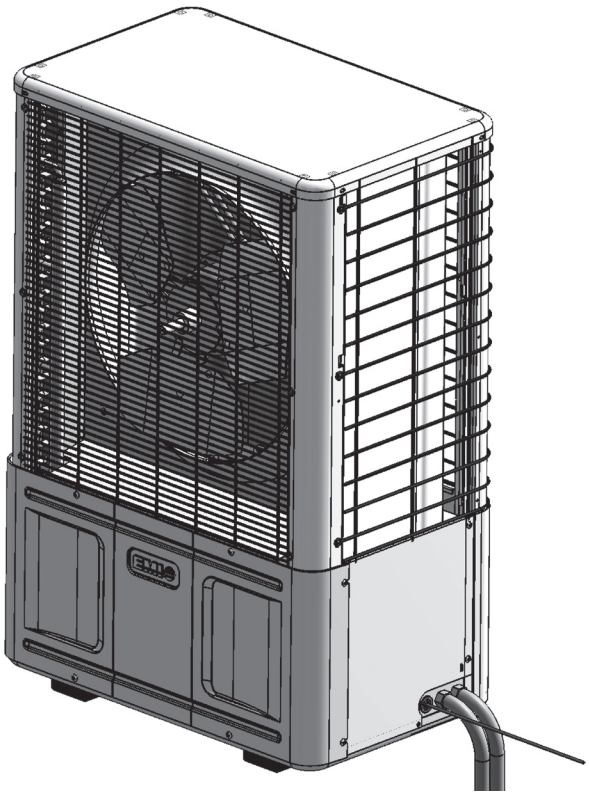
freewatt®

Air Cooled Heat Rejection System

Model FWHRJ

INSTALLATION, OPERATION & MAINTENANCE MANUAL



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MEMBER: *The Hydronics Institute*

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TABLE OF CONTENTS

To the Installer

Retain this manual and warranty for future reference. Before leaving the premises, review this manual to be sure the unit has been installed correctly and run the unit for one complete cycle to make sure it functions properly.

To obtain technical service or warranty assistance during or after the installation of this unit, contact your local factory authorized distributor. For a local distributor listing, visit our web site:

www.freewatt.com

When calling for assistance, please have the following information ready:

Model Number _____

Serial Number _____

Date of installation _____

NOTICE

The air cooled heat rejection system, Model FWHRJ is manufactured by ECR International and is tested and rated in accordance with AHRI Standard 210/240-2008 and UL-1995. Due to ongoing product development, product designs and specifications may change without notice. Please contact the factory for more information.

Recognize This Symbol As An Indication Of Important Safety Information.

WARNING

Read completely all instructions prior to assembling, installing, operating, or repairing this product.

Inspect all parts for damage prior to installation and start-up. The outdoor heat rejection system, Model FWHRJ must be installed ONLY by qualified installation personnel.

DANGER

Tampering with the Model FWHRJ is dangerous. Tampering voids all warranties. DO NOT attempt to modify or change this unit in any way.

DANGER

The outdoor heat rejection system, Model FWHRJ must:

- Be connected to a properly grounded electrical supply with the proper voltage as stated on the rating plate.
- Have proper over-current protection (i.e. time-delay fuse/HACR Breaker) as listed on the rating plate.
- Failure to follow these instructions can result in a fire, explosion, or electrical shock causing property damage, personal injury, or death.

Safety Instructions

This manual is intended as an aid to qualified service personnel for proper installation, operation, and maintenance of the outdoor heat rejection system, Model FWHRJ. Read these instructions thoroughly and carefully before attempting installation or operation. Failure to follow these instructions may result in improper installation, operation, service, or maintenance, possibly resulting in fire, electrical shock, property damage, personal injury, or death.

Read all instructions before using this unit. Install or locate this unit only in accordance with these instructions. Use this unit only for its intended use as described in this manual.

Check the rating plate on the unit before installation to make certain the voltage shown is the same as the electric supply to the unit. The rating plate is located on the front panel only.

This unit must be connected only to a properly grounded electrical supply. Do not fail to properly ground this unit.

Turn off the electrical supply before servicing the unit.

Do not use the unit if it has damaged wiring, is not working properly, or has been damaged or dropped.

INTRODUCTION

Introduction

The **freewatt** PLUS air cooled heat rejection system is a vertically arranged side discharge unit designed for outdoor installation specifically for the **freewatt** PLUS System. The FWHRJ unit will provide cooling for the **freewatt** PLUS System up to 1,800 watts of power output or about 18,000 Btuh heat output. The unit is a quiet and has low power consumption.

Installation of the FWHRJ unit is simplified by a 24V control interconnection from the **freewatt** PLUS System controller. Multiple units can be installed within close proximity to an exterior wall.

Installer-Supplied Items

- Power wiring
- Low Voltage wiring (18 awg minimum)
- Secure mounting pad or foundation
- Propylene Glycol Coolant Loop from HI Module to FWHRJ. Includes piping, circulator, air separator, pressure relief valve, expansion tank, flow check and purge valves.

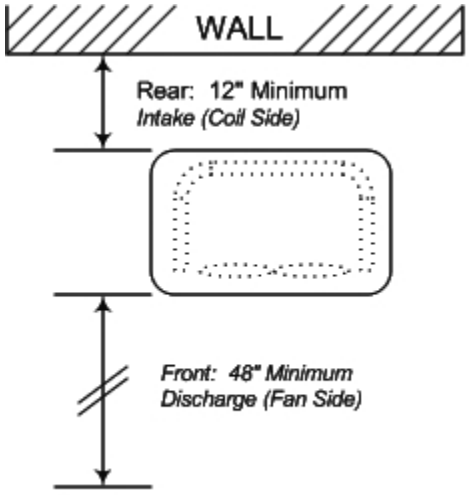
Controls And Components (Factory-Installed Or Supplied)

- Fan motor contactor
- Run Capacitor
- Low Voltage terminal connections

Locating the Unit

- Locate the unit as close to the **freewatt** PLUS System as possible (See Tubing Specifications Chart on Page 7). Maximum tubing length (one-way) is 100 ft..

Figure 1 - Clearances



- All Dimensions are minimum dimensions, unless otherwise noted.
- Locate the unit as close to the indoor **freewatt** PLUS System as possible.
- Avoid high traffic areas and prevailing wind locations.
- Surface must be flat and level.
- Ensure free flow of air through the unit. Air must not recirculate from discharge to intake.
- Consider how power will be routed to the unit from the power source.
- Coolant piping should be installed in a direct line to the indoor unit.

Site Preparation

- Place the unit on a flat concrete surface or pad if on the ground. Roof mounting should use a build up platform to avoid intake of hot air from the roof.

Unit Mounting Instructions

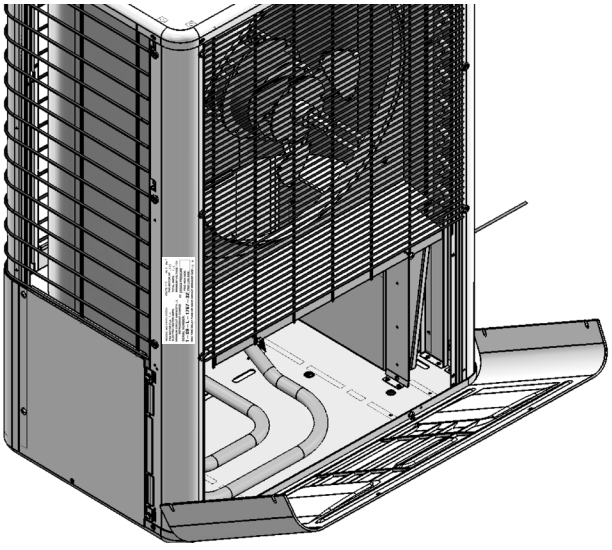
Side discharge units allows for permanent mounting through the feet. This is highly recommended due to the vertical design of the unit.

1. Loosen the screws on the left and right sides of the front panel. (Do not remove these screws.)

Figure 2 - Remove Front Panel Screws

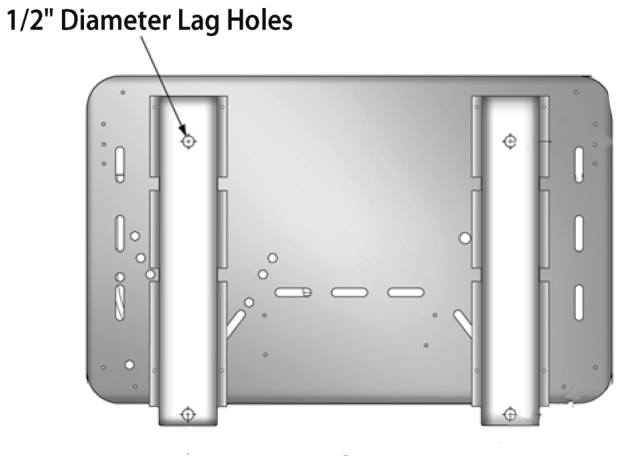
2. Remove the screws on the front of the panel.
3. Slide front panel forward to clear side screws and remove.

Figure 3 - Remove Front Panel



4. Insert lag bolts through the holes in the bottom of the unit and tighten to secure.
5. Insert lag bolts through the holes in the feet on the back of the unit and tighten to secure.

Figure 4 - Tighten Lag Bolts



6. Replace the front panel, do not tighten the side screws at this time.

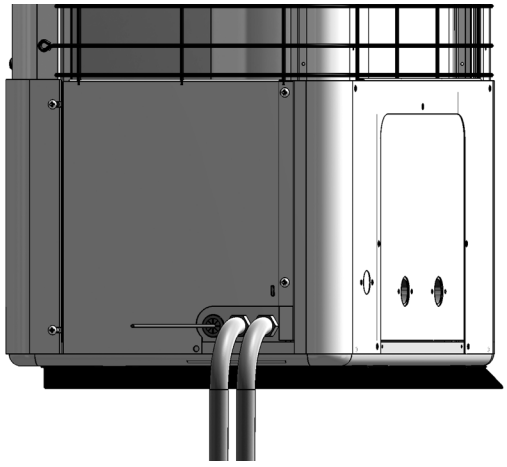
Electrical Wiring

NOTICE

All electrical wiring must be run according to NEC and local codes.

1. Refer to the unit rating plate for voltage, minimum circuit ampacity and over current protection requirements.

Figure 5 - Rating Plate

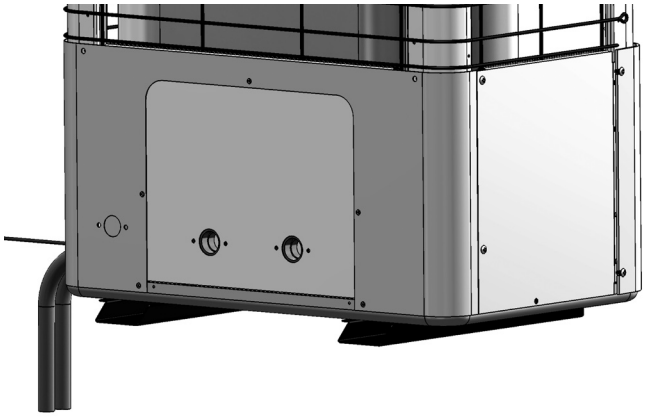


2. Use only HACR type breakers or time delay fuses. Select the wire size according to the ampacity rating.

3. To access electrical connections and wiring diagram:

A. Remove the screws on the side panel adjacent to the back panel.

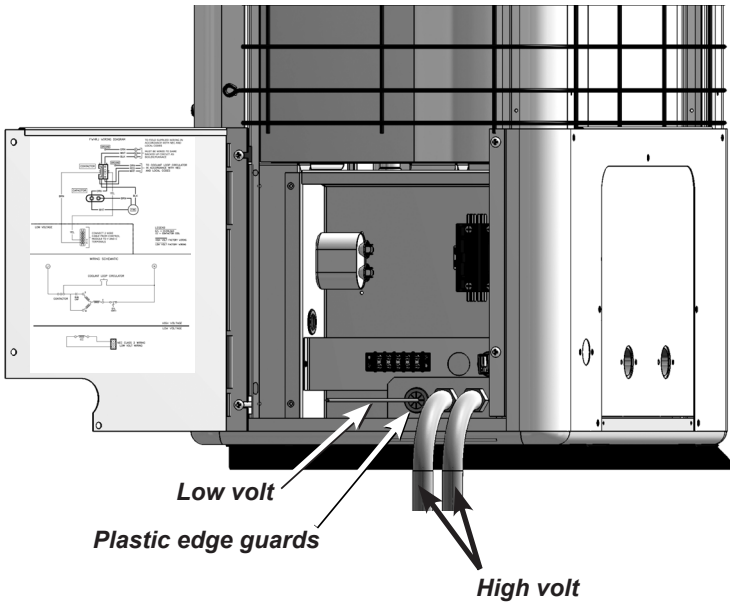
Figure 6 - Remove Side Panels



B. The screws adjacent to the front panel should already be loose (don't remove them).

C. Slide the side panel out to access the high/low electrical connections and wire diagram.

Figure 7 - Power Entrances

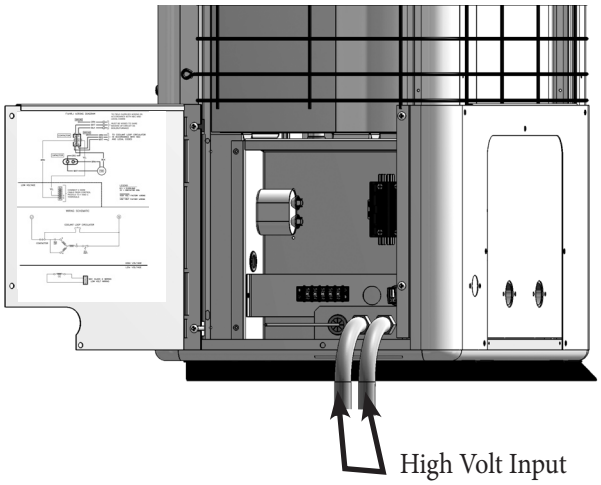


D. Remove the plastic edge guards from the holes and replace with a water-tight strain relief fitting (High V) and a split grommet fitting (low V)

4. Power should be run to a weather proof disconnect box usually within 3 feet of the unit.

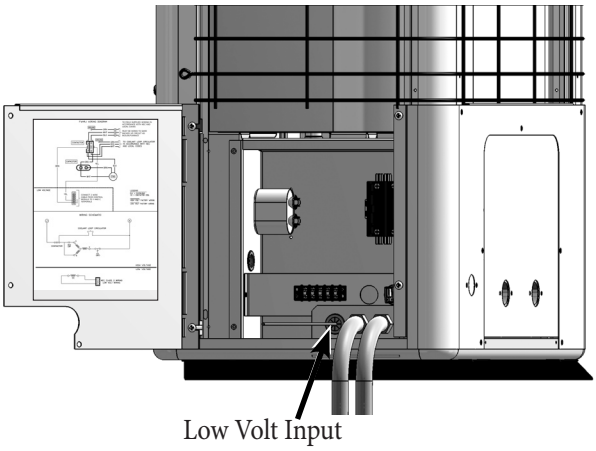
5. From the disconnect box, run the power through the 7/8" hole on the side of the unit and into the electrical box. Anchor with the strain relief fitting.

Figure 8 - High Voltage Connections



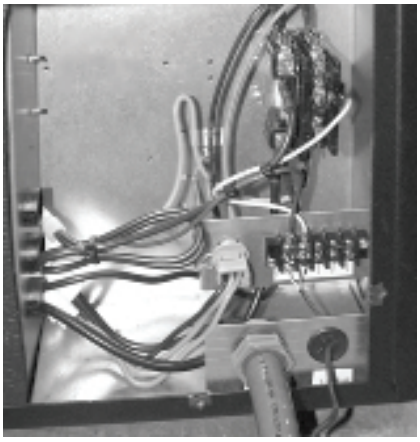
6. Run wires to the high volt pigtail in the control box and attach L1 and L2 connections. Also run green wire to ground wire.
7. Check wiring diagram for the required number of low voltage wires to be run between indoor and outdoor sections.

Figure 9 - Low Voltage Connection



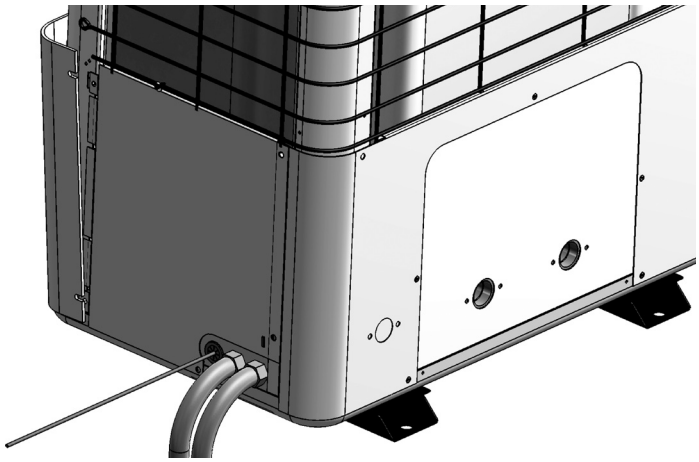
8. Connect the 24 volt wiring matching color to color. Refer to the wiring diagram on the inside panel of the unit, and also refer to the wiring diagram on the indoor unit. Low volt interconnect should be at least 18 awg.

Figure 10 - Completed Electrical Connections



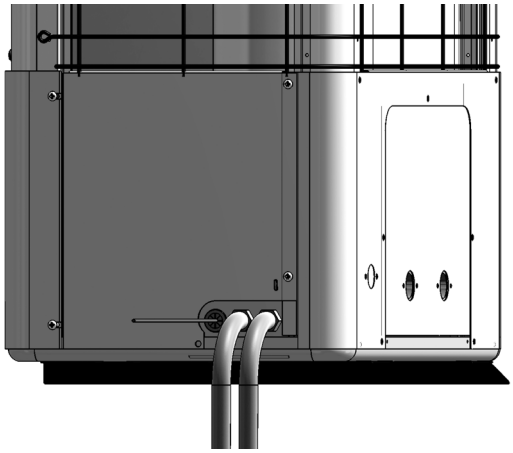
9. To replace side panel slide the slotted holes of the panel onto the loosened screws of the front panel so that the edge of the front panel covers the edge of the side panel.

Figure 11 - Replacing Side Panel



10. Fasten all remaining loose screws.

Figure 12 - Fasten Loose Screws



Coolant

INTERCONNECT PIPING SPECIFICATIONS			
Max. Length	Max. Lift	Copper Piping TO	Copper Piping FROM
	"H"	O.D.	O.D.
150' (45 m)	35' (11 m)	3/4"	3/4"

The system will support 3/4" copper tubing to the inside unit or up to 100 feet with a 35' rise included. The units are furnished with sweat connections 3/4" NPT

NOTICE

Maximum Inlet Coolant Temperature = 190° F

Heat Rejection Piping System

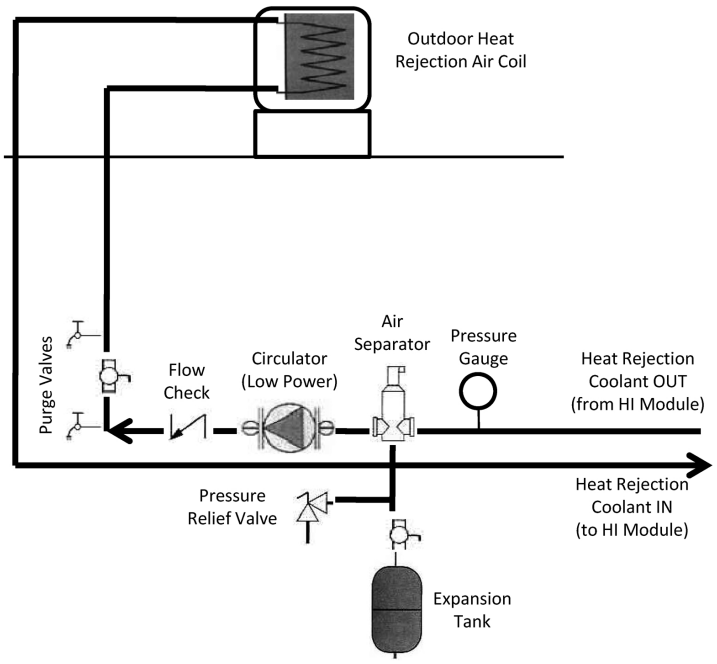
The piping shall be installed per the mechanical schematic, see **Figure 13** located on page 8 of this manual.

Please follow the guidelines found below:

Pipe/tube sizing: It is recommended to use 3/4" tubing or piping to a maximum equivalent length of 150 ft. The flow rate of the 30-50% propylene glycol coolant through the piping system should be above 3 gpm.

- **Circulator:** Minimum flowrate of 3gpm. It is recommended to use the Grundfos Alpha pump, which offers low power consumption and self-adjusting flow settings.
- **Air Separator:** The system should include an air separator to ensure that the system does not collect air.
- **Expansion Tank:** Due to the coolant temperature increasing significantly, an expansion tank is required for the closed loop.
- **Pressure Relief Valve:** This relief valve will act as a safety in the case that the coolant loop increases in pressure.
- **Pressure Gauge:** The pressure gauge presents the installer and service technicians a measurement of the coolant pressure in the loop. Maximum coolant loop pressure is 35 psi.

Figure 13 - Heat Rejection System - Full Mechanical Schematic



Notes:

1. Recommended piping layout between the heat rejection unit and the **freewatt** PLUS System.
2. Piping, purge valves, shut-off valves, flow check, circulator, air separator, pressure relief valve, expansion tank and pressure gauge to be field-supplied.
3. The system requires 30% propylene glycol for proper anti-freeze and heat transfer properties.
4. Flow through the brazed plate heat exchanger should be counter-current as shown in **Figure 13,** above.
5. Circulator Options:
   A. Lowest Power: Grundfos ALPHA
   B. Most flexibility: Grundfos SuperBrute (3-Speed) or
   C. Most Economical/High Power: TACO 007.
6. Connect piping (3/4" dia. minimum) to the heat rejection brazed plate heat exchanger (1/2" MNPT Connections) in the HI module. With the WDJ model, make sure the heat rejection and DHW brazed plate heat exchangers are identified and marked properly.
7. The total piping system requirement for the piping system is 150 equivalent feet (90° elbows are equivalent to 5 ft. of pipe).
8. The connections on the back of the outdoor heat rejection unit are 3/4" NPT fittings. Depending on the piping or tubing being installed, select the correct transition fitting to connect the unit.

WARNING

FOR YOUR SAFETY, TURN OFF ELECTRICAL POWER SUPPLY AT THE SERVICE PANEL BEFORE MAKING ANY ELECTRICAL CONNECTIONS TO AVOID POSSIBLE ELECTRIC SHOCK HAZARD. FAILURE TO DO SO CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

See **Figure 15**, Page 10 for Full Wiring Diagram and Schematic.

NOTICE

IMPORTANT: Wiring must be N.E.C. class 1. System must be electronically grounded as required by National Electric Code ANSI/NFPA 70 - latest edition. Installations must conform with National Electric Code, any other national, State, provincial or local codes or regulations, and in Canada, with CSA C22.1 Canadian Electrical Code (Part 1) and any local codes.

Line Voltage Connections

The circulator and heat rejection unit require 120 VAC power for proper operation.

1. Connect the wiring to the circulator according to the manufacturer's instructions.
2. Connect the wiring to the heat rejection unit according to the electrical schematic provided with the unit and shown in the electrical schematic herein.

Low Voltage Connections

The low voltage connection is between the system controller and the heat rejection unit. The 2-wire cable (p/N 240007825; min. 18 AWG) should be routed through the side knockout of the system controller's sheet metal enclosure and connected to the system controller at Jumper J19. The other end should be terminated at the outdoor heat rejection unit per the unit's electrical schematic. See **Figure 14,** below.

Figure 14 - Low Voltage Connection

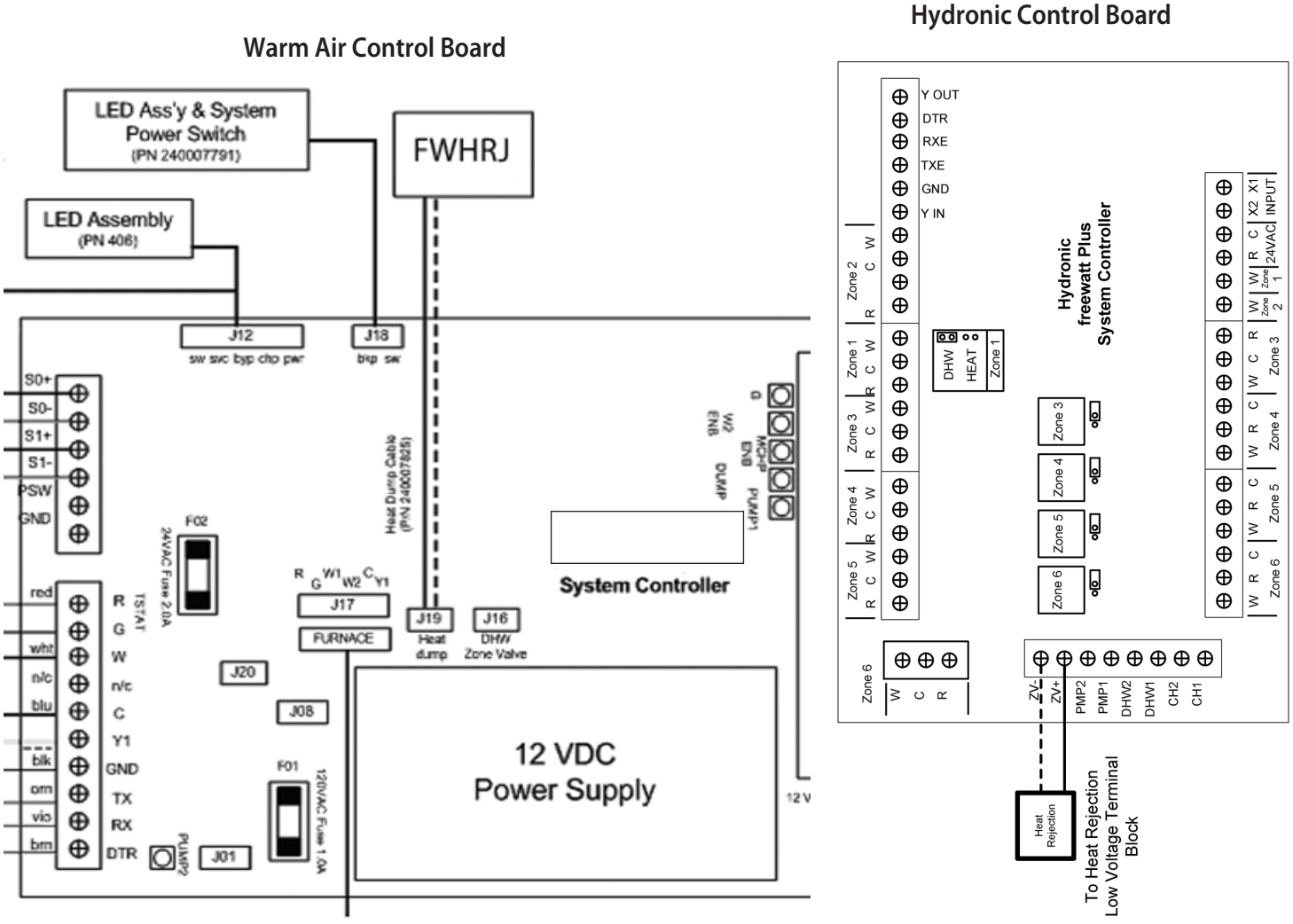
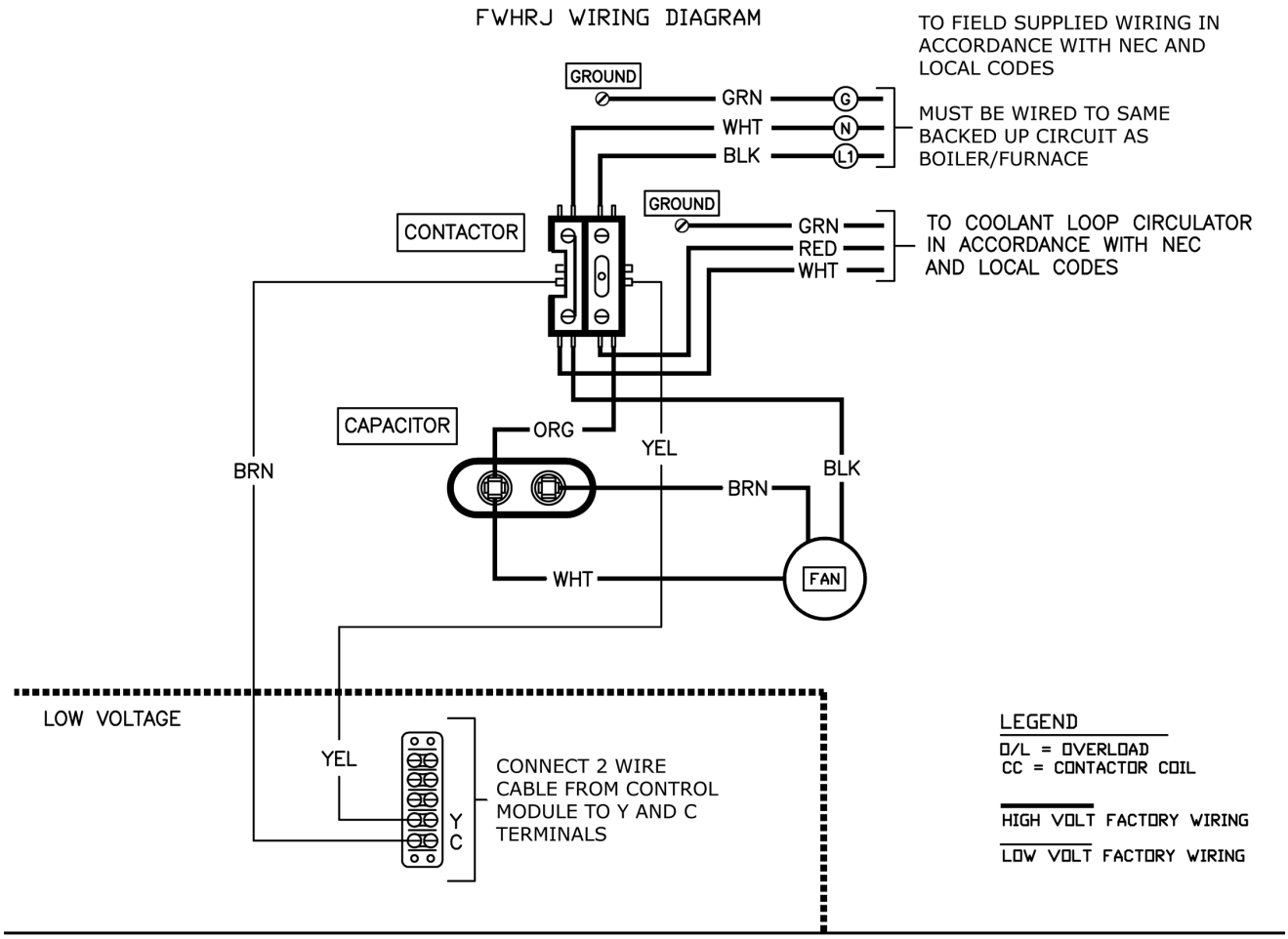
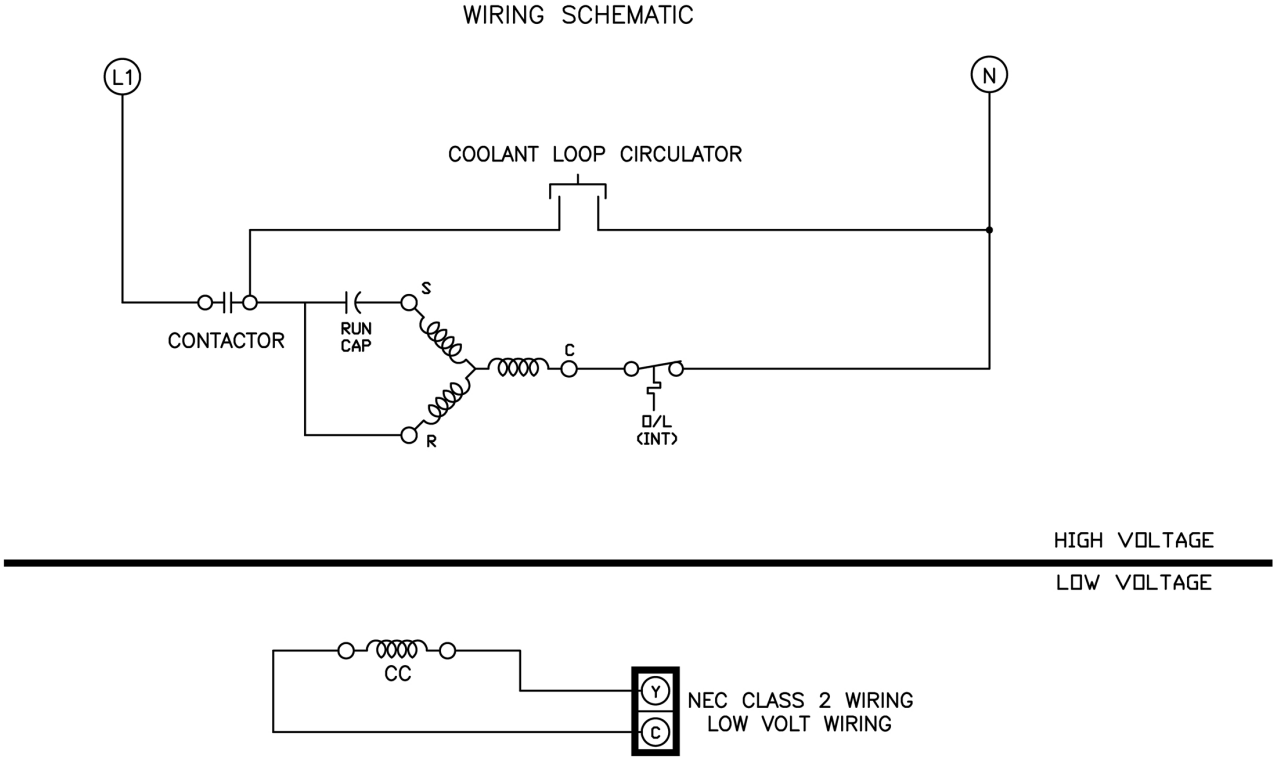


Figure 15 - Full Wiring Diagram and Schematic





Preparation For Start-Up

- Check electrical connections, breakers and switches for FWHRJ unit.
- Check coolant connections for tightness and leak-free installation.
- Check **freewatt** PLUS System
- Make final visual inspection and repair any deficiencies.

Start-up Procedure/Commissioning

The start-up procedure includes filling the glycol loop with propylene glycol solution (30-50%), the following precautions must be followed during this operation:

- The piping system must be fully cleaned prior to adding the glycol-water solution to the system.
- Use only propylene glycol-water solutions with corrosion-inhibitors and approved for heat exchanger duty.
- Consult glycol fluid manufacturers for burst protection recommendations and fluid specifications.

PROPYLENE GLYCOL SOLUTION	FREEZING POINT (°F)	MAXIMUM OUTDOOR AIR OPERATING TEMPERATURE (°F)
50%	-28	90
40%	-13	95
30%	+4	100

- All air must be removed from the piping systems before operating the outdoor heat rejection unit.
- Ensure that all piping connections have been completed and tested for leaks before filling.
- Fill the piping system with pre-mixed glycol-water solutions. DO NOT fill the system with water first and then glycol, or vice versa, because they will not mix in the piping system.

Propylene Glycol Solution - Preparation

The selection of the proper propylene glycol solution should be performed at the site based on the expected lowest outdoor temperature. The table above presents the impact of 30% and 50% propylene glycol solutions on the operation of the **freewatt** PLUS at maximum outdoor air operating temperatures.

Notes: The Maximum Outdoor Operating Temperature is based on the following installation: maximum 100 equivalent feet of FWHRJ coolant tubing, 1,800 watt MCHP output power in backup or grid boost mode and one of the following pumps: Grundfos Alpha pump, Grundfos Superbrute or Taco 007.

Propylene Glycol Solution - Filling Procedure

The following steps should be followed to fill the system piping with the propylene glycol solution.

1. Prepare the propylene glycol solution.
2. Fill the piping system with pre-mixed glycol solution before turning the pump ON. This must be performed with a transfer pump and bucket to remove a majority of the air in the system.
3. System Loop pressure must be a least 20 to 30 psi.
4. Turn the system circulator ON using MINT software.
5. Monitor air separator to ensure the ***all air is removed*** from the system's piping.
6. Turn the system circulator OFF using MINT software.

Commissioning Procedure

Commissioning the system includes an operational test of the outdoor heat rejection system.

1. Power the system OFF and create a simulated POWER OUTAGE by turning the backup circuits OFF at the main service panel.
2. Operate the system in Back-up Mode and make sure that the outdoor heat rejection system operates smoothly.

Description of Operation

The air cooled heat rejection unit, model FWHRJ, is specifically designed for use with the **freewatt** PLUS product family. The unit provides heat rejection for the Honda MCHP, Model UCFJ, during periods when heat is not required within the building, but power is required due to a power outage (Back-Up Mode) or impending power outage (Grid Boost). The unit comprises of a custom engineered air coil and fan mounted within a weather-proof enclosure. The electrical connections include one - 120 VAC Line power cable and one - 24 VAC signal cable. The mechanical connections include coolant IN and coolant OUT.

The operation of the air cooled heat rejection unit begins with the **freewatt** PLUS System starting in either Back-Up or Grid Boost mode. As the **freewatt** PLUS System controller monitors the MCHP's coolant temperatures, the thermal management algorithm will signal the circulator and heat rejection unit to start. This will effectively transfer heat from the coolant into the outside air and allow the Honda MCHP to operate during the non-heating season. When the MCHP coolant temperature lowers significantly or if the Back-Up or Grid Boost signal are satisfied, the thermal management algorithm will signal the circulator and heat rejection unit to stop.

Remote Operation

The **freewatt** PLUS System also has remote start capability to assist the Electrical Utility in supplying electric power in brownout conditions. Distributed generation allows the Utility to remove electric load from the Utility Grid by turning ON generators throughout the Smart Grid.

NOTICE

IMPORTANT: Your **freewatt** PLUS System can only be turned ON if you have agreed on this operation with the Electric Utility.

Energy Management

It is recommended to select a coolant loop circulator that consumes low power. Currently, several circulators provide low power consumption, while also providing the performance required for the FWHRJ. The recommended pumps include:

A. Lowest Power: Grundfos ALPHA

B. Most flexibility: Grundfos SuperBrute (3-Speed) or

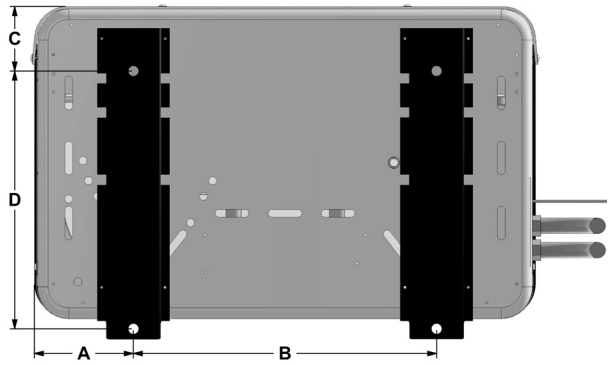
C. Most Economical/High Power: TACO 007.

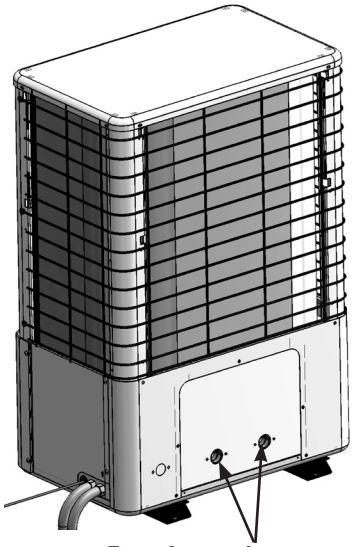
NOTICE

Performance data listed in this manual is subject to change without notice. For the most current unit/system performance data, please refer to the ECR International listing of certified products in the AHRI directory, at www.ahridirectory.org.

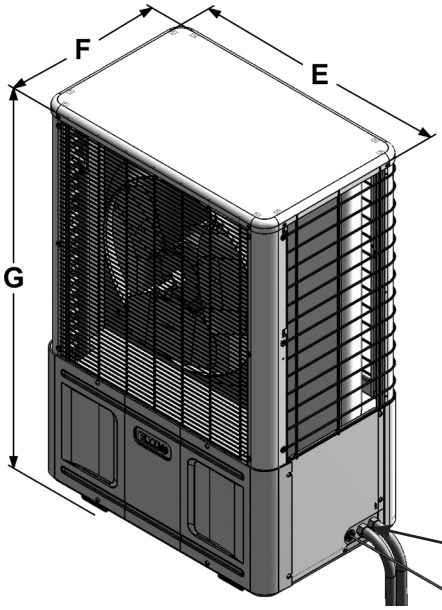
Due to ongoing product development, designs, specifications, and performance are subject to change without notice. Please consult the factory for further information.

1/2" Diameter Lag Holes





Easy Access Interconnects On Back Of Unit



Electrical Connections

Dimensional Data, Sound Data And Shipping Weights

Model	Size Btuh	Mounting Dimensions Inches (mm)				Unit Dimensions Inches (mm)			Sound Level DBA	Shipping Weight Lbs (kg)
		A	B	C	D	E	F	G		
FWHRJ	18	4 5/8 (117)	14 11/16 (373)	3 (76)	12 7/16 (316)	24 (610)	15 (381)	36 (914)	62	98

FWHRJ Electrical Specifications

Model #	Volts/HZ/PH	Fan Motor		Circulator Motor		Min. Volt	M.C.A.	HACR BRKR
		AMPS	HP	AMPS	HP			
FWHRJ	115/60/1	1.4	0.125	0.71		104	1.7	15

WARNING

Disconnect the electrical power supply to the furnace before attempting any maintenance. Failure to do so can cause electrical shock resulting in personal injury or loss of life.

WARNING

This unit has high voltage components with rotating parts. To prevent personal injury, keep clear of rotating parts.

The air cooled heat rejection units are designed and constructed for reliability and long life with minimal maintenance. Peak operating efficiency can be ensured by regularly inspecting for free air passage into and through the coil. If debris collects on the air coil, it should be cleaned by "back-flushing" with a spray of water or vacuuming.. Outdoor units may be cleaned or waxed if desired. Use a non-abrasive car wax (on metal surfaces only).

The unit is equipped with a permanently lubricated motor. Although oiling is not necessary, adding a few drops of oil through the oiling ports twice yearly will extend the life of the motor.

DO NOT OVER OIL.

Panels should remain on the unit at all times. Service should be performed by a **QUALIFIED** service agency only.

General maintenance items include, but are not limited to:

- Cleaning
- Tightening electrical connections
- Conducting a visual inspection of the system's components
- Coolant condition (glycol condition & pressure)
- Piping system (leaks, supports, condition)

WARNING

Disconnect the electrical power supply to the furnace before attempting any maintenance. Failure to do so can cause electrical shock resulting in personal injury or loss of life.

WARNING

This unit has high voltage components with rotating parts. To prevent personal injury, keep clear of rotating parts.

SYMPTOM	PROBABLE CAUSE	SUGGESTION
UNIT FAILS TO START	A. INCORRECT PHASING OR VOLTAGE	Correct Phase Or Voltage Input
	B. LOW LINE VOLTAGE	Check Power Source
	C. POWER FAILURE	Check Power Source, Power Inlet And Fuses. Check Power Cables And Connections.
	D. SYSTEM CONTROLLER	Check For Cause Of Overload And Replace Fuses
CONTROL IS ERRATIC	WIRING: IMPROPERLY CONNECTED OR BROKEN.	Check Wires For Continuity Check Wires & Wiring Schematic
LACK OF / OR LOW FLOW	A. CIRCULATOR NOT MOVING FLUID	Check Power Source/Signal & Repair. Check Circulator, Replace If Necessary.
	B. LOSS OF FLUID	Locate Leak And Repair. Replace Lost Fluid In System.
	C. OBSTRUCTION IN PIPING SYSTEM	Locate Obstruction And Remove.
FAN FAILS TO START	D. NO START SIGNAL	Check Signal Wiring And Connections.
	E. FAN MOTOR	Check Fan Motor. Replace, If Necessary.
	F. CAPACITOR	Check Capacitor, Power Cables And Connections. Replace Or Repair, If Necessary.

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