each heat pump upon startup. This check can eliminate nuisance trip outs and high velocity water flows that can erode heat exchangers.
- ❑ **Unit Controls:** Verify CXM2 or DXM2.5 field-selection options are proper and complete.

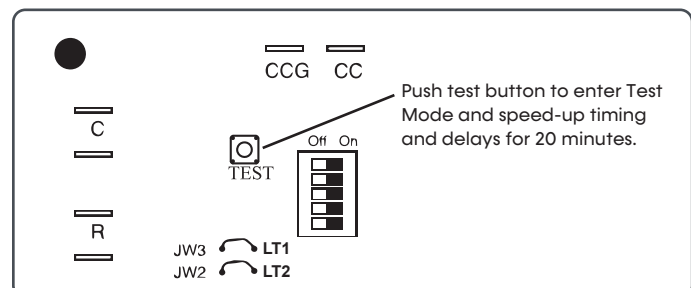
⚠ WARNING

Polyester 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.

SYSTEM CHECKOUT

- ❑ **System Water Temperature:** Check load and source water temperature for proper range and also verify heating and cooling setpoints for proper operation.
- ❑ **System pH:** System water pH is 6 - 8.5. Proper pH promotes longevity of hoses and fittings.
- ❑ **System Flushing:** Verify all hoses are connected end to end when flushing to ensure debris bypasses unit heat exchanger and water valves etc. 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.
- ❑ **Cooling Tower/Boiler:** Check equipment for proper setpoints and operation.
- ❑ **Standby Pumps:** Verify the standby pump is properly installed and in operating condition.
- ❑ **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 or operating problems occur.
- ❑ **System Control Center:** Verify control center and alarm panel for proper setpoints and operation.
- ❑ **Strainers:** Verify 20 mesh (841 micron) [0.84mm] strainers are installed in load and source water piping. Confirm maintenance schedule for strainers.
- ❑ **Miscellaneous:** Note any questionable aspects of the installation.

Figure 23: Test Mode Button



Models:
MW
036-120

Unit Startup Procedure

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.

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.

1. Adjust all valves to their full open position. Turn on the line power to all heat pump units.
2. Operate each unit in the cooling cycle. Loop water temperature entering the heat pumps should be between 70°F (21°C) and 110°F (43°C).
3. Operate each heat pump in the heating cycle immediately after checking cooling cycle operation. A time delay will prevent the compressor from re-starting for approximately five (5) minutes.
4. Establish a permanent operating record by logging the unit operating conditions at initial startup for each unit.
5. If a unit fails to operate, conduct the following checks:
 - a. Check the voltage and current. They should comply with the electrical specifications described on the unit nameplate.
 - b. Look for wiring errors. Check for loose terminal screws where wire connections have been made on both the line and low-voltage terminal boards.
 - c. Check the supply and return piping. They must be properly connected to the inlet and outlet connections on the unit.
 - d. If the checks described above fail to reveal the problem and the unit still will not operate, contact a trained service technician to ensure proper diagnosis and repair of the equipment.

NOTE: Units have a 5-minute time delay in the control circuit that can be bypassed on the CXM2 as shown in Figure 23. See controls description for detailed features of the control.

Table 6: Braze-Plate Water Pressure Drop

| Model | GPM | Pressure Drop PSI | | | |
|-----------------------------|------|-------------------|------|------|------|
| | | 30°F | 50°F | 70°F | 90°F |
| Source/Outdoor Brazed Plate | | | | | |
| MW036 | 4.5 | 1.7 | 1.3 | 1.0 | 0.8 |
| | 6.8 | 4.1 | 3.4 | 2.8 | 2.4 |
| | 9.0 | 7.1 | 6.0 | 5.1 | 4.5 |
| MW060 | 7.5 | 1.5 | 1.3 | 1.1 | 0.9 |
| | 11.3 | 4.0 | 3.4 | 3.0 | 2.7 |
| | 15.0 | 6.9 | 6.2 | 5.5 | 5.0 |
| MW120 | 15.0 | 1.7 | 1.4 | 1.2 | 0.9 |
| | 22.5 | 4.4 | 3.8 | 3.3 | 2.7 |
| | 30.0 | 7.6 | 6.8 | 6.1 | 5.0 |
| Load/Outdoor Brazed Plate | | | | | |
| MW036 | 4.5 | | 0.6 | 0.5 | 0.3 |
| | 6.8 | | 1.4 | 1.3 | 1.1 |
| | 9.0 | | 2.6 | 2.4 | 2.2 |
| MW060 | 7.5 | | 1.4 | 1.3 | 1.2 |
| | 11.3 | | 3.5 | 3.2 | 3.0 |
| | 15.0 | | 6.2 | 5.8 | 5.5 |
| MW120 | 15.0 | | 1.6 | 1.4 | 1.3 |
| | 22.5 | | 3.8 | 3.5 | 3.3 |
| | 30.0 | | 6.8 | 6.4 | 6.0 |

- Antifreeze is required for operation in the light grey area
- Operation in the dark grey area is not recommended

Unit Startup Procedure

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] |
| Water Limits | | |
| Min. entering water | 20°F [-6.7°C] ² | 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] ³ | |

Notes:

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

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] ⁵ |
| Max. entering air, DB/WB | 100/75°F [38/24°C] ⁴ | 80°F [27°C] |
| Water Limits | | |
| Min. entering water | 20°F [-6.7°C] ² | 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] | |

Notes:

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

Unit Maximum Water Working Pressure and Flow

| Unit Maximum Water Working Pressure PSIG (kPa) | |
|--|------------|
| Unit | 145 (100) |
| Maximum Water Flow Through Unit GPM (l/min) | |
| 036 | 25 (94.6) |
| 060, 120 | 35 (132.5) |

Models:
MW
036-120

Operating Pressures

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: MW Series Typical Unit Operating Pressures and Temperatures

| MW036-120 (MW120 Per Circuit) | | | | | | | | |
|-------------------------------|---------------------------------|------------------------------------|-----------------------------|-------------------------------|------------|-----------------|--------------------------------|---------------------------|
| Source EWT F | Source Water Flow GPM/ton | Cooling | | | | | | |
| | | Load EWT F @ 1.5-3.0 GPM/Ton | Suction Pressure PSIG | Discharge Pressure PSIG | Super-heat | Sub- cooling | Water Temp Rise F Source | Water Temp Drop F Load |
| 50 | 1.5 | 50 | 80-100 | 180-200 | 14-18 | 18-28 | 15-30 | 7-15 |
| | | 60 | 90-110 | 190-210 | 14-18 | 18-28 | | 8-17 |
| | | 70 | 100-120 | 200-220 | 17-21 | 18-28 | | 8-19 |
| | | 80 | 120-140 | 210-230 | 18-22 | 18-28 | | 9-20 |
| | 2.25 | 50 | 80-100 | 170-190 | 15-19 | 14-22 | 10-20 | 7-15 |
| | | 60 | 90-110 | 175-195 | 15-19 | 14-22 | | 8-17 |
| | | 70 | 100-120 | 180-200 | 16-20 | 14-22 | | 9-19 |
| | | 80 | 120-140 | 200-220 | 17-21 | 14-22 | | 9-20 |
| | 3.0 | 50 | 75-95 | 165-185 | 15-19 | 12-20 | 5-15 | 8-16 |
| | | 60 | 90-110 | 170-190 | 15-19 | 12-20 | | 8-17 |
| | | 70 | 95-115 | 175-195 | 16-20 | 12-20 | | 9-19 |
| | | 80 | 120-140 | 190-210 | 20-24 | 12-20 | | 9-20 |
| 80 | 1.5 | 50 | 90-110 | 300-320 | 11-15 | 18-25 | 15-30 | 7-14 |
| | | 60 | 100-120 | 310-330 | 11-15 | 18-25 | | 7-16 |
| | | 70 | 110-130 | 330-350 | 11-15 | 18-25 | | 8-18 |
| | | 80 | 130-150 | 350-370 | 12-16 | 18-25 | | 9-20 |
| | 2.25 | 50 | 95-115 | 295-315 | 10-14 | 14-21 | 12-18 | 7-14 |
| | | 60 | 105-125 | 305-325 | 10-14 | 14-21 | | 8-16 |
| | | 70 | 115-135 | 320-340 | 11-15 | 14-21 | | 8-18 |
| | | 80 | 130-150 | 340-360 | 14-18 | 14-21 | | 9-20 |
| | 3.0 | 50 | 100-120 | 285-305 | 10-14 | 12-18 | 10-15 | 7-15 |
| | | 60 | 110-130 | 300-320 | 10-14 | 12-18 | | 8-16 |
| | | 70 | 120-140 | 310-330 | 12-16 | 12-18 | | 9-18 |
| | | 80 | 140-160 | 330-350 | 13-17 | 12-18 | | 9-20 |
| 110 | 1.5 | 50 | 95-115 | 475-495 | 9-13 | 17-23 | 14-25 | 5-11 |
| | | 60 | 110-130 | 490-510 | 9-13 | 17-23 | | 6-13 |
| | | 70 | 120-140 | 510-530 | 10-14 | 17-23 | | 7-15 |
| | 2.25 | 50 | 90-110 | 460-480 | 9-13 | 15-20 | 14-17 | 5-11 |
| | | 60 | 115-135 | 465-485 | 9-13 | 15-20 | | 6-13 |
| | | 70 | 120-140 | 475-495 | 10-14 | 15-20 | | 7-15 |
| | 3.0 | 50 | 90-110 | 440-460 | 9-13 | 12-17 | 7-13 | 5-12 |
| | | 60 | 110-130 | 450-470 | 9-13 | 12-17 | | 6-14 |
| | | 70 | 120-140 | 470-490 | 10-14 | 12-17 | | 7-15 |
| | | 80 | 140-160 | 480-500 | 11-15 | 12-17 | | 8-17 |

Operating Pressures

Models:
MW
036-120

| MW036-120 (MW120 Per Circuit) | | | | | | | | |
|-------------------------------|---------------------------|------------------------------|-----------------------|-------------------------|------------|-------------|--------------------------|------------------------|
| Source EWT F | Source Water Flow GPM/ton | Heating | | | | | | |
| | | Load EWT F @ 1.5-3.0 GPM/Ton | Suction Pressure PSIG | Discharge Pressure PSIG | Super-heat | Sub-cooling | Water Temp Drop F Source | Water Temp Rise F Load |
| 20 | 3.0 | 60 | 50-60 | 180-200 | 10-14 | 6-15 | 2-6 | 5-14 |
| | | 80 | 50-60 | 280-300 | 10-14 | 6-15 | | 5-14 |
| | | 90 | 55-65 | 290-310 | 11-15 | 6-15 | | 4-14 |
| | | 100 | 55-65 | 360-385 | 11-15 | 6-15 | | 4-14 |
| | | 120 | 55-65 | 425-435 | 13-16 | 6-15 | | 4-13 |
| 50 | 1.5 | 60 | 70-80 | 200-220 | 11-15 | 12-18 | 9-16 | 6-17 |
| | | 80 | 75-85 | 310-330 | 11-15 | 12-18 | | 6-17 |
| | | 90 | 80-90 | 320-340 | 11-15 | 12-18 | | 6-17 |
| | | 100 | 85-95 | 380-400 | 11-15 | 12-18 | | 5-17 |
| | | 120 | 90-100 | 450-470 | 11-15 | 12-18 | | 4-16 |
| | 2.25 | 60 | 75-85 | 195-215 | 10-14 | 10-14 | 6-13 | 7-18 |
| | | 80 | 80-90 | 305-325 | 10-14 | 10-14 | | 6-18 |
| | | 90 | 85-95 | 310-330 | 10-14 | 10-14 | | 6-18 |
| | | 100 | 90-100 | 360-380 | 10-14 | 10-14 | | 6-17 |
| | | 120 | 95-105 | 445-465 | 10-14 | 10-14 | | 5-17 |
| | 3.0 | 60 | 80-90 | 190-210 | 9-13 | 7-15 | 5-10 | 7-19 |
| | | 80 | 85-95 | 300-320 | 9-13 | 7-15 | | 7-19 |
| | | 90 | 90-100 | 305-325 | 9-13 | 7-15 | | 6-19 |
| | | 100 | 95-105 | 360-380 | 9-13 | 7-15 | | 6-18 |
| | | 120 | 100-110 | 440-460 | 9-13 | 7-15 | | 5-17 |
| 80 | 1.5 | 60 | 110-120 | 220-240 | 13-17 | 16-20 | 15-21 | 8-18 |
| | | 80 | 120-130 | 310-330 | 13-17 | 16-20 | | 8-19 |
| | | 90 | 125-135 | 320-340 | 13-17 | 16-20 | | 7-19 |
| | | 100 | 130-140 | 400-420 | 13-17 | 16-20 | | 7-19 |
| | | 120 | 135-145 | 480-500 | 13-17 | 16-20 | | 6-20 |
| | 2.25 | 60 | 100-110 | 215-235 | 12-16 | 14-19 | 9-16 | 8-20 |
| | | 80 | 120-130 | 290-300 | 12-16 | 14-19 | | 8-20 |
| | | 90 | 130-140 | 330-350 | 12-16 | 14-19 | | 8-20 |
| | | 100 | 140-150 | 400-420 | 12-16 | 14-19 | | 7-20 |
| | | 120 | 150-160 | 475-495 | 12-16 | 14-19 | | 6-20 |
| | 3.0 | 60 | 110-120 | 220-240 | 11-15 | 6-18 | 7-12 | 9-21 |
| | | 80 | 135-150 | 280-300 | 11-15 | 6-18 | | 8-21 |
| | | 90 | 130-140 | 340-360 | 11-15 | 6-18 | | 8-21 |
| | | 100 | 140-150 | 405-425 | 11-15 | 6-18 | | 8-21 |
| | | 120 | 150-160 | 490-510 | 11-15 | 6-18 | | 6-21 |

Models:
MW
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Preventative Maintenance

HEAT EXCHANGER MAINTENANCE (DIRECT GROUND WATER APPLICATIONS ONLY)

If the installation is performed in an area with a known high mineral content (125 ppm or greater) in the water, it is best to establish with the owner a periodic maintenance schedule so the coil can be checked regularly. Consult the well water applications section of this manual for a more detailed water coil material selection. Should periodic coil cleaning be necessary, use standard coil cleaning procedures which are compatible with either the heat exchanger material or copper water lines. Generally, the more water flowing through the unit the less chance for scaling therefore 2.5 GPM per ton (2.0 l/m per kW) is recommended as a minimum flow.

HEAT EXCHANGER MAINTENANCE (ALL OTHER WATER LOOP APPLICATIONS)

Generally water coil maintenance is not needed however, if the installation is located in a system with a known high dirt or debris content, it is best to establish with the owner a periodic maintenance schedule so the coil can be checked regularly. These dirty installations are a result of the deterioration of iron or galvanized piping or components in the system or open cooling towers requiring heavy chemical treatment and mineral buildup through water use. 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.

Clean or replace 20 mesh (841 micron) [0.84mm] strainer/filters on a timely schedule.

COMPRESSORS

Conduct annual amperage checks to ensure amp draw is no more than 10% greater than that indicated by serial plate data.

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 smaller cabinets are set up from the floor a few inches for prevention. The cabinet can be cleaned using a mild detergent.

REFRIGERANT SYSTEM

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

If the refrigerant circuit is opened for any reason, a new liquid line filter-drier must be installed.

Startup Log Sheet

Models:
MW
036-120

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.

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

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

| | Cooling Mode | | Heating Mode | |
|----------------------------|--------------|-----|--------------|-----|
| Source | | | | |
| Entering Fluid Temperature | | | | |
| Leaving Fluid Temperature | | | | |
| Temperature Differential | DB | | DB | |
| Pressure | In | Out | In | Out |
| Pressure Differential | | | | |
| Load | | | | |
| Entering Fluid Temperature | | | | |
| Leaving Fluid Temperature | | | | |
| Temperature Differential | DB | | DB | |
| Pressure In | In | Out | In | Out |
| Pressure Differential | | | | |
| Compressor | | | | |
| Amps | | | | |
| Volts | | | | |
| Discharge Line Temperature | | | | |

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:
MW
036-120

Refrigeration Troubleshooting Form

Customer:

Loop Type:

Startup Date:

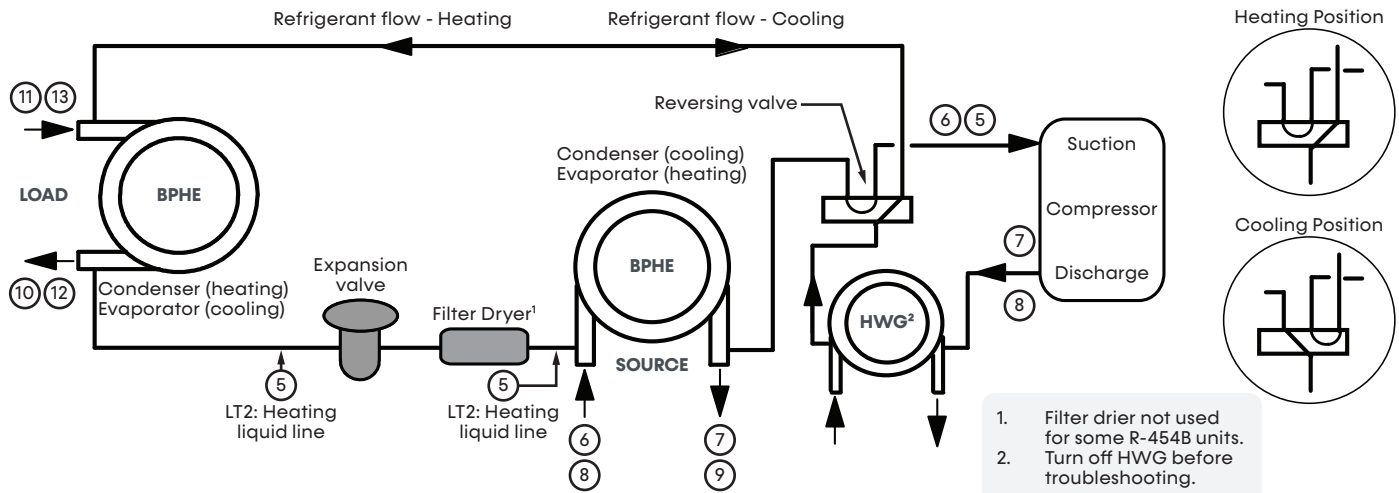
Model #:

Serial #:

Antifreeze Type:

%

Complaint:



| 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 Load Water In Temp. | | | |
| 11 Load Water Out Temp. | | | $\Delta T =$ |
| 12 Load Water In Pressure | | | |
| 13 Load Water Out Pressure | | | |
| 13a Pressure Drop | | | |
| 13b Flow Rate GPM [l/s] | | | |

Warranty

Models:
MW
036-120



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 MW 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 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 MW Series 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

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.

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



KEEP THIS INFORMATION AS A RECORD OF YOUR PURCHASE

GEO THERMAL HEAT PUMP

Model Number _____

Serial Number _____

Date of Purchase _____

INSTALLATION

Installer Name _____

Phone Number/Contact Information _____

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:
MW
036-120

Revision History

| Date | Section | Description |
|----------|---------|-------------|
| 06/26/25 | All | Created |



1900 Wellworth Ave. | Jackson, MI 49203
Phone: 517.787.2100
www.marsdelivers.com



9 7 B 0 1 6 4 N 0 3

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.

Engineered and assembled in the USA.

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