The Whalen Company

WHALEN CLOSETLINE® WR SINGLE-STAGE SERIES

INSTALLATION, OPERATION & MAINTENANCE MANUAL

Part#: 97B0167N01 | Updated: August 22, 2024

Models: WR 006-060
60 Hz – R-454B

Models:
WR
006-060

Table of Contents

Model Nomenclature

Models:
WR
006-060

Position	Option	Option Code	Description
1	Brand	W	W - Whalen Closetline Series
2	Product Family	R	R - Single-Stage Mid-Size Cabinet
3	Configuration	H	H - Horizontal unit configuration
		V	V - Vertical unit configuration
4	System Type	G	G - Heat Pump
		C	C - Air Conditioning and Hydronic Heat
5-7	Unit Capacity	M	M - Heat Pump with Waterside Economizer
		006	006 - 0.50 ton R-454B WR Packaged Heat Pump
		009	009 - 0.75 ton R-454B WR Packaged Heat Pump
		012	012 - 1.00 ton R-454B WR Packaged Heat Pump
		015	015 - 1.25 ton R-454B WR Packaged Heat Pump
		018	018 - 1.50 ton R-454B WR Packaged Heat Pump
		024	024 - 2.00 ton R-454B WR Packaged Heat Pump
		030	030 - 2.50 ton R-454B WR Packaged Heat Pump
		036	036 - 3.00 ton R-454B WR Packaged Heat Pump
		042	042 - 3.50 ton R-454B WR Packaged Heat Pump
		048	048 - 4.00 ton R-454B WR Packaged Heat Pump
		060	060 - 5.00 ton R-454B WR Packaged Heat Pump
8	Revision	A	A - 1st Generation
9	Voltage	A	A - Unit Voltage: 115-60-1
		B	B - Unit Voltage: 208/230-60-1
		D	D - Unit Voltage: 265-60-1
		J	J - Unit Voltage: 208/230-60-3
		M	M - Unit Voltage: 460-60-3
		Q	Q - Unit Voltage: 575-60-3
10	Refrigerant Detection	X	X - No Refrigerant Detection Sensor Installed
		A	A - Refrigerant Detection Sensor
11	Control Type	A	A - Solid State Control for Thermostat Input
		B	B - Solid State Control with IO Zone 560 DDC Control
		C	C - Deluxe Solid State Control for Thermostat Input
		D	D - Deluxe Solid State Control with IO Zone 560 DDC Control
12	Power Termination	X	X - Single Point Power: No disconnect
		A	A - Single Point Power: Non-Fused unit disconnect
13	Drain pan	A	A - Standard Stainless Steel P-trap Drain Pan
		C	C - Anti-corrosion Polymer Drain Pan
14	Insulation	A	A - Fiberglass

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Position	Option	Option Code	Description
15	Application	1	1 - WSHP Application
		2	2 - Extended Range / Geothermal Application
16	Sound Attenuation	X	X - Standard Quiet Construction
		C	C - Enhanced Quiet Construction
17	Filter Mount	A	A - Filter Rail - 1 Inch - Free Return
		B	B - Full Frame - 1 Inch - Ducted
		C	C - Filter Rail - 2 Inch - Free Return
		D	D - Full Frame - 2 Inch - Ducted
18	Filtration	X	X - Field installed / field furnished
		A	A - 1" MERV 4 Throwaway
19	Refrigerant Circuit	S	S - Standard Coax
		C	C - Cupro-Nickel Coax
20	Control valves	X	X - No control valve installed
		A	A - 2-way valve, on/off, 30 psi differential
		B	B - 2-way valve, on/off, 60 psi differential
		C	C - 2-way valve, on/off, 125 psi differential
		D	D - 3-way valve, on/off, 30 psi differential
21	Flow Control	X	X - No flow control device installed
		A	A - Automatic Flow Valve - 2.5 GPM / Ton
		B	B - Automatic Flow Valve - 3.0 GPM / Ton
		C	C - Manual Flow Control Valve
		D	D - Secondary Circulating Pump
22	Strainers	X	X - No Strainer or Pressure Ports Installed
23	Coil Protection	C	C - Copper tube / Aluminum fin
		T	T - Tin Dipped Hairpins
24	Air Flow	T	T - Top Supply / Left Return
		K	K - Top Supply / Right Return
		B	B - Back Supply / Left Return
		P	P - Back Supply / Right Return
		L	L - Straight Supply / Left Return
		R	R - Straight Supply / Right Return
25	Fan	S	S - PSC - Standard Motor
		T	T - ECM - Constant Torque Motor
		V	V - ECM - Constant Air Volume Motor - DELUXE CONTROL REQUIRED
26	HWG	X	X - None - No Hot Water Generator
		A	A - Hot Water Generator (Coil Only)
27	Future	X	X - Future Option 1
28-30	Future	XXX	XXX - Future Option 2

Attentions, Cautions, and Warnings

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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 Amin 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

Auxillary 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 ClimateMaster shall be installed in connecting ductwork. The installation of any other auxiliary devices is beyond ClimateMaster's responsibility.

⚠ WARNING

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

⚠ WARNING

Children being supervised are NOT to play with the appliance.

⚠ WARNING

Do not pierce or burn.

⚠ WARNING

Be aware that refrigerants may not contain odor.

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Attentions, Cautions, and Warnings

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ CAUTION

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

⚠ NOTICE

Servicing shall be performed only as recommended by the manufacturer.

⚠ NOTICE

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

⚠ NOTICE

An unconditioned attic is not considered natural ventilation.

⚠ NOTICE

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

⚠ NOTICE

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

⚠ NOTICE

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

General Information

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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.

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General Information

Work Procedure

Work shall be undertaken under a controlled procedure so as to minimise 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 CO_2 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.

REPAIR TO INTRINSICALLY SAFE COMPONENTS

Intrinsically safe components must be replaced.

CABLING

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

REQUIRED AREA FOR INSTALLATION

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

NOTE: You can use Imperial or Metric measurements to calculate A_{min} or T_{amin}.

Table 1: Altitude Adjustment

H_{alt} ft (m)	AF
0 (0)	1.00
656 (200)	1.00
1,312 (400)	1.00
1,968 (600)	1.00
2,624 (800)	1.02
3,280 (1,000)	1.05
3,937 (1,200)	1.07
4,593 (1,400)	1.10
5,249 (1,600)	1.12
5,905 (1,800)	1.15
6,561 (2,000)	1.18
7,217 (2,200)	1.21
7,874 (2,400)	1.25
8,530 (2,600)	1.28
9,186 (2,800)	1.32
9,842 (3,000)	1.36
10,498 (3,200)	1.40

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Minimum Installation Area

MINIMUM INSTALLATION AREA

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

Model	Charge (oz)	Configuration	Minimum Installation Area ft² (m²) [A_{min}]			
			Floor	Window	Wall	Ceiling
WR060	69	Vertical	237 (22.0)	132 (12.2)	76 (7.0)	63 (5.9)
		Horizontal	237 (22.0)	141 (13.1)	79 (7.3)	65 (3.0)

A_{min} = Minimum area where unit is installed where unit has incorporated airflow

h_{inst} (floor) = 0.0 ft (0.0 m)

h_{inst} (window) = 3.3 ft (1.0 m)

h_{inst} (wall) = 5.9 ft (1.8 m)

h_{inst} (ceiling) = 7.2 ft (2.2 m)

Minimum area and CFM requirements for the conditioned space

Model	Charge (oz)	Minimum CFM [Q_{min}]	
		TA_{min} (ft²)	Q_{min} (ft³/min)
WR060	69	3.54	117

TA_{min} = Minimum conditioned area for venting leaked refrigerant

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

Minimum area of opening for natural ventilation

Model	Charge (oz)	A_{nv} (in²)
WR060	69	111.57

A_{nv} = Minimum natural ventilation area opening

When the openings for connected rooms or natural ventilation are required, the following conditions shall be applied:

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

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REFRIGERANT SYSTEM

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 if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe. 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 is 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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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 pipe-work.

NOTE:
Examples of leak detection fluids are:

- Bubble method
- Fluorescent method agents

If a leak is suspected, all naked flames shall be removed/extinguished.

If a refrigerant leak that requires brazing is identified, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off 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, make sure 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 is has been decommissioned and emptied of refrigerant. The label shall be dated and signed.

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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 shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

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

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

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

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

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Physical Data

Whalen (WR) Series

Unit Size	006	009	012	015	018	024	030	036	042	048	060
Number of refrigerant circuits	1	1	1	1	1	1	1	1	1	1	1
Factory Charge R-454B - (oz.)	17	18	21	29	37	40	39	46	56	56	69
Refrigerant Leak Detection System	O	O	O	O	O	O	O	O	O	O	R
Number of Sensors	2	2	2	2	2	2	2	2	2	2	2
Water Connection Size											
Source FPT	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"	1"	1"
System Water Volume (gallons)	0.143	0.143	0.167	0.286	0.45	0.323	0.323	0.738	0.89	0.89	0.939
Vertical											
Filter Standard - 1" Throwaway	10X18	10X18	10X18	20X20	20X20	20x20	20x20	24x24	24x24	28x28	28x28
Weight - Operating (lbs.)	110	112	121	163	168	216	224	245	260	315	330
Weight - Packaged (lbs.)	115	117	126	168	173	221	229	251	266	322	337
Horizontal											
Filter Standard - 1" Throwaway	10X18	10X18	10X18	16X25	16X25	18x24	18x24	2-14x20	2-14x20	1-20x24 1-14x20	1-20x24 1-14x20
Weight - Operating (lbs.)	110	112	121	163	168	208	208	233	244	299	314
Weight - Packaged (lbs.)	115	117	126	168	173	213	213	239	250	306	321
Vertical - Hot Water Generator											
FPT - All Other				1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Weight - Operating (lbs.)				178	183	231	239	260	275	330	345
Weight - Packaged (lbs.)				183	188	236	244	266	281	337	352
Horizontal - Hot Water Generator											
FPT - All Other				1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Weight - Operating (lbs.)				178	183	223	223	248	259	314	329
Weight - Packaged (lbs.)				183	188	228	228	254	265	321	336

Notes:
All dimensions displayed above are in inches unless otherwise marked.
All units have TXV and ½-inch and ¾-inch electrical knockouts.
The standard Condensate Drain Connection is a rubber coupling that couples to ¾-inch schedule 40/80 PVC.
The optional Stainless Steel Condensate Drain Connection is ¾-inch FPT.
575V fan motors are two speed.
FPT=Female Pipe Thread
O = Optional, R = Required

Horizontal Installation

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HORIZONTAL UNIT LOCATION

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

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

Conform to the following guidelines when selecting unit location:

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

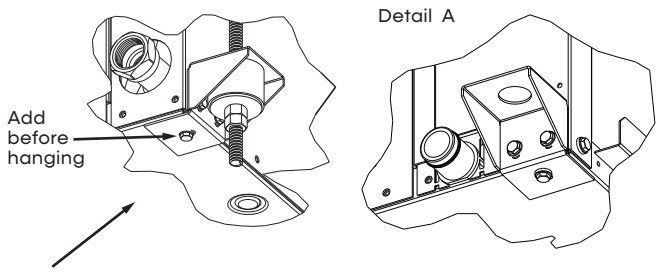
The installation of water source heat pump units and all associated components, parts and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations. **NOTE: Minimum clearances for installation are the same as the minimum required service clearances. Consult the service clearances or reference of installation clearances for more information.**

MOUNTING HORIZONTAL UNITS

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

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

Figure 1: Hanger Bracket



View: Water Connection End Fully Assembled
(Unit pictured for hanger bracket reference)
(Water hardware may vary per unit model)

Models:
WR
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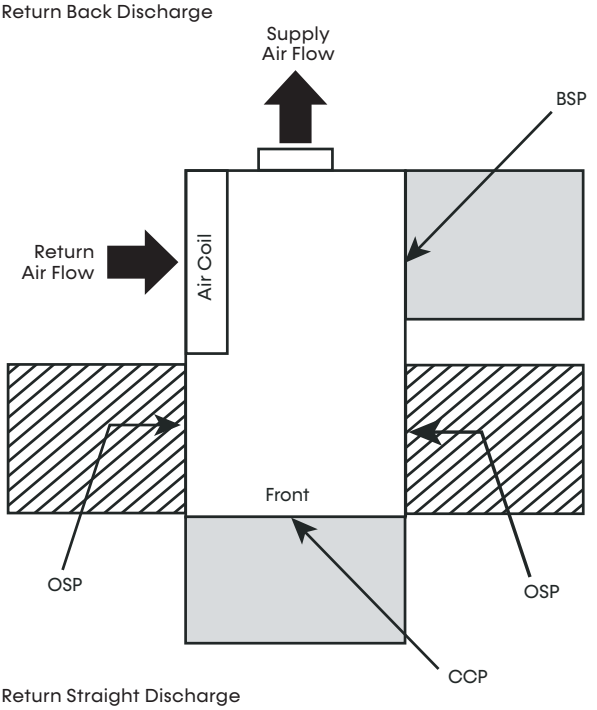
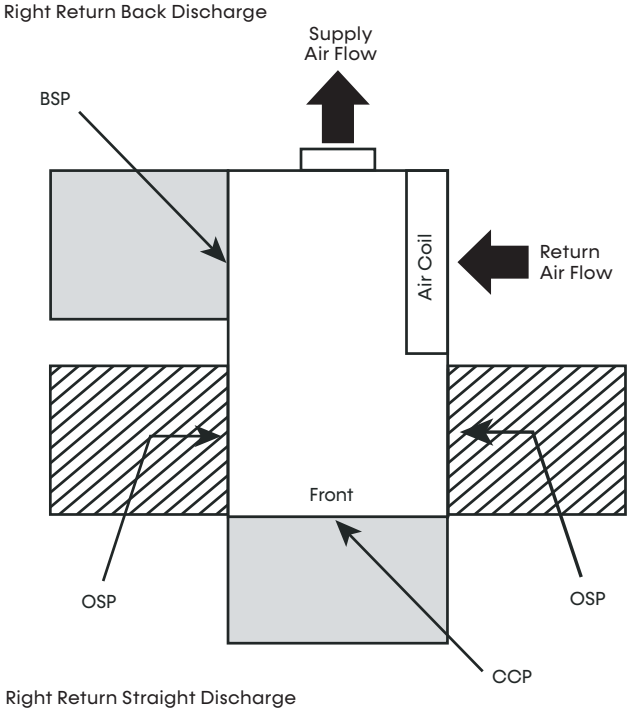
Horizontal Installation: Service Access

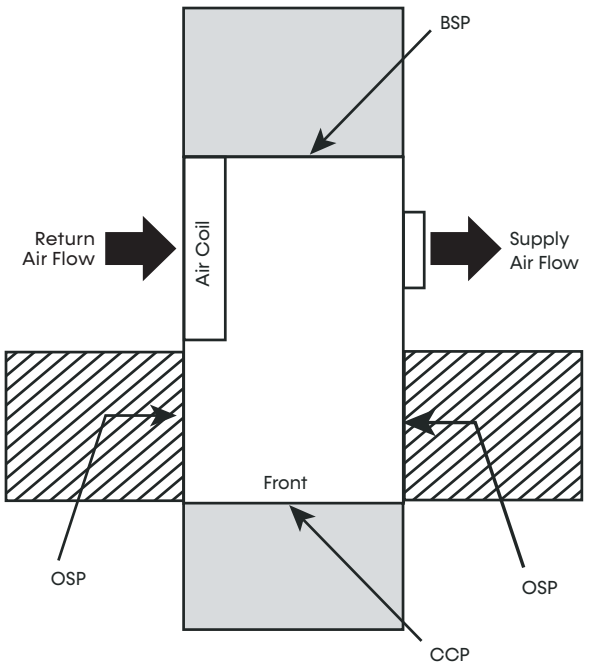
Left Return Back Discharge



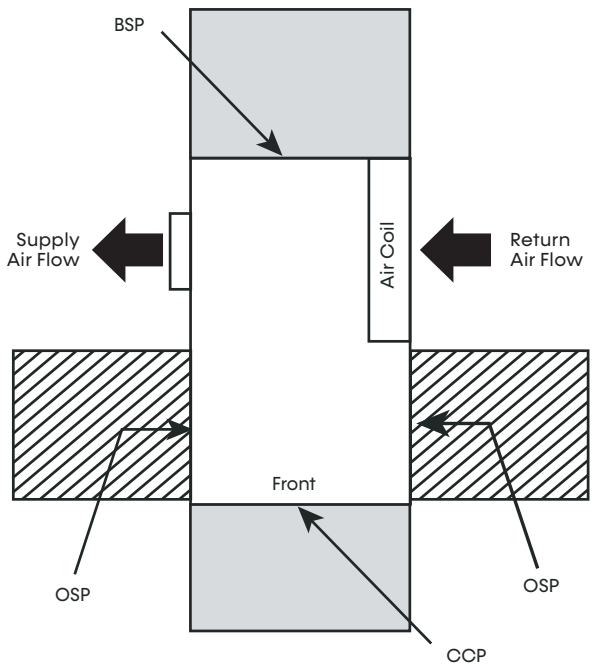
Right Return Back Discharge



Left Return Straight Discharge



Right Return Straight Discharge



Notes:

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

= Mandatory Service Access 2-foot (61 cm)

= Optional Service Access 2-foot (61 cm)

Legend:
CCP = Control/Compressor Access
BSP = Blower Service Panel
OSP = Optional Service Panel (not required)

Horizontal Installation

Models:
WR
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Figure 2: Horizontal Unit Pitch

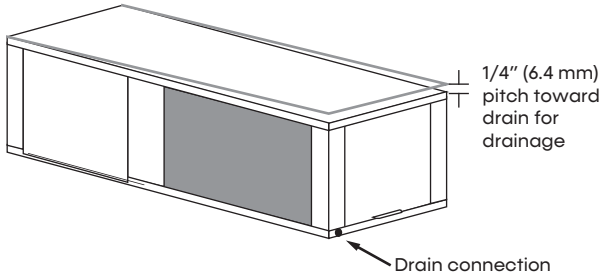
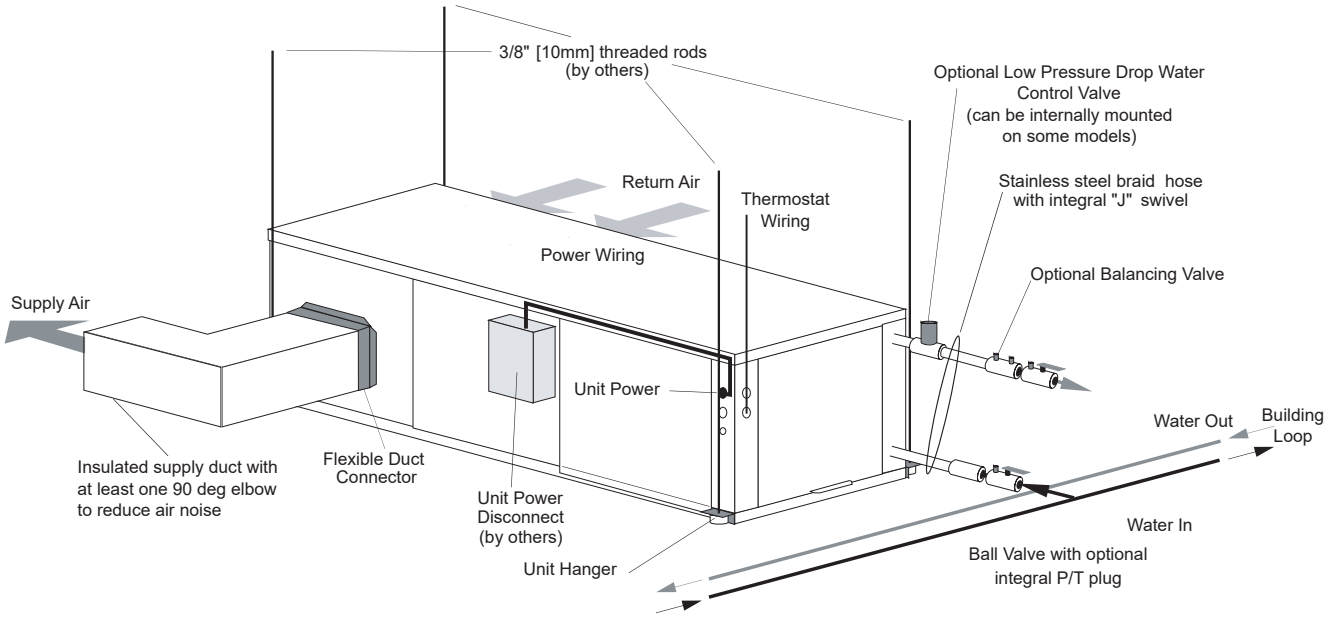


Figure 3: Typical Unit Installation



AIR COIL

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

⚠ NOTICE

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

Models:
WR
006-060

Horizontal Installation

CONDENSATE PIPING

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

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

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

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

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

POLYMER DRAIN PANS

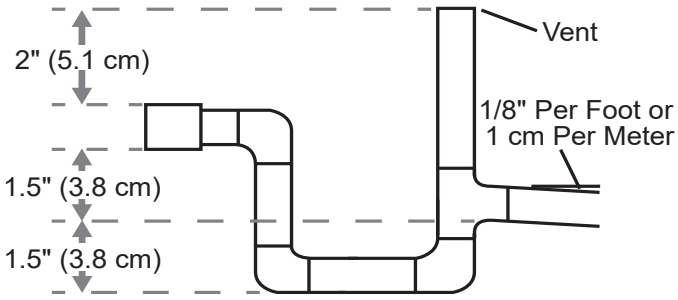
Condensate drain connection is a rubber coupling that connects to ¾-inch schedule 40/80 PVC. Use hose clamps to secure the pipe inside the coupling. If the connection is not secure, the connection may leak.

Instructions for coupling the condensate drain to the trap are included in the bag that includes the coupling and hose clamps.

STAINLESS STEEL DRAIN PANS

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

Figure 4: Horizontal Condensate Connection



⚠ CAUTION

Ensure condensate line is pitched toward drain ⅛ inch per foot [11 mm per m] of run.

Duct System Installation

Models:
WR
006-060

DUCT SYSTEM INSTALLATION

Proper duct sizing and design is critical to the performance of the unit. The duct system should be designed to allow adequate and even airflow through the unit during operation. Air flow through the unit MUST be at or above the minimum rated airflow for a given unit size to avoid equipment damage. Duct systems should be designed for quiet operation. Refer to Figure 4 for horizontal duct system details or Figure 9 for vertical duct system details. A flexible connector is recommended for both discharge and return air duct connections on metal duct systems to eliminate the transfer of vibration to the duct system. To maximize sound attenuation of the unit blower, the supply and return plenums should include internal fiberglass duct liner or be constructed from ductboard for the first few feet. Application of the unit to uninsulated ductwork in an unconditioned space is not recommended, as the unit's performance may be adversely affected.

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

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

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

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

For duct-connected units, false ceilings or drop ceilings may be used as a return air plenum as long as the Whalen RDS is installed as shown in Figure 20.

⚠ WARNING

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

⚠ WARNING

Keep any required ventilation openings clear of obstruction.

⚠ WARNING

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

Models:
WR
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Field Conversion of Air Discharge

OVERVIEW

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

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

PREPARATION

It is best to field convert the unit discharge configuration on the ground before hanging. If the unit is already hung it should be taken down for the field conversion.

SIDE-TO-BACK DISCHARGE CONVERSION

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

BACK-TO-SIDE DISCHARGE CONVERSION

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

LEFT VERSUS RIGHT RETURN

It is not possible to field convert return air between left or right return models due to the necessity of refrigeration copper piping changes. However, the conversion process of side-to-back or back-to-side discharge for either right or left return configuration is the same. In some cases, it may be possible to rotate the entire unit 180 degrees if the return air connection needs to be on the opposite side. **NOTE: rotating the unit moves the piping to the other end of the unit.**

Figure 5: Left Return – Side-to-Back

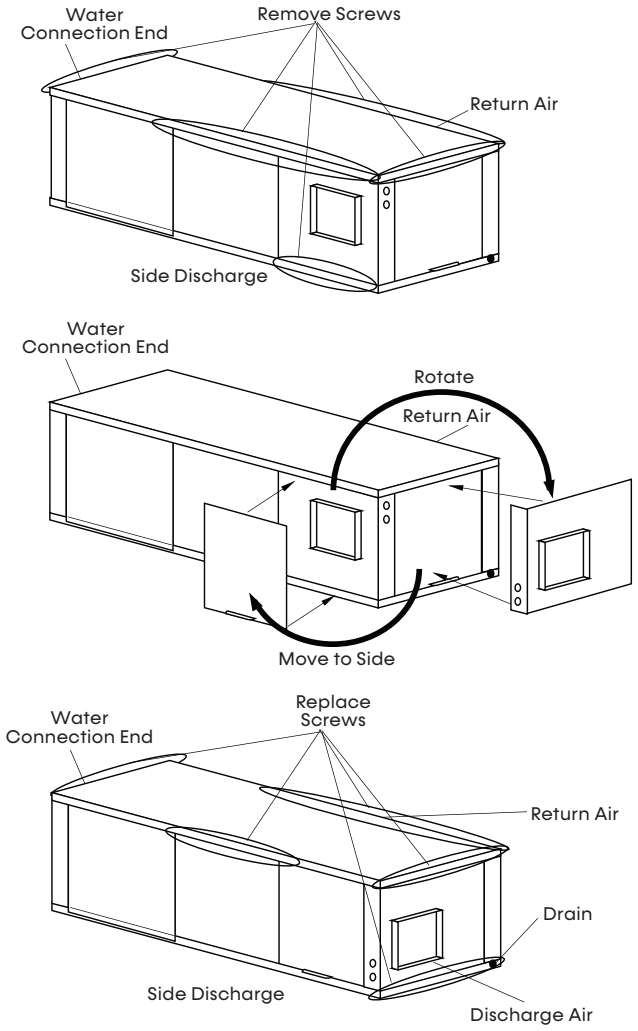
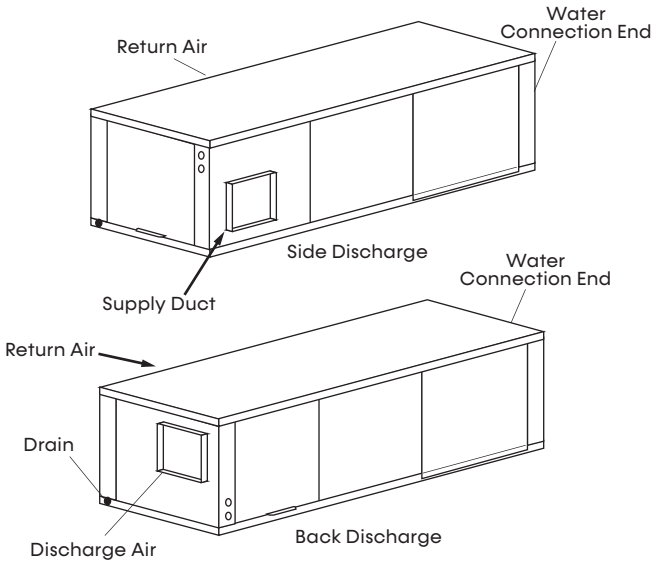


Figure 6: Right Return – Side-to-Back



Vertical Installation

Models:
WR
006-060

VERTICAL UNIT LOCATION

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

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

1. For optimal sound performance, install the unit on a piece of rubber, neoprene, or other mounting pad material for sound isolation. The pad should be at least ⅜-inch (10 mm) to ½-inch (13 mm) in thickness. The vibration isolation pad should cover the entire base of the unit and slightly extend past all four edges of the base.
2. Provide adequate clearance for filter replacement and drain pan cleaning. Do not block filter access with piping, conduit, or other materials. Refer to unit submittal data or engineering design guide for dimensional data.
3. Provide access for fan and fan motor maintenance and for servicing the compressor and coils without removing the unit.
4. Provide an unobstructed path to the unit within the closet or mechanical room. Space should be sufficient to allow removal of the unit, if necessary.
5. In limited side access installations, pre-removal of the control box side mounting screws will allow control box removal for future servicing.
6. Provide access to water valves and fittings and screwdriver access to the unit side panels, discharge collar and all electrical connections.

Figure 7: Vertical Unit Mounting

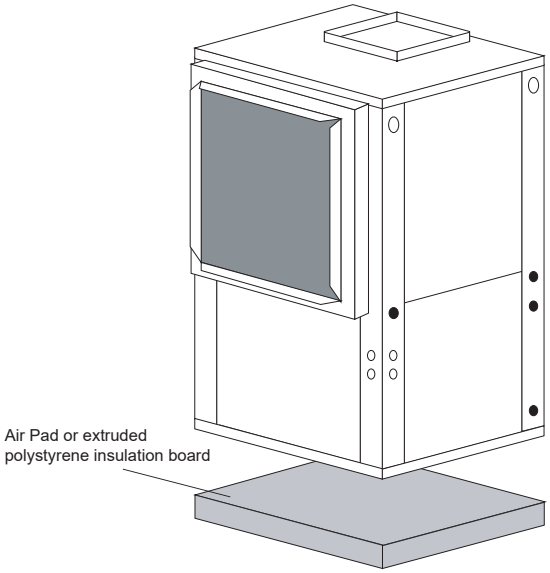
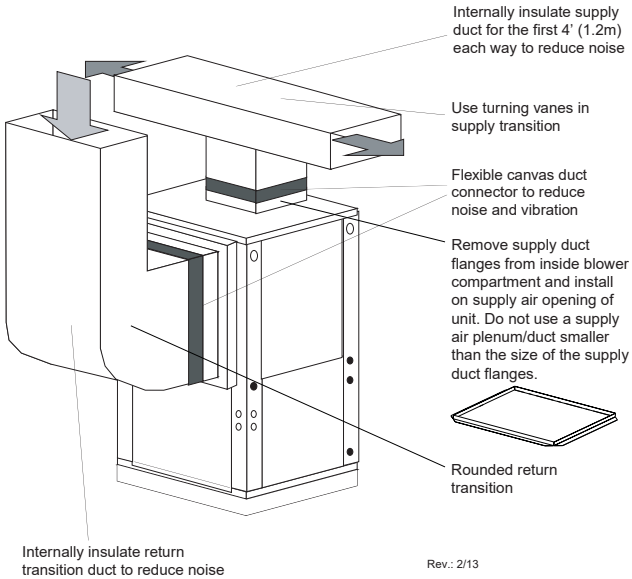


Figure 8: Typical Vertical Unit Installation Using Ducted Return Air



⚠ NOTICE

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

Models:
WR
006-060

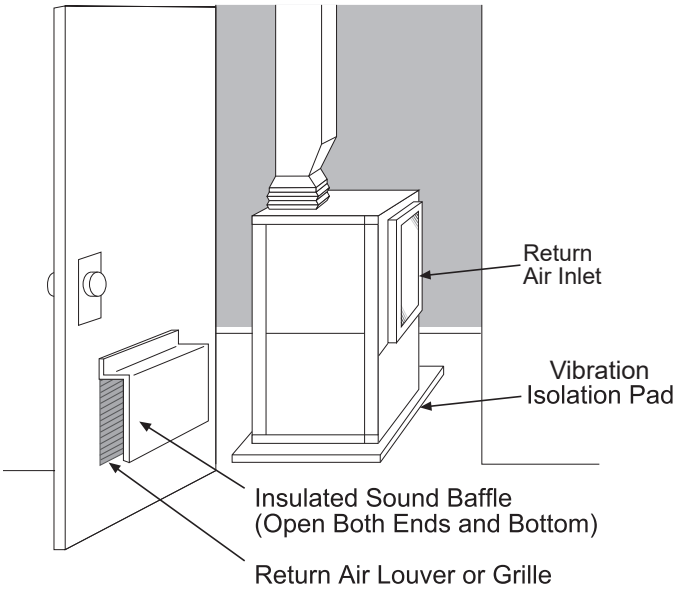
Vertical Installation

SOUND ATTENUATION FOR VERTICAL UNITS

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

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

Figure 9: Vertical Sound Attenuation



CONDENSATE PIPING FOR VERTICAL UNITS

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

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

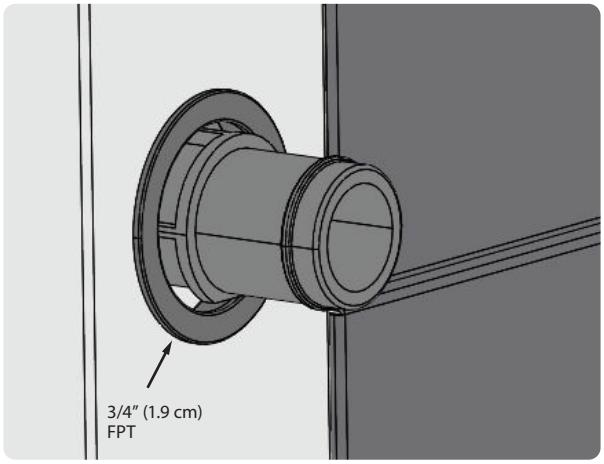
Always vent the condensate line when dirt or air can collect in the line or a long horizontal drain line is required. Also vent when large units are working against higher external static pressure than other units connected to the same condensate main since this may cause poor drainage for all units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

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

Condensate drain connection is a rubber coupling that couples to ¾-inch schedule 40/80 PVC. Use hose clamps to secure the pipe inside the coupling. If the connection is not secure, the connection may leak.

Instructions for coupling the condensate drain to the trap are included in the bag that includes the coupling and hose clamps.

Figure 10: Vertical Condensate Drain

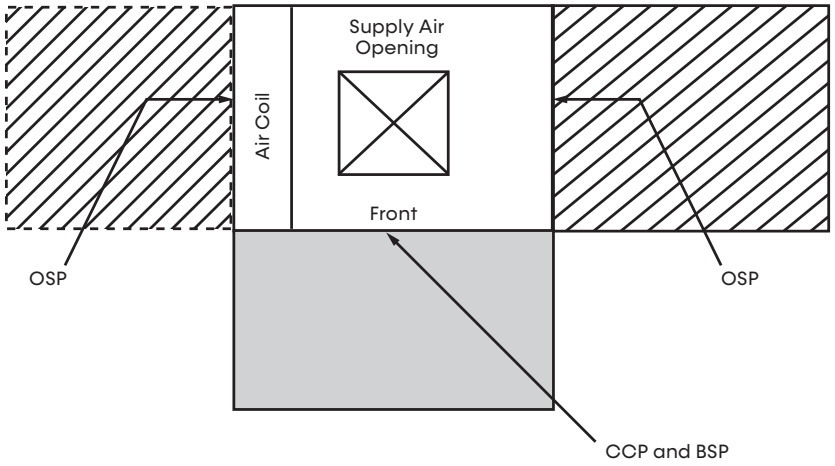


Vertical Installation: Service Access

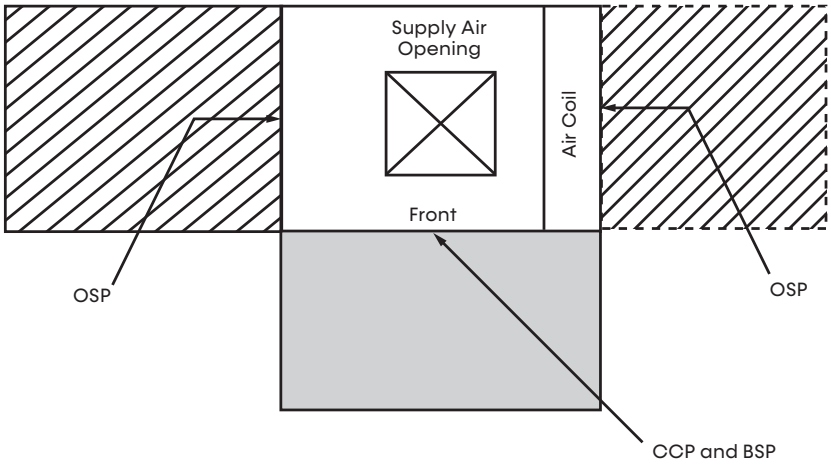
Models:
WR
006-060

Vertical Units

Left Return



Right Return



Notes:

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

= Mandatory Service Access 2-foot (61 cm)

= Optional Service Access 2-foot (61 cm)

Legend:
CCP = Control/Compressor Access
BSP = Blower Service Panel
OSP = Optional Service Panel (not required)

Models:
WR
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Piping Installation

INSTALLATION 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 shut-off/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. Refer to Table 2. Do not exceed the minimum bend radius for the hose selected. Exceeding the minimum bend radius may cause the hose to collapse, which reduces water flow rate. Install an angle adapter to avoid sharp bends in the hose when the radius falls below the required minimum.

Insulation is not required on loop water piping except where the piping runs through unheated areas, outside the building or when the loop water temperature is below the minimum expected dew point of the pipe ambient conditions. Insulation is required if loop water temperature drops below the dew point (insulation is required for ground loop applications in most climates).

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 external pipe threads of the fitting adapters. Prevent sealant from reaching the flared surfaces of the joint.

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

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.

Optional pressure-rated hose assemblies designed specifically for use with Whalen units are available. Similar hoses can be obtained from alternate suppliers. Supply and return hoses are fitted with swivel-joint fittings at one end to prevent kinking during installation.

The figure below illustrates a typical supply/return hose kit. Adapters secure hose assemblies to the unit and risers. Install hose assemblies properly and check 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.

⚠ CAUTION

Do not bend or kink supply lines or hoses.

⚠ CAUTION

Piping must comply with all applicable codes.

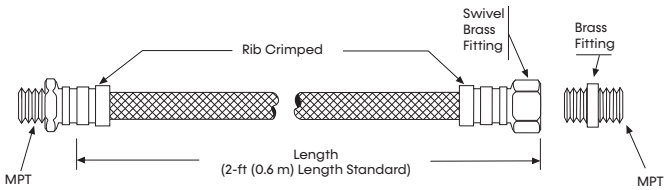
⚠ NOTICE

Do not allow hoses to rest against structural building components. Compressor vibration may be transmitted through the hoses to the structure, causing unnecessary noise complaints.

Table 2: Metal Hose Minimum Bend Radii

Hose Diameter	Minimum Bend Radii
1/2" [12.7 mm]	2-1/2" [6.4 cm]
3/4" [19.1 mm]	4" [10.2 cm]
1" [25.4 mm]	5-1/2" [14 cm]
1-1/4" [31.8 mm]	6-3/4" [17.1 cm]

Figure 11: Supply/Return Hose Kit



Water-Loop Heat Pump Applications

Models:
WR
006-060

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. Consideration should be given to insulating the piping surfaces to avoid condensation. The manufacturer recommends piping insulation any time the water temperature is below 60°F (15.6°C). Metal to plastic threaded joints should never be used 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 upon selection, hose kits may include shut off 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.

The piping system should be flushed 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 will be necessary.

Models:
WR
006-060

Ground-Loop Heat Pump Application

⚠ CAUTION

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

⚠ CAUTION

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

PRE-INSTALLATION

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

PIPING INSTALLATION

All earth loop piping materials should be limited to polyethylene fusion only for in-ground sections of the loop. Galvanized or steel fittings should not be used at any time due to their tendency to corrode. All plastic to metal threaded fittings should be avoided due to their potential to leak in earth coupled applications. A flanged fitting should be substituted. P/T plugs should be used so that flow can be measured using the pressure drop of the unit heat exchanger.

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

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

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.

ANTIFREEZE

In areas where minimum entering loop temperatures drop below 40°F (5°C) or where piping will be routed through areas subject to freezing, antifreeze is required. Alcohols and glycols are commonly used as antifreeze; however your local sales office should be consulted to determine the antifreeze best suited to your area. Freeze protection should be maintained 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 22 to 25°F (-6 to -4°C) and freeze protection should be at 15°F (-10°C).

Calculation is as follows:

30°F - 15°F = 15°F [-1°C - 9°C = -10°C]

All alcohols should be premixed and pumped from a reservoir outside of the building when possible or introduced under the water level to prevent fumes. Calculate the total volume of fluid in the piping system. Then use the percentage by volume shown in the table below for the amount of antifreeze needed. Antifreeze concentration should be checked from a well mixed sample using a hydrometer or refractometer to measure specific gravity.

Table 3: Antifreeze Percentages by Volume

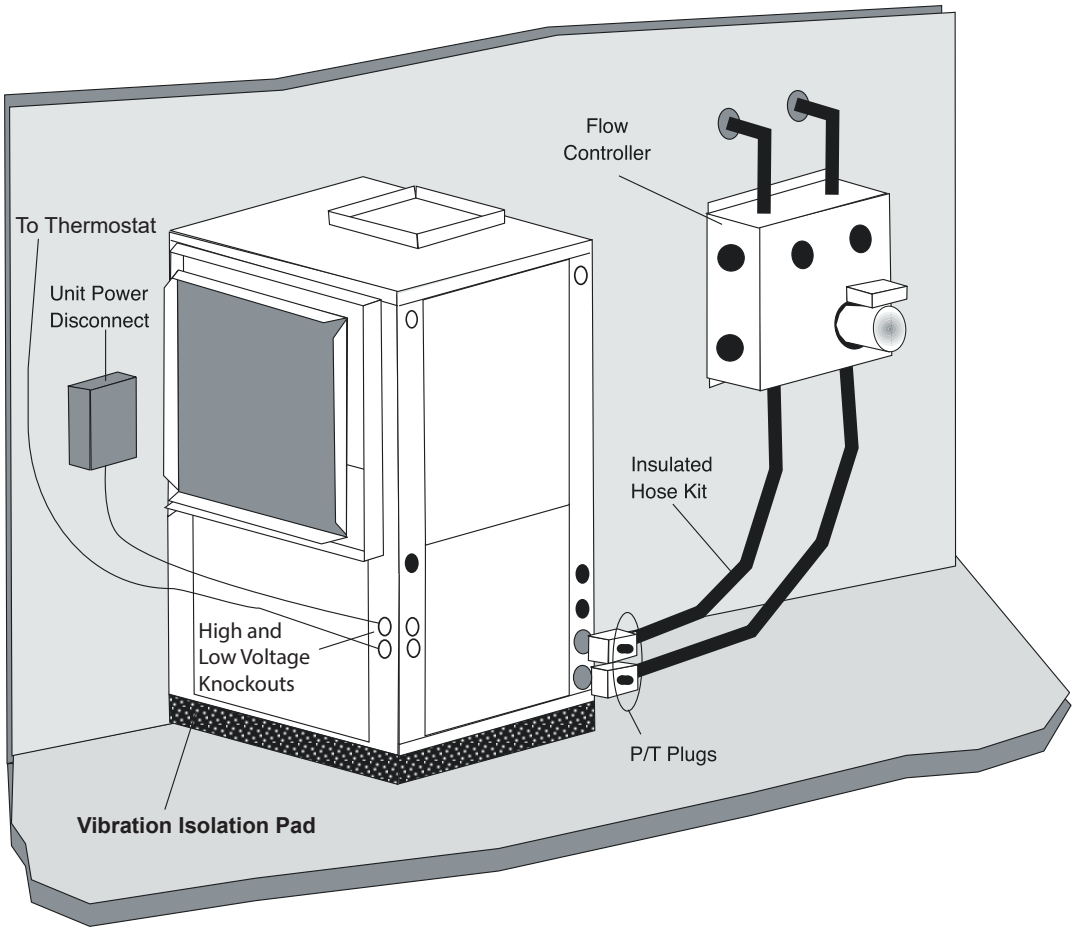
Type	Minimum Antifreeze Concentration % for Low Temperature Protection			
	10°F [-12.2°C]	15°F [-9.4°C]	20°F [-6.7°C]	25°F [-3.9°C]
Methanol	25%	21%	16%	10%
100% USP food grade Propylene Glycol	38%	25%	22%	15%
Ethanol*	29%	25%	20%	14%

* Must not be denatured with any petroleum based product

Ground-Loop Heat Pump Applications

Models:
WR
006-060

Figure 12: Typical Ground-Loop Application



Models:
WR
006-060

Water Quality Requirements

Table 4: 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 - $CaC0_3$ 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	(CaC03)	ppm - $CaC0_3$ 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 - $CaC0_3$ 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_2S)	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_2CL)	ppm	0	0	0	0
Fouling & Biological	Iron bacteria		cells/mL	0	0	0	0
	Slime-forming bacteria		cells/mL	0	0	0	0
	Sulfate-reducing bacteria		cells/mL	0	0	0	0
	Suspended Solids[β]	(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[δ]		mV		Measure voltage and internal water loop to HP ground		
	Leakage Current[δ]		mA		Measure current in water loop pipe		
	Building Primary Electrical Ground to unit, must meet local diameter and penetration length requirements. Do not connect heat pump to steel pipe unless dissimilar materials are separated by using Di-electric unions. Galvanic corrosion of heat pump water pipe will occur						

Water Quality Requirements

Models:
WR
006-060

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.

Strainer / Filter Sizing

Mesh Size	Particle Size		
	Microns	MM	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

α Hydrogen Sulfide has an odor of rotten eggs. If one detects this smell, a test for H_2S must be performed. If H_2S is detected above the limit indicated, remediation is necessary (Consult with your Water Testing/Treatment Professional) or a secondary heat exchanger is required using 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.

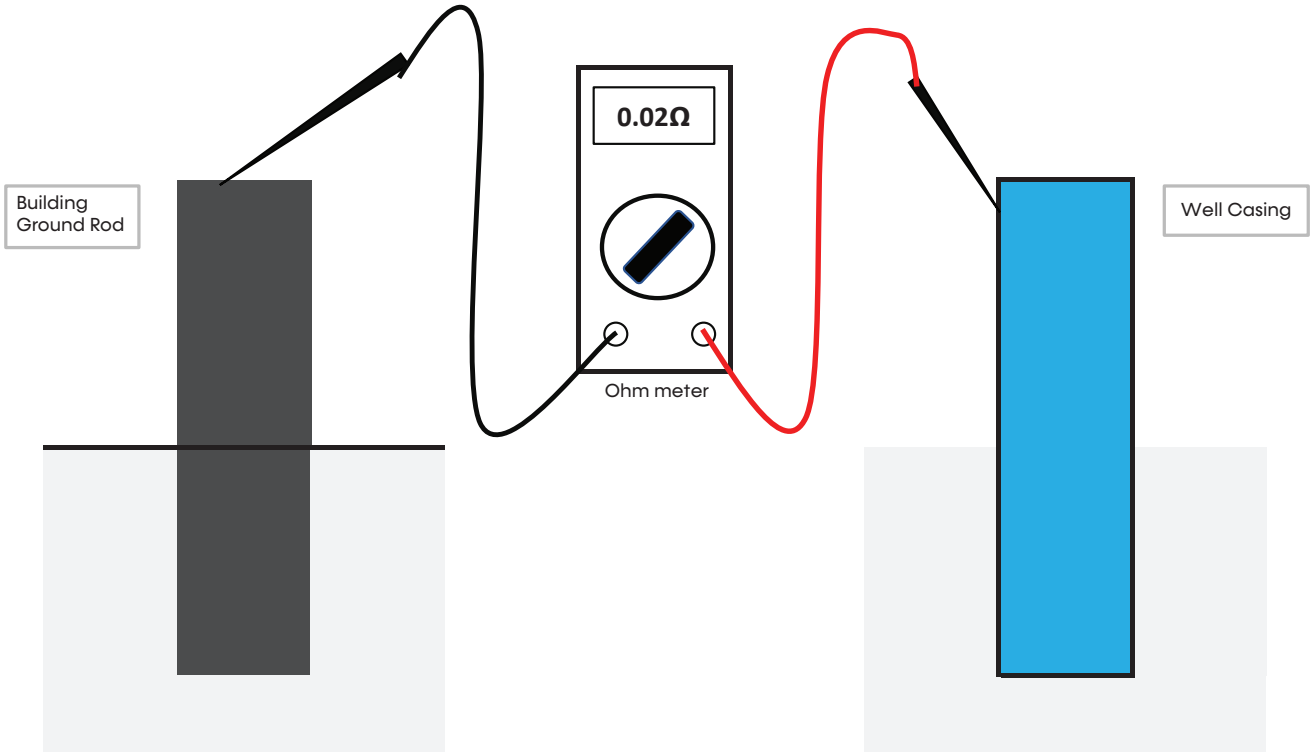
χ The WSHP piping system or other plumbing pipes must not be used as the building ground. An electrical grounding system using a dedicated ground rod meeting NEC and local electrical codes must be installed.

δ Refer to the Antifreeze Percentages by Volume table for instructions on measuring resistance and leakage currents within water loops.

Models:
WR
006-060

Water Quality Requirements

Measuring Earth Ground Resistance for Ground-Water Applications



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

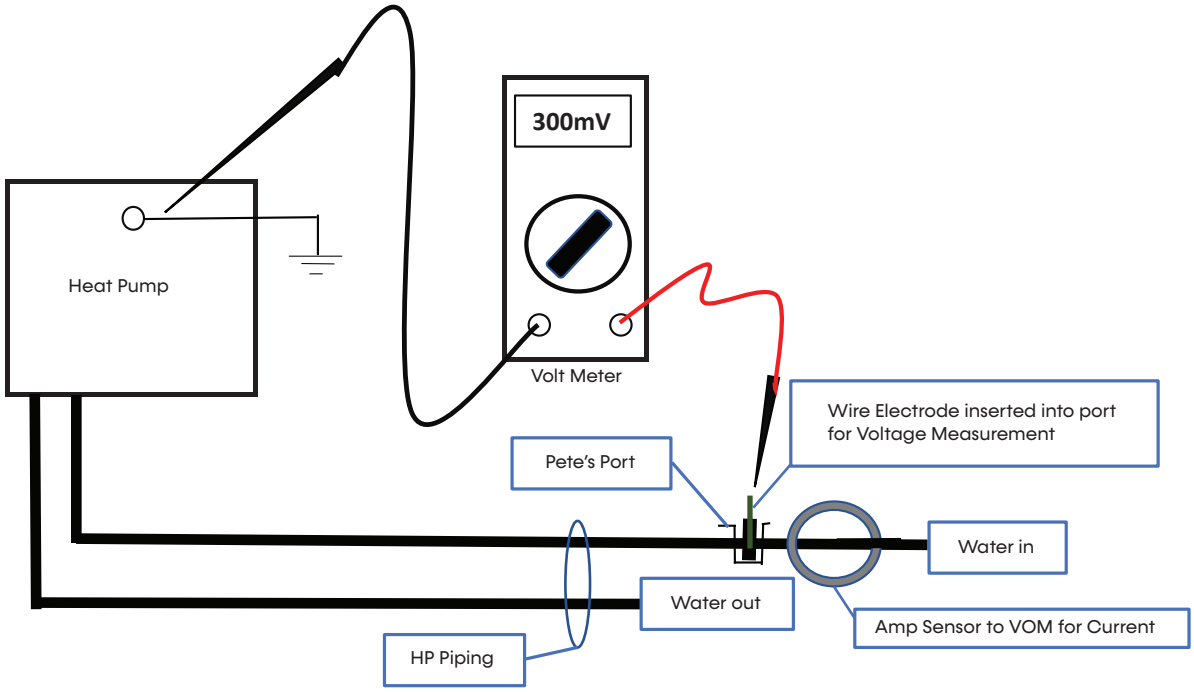
The resistance measured should be zero Ohms. The NEC allows a resistance to ground up to 20 Ohms. Any resistance above zero indicates a poor earth ground, which may be the result of a hot neutral line or that conductive water is present. Both of these may lead to electrolysis and corrosion of the heat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

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

Water Quality Requirements

Models:
WR
006-060

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 corresion 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.

Models:
WR
006-060

Hot Water Generator

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

Heat pumps equipped with the HWG option include a built-in water-to-refrigerant heat exchanger that eliminates the need to tie into the heat pump's refrigerant circuit in the field. The control circuit and pump are also built in for residential equipment. The Typical HWG Installation figure shows a typical example of HWG water piping connections on a unit with built-in circulating pump. This piping layout prevents sludge/debris from the bottom of the tank being pulled into the HWG pump.

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

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

⚠ WARNING

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

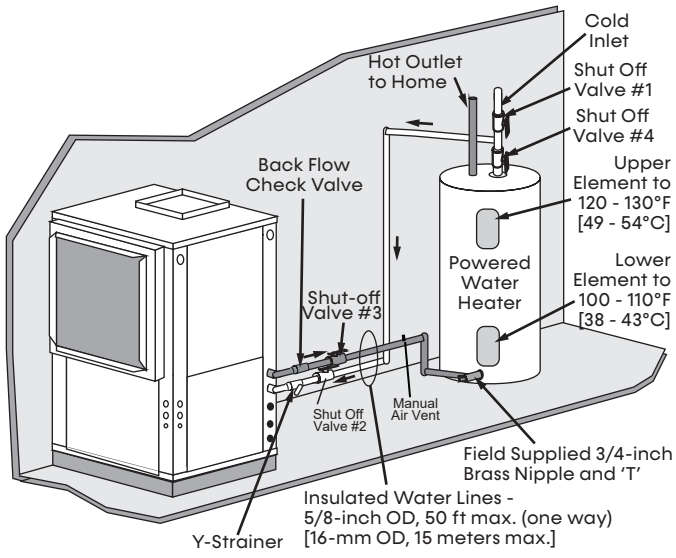
Using a 125°F setpoint, the HWG can heat the lower 40 gallons of water from 100°F to 125°F, providing up to 8,330 btu's of heat. Using the 150°F setpoint, the HWG can heat the same 40 gallons of water from 100°F to 150°F and the remaining 10 gallons of water from 125°F to 150°F, providing a total of 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, a second preheat tank must be installed (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 insure a usable entering water temperature for the HWG.

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

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

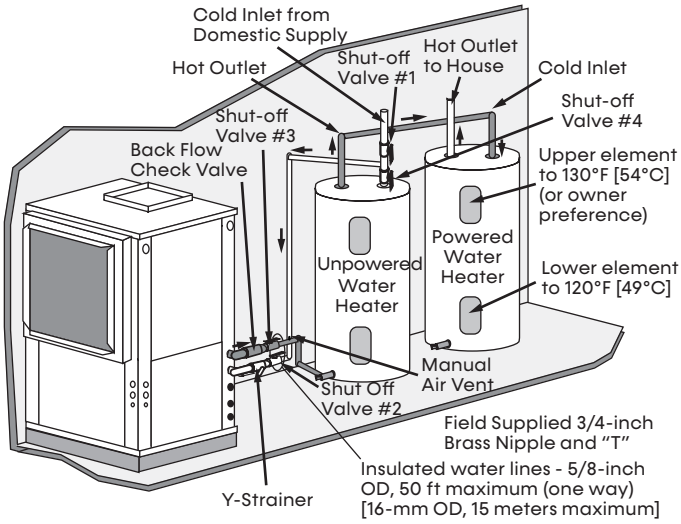
Figure 13: Typical HWG Installation



Hot Water Generator

Models:
WR
006-060

Figure 14: Two-tank HWG Installation



INSTALLATION

The HWG is controlled by two sensors and the Solid State Control/Deluxe Solid State Control microprocessor control. 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 Solid State Control/Deluxe Solid State Control microprocessor control monitors the refrigerant and water temperatures to determine when to operate the HWG. The HWG operates any time the refrigerant temperature is sufficiently above the water temperature. Once the HWG has satisfied the water heating demand during a heat pump run cycle, the controller cycles the pump at regular Intervals to determine if an additional HWG cycle can be utilized.

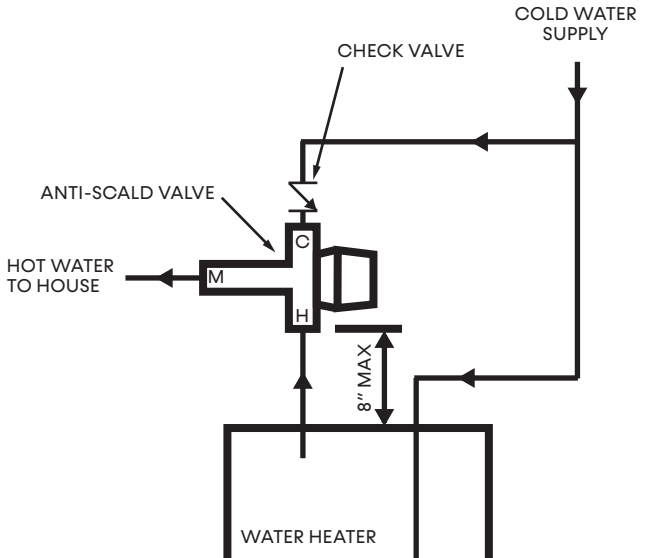
When the control is powered and the HWG pump output is active for water temperature sampling or HWG operation, the Solid State Control/Deluxe Solid State Control status LED slowly flashes (On 1 second, Off 1 second).

If the control detects a HWG fault, the Solid State Control/Deluxe Solid State Control status LED flashes a numeric fault code as follows:

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

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

Figure 15: Anti-scald Valve-Piping Connection



⚠ WARNING

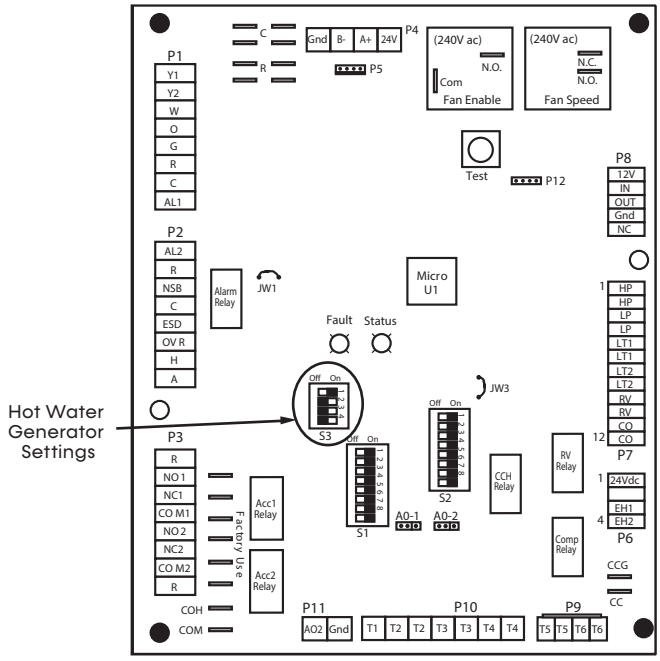
Using 150°F setpoint on the HWG results in water temperatures sufficient to cause severe physical injury in the form of scalding or burns, even when the hot water tank temperature setting is visibly set below 150°F. The 150°F HWG setpoint must only be used on systems that employ an approved anti-scald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

Models:
WR
006-060

Hot Water Generator

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

Figure 16: 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 ft. [15 m]. See the HWG Water Piping Sizes and Length table for recommended piping sizes and maximum lengths.

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

⚠ NOTICE

Powering the pump before all installation steps are completed will damage the pump.

WATER TANK PREPARATION

1. Turn off power or fuel supply to the hot water tank.
2. Connect a hose to the drain valve on the water tank.
3. Shut off the cold water supply to the water tank.
4. Open the drain valve and open the pressure relief valve or a hot water faucet to drain tank.
5. 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.
6. Close all valves and remove the drain hose.
7. Install HWG water piping.

HWG WATER PIPING

1. 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.
2. Insulate all HWG water piping with no less than ⅜-inch (10-mm) wall closed cell insulation.
3. Open both shut off valves and make sure the tank drain valve is closed.

Hot Water Generator

Models:
WR
006-060

WATER TANK REFILL

1. Close valve #4. Ensure that the HWG valves (valves #2 and #3) are open. Open the cold water supply (valve #1) to fill the tank through the HWG piping. This will force water flow through the HWG and purge air from the HWG piping.
2. Open a hot-water faucet to vent air from the system until water flows from faucet; turn off faucet. Open valve #4.
3. Depress the hot water tank pressure relief valve handle to ensure that there is no air remaining in the tank.
4. Inspect all work for leaks.
5. Before restoring power or fuel supply to the water heater, adjust the temperature setting on the tank thermostat(s) to insure maximum utilization of the heat available from the refrigeration system and conserve the most energy. On tanks with both upper and lower elements and thermostats, the lower element should be turned down to 100°F [38°C] or the lowest setting; the upper element should be adjusted to 120-130°F [49-54°C]. Depending upon the specific needs of the customer, you may want to adjust the upper element differently. On tanks with a single thermostat, a preheat tank should be used.
6. Replace access cover(s) and restore power or fuel supply.

INITIAL STARTUP

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

Table 5: HWG Water Piping Sizes and Length

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

*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

Models:
WR
006-060

Electrical Data: PSC Blower Motor Standard Unit

Model	VOLTAGE CODE	VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	FUSE/ HACR AMP
				QTY	RLA	LRA				
WR006	G.J.	208/230-1-60	187/252	1	3.7	17.7	0.3	4.0	4.9	15
	E.D.	265-1-60	249/291	1	2.6	10.5	0.4	3.0	3.7	15
WR009	G.J.	208/230-1-60	187/252	1	5.0	22.2	0.8	5.8	7.1	15
	E.D.	265-1-60	249/291	1	3.6	13.5	0.8	4.4	5.3	15
WR012	G.J.	208/230-1-60	187/252	1	5.6	32.5	0.8	6.4	7.8	15
	E.D.	265-1-60	249/291	1	4.2	23.0	0.8	5.0	6.1	15
WR015	G.J.	208/230-1-60	187/252	1	6.6	31.0	0.9	7.5	9.2	15
	E.D.	265-1-60	249/291	1	5.0	27.0	0.7	5.7	7.0	15
WR018	G.J.	208/230-1-60	187/252	1	7.0	35.0	0.9	7.9	9.7	15
	E.D.	265-1-60	249/291	1	6.5	40.0	0.7	7.2	8.8	15
WR024	G.J	208/230-1-60	187/252	1	11.4	64.4	1.5	12.9	15.8	25
	E.D.	265-1-60	249/291	1	10.3	60.5	1.2	11.5	14.1	20
	H.K.	208/230-3-60	187/252	1	7.7	59.9	1.5	9.2	11.1	15
	F.L.	460-3-60	432/504	1	3.8	32.4	0.8	4.6	5.5	15
WR030	G.J	208/230-1-60	187/252	1	12.7	75.6	2.7	15.4	18.6	30
	E.D.	265-1-60	249/291	1	11.5	84.0	2.9	14.4	17.3	25
	H.K.	208/230-3-60	187/252	1	9.6	67.7	2.7	12.3	14.7	20
	F.L.	460-3-60	432/504	1	4.5	38.1	1.6	6.1	7.2	15
WR036	G.J	208/230-1-60	187/252	1	14.4	86.0	2.6	17.0	20.6	30
	E.D.	265-1-60	249/291	1	15.4	55.0	2.0	17.4	21.3	35
	H.K.	208/230-3-60	187/252	1	9.0	70.0	2.6	11.6	13.9	20
	F.L.	460-3-60	432/504	1	4.1	39.0	1.2	5.3	6.3	15
WR042	G.J	208/230-1-60	187/252	1	17.3	123.0	2.7	20.0	24.3	40
	H.K.	208/230-3-60	187/252	1	12.8	102.8	2.7	15.5	18.7	30
	F.L.	460-3-60	432/504	1	5.8	48.5	1.6	7.4	8.9	15
	N.M.	575-3-60	540/630	1	5.1	41.0	1.4	6.5	7.8	15
WR048	G.J	208/230-1-60	187/252	1	22.4	126.0	3.3	25.7	31.3	50
	H.K.	208/230-3-60	187/252	1	12.8	120.4	3.3	16.1	19.3	30
	F.L.	460-3-60	432/504	1	6.0	49.4	1.7	7.7	9.2	15
	N.M.	575-3-60	540/630	1	5.8	41.0	1.4	7.2	8.7	15
WR060	G.J	208/230-1-60	187/252	1	23.7	157.0	4.8	28.5	34.4	50
	H.K.	208/230-3-60	187/252	1	16.0	156.4	4.8	20.8	24.8	40
	F.L.	460-3-60	432/504	1	7.1	69.0	2.4	9.5	11.3	15
	N.M.	575-3-60	540/630	1	6.4	48.0	1.8	8.2	9.8	15

Notes:
- All fuses Class RK-5.

Electrical Data: PSC Blower Motor with Internal Secondary Pump

Models:
WR
006-060

Model	VOLTAGE CODE	VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			PUMP FLA	FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	FUSE/ HACR AMP
				QTY	RLA	LRA					
WR006	G.J.	208/230-1-60	187/252	1	3.7	17.7	0.4	0.3	4.4	5.3	15
	E.D.	265-1-60	249/291	1	2.6	10.5	0.7	0.4	3.7	4.4	15
WR009	G.J.	208/230-1-60	187/252	1	5.0	22.2	0.4	0.8	6.2	7.5	15
	E.D.	265-1-60	249/291	1	3.6	13.5	0.7	0.8	5.1	6.0	15
WR012	G.J.	208/230-1-60	187/252	1	5.6	32.5	0.8	0.8	7.2	8.6	15
	E.D.	265-1-60	249/291	1	4.2	23.0	0.7	0.8	5.7	6.8	15
WR015	G.J.	208/230-1-60	187/252	1	6.6	31.0	0.8	0.9	8.3	10.0	15
	E.D.	265-1-60	249/291	1	5.0	27.0	0.7	0.7	6.4	7.7	15
WR018	G.J.	208/230-1-60	187/252	1	7.0	35.0	0.8	0.9	8.7	10.5	15
	E.D.	265-1-60	249/291	1	6.5	40.0	0.7	0.7	7.9	9.5	15
WR024	G.J.	208/230-1-60	187/252	1	11.4	64.4	0.8	1.5	13.7	16.6	25
	E.D.	265-1-60	249/291	1	10.3	60.5	0.7	1.2	12.2	14.8	25
	H.K.	208/230-3-60	187/252	1	7.7	59.9	0.8	1.5	10.0	11.9	15
	F.L.	460-3-60*	432/504	1	3.8	32.4	0.7	0.8	5.3	6.2	15
WR030	G.J.	208/230-1-60	187/252	1	12.7	75.6	0.8	2.7	16.2	19.4	30
	E.D.	265-1-60	249/291	1	11.5	84.0	0.7	2.9	15.1	18.0	25
	H.K.	208/230-3-60	187/252	1	9.6	67.7	0.8	2.7	13.1	15.5	25
	F.L.	460-3-60*	432/504	1	4.5	38.1	0.7	1.6	6.8	7.9	15
WR036	G.J.	208/230-1-60	187/252	1	14.4	86.0	0.8	2.6	17.8	21.4	30
	E.D.	265-1-60	249/291	1	15.4	55.0	0.7	2.0	18.1	22.0	35
	H.K.	208/230-3-60	187/252	1	9.0	70.0	0.8	2.6	12.4	14.7	20
	F.L.	460-3-60*	432/504	1	4.1	39.0	0.7	1.2	6.0	7.0	15
WR042	G.J.	208/230-1-60	187/252	1	17.3	123.0	0.8	2.7	20.8	25.1	40
	H.K.	208/230-3-60	187/252	1	12.8	102.8	0.8	2.7	16.3	19.5	30
	F.L.	460-3-60*	432/504	1	5.8	48.5	0.7	1.6	8.1	9.6	15
	N.M.	575-3-60	540/630	1	5.1	41.0					
WR048	G.J.	208/230-1-60	187/252	1	22.4	126.0	1.1	3.3	26.8	32.4	50
	H.K.	208/230-3-60	187/252	1	12.8	120.4	1.1	3.3	17.2	20.4	30
	F.L.	460-3-60*	432/504	1	6.0	49.4	1.3	1.7	9.0	10.5	15
	N.M.	575-3-60	540/630	1	5.8	41.0					
WR060	G.J.	208/230-1-60	187/252	1	23.7	157.0	1.1	4.8	29.6	35.5	50
	H.K.	208/230-3-60	187/252	1	16.0	156.4	1.1	4.8	21.9	25.9	40
	F.L.	460-3-60*	432/504	1	7.1	69.0	1.3	2.4	10.8	12.6	15
	N.M.	575-3-60	540/630	1	6.4	48.0					

Notes:
- All fuses Class RK-5.

***Neutral connection required! All F and L voltage (460VAC) units with an Internal Secondary Pump require a four-wire power supply with neutral. The ISP is rated 265VAC and is wired between one hot leg and neutral.**

Models:
WR
006-060

Electrical Data: EC Blower Motor Standard Unit

WR Electrical Table							CT EC				CV EC*			
Model	VOLTAGE CODE	VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	FUSE/ HACR AMP	FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	FUSE/ HACR AMP
				QTY	RLA	LRA								
WR006	G.J.	208/230-1-60	187/252	1	3.7	17.7	2.3	6.0	6.9	15	1.5	5.2	6.1	15
	E.D.	265-1-60	249/291	1	2.6	10.5	2.3	4.9	5.6	15	1.4	4.0	4.7	15
WR009	G.J.	208/230-1-60	187/252	1	5.0	22.2	2.3	7.3	8.6	15	1.5	6.5	7.8	15
	E.D.	265-1-60	249/291	1	3.6	13.5	2.3	5.9	6.8	15	1.4	5.0	5.9	15
WR012	G.J.	208/230-1-60	187/252	1	5.6	32.5	2.3	7.9	9.3	15	2.6	8.2	9.6	15
	E.D.	265-1-60	249/291	1	4.2	23.0	2.3	6.5	7.6	15	2.5	6.7	7.8	15
WR015	G.J.	208/230-1-60	187/252	1	6.6	31.0	2.6	9.2	10.9	15	2.6	9.2	10.9	15
	E.D.	265-1-60	249/291	1	5.0	27.0	1.9	6.9	8.2	15	2.4	7.4	8.7	15
WR018	G.J.	208/230-1-60	187/252	1	7.0	35.0	2.6	9.6	11.4	15	2.6	9.6	11.4	15
	E.D.	265-1-60	249/291	1	6.5	40.0	1.9	8.4	10.0	15	2.1	8.6	10.2	15
WR024	G.J	208/230-1-60	187/252	1	11.4	64.4	3.9	15.3	18.2	25	4.2	15.6	18.5	25
	E.D.	265-1-60	249/291	1	10.3	60.5	3.7	14.0	16.6	25	3.4	13.7	16.3	25
	H.K.	208/230-3-60	187/252	1	7.7	59.9	3.9	11.6	13.5	20	4.2	11.9	13.8	20
	F.L.	460-3-60*	432/504	1	3.8	32.4	1.2	5.0	6.0	15	3.4	7.2	8.2	15
WR030	G.J	208/230-1-60	187/252	1	12.7	75.6	3.9	16.6	19.8	30	4.2	16.9	20.1	30
	E.D.	265-1-60	249/291	1	11.5	84.0	3.7	15.2	18.1	25	3.4	14.9	17.8	25
	H.K.	208/230-3-60	187/252	1	9.6	67.7	3.9	13.5	15.9	25	4.2	13.8	16.2	25
	F.L.	460-3-60*	432/504	1	4.5	38.1	1.2	5.7	6.8	15	3.4	7.9	9.0	15
WR036	G.J	208/230-1-60	187/252	1	14.4	86.0	6.0	20.4	24.0	30	5.9	20.3	23.9	30
	E.D.	265-1-60	249/291	1	15.4	55.0	5.2	20.6	24.5	35	4.8	20.2	24.1	35
	H.K.	208/230-3-60	187/252	1	9.0	70.0	6.0	15.0	17.3	25	5.9	14.9	17.2	25
	F.L.	460-3-60*	432/504	1	4.1	39.0	1.7	5.8	6.8	15	4.8	8.9	9.9	15
WR042	G.J.	208/230-1-60	187/252	1	17.3	123.0	6.0	23.3	27.6	40	5.9	23.2	27.5	40
	H.K.	208/230-3-60	187/252	1	12.8	102.8	6.0	18.8	22.0	30	5.9	18.7	21.9	30
	F.L.	460-3-60*	432/504	1	5.8	48.5	1.7	7.5	9.0	15	4.8	10.6	12.1	15
WR048	G.J.	208/230-1-60	187/252	1	22.4	126.0	6.0	28.4	34.0	50	5.9	28.3	33.9	50
	H.K.	208/230-3-60	187/252	1	12.8	120.4	6.0	18.8	22.0	30	5.9	18.7	21.9	30
	F.L.	460-3-60*	432/504	1	6.0	49.4	1.7	7.7	9.2	15	4.8	10.8	12.3	15
WR060	G.J.	208/230-1-60	187/252	1	23.7	157.0	7.4	31.1	37.0	60	7.5	31.2	37.1	60
	H.K.	208/230-3-60	187/252	1	16.0	156.4	7.4	23.4	27.4	40	7.5	23.5	27.5	40
	F.L.	460-3-60*	432/504	1	7.1	69.0	2.3	9.4	11.2	15	6.2	13.3	15.1	20

Notes:
- All fuses Class RK-5

***Neutral connection required! All F and L voltage (460VAC) units with a CV EC motor require a four-wire power supply with neutral. The CV EC motor is rated 265VAC and is wired between one hot leg and neutral.**

Electrical Data: EC Blower Motor with Internal Secondary Pump

Models:
WR
006-060

WR Commercial Electrical Table W/ ISP								CT EC				CV EC*			
Model	VOLTAGE CODE	VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			PUMP FLA	FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	FUSE/ HACR AMP	FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	FUSE/ HACR AMP
				QTY	RLA	LRA									
WR006	G.J.	208/230-1-60	187/252	1	3.7	17.7	0.4	2.3	6.4	7.3	15	1.5	5.6	6.5	15
	E.D.	265-1-60	249/291	1	2.6	10.5	0.7	2.3	5.6	6.3	15	1.4	4.7	5.4	15
WR009	G.J.	208/230-1-60	187/252	1	5.0	22.2	0.4	2.3	7.7	9.0	15	1.5	6.9	8.2	15
	E.D.	265-1-60	249/291	1	3.6	13.5	0.7	2.3	6.6	7.5	15	1.4	5.7	6.6	15
WR012	G.J.	208/230-1-60	187/252	1	5.6	32.5	0.8	2.3	8.7	10.1	15	2.6	9.0	10.4	15
	E.D.	265-1-60	249/291	1	4.2	23.0	0.7	2.3	7.2	8.3	15	2.5	7.4	8.5	15
WR015	G.J.	208/230-1-60	187/252	1	6.6	31.0	0.8	2.6	10.0	11.7	15	2.6	10.0	11.7	15
	E.D.	265-1-60	249/291	1	5.0	27.0	0.7	1.9	7.6	8.9	15	2.4	8.1	9.4	15
WR018	G.J.	208/230-1-60	187/252	1	7.0	35.0	0.8	2.6	10.4	12.2	15	2.6	10.4	12.2	15
	E.D.	265-1-60	249/291	1	6.5	40.0	0.7	1.9	9.1	10.7	15	2.1	9.3	10.9	15
WR024	G.J	208/230-1-60	187/252	1	11.4	64.4	0.8	3.9	16.1	19.0	30	4.2	16.4	19.3	30
	E.D.	265-1-60	249/291	1	10.3	60.5	0.7	3.7	14.7	17.3	25	3.4	14.4	17.0	25
	H.K.	208/230-3-60	187/252	1	7.7	59.9	0.8	3.9	12.4	14.3	20	4.2	12.7	14.6	20
	F.L.	460-3-60*	432/504	1	3.8	32.4	0.7	1.2	5.7	6.7	15	3.4	7.9	8.9	15
WR030	G.J	208/230-1-60	187/252	1	12.7	75.6	0.8	3.9	17.4	20.6	30	4.2	17.7	20.9	30
	E.D.	265-1-60	249/291	1	11.5	84.0	0.7	3.7	15.9	18.8	30	3.4	15.6	18.5	25
	H.K.	208/230-3-60	187/252	1	9.6	67.7	0.8	3.9	14.3	16.7	25	4.2	14.6	17.0	25
	F.L.	460-3-60*	432/504	1	4.5	38.1	0.7	1.2	6.4	7.5	15	3.4	8.6	9.7	15
WR036	G.J	208/230-1-60	187/252	1	14.4	86.0	0.8	6.0	21.2	24.8	30	5.9	21.1	24.7	30
	E.D.	265-1-60	249/291	1	15.4	55.0	0.7	5.2	21.3	25.2	40	4.8	20.9	24.8	40
	H.K.	208/230-3-60	187/252	1	9.0	70.0	0.8	6.0	15.8	18.1	25	5.9	15.7	18.0	25
	F.L.	460-3-60*	432/504	1	4.1	39.0	0.7	1.7	6.5	7.5	15	4.8	9.6	10.6	15
WR042	G.J	208/230-1-60	187/252	1	17.3	123.0	0.8	6.0	24.1	28.4	40	5.9	24.0	28.3	40
	H.K.	208/230-3-60	187/252	1	12.8	102.8	0.8	6.0	19.6	22.8	30	5.9	19.5	22.7	30
	F.L.	460-3-60*	432/504	1	5.8	48.5	0.7	1.7	8.2	9.7	15	4.8	11.3	12.8	15
WR048	G.J	208/230-1-60	187/252	1	22.4	126.0	1.1	6.0	29.5	35.1	50	5.9	29.4	35.0	50
	H.K.	208/230-3-60	187/252	1	12.8	120.4	1.1	6.0	19.9	23.1	30	5.9	19.8	23.0	30
	F.L.	460-3-60*	432/504	1	6.0	49.4	1.3	1.7	9.0	10.5	15	4.8	12.1	13.6	15
WR060	G.J	208/230-1-60	187/252	1	23.7	157.0	1.1	7.4	32.2	38.1	60	7.5	32.3	38.2	60
	H.K.	208/230-3-60	187/252	1	16.0	156.4	1.1	7.4	24.5	28.5	40	7.5	24.6	28.6	40
	F.L.	460-3-60*	432/504	1	7.1	69.0	1.3	2.3	10.7	12.5	15	6.2	14.6	16.4	20

Notes:
- All fuses Class RK-5.

***Neutral connection required! All F and L voltage (460VAC) units with a CV EC motor or an Internal Secondary Pump require a four-wire power supply with neutral. The CV EC motor and ISP are rated 265VAC and is wired between one hot leg and neutral.**

Models:
WR
006-060

Electrical: Power Wiring

⚠ WARNING

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

⚠ CAUTION

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

ELECTRICAL

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

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

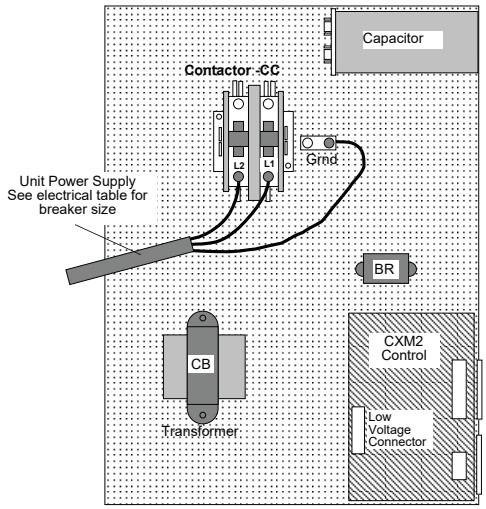
POWER CONNECTION

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

GENERAL LINE VOLTAGE WIRING

Be sure 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 17: Single Phase Line Voltage Field Wiring



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

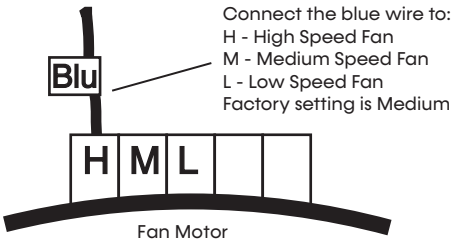
TRANSFORMER

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

BLOWER SPEED SELECTION

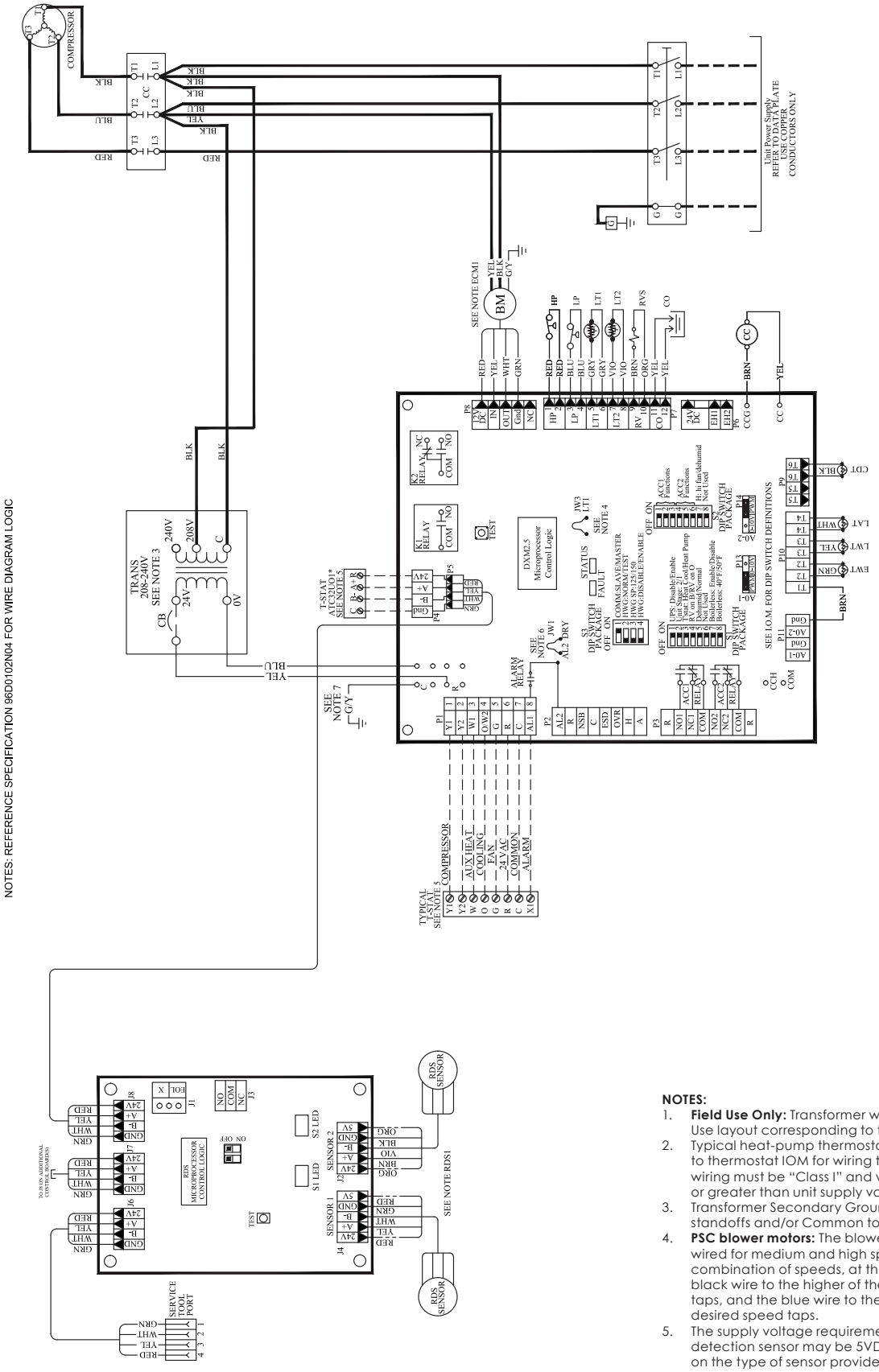
Units with PSC Motor - PSC (Permanent Split Capacitor) blower motor speed can be changed by moving the blue wire on the motor terminal block to the desired speed as shown in the figure below. Most units are shipped on the medium speed tap. Consult submittal data or engineering design guide for specific unit airflow tables. Typical unit design delivers rated airflow at nominal static (0.15 inch w.g. [37 Pa]) on medium speed and rated airflow at a higher static (0.4 to 0.5 in. w.g. [100 to 125 Pa]) on high speed for applications where higher static is required. Low speed will deliver approximately 85% of rated airflow at 0.10 in. w.g. [25 Pa].

Figure 18: PSC Motor Speed Selection



Electrical: Solid State Control Example Wiring Diagram

Models:
WR
006-060



NOTES:

1. **Field Use Only:** Transformer wiring is voltage-sensitive. Use layout corresponding to the unit voltage.
2. Typical heat-pump thermostat wiring shown. Refer to thermostat IOM for wiring to the unit. Thermostat wiring must be "Class I" and voltage rating equal to or greater than unit supply voltage.
3. Transformer Secondary Ground via control board standoffs and/or Common to Control Box.
4. **PSC blower motors:** The blower motor is factory wired for medium and high speeds. For any other combination of speeds, at the motor, attach the black wire to the higher of the two desired speed taps, and the blue wire to the lower of the two desired speed taps.
5. The supply voltage requirement for the refrigerant-detection sensor may be 5VDC or 24VAC depending on the type of sensor provided by the manufacturer.

Models:
WR
006-060

Electrical: Low Voltage Wiring

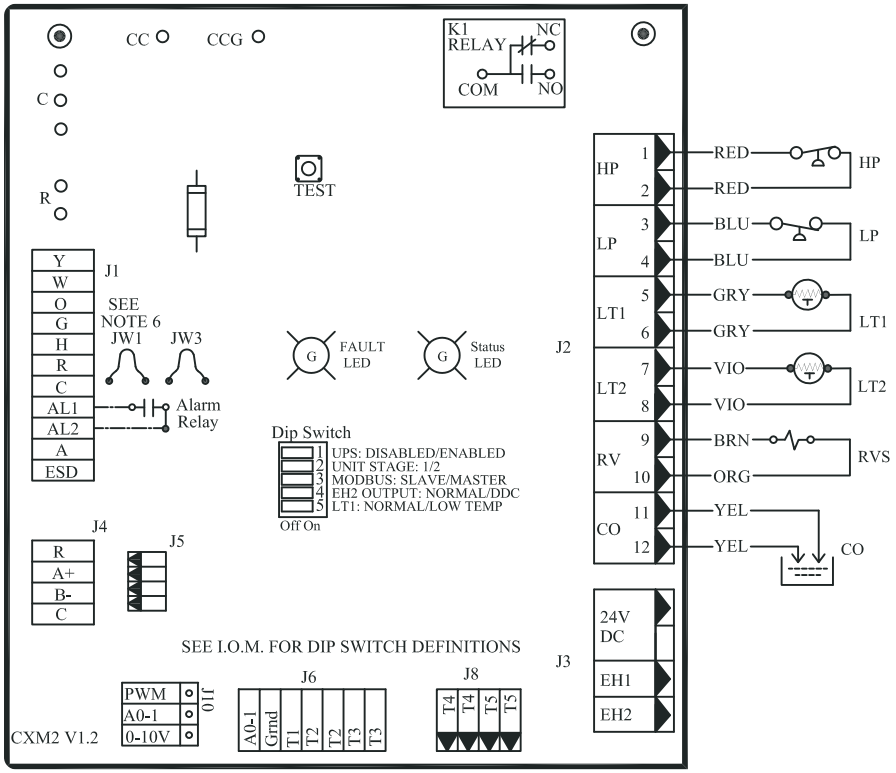
THERMOSTAT CONNECTIONS

The thermostat should be wired directly to the Solid State Control or Deluxe Solid State Control board. 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 Solid State Control/Deluxe Solid State Control control allows the field selection of low water (or water-antifreeze solution) temperature limit by clipping jumper JW3 (see the figure below), which changes the sensing temperature associated with thermistor LT1. Note that the LT1 thermistor is located on the refrigerant line between the coaxial heat exchanger and expansion device (TXV). Therefore, LT1 is sensing refrigerant temperature, not water temperature, which is a better indication of how water flow rate/temperature is affecting the refrigeration circuit. The factory setting for LT1 is for systems using water (30°F [-1.1°C] refrigerant temperature). In low water temperature (extended range) applications with antifreeze (most ground loops), jumper JW3 should be clipped as shown in the figure below to change the setting to 10°F [-12.2°C] refrigerant temperature, a more suitable temperature when using an antifreeze solution. All Whalen units operating with entering water temperatures below 60°F [15.6°C] must include the optional water/refrigerant circuit insulation package to prevent internal condensation.

Figure 19: LT1 Limit Setting



Electrical: Low Voltage Wiring

Models:
WR
006-060

ACCESSORY CONNECTIONS

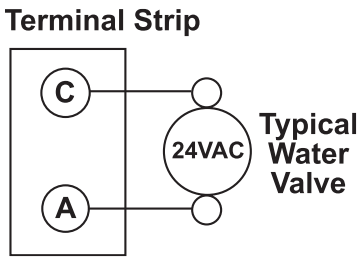
A terminal paralleling the compressor contactor coil has been provided on the Solid State Control/Deluxe Solid State Control control. Terminal "A" is designed to control accessory devices, such as water valves. **Note: This terminal should be used only with 24V signals and not line voltage.** Terminal "A" is energized with the compressor contactor. See Figure 16 or the specific unit wiring diagram for details.

Table 6: 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
+ Solid State Control board (5 - 9VA)*	21 - 31
Remaining VA for Accessories	19 - 29
+ Deluxe Solid State Control board (8 - 12VA)*	24 - 34
Remaining VA for Accessories	41 - 51

*Standard transformer for Solid State Control board is 50VA. Optional Deluxe Solid State Control board and/or DDC controls Include 75VA transformer.

Figure 20: Accessory Wiring



WATER SOLENOID VALVES

An external solenoid valve(s) should be used 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. Figure 16 shows typical wiring for a 24VAC external solenoid valve. Figure 17 and Figure 18 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 will flow before 45 seconds). Once fully open, an end switch allows the compressor to be energized. Only relay or triac based electronic thermostats should be used 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.

Figure 21: Accessory Motorized Water Valve – Typical Wiring Example #1

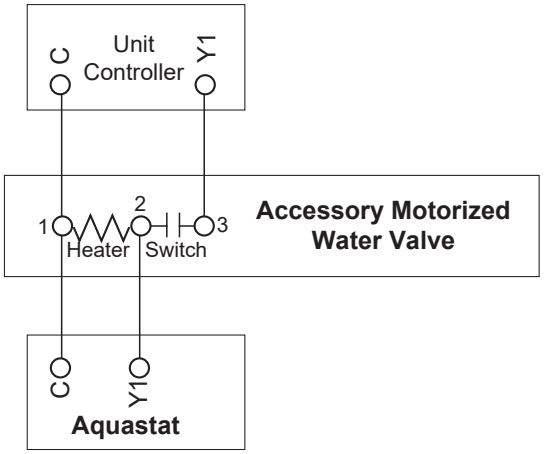
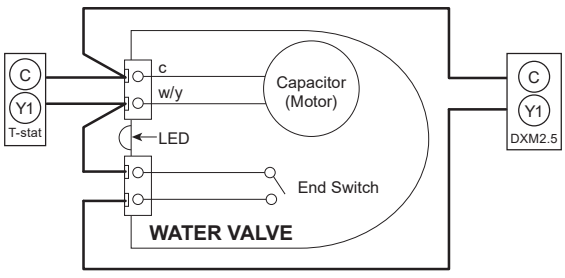


Figure 22: Accessory Motorized Water Valve - Typical Wiring Example #2



Models:
WR
006-060

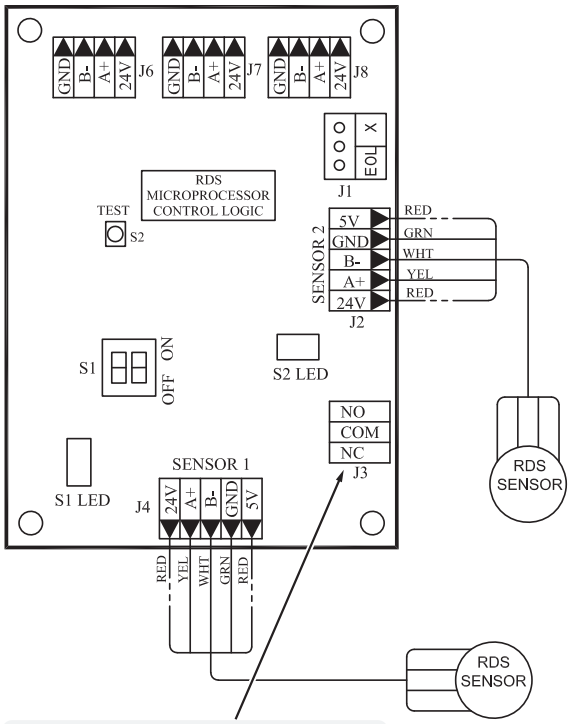
Electrical: Low Voltage Wiring

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 enables the unit blower, disables the compressor(s), and enables the pilot relay on the RDS control board. You can use this relay to open external zoning dampers and/or activate external mechanical ventilation. The relay is normally closed (NC) and can control a signal with a maximum of 28VA @ 24VAC.
- A fault is enabled if the RDS control board loses communication with a refrigerant sensor or if the main control board loses communication with the RDS board. See Functional Troubleshooting for steps to troubleshoot the RDS.

Figure 23: RDS Board



NOTE: Connect mitigation measures to the J3 jumper.

FIELD-INSTALLED RDS SYSTEM

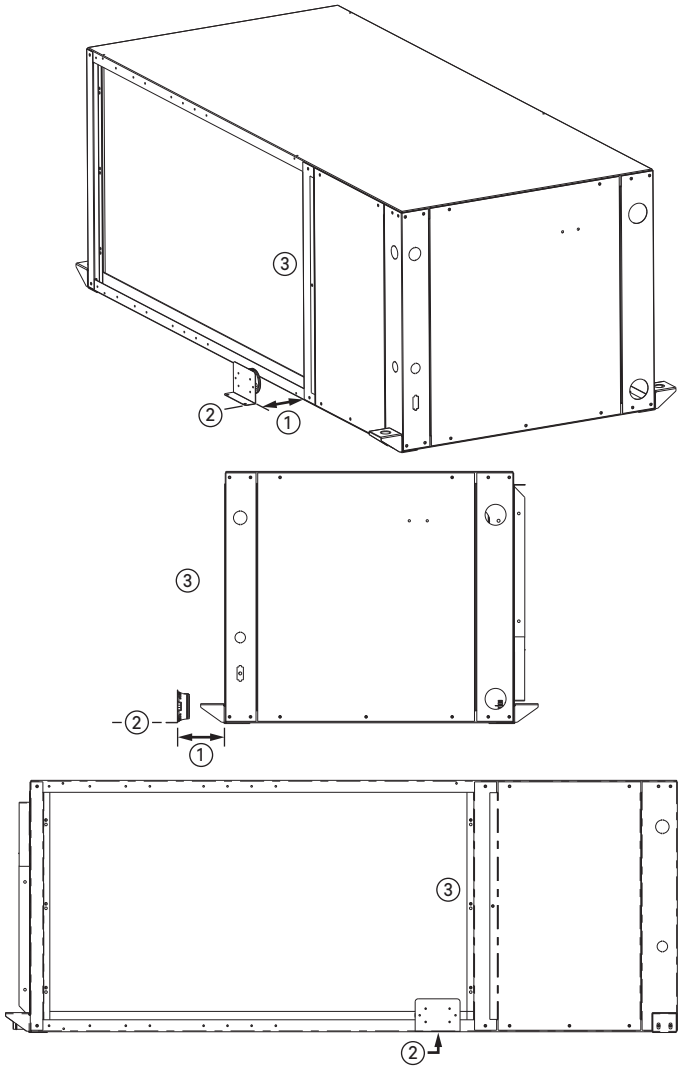
If an RDS is optionally being field-installed on non-ducted horizontal units in sizes 006 to 048, use the following guidelines to install the the refrigerant detection sensor upstream of the unit's return air inlet:

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

NOTICE

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

Figure 24: RDS Installation



Electrical: Thermostat Wiring

Models:
WR
006-060

THERMOSTAT INSTALLATION

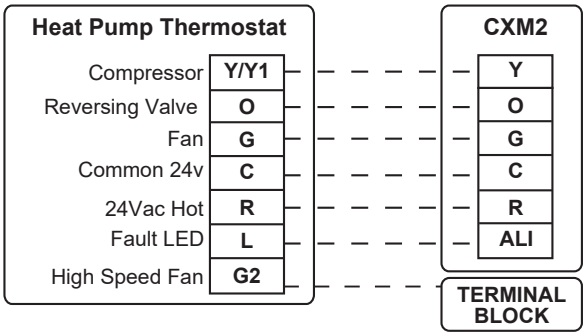
The thermostat should be located on an interior wall in a larger room, away from supply duct drafts. DO NOT locate the thermostat in areas subject to sunlight, drafts or on external walls. The wire access hole behind the thermostat may in certain cases need to be sealed to prevent erroneous temperature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

Position the thermostat back plate against the wall so that it appears level and so the thermostat wires protrude through the middle of the back plate. Mark the position of the back plate mounting holes and drill holes with a 3⁄16-inch (5 mm) bit. Install supplied anchors and secure plate to the wall. Thermostat wire must be 18 AWG wire.

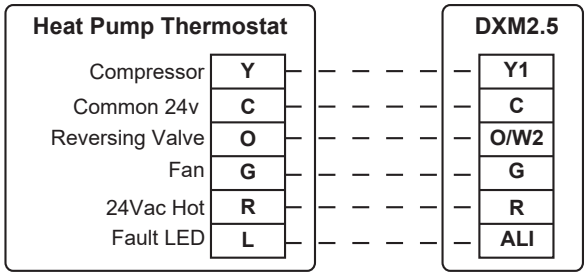
Representative thermostat wiring is shown in Figure 21 however, actual wiring connections should be determined from the thermostat IOM and or unit wiring diagram. Practically any heat pump thermostat will work with heat pump units, provided it has the correct number of heating and cooling stages.

Figure 25: Units with PSC, CT EC, and CV EC Blower Motors

Conventional Thermostat Connection to CXM2 Controller



Conventional Thermostat Connection to DXM2.5 Controller



Models:
WR
006-060

Blower Performance Standard Unit
WR*006

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR006	275	150	PSC	Low	Power (W)	72	69	65	61	57	Operation Not Recommended				
					CFM	238	218	196	170	142					
				Medium	Power (W)	81	77	73	68	63	58				
					CFM	261	242	220	193	163	129				
				High	Power (W)	103	98	93	88	82	75	68			
					CFM	326	306	282	253	219	181	139			
	275	150	CT EC	1	Power (W)	22	24	25	28	30					
					CFM	225	207	187	169	150					
				2	Power (W)			34	37	39	42	44	48	51	
					CFM			233	217	201	185	173	164	150	
				3	Power (W)				43	45	48	51	54	58	61
					CFM				241	227	212	200	188	179	168
				4	Power (W)	Operation Not Recommended					55	58	61	65	67
					CFM						240	227	216	205	193
	275	150	CV EC	Minimum CFM	Power (W)	16	21	27	40	36	41	46	52	59	
					CFM	150	150	150	150	150	150	150	150	150	
				Default CFM	Power (W)	29	35	41	47	53	60	67	76	81	77
					CFM	225	225	225	225	225	225	225	225	225	255
				Maximum CFM	Power (W)	35	41	47	53	60	67	76	84	88	78
					CFM	250	250	250	250	250	250	250	250	250	250

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Blower Performance Standard Unit WR*009

Models:
WR
006-060

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR009	345	225	PSC	Low	Power (W)	Operation Not Recommended									
					CFM	340	322	300	260						
				Medium	Power (W)										
					CFM	390	360	320	290	260					
				High	Power (W)										
					CFM	410	380	350	320	280					
	345	225	CT EC	1	Power (W)	40	42	44	47	49					
					CFM	294	278	259	245	230					
				2	Power (W)	67	70	73	74	79	82	85	88	90	85
					CFM	370	357	343	326	318	302	291	278	265	235
				3	Power (W)	Operation Not Recommended		86	88	91	95	98	101	96	90
					CFM			370	358	346	334	322	307	280	247
				4	Power (W)							120	113	107	102
					CFM							340	309	276	234
	345	225	CV EC	Minimum CFM	Power (W)	25	32	39	45	53	60	66	78	83	
					CFM	225	225	225	225	225	225	225	225	225	
				Default CFM	Power (W)	49	58	67	77	88	100	105	95	88	
					CFM	325	325	325	325	325	325	325	325	325	
				Maximum CFM	Power (W)	126	134	131	125	119	118	105	98	90	
					CFM	375	375	375	375	375	375	375	375	375	

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Models:
WR
006-060

Blower Performance Standard Unit
WR*012

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR012	400	300	PSC	Low	Power (W)	Operation Not Recommended									
					CFM	360	350	320	310						
				Medium	Power (W)										
					CFM	420	400	380	360	340					
				High	Power (W)										
					CFM	470	450	430	400	380	320				
	400	300	CT EC	1	Power (W)	64	66	69	71	75	78	82	85	87	83
					CFM	358	345	332	319	305	291	275	261	247	218
				2	Power (W)	86	88	91	94	97	100	103	104	97	91
					CFM	400	388	377	365	354	342	328	309	269	237
				3	Power (W)	116	119	122	124	126	126	121	114	99	91
					CFM	449	437	427	414	401	385	359	327	274	238
				4	Power (W)	131	133	135	137	135	130	123	110	99	92
					CFM	467	456	444	433	414	390	361	318	273	239
	400	300	CV EC	Minimum CFM	Power (W)	55	64	73	81	90	99	107	106		
					CFM	300	300	300	300	300	300	300	300		
				Default CFM	Power (W)	105	115	125	135	132	127	123	118		
					CFM	380	380	380	380	380	380	380	380		
				Maximum CFM	Power (W)	147	149	146	143	139	134	130	126	120	
					CFM	415	415	415	415	415	415	415	415	415	

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Blower Performance Standard Unit WR*015

Models:
WR
006-060

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR015	525	375	PSC	Low	Power (W)	161	158	146	138	Operation Not Recommended					
					CFM	503	490	479	439						
				Medium	Power (W)	184	181	174	153	143					
					CFM	595	575	562	510	451					
				High	Power (W)				174	159	141				
					CFM				581	510	386				
	525	375	CT EC	1	Power (W)	67	55	62	68	75	82				
					CFM	648	588	542	493	441	378				
				2	Power (W)	67	74	81	87	95	102	108			
					CFM	648	608	557	514	460	402	354			
				3	Power (W)	79	86	94	101	107	117	124	130		
					CFM	695	659	611	570	526	475	422	377		
				4	Power (W)	92	98	107	114	121	129	138	145	151	
					CFM	737	705	661	622	582	534	482	438	396	
				5	Power (W)	106	110	117	126	133	141	151	159	165	172
					CFM	745	745	708	662	626	585	535	488	444	402
	525	375	CV EC	Minimum CFM	Power (W)		36	52	68	84	99	114	129		
					CFM		375	375	375	375	375	375	375		
				Default CFM	Power (W)		55	74	90	108	127	147	166	186	
					CFM		525	525	525	525	525	525	525	525	
				Maximum CFM	Power (W)	54	73	93	112	132	152	173	194	216	238
					CFM	625	625	625	625	625	625	625	625	625	625

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Models:
WR
006-060

Blower Performance Standard Unit WR*018

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR018	630	450	PSC	Low	Power (W)	147	145	135	127	Operation Not Recommended					
					CFM	524	509	493	451						
				Medium	Power (W)	170	167	161	143						
					CFM	611	588	564	514						
				High	Power (W)	195	189	184	177	149					
					CFM	704	668	643	617	504					
	630	450	CT EC	1	Power (W)	73	78	85	90						
					CFM	600	558	518	491						
				2	Power (W)	92	99	107	109	116	123	131			
					CFM	676	641	599	570	536	498	452			
				3	Power (W)	112	118	126	135	140	147	155	163	170	
					CFM	741	713	677	640	619	586	554	512	471	
				4	Power (W)	138	144	152	161	170	174	181	190	199	207
					CFM	802	780	751	714	680	662	633	603	567	529
				5	Power (W)	170	175	182	190	201	210	214	222	231	240
					CFM	854	848	820	791	754	724	711	683	655	625
	630	450	CV EC	Minimum CFM	Power (W)	Operation Not Recommended			93	111	132	157	180		
					CFM				450	450	450	450	450		
				Default CFM	Power (W)	85	101	113	145	178	206	228	248	266	
					CFM	600	600	600	600	600	600	600	600	600	
				Maximum CFM	Power (W)	157	171	186	200	214	251	286	323		
					CFM	750	750	750	750	750	750	750	750		

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Blower Performance Standard Unit WR*024

Models:
WR
006-060

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR024	800	600	PSC	Low	Power (W)	224	215	204	191	176	Operation Not Recommended				
					CFM	777	768	737	684	608					
				Medium	Power (W)	257	246	233	219	204	187				
					CFM	888	868	830	774	701	610				
				High	Power (W)	294	281	268	253	237	219				
					CFM	997	964	916	854	777	686				
	800	600	CT EC	1	Power (W)	116	122	128	135						
					CFM	755	728	695	653						
				2	Power (W)	146	152	159	166	174	185	193			
					CFM	836	810	782	750	708	657	616			
				3	Power (W)	181	187	194	201	209	218	230	239	246	252
					CFM	910	887	861	834	804	762	714	674	642	619
				4	Power (W)	232	240	247	254	262	270	278	291	303	312
					CFM	996	975	952	929	904	876	845	798	755	725
				5	Power (W)	Operation Not Recommended				323	331	340	348	361	374
					CFM					999	975	951	923	884	840
	800	600	CV EC	Minimum CFM	Power (W)	71	89	107	124	141	159	177	195	213	230
					CFM	600	600	600	600	600	600	600	600	600	600
				Default CFM	Power (W)	145	165	185	205	225	245	266	285	306	326
					CFM	800	800	800	800	800	800	800	800	800	800
				Maximum CFM	Power (W)	284	300	315	332	351	364	379	396	412	428
					CFM	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Models:
WR
006-060

Blower Performance Standard Unit
WR*030

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR030	1,000	750	PSC	Low	Power (W)	305	290	274	256	236	Operation Not Recommended				
					CFM	916	911	883	833	761					
				Medium	Power (W)	338	323	306	288	268	246				
					CFM	1,021	1,014	983	929	850	747				
				High	Power (W)	384	372	357	340	322	301				
					CFM	1,084	1,076	1,044	988	906	800				
	1,000	750	CT EC	1	Power (W)	158	165	176	184	192					
					CFM	904	873	832	796	763					
				2	Power (W)	211	219	227	240	250	258	267	276	285	
					CFM	1,020	992	965	927	894	864	835	805	771	
				3	Power (W)	280	289	298	306	321	330	342	351	361	368
					CFM	1,139	1,113	1,089	1,064	1,027	999	966	937	910	879
				4	Power (W)	336	346	355	364	374	389	399	413	423	430
					CFM	1,216	1,193	1,168	1,146	1,123	1,086	1,062	1,028	1,002	975
				5	Power (W)				452	462	471	490	499	508	478
					CFM				1,250	1,229	1,208	1,173	1,151	1,112	1,036
	1,000	750	CV EC	Minimum CFM	Power (W)	71	89	108	127	145	162	181	199	217	235
					CFM	750	750	750	750	750	750	750	750	750	750
				Default CFM	Power (W)	251	274	296	315	337	362	387	407		
					CFM	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000		
				Maximum CFM	Power (W)	388	410	431	453	471	Operation Not Recommended				
					CFM	1,150	1,150	1,150	1,150	1,150					

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Blower Performance Standard Unit WR*036

Models:
WR
006-060

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR036	1,150	900	PSC	Low	Power (W)										
					CFM	970	960	951	941	902	Operation Not Recommended				
				Medium	Power (W)										
					CFM	1,106	1,096	1,086	1,067	1,009	912				
				High	Power (W)										
					CFM	1,436	1,387	1,329	1,280	1,174	1,077	931			
	1,150	900	CT EC	1	Power (W)	166	175	184							
					CFM	974	941	904							
				2	Power (W)	241	251	261	272	282	292	299	307		
					CFM	1,132	1,103	1,074	1,041	1,005	973	944	916		
				3	Power (W)	294	304	316	326	337	349	359	367	375	385
					CFM	1,271	1,242	1,214	1,185	1,153	1,118	1,083	1,056	1,029	999
				4	Power (W)	376	387	399	409	421	433	446	457	468	478
					CFM	1,403	1,377	1,351	1,324	1,295	1,268	1,233	1,201	1,169	1,143
				5	Power (W)			499	510	523	524	521	519	516	514
					CFM			1,485	1,460	1,434	1,396	1,347	1,295	1,240	1,194
	1,150	900	CV EC	Minimum CFM	Power (W)	105	132	164	188	211	233	257	280	307	339
					CFM	900	900	900	900	900	900	900	900	900	900
				Default CFM	Power (W)	205	232	261	303	349	382	415	446	475	505
					CFM	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150
				Maximum CFM	Power (W)	406	403	438	474	511	564	629	680	692	691
					CFM	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Models:
WR
006-060

Blower Performance Standard Unit
WR*042

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR042	1,350	1,050	PSC	Low	Power (W)	388	Operation Not Recommended								
					CFM	918									
				Medium	Power (W)	517	509	496	477	452	422				
					CFM	1,201	1,223	1,218	1,185	1,125	1,038				
				High	Power (W)	665	654	636	611	580	542	498			
					CFM	1,584	1,592	1,571	1,518	1,436	1,323	1,180			
	1,350	1,050	CT EC	1	Power (W)	238	248	259	272						
					CFM	1,186	1,152	1,113	1,056						
				2	Power (W)	331	369	352	365	381	396	411	423	437	446
					CFM	1,345	1,317	1,283	1,251	1,215	1,181	1,150	1,124	1,094	1,050
				3	Power (W)	448	461	474	486	501	518	534	551	568	581
					CFM	1,507	1,482	1,455	1,427	1,396	1,365	1,331	1,296	1,276	1,246
				4	Power (W)	582	595	609	622	635	651	669	688	706	681
					CFM	1,641	1,623	1,601	1,577	1,548	1,519	1,488	1,455	1,423	1,355
				5	Power (W)			756	775	776	774	772	768	765	679
					CFM			1,743	1,717	1,688	1,645	1,596	1,541	1,490	1,352
	1,350	1,050	CV EC	Minimum CFM	Power (W)	154	177	200	224	252	280	306	331	355	383
					CFM	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050
				Default CFM	Power (W)	334	359	390	421	453	484	517	555	595	636
					CFM	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
				Maximum CFM	Power (W)	658	674	703	700	697	Operation Not Recommended				
					CFM	1,750	1,750	1,750	1,750	1,750					

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Blower Performance Standard Unit WR*048

Models:
WR
006-060

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR048	1,550	1,200	PSC	Low	Power (W)	608	585	559	531	499					
					CFM	1,512	1,487	1,440	1,371	1,280					
				Medium	Power (W)	680	652	622	588	552	513				
					CFM	1,670	1,639	1,584	1,507	1,406	1,281				
				High	Power (W)	780	746	709	669	625	579	529			
					CFM	1,885	1,841	1,772	1,678	1,560	1,416	1,248			
	1,550	1,200	CT EC	1	Power (W)	286	303	320	336	351	Operation Not Recommended				
					CFM	1,482	1,411	1,342	1,276	1,211					
				2	Power (W)	360	379	397	415	433	450	467			
					CFM	1,604	1,553	1,500	1,444	1,385	1,323	1,258			
				3	Power (W)	457	472	488	505	525	546	569			
					CFM	1,753	1,707	1,659	1,607	1,553	1,495	1,435			
				4	Power (W)	626	642	658	673	687	701				
					CFM	1,984	1,937	1,890	1,843	1,795	1,747				
				5	Power (W)				805	829					
					CFM				1,980	1,938					
	1,550	1,200	CV EC	Minimum CFM	Power (W)	240	132	163	293	342	309	280	395	401	453
					CFM	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
				Default CFM	Power (W)	445	251	294	500	570	498	438	617	602	672
					CFM	1,550	1,550	1,550	1,550	1,550	1,550	1,550	1,550	1,550	1,550
				Maximum CFM	Power (W)	723	418	474	780	873	761	644	912	853	939
					CFM	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900	1,900

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Models:
WR
006-060

Blower Performance Standard Unit
WR*060

Model	Rated CFM	Min CFM	Motor Type	Speed Tap		External Static Pressure (in. wg)									
						0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
WR060	2,000	1,500	PSC	Low	Power (W)	779	766	750	731	710	686	659			
					CFM	1,771	1,756	1,732	1,700	1,658	1,608	1,549			
				Medium	Power (W)	877	856	833	806	777	744	708	669		
					CFM	1,979	1,968	1,940	1,894	1,831	1,751	1,653	1,539		
				High	Power (W)	996	969	938	904	867	826	783	736	687	
					CFM	2,208	2,178	2,132	2,069	1,990	1,893	1,780	1,649	1,502	
	2,000	1,500	CT EC	1	Power (W)	342	354	366	380	Operation Not Recommended					
					CFM	1,685	1,640	1,593	1,545						
				2	Power (W)	460	476	489	501	518	533	548	561	577	
					CFM	1,879	1,833	1,795	1,754	1,705	1,657	1,608	1,563	1,514	
				3	Power (W)	648	666	678	694	708	724	740	757	773	
					CFM	2,113	2,069	2,039	1,998	1,963	1,925	1,885	1,840	1,795	
				4	Power (W)	771	785	803	817	832	848	864	883	900	
					CFM	2,235	2,198	2,163	2,130	2,094	2,061	2,019	1,977	1,939	
				5	Power (W)	866	881	899	916	934	951	970	977	973	969
					CFM	2,322	2,290	2,253	2,219	2,188	2,152	2,120	2,083	2,013	1,940
	2,000	1,500	CV EC	Minimum CFM	Power (W)	246	301	354	405	453	500	544	587	627	665
					CFM	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
				Default CFM	Power (W)	503	564	631	686	734	808	875	929	990	1,051
					CFM	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
				Maximum CFM	Power (W)	885	896	901	916	937	Operation Not Recommended				
					CFM	2,200	2,200	2,200	2,200	2,200					

- Blower performance data is based on the lowest nameplate voltage setting.
- Blower performance is based on a wet coil with clean 1-inch filter.
- Blower performance is based on operating conditions of 80°F DB and 67°F WB.
- CFM Tolerance is ±7%
- Cells in grey - option not available

Constant Volume CV EC Motor Limits

Models:
WR
006-060

CV EC ADVANTAGE

A major benefit of the CV EC motor over other blower motor types is its ability to adjust airflow directly at the unit with a communicating diagnostic service tool. Airflow levels can be adjusted in increments of 25 CFM from the unit's minimum and maximum CFM range (see the CV EC motor configuration table for details).

Table 7: CV EC Blower Motor Limits

Size	Max ESP (in. wg)	Fan Motor (hp)	Airflow Range	Cooling Mode	Heating Mode	Dehumid Mode	Fan Only
6	0.9	1/8	Minimum	150	150	150	150
	1.0		Default	275	275	150	275
	1.0		Maximum	275	275	225	275
9	0.9	1/8	Minimum	225	225	225	225
	0.9		Default	345	345	225	345
	0.9		Maximum	375	375	325	375
12	0.8	1/4	Minimum	300	300	300	300
	0.8		Default	400	400	300	400
	0.9		Maximum	415	415	380	415
15	0.8	1/3	Minimum	375	375	375	375
	1.0		Default	525	525	375	525
	1.0		Maximum	625	625	600	625
18	0.8	1/3	Minimum	450	450	450	450
	0.9		Default	630	630	450	630
	0.9		Maximum	750	750	600	750
24	0.75	1/2	Minimum	600	600	600	300
			Default	750	750	650	350
			Maximum	850	850	800	850
30	0.5	1/2	Minimum	750	750	750	375
			Default	925	925	800	425
			Maximum	1,050	1,050	1,000	1,050
36	0.6	3/4	Minimum	900	900	900	450
			Default	1,125	1,125	975	525
			Maximum	1,275	1,275	1,200	1,275
42	0.6	3/4	Minimum	1,050	1,050	1,050	525
			Default	1,300	1,300	1,125	600
			Maximum	1,475	1,475	1,400	1,475
48	0.6	3/4	Minimum	1,200	1,200	1,200	600
			Default	1,500	1,500	1,300	700
			Maximum	1,700	1,700	1,600	1,700
60	0.75	1	Minimum	1,500	1,500	1,500	750
			Default	1,875	1,875	1,625	875
			Maximum	2,125	2,125	2,000	2,125

- Airflow is controlled within ±5% up to Max ESP shown with wet coil and standard 1-inch fiberglass air filter.
- Performance shown is with wet coil and factory air filters.

Models:
WR
006-060

Controls: Solid State Control and Deluxe Solid State Control

Solid State Control

For detailed controller information, see the Solid State Control 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.

Deluxe Solid State Control

For detailed controller information, see the Deluxe Solid State Control 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.

Operating Limits and Commissioning Conditions

Models:
WR
006-060

OPERATING LIMITS

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

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

Determination of operating limits is dependent primarily upon three factors: 1) return air temperature. 2) water temperature, and 3) ambient temperature. When any one of these factors is at minimum or maximum levels, the other two factors should be at normal levels to ensure proper unit operation. Extreme variations in temperature and humidity and/or corrosive water or air will adversely affect unit performance, reliability, and service life.

COMMISSIONING CONDITIONS

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

NOTES:

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

Table 8: Operating Limits

Operating Limits	Cooling	Heating
Air Limits		
Min. ambient air, DB	*10°F [-12°C]	*10°F [-12°C]
Max. ambient air, DB	130°F [54.4°C]	130°F [54.4°C]
Min. entering air, DB/WB	65/45°F [18/7°C]	50°F [10°C]
Max. entering air, DB/WB	90/72°F [32/22°C]	80°F [27°C]
Min/Max Airflow (CFM/Ton)	**300 to 500 CFM/Ton	
Water Limits		
Min. entering water	***30°F [-1°C]	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:
*To prevent unit damage, the water loop should contain antifreeze to prevent freezing when not in operation.
** Refer to specific blower tables for each model size
***With unit flow-control automation.
**** Unless specified different on performance table for any model size

Table 9: Commissioning Conditions

Commissioning Conditions	Cooling	Heating
Air Limits		
Min. ambient air, DB	*10°F [-12°C]	*10°F [-12°C]
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]	[2]40°F [4.4°C]
Max. entering air, DB/WB	[1]100/75°F [38/24°C]	80°F [27°C]
Min/Max Airflow (CFM/Ton)	**300 to 500 CFM/Ton	
Water Limits		
Min. entering water	***20°F [-6.7°C]	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:
*To prevent unit damage, the water loop should contain antifreeze to prevent freezing when not in operation.
** Refer to specific blower tables for each model size
***With unit flow-control automation.
**** Unless specified different on performance table for any model size
1. Commission units for cooling at entering air temperatures of 100/75°F [38/24°C] only at rated water flow or 3 gpm/ton.
2. 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

Options	Max Pressure PSIG [kPa]
Base Unit	300 [2,068]
Internal Secondary Pump (ISP)	145 [999]
Internal Motorized Water Valve (MWV)	300 [2,068]
Internal Auto Flow Valve	300 [2,068]

Use the lowest maximum pressure rating when multiple options are combined.

Models:
WR
006-060

Piping System Cleaning and Flushing

PIPING SYSTEM CLEANING AND FLUSHING

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

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

1. Ensure that 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 water. DO NOT allow system to overflow. Bleed all air from the system. Pressurize and check the system for leaks and repair as appropriate.
4. Verify that all strainers are in place. A strainer with a #20 stainless steel wire mesh is recommended. Start the pumps, and systematically check each vent to ensure that all air is bled from the system.
5. Verify that make-up water is available. Adjust make-up water as required 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 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 (0.8 kg per 1000 l) of water (or other equivalent approved cleaning agent). Reset the boiler to raise the loop temperature to 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 the 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 in the range of pH 6.0 - 8.5 (see the Water Quality Requirements Table). Add chemicals, as appropriate to maintain neutral pH 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 similar chemical agent in this system. Addition of chemicals of this type to the loop water will foul the heat exchanger and inhibit unit operation.

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.

Unit and System Checkout

Models:
WR
006-060

UNIT AND SYSTEM CHECKOUT

BEFORE POWERING SYSTEM, please check the following:

UNIT FEATURES

- ☐ **Balancing/shutoff valves:** Ensure that all isolation valves are open and water control valves are wired.
- ☐ **Line voltage and wiring:** Verify that voltage is within an acceptable range for the unit and wiring and fuses/breakers are properly sized. Verify that low voltage wiring is complete.
- ☐ **Unit control transformer:** Ensure that transformer has the properly selected voltage tap.
- ☐ **Entering water and air:** Ensure that entering water and air temperatures are within operating limits of Table 8 and Table 9.
- ☐ **Low water temperature cutout:** Verify that low water temperature cut-out on the Solid State Control/Deluxe Solid State Control control is properly set.
- ☐ **Unit fan:** Manually rotate fan to verify free rotation and ensure that blower wheel is secured to the motor shaft. Be sure to remove any shipping supports if needed. DO NOT oil motors upon startup. Fan motors are pre-oiled at the factory. Check unit fan speed selection and compare to design requirements.
- ☐ **Condensate line:** Verify that condensate line is open and properly pitched toward drain.
- ☐ **Water flow balancing:** Record inlet and outlet water temperatures for each heat pump upon startup. This check can eliminate nuisance trip outs and high velocity water flow that could erode heat exchangers.
- ☐ **Unit air coil and filters:** Ensure that filter is clean and accessible. Clean air coil of all manufacturing oils.
- ☐ **Unit controls:** Verify that Solid State Control or Deluxe Solid State Control field selection options are properly set.

SYSTEM CHECKOUT

- ☐ **System water temperature:** Check water temperature for proper range and also verify heating and cooling set points for proper operation.
- ☐ **System pH:** Check and adjust water pH if necessary to maintain a level between 6 and 8.5. Proper pH promotes longevity of hoses and fittings (see Table 4).
- ☐ **System flushing:** Verify that all hoses are connected end to end when flushing to ensure that debris bypasses the unit heat exchanger, water valves and other components. Water used in the system must be potable quality initially and clean of dirt, piping slag, and strong chemical cleaning agents. Verify that 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 that the standby pump is properly installed and in operating condition.
- ☐ **System controls:** Verify that system controls function and operate in the proper sequence.
- ☐ **Low water temperature cutout:** Verify that low water temperature cut-out controls are provided for the outdoor portion of the loop. Otherwise, operating problems may occur.
- ☐ **System control center:** Verify that the control center and alarm panel have appropriate setpoints and are operating as designed.
- ☐ **Miscellaneous:** Note any questionable aspects of the installation.

⚠ CAUTION

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

⚠ CAUTION

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

Models:
WR
006-060

Unit Startup Procedure

UNIT STARTUP PROCEDURE

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

      NOTE: Units have a five minute time delay in the control circuit that can be eliminated on the Solid State Control/Deluxe Solid State Control control board as shown in the Test Mode Button figure. See controls description for details.

   c. Run the unit for 15 minutes before recording performance data in the Startup Log Sheet.
   d. Verify that the compressor is on and that the water flow rate is correct by measuring pressure drop through the heat exchanger using the P/T plugs and comparing to the Coax Water Pressure Drop table.
   e. Check the elevation and cleanliness of the condensate lines. Dripping may be a sign of a blocked line. Check that the condensate trap is filled to provide a water seal.
   f. Refer to the Typical Unit Operating Pressures and Temperatures tables. Check the temperature of both entering and leaving water. If temperature is within range, proceed with the test. Heat of rejection (HR) can be calculated and compared to submittal data capacity pages. The formula for HR for systems with water is as follows: HR (Btuh) = TD x GPM x 500, where TD is the temperature difference between the entering and leaving water, and GPM is the flow rate in U.S. GPM, determined by comparing the pressure drop across the heat exchanger to the Coax Water Pressure Drop table. In S-I units, the formula is as follows:

      HR (kW) = TD x l/s x 4.18.

   g. Check air temperature drop across the air coil when compressor is operating. Air temperature drop should be between 15°F and 25°F (8°C and 14°C).
   h. Turn thermostat to "OFF" position. A hissing noise indicates proper functioning of the reversing valve.
6. Allow five (5) minutes between tests for pressure to equalize before beginning heating test.
   a. Adjust the thermostat to the lowest setting. Place the thermostat mode switch in the "HEAT" position.
   b. Slowly raise the thermostat to a higher temperature until the compressor activates.
   c. Check for warm air delivery within a few minutes after the unit bgins to operate.
   d. Run the unit for 15 minutes before recording performance data in the Startup Log Sheet.

Unit Startup Procedure

Models:
WR
006-060

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

HE (kW) = TD x GPM x 500

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

HE (kW) = TD x l/s x 4.18

f. Check air temperature rise across the air coil when compressor is operating. Air temperature rise should be between 20°F and 30°F (11°C and 17°C).

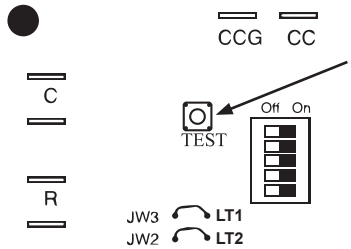
g. Check for vibration, noise, and water leaks.

7. If the unit fails to operate, perform troubleshooting analysis (see Functional Troubleshooting). If the check procedure described fails to reveal the problem, and the unit still does not operate, contact a trained service technician to ensure proper diagnosis and repair of the equipment.

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

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

Figure 26: Test Mode Button



⚠ WARNING

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

⚠ CAUTION

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

⚠ CAUTION

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

Models:
WR
006-060

Unit Startup Procedure

Table 11: Motorized Water Valve Option Corrections

Model	GPM	MWV Pressure Drop (Adders)				
		CV	Close Off	MOPD	PSI	FT
WR*006	1.75	4.9	125	300	0.1	0.3
	1.31				0.1	0.2
	0.88				0.0	0.1
WR*009	2.5	4.9	125	300	0.3	0.6
	1.88				0.1	0.3
	1.25				0.1	0.2
WR*012	3	4.9	125	300	0.4	0.9
	2.25				0.2	0.5
	1.50				0.1	0.2
WR*015	4	4.9	125	300	0.7	1.5
	3.00				0.4	0.9
	2.00				0.2	0.4
WR*018	4.5	4.9	125	300	0.8	1.9
	3.38				0.5	1.1
	2.25				0.2	0.5
WR*024	6	4.9	125	300	1.5	3.5
	4.5				0.8	1.9
	3				0.4	0.9
WR*030	7.5	10.3	125	300	0.5	1.2
	5.6				0.3	0.7
	3.8				0.1	0.3
WR*036	9	10.3	125	300	0.8	1.8
	6.8				0.4	1.0
	4.5				0.2	0.4
WR*042	10.5	10.3	125	300	1.0	2.4
	7.9				0.6	1.4
	5.2				0.3	0.6
WR*048	12	10.3	125	300	1.4	3.1
	9				0.8	1.8
	6				0.3	0.8
WR*060	15	8.9	125	300	2.8	6.6
	11.3				1.6	3.7
	7.5				0.7	1.6

Table 12: WR Coax Water Pressure Drop

Model	U.S. GPM	l/s	Pressure Drop, psi [kPa]				
			30°F [-1°C]	50°F [10°C]	70°F [21°C]	90°F [32°C]	110°F [43°F]
WR*006	0.75	0.05	0.5	0.3	0.3	0.2	0.2
	1.13	0.07	1.0	0.8	0.7	0.6	0.5
	1.50	0.09	1.6	1.3	1.1	1.0	0.9
WR*009	1.13	0.07	1.3	1.0	0.8	0.7	0.6
	1.69	0.11	2.5	2.0	1.7	1.4	1.3
	2.25	0.14	3.8	3.1	2.7	2.4	2.1
WR*012	1.50	0.09	1.9	1.1	0.8	0.6	0.5
	2.25	0.14	3.6	2.6	2.1	1.8	1.6
	3.00	0.19	6.7	5.0	4.1	3.6	3.2
WR*015	1.88	0.12	0.5	0.5	0.4	0.4	0.3
	2.81	0.18	1.3	1.2	1.0	0.9	0.8
	3.75	0.24	2.3	2.0	1.7	1.5	1.3
WR*018	2.25	0.14	2.7	1.8	1.4	1.3	1.2
	3.38	0.21	5.0	3.4	2.8	2.6	2.5
	4.50	0.28	7.3	5.5	4.5	4.2	3.8
WR*024	2.20	0.14	0.8	0.5	0.4	0.3	0.3
	3.00	0.19	1.3	0.8	0.6	0.6	0.5
	4.50	0.28	2.4	1.6	1.3	1.2	1.1
	6.00	0.38	3.5	2.5	2.1	2.0	1.8
WR*030	2.80	0.18	1.1	0.6	0.4	0.4	0.3
	3.80	0.24	1.8	1.0	0.8	0.7	0.7
	5.60	0.35	3.3	2.1	1.7	1.6	1.4
	7.50	0.47	4.8	3.3	2.8	2.7	2.5
WR*036	3.40	0.21	1.0	0.7	0.6	0.6	0.6
	4.50	0.28	1.6	1.1	1.0	0.9	0.9
	6.80	0.43	3.0	2.0	1.7	1.7	1.6
	9.00	0.57	4.4	3.3	2.8	2.7	2.6
WR*042	4.25	0.27	0.9	0.8	0.8	0.8	0.7
	5.25	0.33	1.4	1.2	1.1	1.1	1.0
	7.90	0.50	2.7	2.3	2.1	2.1	1.9
	10.50	0.66	4.3	3.7	3.5	3.3	3.1
WR*048	4.20	0.26	0.6	0.6	0.7	0.7	0.5
	6.00	0.38	1.4	1.2	1.1	1.0	1.0
	9.00	0.57	3.0	2.6	2.3	2.1	2.0
	12.00	0.76	4.9	4.4	4.0	3.6	3.3
WR*060	5.25	0.33	1.6	1.3	1.1	1.0	1.0
	7.50	0.47	2.6	2.3	2.0	1.9	1.7
	11.25	0.71	5.1	4.4	4.0	3.7	3.4
	15.00	0.95	8.2	7.2	6.5	6.1	5.6

*Based on 20% methanol antifreeze solution.

Unit Operating Conditions

Models:
WR
006-060

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 13: WR Series Typical Unit Operating Pressures and Temperatures

WR*006		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	3	126-146	108-118	14-18	14-18	10-12	17-23	289-309	70-80	4-8	12-16	4-6	19-25
	2.25	137-157	109-119	12-16	16-20	16-18	17-23	285-305	67-77	3-7	12-16	5-7	18-24
	1.5	148-168	110-120	11-15	18-22	21-23	17-23	282-302	64-74	3-7	12-16	7-9	18-24
50	3	176-196	114-124	9-13	14-18	10-12	16-22	329-349	103-113	5-9	14-18	5-7	25-31
	2.25	189-209	114-124	9-13	16-20	15-17	16-22	324-344	98-108	5-9	14-18	8-10	25-31
	1.5	202-222	115-125	8-12	19-23	20-22	16-22	318-338	94-104	4-8	14-18	11-13	24-30
70	3	240-260	119-129	7-11	13-17	9-11	15-21	370-390	139-149	7-11	14-18	7-9	32-38
	2.25	254-274	119-129	6-10	16-20	14-16	14-20	362-382	133-143	6-10	14-18	11-13	31-37
	1.5	268-288	120-130	6-10	18-22	19-21	14-20	355-375	126-136	6-10	14-18	14-16	30-36
90	3	317-337	124-134	5-9	12-16	8-10	13-19	411-431	178-188	10-14	11-15	9-11	38-44
	2.25	332-352	124-134	5-9	15-19	13-15	13-19	402-422	169-179	9-13	12-16	13-15	37-43
	1.5	347-367	124-134	5-9	17-21	18-20	13-19	393-413	161-171	8-12	12-16	18-20	35-41
120	3	457-477	130-140	5-9	10-14	7-9	11-17						
	2.25	472-492	131-141	5-9	12-16	12-14	11-17						
	1.5	488-508	131-141	5-9	13-17	16-18	10-16						

*Based on 20% Methanol antifreeze solution

WR*009		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	3	126-146	108-118	14-18	14-18	10-12	17-23	289-309	70-80	4-8	12-16	4-6	19-25
	2.25	137-157	109-119	12-16	16-20	16-18	17-23	285-305	67-77	3-7	12-16	5-7	18-24
	1.5	148-168	110-120	11-15	18-22	21-23	17-23	282-302	64-74	3-7	12-16	7-9	18-24
50	3	176-196	114-124	9-13	14-18	10-12	16-22	329-349	103-113	5-9	14-18	5-7	25-31
	2.25	189-209	114-124	9-13	16-20	15-17	16-22	324-344	98-108	5-9	14-18	8-10	25-31
	1.5	202-222	115-125	8-12	19-23	20-22	16-22	318-338	94-104	4-8	14-18	11-13	24-30
70	3	240-260	119-129	7-11	13-17	9-11	15-21	370-390	139-149	7-11	14-18	7-9	32-38
	2.25	254-274	119-129	6-10	16-20	14-16	14-20	362-382	133-143	6-10	14-18	11-13	31-37
	1.5	268-288	120-130	6-10	18-22	19-21	14-20	355-375	126-136	6-10	14-18	14-16	30-36
90	3	317-337	124-134	5-9	12-16	8-10	13-19	411-431	178-188	10-14	11-15	9-11	38-44
	2.25	332-352	124-134	5-9	15-19	13-15	13-19	402-422	169-179	9-13	12-16	13-15	37-43
	1.5	347-367	124-134	5-9	17-21	18-20	13-19	393-413	161-171	8-12	12-16	18-20	35-41
120	3	457-477	130-140	5-9	10-14	7-9	11-17						
	2.25	472-492	131-141	5-9	12-16	12-14	11-17						
	1.5	488-508	131-141	5-9	13-17	16-18	10-16						

*Based on 20% Methanol antifreeze solution

Models:
WR
006-060

Unit Operating Conditions

WR*012		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	3	126-146	108-118	14-18	14-18	10-12	17-23	289-309	70-80	4-8	12-16	4-6	19-25
	2.25	137-157	109-119	12-16	16-20	16-18	17-23	285-305	67-77	3-7	12-16	5-7	18-24
	1.5	148-168	110-120	11-15	18-22	21-23	17-23	282-302	64-74	3-7	12-16	7-9	18-24
50	3	176-196	114-124	9-13	14-18	10-12	16-22	329-349	103-113	5-9	14-18	5-7	25-31
	2.25	189-209	114-124	9-13	16-20	15-17	16-22	324-344	98-108	5-9	14-18	8-10	25-31
	1.5	202-222	115-125	8-12	19-23	20-22	16-22	318-338	94-104	4-8	14-18	11-13	24-30
70	3	240-260	119-129	7-11	13-17	9-11	15-21	370-390	139-149	7-11	14-18	7-9	32-38
	2.25	254-274	119-129	6-10	16-20	14-16	14-20	362-382	133-143	6-10	14-18	11-13	31-37
	1.5	268-288	120-130	6-10	18-22	19-21	14-20	355-375	126-136	6-10	14-18	14-16	30-36
90	3	317-337	124-134	5-9	12-16	8-10	13-19	411-431	178-188	10-14	11-15	9-11	38-44
	2.25	332-352	124-134	5-9	15-19	13-15	13-19	402-422	169-179	9-13	12-16	13-15	37-43
	1.5	347-367	124-134	5-9	17-21	18-20	13-19	393-413	161-171	8-12	12-16	18-20	35-41
120	3	457-477	130-140	5-9	10-14	7-9	11-17						
	2.25	472-492	131-141	5-9	12-16	12-14	11-17						
	1.5	488-508	131-141	5-9	13-17	16-18	10-16						

*Based on 20% Methanol antifreeze solution

WR*015		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	3	126-146	108-118	14-18	14-18	10-12	17-23	289-309	70-80	4-8	12-16	4-6	19-25
	2.25	137-157	109-119	12-16	16-20	16-18	17-23	285-305	67-77	3-7	12-16	5-7	18-24
	1.5	148-168	110-120	11-15	18-22	21-23	17-23	282-302	64-74	3-7	12-16	7-9	18-24
50	3	176-196	114-124	9-13	14-18	10-12	16-22	329-349	103-113	5-9	14-18	5-7	25-31
	2.25	189-209	114-124	9-13	16-20	15-17	16-22	324-344	98-108	5-9	14-18	8-10	25-31
	1.5	202-222	115-125	8-12	19-23	20-22	16-22	318-338	94-104	4-8	14-18	11-13	24-30
70	3	240-260	119-129	7-11	13-17	9-11	15-21	370-390	139-149	7-11	14-18	7-9	32-38
	2.25	254-274	119-129	6-10	16-20	14-16	14-20	362-382	133-143	6-10	14-18	11-13	31-37
	1.5	268-288	120-130	6-10	18-22	19-21	14-20	355-375	126-136	6-10	14-18	14-16	30-36
90	3	317-337	124-134	5-9	12-16	8-10	13-19	411-431	178-188	10-14	11-15	9-11	38-44
	2.25	332-352	124-134	5-9	15-19	13-15	13-19	402-422	169-179	9-13	12-16	13-15	37-43
	1.5	347-367	124-134	5-9	17-21	18-20	13-19	393-413	161-171	8-12	12-16	18-20	35-41
120	3	457-477	130-140	5-9	10-14	7-9	11-17						
	2.25	472-492	131-141	5-9	12-16	12-14	11-17						
	1.5	488-508	131-141	5-9	13-17	16-18	10-16						

*Based on 20% Methanol antifreeze solution

Unit Operating Conditions

Models:
WR
006-060

WR*018		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	3	126-146	108-118	14-18	14-18	10-12	17-23	289-309	70-80	4-8	12-16	4-6	19-25
	2.25	137-157	109-119	12-16	16-20	16-18	17-23	285-305	67-77	3-7	12-16	5-7	18-24
	1.5	148-168	110-120	11-15	18-22	21-23	17-23	282-302	64-74	3-7	12-16	7-9	18-24
50	3	176-196	114-124	9-13	14-18	10-12	16-22	329-349	103-113	5-9	14-18	5-7	25-31
	2.25	189-209	114-124	9-13	16-20	15-17	16-22	324-344	98-108	5-9	14-18	8-10	25-31
	1.5	202-222	115-125	8-12	19-23	20-22	16-22	318-338	94-104	4-8	14-18	11-13	24-30
70	3	240-260	119-129	7-11	13-17	9-11	15-21	370-390	139-149	7-11	14-18	7-9	32-38
	2.25	254-274	119-129	6-10	16-20	14-16	14-20	362-382	133-143	6-10	14-18	11-13	31-37
	1.5	268-288	120-130	6-10	18-22	19-21	14-20	355-375	126-136	6-10	14-18	14-16	30-36
90	3	317-337	124-134	5-9	12-16	8-10	13-19	411-431	178-188	10-14	11-15	9-11	38-44
	2.25	332-352	124-134	5-9	15-19	13-15	13-19	402-422	169-179	9-13	12-16	13-15	37-43
	1.5	347-367	124-134	5-9	17-21	18-20	13-19	393-413	161-171	8-12	12-16	18-20	35-41
120	3	457-477	130-140	5-9	10-14	7-9	11-17						
	2.25	472-492	131-141	5-9	12-16	12-14	11-17						
	1.5	488-508	131-141	5-9	13-17	16-18	10-16						

*Based on 20% Methanol antifreeze solution

WR*024		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	6	136-156	100-110	31-35	17-21	9-11	18-24	292-312	67-77	8-12	8-12	4-6	19-25
	4.5	144-164	108-118	22-26	17-21	14-16	19-25	288-308	64-74	8-12	8-12	-1-1	19-25
	3	157-177	110-120	18-22	19-23	21-23	20-26	283-303	60-70	8-12	7-11	8-10	18-24
50	6	190-210	112-122	19-23	15-19	9-11	18-24	328-348	96-106	9-13	10-14	6-8	26-32
	4.5	200-220	115-125	15-19	16-20	13-15	19-25	325-345	93-103	9-13	10-14	1-3	26-32
	3	219-239	116-126	13-17	18-22	20-22	19-25	319-339	87-97	8-12	9-13	11-13	24-30
70	6	259-279	121-131	11-15	14-18	9-11	18-24	366-386	128-138	11-15	10-14	7-9	32-38
	4.5	271-291	121-131	10-14	16-20	13-15	18-24	362-382	124-134	11-15	10-14	3-5	32-38
	3	294-314	122-132	10-14	18-22	20-22	18-24	353-373	116-126	9-13	10-14	14-16	30-36
90	6	343-363	127-137	7-11	13-17	9-11	18-24	404-424	162-172	14-18	8-12	9-11	39-45
	4.5	356-376	126-136	7-11	16-20	13-15	17-23	398-418	156-166	13-17	8-12	6-8	38-44
	3	383-403	127-137	8-12	19-23	19-21	17-23	386-406	145-155	12-16	8-12	18-20	36-42
120	6	497-517	132-142	8-12	15-19	8-10	16-22						
	4.5	512-532	133-143	6-10	17-21	12-14	16-22						
	3	540-560	135-145	7-11	19-23	18-20	15-21						

*Based on 20% Methanol antifreeze solution

Models:
WR
006-060

Unit Operating Conditions

WR*030		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	7.5	133-153	107-117	20-24	12-16	9-11	18-24	288-308	66-76	7-11	7-11	3-5	18-24
	5.6	144-164	112-122	14-18	10-14	13-15	19-25	284-304	63-73	7-11	7-11	5-7	18-24
	3.8	156-176	113-123	12-16	12-16	19-21	19-25	281-301	59-69	6-10	7-11	7-9	17-23
50	7.5	174-194	115-125	13-17	10-14	9-11	18-24	321-341	94-104	8-12	7-11	5-7	24-30
	5.6	201-221	117-127	11-15	11-15	13-15	18-24	317-337	92-102	8-12	7-11	7-9	24-30
	3.8	218-238	118-128	9-13	13-17	19-21	18-24	312-332	87-97	7-11	8-12	10-12	23-29
70	7.5	223-243	121-131	8-12	10-14	9-11	17-23	356-376	126-136	11-15	6-10	6-8	30-36
	5.6	272-292	122-132	8-12	11-15	12-14	17-23	351-371	123-133	10-14	6-10	9-11	29-35
	3.8	293-313	123-133	7-11	13-17	18-20	17-23	343-363	115-125	9-13	6-10	13-15	28-34
90	7.5	280-300	127-137	5-9	10-14	9-11	16-22	392-412	161-171	15-19	4-8	8-10	36-42
	5.6	357-377	127-137	6-10	12-16	12-14	16-22	385-405	156-166	13-17	4-8	11-13	35-41
	3.8	379-399	128-138	6-10	14-18	18-20	16-22	375-395	146-156	12-16	4-8	16-18	33-39
120	7.5	383-403	134-144	5-9	11-15	8-10	14-20						
	5.6	508-528	135-145	4-8	12-16	11-13	14-20						
	3.8	531-551	137-147	4-8	15-19	17-19	14-20						

*Based on 20% Methanol antifreeze solution

WR*036		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	9	133-153	104-114	22-26	10-14	9-11	19-25	310-330	66-76	9-13	12-16	4-6	20-26
	6	142-162	106-116	17-21	10-14	14-16	20-26	304-324	62-72	8-12	12-16	6-8	19-25
	3	175-195	109-119	10-14	16-20	29-31	21-27	293-313	54-64	10-14	12-16	11-13	17-23
50	9	187-207	111-121	14-18	8-12	9-11	19-25	350-370	96-106	8-12	14-18	5-7	27-33
	6	200-220	112-122	11-15	10-14	14-16	19-25	344-364	91-101	8-12	14-18	8-10	26-32
	3	242-262	114-124	7-11	15-19	29-31	19-25	331-351	80-90	7-11	14-18	15-17	24-30
70	9	255-275	117-127	8-12	8-12	9-11	18-24	392-412	128-138	10-14	14-18	7-9	33-39
	6	271-291	117-127	7-11	10-14	14-16	18-24	385-405	122-132	9-13	14-18	10-12	32-38
	3	320-340	120-130	5-9	15-19	28-30	18-24	366-386	107-117	8-12	15-19	19-21	30-36
90	9	336-356	123-133	5-9	8-12	9-11	18-24	435-455	163-173	15-19	12-16	9-11	40-46
	6	355-375	123-133	5-9	10-14	13-15	18-24	425-445	153-163	14-18	12-16	13-15	38-44
	3	408-428	125-135	4-8	15-19	27-29	17-23	400-420	133-143	11-15	13-17	24-26	34-40
120	9	485-505	130-140	4-8	9-13	9-11	16-22						
	6	505-525	130-140	4-8	10-14	12-14	16-22						
	3	560-580	133-143	3-7	16-20	26-28	15-21						

*Based on 20% Methanol antifreeze solution

Unit Operating Conditions

Models:
WR
006-060

WR*042		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	10.5	139-159	100-110	27-31	16-20	9-11	19-25	284-304	63-73	5-9	6-10	4-6	18-24
	7.8	148-168	104-114	21-25	16-20	12-14	19-25	280-300	59-69	4-8	6-10	5-7	17-23
	5.25	163-183	107-117	18-22	18-22	19-21	19-25	275-295	55-65	5-9	6-10	4-6	16-22
50	10.5	189-209	108-118	18-22	15-19	9-11	19-25	319-339	91-101	8-12	5-9	5-7	26-32
	7.8	199-219	110-120	15-19	16-20	13-15	19-25	316-336	88-98	7-11	5-9	7-9	25-31
	5.25	219-239	112-122	13-17	18-22	19-21	19-25	310-330	83-93	7-11	6-10	4-6	24-30
70	10.5	256-276	115-125	11-15	15-19	9-11	18-24	354-374	122-132	12-16	4-8	6-8	32-38
	7.8	268-288	116-126	10-14	16-20	13-15	19-25	351-371	118-128	11-15	4-8	9-11	31-37
	5.25	292-312	117-127	9-13	19-23	19-21	18-24	343-363	112-122	10-14	5-9	5-7	30-36
90	10.5	340-360	121-131	7-11	16-20	8-10	18-24	389-409	155-165	17-21	2-6	8-10	38-44
	7.8	354-374	122-132	6-10	17-21	14-16	18-24	383-403	150-160	16-20	2-6	11-13	37-43
	5.25	381-401	122-132	6-10	21-25	18-20	17-23	374-394	142-152	15-19	3-7	5-7	36-42
120	10.5	498-518	128-138	6-10	19-23	8-10	15-21						
	7.8	515-535	129-139	4-8	20-24	15-17	16-22						
	5.25	544-564	130-140	4-8	24-28	17-19	15-21						

*Based on 20% Methanol antifreeze solution

WR*048		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	12	140-160	106-116	21-25	6-10	10-12	18-24	300-320	60-70	0-4	14-18	4-6	20-26
	9	146-166	109-119	16-20	4-8	13-15	19-25	295-315	56-66	2-6	15-19	5-7	20-26
	6	162-182	111-121	12-16	7-11	20-22	19-25	290-310	52-62	-3-1	15-19	7-9	19-25
50	12	189-209	111-121	14-18	7-11	10-12	18-24	335-355	90-100	3-7	10-14	5-7	27-33
	9	198-218	112-122	12-16	7-11	13-15	18-24	331-351	87-97	2-6	10-14	7-9	26-32
	6	219-239	114-124	11-15	10-14	20-22	18-24	324-344	80-90	1-5	11-15	10-12	25-31
70	12	255-275	116-126	10-14	8-12	9-11	18-24	374-394	124-134	7-11	6-10	7-9	33-39
	9	268-288	116-126	10-14	10-14	13-15	18-24	370-390	120-130	6-10	6-10	9-11	32-38
	6	292-312	117-127	10-14	13-17	20-22	17-23	359-379	111-121	5-9	7-11	14-16	31-37
90	12	340-360	121-131	8-12	10-14	9-11	17-23	416-436	162-172	12-16	2-6	8-10	39-45
	9	354-374	121-131	9-13	12-16	12-14	16-22	410-430	156-166	12-16	2-6	12-14	39-45
	6	382-402	121-131	10-14	16-20	19-21	16-22	397-417	145-155	9-13	3-7	17-19	37-43
120	12	499-519	127-137	10-14	14-18	9-11	15-21						
	9	515-535	128-138	10-14	16-20	12-14	14-20						
	6	546-566	129-139	10-14	19-23	18-20	14-20						

*Based on 20% Methanol antifreeze solution

Models:
WR
006-060

Unit Operating Conditions

WR*060		Full Load Cooling - without HWG active						Full Load Heating - without HWG active					
Entering Water Temp °F	Water Flow GPM	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB	Discharge Pressure PSIG	Suction Pressure PSIG	Superheat °F	Subcooling °F	Water Temp Rise°F	Air Temp Drop °F DB
30*	15	142-162	108-118	36-40	10-14	10-12	18-24	281-301	64-74	7-11	3-7	3-5	18-24
	11.25	151-171	115-125	20-24	3-7	13-15	19-25	276-296	60-70	7-11	3-7	4-6	18-24
	7.5	164-184	118-128	17-21	3-7	20-22	19-25	274-294	57-67	7-11	3-7	7-9	17-23
50	15	191-211	115-125	22-26	9-13	9-11	18-24	315-335	93-103	6-10	3-7	5-7	25-31
	11.25	201-221	118-128	15-19	7-11	13-15	18-24	313-333	90-100	6-10	3-7	7-9	24-30
	7.5	220-240	120-130	13-17	9-13	20-22	18-24	308-328	85-95	6-10	3-7	10-12	23-29
70	15	256-276	121-131	12-16	9-13	9-11	17-23	352-372	126-136	8-12	2-6	7-9	31-37
	11.25	268-288	122-132	11-15	10-14	13-15	17-23	350-370	122-132	8-12	2-6	9-11	31-37
	7.5	292-312	123-133	10-14	14-18	20-22	17-23	342-362	115-125	7-11	2-6	13-15	29-35
90	15	338-358	126-136	8-12	10-14	9-11	16-22	392-412	161-171	14-18	1-5	8-10	37-43
	11.25	350-370	126-136	8-12	13-17	12-14	16-22	387-407	157-167	13-17	1-5	11-13	36-42
	7.5	378-398	127-137	8-12	17-21	19-21	16-22	376-396	147-157	12-16	2-6	16-18	35-41
120	15	491-511	132-142	11-15	15-19	8-10	14-20						
	11.25	505-525	133-143	8-12	15-19	12-14	14-20						
	7.5	537-557	134-144	8-12	18-22	19-21	15-21						

*Based on 20% Methanol antifreeze solution

Preventative Maintenance

Models:
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WATER COIL MAINTENANCE (WATER LOOP APPLICATIONS)

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

HOT WATER GENERATOR COILS

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

FILTERS

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

CONDENSATE DRAIN

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

COMPRESSOR

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

AIR COIL

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

⚠ CAUTION

Fin edges are sharp and may cause injury.

CABINET

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

REPAIRS TO SEALED COMPONENTS

Sealed electrical components shall be replaced.

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Functional Troubleshooting

Fault	Htg	Clg	Possible Cause	Solution
Main power problems	X	X	Green Status LED Off	Check line voltage circuit breaker and disconnect.
				Check for line voltage between L1 and L2 on the contactor.
				Check for 24VAC between R and C on Solid State Control/Deluxe Solid State Control.
				Check primary/secondary voltage on transformer.
HP Fault Code 2 High Pressure		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow adjust to proper flow rate.
		X	Water Temperature out of range in cooling	Bring water temp within design parameters.
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Dirty Air Coil - construction dust etc.
				Too high of external static? Check static vs blower table.
	X		Air temperature out of range in heating	Bring return air temp within design parameters.
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table.
	X	X	Bad HP Switch	Check switch continuity and operation. Replace.
LP/LOC Fault Code 3 Low Pressure / Loss of Charge	X	X	Insufficient charge	Check for refrigerant leaks.
	X		Compressor pump down at startup	Check charge and startup water flow.
LT1 Fault Code 4 Water coil low-temperature limit	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting.
				Plugged strainer or filter? Clean or replace.
				Check water flow. Adjust to proper flow rate.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X		Improper temperature limit setting (30°F vs 10°F [-1°C vs -2°C])	Clip JW3 jumper for antifreeze (10°F [-12°C]) use.
	X		Water Temperature out of range	Bring water temp within design parameters.
	X	X	Bad thermistor	Check temp and impedance correlation per chart.
LT2 Fault Code 5 Air coil low-temperature limit		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static? Check static vs blower table.
		X	Air Temperature out of range	Too much cold vent air? Bring entering air temp within design parameters.
		X	Improper temperature limit setting (30°F vs 10°F [-1°C vs -12°C])	Normal airside applications will require 30°F [-1°C] only.
	X	X	Bad thermistor	Check temp and impedance correlation per chart.

Table continued on next page.

Functional Troubleshooting

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Table continued from previous page.

Fault	Htg	Clg	Possible Cause	Solution
Condensate Fault Code 6	X	X	Blocked drain	Check for blockage and clean drain.
	X	X	Improper trap	Check trap dimensions and location ahead of vent.
		X	Poor drainage	Check for piping slope away from unit.
				Check slope of unit toward outlet.
				Poor venting? Check vent location.
		X	Moisture on sensor	Check for moisture shorting to air coil.
	X	X	Plugged air filter	Replace air filter.
	X	X	Restricted Return Airflow	Find and eliminate restriction. Increase return duct and/or grille size.
Over/Under Voltage Code 7 (Auto resetting)	X	X	Under Voltage	Check power supply and 24VAC voltage before and during operation.
				Check power supply wire size.
				Check compressor starting. Need hard start kit?
				Check 24VAC and unit transformer. Tap for correct power supply voltage.
	X	X	Over Voltage	Check power supply voltage and 24VAC before and during operation.
				Check 24VAC and unit transformer. Tap for correct power supply voltage.
Unit Performance Sentinel Code 8	X		Heating mode LT2>125°F [52°C]	Check for poor airflow or overcharged unit.
		X	Cooling Mode LT1>125°F [52°C] OR LT2< 40°F [4°C])	Check for poor water flow or airflow.
Swapped Thermistor Code 9	X	X	LT1 and LT2 swapped	Reverse position of thermistors
Low Water Flow Code 13	X	X	Reduced or no water flow	Check pump or valve operation setting.
				Check water flow and adjust to proper flow rate.
				Clogged Y strainer, replace mesh.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X	X	Bad flow switch	Confirm applied flow to looks vs minimum flow siwtch setpoint on label.
Leaving Water Temperature Low Code 14	X		Reduced or no water flow in heating	Check pump or valve operation setting.
				Check water flow and adjust to proper flow rate.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X		Improper temperature limit setting (30°F vs 15°F [-1°C vs -9°C]	Clip JW3 jumper for antifreeze (15°F [-9°C]) use.
	X		Water temperature out of range	Bring water temperature within design parameters.
	X	X	Bad thermistor	Check temperature impedence correlation per chart.

Table continued on next page.

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Functional Troubleshooting

Table continued from previous page.

Fault	Htg	Clg	Possible Cause	Solution
Refrigerant and RDS Code 15	X	X	Refrigerant Leak	Check refrigerant charge. If the charge is low, identify and repair the leak.
			Faulty RDS sensor	Check refrigerant charge. If the charge is not low, replace the RDS sensor.
No Fault Code Shown	X	X	No compressor operation	See "Only Fan Runs".
	X	X	Compressor overload	Check and replace, if necessary.
	X	X	Control board	Reset power and check operation.
Unit Short Cycles	X	X	Dirty air filter	Check and clean air filter.
	X	X	Unit in "test mode"	Reset power or wait 30 minutes for auto exit.
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.
	X	X	Compressor overload	Check and replace, if necessary.
Only Fan Runs	X	X	Thermostat position	Ensure thermostat set for heating or cooling operation.
	X	X	Unit locked out	Check for lockout codes. Reset power.
	X	X	Compressor Overload	Check compressor overload. Replace if necessary.
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode.
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation.
	X	X		Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode.
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for line voltage across BR contacts.
	X	X		Check fan power enable relay operation (if present).
	X	X	Fan motor	Check for line voltage at motor. Check capacitor.
Unit Doesn't Operate in Cooling		X	Reversing valve	Set for cooling demand and check 24VAC on RV coil and at Solid State Control/Deluxe Solid State Control board.
		X		If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	Check for 'O' RV setup not 'B'.
		X	Thermostat wiring	Check O wiring at heat pump. Jumper O and R for RV coil 'click'.
		X		Put thermostat in cooling mode. Check 24VAC on O (check between C and O); check for 24VAC on W (check between W and C). There should be voltage on O, but not on W. If voltage is present on W, thermostat may be bad or wired incorrectly.

Performance Troubleshooting

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

Table continued on next page.

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Performance Troubleshooting

Table continued from previous page.

Symptom	Htg	Clg	Possible Cause	Solution
High humidity		X	Too high of airflow	Check fan motor speed selection and airflow chart.
		X	Unit oversized	Recheck loads & sizing. Check sensible cooling load and heat pump capacity.
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation.
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for line voltage across blower relay contacts.
				Check fan power. Enable relay operation (if present).
	X	X	Fan motor	Check for line voltage at motor. Check capacitor.
	X	X	Thermostat wiring	Check thermostat wiring at Solid State Control. Put in Test Mode and then jumper Y1 and W1 to R to give call for fan, compressor and electric heat.
Unit Doesn't Operate in Cooling		X	Reversing valve	Set for cooling demand and check 24VAC on RV coil.
				If RV is stuck, run high pressure up by reducing water flow and, while operating, engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	For Deluxe Solid State Control, check for "O' RV setup, not "B".
		X	Thermostat wiring	Check O wiring at heat pump. Solid State Control requires call for compressor. You should hear a "click" sound from the reversing valve..
Modulating Valve Troubleshooting	X	X	Improper output setting	Verify the AO-2 jumper is in the 0-10V position.
	X	X	No valve output signal	Check DC voltage between AO2 and GND. Should be O when valve is off and between 3.3V and 10V when valve is on.
	X	X	No valve operation	Check voltage to the valve.
				Replace valve if voltage and control signals are present at the valve and it does not operate.

Startup Log Sheet

Models:
WR
006-060

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

Job Name:

Street Address:

Model Number: **Serial Number:**

Unit Location in Building:

Date: **Sales Order Number:**

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

Fan Motor	Description	Value
PSC	Speed Tap	
CT EC	Speed Tap	
CV EC	CFM Setting	

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

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

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

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

Models:
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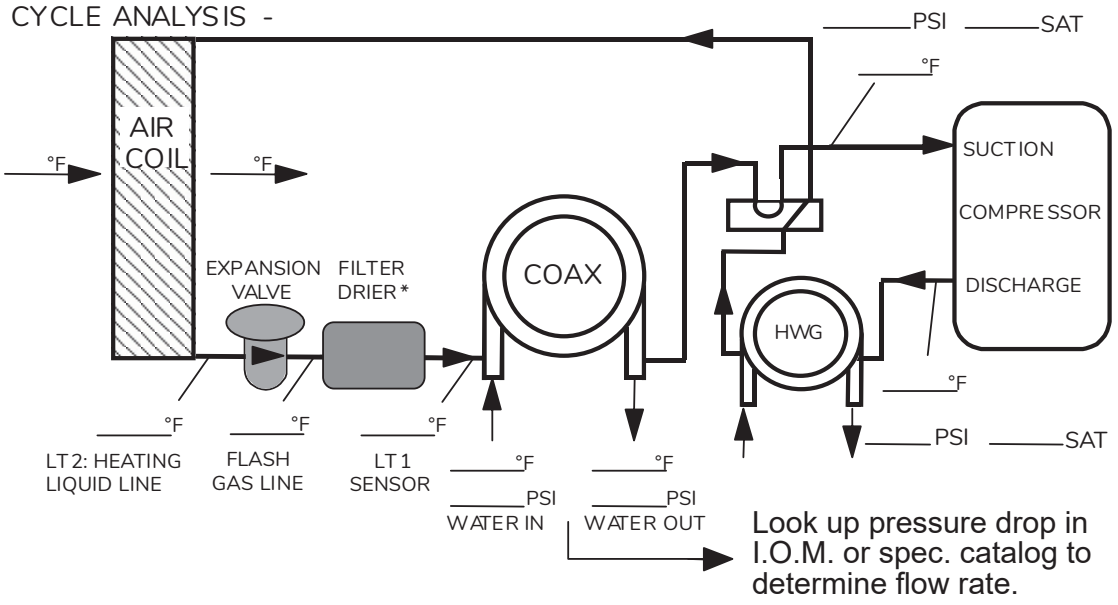
Functional Troubleshooting Form

HEATING CYCLE ANALYSIS -



COOLING CYCLE ANALYSIS -

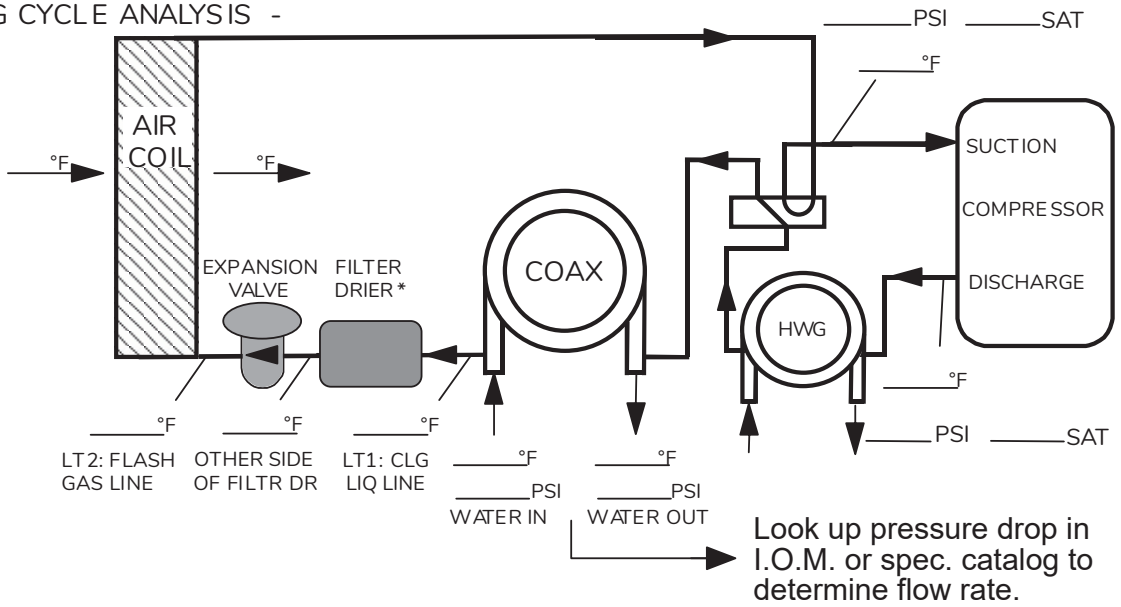
Refrigerant Type:

R-454B

Voltage: _____

Comp Amps: _____

Total Amps: _____



Heat of Extraction (Absorption) or Heat of Rejection =

_____ flow rate (gpm) x _____ temp.diff. (deg. F) x _____ fluid factor[†] = _____ (Btu/hr)

Superheat = Suction temperature - suction saturation temp. = _____ (deg F)

Subcooling = Discharge saturation temp. - liquid line temp. = _____ (deg F)

[†] Use 500 for water, 485 for antifreeze.

Rev. 3/24

Notes

Models:
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Models:
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Revision History

Date	Section	Description
08/22/2024	All	Created

97B0167N01

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