freewatt®

Warm Air freewatt Plus System, Models WAJ & WDJ

POWERED by HONDA™

INSTALLATION, OPERATION & MAINTENANCE MANUAL

PATH
PARTNERSHIP FOR ADVANCING TECHNOLOGY IN HOUSING
PARTNER

Information and specifications in the manual were in effect at time of printing of this manual. ECR International reserves the right to discontinue, change specifications or system design at any time without notice and without incurring any obligation, whatsoever.

An ISO 9001-2008 Certified Company
ECR International, Inc.
2201 Dwyer Ave.
Utica, NY 13501

ecr
innovative living™

P/N # 240007714, Rev. F [03/2011]

Check our website frequently for updates: www.**freewatt**.com www.ecrinternational.com

TABLE OF CONTENTS

Safety Symbols

Manual contains important safety information. Read all **freewatt PLUS** System manuals for safety information and warnings.

⚠ DANGER

Indicates a hazardous situation which, if not avoided, WILL result in death or serious injury

⚠ WARNING

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

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Used to address practices not related to personal injury.

As an Energy Star partner, ECR International has determined the furnace included as part of **freewatt PLUS** System meets Energy Star guidelines for energy efficiency.

Furnace and HI Module assembly is design certified in US and Canada by Canadian Standards Association.

Honda MCHP is Intertek-ETL Listed, "Utility Interactive, Cogeneration, Stationary Engine-Generator Assembly, Control # 3163904 (US)."

1 - SAFETY INFORMATION

⚠ WARNING

Do not install this system in mobile home! Furnace is not approved for installation in mobile home. Doing so could cause fire, property damage, personal injury or loss of life.

Instructions are intended as aid to qualified, service personnel for proper installation, adjustment and operation of this system. Read instructions before attempting installation or operation. Failure to follow instructions could cause malfunction of system and result in death, serious bodily injury, and/or property damage. Consult qualified installer, service agency or gas supplier for assistance or additional information.

⚠ WARNING

Do not store or use gasoline or other flammable vapors and liquids, or other combustible materials in vicinity of this or any other appliance.

Natural gas and propane are normally odorized by fuel supplier. Odorant may not be perceivable. Installation of UL and CUL recognized fuel gas detectors installed in accordance with manufacturer's instructions is recommended as additional safety.

Exhaust gases from furnace contain chemicals which may include carbon monoxide (CO). Carbon monoxide is odorless, tasteless, clear colorless gas, which is highly toxic. Even low concentrations are suspected of causing birth defects and other reproductive harm.

UL and ULC recognized CO detectors are required for all buildings equipped with ECR **freewatt PLUS** System. All CO detectors should be installed in accordance with manufacturer's instructions and applicable local building codes.

1.1 Safety Information

1. Check all applicable state and local building codes and utility company requirements before installation. Installation shall conform to these requirements in their entirety. In the absence of these codes, use NFPA installation codes and authority having jurisdiction
2. Use only with gas approved for system components. Refer to furnace and MCHP unit rating plates.
3. Provide adequate combustion and ventilation air to system space as specified in Section 8, "Combustion Air and Ventilation Pipe."
4. Combustion products shall be discharged outdoors. Connect system components (furnace and MCHP unit) to approved vent system only, specified in Section 8, "Combustion Air and Vent Pipe'.
5. Allow system to cool before servicing.
6. Shut off electricity and gas supply connected to system before servicing.
7. Never test for gas leaks with open flame. Use commercially available soap solution specifically made for detection of leaks to check all connections see Section 9, 'Gas Supply Piping'.
8. Verify furnace gas input is correct. Over-firing may result in early failure of furnace components. Under-firing may result in too much air for combustion process resulting in poor or loss of combustion.
9. Install furnace to operate within its intended temperature-rise range with duct system, having external static pressure within allowable range, see furnace 'Installation Operation & Maintenance' manual.
10. When system delivers heated air into supply ducts to areas outside space containing system, return air shall also be handled by duct(s) sealed to system return opening and terminating outside space containing system.
11. Follow regular service and maintenance schedule for efficient and safe operation.
12. Keep system area clean of debris and free from combustible and flammable materials.
13. System is not intended for temporary heating of buildings under construction.
14. System is not do-it-yourself project. Install and service by qualified professionals.

2 - INTRODUCTION

2.1 Gas-fired, micro-combined heat and power (micro-CHP) system suitable for residential and light commercial heating applications from 60,000 to 120,000 Btu/hr.

freewatt PLUS System modes of operation:

- heating only,
- combined heat and power generation with connection to utility electrical grid,
- self-starting combined heat and power generation during electrical grid outage.

System consists of:

- high efficiency (condensing) furnace,
- hybrid integration module,
- automatic transfer switch,
- electrical load distribution and management panel,
- Honda MCHP unit.

freewatt PLUS high efficiency furnace certified as Category IV direct vent central forced air furnace, combustion air supplied directly from outdoors through dedicated air intake pipe. Combustion products exit furnace to outdoors through dedicated vent pipe. See section on Combustion Air and Vent Pipe.

Hybrid integration (HI) module consist of control module, hydronic coolant loop and filter housing.

- Control module is custom-engineered micro-processor monitors and controls operation of **freewatt PLUS** System.
- Hydronic coolant loop delivers heat from Honda MCHP to air coil in HI module, transfers into building's air stream.
- Filter housing includes 4" pleated high efficiency air filter and air coil heat exchanger.
- CSA certified module to install with furnace in **freewatt PLUS** System configuration.
- Honda MCHP unit manufactured by Honda Motor Company. Unit produces electrical power as by-product of providing heat on building's normal thermostatic demand and supplying back-up power to APC Universal Transfer Switch in power outage conditions.
- Unit is natural gas or propane fired and produces 240 VAC power delivered to main circuit panel through 240 VAC dedicated circuit.
- Unit is certified under UL 2200 – Stationary Generators and UL 1741 – Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources.
- Honda MCHP uses dedicated non-direct vent system, taking combustion air from dwelling space around unit and discharging exhaust to outdoors through dedicated vent pipe.

2.2 Save These Instructions

Read this manual carefully and keep for future reference by service technician. Manual is considered permanent part of your Warm Air **freewatt PLUS** System and should remain with system.

Manufacturer is not responsible for any field installation changes made to system installation that are not described or acknowledged in this manual.

Product must be installed by licensed plumber or gas fitter when installed within Commonwealth of Massachusetts.

Appliance has been equipped for residential installations. If used for commercial applications, all code requirements must be adhered to for installation. May require additional controls or system components.

2.3 Read All Documents

Manual is to be used in conjunction with following manuals:

- Warm Air **freewatt PLUS** Installation Manual & Operating Instructions
- **freewatt PLUS** Furnace Installation Manual and User's Information Manual
- Honda MCHP Installation Manual and Owner's Manual
- HAI Thermostat Owner's Manual
- **freewatt PLUS** Transfer Switch Installation Manual
- APC Universal Transfer Switch Site Preparation and Installation Guide

2 - INTRODUCTION

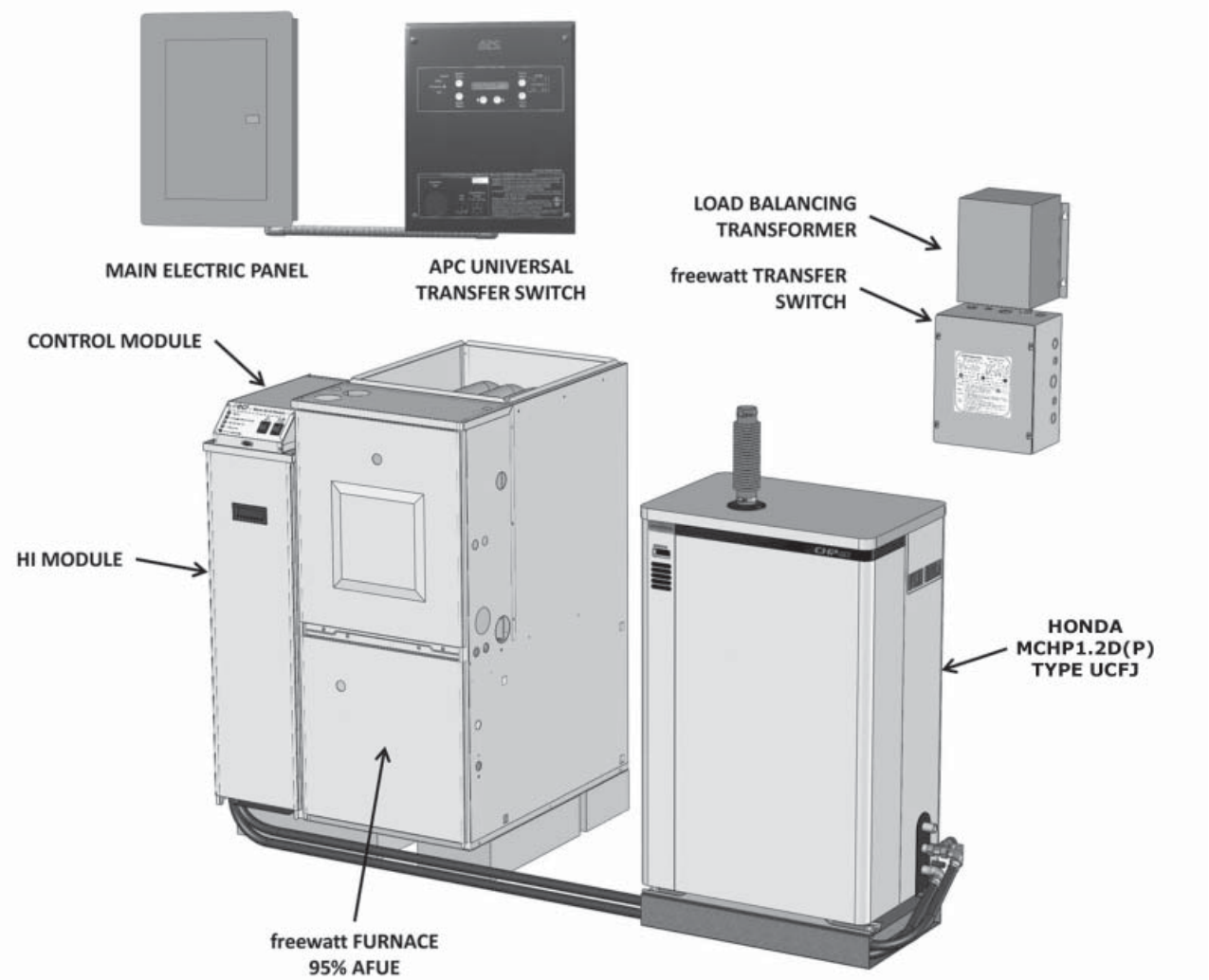


Table 2 -1 System Rating And Sizing

Unit		Input (MBH)	Heating Capacity (MBH)	Overall Efficiency (%)	Nominal Power (kWe)	Weight (lbs)
Honda MCHP Unit (0 - 3,300')	MCHP Mode	18.4	12.3	89%	1.2	180
	Backup Mode	18.5 - 26	12 - 17	89%	0 - 1.8	180
	Boost Mode	26	17	89%	1.8	180
Furnace Module (0 - 2,000')		60 to 120	57 to 114	95%	-	120 – 160

Ratings are for sea level applications. **Furnace:** consult furnace 'Installation Operation' manual for high altitude conversion and derating instructions. **Honda MCHP:** consult with ECR International Technical Support for high altitude conversion and derating instructions.

Follow instructions found in furnace manual for System sizing. Sizing instructions require calculation of maximum hourly heat loss to properly size firing rate of furnace. Review duct-work to ensure proper air flow characteristics.

Furnace sized to provide dwelling with heat required to offset maximum hourly heat loss calculated by factory-trained representative.

Figure 2 -1 Typical MCHP Location Relative to Integrated Furnace/HI Module

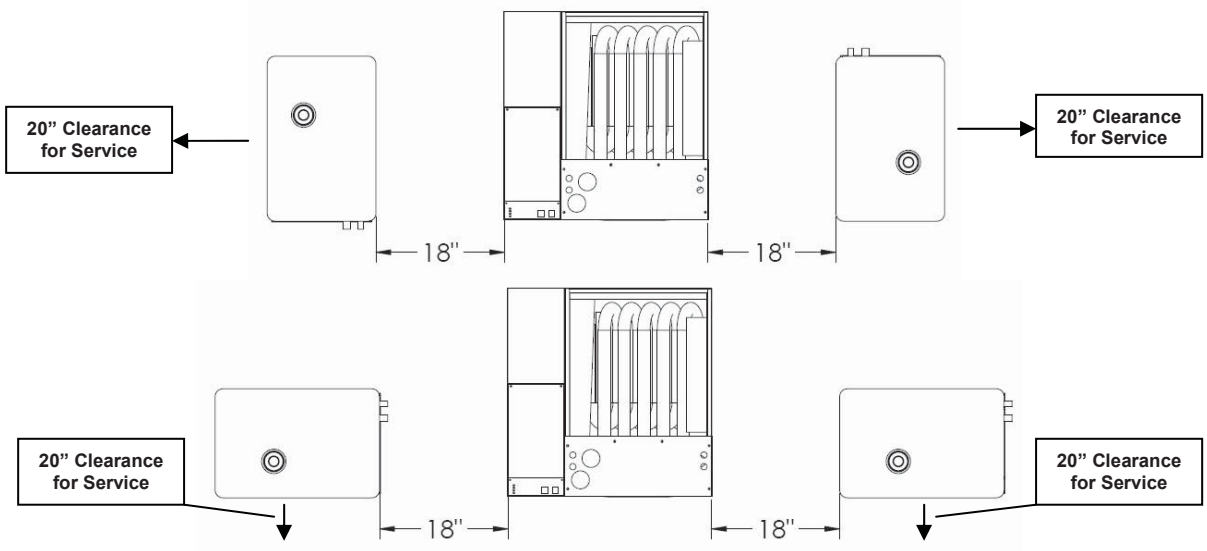
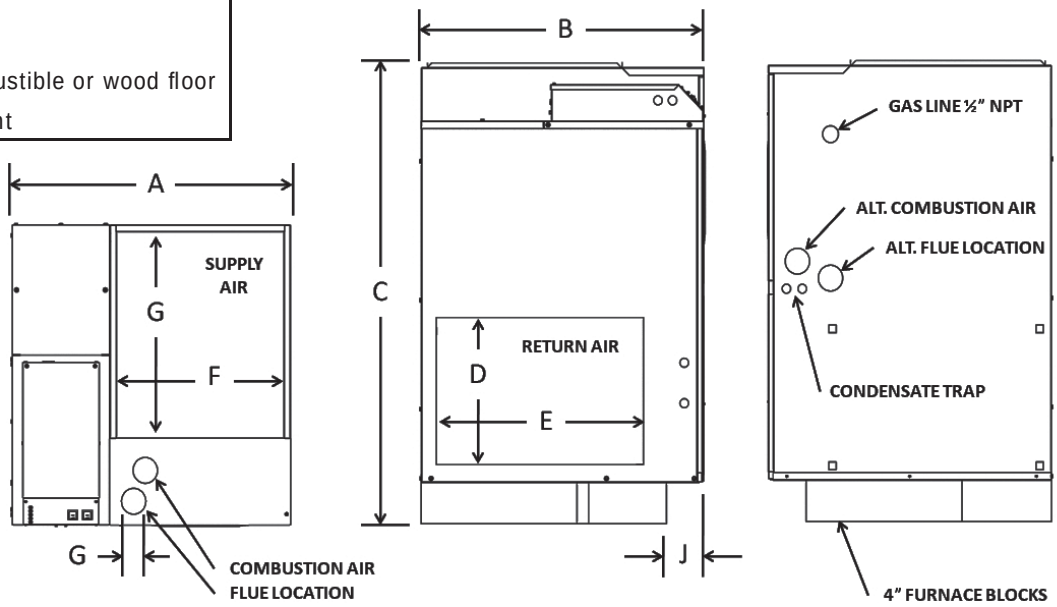


Figure 2-2 Integrated Furnace and HI Module Dimension

Clearance to Combustibles	
Top	1 inch
Front	2 inches (24"for Service)
Sides	0 inches
Rear	0 inches
Bottom	Non-Combustible or wood floor
Return	Left or Right



Model	Width A	Depth B	Height C	Vent D	Supply Air F X G	Return Air D X E	Overhang J
60	27	29	44	2	15-7/8 x 20	14-1/4 x 21-1/4	3-1/2 to 5
80	28-1/2	29	44	2	17-1/2 x 20	14-1/4 x 21-1/4	3-1/2 to 5
100	30-1/2	29	44	2	19-1/2 x 20	14-1/4 x 21-1/4	3-1/2 to 5
120	33-1/2	29	44	2	22-1/2 x 20	14-1/4 x 21-1/4	3-1/2 to 5

Figure 2-3 Furnace Details

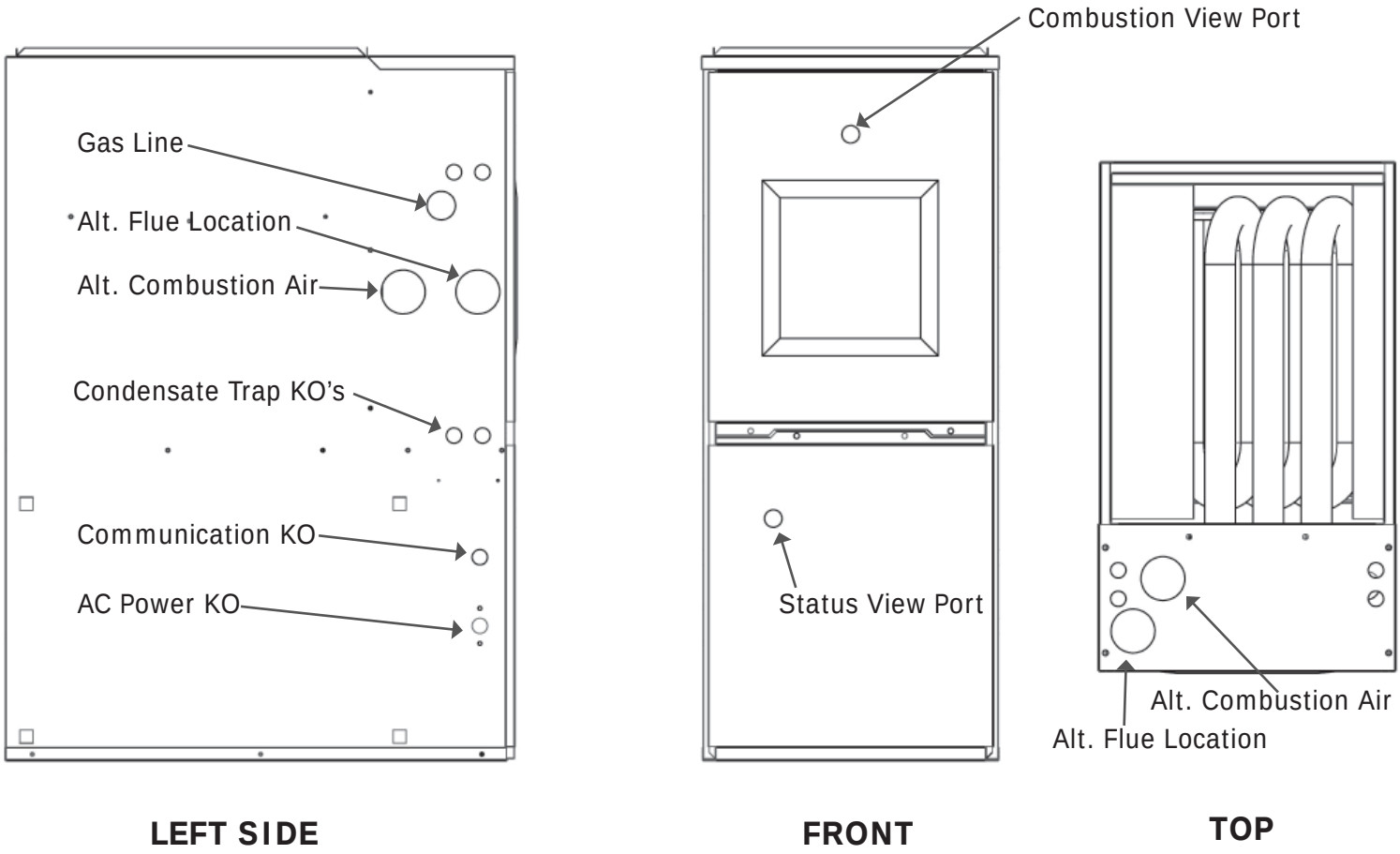


Figure 2-4 Hybrid Integration (HI) Module Details, Model WAJ

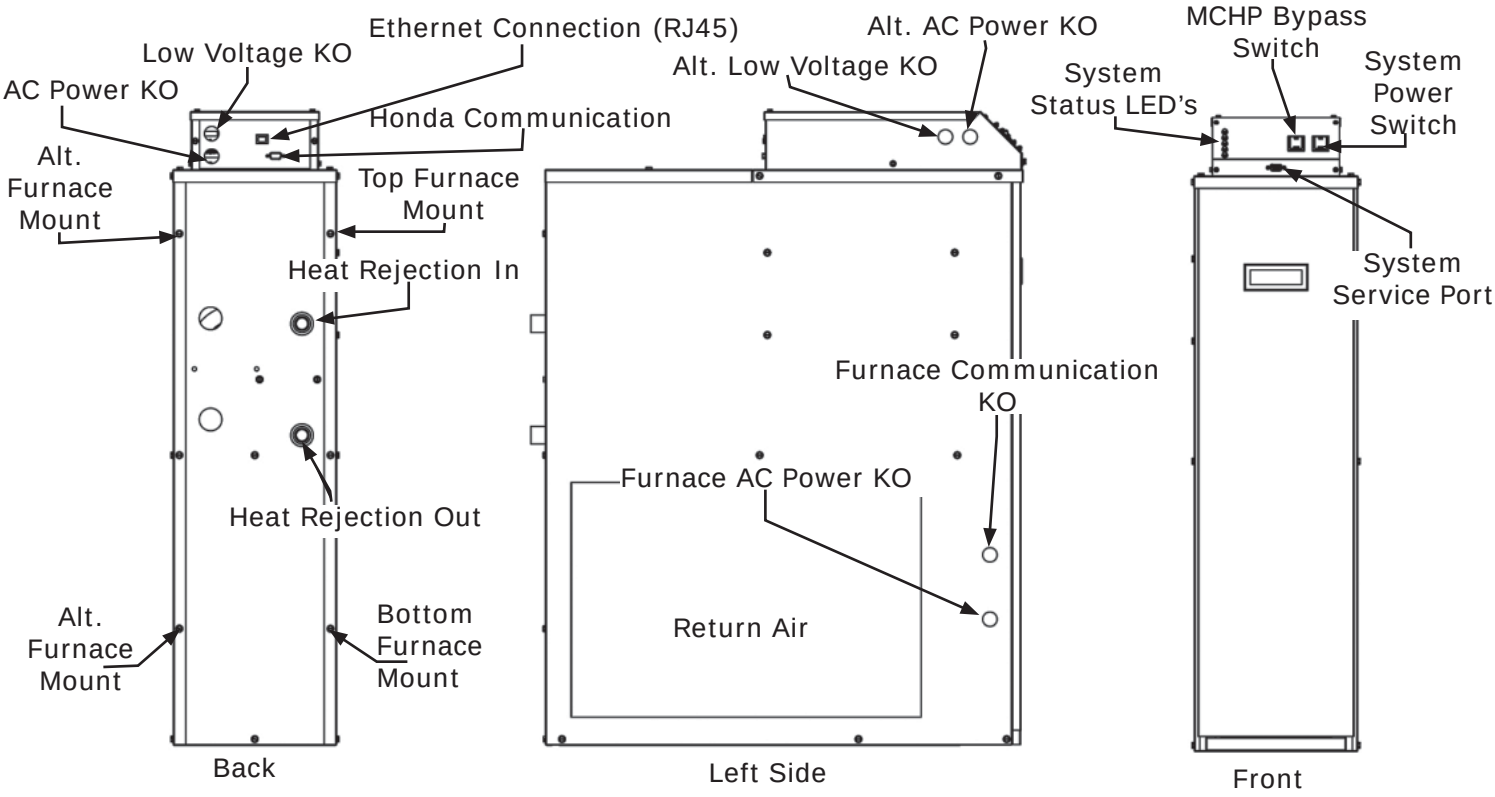
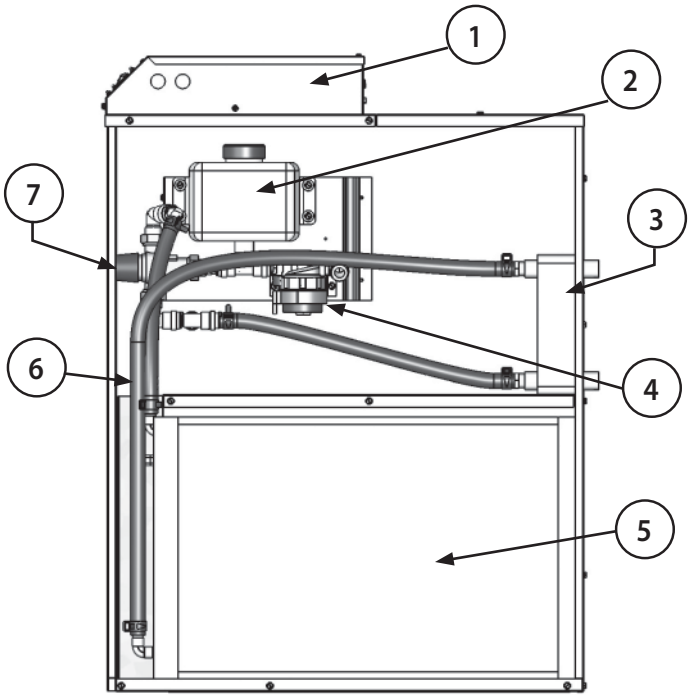


Figure 2-5 Detailed Cross Section View of WAJ HI Module



1. Electronics Enclosure
2. Coolant Tank
3. Heat Rejection Heat Exchanger
4. Coolant Pump
5. Air Coil Heat Exchanger
6. Coolant Tubing
7. Mixing Valve

Figure 2-6 Hybrid Integration (HI) Module Details, Model WDJ

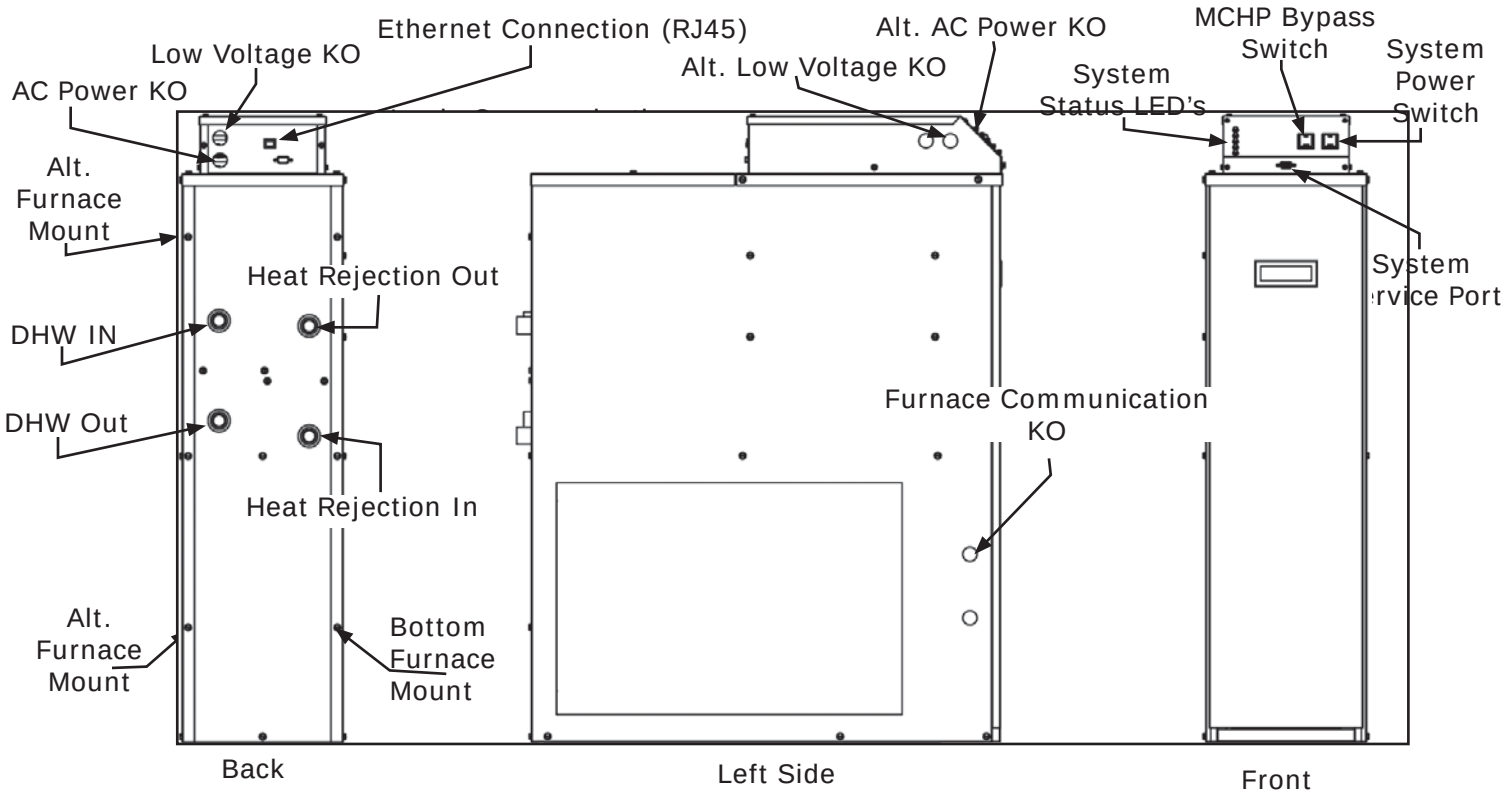
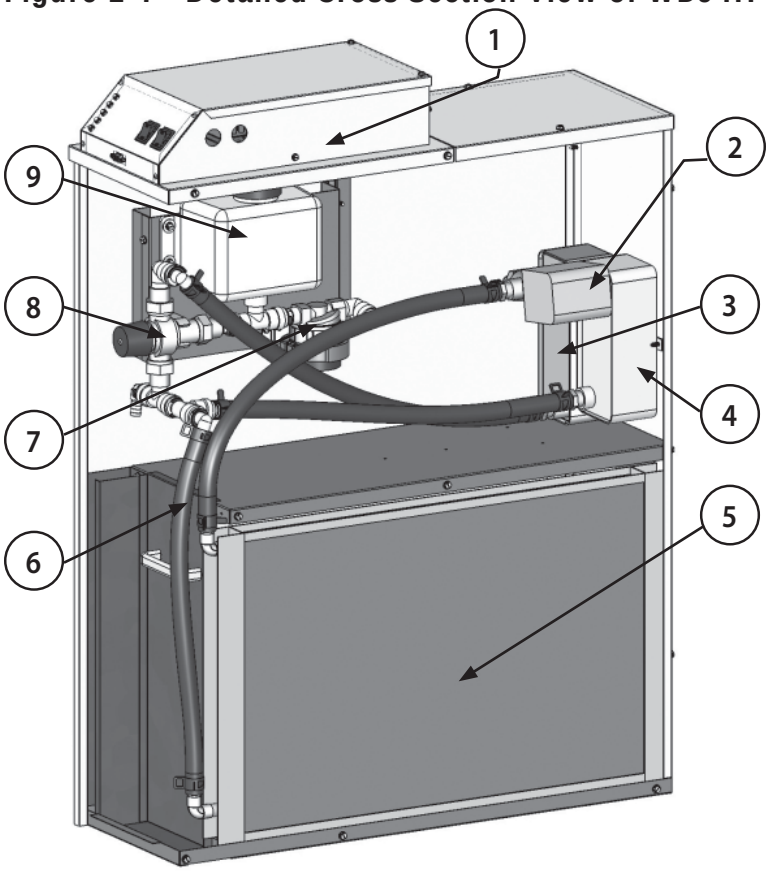


Figure 2-7 Detailed Cross Section View of WDJ HI Module



1. Electronics Enclosure
2. 3-way Valve
3. Heat Rejection Heat Exchanger
4. DHW Heat Exchanger
5. Air Coil Heat Exchanger
6. Coolant Tubing
7. Coolant Pump
8. Mixing valve
9. Coolant Tank

Figure 2-8 Electronics Box Details

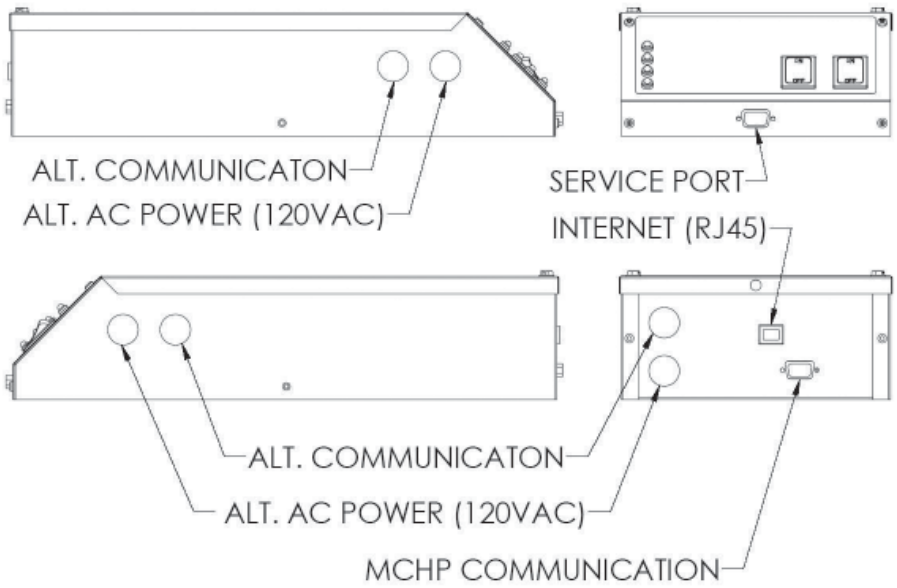
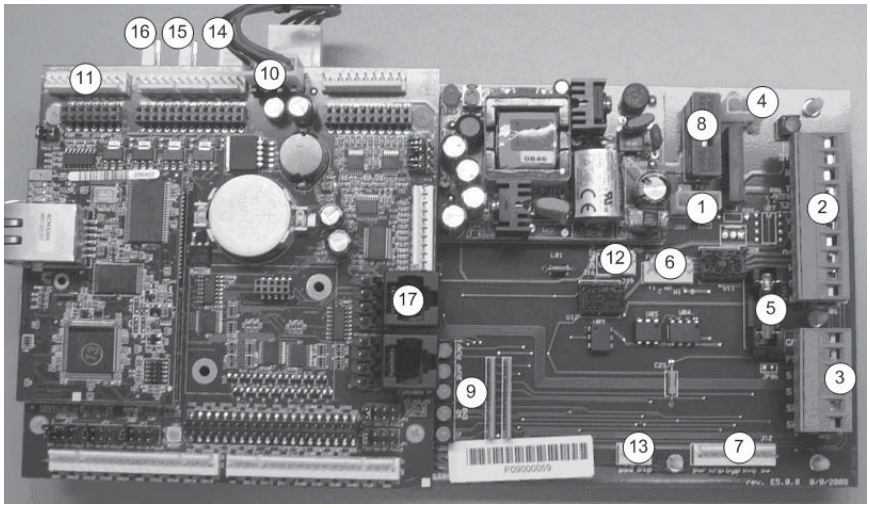


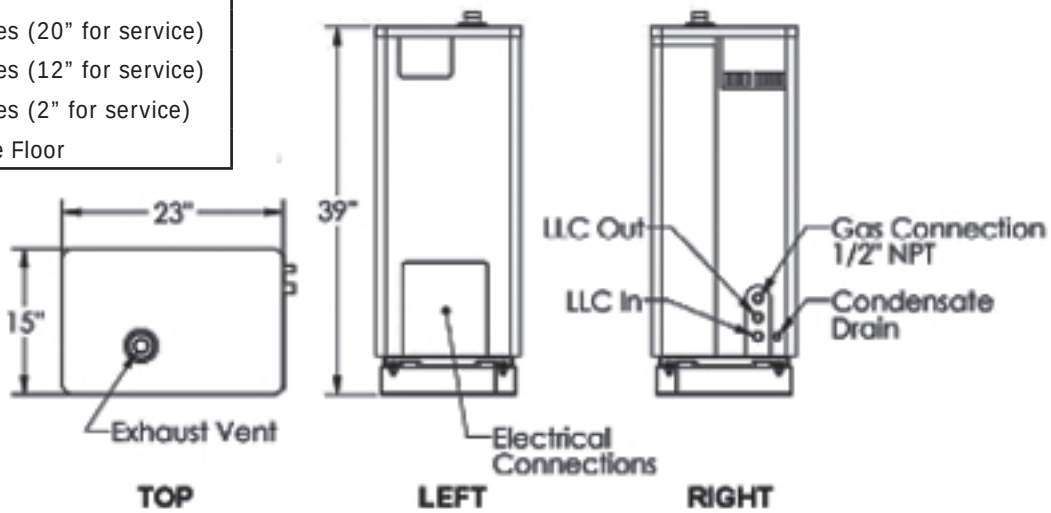
Figure 2-9 Electronics Box: Relay Board Details



No.	Board No.	Description
1	J09	120 VAC System Power
2	J06	Thermostat Connection
3	J05	Thermistor/Outdoor Sensor
4	J01	120V 3-Way/DHW Pump (WDJ)
5	F02	24VAC Fuse
6	J17	Furnace Communication
7	J12	LED Cable Connection
8	F01	120 VAC Fuse
9	LED01	Board LEDs
10	Rabbit - J12	CPU Power
11	Rabbit - j17	Front Serial Connection
12	J19	Heat Dump Connection
13	J18	LED/System Power
14	J09	24V Power Supply
15	J04	24V MCHP Coolant Pump
16	J10	12V Transfer Switch
17	Rabbit - J9	FTS Communication

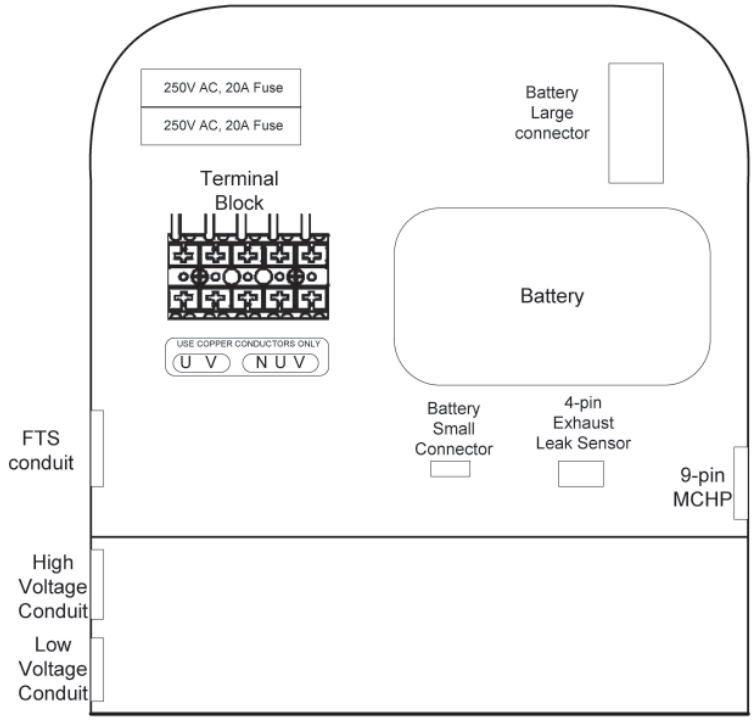
Figure 2-10 Honda MCHP Dimensions

Clearance to Combustibles	
Top	14 inches
Front	0.4 inches (20” for service)
Sides	0.4 inches (12” for service)
Rear	0.4 inches (2” for service)
Bottom	Concrete Floor



Concrete Floor Requirements	
Thickness:	3” Minimum
Flatness:	1/4”/10’ (Class CX)
Drop-In Anchor:	3/8” O.D. x 1-3/4” Long (5/16” - 18 Thread)
Quantity:	4

Figure 2-11 MCHP Connection



3 -BEFORE INSTALLING THE SYSTEM

3.1 Codes

System incorporates gas-fired, direct vent, condensing appliances and must be installed in accordance with the following:

Fuel Gas:

- United States: Installation shall conform to National Fuel Gas Code (NFPA-54/ANSI Z223.1).
- Canada: Installation shall be in accordance with CSA-B149.1 and B149.2 installation codes.
- Authority having jurisdiction

Electrical:

- United States: National Electrical Code (ANSI/NFPA-70).
- Canada: CAN/CSA-C22.1 Canadian Electrical Code.
- Authority having jurisdiction

Condensate Disposal:

- Authority having jurisdiction

Installers:

- Authority having jurisdiction
- Follow recommended maintenance outlined in this manual.

Grid Interconnection:

- Authority having jurisdiction with respect to interconnecting to grid.

3.2 System Sizing

Select system with proper capacity before continuing installation. Heating capacity should be greater than or equal to calculated peak heating load (heat loss) for building or area(s) served by system. See Section 2 for system ratings.

Base heat loss calculations on approved industry methods.

3.3 Considerations for System Location

Before selecting location for system, following should be considered. Each system component considered for installation must be:

- Supply correct type of gas.
- Connect to suitable combustion air intake piping system to supply fresh (outdoor) air for combustion (furnace only).
- Connect to venting system removing hazardous products of gas combustion.
- Supplied with suitable electrical supply for all system motors and controls.
- Connect to properly located thermostat or operating control (must be **freewatt** communicating thermostat).
- Place on level surface (shall NOT be installed on carpeting).
- Pitch condensate drain line down to floor drain or external condensate pump with reservoir at ¼" per foot (wood frame or concrete blocks may be used to raise furnace).

3.4 Locating the System

- Select level location, central to duct systems served and close to vent and air intake terminals.
- Use accessibility clearances for system installation, if more stringent (i.e. larger clearances) than required fire protection clearances.
- Removable walls or partitions may be used to achieve accessibility clearances.
- System shall be installed on solid, concrete floor with adequate make-up air available for 27,000 Btu/hr net input heating appliance.
- Clearances shown in table 4-1 indicate integrated furnace and HI Module required clearances per CSA listing.
- Equipment shall be installed in location facilitating operation of venting and combustion air intake piping systems as described in this manual (Section 8).
- Keep venting and combustion air intake passageways free of obstructions. Both venting and combustion air intake piping systems connected to outdoors must permit flow through piping systems without restrictions for system operation.
- Install control module components to protect from water (dripping, spraying, rain, etc.) during operation and service (pump replacement, MCHP maintenance, etc.).
- Locate system where ambient room temperatures (minimum possible temperatures where system is installed assuming system is not in operation and contributes no heat to space) are always at or above 32°F to prevent freezing of liquid condensate.

3.5 Combustion Air and Vent Pipe Requirements

- System requires dedicated vent systems for furnace and Honda MCHP discharging all combustion products to outside atmosphere.
- Furnace requires combustion air intake to complete direct vent system and provide air from outdoors. Honda MCHP requires make-up air from space where installed.

⚠ CAUTION

Keep system area clean of debris and free of flammable and combustible materials, vapors and liquids.

- Terminate combustion air and vent pipe connections together in same atmospheric pressure zone, through roof or sidewall (roof termination preferred). Consult furnace and Honda MCHP Installation Manuals for required clearances and installation instructions.
- Concentric vent termination installation, refer to furnace Installation Manual for installation guidelines.

3.6 Condensate Drain Requirements

- Install condensate drain lines with pitch down to floor at minimum of ¼" per foot.
- External condensate pump (not furnished) may be used if floor drain is not available.
- Use condensate pump designed for flue gas condensate application.
- Consult furnace and Honda MCHP Installation Manuals for guidelines for condensate drain installation.

3.7 Foundation Requirements

- Place system on level concrete surface. DO NOT install on carpeting.
- System: Level System will allow the condensate drain lines to function properly. Shims should be used between boiler, floor, MCHP and base to make up for minor surface irregularities or tilt.
- Honda MCHP: Honda MCHP is supplied with a base to raise unit above floor and secure to concrete floor.

NOTICE

It is recommended no additional electrical connections be made within **freewatt PLUS** System for line power. Separate junction box and receptacle should be provided if line power is required for condensate pump,.

3.8 Removal of Existing Furnace from Common Vent System

Existing common venting system is likely to be too large for proper venting of appliances remaining connected to it. Refer to decommissioning procedure outlined in furnace installation manual.

4 - PLACING THE SYSTEM

4.1 Place system to provide direct connections to:

- combustion air/vent piping system,
- natural gas piping,
- return and supply duct-work,
- condensate removal system,
- electrical connections.

4.2 Instructions for preparation and placement of Warm Air **freewatt PLUS** System:

NOTICE

Leave 4" gap in front of 4" concrete block foundation for integrated furnace/HI module unit. Coolant piping from MCHP unit will connect to HI module through bottom of HI module and needs opening in front of block foundation (J) to accommodate piping. See Figure 4-1.

1. Place 4" concrete block platform, consisting of minimum 4 – 4" x 8" x 16" blocks, in level location for utility connections and vent/air intake connections. See above note about front overhang (J) see Figure 4-1.
2. Place crated furnace and hybrid integration (HI) module close to selected location un-crate both units.

Table 4-1 HI Module/Furnace — Clearance to Combustibles

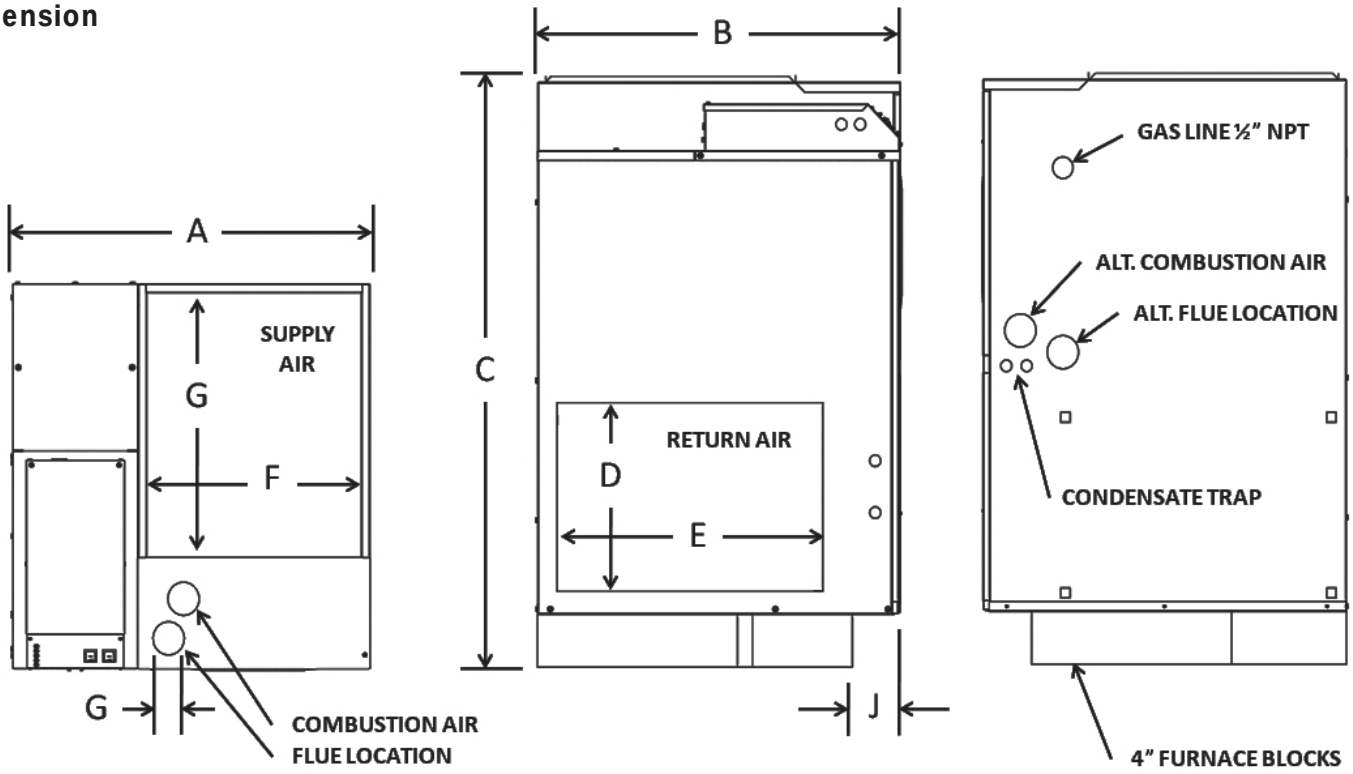
Top:	1 Inch
Front:	2 Inches (24" for Service)
Sides:	0 Inches
Rear:	0 Inches
Bottom:	Non-Combustible or Wood floor
Return:	Left or Right

Table 4-2 MCHP - Clearance to Combustibles

Top:	14 Inches
Front:	0.4 Inches (20" for service)
Sides:	0.4 Inches (12" for service)
Rear:	0.4 Inches (2" for service)
Bottom:	Concrete Floor

3. Determine if duct-work will enter furnace/HI Module on right side or left side. Prepare return air opening on furnace per instructions in furnace installation manual by cutting opening to match HI Module opening. See Figure 4-2.

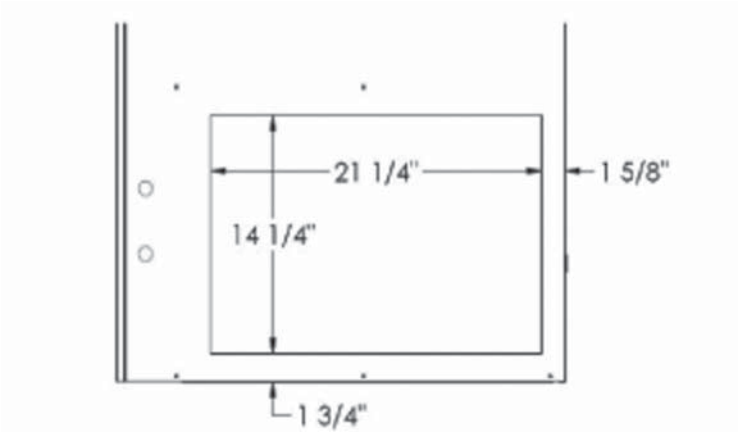
Figure 4-1 Integrated Furnace and HI Module Dimension



NOTICE

Relocate furnace blower door safety switch to properly wire HI Module if system has Right-Hand Return.

Figure 4 -2 Return Air Opening Dimensions



4. Inspect return/supply air duct-work and modify duct-work to connect to furnace and HI Module.
5. Install supplied ¼" thick sealing foam around peripheral edge of furnace's return opening to seal interface. Figure 4-3.

NOTICE

Self-tapping screw may be installed through top furnace compartment into side of HI module for additional support. Do not penetrate HI Module's Electrical Enclosure.

Figure 4-3 Sealing Foam

6. Connect HI Module to furnace with 3 attachment plates (Figures 4-4A & 4-4B). Start with front plate installation with chase nipple (Figure 4-4B).

Figure 4-4A Rear Attachment Plates

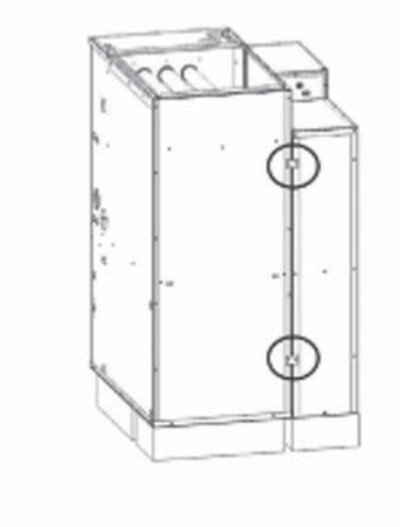
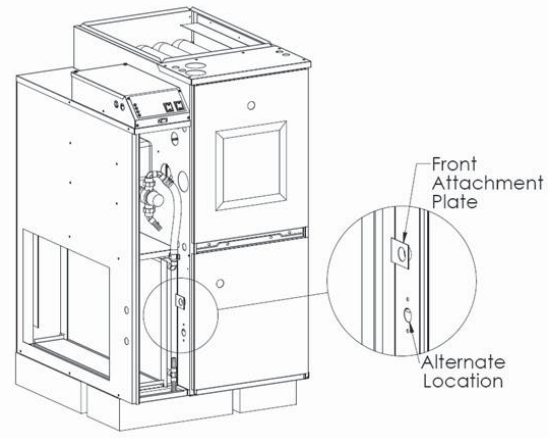


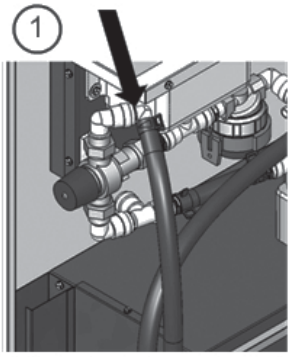
Figure 4-4B Front Attachment Plates



4 - PLACING THE SYSTEM

Instructions to change WAJ Hybrid Integration Module from left-hand to right-hand return

1

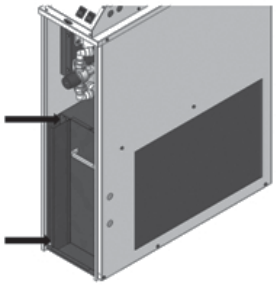


Remove plastic fitting from the tee, keeping the tubing attached to the aircoil

2

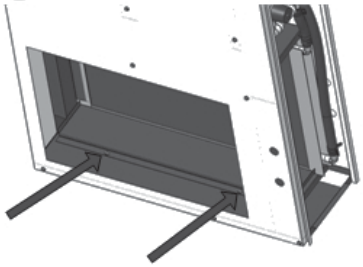
Remove front panel and airfilter

3



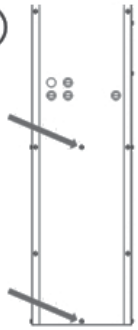
Remove Coolant Tubing guide (2 Screws)

4



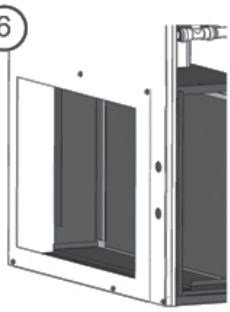
Remove two screws from base air filter plate securing air coil.

5



Remove 2 lower rear screws

6

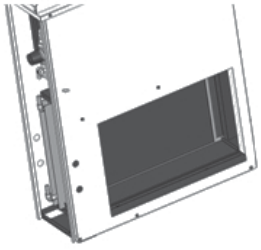


Pull Air filter support plate forward and lift to remove

7

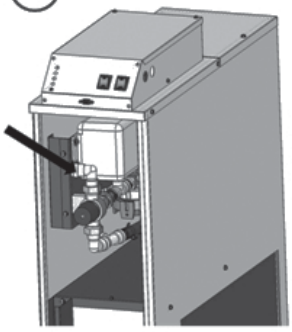
Move aircoil and reinstall air filter support plate, ensuring that the notches face the aircoil

8



Reinstall airfilter baseplate and coolant tubing guide with 4 screws.

9

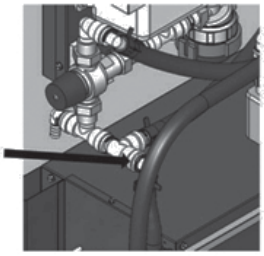


Loosen the Cold Mixing Valve Nut to rotate the elbow and reconnect the top of the aircoil to the left side of the tee

4 - PLACING THE SYSTEM

Instructions to change WDJ Hybrid Integration Module from left-hand to right-hand return

1

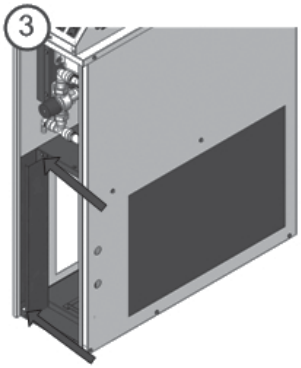


Remove plastic fitting from the tee, keeping the tubing attached to the aircoil

2

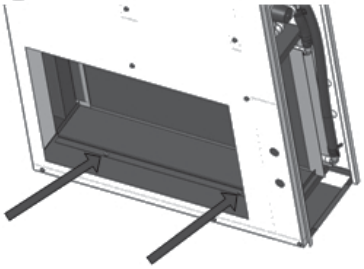
Remove front panel and airfilter

3



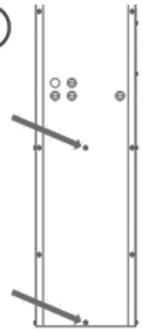
Remove Coolant Tubing guide (2 Screws)

4



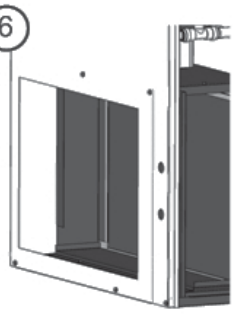
Remove two screws from base air filter plate securing air coil.

5



Remove 2 lower rear screws

6

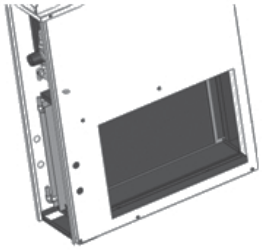


Pull Air filter support plate forward and lift to remove

7

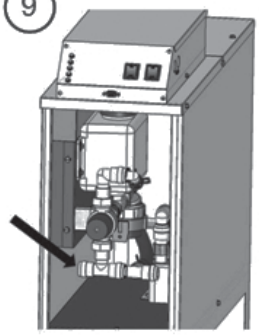
Move aircoil and reinstall air filter support plate, ensuring that the notches face the aircoil

8



Reinstall airfilter baseplate and coolant tubing guide with 4 screws.

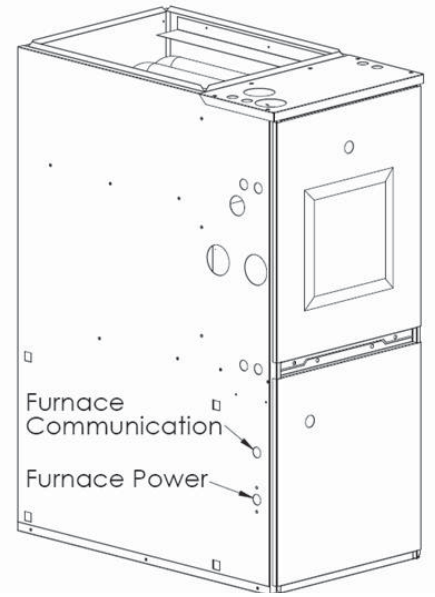
9



Reconnect the top of the aircoil to the left side of the tee

7. Install integration wiring between HI Module and furnace before moving integrated unit into position. Route furnace power and furnace communication cables from HI Module through two knockouts in furnace shown in Figure 4-5. Communication cable will connect directly to thermostat terminals and power cable will connect to power leads in internal J-box.

Figure 4-5 Furnace Knockouts



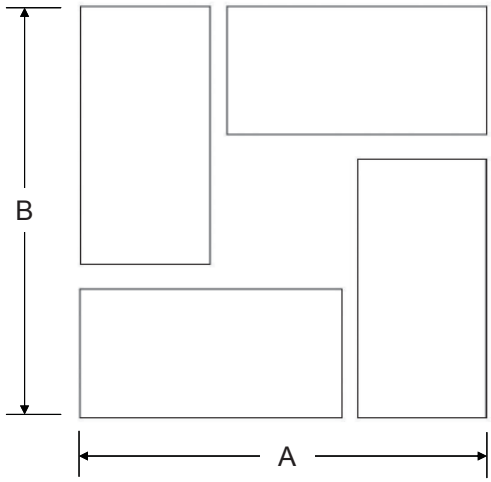
8. Place integrated HI Module/Furnace unit onto 4" block platform and align with existing return and supply duct work, see Figure 4-7.

NOTICE

Four - 4" Concrete blocks on clean floor are required for platform.

Level integrated unit with shims between integrated unit and block platform.

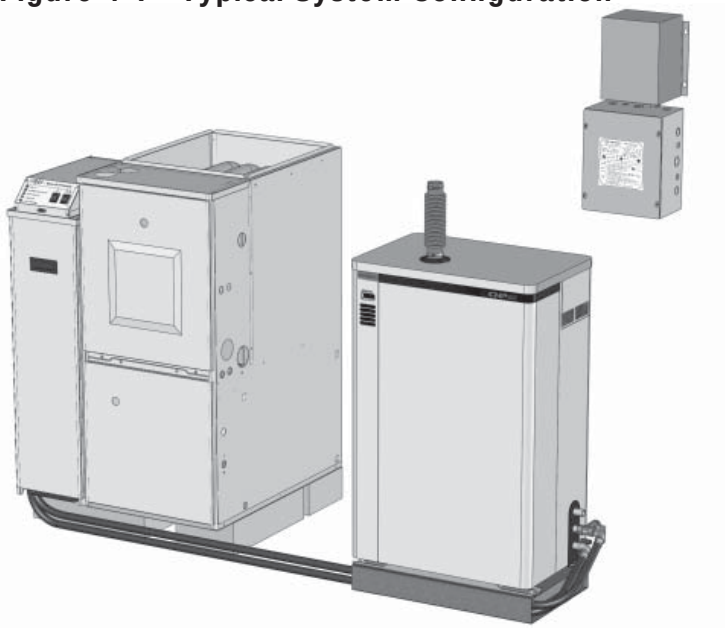
Figure 4-6 Typical Arrangement of Concrete Block Arrangement



Model	With A	Depth B
60	25	25.5
80	26.5	25.5
100	28.5	25.5
120	30.5	25.5

9. Locate Honda MCHP unit's base adjacent to integrated unit with MCHP's service door facing forward shown in Figure 4-7. Please review Figures 4-1, 4-2 & 4-9 for system configuration requirements and clearances.

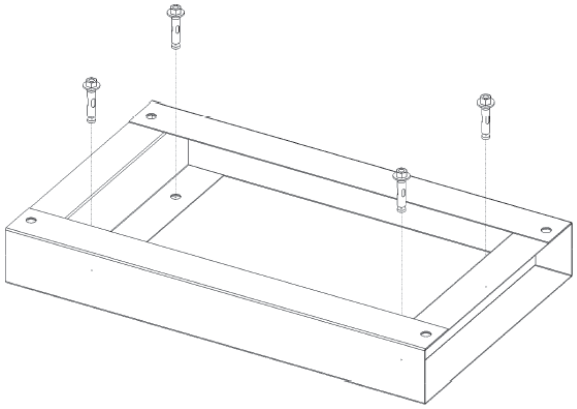
Figure 4-7 Typical System Configuration



10. Install the MCHP unit base as outlined in Figure 4-8.

- Place base on concrete floor and check for levelness.
- Mark anchor bolt locations on concrete floor.
- Drill proper hole diameters in concrete for anchor bolts per manufacturer's installation instructions. If obstruction is hit, move base and re-drill.
- Attach base to anchor bolts with supplied hardware.

Figure 4-8 MCHP Base Installation



11. Place Honda MCHP on base and secure MCHP unit to base with supplied hardware after base is installed,. Figure 4-9 shows alignment and installation hardware. Expansion Type Anchor Bolts: Quantity (4) 3/8" OD x 1.75" long (5/16" - 18 thread).

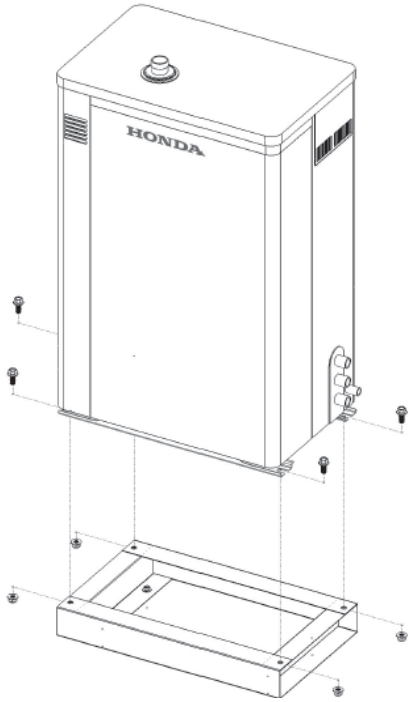
NOTICE

If unit needs to be shimmed level, washers should be located between MCHP and base.

NOTICE

Orientation of bolt and nut is important! Bolt must be installed from top with nut on bottom.

Figure 4-9 MCHP Installation



12. After system's three components are located and secure, final connection of return and supply openings to existing duct-work should be completed.

5 -NEAR SYSTEM PIPING

Figure 5-1B WDJ Series

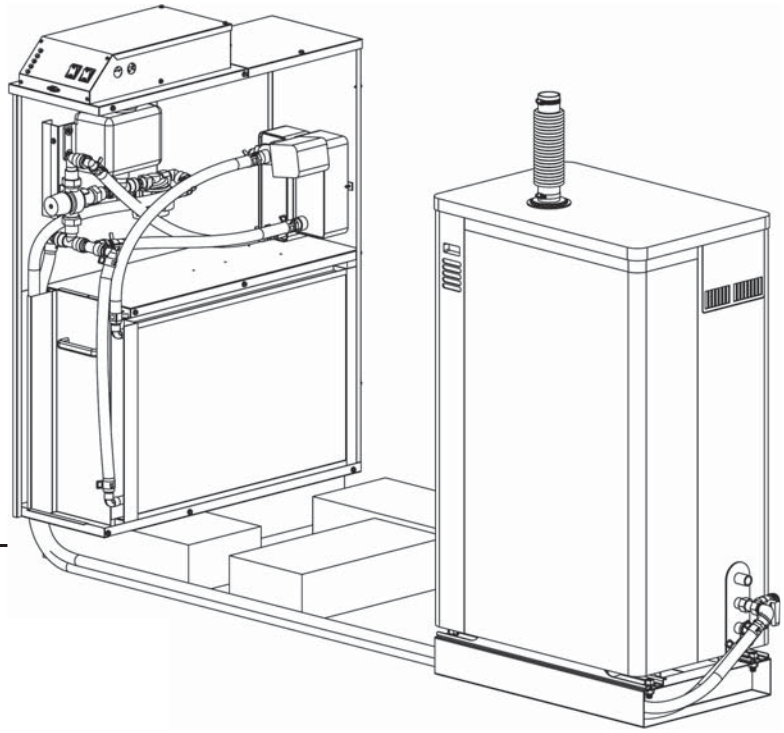
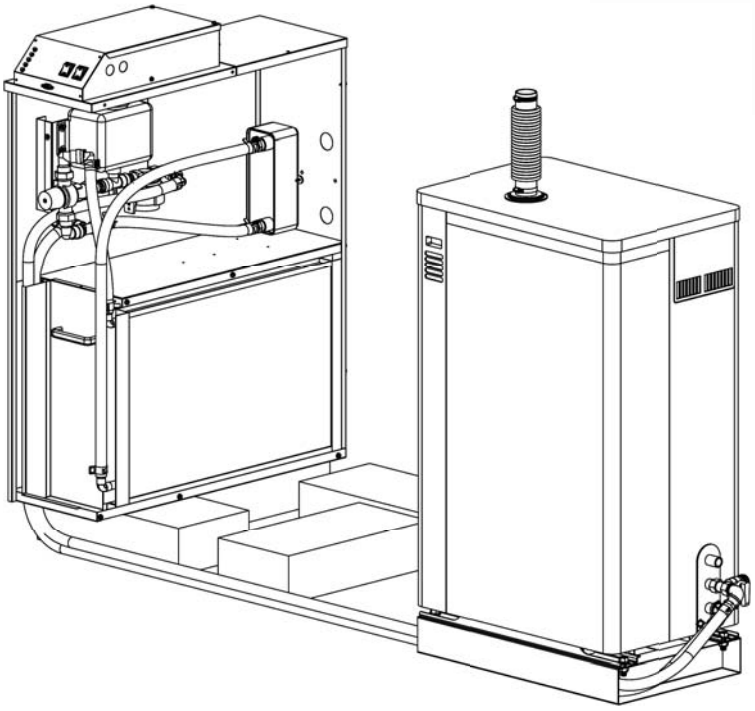


Figure 5-1A WAJ Series



5.1 Coolant Tubing

Locate and secure system's three components, connect coolant piping to MCHP unit and HI module as shown in Figures 5-1A thru 5-4.

Following steps are required to install long life coolant (LLC) tubing between HI module and Honda MCHP. If not followed, system will not operate properly and permanent damage to HI Module or Honda MCHP may occur.

1. Prepare MCHP Connections:

- Rear connections (LLC In and LLC Out) of MCHP unit are ½" NPT and should be prepared with sealant.
- Install ½" NPT brass street elbow onto drain fitting before installing ½" NPT street elbow onto MCHP unit's ½" MNPT LLC Out fitting. Install other 1/2" NPT brass elbow onto MCHP unit's 1/2" MNPT LLC In fitting. IMPORTANT: Use wrench on MCHP's fitting to ensure fitting is stable.

- Install ½" NPT x ½" barb brass fittings into drain fitting and ½" NPT elbow. Fittings should point downward at 45° angle in direction of front of HI Module. See Figures 5-2 & 5-3.

Figure 5-2 Coolant Connector

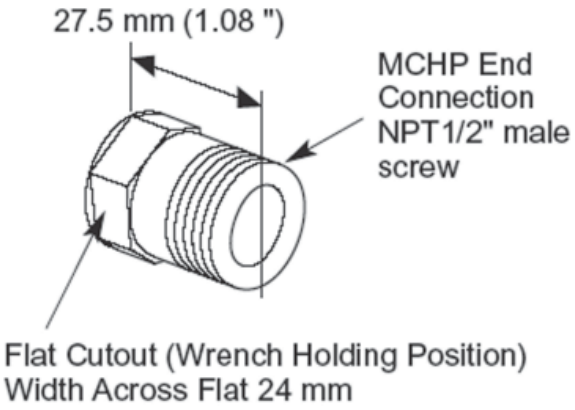
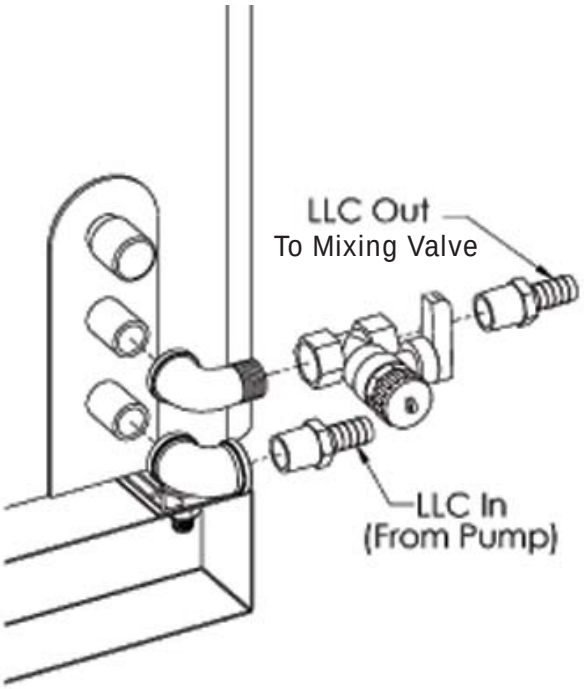


Figure 5-3 MCHP Coolant Line Installation Instructions



NOTICE

Install LLC OUT drain fitting onto street elbow before installing elbow onto MCHP's male nipple. Failure to do this will result in inability to turn drain fitting on elbow. Also, this operation must be performed before installing LLC IN MCHP coolant fittings.

2. Long Life Coolant Out (LLC Out)
[MCHP to Mixing valve. Figure 5-3

- Install stackable hose barb elbow into open Onix tube end and secure with SelfTite clamp (see Figure 5-5).
- Insert stackable hose barb elbow into open tee on hot side of mixing valve inside HI Module cabinet and secure with collet clip (see Figure 4-13).
- Route tubing out bottom of HI Module using channel alongside air filter door, through open channel in front of MCHP base to LLC Out fitting on rear of MCHP and cut to length (see Figure 5-2).
- Connect tubing to LLC Out brass barbed fitting on MCHP and secure with SelfTite clamp.

NOTICE

Install Onix tubing per manufacturer's instructions. Maximum Onix Bending Radius is 4". Maximum total Onix tubing length is 20 feet.

Figure 5-4A WAJ - Long Life Coolant Out Connection From MCHP

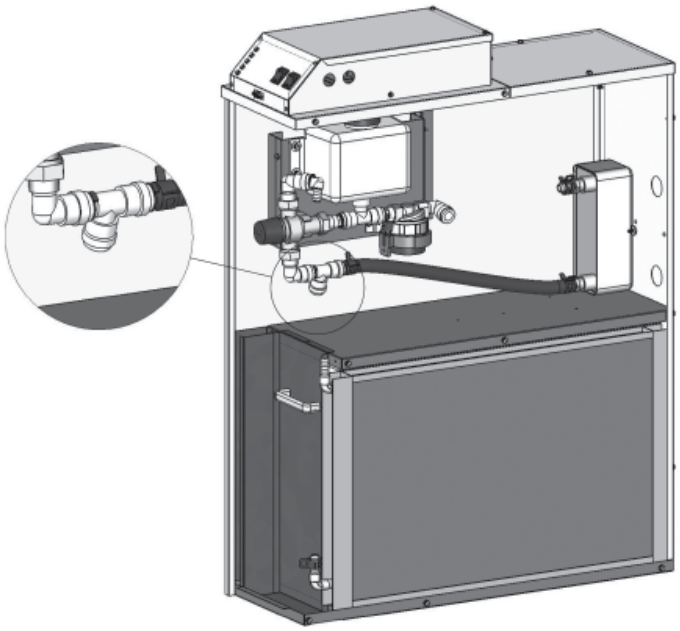


Figure 5-4B WDJ - Long Life Coolant Out Connection From MCHP

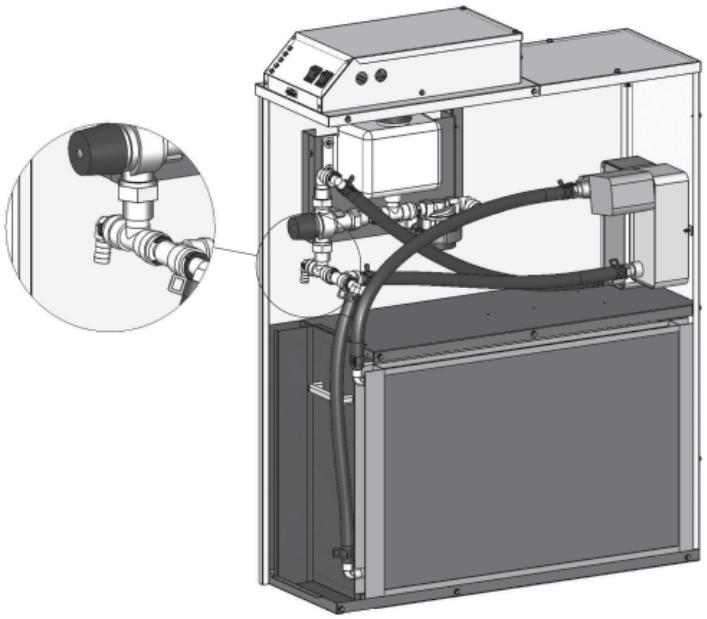


Figure 5-5A WAJ Long Life Coolant In [Pump to MCHP]

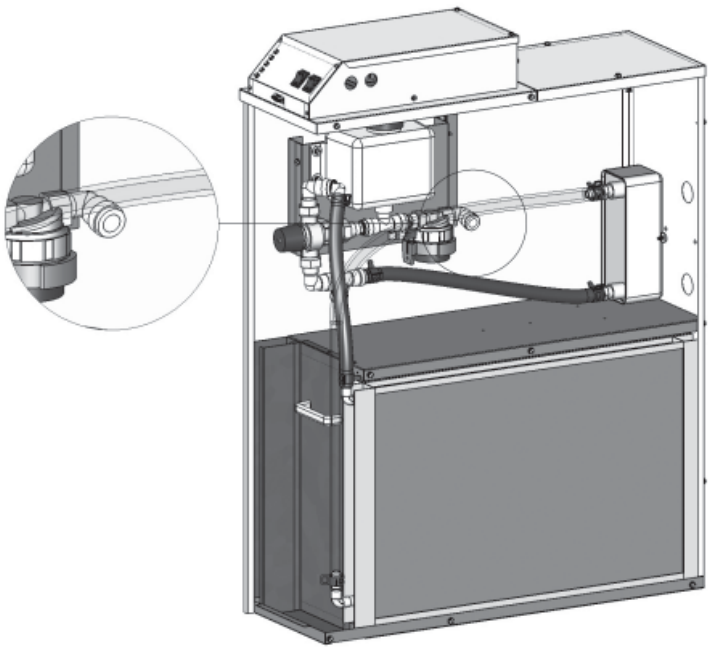
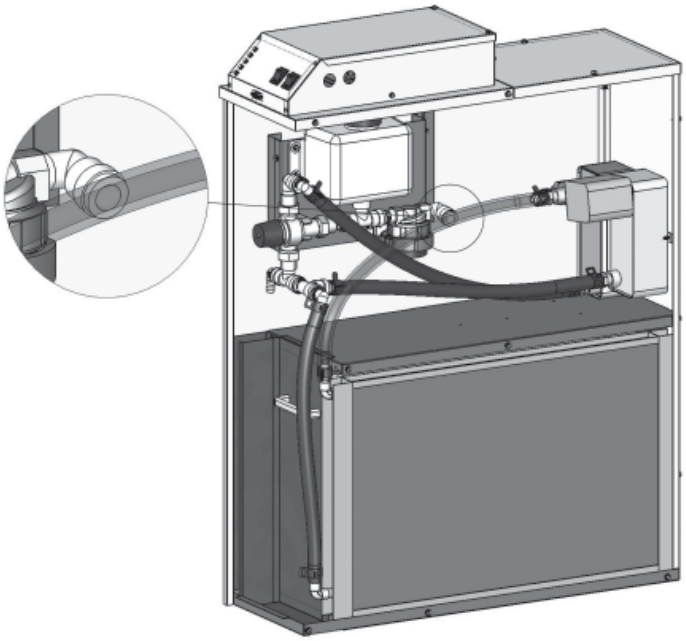


Figure 5-5B WDJ Long Life Coolant In [Pump to MCHP]



3. Long Life Coolant in (LLC IN) [Coolant pump to MCHP LLC In, Figure 5-5B]

- Use remaining length of Onix tubing to extend from coolant pump to MCHP's LLC in connection.
- Install stack-able hose barb fitting into open tube end and secure with SelfTite clamp. (See Figure 5-6)
- Insert same stack-able hose barb fitting into female elbow (Figures 5-4 and 5-5 on coolant pump & secure with collet clip;
- Route tubing out bottom of HI Module using channel alongside air filter door through open channel in front of HI Module to LLC In brass barb fitting on rear of MCHP and cut to length;
- Slip SelfTite clamp onto tubing (about 3 inches from end) and install tubing onto bottom LLC In brass hose barb fitting and secure SelfTite clamp onto tubing;

Figure 5-6 Stack-able Hose Barb and Female Swivel Elbow

5.2 Onix Clamps

NOTICE

Safety glasses must be worn when installing SelfTite Clamps.

Onix requires special mechanical clamps, designed for higher temperature and burst pressure ratings. Watts Radian provides two clamp options:

1. Torque Tite clamps are heavy-duty screw type, wide-band, stainless steel clamps. An inch/lb. torque wrench is required to install. Each clamp should be tightened according to proper torque setting for size of clamp being used. Torque settings are listed on instruction sheet supplied with clamps. Do not over tighten Torque Tite clamp. Over-tightening may cause long term damage to Onix tubing and/or clamp.

2. SelfTite Clamps are chrome-vanadium, constant tension clamps. Watts Radiant recommends using Squeeze Tite pliers to properly open and install clamps.

3. Important to not allow clamp to flatten while being held open. Flattened clamps will not fit properly over Onix and barb assembly.
4. Do not solder near, or overheat, Onix connections. Extreme temperatures associated with soldering may seriously damage Onix and will void warranty.
5. All Onix and brass fitting surfaces must be clean and dry before making connection.
6. Whenever possible, avoid making connections or splices in inaccessible locations.
7. Repairing Onix that has been in service requires attention, particularly when glycol has been used. Any residual amounts of glycol or any other coating inside Onix tube must be removed. Use alcohol swab or pad to remove residue(s), allow tube to dry prior to connection.
8. Do not use screw gun or wrench to tighten TorqueTite clamps. Safety glasses must be worn when installing SelfTite Clamps.
9. Maximum bending radius of ½" Onix tubing is 4".
10. It is recommended to only use Watts Radiant brass barb fittings with Onix tubing. Off-the-shelf brass fittings are made to different dimensions and tolerances, which may result in leaks.

5.3 Heat Rejection System

Each **freewatt PLUS** System installation requires either water cooled or air cooled heat rejection system, sold separately, to provide cooling for Honda MCHP when operating in backup mode in summertime when there is no space heating or water heating load. Heat rejection system is connected to heat rejection brazed plate heat exchanger in HI Module through connections on rear of HI Module (see Figures 2-4 and 2-6). Refer to installation instructions provided with heat rejection system for complete details.

6 - CONDENSATE DRAIN PIPING

6.1 Condensate Drain Piping

- Furnace and MCHP unit will produce condensate at rates up to 2 ½ US quarts (2.4 L) or more per hour.
- Drain condensate away from appliances to ensure proper operation. Furnace is supplied with drain trap assembly, may be installed on either left or right side furnace panel.

NOTICE

Furnace drain trap assembly must be filled with water before operating furnace. Dry trap may cause pressure switch to behave erratically, preventing furnace from operating normally.

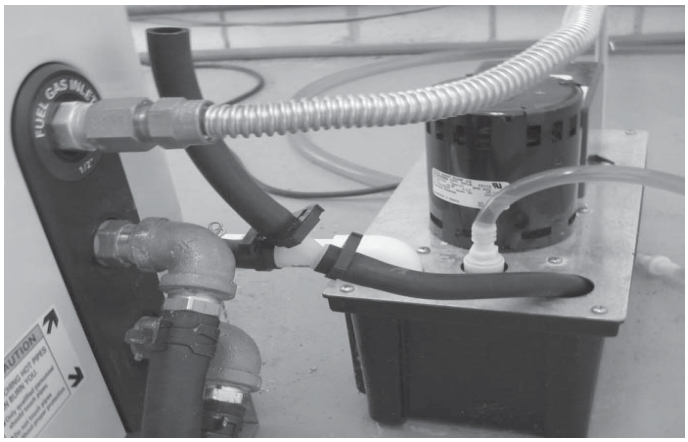
- MCHP condensate line should be installed directly into condensate pump, located directly behind MCHP unit, when using condensate pump.
- Verify tubing is open to atmosphere, condensate line should have “Y connector, removing possibility of air lock in line. See Figure 6-1
- Route furnace condensate line behind MCHP unit and install directly into condensate pump.

NOTICE

It is recommended no additional electrical connections be made within **freewatt PLUS** System for 120 VAC power. Provide 120 VAC power required for condensate pump, separate junction box and receptacle.

- Review condensate drain instructions in furnace and Honda MCHP installation manuals for proper system installation and operation.

Figure 6-1 MCHP Condensate Drain Tubing



7– EXHAUST GAS SENSOR

- Exhaust Gas Sensor (EGS) monitors integrity of MCHP unit's combustion system and shuts down MCHP unit if certain potentially unsafe conditions are detected. This is done by monitoring carbon monoxide level in air space near MCHP unit.
- EGS is independent of, separate from, audible CO alarming system also installed with **freewatt PLUS** System in compliance with best practices for all fuel-fired central heating equipment.
- Exhaust Gas Sensor does not fulfill State of Massachusetts's CO detector requirement.
- Exhaust Gas Sensor supplied with Warm Air **freewatt PLUS** System is intended for installation in close proximity of Honda MCHP unit. Figure 7-1 shows connections to Honda MCHP and Figure 7-2 shows connections to Exhaust Gas Sensor.

⚠ WARNING

Use only components and materials supplied with **freewatt PLUS** System to complete installation. Failure to comply could result in severe personal injury, death or substantial property damage.

⚠ WARNING

Exhaust gases from this appliance contain chemicals which may include carbon monoxide (CO). Carbon monoxide is an odorless, tasteless, clear colorless gas, which is highly toxic. Even low concentrations are suspected of causing birth defects and other reproductive harm. UL and ULC recognized CO detectors are required for all buildings equipped with ECR **freewatt PLUS** System. All CO detectors should be installed in accordance with their manufacturer's instructions and applicable local building codes.

7.1 Preparation

Before Exhaust Gas Sensor can be installed, following items must be installed:

- Integrated Unit (Furnace & HI Module)
- Honda MCHP Unit
- Thermostat

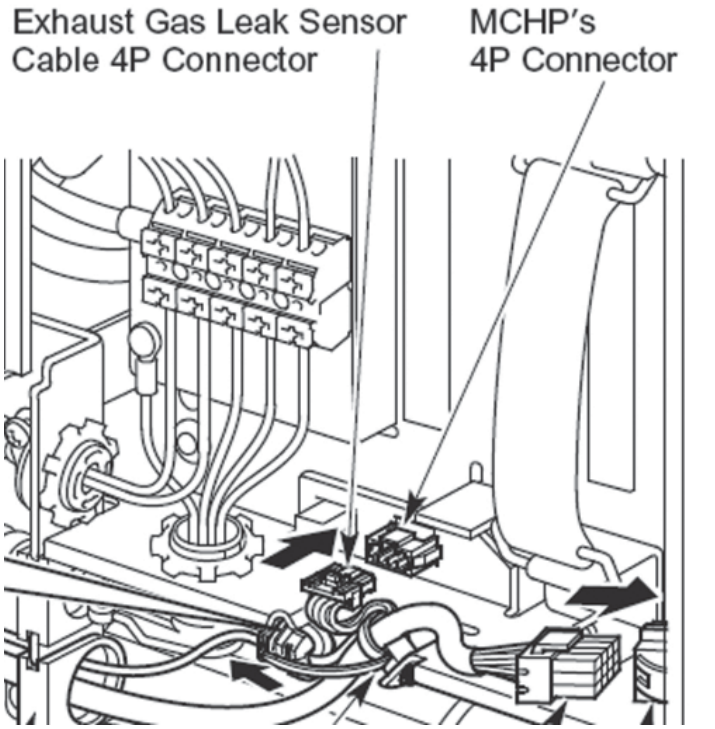
7.2 Installation

Exhaust Gas Sensor is connected to Honda MCHP unit with four-wire stranded insulated cable. Cable is factory supplied and field-installed and allows for quick connection to Exhaust Gas Sensor. Please follow installation instructions:

Exhaust Gas Sensor is Macurco CO Detector and is connected directly to control module. Follow directions below:

1. Read installation and operation manual for **freewatt PLUS** - supplied Exhaust Gas Sensor.
2. Install Exhaust Gas Sensor per manufacturer's instructions in close proximity of Honda MCHP unit.
3. Install four-wire cable from Honda MCHP to Exhaust Gas Sensor per wiring schematic found in Figure 7-1 & 7-2.
4. Ensure that cable is properly secured (Max. Interval: every 3 ft. (0.9 m).

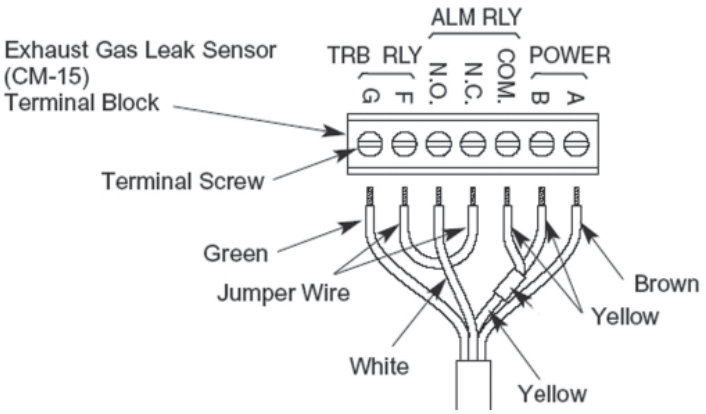
Figure 7-1 Honda MCHP Connections



7.3 Honda MCHP Connection

- 4-pin cable connector to Honda MCHP for Exhaust Gas Sensor is factory-supplied and field installed.
- Honda MCHP installation kit includes electrical schematic for wiring details. Figure 7-1 shows Honda MCHP connection details.

Figure 7-2 Exhaust Gas Sensor Connections



7.4 Exhaust Gas Sensor Connection

- Field install cable connection to Exhaust Gas Sensor after installation of sensor. Figure 7-2 shows field connections. 4-conductor shielded stranded cable is factory supplied and field installed. See Honda MCHP IOM for more information.
- Field install white jumper wire between second terminal (F) and fourth terminal (N.C.).

NOTICE

Install Exhaust Gas Sensor's cable connections properly or Warm Air **freewatt PLUS** System will not initialize and therefore not operate (ERROR – 14 or 15 Flashes).

7.5 Test Procedure

Before commissioning system, Exhaust Gas Sensor should be tested to ensure proper operation. Depress Exhaust Gas Sensor test button. MCHP unit should stop.

Test Procedure:

1. Disconnect **freewatt PLUS** System from Internet. Temporarily disconnect LAN cable from rear of unit or disconnect LAN cable where it plugs into home's network.
2. Power is supplied to exhaust gas sensor by MCHP so MCHP must be operating during testing of exhaust gas sensor. If MCHP is not operating turn up thermostat until MCHP operates.

NOTICE

LED indicator on Exhaust Gas Sensor must be solid green. If it is flashing red and green, sensor is initializing. Please wait approximately 3 minutes until LED is on solid green before proceeding.

3. Press button on Exhaust Gas Sensor labeled "Push Here to Test or Reset" for at least 6 seconds when LED is on solid green. This action should cause system error condition.
4. Confirm that Honda MCHP unit has stopped operating, and red "Service Required" LED on **freewatt PLUS** System's front panel is blinking error code "14", and yellow "Bypass" LED is ON. Contact technical support if any of these conditions do not occur.
5. Clear error condition. Turn OFF **freewatt PLUS** System's "System Power" switch, and turn OFF power to Honda MCHP at MCHP service switch.
6. Reconnect LAN cable to **freewatt PLUS** System.
7. Turn power ON to Honda MCHP, then turn ON **freewatt PLUS** System's "System Power" switch to return system to normal operation.

NOTICE

Exhaust Gas Sensor must be replaced every 5 years and installed by qualified and trained service personnel.

Exhaust Gas Sensor does not fulfill State of Massachusetts's CO requirement.

⚠ WARNING

Electrical shock may cause serious injury or death. Following procedures may expose you to dangerous line voltage use caution to avoid touching live electrical contacts. All service must be performed by trained, experienced service technician.

GENERAL TROUBLESHOOTING		
IF	**AND**	**CHECK or REPAIR**
NO POWER TO EXHAUST GAS SENSOR		**1.** CHECK CABLE & CONNECTIONS
ERROR CODE # 14		**1.** IS EXHAUST GAS SENSOR PRESENT? **2.** CHECK CABLE & CONNECTIONS
ERROR CODE # 15		**1.** IS EXHAUST GAS SENSOR PRESENT? **2.** CHECK CABLE & CONNECTIONS
ERROR CODE # 16		**1.** IS EXHAUST GAS SENSOR PRESENT? **2.** CHECK CABLE & CONNECTIONS **3.** LOSS OF POWER AT DEVICE **4.** CO DETECTED

8 – COMBUSTION AIR AND VENT PIPE

⚠ WARNING

Failure to properly vent or supply combustion air to furnace could cause carbon monoxide poisoning, explosion or fire, resulting in property damage, personal injury or loss of life.

8.1 General Considerations

If system is replacing Category I type furnace connected to chimney serving other appliances; existing common venting system is likely to be too large for proper venting of appliances remaining connected to it. Refer to decommissioning procedure outlined in furnace installation manual.

For home heating appliances connected to gas vents or chimneys, vent installations shall be in accordance with National Fuel Gas Code, ANSI Z223.1, CSA-B149.1, B149.2, or authority having jurisdiction.

Provisions for combustion and ventilation air must be in accordance with Air for Combustion and Ventilation, of National Fuel Gas Code, ANSI Z223.1, CSA-B149.1 and B149.2, or authority having jurisdiction.

Warm Air **freewatt PLUS** System has two separate components requiring combustion air and discharge of combustion products.

- Furnace component requires dedicated direct vent system. All air for furnace combustion is taken directly from outdoors through combustion air intake pipe. All combustion products are discharged outdoors through vent pipe.
- Honda MCHP uses dedicated non-direct vent system. Honda MCHP takes combustion air from dwelling's open space and all combustion products are discharged to outdoors through vent pipe.

1. See furnace installation instructions and Honda MCHP manuals for combustion air and vent pipe, roof and sidewall termination (roof termination is preferred).
2. Combustion air and vent pipes must terminate together in same atmospheric pressure zone as shown. Construction through which vent and air intake pipes may be installed is maximum 24 inches, minimum ¼" thickness.
3. Combustion air and vent pipe fittings must conform to American National Standards Institute (ANSI) standards and American Society for Testing and Materials (ASTM) standards D1784 (schedule 40 CPVC, D1785 (schedule 40 PVC, D2665 (PVC-DWV), D2241 (SDR-21 and SDR-26 PVC), D2661 (ABS-DWV), or F628 (schedule 40 ABS).
4. Pipe cement and primer must conform to ASTM standards D2564 (PVC) or D2235 (ABS). In Canada construct all combustion air and vent pipes for this system of CSA or ULC certified schedule-40 CPVC, schedule-40 PVC, PVC-DWV or ABS-DWV pipe and pipe cement. SDR pipe is not approved in CANADA.
5. Furnace and MCHP combustion air and vent piping connections unit are 2" (5 cm) and 1 ½" (3.8 cm), respectively, although the 2" (5 cm) connection for furnace must be upgraded to 3" (7.6 cm) for higher firing rates and lengthy intake/vent piping.
6. Additional guidelines for air intake and vent piping are found in Section 8.2.

NOTICE

Exhaust transition from 2" (5 cm) pipe to 3" (7.6 cm) pipe must be made in vertical run. Transition pieces are not included.

See furnace installation manual for more details.

8.2 Direct Vent Guidelines

1. Venting may be vertical or horizontal.
2. Minimum furnace vent length = 25 total equivalent feet (7.6 m). (See furnace Venting Table)
3. Horizontal piping must slope back towards furnace at minimum rate of 1/4" (0.6 cm) per foot, drain condensate towards furnace.
4. Horizontal runs must be supported at least every 3 feet (7.6 m). Horizontal sections must not dip or sag.
5. All vent runs through unconditioned space where freezing might occur should be insulated with 1" (2.5 cm) thick medium density, foil-faced Fiberglass Insulation. An equivalent "arm-a-flex" or "rub-a-flex" may also be used as long as there is no heat tape applied to vent pipe. For horizontal runs, where water may collect, wrap vent pipe with self regulating 3 or 5 watt heat tape. Heat tape must be CSA, UL or ULC listed and installed per manufacturer's instructions.
6. Do not common vent with any other appliance.
7. If venting vertically do not vent up chimney servicing another appliance or install in chase with metal or high temperature plastic pipe from another gas or fuel burning appliance unless required clearances to combustibles can be maintained between PVC pipe and other pipes.

NOTICE

State of Massachusetts has specific requirements regarding the installation of direct vent home heating appliances these requirements are found in section 8.3.

Use of periscopes on air intake and venting is allowed, but if they extend over 24" (0.6 m) in length, straight length should be insulated with proper weather-resistant pipe insulation.

8.3 Installation Requirements Specific To The State Of Massachusetts

For direct vent, mechanical vent, and domestic hot water appliances

For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the commonwealth and where side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of venting, including but not limited to decks and porches, following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS:
At time of installation of side wall horizontal vented gas fueled equipment, installing plumber or gas-fitter shall observe that hard wired carbon monoxide detector with alarm and battery back-up is installed on floor level where gas equipment is to be installed. In addition, installing plumber or gas-fitter shall observe that battery operated or hard wired carbon monoxide detector with alarm is installed on each additional level of dwelling, building or structure served by side wall horizontal vented gas fueled equipment. It shall be responsibility of property owner to secure services of qualified licensed professionals for installation of hard wired carbon monoxide detectors.

A. In event that side wall horizontally vented gas fueled equipment is installed in crawl space or attic, hard wired carbon monoxide detector with alarm and battery back-up may be installed on next adjacent floor level.

B. In event requirements of this subdivision cannot be met at time of completion of installation, owner shall have period of thirty (30) days to comply with above requirements. Provided, however, during said thirty (30) day period, battery operated carbon monoxide detector with alarm shall be installed.

2. APPROVED CARBON MONOXIDE DETECTORS:
Each carbon monoxide detector as required in accordance with above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE:
Metal or plastic identification plate shall be permanently mounted to exterior of building at minimum height of eight (8) feet above grade directly in line with exhaust vent terminal for horizontally vented gas fueled heating appliance or equipment. Sign shall read, in print size no less than one-half (1/2) inch in size:
"GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".

4. INSPECTION:
State or local gas inspector of side wall horizontally vented gas fueled equipment shall not approve installation unless, upon inspection, inspector observes carbon monoxide detectors and signage installed in accordance with provisions of 248 CMR 5.08(2)(a)1 through 4.

5. PRODUCT-APPROVED VENT/AIR-INTAKE:
Product-approved vent terminal must be used and, if applicable, product-approved air intake must be used. Installation shall be in strict compliance with manufacturer's instructions.

6. INSTALLATION INSTRUCTIONS:
Copy of all installation instructions for all product approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with appliance or equipment at completion of installation.

8.4 freewatt PLUS System Combustion Air and Venting

Recommended combustion air and venting installation procedures and specifications are based on installation specifications of furnace and MCHP. Installers are required to follow specific installation requirements found in furnace and MCHP installation manuals and following guidelines are taken from these manuals.

Please find below drawings showing integrated system's combustion air and venting requirements for Sidewall and Vertical terminations:

Figure 8-1 System Combustion Air and Venting Requirements - Side Wall Penetration

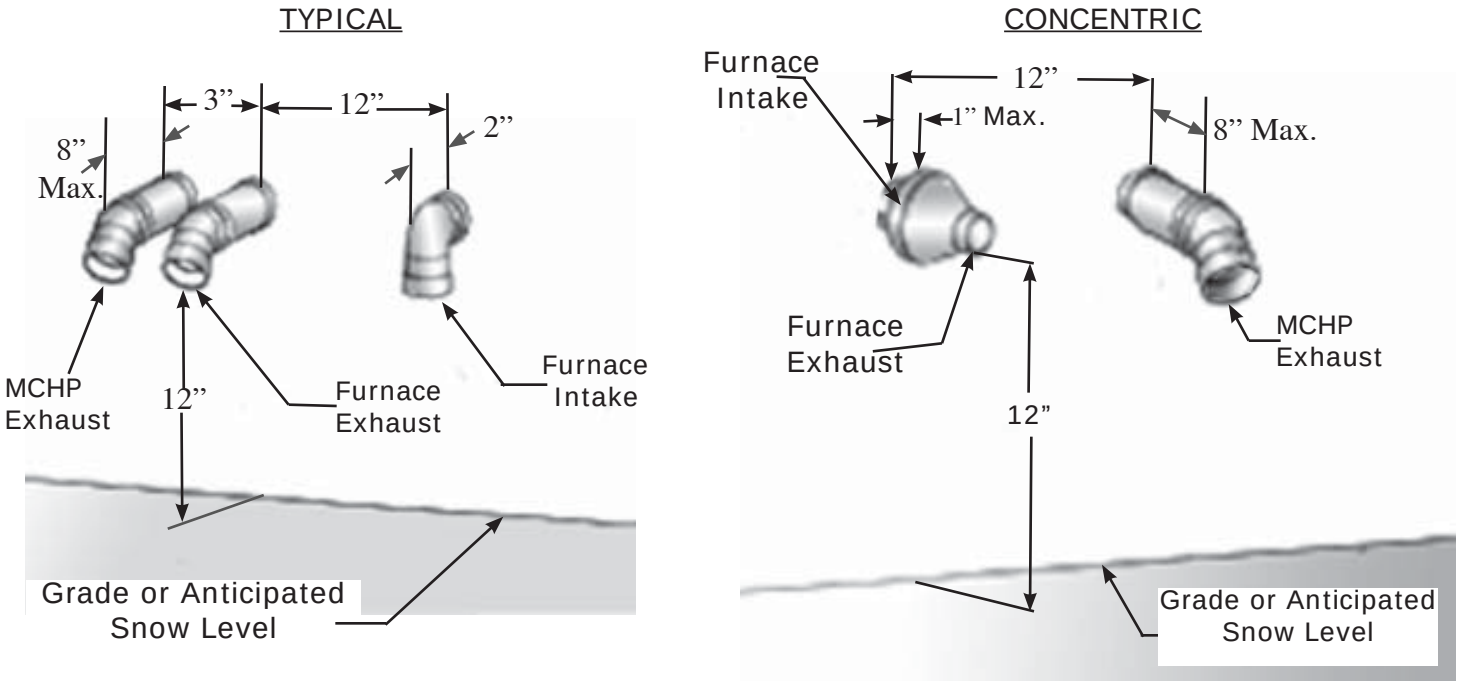
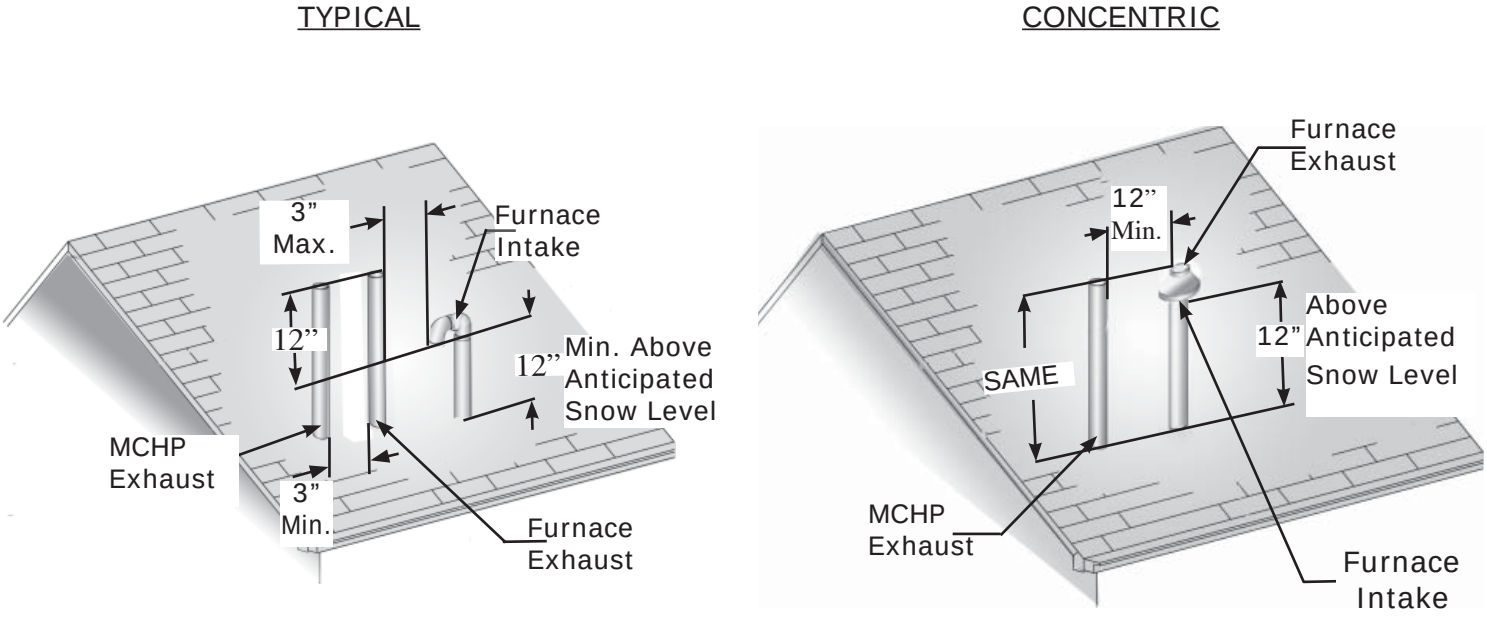


Figure 8-2 System Combustion Air and Venting Requirements - Vertical Penetration



In addition to general guidelines, in United States, direct vent exhaust for furnace shall be installed in accordance with requirements found below and direct vent intake and exhaust piping lengths for furnace are found in Table 8-1. See furnace manual for Canadian venting requirements.

NOTICE

Please note the Furnace should be installed per Direct Venting requirements and MCHP should be installed per Non-Direct Venting Requirements. This distinction is noted to ensure proper location of vent terminations.

8.5 Furnace - United States DIRECT Vent, System Requirements

- Clearance from bottom of termination to grade shall be 12" (.30 m) or increased to maintain 12" (.30 m) above anticipated accumulated snow level.
- Vent shall not terminate over public walkways or over area where condensate or vapor could create nuisance or hazard.
- Vent termination shall be installed at least 1 foot (.30 m) from any opening through which flue gases could enter building.
- Vent termination shall have minimum horizontal clearance of 4 feet (1.2 m) from electric meters, gas meters, regulators and relief equipment.
- Locate vent terminal 3 feet (0.9 m) horizontally from vent of any side wall vented fuel gas appliance or electric clothes dryer, except in case of our system or where two or more of these furnaces are multi-vented.

Table 8-1 FURNACE, Direct Vent Lengths - Maximum Allowable Length of Exhaust or Intake

Maximum Allowable length of exhaust or intake. Minimum vent length - 25 Total equivalent feet.									
Model	Pipe Size	Number of 90° Elbows							Notes
		0	1	2	3	4	5	6	
60	1½	25	20	15	10	5	-	-	1. Count concentric vent fitting as straight pipe. 2. Use medium or long sweep elbows where possible. 3. One 90° elbow is equivalent to two 45° elbows. 4. For direct vent, listed lengths are allowed for each vent (intake and exhaust). 5. For non-direct vent, listed lengths are allowed for exhaust. Intake should have 1½ " or 2" snorkel intake fitting. (Figure 7) 6. Include 2 vestibule elbows when calculating total vent length for all models.
	2	75	70	65	60	55	50	45	
	3	100	95	90	85	80	75	70	
80	2	50	45	40	35	30	25	20	
	3	100	95	90	85	80	75	70	
100	2	50	45	40	35	30	25	20	
	3	100	95	90	85	80	75	70	
120	3	100	95	90	85	80	75	70	
When 1½" or 3" pipe is used, exit the cabinet with 2" pipe. Reduce or increase immediately after exiting cabinet making provisions to secure vent bracket between cabinet and fitting. Use of concentric termination reduces allowable length by 5 feet from lengths shown in this table.									

United States: non-direct vent exhaust for MCHP shall be installed in accordance with following requirements; non-direct vent exhaust piping lengths for MCHP are found in Table 8-2. See MCHP Manual for Non-Direct Vent System requirements for Canada.

8.6 MCHP - United States NON-DIRECT Vent, System Requirements

- Clearance from bottom of termination grade shall be 12" (.30 m) or increased to maintain 12" (.30 m) above anticipated accumulated snow level.
- Vent shall not terminate over public walkways or over area where condensate or vapor could create nuisance or hazard.
- Vent termination shall be installed at least 4 feet (1.2 m) below, 4 feet (1.2 m) horizontally from, or 1 foot (.30 m) above any door, window, soffit, under eave vent or gravity air inlet to building.
- Vent termination shall have minimum horizontal clearance of 4 feet (1.2 m) from electric meters, gas meters, regulators and relief equipment.
- Locate vent terminal 3 feet (.91 m) horizontally from vent of any side wall vented fuel gas appliance or electric clothes dryer, except in the case of our system where two or more of these furnaces are multi-vented.

Table 8-2 MCHP, NON-DIRECT Vent Length, Maximum Allowable Length of Exhaust

Model	Pipe Size	Number of 90° Elbows						
		0	1	2	3	4	5	6
MCHP 1.2	1 1/2"	90	85	90	75	70	65	60
	2"	110	105	100	95	90	85	80

1. Count concentric vent fitting as straight pipe.
2. Use medium or long sweep elbows where possible
3. One 90°. Elbow is equivalent to Two 45° Elbows.
4. For systems with more than (6)qty. 90° elbows, subtract 5 feet from equivalent length for every elbow.

9 – GAS SUPPLY PIPING

9.1 Check Gas Supply

⚠ WARNING

Furnace is factory equipped to burn natural gas. Propane conversion kit is included with furnace. Furnace may be field converted for use with propane gas.

Honda MCHP may be factory equipped to burn natural gas or may be factory equipped to burn propane gas. It is not convertible between the two fuels. Must be ordered from factory for correct fuel.

Verify furnace and Honda MCHP are properly equipped for correct fuel before proceeding with installation.

NOTICE

Connect furnace and Honda MCHP units only to gas supplied by commercial utility or supplier. Private gas wells do not generally provide gas with consistent, uniform and predictable heating values and densities. Many non-commercial wells contain impurities such as sulphur, which may damage furnace or Honda MCHP. Units cannot operate properly or safely using fuels outside normal commercial standards.

Gas pipe to furnace must be correct size for length of run and for total BTU per hour input of all gas utilization equipment connected to piping. See Tables in furnace and Honda MCHP installation manuals for proper size. Be sure gas line complies with local codes and gas company requirements.

Disconnect system and its individual shutoff valve from gas supply piping system during any pressure testing of system at test pressures in excess of ½ psig (3.5 kPa).

Isolate System from gas supply piping system by closing its individual manual shutoff valve during any pressure testing of gas supply piping system at test pressures less than or equal to ½ psig (3.5 kPa).

In order for proper operation of system, it is recommended line pressure be within minimum and maximum values in Table 9-1. See furnace and MCHP manuals for specific appliance requirements.

Table 9-1 Fuel gas supply pressures (inches w.c.)

Fuel Gas	Minimum	Nominal	Maximum
Natural Gas	4”	7”	10”
Propane Gas	10”	12”	14”

Consult furnace and Honda MCHP installation procedures for leak testing and purging gas lines.

9.2 Gas Piping

Consult furnace and Honda MCHP installation manuals for specific instructions regarding gas piping for these appliances.

10– ELECTRICAL WIRING AND CONNECTIONS

⚠ WARNING

Turn off electrical power supply at service panel and MCHP power switch to "OFF" to prevent MCHP from starting in backup mode, before making any electrical connections to avoid possible electric shock hazard. Failure to do so could cause severe personal injury or death.

NOTICE

Wiring must be N.E.C Class 1. If original furnace wiring must be replaced, use only type 105°C wire or equivalent. System must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 – latest edition.

10.1 Codes

Installations must comply with National Electrical Code, any other national, state, provincial or local codes or regulations, and in Canada, with CSA C22.1 Canadian Electrical Code (Part 1) and authority having jurisdiction.

10.2 Line Voltage Connections

System installation will include 120 VAC dedicated circuit (15 amp) to Hybrid Integration (HI) Module and 240 VAC dedicated circuit (2 pole. 15 amp) to Honda MCHP unit.

HI Module:

1. Route 120 VAC power wiring to electrical enclosure on top of HI Module. See Figure 10-1 for electrical knock-out locations.

Figure 10-1 HI Module 120 VAC Power (Side Connections)

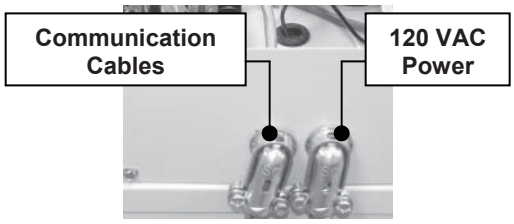


Figure 10-2 HI Module 120 VAC Power (Inside Connections)

Refer To Electrical Schematic in Section 19

2. Provide and install non-fused disconnect or service switch (2 pole 15 amp recommended) as required by code.

NOTICE

HI Module is supplied with switch on front of electrical enclosure (see Figure 10-4). Install additional switches required for service or safety by authority having jurisdiction.

120 VAC dedicated circuit should conform to NEC and use as minimum 3-conductor, 14 Ga. Cable.

3. Connect 120 VAC power cable from HI Module to furnace. Route cable through knock-out openings in HI Module and furnace's electrical knockout. Use wire nuts to connect in furnace's internal junction box. See Figure 10-5 for details.

⚠ WARNING

Do not install un-switched line-powered cables or wires through **freewatt PLUS** System this may pose potential electric shock hazard. Failure to do so could cause severe personal injury or death.

Figure 10-3 120 VAC HI Module Mounting

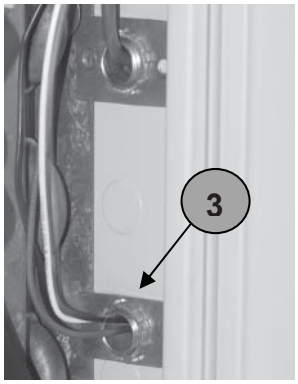
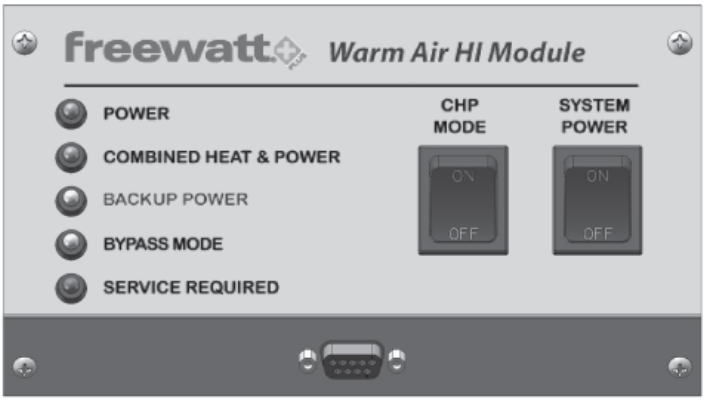


Figure 10-4 120 VAC Appliance Switch



NOTICE

It is recommended no additional electrical connections be made within **freewatt PLUS** System for line power. If line power is required for condensate pump, separate junction box and receptacle should be provided.

Figure 10-5 120 VAC Furnace Connections

Refer to Electrical Schematic in Section 19

10.3 Honda MCHP:

NOTICE

Refer to Honda MCHP Installation Manual — Electrical Connections Section before performing installation instructions in this section.

1. Remove cover plate and connect 240 VAC power cable to terminal block on Honda MCHP unit. Install per Figure 10-6 and MCHP Installation, Operation Manual's instructions.
2. Provide and install 240-VAC disconnect switch and junction box near Honda MCHP. This switch should be installed on 240-VAC cable extending from Main Service Panel to **freewatt PLUS** Transfer Switch. Mark switch as MCHP Serviceman's Switch. Install per electrical schematic.
3. Affix Generator warning label (PN 240007836) to main distribution panel where it can be clearly seen by any service personnel.

GENERATOR WARNING LABEL

⚠ DANGER

ELECTRIC SHOCK HAZARD
DUAL POWER SUPPLY

You will be seriously injured or killed.

Always turn off the master switch on the home generator [next to the furnace or boiler] before servicing this home's electrical system.

Per NEC 692

DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

OTR54080-A

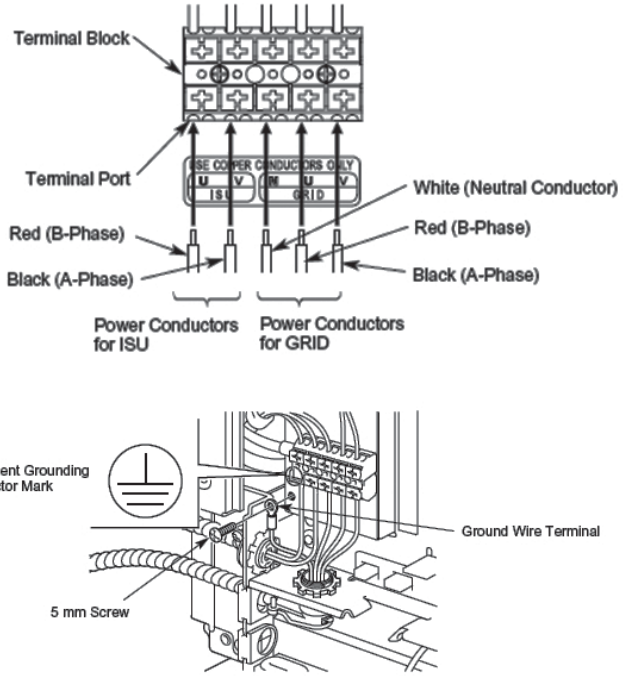
NOTICE

Recommended Breaker: 2-pole. 15 Amp breaker.

Flexible metal conduit is required to provide vibration isolation for Honda MCHP.

240 VAC dedicated circuit should conform to NEC and be minimum 4-conductor, 14 AWG flexible metal conduit.

Figure 10-6 MCHP Line Voltage Connections



10.4 Thermostat Connections

NOTICE

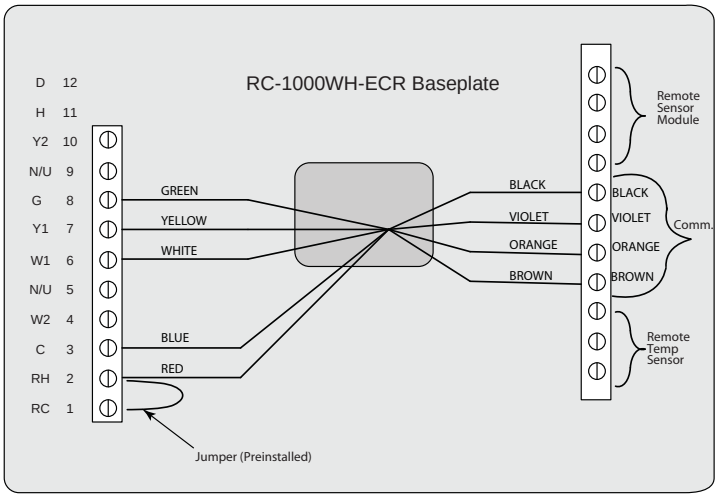
Supplied system includes communicating thermostat. Communicating thermostat must be installed correctly and properly commissioned to ensure optimum operation of system.

Refer to installation instructions supplied with thermostat for specific unit instructions. Thermostat cable will extend from thermostat to control module, electrical schematic shown in Figure 10-8. Thermostat cable shall be connected to thermostat according to electric schematic.

1. Install thermostat on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, televisions, sun-rays, or fireplaces.
2. Connect thermostat cable to back side of thermostat.

Figure 10-7 - RC 1000 Communicating Thermostat

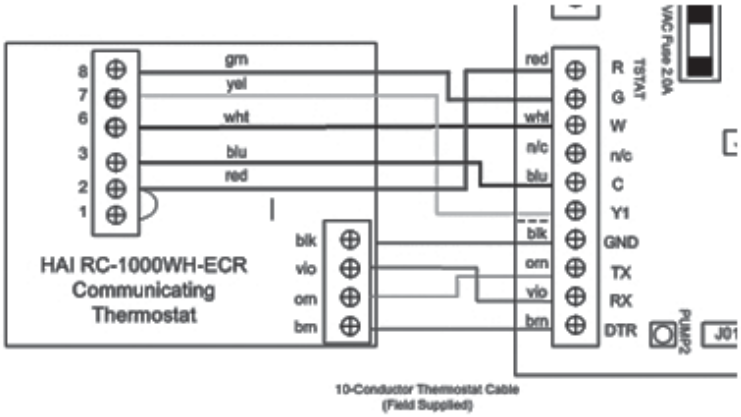
Figure 10-8 - Thermostat Connections



3. Route cable to Control Module. Cable will enter electronics enclosure through side or rear knockout opening and connect to control module's plug-in connection (See Figure 10-9).

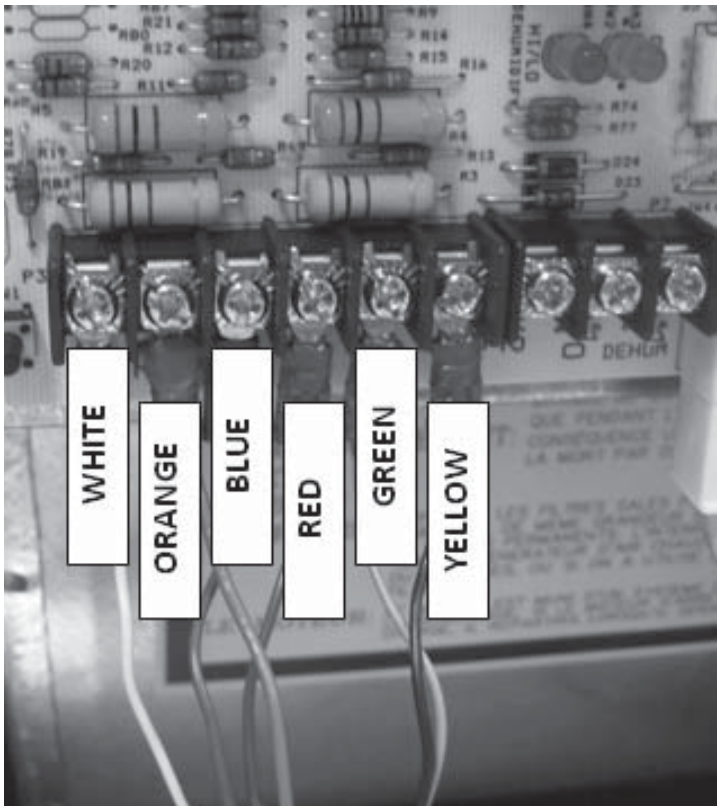
4. Control module's output to furnace is via furnace control cable. Control module connection is factory installed, opposite end is found in lower compartment of HI module. Route cable through knockout between HI module and furnace, connect to thermostat terminals on furnace control board. (Figure 10-10).

Figure 10-9 Control Module Thermostat Connections



Refer to Electrical Schematic in Section 19.

Figure 10-10 Furnace Control Cable Connection



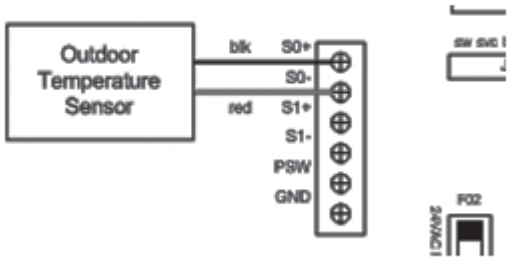
Refer to Electrical Schematic in Section 19.

10.5 Outdoor Temperature Sensor

Outdoor sensor will be mounted on exterior wall per sensor manufacturer's instructions, shielded from direct sunlight or flow of heat or cooling from other sources.

Sensor's wires will be routed through exterior wall into house and through opening on side of electronics box. See Figure 10-11 and Electrical Schematic (Section 19) for connection details.

Figure 10-11 - Outdoor Temperature Sensor

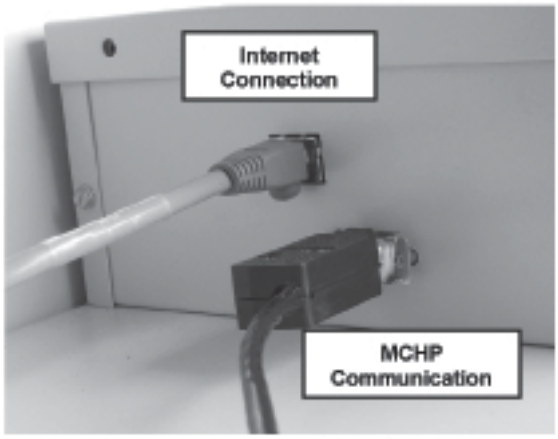


Refer to Electrical Schematic in Section 19.

10.6 Internet Connection

Control module has RJ 45 network connection. Connection is found at rear of electronics enclosure on top of HI Module (Figure 10-12). Connection point accepts CAT 5e cable. Setup instructions found in Section 15.4.

Figure 10-12 - Internet & MCHP Communication

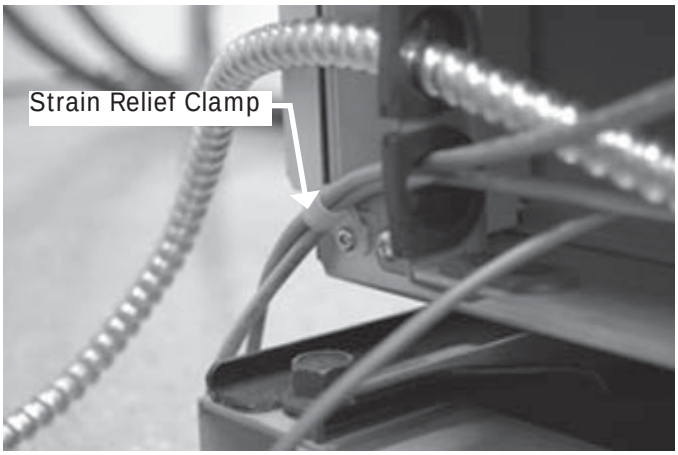


Refer to Electrical Schematic in Section 19.

10.7 MCHP Communication Connection

- System-supplied RS 232 communication cable will connect Honda MCHP to HI Module.
- MCHP communication cable will be connected to HI Module Cable and route behind or above furnace to Honda MCHP and connect to communication port on Honda MCHP. Figure 10-13 shows communication cable entering MCHP and its strain relief clamp.
- Connect Honda MCHP communication cable to Honda MCHP according to instructions found in MCHP manual.
- Figure 10-14 shows connections inside MCHP.

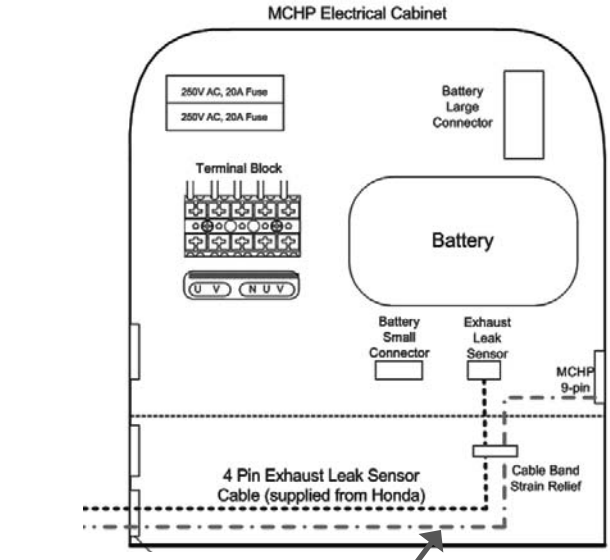
Figure 10-13 MCHP Communication Cable & Exhaust Leak Sensor Cable



NOTICE

Communication cables must have proper strain relief to protect connectors from pulling apart. (Figure 10-13).

Figure 10-14 Low Voltage MCHP Connection



Refer to Electrical Schematic in Section 19.

10.8 MCHP Battery Installation

Please see the Honda MCHP manual for installation of the MCHP battery.

- Honda MCHP1.2D/MCHP1.2DP unit requires battery to provide power to start up in backup power mode.
- Battery is provided for **freewatt PLUS** System, however to insure proper battery storage and charge level, battery is not packaged with system.
- Battery must be ordered at time of installation from ECR Customer Service by **freewatt** dealer performing installation.
- Original battery provided for each **freewatt PLUS** System will be shipped to installing dealer at no charge.
- Following information must be provided to obtain battery:
  - A. Either Honda MCHP Serial Number or **freewatt PLUS** System Serial Number.
  - B. Your **freewatt** dealer name or dealer number.
  - C. Desired ship-to address.

Call **ECR freewatt** Customer Service toll free at 866-944-6247 to order battery.

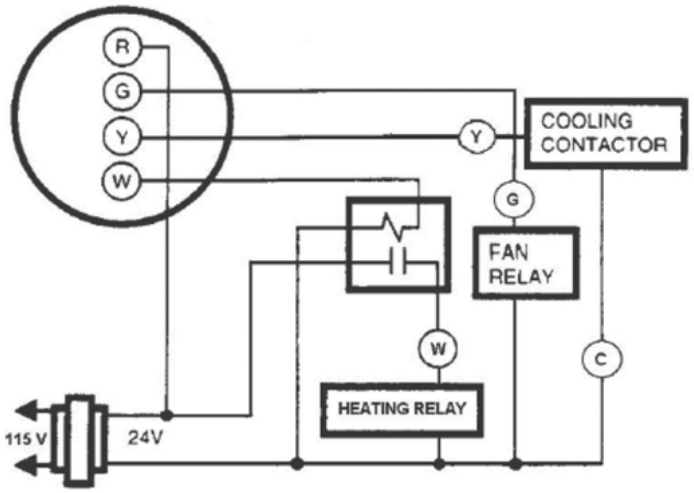
NOTICE

IMPORTANT - Honda MCHP unit will not operate without a battery. Use only battery specifically designed for use in Honda MCHP.

10.9 A/C Connection

- Suggest A/C compressor contactor connection be made directly to furnace's integrated furnace control in blower assembly compartment as shown in Figure 10-15.
- Connection should be routed through furnace's sheet metal opposite HI Module/return opening; leave service loop for future servicing of blower assembly.

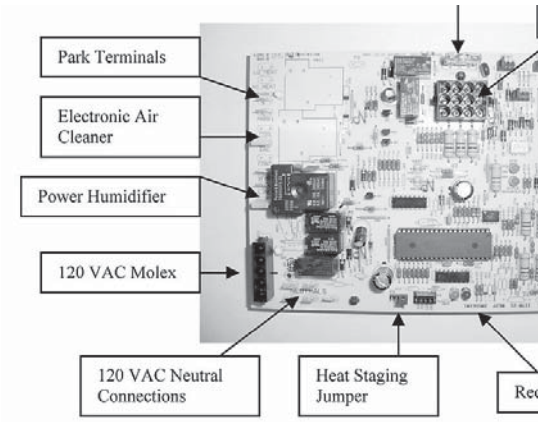
Figure 10-15 A/C Connection



10.10 Humidifier & Electronic Air Cleaner Connection

- Suggest use of Aprilaire 400 Humidifier for Warm Air **freewatt PLUS** System because of its resource conservation design includes float valve and wicking media design to conserve water. Figure 12-16 shows humidifier connections to integrated furnace control board.
- Suggest electronic air cleaner be connected to EAC connections on integrated furnace control board as shown in Figure 10-16 and in furnace installation manual.

Figure 10-16 Humidifier and EAC Connections



Refer to Electrical Schematic in Furnace Installation, Operation and Maintenance Manual.

NOTICE

Do not install/connect A/C compressor contactor leads to **freewatt PLUS** control module as damage may occur to control module. All connections should be made at furnace control board.

NOTICE

All HUM and EAC terminals are 120 VAC (1.0 Amp Max). DO NOT directly connect 24 VAC equipment to these terminals.

11 - FREEWATT TRANSFER SWITCH MODEL FTS-1.8

11.1 freewatt Transfer Switch Model FTS-1.8

- **freewatt** Transfer Switch is specifically designed for use with **freewatt PLUS micro-Combined Heat and Power system.**
- **freewatt** Transfer Switch provides automatic transfer of electric load from utility power source to MCHP unit. Under normal operation, no manual adjustments or switching are required by homeowner.
- **freewatt** Control module and **freewatt** Transfer Switch monitor utility power source for failure and monitor HONDA MCHP power source for electrical power output and proper operating conditions.
- **freewatt** Transfer Switch provides **freewatt PLUS** product line with reliable means of providing back-power to critical loads while preventing electrical feedback to utility from MCHP.
- **freewatt PLUS** product line provides backup power up to 1.8 kW and is limited in type, wattage, and number of loads that can be supported.
- **freewatt** Transfer Switch is certified only for use as part of **freewatt PLUS** System and should only be installed with **freewatt PLUS** System by qualified, trained installer.
- Please consult **freewatt** Transfer Switch 'Installation Operation & Maintenance Manual' for installation, operating and troubleshooting information.

Figure 11-1 freewatt Transfer Switch Model FTS-1.8

12 – APC UNIVERSAL TRANSFER SWITCH CONFIGURATION

⚠ WARNING

APC universal transfer switch is provided for use with **freewatt plus** system and is not intended for emergency backup power applications. Manufacturer is not responsible for the use of this switch in any manner not outlined in this manual or APC UTS6H Installation Guide.

12.1 APC Universal Transfer Switch

- Warm Air **freewatt PLUS** System incorporates APC Universal Transfer Switch as load panel in Back-Up Power Mode.
- UTS6H requires customized configuration in order to operate effectively with **freewatt PLUS** System. Following section will explain configuration process for this component.
- Set-up for APC Universal Transfer Switch (UTS6H) involves following System Configuration and Setup section in UTS's Installation Guide.
- Important notes about this product:

⚠ CAUTION

Improper configuration may result in improper operation of **freewatt PLUS** System in Backup Power Mode. Failure to follow these instructions could cause malfunction of system and result in death, serious bodily injury, and/or property damage. Read and follow these instructions before attempting installation, commissioning or operation.

NOTICE

Use only outlet mounted AFCI and GFCI circuit interrupters with the UTS. Do not connect UTS to circuits utilizing AFCI or GFCI circuit breakers in main electrical panel.

Circuit 1

- Circuit 1 includes Load attached to Circuit-labeled "1" and convenience outlet on front of UTS6H, together must consume less than 15 amps when system is operating in Backup Mode. If not using Uninterruptable Power Supply (UPS), it is recommended to use circuit 1 to power **freewatt PLUS** System's low power condensate pump.
- Circuit 1 is only powered by MCHP when in Backup Power Mode. It will not be powered from UPS if UTS6H is equipped and configured to use UPS. It is recommended that UPS be plugged into front convenience outlet and therefore is powered by Circuit 1.

Circuit 5 & 6

- Although all UTS circuits do not need to be used, Circuits 5 & 6 must be connected to main circuit panel and must receive power for UTS to function. Circuits 5 & 6 must also be connected to circuits that are in opposite phases, so 240V is present across two circuits. Allows UTS6H to monitor Utility power supply.

12.2 Uninterruptible Power Supply (UPS)

- If using UPS to power "uninterruptable" loads, plug UPS power input cord into convenience outlet to charge UPS batteries when MCHP Backup Power is available. Note, UPS batteries will also be charged from convenience outlet when grid power is available.
- Please follow UPS and UTS6H instructions for sizing UPS for loads configured to be powered by UPS in Backup Mode. Typically, low power circuits, such as computers or security systems, are configured for use with UPS.

12.3 Non-Delayable & Delayable Circuits

- Circuit assigned to **freewatt PLUS** furnace (or boiler) shown in examples on Circuit 3 must be configured as "Delayable-No" to ensure **freewatt PLUS** System always has power when in Backup Mode, otherwise system may not operate correctly.
- All other circuits must be configured as "Delayable-Yes" except in case of example where UPS is used and circuit source is configured as "UPS" or "Un-interruptable".

12.4 Hardwire Kit

- UTS6H is supplied with Hardwire Kit (PN 240007866) used to connect **freewatt PLUS** Transfer Switch to UTS6H. Hard-wire kit is installed in UTS6H and accepts cable delivering Honda generator's backup power output. Follow electrical schematics in this manual and instructions in Hard-wire Kit for installation.

NOTICE

To allow UTS6H to monitor utility power supply and sense power outage, Circuits 5 & 6 must be connected to circuits that are in opposite phases to ensure 240VAC is present across two circuits.

NOTICE

Mark all breakers in Electric Panel as moved to UTS6H for future reference.

12 – APC UNIVERSAL TRANSFER SWITCH CONFIGURATION

Table 12-1 Typical UTS6H Circuit Setup *without* UPS

Typical UTS Circuit Setup without UPS						
PARAMETER	**CIRCUIT 1**	**CIRCUIT 2**	**CIRCUIT 3**	**CIRCUIT 4**	**CIRCUIT 5**	**CIRCUIT 6**
Load Type	Other (condensate pump)	Sump pump	Furnace (warm air)	Computer	Security System	Refrigerator
Source	GEN	GEN	GEN	GEN	GEN	GEN
Delayable	Yes	Yes (1)	No	Yes	Yes	Yes
Max time off (min)	30	1	30	5	60	30
Min time on (min)	30	2	30	5	60	15
Security Mode	Off	Off	Off	Off	Off	Off
Amp Rating(A)	15	15	15	15	15	15

Note (1)

Delayable - Yes: Setting is required for Warm Air **freewatt PLUS** System (particularly 100 or 120 MBH furnace with 1 hp ECM blower motor) to prevent **freewatt PLUS** System or sump pump from losing power when in Backup Mode. If sump pump and furnace may operate at same time (power outages during heating season and heavy rain events), possible solutions include:

A. Battery-backed sump pump

B. UPS and configure sump pump power source as “Either” UPS or Generator.

Table 12-2 Typical UTS6H System Setup *without* UPS

Typical UTS6H System Setup *without* UPS	
Bypass mode	No
Load shedding?	On
Voltage sensitivity	Medium
Time Management	On
Reset Energy Meter	No
System Test	No
Backup1 Source Type	Generator
GEN power rating	1700 (1)
GEN SRGE Overload Time	0 seconds
GEN Start Mode	manual
Backup2 Source Type	none
GEN power rating	1800
GEN SRGE Overload Time	0 seconds
Reset to default	no

NOTE:

(1) Available generator power is set to 1,700 watts to account for 100 watt power consumption of load balancing transformer.

12 – APC UNIVERSAL TRANSFER SWITCH CONFIGURATION

Table 12-3 Typical UTS6H Circuit Setup *with* UPS

Typical UTS Circuit Setup *with* UPS						
PARAMETER	**CIRCUIT 1**	**CIRCUIT 2**	**CIRCUIT 3**	**CIRCUIT 4**	**CIRCUIT 5**	**CIRCUIT 6**
Load Type	Other (condensate pump)	Sump pump	Furnace (warm air)	Computer	Security System	Refrigerator
Source	GEN	EITHER	GEN	EITHER	EITHER	GEN
Delayable	Yes	Yes	No	Yes	Yes	Yes
Max time off (min)	30	1	30	5	60	30
Min time on (min)	30	2	30	5	60	15
Security Mode	Off	Off	Off	Off	Off	Off
Amp Rating(A)	15	15	15	15	15	15

Note: UPS power output cord shall be attached to “UPS” inlet port of the UTS6H.

Table 12-4 - Typical UTS6H System Setup *with* UPS

Typical UTS6H System Setup *with* UPS	
Bypass mode	No
Load shedding?	On
Voltage sensitivity	Medium
Time Management	On
Reset Energy Meter	No
System Test	No
Backup1 Source Type	Generator (1)
GEN power rating	1700 (2)
GEN SRGE Overload Time	0 seconds
GEN Start Mode	manual
Backup2 Source Type	UPS (3)
GEN power rating	2100 (4)
GEN SRGE Overload Time	0 seconds
Reset to default	no

Notes:

1. **Generator:** Corresponds to 240VAC GEN port on UTS6H.
2. **GEN Power Rating (Backup1)**: Set to 1,700 watts to account for 100 watt power consumption of load balancing transformer.
3. **UPS:** Corresponds to UPS inlet port on UTS6H.
4. **GEN Power Rating (Backup2):** Corresponds to 1,700 watts of MCHP power **PLUS** UPS power rating (in this case 400 watts).

13 – DOMESTIC WATER HEATING RECIRCULATION LOOP (MODEL WDJ ONLY)

13.1 Domestic Water Heating

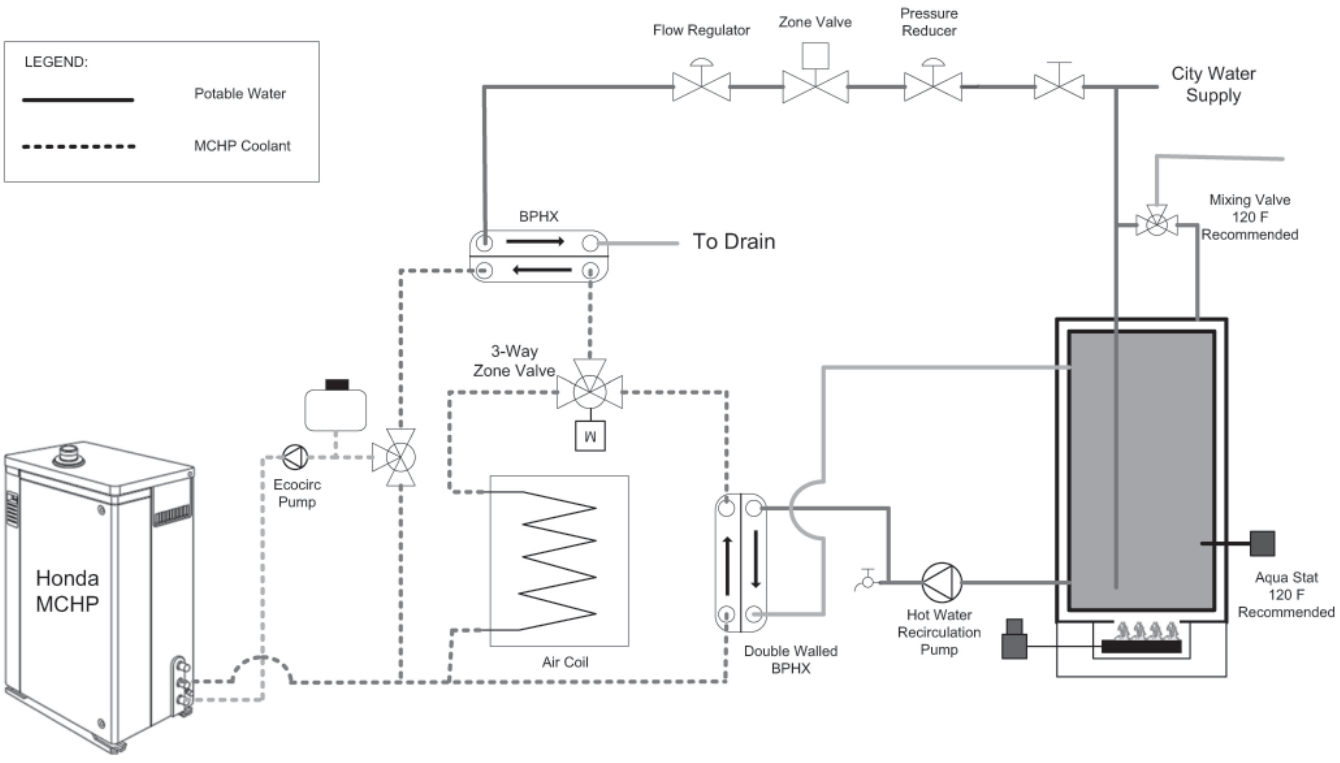
Model WDJ incorporates domestic water heating into Warm Air **freewatt PLUS** System and transfers heat directly from MCHP's coolant to potable water through double-walled brazed plate heat exchanger.

13.2 Model WDJ Mechanical Schematic

HI module for WDJ system incorporates two separate coolant paths that allow operation in Central Heating Mode and Domestic Hot Water Mode.

- Central Heating Mode: Mode has coolant flow through air coil heat exchanger, three-way zone valve and then heat rejection brazed plate heat exchanger. Allows coolant's heat to be transferred into building's space and then, if in Backup Mode, uses heat rejection to thermally manage coolant's temperature to within its operating range.
- Domestic Hot Water Mode: Coolant flows through double walled braze plate heat exchanger, three-way zone valve and then heat rejection brazed plate heat exchanger. Double walled braze plate heat exchanger has potable water flowing through secondary side from direct-fired water heater which allows water heater's temperature to rise to over 160° F while in this mode of operation.
- Hot Water Recirculation Pump (field supplied): Recommended model Grundfos UP-10 or Taco 003 or equivalent.
  - Pump Housing: Brass/Bronze (suitable for potable water).
  - Electrical: 115 VAC, single phase 0.5 amps maximum* (* If pump current draw exceeds 0.5 Amps, an isolation relay will be required.)
  - Head Range: 0-5 feet.
  - Flow Range: 0-3 gpm.
  - Maximum Fluid Temperature at least 180°F
- Anti-Scald Mixing Valve (field supplied): Although WDJ arrangement helps increase water heater's capacity, it also requires Anti-Scald mixing valve to be installed on outlet of water heater to ensure proper water temperature being supplied to tap, shower head or final use. See Figure 13-1.
- Heat Rejection Water: Piping is shown as being routed to drain. **DO NOT** use condensate pump this may not be sized to accommodate flow and will also use electric power.

Figure 13-1 WDJ Mechanical Schematic



13 – DOMESTIC WATER HEATING RECIRCULATION LOOP (MODEL WDJ ONLY)

13.3 Mechanical Connections

Mechanical connections for WDJ's domestic water heating recirculation loop are made on back of HI module and allow ½" NPT male threaded fittings to be attached to double-walled braze plate heat exchanger. Bold thick lines represent flowing conditions during this mode of operation.

Figure 13-2 WDJ Flow: Grid Power – Central Heating

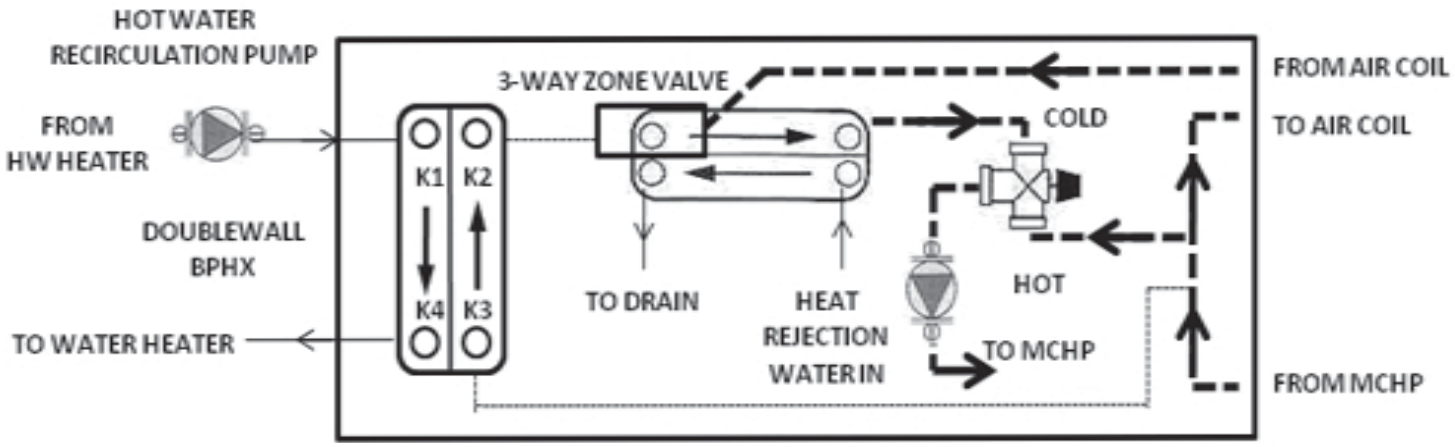


Figure 13-3 WDJ Flow: Grid Power – Water Heating

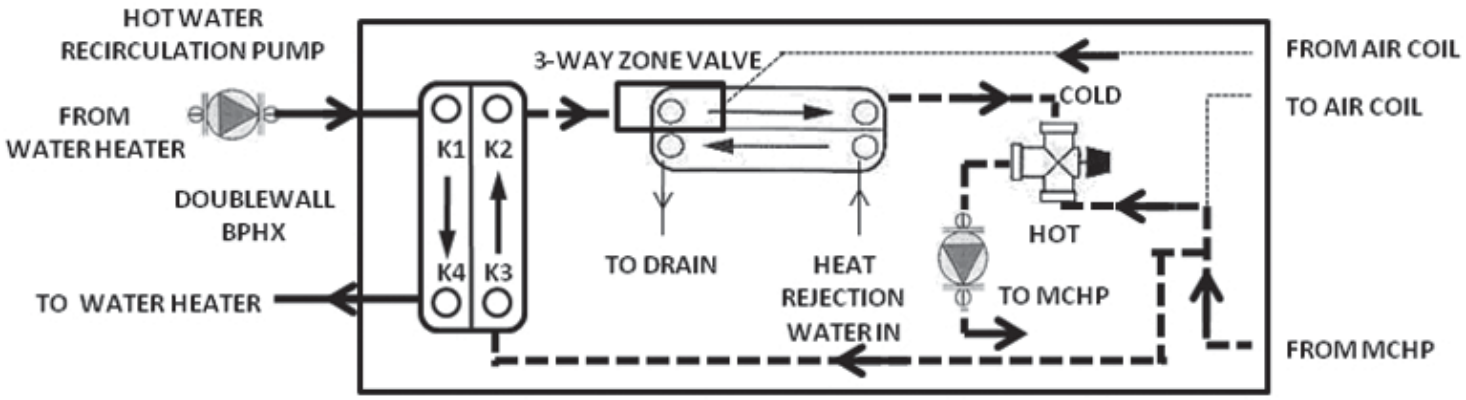
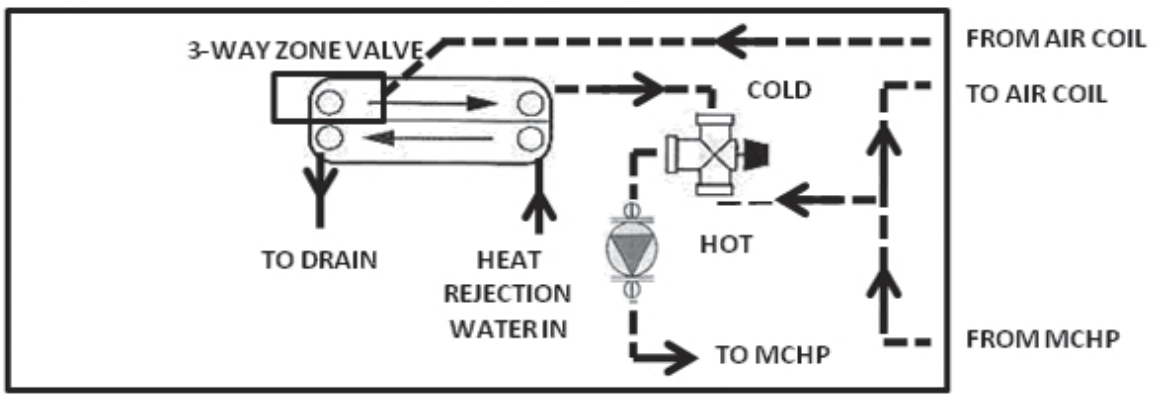


Figure 13-4 WDJ Flow: Backup Power – Heat Call



13 – DOMESTIC WATER HEATING RECIRCULATION LOOP (MODEL WDJ ONLY)

Figure 13-5 Backup Power – No Heat Call

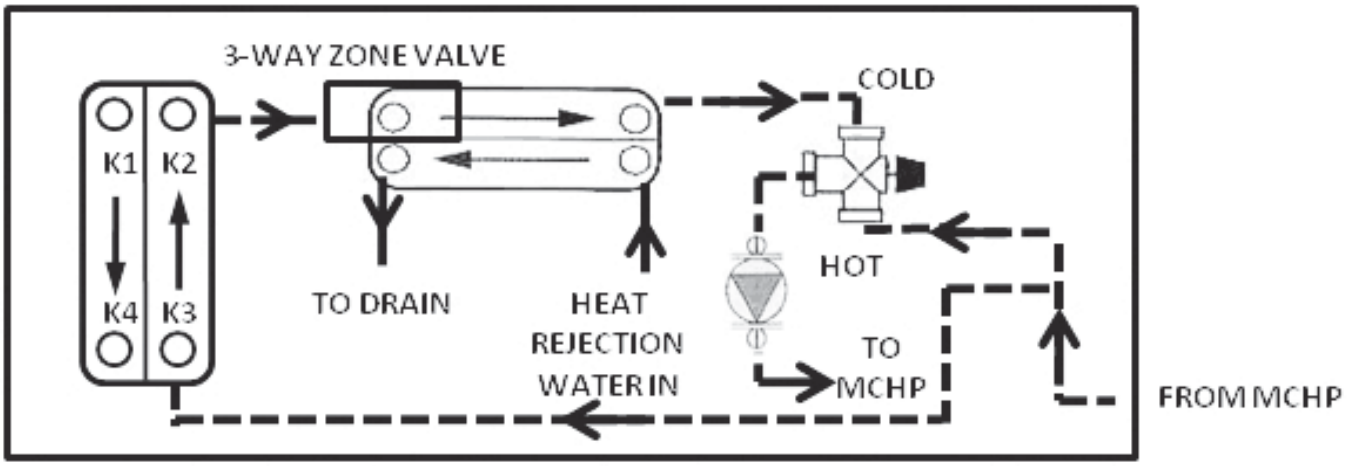
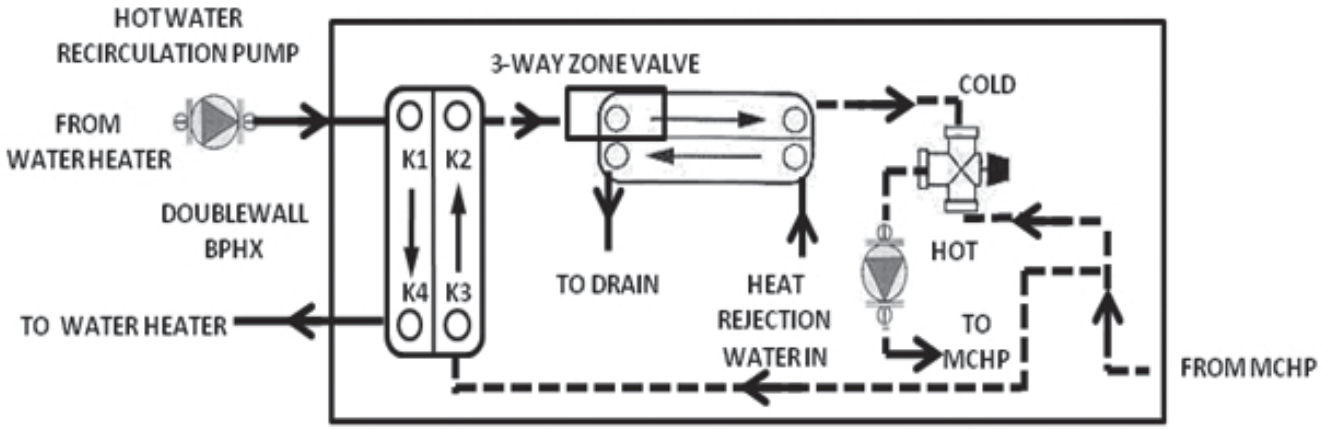


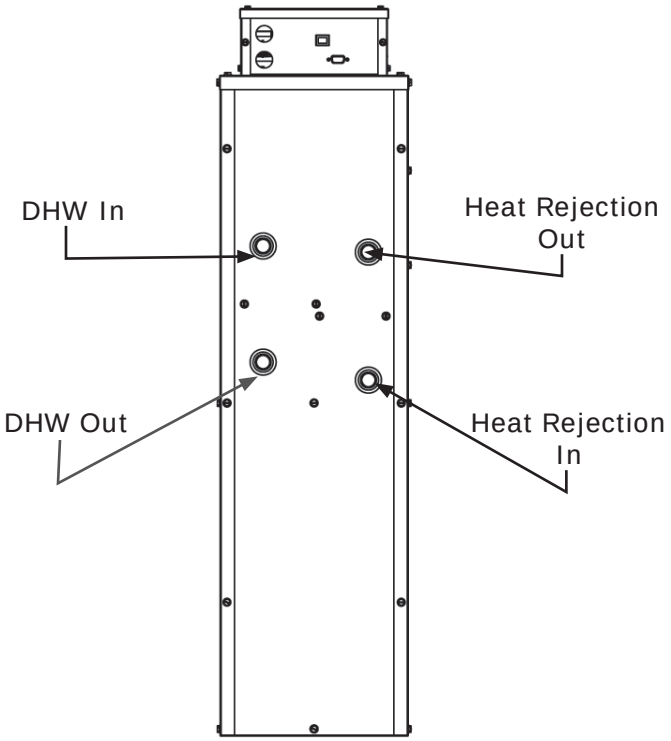
Figure 13-6 Backup Power – Water Heating



13.4 Mechanical Connection Method

- 1/2" NPT Female connections are provided on back of HI Module. Install 1/2" NPT Male fittings with Teflon tape and pipe joint compound to ensure proper seal.
- Use ½" or larger diameter tubing to deliver water through system.
- Connect domestic hot water recirculation pump (field supplied) to lower side tapping on water heater which supplies water to double wall BPHX. Heated water is then returned to upper side tapping on water heater. Tee into drain valve and T&P relief valve connections if dedicated side tappings are not available on water heater. (A longer stem T&P relieve valve may be required.) Use of existing cold and hot connections on top of water heater is not recommended as short-circuiting of water flow may occur.

Figure 13-8 Back Panel of WDJ HI Module



13.5 Integrated Direct-Fired Water Heater

Warm Air **freewatt PLUS** System, Model WDJ, is integrated with power vented direct-fired water heater to incorporate water heating into system. See Table 13-1 for power vented direct-fired water heaters that are compatible with Warm Air **freewatt PLUS** System, Model WDJ. It is not recommended to integrate other types of water heaters with this system as control mechanisms may not perform properly.

NOTICE

Verify Warm Air **freewatt PLUS** System, Model WDJ, is integrated with water heater found on following page or equivalent to ensure proper operation. If water heater is not of correct type, control strategy of WDJ system may not properly monitor and control water heater's operation and therefore may perform unsatisfactorily.

NOTICE

Direct-fired water heater is not supplied by ECR International and therefore is not covered under **freewatt** warranty. Please review warranty supplied by water heater manufacturer.

13 – DOMESTIC WATER HEATING RECIRCULATION LOOP (MODEL WDJ ONLY)

Table 13-1 Approved Water Heaters for use with the Warm Air freewatt PLUS System, Model WDJ

Manufacturer	Name	Model No.	Tank Cap.	Input Rating	Energy Factor	Energy Star
			(gal)	BTU/hr	Ef	
American Water Heaters	PowerFlex Power Vent	PVG62-50T42-NV	50	42,000	0.66	Yes
American Water Heaters	PowerFlex Power Vent	PVG62-50T60-NV	50	60,000	0.66	Yes
American Water Heaters	PowerFlex Power Direct Vent	PDVG62-50T42-NV	50	42,000	0.66	Yes
American Water Heaters	PowerFlex Power Direct Vent	PDVG62-50T60-3NV	50	60,000	0.66	Yes
A.O Smith	ProMaxSL	GPVT-40L	40	40,000	0.65	No
A.O Smith	ProMaxSL	GPVT-50L	50	50,000	0.65	No
A.O Smith	ProMaxSL	GPVX-50L	50	62,500	0.65	No
A.O Smith	ProMaxSL	GPS-75L	74	80,000	N/A	No
A.O Smith	ProMax	GPVR-40	40	40,000	0.67	Yes
A.O Smith	ProMax	GPVT-50	50	50,000	0.65	Yes
A.O Smith	ProMax	GPVT-40	40	50,000	0.65	Yes
A.O Smith	ProMax	GPVX-50	50	62,500	0.65	Yes
Bradford-White	TTW1	M-1-TW-40S6FBN	40	40,000	0.63	Yes
Bradford-White	TTW1	M-1-TW-50S6FBN	50	40,000	0.63	Yes
Bradford-White	TTW1	M-1-TW-60T6FBN	60	42,000	0.63	Yes
Bradford-White	TTW2	M-2-TW-50T6FBN	48	67,000	0.66	Yes
Bradford-White	TTW2	M-2-TW-65T6FBN	65	70,000	0.63	Yes
Bradford-White	Res. Power Direct Vent	PDX2-50T6FBN	48	60,000	0.62	Yes
Bradford-White	Res. Power Direct Vent	PDX2-65T6FBN	65	65,000	0.60	No
Bradford-White	Res. Power Direct Vent	PDX2-75T6FBN	75	70,000	0.59	No
Rheem/Ruud	Power Vent	42VP50FW/PVP50FW	50	42,000	0.64	Yes
Rheem/Ruud	Power Vent	42VP50FW/PVP50FW	50	42,000	0.64	Yes
Rheem/Ruud	Power Vent	42VP60FW/PVP60FW	60	55,000	0.62	Yes
Rheem/Ruud	Power Vent	42VP75FW/PVP75FW	75	55,000	0.57	No
State Industries	Select Power-Vent	GS6 40 YBVIT 2	40	40,000	0.67	Yes
State Industries	Select Power-Vent	GS6 50 YRVIT	50	50,000	0.65	Yes
State Industries	Select Power-Vent	GS6 50 YRVIT 5	50	62,500	0.65	Yes
State Industries	Select Direct-Vent	GS6 40 YBPDT	40	40,000	0.6	No
State Industries	Select Direct-Vent	GS6 50 YBPDT	50	40,000	0.59	No
State Industries	Select Direct-Vent	GS6 50 YBPDT 5	50	65,000	0.58	No
State Industries	Select Direct-Vent	GS6 75 YBPDT	75	70,000	0.58	No

WDJ series warm air **freewatt PLUS** System is designed to work with any direct fired, power vented, non-condensing storage tank type water heater. Based on specifications available at time of publication, ECR International has determined water heaters listed above should be compatible with WDJ series **freewatt PLUS** models. This listing is simply for specifier's convenience and is representative sampling of available models. It is not an all inclusive list. It is understood there are other compatible brands and models.

13.6 System Electrical Schematic

High Voltage - 120 VAC Volts:

High voltage circuits included in domestic water heating recirculation loop include connection of factory-supplied pigtail (connected to J01) to hot water recirculation circulator (Grundfos UP10 or equivalent – certified for potable water use). This cable can be connected in control module with wire nuts and routed to circulator according to latest applicable NEC code and electrical schematic found in this manual. High voltage connections are shown in Figure 13-9,

Low Voltage:

Low voltage connections for WDJ control module are shown in Figure 13-10.

Figure 13-9 120 VAC Connections

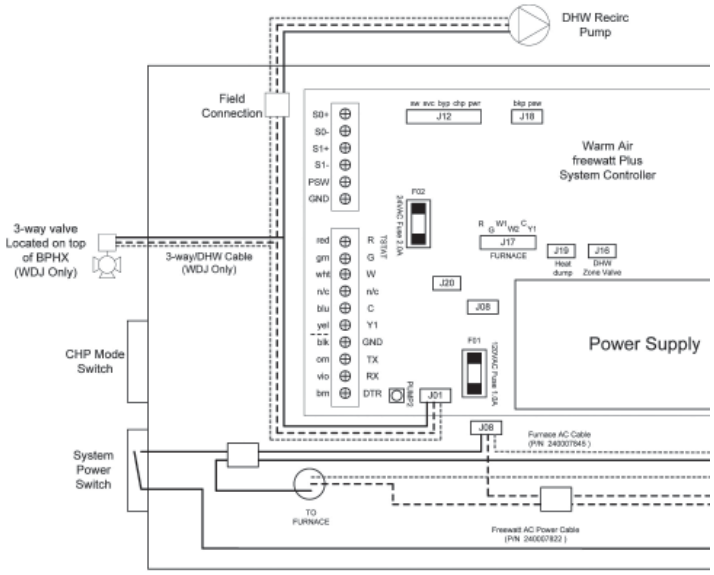
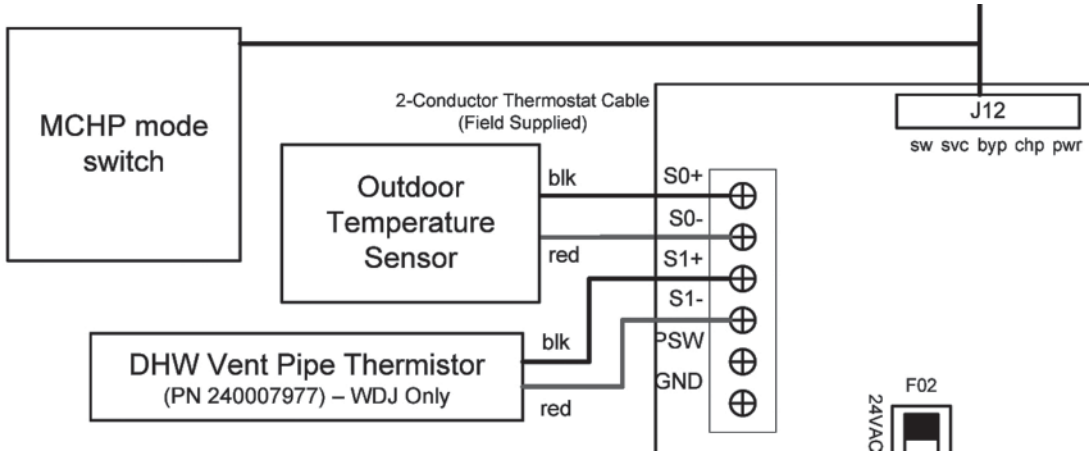


Figure 13-10 Control Module Low Voltage Connections



13.7 PVC Vent Thermistor Installation

Installation of PVC vent thermistor is required to provide signal water heater is operating.

- Install thermistor on outside of 2" or 3" PVC vent pipe of water heater (See Figure 13-11);
- Locate thermistor within first 3 linear feet of PVC vent pipe from water heater;
- Thermistor is supplied with insulating foam and clamps. Place Insulating foam on top of thermistor to hold it against PVC pipe and insulate from surroundings.
- Tighten cable ties to securely hold foam/thermistor in place;
- Route back two-wire cable to control module, inserted through low-voltage knockout and then connected to Control board shown in Figure 13-13.

⚠ WARNING

Turn off electrical power supply at service panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so could cause severe personal injury or death.

NOTICE

Route two-wire cable in a path preventing cable from being secured within 1 foot(.30 m) of any low or high voltage wiring. Preventing any disturbance of thermistor's signal and ensuring proper operation of **freewatt PLUS** System.

Figure 13-11 Water Heater Exhaust Thermistor Location

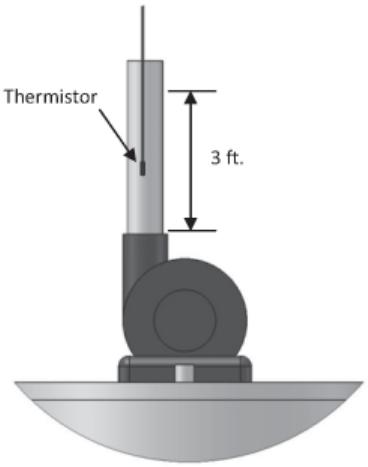


Figure 13-12 - Final Configuration

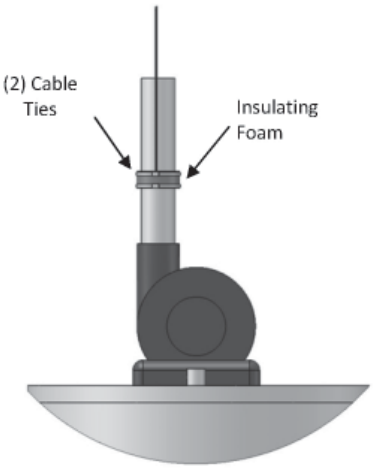
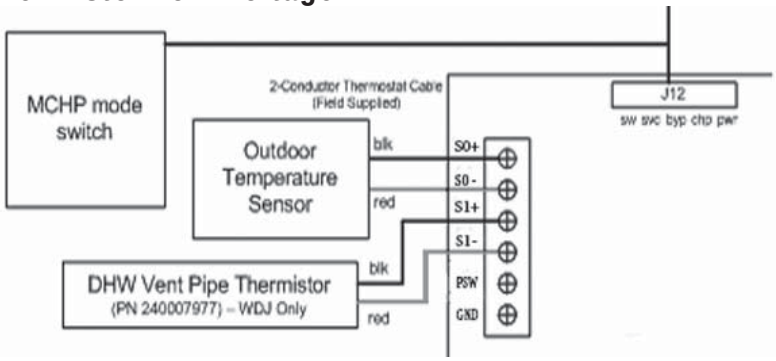


Figure 13-13 Exhaust Thermistor Low Voltage



14 – CONTROLS AND ACCESSORIES

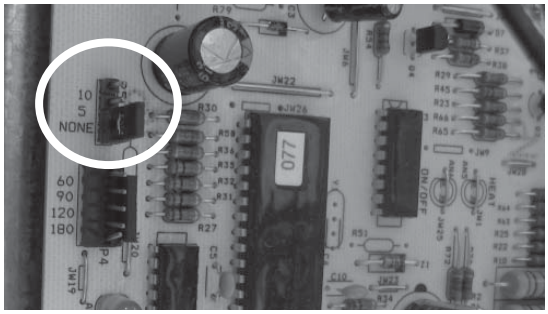
Section provides description of key controls and accessories found in system. See Section 18, for sequence of operation. See "Repair Parts Manual" for locations of components and accessories described.

14.1 Furnace

Furnace is Category IV, natural gas-fired, high efficiency (95% AFUE), condensing warm air furnace. Furnace has integrated furnace control and is factory-set for proper operation. Some steps may be necessary to properly commission system, these are found in furnace installation manual. It is suggested to use jumpers available to improve furnace's operation:

- **Adjusting Blower Speeds:** There are three sets of 4 position movable jumpers for HEAT, COOL and ADJUST taps for variable speed motor. Jumpers will only impact ECM motor's speed & furnace's air flow without impacting other operation on integrated furnace control.
- **Adjusting Continuous Fan Mode:** Continuous fan mode is factory set to be 50% of COOL mode speed. If COOL mode speed is changed, continuous fan speed is changed.
- **HEAT Staging Jumper:** HAI Thermostat is single stage thermostat and will require HEAT Staging Jumper to be in "None" position to ensure proper 2nd stage operation of furnace. **freewatt** System will control second stage furnace operation.

Figure 14-1 Heat Staging Jumper



14.2 Hybrid Integration (HI) Module

HI Module has three areas within its jacket.

- Control Module (upper electrical cabinet) includes,
  - A. Microprocessor based controller and wiring compartment.
  - B. LED's, power switches and communication ports.
- mid-level mechanical cabinet holds:
  - A. Mechanical sub-assembly consists of mixing valve, coolant reservoir, pump, heat rejection brazed plate heat exchanger, double wall domestic hot water brazed plate heat exchanger (WDJ only). Mixing valve will be set during system's commissioning and delivers coolant to pump, which then delivers coolant to Honda MCHP unit. Coolant reservoir holds spare coolant and is also instrumental in proper commissioning of system.
- lower return air cabinet holds:
  - A. High efficiency air filter provides air filtration for dwellings air stream and is major component of ensuring proper indoor air quality and comfort.
  - B. Air coil heat exchanger is designed to transfer heat from coolant fluid into return air stream.

14.3 Honda MCHP Unit

- Honda MCHP Unit is custom-engineered micro-combined heat and power module integrated into Warm Air **freewatt PLUS** System.
- MCHP unit is designed to start and stop by means of digital signal from control module, when control module decides there is demand for heat in dwelling.
- MCHP unit is ETL certified for grid interconnection and if your state allows, unit can deliver electrical power back into the grid. Unit also provides control module with system operating data and diagnostic data.
- More details on MCHP unit can be found in Honda MCHP (MCHP1.2D/DP (Type UCFJ) Installation Manual and Owners Manual.

14.4 Communicating Thermostat

freewatt communicating thermostat has ability to communicate directly with control module. Feature allows control module to download settings and maximize system's electrical power generation, also providing higher level of comfort to dwelling.

14.5 Outdoor Temperature Sensor

System uses outdoor temperature sensor to anticipate need for heat demand within dwelling by tracking outdoor temperature. As outdoor temperature falls, control module will determine optimum temperature to activate MCHP unit and provide thermal comfort, also maximizing generation of electrical power.

14.6 Internet Connection

Control module can connect to high-speed internet connection (Broadband cable, DSL, etc.) and can be configured to allow your service provider to continuously monitor your system's operating characteristics. If system has any operating characteristics that are outside their normal operating range, system controller will notify service provider of abnormality.

14.7 Website

Control module has website address assigned to system at factory. Allows homeowner and service provider to monitor or control system's operation.

14.8 External Condensate Pump

External float activated condensate pump with integral sump is required for installation where there is no floor drain or other appropriate drainage receptacle available to receive condensate from system (furnace and MCHP unit). Condensate pump can be piped to remote tie-in point to sanitary sewer system (Please follow all state or local regulations regarding disposal of condensate). For this application, system must be installed so proper pitch can be placed on piping to deliver condensate safely to external condensate sump. Use concrete blocks to raise system as required for proper installation. Base of furnace and MCHP unit should be at same elevation above floor to ensure proper operation of system.

14.9 Exhaust Gas Leak Sensor

Exhaust Gas Leak Sensor monitors integrity of Honda MCHP unit combustion system and shuts down MCHP unit if certain potentially unsafe conditions are detected. By monitoring carbon monoxide level in air space near MCHP unit, sensor signals Honda MCHP unit of potentially unsafe conditions. Sensor is independent of, and separate from, audible CO alarming system also installed with Warm Air **freewatt PLUS** System in compliance with best practices for all fuel-fired central heating equipment. System is required to commission Warm Air **freewatt PLUS** System.

14.10 Concentric Vent/Air Intake Termination (Optional)

Optional concentric vent/air intake termination utilizes single opening for furnace through wall or roof of structure. MCHP unit will only require use of exhaust vent.

14.11 Heat rejection kit (sold separately) required for installation.

Heat rejection system is required for back up power mode operation during times when no space heating or water heating is required.

Water cooled heat rejection kit (PN 550002037) should be used when there is uninterruptable supply of water during power outage. Kit ties into main water supply line and discharges water to appropriate drain.

Air cooled heat rejection kit (FWHRJA000A) should be used when there is not an uninterruptable supply of water during outage (most houses with well pumps). Air cooled heat rejection system is vertically arranged side discharge fan-coil unit with closed coolant loop designed for outdoor installation.

15 – CONTROL MODULE FEATURES

15.1 Control Module Design

Control module incorporates relay/interconnect board, advanced microprocessor computer board, DC power supply, RS-232/RS-485 serial ports and 10/100 Base-T Ethernet port. Control module operates in combination with display/user interface (ie. laptop computer or PDA) for both information and operation purposes. Control module requires **freewatt** communicating thermostat and outdoor sensor to operate properly.

15.2 Control Module Functions

Control module integrates furnace and Honda MCHP with communicating thermostat, outdoor temperature sensor and remote locations. Communicating thermostat and outdoor temperature provide system controller with settings and temperatures.

Proprietary heating control algorithm maximizes MCHP run time and minimizes furnace run time in response to heat demand to maximize comfort and energy cost savings.

15.3 Display/User Interface

Homeowner can use personal computer on their home network or remotely to scroll through control settings and change operating settings to customize their **freewatt PLUS** , with appropriate internet connection and settings. See **freewatt PLUS** User's Information Manual for more information on using embedded **freewatt** webpage.

15.4 Internet Connection

Control Module connects to customer's home network in same way any computer or network appliance does – by connecting via Ethernet connection available on most mass market routers. **freewatt PLUS** connection uses 10/100 Mbit/s wired Ethernet connection, wireless bridges may be used when wired connection isn't possible.

Control module is assigned a static address outside of any DHCP range available from router. IP address, gateway, and DNS addresses will need to be programmed into Control module using **freewatt PLUS** service tool.

Configure router to allow incoming traffic for diagnostics and embedded customer webpage. Routers refer to settings as 'port forwarding', 'applications', or 'virtual servers'. Refer to router manufacturer documentation. Remote diagnostics requires **port 4500** be directed to **freewatt PLUS** controller, customer webpage must be directed to **port 8082**.

If wireless configuration is required, number of wireless bridge or gaming bridges have been tested to work with control module. Configure using manufacturer instructions.

Connect to System Controller using **freewatt PLUS** service tool to apply network settings to **freewatt PLUS** controller.

1. Select "Network Setup"
2. Default settings are DHCP – Check to see if you get an IP Address in the "Router" text box. If so, proceed to the next step.
   A. If you do not get IP address in "Router" text box, check wiring, and verify you have internet connection
3. Select "Use Manual"
4. In "IP Address" text box, change ast three digits of this field to .200 (xxx.xxx.x.200)
5. Select "Use OpenDNS"
6. Select "Update"

Disconnect and restart **freewatt** service tool. After reconnecting to system, check Network Status in "Network Setup". If Network status is OK then open web browser and type http://xxx.xxx.x.200:8082 (Use actual IP address from "IP Address" text box) and you should be directed to **freewatt** status page. DDNS service may be used to support dynamic IP addresses.

If homeowner has signed monitoring consent form, turn on reporting from **freewatt PLUS** system to **freewatt PLUS** system telemetry server:

1. While connected to the freewatt with the freewatt service tool, select "Alerting Setup"
2. Verify database address is telemetry.freewatt.com
3. Verify sampling rate is 86400 (one report per day)
4. Click Enable Sampling Checkbox
5. Click update
6. Disconnect service tool from **freewatt PLUS** system.

Please contact **freewatt** technical service for more details concerning connection.

16 – COMMISSIONING AND STARTUP

16.1 System commissioning and start up procedures, refer to separate document in literature packet entitled ***freewatt*** *WAJ/WDJ Warm Air System Commissioning Procedure. Refer to section* 18 or to commissioning procedure document for basic **freewatt** System sequence of operation.

17 – MAINTENANCE AND CLEANING

⚠ WARNING

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

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

Always verify proper operation after servicing.

Furnace and Honda MCHP unit have specific maintenance and cleaning procedures outlined in their installation, operation and maintenance manuals provided with this manual. Please review these manuals before proceeding to system procedures found below.

Regular service and maintenance by qualified service agency must be performed to ensure safe, trouble-free operation and maximum efficiency. Recommendation is for servicing or inspecting system at least once every 12 months.

17.1 Beginning of Each Heating Season

1. Schedule annual service call by your **freewatt** dealer or other certified service agency, which includes:

A. Furnace: Examine furnace per its annual inspection/service procedures outlined in its Installation, Operation and Maintenance Manual. Inspections include, but are not limited to:

i. Heat Exchanger

ii. Burners

iii. Drainage

iv. Combustion Fan (Inducer)

v. Circulating Fan

vi. Electrical

vii. Condensate Drain

viii. Intake Air and Exhaust Piping

ix. Furnace Operation (Safeties, Temperature Rise & Burner Ignition)

B. Hybrid Integration (HI) Module: Examine HI Module per its annual inspection/service procedures outlined below:

i. Control module: Check control module's functions through laptop computer or PDA. Detailed procedures are found in MINT Tool Supplemental.

ii. Communication/Electrical Connections: Inspect connections to and within HI Module to verify they are secure and connected properly.

iii. Bypass Switch: Depress bypass switch and operate furnace to verify this switch is working properly.

iv. Coolant Level: Check coolant level in coolant tank and fill with coolant, if necessary.

v. Mixing Valve: While system is operating, check coolant temperature being delivered by the valve. Check for leaks and fix, if necessary.

vi. Pump: Inspect pump and connections. Check for leaks and fix, if necessary.

vii. Coolant Tubing and Connections: Inspect coolant tubing and connections for leaks and fix, if necessary.

viii. Air Filter: Check air filter and replace, if necessary.

ix. Air Coil Heat Exchanger: Inspect heat exchanger for cleanliness and remove any debris, if necessary.

C. Honda MCHP unit: Honda MCHP unit requires periodic inspection by certified **freewatt PLUS** service professional to maintain acceptable performance and ensure safe operation. Inspection/service procedures are outlined in unit's Owner's Manual. Services are typically required every 6,000 hours, so operating time of unit will directly impact service interval. Inspections include, but are not limited to:

i. Starting Ease

ii. Oil Leakage

iii. Engine Coolant

iv. Breather Tube

v. Condensate and Condensate Drain

vi. Air Cleaner Element

vii. Intake Air and Exhaust Piping

viii. Ventilation Air Inlet and Outlet

ix. Coolant Tubing and Connections

x. Electrical System and Connections

xi. Communication System and Connections

xii. Replace:

1. Engine Oil and Drain Washer.
2. Engine Oil Filter Cartridge.
3. Spark Plugs.
4. Adjust Clearance Between Tappets.
5. Breather Separator.

Honda MCHP Owner's Manual outlines specific maintenance intervals (6,000, 12,000, 18,000 & 24,000 hours) and requirements for each interval. Maintenance should be conducted by **freewatt PLUS** service professional to maintain acceptable performance and safe operation of your Honda MCHP.

17.2 Air Filter

It is recommended filter is inspected frequently and cleaned as necessary. Homeowner should perform monthly inspections upon initial system installation. Filter should generally be replaced after 90 day's of continuous operation. Actual required frequency of air filter cleaning and/or replacement will be specific to each home's experience and conditions.

Avoid use of 1" fiberglass filters, which can become blocked quickly and result in higher power consumption and higher operating temperatures.

⚠ CAUTION

Do not operate furnace for prolonged periods of time without air filter.

Portion of dust entrained in air may lodge in supply air duct-work and registers. Any recirculated dust particles will be heated and charred by contact with furnace's heat exchanger. Residue will soil ceilings, walls, drapery, carpets, and other household articles.

NOTICE

If two return air inlets are used, both must be equipped with filters.

Seat filter properly in air filter bracket to ensure no air can bypass filter, when installing new filter and after shutting system down.

RECOMMENDED:

It is suggested to use double wall, metal supported pleated filter (16" x 25" x 4") having MERV 8 rating and provides outstanding performance for indoor air quality, such as Purolator FMEX40 or equivalent.

17.3 Draining Procedure

It may be necessary to drain system during maintenance operations. Follow procedure below:

NOTICE

Use caution while servicing and disposing of coolant in proper manner. MCHP coolant is 50/50 ethylene glycol solution and is toxic. Glycol is specially formulated with bittering agent to discourage ingestion.

Wait for coolant to cool down if system has been operating. Several hours may be necessary to cool coolant fluid to safe working temperature.

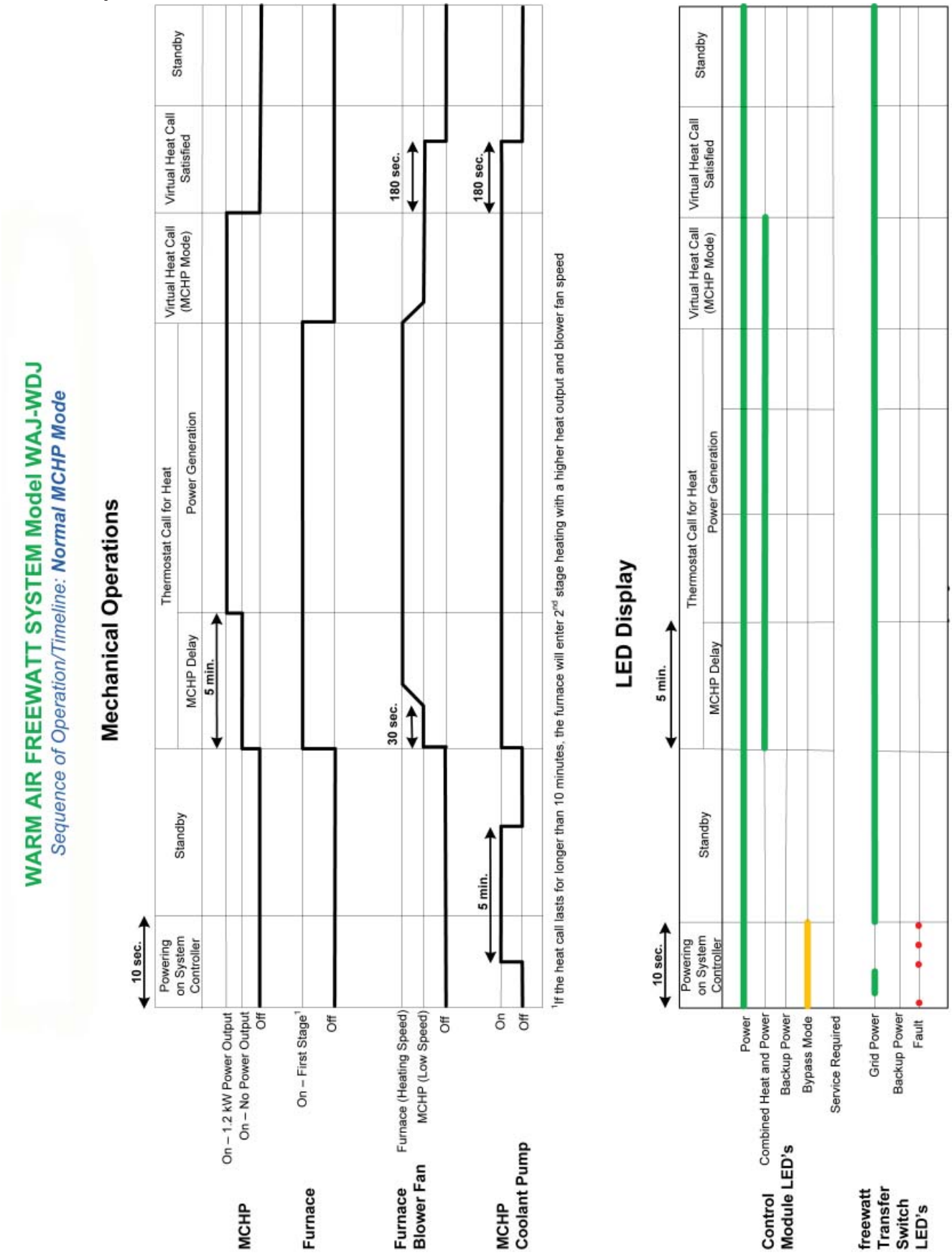
Use precautions while collecting coolant. Coolant may flow at high rate due to pressure in system.

Verify tubing loops are open to prevent any vacuum effect to adversely impact draining operation. If coolant has under 24,000 hours of operation and is clean, reuse when refilling system.

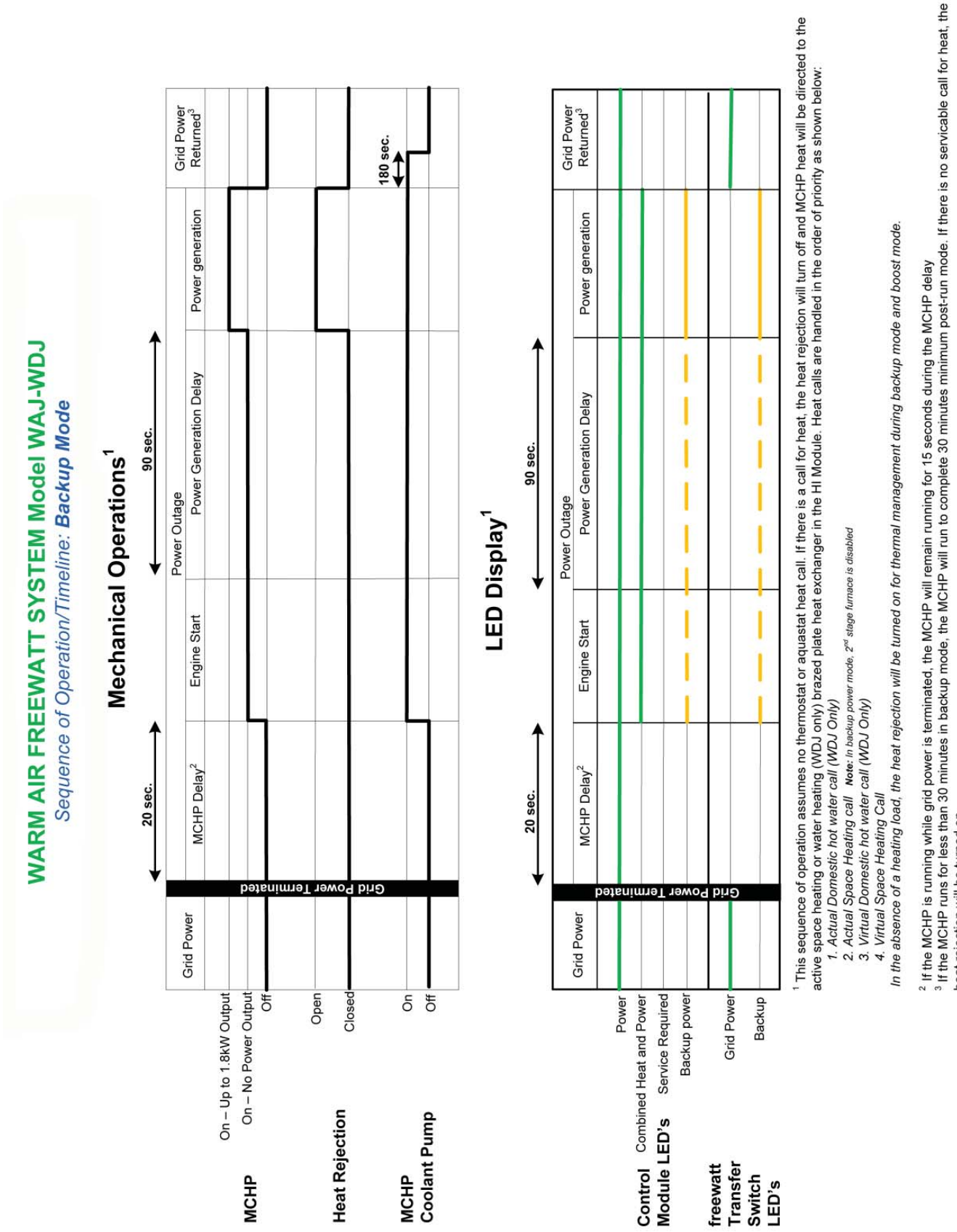
It is recommended to evacuate lines with aid of LOW pressure (under 5 psi) compressed air. Alternatively, hand pump can be used.

1. Shutdown Procedure:
   A. Preferred Method: Set thermostat to OFF by pressing Mode button until display reads OFF. Turn SYSTEM POWER switch to off after shut down cycle of approximately three minutes is completed.
   B. Emergency Method: Turn SYSTEM POWER and BYPASS switch to OFF. MCHP may overheat and flash error message due to coolant pump turning off.
2. Inspect coolant connections on MCHP unit and integral brass drain valve when coolant achieves a safe working temperature.
3. Place towel under drain valve.
4. Verify valve's position is OFF, slowly remove drain cap.
5. Connect short hose to drain valve and extend to coolant container pan.
6. Open valve and evacuate coolant from system. Coolant tank's cap may need to be taken off to remove vacuum.

Sequence of Operation / Timeline - Normal MCHP Mode



Sequence of Operation / Timeline - Backup Power Mode



[1] This sequence of operation assumes no thermostat or aquastat heat call. If there is a call for heat, the heat rejection will turn off and MCHP heat will be directed to the active space heating or water heating (WDJ only) brazed plate heat exchanger in the HI Module. Heat calls are handled in the order of priority as shown below:

1. *Actual Domestic hot water call (WDJ Only)*
2. *Actual Space Heating call* **Note:** *In backup power mode, 2nd stage furnace is disabled*
3. *Virtual Domestic hot water call (WDJ Only)*
4. *Virtual Space Heating Call*

In the absence of a heating load, the heat rejection will be turned on for thermal management during backup mode and boost mode.

[2] If the MCHP is running while grid power is terminated, the MCHP will remain running for 15 seconds during the MCHP delay

[3] If the MCHP runs for less than 30 minutes in backup mode, the MCHP will run to complete 30 minutes minimum post-run mode. If there is no servicable call for heat, the heat rejection will be turned on.

19 – ELECTRICAL SCHEMATIC

Figure 19-1 240 VAC Wiring, Warm Air freewatt PLUS System, WAJ/WDJ

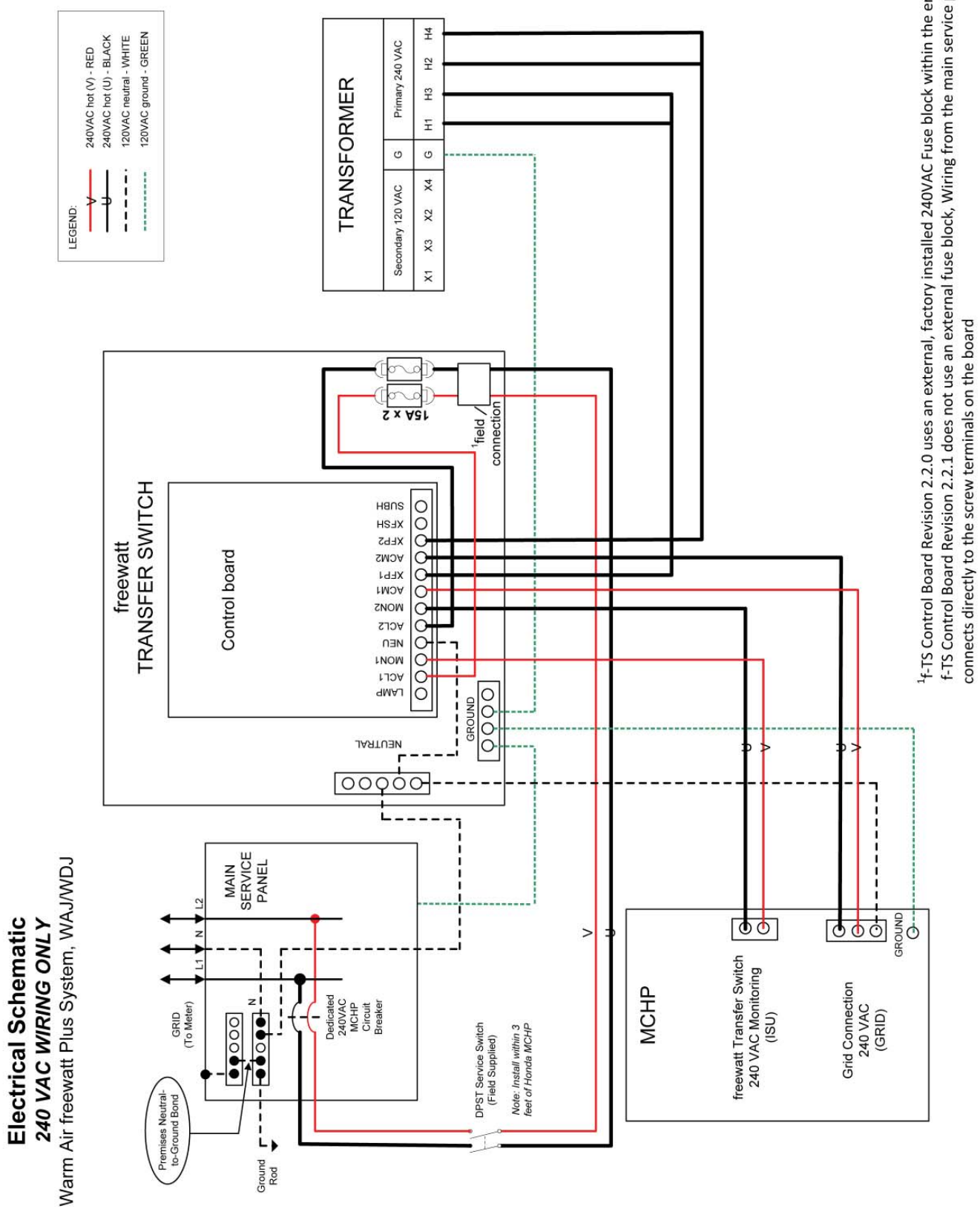


Figure 19-2 120 VAC Wiring, Warm Air freewatt PLUS System, WAJ/WDJ

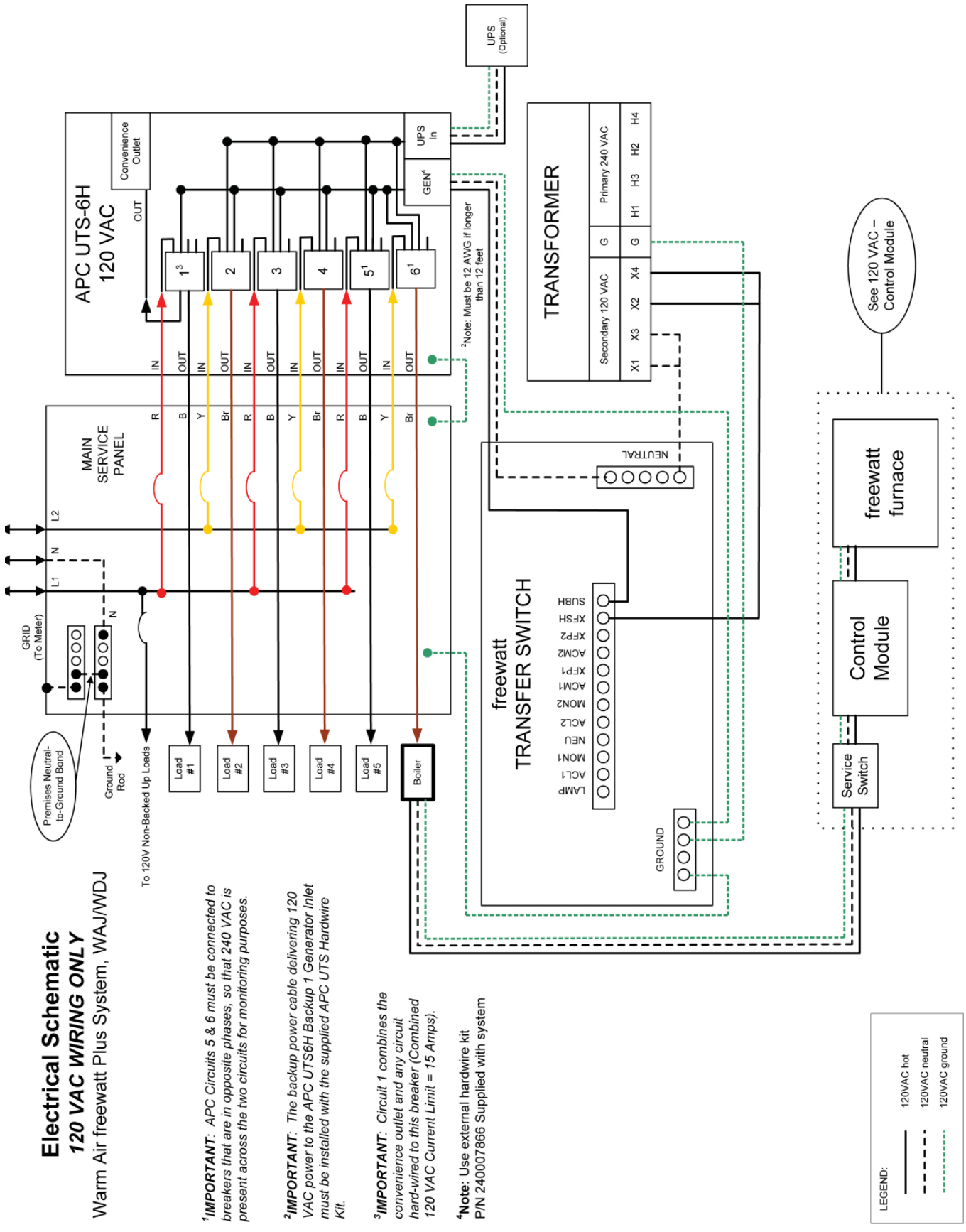
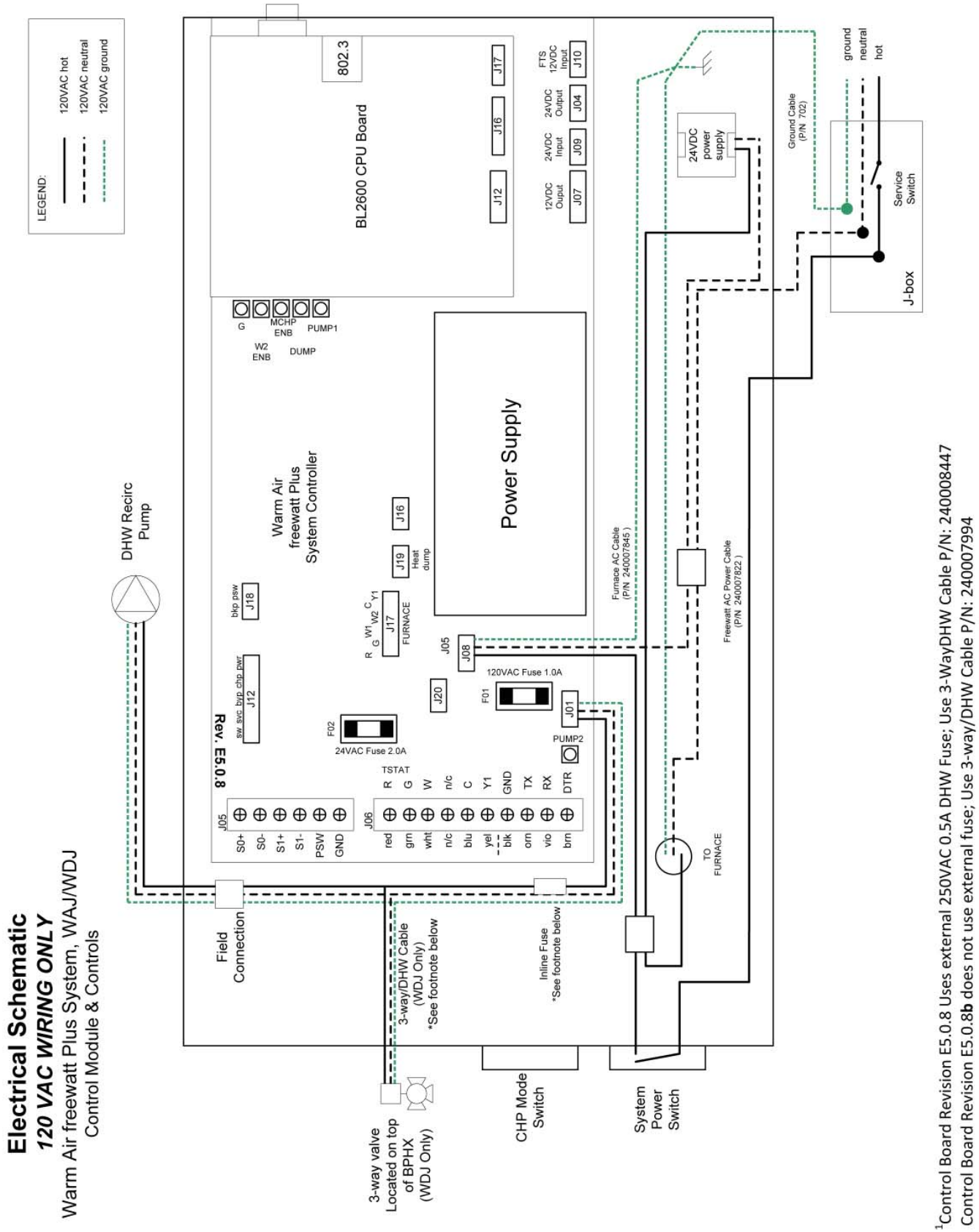


Figure 19-3 120 VAC Wiring, Warm Air freewatt PLUS System, WAJ/WDJ, - Control Module & Controls



[1]Control Board Revision E5.0.8 Uses external 250VAC 0.5A DHW Fuse; Use 3-WayDHW Cable P/N: 240008447
Control Board Revision E5.0.8**b** does not use external fuse; Use 3-way/DHW Cable P/N: 240007994

Figure 19-4 Low Voltage Wiring, Warm Air freewatt PLUS System, WAJ/WDJ

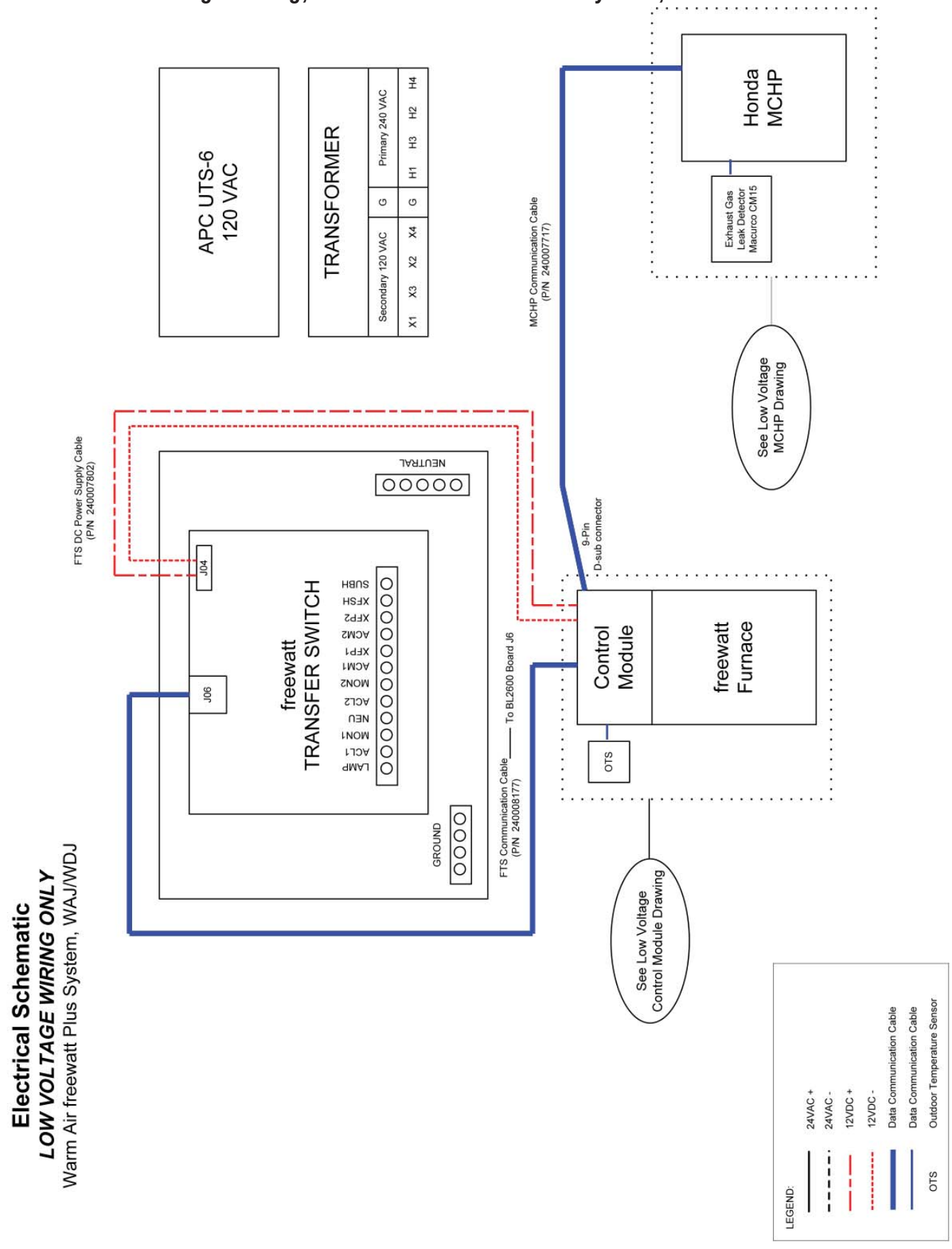


Figure 19-5 Low Voltage Wiring, Warm Air freewatt PLUS System, WAJ/WDJ - Control Module & Controls

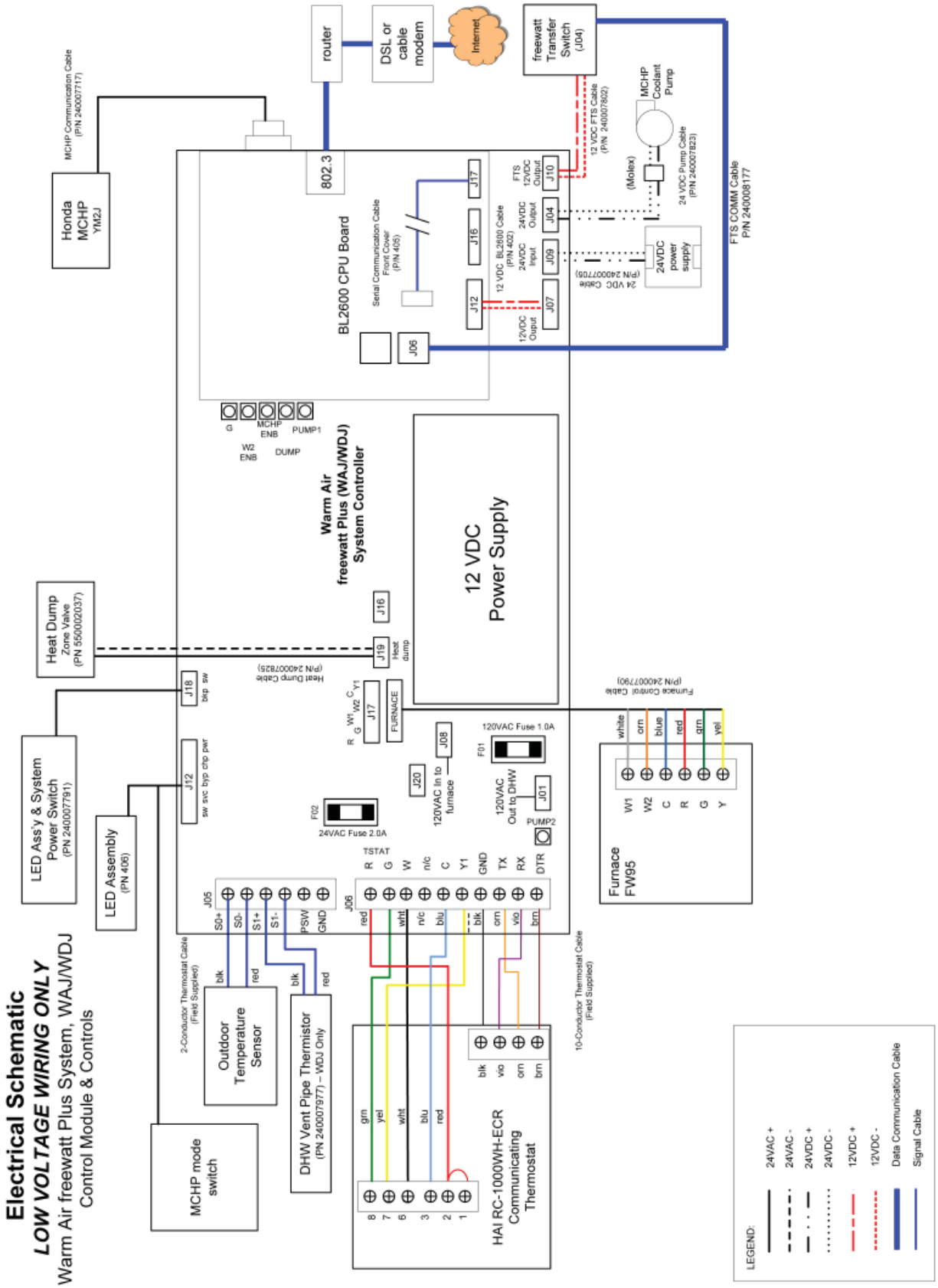
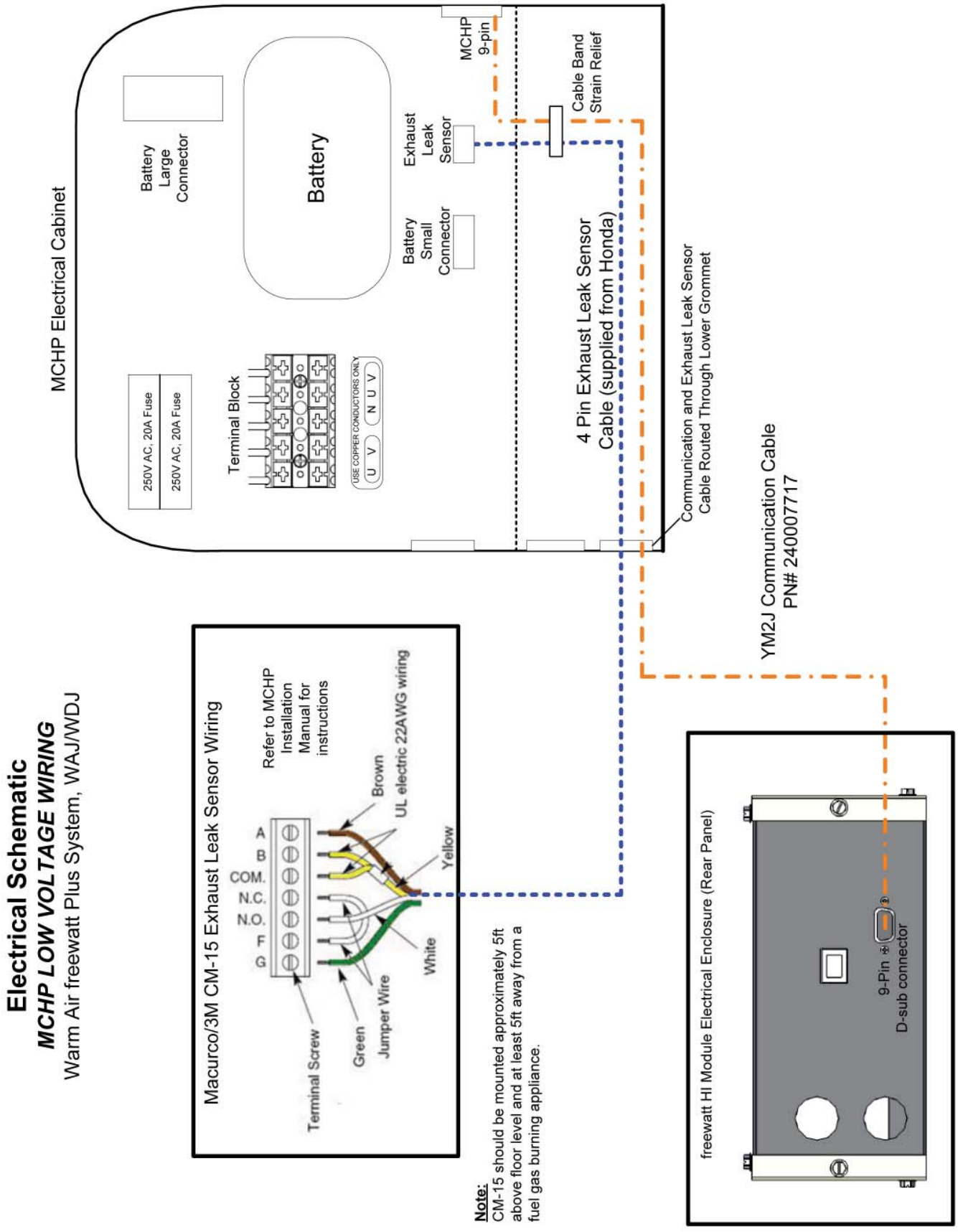


Figure 19-6 Low Voltage Wiring, Warm Air freewatt PLUS System, WAJ/WDJ, MCHP Unit



20 – TROUBLESHOOTING

⚠ WARNING

Use caution to avoid touching live electrical contacts. Following procedures may expose you to dangerous line voltage. All service must be performed by trained, experienced service technician. Electrical shock could cause serious injury or death.

⚠ WARNING

Shut off gas at location external to appliance if overheating occurs or gas supply fails to shut off, do not turn off or disconnect electrical supply to furnace or hybrid integration module.

Do not use system if any part of gas control system (furnace or MCHP unit) has been underwater. Qualified service technician should inspect system and replace any part of control system and any gas control, which has been underwater.

Use only your hand to turn gas control knob. Never use tools. If knob will not turn by hand, don't try to repair it. Force or attempted repair could result in fire or explosion.

⚠ CAUTION

WHAT TO DO IF YOU SMELL GAS.

Do not try to light appliance.

Do not touch any electrical switches. Do not use any phones in your building.

Immediately call your gas supplier from a neighbor's phone. Follow gas supplier's instructions.

If you cannot reach your gas supplier, call Fire Department.

⚠ CAUTION

Turn system OFF and allow coolant to drop in temperature if troubleshooting system involves draining MCHP coolant. Failure to perform this act may result in serious injury or coolant spills.

20 - TROUBLESHOOTING

20.1 General Troubleshooting

Warm air **freewatt PLUS** consists of several major components: Furnace, Hybrid Integration (HI) Module, Honda MCHP, **freewatt** Transfer Switch, APC Universal Transfer Switch and **freewatt** Communicating thermostat. **freewatt** system and HI Module troubleshooting information is outlined below. Refer to respective installation and service manuals for other components.

IF	AND	CHECK OR REPAIR
NO HI MODULE OPERATION		**1.** 120 VAC ELECTRICAL CONNECTIONS **2.** BLOWN FUSE ON CIRCUIT BOARD
NO FURNACE OPERATION		**1.** THERMOSTAT SETTINGS **2.** LOWER FURNACE ACCESS PANEL MUST BE INSTALLED
HONDA MCHP OVERHEATS		**1.** PUMP FUNCTIONING PROPERLY **2.** FURNACE AIR BLOWER OPERATING PROPERLY **3.** AIR IN COOLANT **4.** QUICK DISCONNECT IS FULLY ENGAGED **5.** LLC IN AND LLC OUT PIPING CORRECTLY INTO HONDA MCHP **6.** MIXING VALVE SETTING
NO POWER TO THERMOSTAT	THE DISPLAY IS BLANK	**1.** LOWER FURNACE ACCESS PANEL MUST BE INSTALLED **2.** FUSE IN THERMOSTAT **3.** FAULTY WIRE CONNECTION
NO HONDA MCHP OPERATION		**1.** SEE ALARM CODE SECTION

20.1 Control Board LED Interpretation:

Status of (lighted or not) 6 LEDs can be observed by removing cover of **freewatt** control module. Control board LEDs are valid only in Combined Heat and Power Mode (CHP Mode switch is on). They are not used when system is in Bypass Mode.

	LED ON	LED OFF
G	Blower fan is enabled	Blower Fan is off
W2 Enb	Furnace stage 2 enabled	Furnace stage 2 not enabled
MCHP Enb	MCHP Enabled*	MCHP not enabled*
Dump	Heat Rejection Valve is energized	Heat Rejection Valve is closed
Pump1	HI Module coolant pump is on	HI Module coolant pump is off
Pump2	DHW Pump and 3-Way 120VAC valve activated	DHW Pump and 3-Way 120VAC valve off
*Note: The MCHP Enabled LED does not necessarily mean MCHP is running. This LED indicates MCHP is enabled and communicating with freewatt controller		

21 – ALARM CODE SECTION

ERROR CODE	INDICATES	CHECK OR REPAIR
1	THERMOSTAT COMMUNICATIONS ERROR	1. CHP MODE SWITCH IN **ON** POSITION 2. CABLES AND CONNECTIONS BETWEEN THE THERMOSTAT AND THE HI MODULE 3. LOWER FURNACE ACCESS PANEL INSTALLED 4. IMPROPERLY PROGRAMMED THERMOSTAT
2	OUTDOOR SENSOR ERROR	1. CHECK OUTDOOR SENSOR AND CONNECTION OR INTERNAL 20k OHM DEFAULT RESISTOR
3	MCHP COMMUNICATIONS ERROR	1. RESET SYSTEM POWER 2. POWER TO MCHP 3. CABLES AND CONNECTIONS BETWEEN HONDA MCHP AND HI MODULE
4	MCHP DEVICE ERROR (MCHP ASSERTING “FAILURE” STATUS, IE. A HARD ERROR)	CHECK HONDA MCHP DIAGNOSTICS
5	MCHP DEVICE WARNING (MCHP ASSERTING “WARNING” STATUS, IE. A SOFT ERROR)	
6	**freewatt PLUS** FLASH PARAMETER INTEGRITY CHECK ERROR	SERVICE REQUIRED
7	SYSTEM POWER SWITCH OFF, UNABLE TO ENTER BACKUP MODE (NOTE: NOT DEFINED IN HYDRONIC SYSTEM)	
8	MCHP PLACED IN LOCKED MODE BY SERVICE TECH, PREVENTS MCHP OPERATION	
9	RESERVED FOR FUTURE USE	
10	ERROR CODE 10 NOT USED	
11	LOW DWELLING TEMPERATURE. BOILER DOWN OR THERMOSTAT “OFF” BY MISTAKE	
12	RESERVED FOR FUTURE USE	
13	VIRTUAL WATCHDOG TIME-OUT. AN UNEXPECTED FIRMWARE EXECUTION ERROR OCCURRED.	REPLACE CONTROLLER MODULE
14	EXHAUST GAS LEAK SENSOR FAILURE, HONDA MCHP ERROR 39.0 (EX_SENS_FAIL)	
15	EXHAUST GAS LEAK SENSOR POWER FAILURE, HONDA MCHP ERROR 39.1,(EX_SENS_POWER_FAIL)	
16	EXHAUST GAS LEAK SENSOR ALARM, COMBUSTION GAS DETECTED, HONDA MCHP ERROR 10.1, (EX_LEAKAGE_FAIL)	
17	NO DC POWER SUPPLY VOLTAGE DETECTED IN BACKUP MODE. (LOAD_PWR_FAULT)	INDICATES A FAULT IN 120V LOAD CIRCUIT
18	DETECTED A **freewatt PLUS** TRANSFER SWITCH COMMUNICATIONS FAILURE	Check fTS communications cable
19	DETECTED A **freewatt PLUS** TRANSFER SWITCH DEVICE ERROR	see **freewatt** transfer switch IOM
20	ERROR CODE 20 NOT USED	
21	DETECTED A **freewatt PLUS** TRANSFER SWITCH STATE ERROR	see **freewatt** transfer switch IOM
22	RESERVED FOR FUTURE USE	
23	DETECTED A **freewatt PLUS** TRANSFER SWITCH CONTACTOR #1 ERROR	see **freewatt** transfer switch IOM
24	DETECTED A **freewatt PLUS** TRANSFER SWITCH CONTACTOR #2 ERROR	see **freewatt** transfer switch IOM
25	EXHAUST GAS LEAK SENSOR TEST BUTTON PRESSED	
26	VOLTAGE DETECTED ON THE **freewatt PLUS** TRANSFER SWITCH ISLAND NODES (I1 OR I2) IN BACKUP POWER MODE	see **freewatt** transfer switch IOM
27	RESERVED FOR FUTURE USE	
28	MISSING L1 OR L2 OF AC POWER (fTS_AC_FAULT)	BLOWN FUSE, FAULTY WIRING, UTILITY FAULT
29-98	RESERVED FOR FUTURE USE	
99	VIRTUAL WATCHDOG TIME-OUT OCCURRED 5 OR MORE TIMES. MULTIPLE UNEXPECTED FIRMWARE EXECUTION ERRORS OCCURRED.	REPLACE CONTROL MODULE

22 – CONTROL MODULE FUSES

⚠ WARNING

Always disconnect power to system before servicing. When servicing controls label all wires prior to disconnection. Wiring errors can cause improper and dangerous operation. Failure to comply could result in severe personal injury, death or substantial property damage.

Never jumper (bypass) any device except for momentary testing as outlined on following pages of this manual. Severe personal injury, death or substantial property damage could result.

NOTICE

On board fuses are not available from ECR International. Service technicians should provide fuses for **freewatt PLUS** service from local suppliers.

⚠ WARNING

Do not jumper fuse or replace with any fuse except as specified. Failure to comply could result in severe personal injury, death or substantial property damage

NOTICE

Always check control module fuses before replacing system control module or any major components (pump, motor, etc.). If fuse is blown, it can prevent system control module or other components from operating.

Figure 22-1 Control Module Fuses

Fuse List						
Location	**Qty**	**AMP**	**Voltage**	**Shape**	**Size**	**Notes**
HI Module (Control Board, F01)	1	1	120	Cylinder	5mm x 20 mm	-
HI Module (Control Board, F02)	1	2	24	Cylinder	5mm x 20 mm	-
HI Module (120V DHW Cable, Inline, WDJ Only)*	1	0.5	250 VAC	Cylinder	6.35” x 31.8”	Fast Acting
Furnace (Control Board, F1, Right Side)	1	5	12-32	Blade	Standard Blade	-
MCHP	1	1	650 DC	Cylinder	6.35mmx 31.8mm	Refer to MCHP Shop Manual
MCHP	2	20	600 AC	Cylinder	10.3mm x 38mm	Refer to MCHP Shop Manual
APC (Control Board)	6	15	600 VAC	Cylinder	10.3mm x 38.1mm	Littlefuse KLKR 15

* Control board revision E5.0.8 requires inline fuse, use 3-way DHW cable 240008447
Control board revision E5.0.8b does not require inline fuse, use 3-way DHW cable 240007994

NOTES:

NOTES:

NOTES:

freewatt®

ecr innovative living™

P.O. Box 4729
Utica, NY 13504-4729
www.**freewatt**.com
www.ecrinternational.com

MEMBER: *The Hydronics Institute*